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The Effectiveness of Health Expenditure on Health related Developmental Goals and Targets in South-East Asia Region

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ABSTRACT

Using panel data from 10 South-East Asia Region (SEAR) countries in 2000-2014, this paper examines the effectiveness of health expenditure on health goal and target, by controlling social, institutional and economic factors. We categorized total health expenditure into the public component, resources from domestic and external sources to government and private component, resources from private insurance and private out-of-pocket expenditure. We find that the impact of various components of health expenditure is quite small, the coefficient is numerically small and statistically insignificant on child & infant mortality as well as immunization coverage, controlling deadly diseases, nutrition. Further, it finds that private out-of-pocket expenditure has some significant impact on reducing child mortality and improving life expectancy, by controlling female education, urbanization, government effectiveness, political stability, UHC index, and immunization score. These findings imply that public component of health expenditure would become more effective towards achieving health-related developmental goals and targets if government prioritize health budget and allocate more funds in order strengthen healthcare systems.

Key words: Health expenditure, Infant mortality, Immunization, Universal Health Coverage, Government effectiveness, South-East Asia Region

The Effectiveness of Health Expenditure on Health related Developmental Goals and Targets in South-East Asia Region

1. INTRODUCTION

The recently adopted United Nations post-2015 Sustainable Development Goals (SDGs) provides certain health goals and targets to ensure healthy lives for all by 2030. Similarly, outgoing post-2000 Millennium Development Goals (MDGs) focused on reducing infant, child and maternal mortality (Goals 4, 5); control of HIV/AIDS, malaria and Tb (Goal 6); reduce undernutrition (Goal 1); full access to clean drinking water and sanitation (Goal 7), especially in the low and middle-income countries, by 2015 (Boerma, 2015). The initiation of SDGs and MDGs health goals had put up on post-1978 Alma Ata Declaration[1], provide socially and economically productive life for all by 2000. Health financing for Universal Health Coverage (UHC) is central in post-2015 SDGs, ensures financial protection to people at the time of seeking care. Improve government funding for health and reduce private out-of-pocket health expenditure, strategy towards health financing has gain impetus by the 2010 World Health Report on health financing for UHC, followed by the 2001 Abuja Declaration[2] of African Union countries. The Abuja Declaration proposed that government funding for health should increase to at least 15% of total government budget and emphasized on external assistance for health (World Health Report, 2010). For the time period under our study (2000-2014), only a few low and middle-income countries attained and sustained the 15% target

[1] Access to basic primary health care services to developing counties, which involved universal, community-based preventive and curative services, with substantial community involvement, was affirmed as a fundamental human rights by the Declaration of Alma-Ata in 1978 (Hall and Taylor, 2003).

[2] The Abuja Declaration: http://www.who.Int/healthsystems/publications/abuja_10.pdf.

and most countries health expenditure creeping around 5% of total government budget (NHA, WHO).

Using average values during 2000-2014, Figure 1 shows that South-East Asia Region (SEAR) has experienced an increase in all the key categories of health expenditure since 2000. Government health expenditure from domestic and external sources and private health expenditure channeled through private insurance and non-governmental organization account for most of the increase in expenditure. In addition to the increasing life expectancy, Table 7 in Appendix B shows that the compound annual growth rates of the infant and child mortality during 2000-2014 are negative, implying that these rates have been declining. Despite the notable progress of SEAR towards MDGs 4 and 5 but achievement remains below the potential level of Goals 1, 6 and 7. In the light of recent SDGs, against the backdrop of the upsurge in health expenditure since 2000, this paper attempts to find out whether the increased spending on health in South-East Asia Region (SEAR) has produced better health outcomes. Second, we try to establish the condition under which type of spending on health can become more effective in SEAR.

The paper finds the link between health expenditure and health outcome in three stages. First, we examine the effects of health spending on the health goals, namely, life expectancy at birth, as well as infant and child mortality rates, while controlling Tb detection rate, female education, urbanization, UHC index, government effectiveness, political stability and mobile phone subscription. Second, we examine the effects of health spending on health targets, which are immunization, nutrition, the prevalence of a disease such as malaria and Tb. Third, we examine the effects of the health targets on the health goals, while controlling for per capita income. The effectiveness of health expenditure on health outcomes is of interest to us because it captures the cost-benefit relationship of health expenditure of SEAR.

Investigating health outcome is SEAR is of significant importance, not only due to the nexus between health and economic growth but also as Ranis et al. (2000); and Suri et al. (2011) put it: there are two-way relationships between better human development (measured in increase life expectancy and improves infant & child mortality) and economic growth (measured in labour productivity and rising income). They argued that investment in health, education, and other aspects of human development involves fixed costs that can create higher social returns to various levels of human capital and may result in high level of economic returns in long run. Therefore, strong long-run growth without accompanying human development may not produce sustainable growth. However, as pointed out by Ciccnoe et al. (2014), the health system is associated with governance failure such as less transparent, poor accountability; corrupt health care practices in private doctors; and asymmetrical information between needs and uses of health care, all of which might call for government interventions. We, therefore, focus on health expenditure, especially public health expenditure of both domestic and foreign (external) resources that would exhibit the sensitivity of government towards health care.

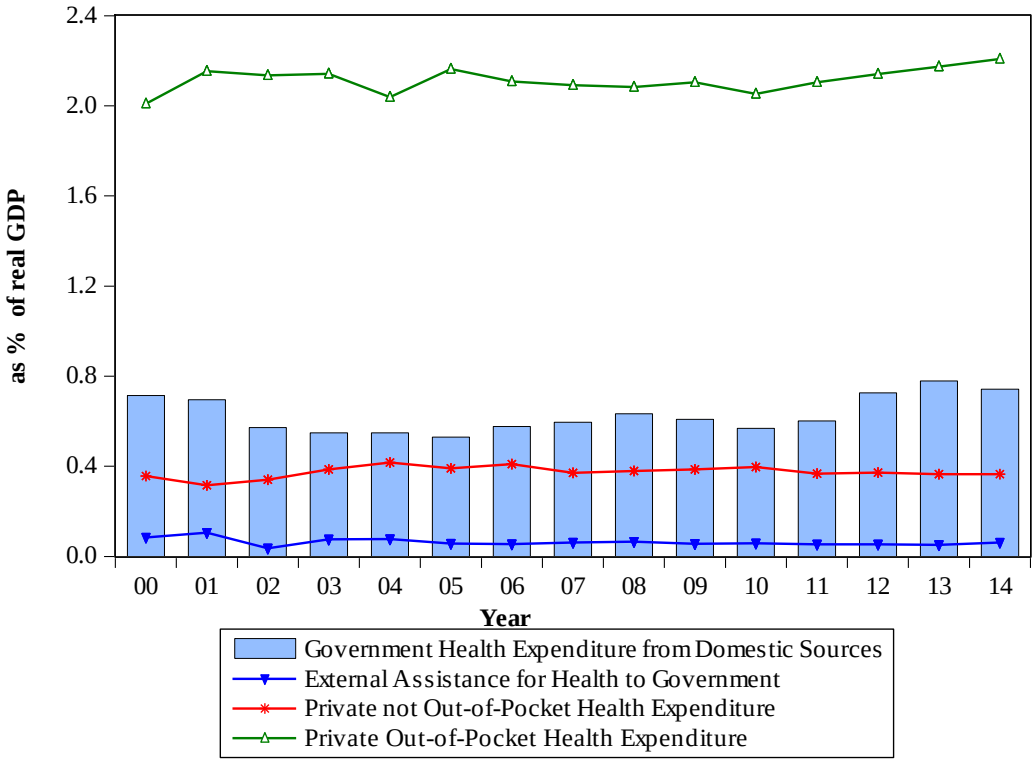

Figure 1. Percentage of health expenditure in South-East Asia (2000-2014)

2. LITERATURE REVIEW

The literature on the effectiveness of spending on health outcome has had diverse attentions including public and private spending, development (external) assistance for health and the role of institutional, social and political factors. Studies on the association of public health spending and health outcomes have found mixed response: While some find an insignificant relationship or weak link between health spending and health outcome, others find stronger and positive effects. Filmer and Pritchett (1999) use cross-sectional data for 100 countries (both developing and industrialized) for 1992-93 to examine the impact of both public spending on health in determining child and infant mortality. They find that the impact of public spending on health mortality is quite small and statistically insignificant. They argued, 95% of cross-country variation in mortality can be explained by non-health factors such as country's per capita income, female education, inequality of income distribution and level of ethnic fragmentation. Other earlier studies also find there is no

cross-national association between public health spending and infant or under-5 mortality at the national level (Barlow and Vissandjee, 1999; Musgrave, 1996). Using same non-health factors for determining child mortality, McGuire (2006) find that maternal & child health care provision (share of birth attendance by trained personnel) is found to be strongly and robustly associated with lower under-5 mortality, controlling for per capita income, female education, income inequality, ethnolinguistic fractionalization. By contrast, indicators of health care spending, per capita availability of doctors, nurses, and hospital beds are found to have no association with under-5 mortality. A similar argument is those of Bryce et al., 2003; Jones et al., 2003, find that specific maternal and infant health care interventions, including immunization, promotion of breastfeeding and oral rehydration, have all been found to be associated with lower under-5 mortality.

In contrast to Filmer and Pritchett (1999), Crémieux et al. (1999), using Canadian provisional data over the period 1978-1992, find that lower health care expenditure is associated with a statistically significant increase in infant mortality and a decrease in life expectancy. It argues that lifestyle factors such as higher alcohol consumption and a larger percentage of smokers in the population both have a negative impact on gender specific life expectancy and infant mortalities. Rajkumar and Swaroop (2008) use data for 1990, 1997 and 2003 for 91 developed and developing countries finds that public health spending lowers child (under-5) mortality rates, by controlling governance indicators (corruption and quality of bureaucracy). They argued that rich countries have lower child mortality due to good governance and linked to the efficiency of public health spending than poor countries with bad governance. Gupta et al. (2002) use cross-sectional data for 50 developing and transition countries for 1993-94 to show the effects of increase public health expenditure on child and infant mortality. The result shows that the elasticity of infant and

child mortality with respect to health spending is -0.3 percent. The coefficient estimates suggest that increasing the share of health spending in GDP by 1 percentage point decreases child and infant mortality rates by about 3 death per 1000 live births. Rajkumar and Swaroop (2008); Gupta et al. (2002) find that increased public spending on health is associated with a reduction in both infant and child mortality rates, but that relationship is weak. They argued that Heath outcome is primarily affected by per capita income, adult education, increasing urbanization, and access to good sanitation & safe water.

In contrast to literature that argues the weak or insignificant association between public health spending and health outcome, others find strong positive effects. Nikon and Ulmann (2006) use fixed effect panel data estimation for data of 15 European countries in 1980-1995 and find that increase in health care expenditure are significantly associated with larger improvements in infant mortality and life expectancy. Anyanwu and Erhijakpor (2009) use fixed effect panel estimation for data of 47 African countries in 1999-2004 and find that total health expenditure and public health expenditure is negatively and significantly related to child and infant mortality rates. They found that female literacy and physician density are significantly correlated with the reduction of both child and infant mortality rate. Further, they found weak positive effects of urbanization and per capita income on both health outcomes. Novignon et al. (2012) uses fixed effect panel estimation for data of 44 sub-Saharan Africa countries in 1995-2010, and find that total health spending, whether public or private, significantly improves the life expectancy at birth. Similarly, total health expenditure, irrespective of the sources, significantly reduces the number of infant and child deaths per 1000 live births. They found that public sources of health spending have a higher impact on health outcomes relative to private sources of health spending. Other earlier studies that

find a strong positive association between health care expenditure and health outcome (Bidani and Ravallion, 1997; Gupta et al., 2003; and Anand and Ravallion, 1993).

Some earlier studies find a positive association between health care expenditure and health outcome, controlling governance indicators. The studies such as Farag et al. (2013); Rajkumar and Swaroop (2008); and Baldacci et al. (2008), find that good governance is the key factors for the effectiveness of health spending by improving health outcomes. Baldacci et al. (2008) use panel data of 118 developing countries in 1971-2000 to explore the channels linking social spending, human capital, and growth, by controlling government policy intervention such as improving governance and taming inflation. They find that health spending has a positive and significant direct impact on the accumulation of health capital and a positive and significant indirect impact on growth. An increase in health spending of 1 percentage point is associated with an increase of 0.6 percentage point in the under-5 child survival rate and a rise of 0.5 percentage point in annual per capita GDP growth. They argued that without improving governance, heath spending alone is likely insufficient to achieve health-related MDGs. Farag et al. (2013) use panel data of 133 low and middle-income countries in 1995-2006 and find total health spending, as well as government health spending, has a significant effect on reducing infant and child mortality, by controlling government effectiveness. Lewis (2006) also finds that government effectiveness has a stronger effect in health service delivery such as immunization coverage and reduce under-5 mortality rate in developing countries. Yaqub et al. (2012) use time series data of Nigeria in 1980-2008 and finds that public health expenditure has a negative effect on infant mortality and under-5 mortality, by controlling corruption index. It argues that as the level of corruption goes down and value of the corruption perception index rises, there is more likely to lead to an improvement in health status. Navarro et al. (2006) use panel data of OECD countries over the period 1950-2000, examine the

complex interaction between political institutions, public policies and health outcome, and find that political ideologies of ruling parties affect some indicators of population health. It argues that public policies that aimed at reducing social inequalities have positive effects on mortality and life expectancy at birth.

Studies on the effectiveness of foreign aid/external assistance/development assistance on health outcome have founded mixed response from the literature. Williamson (2008) use panel data of 208 countries from 1973 to 2004 and find that health aid is ineffective at increasing overall health, and is an unsuccessful tool to promote human development. Wilson (2011) use panel data of 96 high mortality countries from 1975 to 2005 and finds that development assistance for health has no effects on mortality rate. Ravishankar et al. (2009) argue that developmental assistance for health has increased from 5.6 billion dollars in 1990 to 21.8 billion dollars in 2007 in low-income and middle-income countries, resulted in increased fund for family planning, infectious disease, and immunization etc. Both Williamson (2008); and Wilson (2011), argues that such increment of health aid on family planning, infectious disease, and immunization campaign have unsuccessful to translate overall population health. In contrast to Williamson (2008) and Wilson (2011), Mishra and Newhouse (2009) use panel data of 118 countries between 1973 and 2004, find that health aid has a beneficial and statistically significant effect on infant mortality. It implies that increasing per capita health aid by US$ 1.60 per year is associated with 1.5 fewer deaths per thousand births.

We study countries that are exclusively selected from SEAR because: first, despite decades of economic growth and development in countries that belong to the SEAR region, most countries in this region still have a high burden of communicable diseases such as TB, Malaria and HIV/AIDS; second, one-third of the world's burden of tuberculosis (TB), or about 4.9 million prevalent cases, is found in this region; thirdly, approximately 130 million people in the SEAR

still lack access to one or more essential health services and at least 60 million are impoverished as a result of health-care costs; fourth, highest tobacco Death and Disability Adjustment Life year lost due to higher consumption of tobacco, particular in SEAR (WHO-SEAR report, 2016). Gupta and Guin (2010) analyze the impact of health funding on progress towards MDGs for communicable diseases in the region. The analysis indicates that current levels funding are inadequate and need to be expanded in highly disease burden countries. It finds that the effectiveness of health funding depends on the complex set of factors, including behavioral, environmental and health system factors that determine the burden of communicable diseases. Nair et al. (2010) argue that financial support from the global fund to fight HIV/AIDS, TB and malaria have increased over the period in SEAR. Despite the surge of health aid, health system challenge remains to unfold due to chronic staff shortage, inadequate laboratory facilities, and weak procurement. They suggest that stronger commitment of the government to using domestic and external funding more effectively and improve the health system. Palipudi et al. (2014) use Global Adult Tobacco Survey data of four SEAR countries, namely Bangladesh, India, Indonesia, and Thailand, and find that prevalence of tobacco use varied across countries irrespective of gender, age, education, and wealth. They suggest that tobacco control activities should take into account cultural, social and demographic factors for progress towards MDGs. Above all, the incidence of the three critical diseases, namely TB, malaria and Tobacco death, is highest in SEAR. Our innovation in this study are; first, we use universal health coverage index to capture health services coverage across SEAR, employing 16 tracer indicators of World Health Organization; second, we look into the effectiveness of health expenditure on SDGs by controlling simultaneously political, institutional, social and economic factors; third, this will be the first empirical investigation of effectiveness of health expenditure on sustainable development health goals and targets in South

East Asia region. Therefore, there is a need for SEAR-specific studies of the effectiveness of healthcare expenditure on health system goals and targets.

3. DATA DESCRIPTION AND ESTIMATION METHODOLOGY

3.1 Data Description

The dataset is made up of 10 countries (Bangladesh, Bhutan, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste) of South-East Asia Region (SEAR) over the time period 2000-2014. The country sample is determined by data availability on health expenditure, life expectancy, and the infant and child mortality rates. For instance, countries such as the Democratic People's Republic of Korea was not included due to data paucity on health expenditure. The time period 2000-2014 enables us to capture the surge in health expenditure since the enactment of the MDGs (2000), and long enough to allow us to examine the effectiveness of the financial upsurge into the health sector.

Table 1. *Descriptive statistics*

Variables	Obs.	Mean	Std. Dev.	LEI correlation with variables	IMR correlation with variables	CMR correlation with variables	THE correlation with variables
Life expectancy index (LEI)	150	74.41	6.43	1			
Infant mortality rate (IMR)	150	37.23	18.73	-0.922***	1		
Child mortality rate (CMR)	150	47.58	25.21	-0.925***	0.994***	1	
DPT immunization	150	85.65	12.91	0.752***	-0.775***	-0.760***	0.268***
BCG immunization	150	90.58	8.84	0.714***	-0.728***	-0.704***	0.382***
Measles immunization	150	84.18	12.79	0.778***	-0.840***	-0.824***	0.295***
Malaria cases reported (MALARIA)	135	260509.1	504396.6	-0.297***	0.277***	0.305***	0.118
Tb cases detection rate (TB)	150	58.08	20.94	0.191**	-0.132	-0.152*	0.383***
Prevalence of undernourishment (UNPOP)	135	20.23	9.59	-0.485***	0.503***	0.499***	-0.470***
PUBHE	150	2.10	1.81	0.465***	-0.441***	-0.439***	0.567***
PRIVHE	150	1.92	0.98	-0.061	0.045	0.078	0.678***
GHEDS	150	1.81	1.63	0.586***	-0.526***	-0.526***	0.4257***
EAHG	150	0.26	0.33	-0.428***	0.404***	0.386***	0.398***
PNOOP	150	0.33	0.28	0.174**	-0.152**	-0.164**	0.309***
POOP	150	1.59	0.84	-0.1431*	0.120	0.161**	0.678***
Mobile cellular subscriptions (MOBILE)	150	42.38	46.27	0.715***	-0.665***	-0.679***	0.101
Universal Health Coverage index (UHC)	150	52.38	24.85	0.132	-0.181**	-0.200**	0.162**
Immunization coverage index (IMM)	150	72.96	17.37	0.750***	-0.792***	-0.792***	0.187**
Government effectiveness (GOVEF)	150	-0.38	0.58	0.365***	-0.456***	-0.449***	0.354***
Political stability	150	-0.76	0.87	0.124	-0.106	-0.125	0.070
Gender parity index (GPI)	150	0.98	0.06	0.463***	-0.393***	-0.404***	-0.261***
Percentage of urban population (URBAN)	150	30.63	9.52	0.221***	-0.288***	-0.301***	-0.324***
Real per capita GDP (PCGDP)	150	2328.00	1855.22	0.724***	-0.643***	-0.665***	-0.124

Notes: Obs. =observation; Std. Dev. = standard deviation; ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. Real GDP = Gross Domestic Product; THE=Total health expenditure as percent of GDP; PUBHE = Public health expenditure as percent of GDP; PRIVHE = Private health expenditure as percent of GDP; GHEDS = Government health expenditure from domestic sources as percent of GDP; EAHG = External assistance for health to government as percent of GDP; PNOOP = Private not Out-of-Pocket health expenditure as percent of GDP; POOP = Private Out-of-Pocket health expenditure as percent of GDP.

Table 7a in Appendix B provides the list of SEAR countries included in this analysis, along with the compound annual growth rates of life expectancy, and the infant and child mortality rates. Table 7b in Appendix B shows that the compound annual growth rate of the proximate targets such as immunization coverage, the prevalence of malaria, Tb detection rate and prevalence of undernourishment. We find that the reduction of malaria has seen in larger extent across SEAR especially, Bhutan and Sri Lanka. While reduction of undernutrition population and immunization coverage have seen slower growth rate across the SEAR.

Following SSozi and Amlani (2015), we categories health expenditure in various components are: total health expenditure (THE), public health expenditure (PUBHE), private health expenditure (PRIVHE), external assistance for health to government (EAHG), government health expenditure from domestic sources (GHEDS), private not out-of-pocket (PNOOP) and private out-of-pocket (POOP), sourced from global health expenditure database of the World Health Organization (WHO). The healthcare outcome variables are distinguished between ultimate goal and proximate target. The ultimate healthcare goals are the life expectancy index, and the infant and child mortality rates. The proximate healthcare targets are the percentage of immunized children; the cases of malaria reported at a health facility; Tuberculosis case detection rate of all forms; and the percentage of the population that is undernourished. All healthcare outcome variables are sources from the World Development Indicators (WDI) of the World Bank. The details description of the included variables is defined in Table 6 of Appendix A.

Table 1 reports the summary statistics of the variables. We include the correlation coefficients between life expectancy, infant and child mortality rates, total health expenditure and all other variables. Almost all of the correlations are statistically significant and with expected signs. However, PRIVHE is negatively correlated with life expectancy and positively correlated

with both infant and child mortality rates. PRIVHE and POOP are not significantly correlated with child and infant mortality rates. Political stability is not significantly correlated with LEI, IMR, CMR and THE. The UHC is key targets for achieving SDGs, we find that average health coverage around 52.38% across SEAR while the immunization coverage is 73%. So, it needs to improve up to 100% coverage to achieve optimum health outcome. Since correlation can only indicate the absence or present of relationships, not the nature of the relationship and the reported correlation coefficient value are not very informative, we apply Dynamic panel model with fixed effect estimation which can take care endogeneity as well as unobserved country-specific and time-invariant factors determining health outcome.

3.2 Estimation Methodology

We use simple OLS fixed effect estimation with a set of predetermined and control variables, on a sample of that pools all country-year observations. Our most basic OLS regression equation specifies health outcome (proximate goal and ultimate target) as a function of health expenditure in the previous period, as follows:

$$Ln(Y)_{it} = \alpha Ln(H)_{it-1} + \gamma Ln(Y)_{it-1} + \beta Ln(X)_{it} + \nu_t + \varepsilon_{it} \quad (1)$$

Where Y_{it} stands for the dependent variables, which are the ultimate goals and proximate targets of country *i* in period t, Y_{it-1} is one period lagged dependent variable, H_{it-1} stands vector of key predetermine variables, which are different categories of health expenditure in country *i* during the previous period, and X_{it} is a vector of other control variables such as female education (GPI), urbanization (URBAN), mobile phone subscription (MOBILE), universal health coverage index (UHC), government effectiveness (GOVEF) and political stability. ν_t is a vector of the period of dummies, which captures the effects of time trends while ε_{it} is the observations error term.

Both dependent and independent variables are specified in the logarithmic form, as is common in the literature[3]. The log-log specification standardizes the data by reducing or eliminating skew because regression can be influenced a lot by outlier or leverage point of one or both variables. It also allows for interpretation of the regression coefficients as elasticities. Lagged dependent and predetermined variables are introduced in the model to capture the country's initial health and economic status. All control variables are lagged one period to address potential endogeneity of the controls[4]. The parameters α give the percent change in health outcome due to a one percent increase in the previous period's health expenditure as a ratio of GDP. α is identified by using both across- and within-country variation[5].

The OLS results are biased if lagged health expenditure is correlated with the unobserved characteristics of infant mortality such as human behavior, human physiology and geographical location, which is country specific. In particular, if countries receive more health expenditure from government and external sources as health outcome deteriorates, the beneficial effects of health expenditure would be underestimated. Another potential source of bias is measurement error. Since the health expenditure data is reported by the individual country and drafted by the WHO, any measurement error is likely to be correlated with the characteristics of the individual country, which would imply that any beneficial effects health expenditure would be further underestimated.

[3] See, for example, Mishra and Newhouse (2009), Williamson (2008), and Wilson (2011).
[4] The results presented in the paper are qualitatively similar if the contemporaneous values of control variables are used. We reported only lagged health expenditure variables and other control variable are in level form. But results are quite similar, after adding one period lag of all other control variables such as UHC, URBAN, MOBIL, GOVEF, Political stability and GPI.
[5] The results in the paper are quite similar if we use health expenditure in level form (in logs) as the explanatory variables. The result will be available upon request.

Country fixed effects can be introduced in the model to control for unobserved country-specific and time-invariant factors that determine health outcome. The fixed effect regression is specified as follow:

$$Ln(Y)_{it} = \alpha Ln(H)_{it-1} + \gamma Ln(Y)_{it-1} + \beta Ln(X)_{it} + \delta_i + \nu_t + \varepsilon_{it} \quad (2)$$

where δ_i is a vector of country fixed effects which denotes time invariant difference in health outcome across cross section of countries. The presence of the lagged dependent variables and county fixed effects on the right-hand side implies that α is identified by the difference between the within-country change in health expenditure over time and the average observed across countries. The main concerns remain after controlling for country-specific heterogeneity is that the residuals may contain time-varying and country-specific factors that affect health outcomes such as initial access to health clinics, clean water, and the fertility rate in poor households. If these time varying, country-specific factors are correlated with health expenditure, then the estimated coefficient of interest α would be biased (Mishra and Newhouse, 2009). This limitation can be captured by employing panel GMM estimation techniques. As our sample is very less and time periods is more than the cross-sectional unit, there is less possibility of a correlation between error term and unobservable time-invariant factor. Further, implementation of panel GMM in fixed number of observations, increase finite sample bias in the estimates. So, the adoption of panel GMM techniques is not advisable in small sample case, otherwise model suffers overestimation trap (Roodman, 2009).

4. ESTIMATION RESULTS

Our empirical result is divided into five steps. First, we focus on the direct effects of health expenditure on the ultimate goals, namely life expectancy, and infant and child mortality rates (Table 2a); Second, effects of health expenditure on health goals by adopting Institute, social and

political factors (Table 2b and Table 2c); Third, effects of health expenditure on proximate targets, namely immunization service coverage, prevalence of malaria, Tb cases detection rate, and prevalence of undernourishment (Table 3); Fourth, effects of proximate targets on health goals by adopting economic factors (Table 4); Fifth, crowding-out effects of increased external assistance to health on government health expenditure (Table 5).

Table 2a shows that LEI, IMR, and CMR are positive and significantly depend on their lagged values, whose coefficient elasticity is less than unity. This implies that if LEI, IMR and CMR rates increase by 1% point this year, they will increase by less than 1% point next year. It shows that at 1% increment in the growth rate of IMR and CMR of the current year will be slower down in the next year by 0.92% - 0.64% respectively and it exhibits marginal improvement in health outcome by reducing IMR and CMR. While the 1% increment in the growth rate of LEI of the current year will be slower down in next year by 0.89% and it exhibits marginal deterioration in health outcome by reducing LEI. So, an overall analysis of lagged effects of health goals shows that the reduction of child mortality rate has faster as compared to IMR and LEI in all the model specification (Table 2a, Table 2b, and Table 2c). Willson (2011), find the similar result and argues that bigger the decline of mortality rate in the next period, the less difficulty are the challenges and higher will be prospects for success. Ssozi and Amlani (2015), find the elasticity of IMR and CMR increase by more than 1% point next year and argues that IMR and CMR are not stable, health outcome deteriorates in a larger extent.

We assess the effectiveness of total health expenditure on the ultimate goals and find that it is associated with an increase life expectancy and with a decrease in infant and child mortality but the regression coefficient is not significant. When total health expenditure is spilled into the public and private components, the private component (PRIVHE) is significant only in relation to

life expectancy, while public component (PUBHE) is not significant in relation to LEI, IMR, and CMR. We go on to spilled total health expenditure into government health expenditure from domestic sources (GHEDS), external assistance for health to the government (EAHG), private out-of-pocket health expenditure (POOP), and private not out-of-pocket health expenditure (PNOOP). First, we find that an increase in GHEDS and EAHG are insignificant in relation to LEI, IMR, and CMR. This result occurs due to marginal share of public health components to the total health expenditure in SEAR region and it clearly exhibits in Figure 1. Second, POOP expenditure has a negative elasticity of 0.101% points on CMR, while PNOOP expenditure has a positive elasticity of 0.0012% points on LEI (Table 2a). In this region, private insurance is on small scale, and it mostly affects positively to LEI whereas it has positive significant effects on CMR. Ssozi and Amlani (2015) argues in a region where private insurance is on small scale, the POOP health expenditure is driven by household's income and reduce CMR and IMR. Our result implies that household income via POOP expenditure reduced CMR and insurance payment via PNOOP expenditure improves LEI, but the coefficient value is either weak or insignificant. The result is similar as those of Filmer and Pritchett (1999); Barlow and Vissandjee (1999); Musgrave (1996); McGuire (2006); Bryce et al. (2003); Jones et al. (2003); Crémieux et al. (1999); Baldacci et al. (2008); Rajkumar and Swaroop (2008); and Gupta et al. (2002). They argue that improvement in health outcomes such as infant and child mortality is not fully influenced by health expenditure rather the relation is weak or insignificant. They found that larger improvement in health outcome is mostly guided by the institute, social and economic factors.

Table 2b and Table 2c are an extension of the equation estimated by in Table 2a to control for institutional, social and political factors. We control for government effectiveness, political stability, universal health coverage index, female education, urbanization, all of which are defined

in Table 6 of Appendix A. POOP continues to reduce infant and child mortality while the effects of Public health component (GHEDS and EAHG) is insignificant in relation to IMR and CMR, and PNOOP continues to improve LEI in all the model specification. The results are similar to the various specification of Table 2a, find that improvement in life expectancy mostly by private insurance and no significant effect of public components, while per capita income via POOP expenditure has contributed more to the reduction of child and infant mortality. The implication is that GHEDS and EAHG are not targeted well or even very lower for financing health care in SEAR. Therefore, our finding does not provoke to spend on health care from out-of-pocket health expenditure because the continuation of out-of-pocket health expenditure causes financial hardship at the time of seeking health care. In their study on Vietnam, Wagstaff and Doorslaer (2003) argues that intensity of out-of-pocket health payments in paying for health care lead to impoverished the poor people even poorer than the non-poor, and that is not expenses associated with inpatient care that increased poverty but rather non-hospital expenditure. In their study on Cambodia, Damme et al. (2004) argue that even relatively modest out-of-pocket health expenditure leads to indebtedness the poor people and can lead to poverty. They suggested that public health system should prevent such catastrophic health expenditure by improving and monitoring public sources of health financing. Baldacci et al. (2008); Rajkumar and Swaroop (2008); and Gupta et al. (2002), argues that public health expenditure has no impact on health outcome, partially due to lower governance such as corruption, inefficient government, and political instability. Willson (2011) argues that developmental assistance for health has no effect on child mortality, partially due to leakages of health funds and even some case undermine the progress of health infrastructure.

Table 2b, we present the effectiveness of health expenditure on health goals by controlling social and governance factors. We find that female education (ratio of female to male primary and secondary enrollment) is associated with better health outcome by improving life expectancy rates. Female education has no effect on reduction of IMR and CMR. The studies such as Filmer and Pritchett (1999); Gupta et al. (2003), and Baldacci et al. (2008) argued that higher share of female education in schools is associated with lower child mortality rates. They argued that educated women are likely to more aware of issues relating child development and improve child health. We find that rising urban population is associated with lower mortality and increase life expectancy. The UHC index is associated with rising life expectancy while the insignificant relationship with IMR and CMR. As the universal health coverage is new SDGs agenda to achieve healthy lives for all by 2030, and it requires some more time to reduce the mortality by full coverage of health services. Akinkugbe and Mohanoe (2009); McGuire (2006); Bryce et al., 2003; and Jones et al., 2003, finds that specific maternal and child health care provision such as immunization, birth attendance and increased number of physicians are found to be strongly associated with lower child mortality. Additionally, access to safe water and sanitation reduces the IMR suggested by Kim and Moody (1992), and Gupta et al. (2002). We find that government effectiveness as indicator good governance is associated with an increase in life expectancy and there is no impact on the reduction of child mortality. Our result is similar as those of Lewis (2006), find that government effectiveness has a stronger effect in health services delivery and improving health outcome. Other studies such as Farag et al. (2013); Rajkumar and Swaroop (2008); and Baldacci et al. (2008) find that good governance is the key factor for effectiveness of health spending by improving health outcomes in developing countries.

Table 2c is an extension of the equation estimated by Table 2b, in which we present the effectiveness of health expenditure on health goals by controlling political and social factor. We find similar result as of in Table 2b that female education, urbanization, UHC index have positive affects the life expectancy and reduce child mortality. By controlling political stability in regression specification, we find that political stability has a positive effect on life expectancy and also positively affect the child mortality. Alesina and Perotti (1996) and Alesian et al. (1996) argued that political instability reduces investment and growth. They argued that income inequality in poor economics are more politically unstable. It increases social discontent, mass violence and policy uncertainty, which has a negative effect on investment and, as a consequence, reduces growth. So, therefore, political stability is necessary for the investment in human capital, thereby improves health outcome.

Table 2a. *Effectiveness of health expenditure on health goals in the SEAR*

	LN (LEI)	LN(IMR)	LN(CMR)	LN(LEI)	LN(IMR)	LN(CMR)	LN(LEI)	LN(IMR)	LN(CMR)
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable (-1)	0.896***	0.922***	0.647***	0.918***	0.923***	0.649***	0.925***	0.895***	0.536***
	(0.014)	(0.025)	(0.065)	(0.015)	(0.025)	(0.065)	(0.014)	(0.029)	(0.072)
Lagged LN (THE)	1.18e-05	-0.00723	-0.0235						
	(0.0009)	(0.009)	(0.029)						
Lagged LN (PUBHE)				-0.0005	-0.002	-0.009			
				(0.0007)	(0.009)	(0.028)			
Lagged LN (PRIVHE)				0.0016***	-0.0040	-0.0090			
				(0.0006)	(0.0061)	(0.0192)			
Lagged LN (GHEDS)							-0.0006	-0.0016	-0.013
							(0.0006)	(0.0086)	(0.026)
Lagged LN (EAHG)							-3.68e-05	0.0024	0.013
							(0.0004)	(0.00488)	(0.0148)
Lagged LN (POOP)							-0.0015*	-0.0204	-0.101***
							(0.0009)	(0.0125)	(0.036)
Lagged LN (PNOOP)							0.0012***	0.0042	0.0265**
							(0.0002)	(0.0037)	(0.0109)
Constant	0.454***	0.264***	1.429***	0.360***	0.248**	1.378***	0.335***	0.373***	1.958***
	(0.062)	(0.100)	(0.279)	(0.063)	(0.095)	(0.267)	(0.060)	(0.122)	(0.316)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.997	0.988	0.906	0.997	0.988	0.906	0.997	0.988	0.914
No. of country	10	10	10	10	10	10	10	10	10

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

Table 2b. *Effectiveness of health expenditure on health goals by adopting institute and social factors in SAER*

Variable	LN (LEI) (1)	LN(IMR) (2)	LN(CMR) (3)	LN(LEI) (4)	LN(IMR) (5)	LN(CMR) (6)	LN(LEI) (7)	LN(IMR) (8)	LN(CMR) (9)
Dependent variable (-1)	0.883***	0.842***	0.392***	0.883***	0.842***	0.391***	0.875***	0.847***	0.395***
	(0.0150)	(0.0415)	(0.0817)	(0.0150)	(0.0417)	(0.0822)	(0.0151)	(0.0424)	(0.0828)
Lagged LN (GHEDS)	-0.00189***	-0.00423	-0.0195	-0.00153**	-0.00359	-0.0150	-0.00199***	-0.00399	-0.0192
	(0.000616)	(0.00921)	(0.0270)	(0.000719)	(0.0108)	(0.0317)	(0.000605)	(0.00925)	(0.0271)
Lagged LN (EAHG)	1.97e-05	0.00290	0.0129	4.02e-05	0.00294	0.0131	-8.84e-05	0.00316	0.0132
	(0.000357)	(0.00528)	(0.0155)	(0.000358)	(0.00531)	(0.0156)	(0.000353)	(0.00531)	(0.0156)
Lagged LN (POOP)	-0.00109	-0.0281*	-0.120***	-0.000967	-0.0278*	-0.119***	-0.000624	-0.0294**	-0.123***
	(0.000790)	(0.0144)	(0.0380)	(0.000801)	(0.0146)	(0.0385)	(0.000800)	(0.0146)	(0.0392)
Lagged LN (PNOOP)	0.000888***	0.00629	0.0310***	0.000848***	0.00622	0.0305***	0.000667***	0.00682	0.0319***
	(0.000234)	(0.00409)	(0.0110)	(0.000238)	(0.00416)	(0.0112)	(0.000248)	(0.00419)	(0.0115)
LN (GPI)	0.0315***	0.112	0.409**	0.0312***	0.111	0.406**	0.0335***	0.106	0.403**
	(0.00492)	(0.0679)	(0.195)	(0.00493)	(0.0683)	(0.196)	(0.00490)	(0.0686)	(0.196)
LN (URBAN)	0.0150***	-0.0821	-0.418*	0.0149***	-0.0823	-0.420*	0.0180***	-0.0850	-0.426*
	(0.00488)	(0.0789)	(0.214)	(0.00488)	(0.0793)	(0.215)	(0.00495)	(0.0793)	(0.216)
LN (UHC)	0.00111***	0.00360	0.0127	0.00109***	0.00357	0.0124	0.00121***	0.00322	0.0122
	(0.000396)	(0.00598)	(0.0174)	(0.000397)	(0.00602)	(0.0175)	(0.000390)	(0.00603)	(0.0175)
GOVEF	0.00280**	0.0154	0.0695	0.00240*	0.0147	0.0646	0.00125	0.0204	0.0776
	(0.00136)	(0.0210)	(0.0598)	(0.00142)	(0.0220)	(0.0626)	(0.00148)	(0.0225)	(0.0650)
LN (GHEDS)*GOVEF				0.000554	0.000983	0.00701			
				(0.000570)	(0.00863)	(0.0253)			
LN (EAHG)*GOVEF							-0.000973**	0.00403	0.00594
							(0.000414)	(0.00633)	(0.0184)
Constant	0.462***	0.852**	3.916***	0.462***	0.852**	3.924***	0.487***	0.844**	3.933***
	(0.0587)	(0.366)	(0.873)	(0.0587)	(0.368)	(0.877)	(0.0585)	(0.367)	(0.878)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.998	0.989	0.923	0.998	0.989	0.923	0.998	0.989	0.923
No. of country	10	10	10	10	10	10	10	10	10

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

Table 2c. *Effectiveness of health expenditure on health goals by adopting political and social in SAER*

	LN (LEI)	LN(IMR)	LN(CMR)	LN(LEI)	LN(IMR)	LN(CMR)	LN(LEI)	LN(IMR)	LN(CMR)
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable (-1)	0.875***	0.828***	0.384***	0.872***	0.826***	0.382***	0.873***	0.824***	0.376***
	(0.0145)	(0.0411)	(0.0809)	(0.0148)	(0.0413)	(0.0811)	(0.0155)	(0.0416)	(0.0815)
Lagged LN (GHEDS)	-0.00167***	-0.00234	-0.0124	-0.00138**	-0.00583	-0.0217	-0.00165***	-0.00315	-0.0155
	(0.000603)	(0.00899)	(0.0264)	(0.000670)	(0.0101)	(0.0298)	(0.000608)	(0.00910)	(0.0267)
Lagged LN (EAHG)	-0.000120	0.00219	0.0101	-9.05e-05	0.00172	0.00884	-0.000102	0.00157	0.00780
	(0.000348)	(0.00518)	(0.0152)	(0.000349)	(0.00522)	(0.0154)	(0.000351)	(0.00527)	(0.0155)
Lagged LN (POOP)	-0.00158**	-0.0347**	-0.134***	-0.00160**	-0.0355**	-0.135***	-0.00156*	-0.0368**	-0.140***
	(0.000787)	(0.0148)	(0.0386)	(0.000787)	(0.0149)	(0.0387)	(0.000792)	(0.0152)	(0.0393)
Lagged LN (PNOOP)	0.000987***	0.00805*	0.0349***	0.000970***	0.00827*	0.0352***	0.000949***	0.00890**	0.0377***
	(0.000231)	(0.00418)	(0.0111)	(0.000232)	(0.00420)	(0.0111)	(0.000247)	(0.00437)	(0.0116)
LN (GPI)	0.0282***	0.0781	0.287	0.0290***	0.0757	0.279	0.0292***	0.0663	0.240
	(0.00493)	(0.0661)	(0.193)	(0.00498)	(0.0663)	(0.194)	(0.00541)	(0.0685)	(0.200)
LN (URBAN)	0.0178***	-0.0618	-0.359*	0.0186***	-0.0683	-0.372*	0.0185***	-0.0729	-0.395*
	(0.00505)	(0.0785)	(0.215)	(0.00512)	(0.0791)	(0.216)	(0.00533)	(0.0804)	(0.219)
LN (UHC)	0.00169***	0.00870	0.0285	0.00161***	0.00975	0.0310*	0.00170***	0.00885	0.0286
	(0.000388)	(0.00617)	(0.0174)	(0.000396)	(0.00633)	(0.0178)	(0.000390)	(0.00619)	(0.0174)
Political stability	0.00140***	0.0145*	0.0419*	0.00122**	0.0167*	0.0475*	0.00109	0.0214	0.0677*
	(0.000511)	(0.00810)	(0.0231)	(0.000542)	(0.00862)	(0.0245)	(0.000859)	(0.0131)	(0.0374)
LN (GHEDS)* Pol. Stability				0.000444	-0.00494	-0.0132			
				(0.000439)	(0.00654)	(0.0192)			
LN (EAHG)* Pol. Stability							-0.000109	0.00235	0.00892
							(0.000244)	(0.00349)	(0.0102)
Constant	0.483***	0.826**	3.711***	0.493***	0.857**	3.758***	0.491***	0.878**	3.863***
	(0.0557)	(0.362)	(0.878)	(0.0565)	(0.365)	(0.882)	(0.0586)	(0.371)	(0.896)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.998	0.989	0.924	0.998	0.989	0.925	0.998	0.989	0.925
No. of country	10	10	10	10	10	10	10	10	10

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

In Table 3, we focus on the effectiveness of health expenditure on health targets. The proximate targets on which money spent include immunization, nourishment, and the prevention of diseases such as malaria and Tb. These proximate targets play the intermediate role in reaching ultimate health goals with the help of health expenditure. Table 3, find that POOP health expenditure reduces the prevalence of undernutrition, while other components of health expenditure have no impact for other health targets such as immunization coverage, Tb detection rate and prevalence of malaria. Our finds imply that female education and mobile phone subscription have positive effects on achieving health targets. At 1% increase in female education leads to 0.36% increases in immunization coverage and 0.24% reduction in undernutrition population. We used the mobile subscription for the adoption of modern communication technologies in our estimated equation. We find that usage of the mobile phone have reduced the malaria prevalence rate and there have no significant effects on immunization coverage and Tb detection rate. West (2012) argues the utilization Mobile technology have had a huge impact on health care services such as helping with chronic disease management, empowering the elderly and expectant mother, reminding people to take medication at the proper time, extending service to underserved areas, and the improving health outcomes and medical system efficiency. Asongu and Nwachukwu (2016), find that mobile phone subscription has positive and statistically significant to inclusive human development in Sub-Saharan Africa. It recommends that the success of inclusive development strategies in the post-2015 sustainable agenda depends substantially on the adoption of knowledge diffusion technology policies. In the context of Africa, Zurovac et al. (2012), find that rapid expansion of mobile network coverage and the widespread availability of basic handsets have the potential to substantively bridge the communication gap between the manager, health workers, and the patients, resulting in a positive effect on the malaria control. It

recommends that text messaging, as the least expensive mobile phone function found on all handsets, could improve the delivery of health services and health outcomes.

In Table 4, we focus on the effects of specific health intervention such as immunization coverage, malaria prevention, Tb detection and undernutrition on ultimate goals such as IMR, CMR, and LEI. We find that prevalence of malaria control improves life expectancy and there has no significant impact on IMR and CMR. Per capita GDP has negative effects on life expectancy and no significant effects on reduction of child mortality. Overall, the impact of the proximate targets on the ultimate goals are low, despite higher public spending elasticity on the health goals.

Table 3. *Effectiveness of health expenditure on health-related targets in SEAR*

	LN (IMM)	LN (MALARIA)	LN (TB)	Ln (UNPOP)	LN (IMM)	LN (MALARIA)	LN (TB)	Ln (UNPOP)
Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable (-1)	0.756***	0.904***	0.730***		0.650***	0.905***	0.721***	
	(0.0581)	(0.0404)	(0.0374)		(0.0727)	(0.0404)	(0.0416)	
Lagged LN (GHEDS)	-0.0364*	-0.0574	-0.000272	-0.0248*	-0.0722***	0.0676	0.00252	-0.0287
	(0.0200)	(0.150)	(0.0225)	(0.0149)	(0.0236)	(0.186)	(0.0277)	(0.0176)
Lagged LN (EAHG)	-0.00553	0.0618	-0.00912	0.00261	0.00531	0.0460	-0.0108	0.00250
	(0.0113)	(0.0876)	(0.0126)	(0.00923)	(0.0120)	(0.0910)	(0.0132)	(0.00901)
Lagged LN (POOP)	-0.0352	0.142	0.00644	-0.0957***	-0.0165	0.109	-0.000948	-0.0806***
	(0.0253)	(0.218)	(0.0285)	(0.0211)	(0.0269)	(0.232)	(0.0320)	(0.0218)
Lagged LN (PNOOP)	0.00240	0.0579	0.00678	0.0195***	-0.00323	0.0649	0.00870	0.0144**
	(0.00766)	(0.0631)	(0.00908)	(0.00662)	(0.00831)	(0.0651)	(0.0100)	(0.00673)
LN (GPI)					0.364**	1.288	-0.0480	-0.246**
					(0.174)	(1.327)	(0.208)	(0.120)
LN (MOBILE)					0.0129	-0.171*	-0.00378	0.0334***
					(0.0132)	(0.0916)	(0.0139)	(0.00897)
GOVEF					-0.0105	0.154	0.0208	-0.00209
					(0.0438)	(0.380)	(0.0502)	(0.0334)
LN (GHEDS)*GOVEF					-0.0214	0.0265	-0.00206	0.0280*
					(0.0226)	(0.165)	(0.0253)	(0.0161)
Constant	0.993***	1.185**	1.018***	0.0191	1.470***	1.267**	1.056***	0.0355
	(0.244)	(0.571)	(0.152)	(0.0938)	(0.302)	(0.618)	(0.166)	(0.0924)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.880	0.905	0.899	0.978	0.891	0.910	0.899	0.981
No. of country	10	9	10	9	10	9	10	9

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

Table 4. *Effectiveness of health targets on health goals in SEAR*

Variable	LN (LEI) (1)	LN(IMR) (2)	LN(CMR) (3)	LN (LEI) (4)	LN(IMR) (5)	LN(CMR) (6)
Dependent variable (-1)	0.904***	0.654***	0.164*	0.904***	0.574***	0.103
	(0.0115)	(0.0704)	(0.0959)	(0.0179)	(0.0827)	(0.105)
LN (IMM)	-0.00136	-0.0109	-0.0265	0.00213	-0.0318	-0.0740
	(0.00185)	(0.0266)	(0.0759)	(0.00231)	(0.0327)	(0.0935)
LN (MALARIA)	0.00138***	0.00261	0.00657	0.00176***	-0.00194	-0.00633
	(0.000193)	(0.00290)	(0.00826)	(0.000246)	(0.00372)	(0.0106)
LN (TB)	-0.00158	0.0221	0.0733	-0.00178	0.0292	0.0822
	(0.00153)	(0.0213)	(0.0594)	(0.00160)	(0.0242)	(0.0673)
LN (UNPOP)				0.000718	-0.0303	-0.0878
				(0.00124)	(0.0217)	(0.0602)
Lagged LN (PCGDP)				-0.00340***	0.0198	0.0506
				(0.00103)	(0.0145)	(0.0413)
Constant	0.413***	1.215***	3.135***	0.417***	1.583***	3.599***
	(0.0487)	(0.276)	(0.515)	(0.0688)	(0.352)	(0.638)
Country fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.998	0.982	0.898	0.998	0.981	0.889
No. of country	9	9	9	8	8	8

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

In Table 5, we address the issue of EAHG crowding out GHEDS which has been prominently raised by Farag et al. (2009); Lu et al. (2010); Dieleman et al. (2013); and Dieleman and Hanlon (2014). They argue that development assistance of health has a negative and significant effect on domestic government spending on health and DAH is a key factor for reprioritization of the government towards health sector. Our result shows that external assistance for health to government is negatively related to GHEDS by controlling government effectiveness. It implies the efficient spending of health aid is likely to reduce the share of government budget on health. We have not found any significant relationship of other components of health expenditure as well as social and institutional factors. We find that an increase in EAHG of 1% would reduce GHEDS by up to 0.38 percent. Lu et al. (2010) argue that ministries of finance tend to reduce funding to ministries of health and other government ministries that spend money on health when large amounts of development assistance to health are given to the government. Dieleman et al. (2013); Dieleman and Hanlon (2014), find that the displacement of GHEDS are not fully replaced by the

development assistance and not perfectly substitute. They argue that GHEDS displacement does not equal the replacement rate and depends on the government behavior. First, welfare maximizing governments allocate resources according to the marginal gains associated with achieving their priorities. If the government receives large amounts of DAHG relative to developmental assistance for non-health sectors, then a rational government might displace GHES. As a consequence, health aid crowds out government's own resources for health. Second, general governments are constrained by finite budgets that must be allocated across many competing priorities. The increase in DAHG is effectively shared with non-health sectors, on the other hand, a decrease in DAHG cause the government's budget to contract.

Table 5. *Crowding-out effects of external assistance to health in SEAR*

	LN (GHEDS)		
Variable	(1)	(2)	(3)
Dependent variable (-1)	0.580***	0.596***	0.585***
	(0.0801)	(0.0786)	(0.0789)
Lagged LN (EAHG)	0.0543	0.0503	0.0455
	(0.0450)	(0.0439)	(0.0442)
Lagged LN (POOP)	0.0492	0.0575	0.127
	(0.100)	(0.0996)	(0.103)
Lagged LN (PNOOP)	-0.0194	-0.0199	-0.0426
	(0.0319)	(0.0317)	(0.0328)
LN (TB)	-0.150	-0.114	-0.146
	(0.158)	(0.159)	(0.158)
LN (URBAN)	0.530		0.495
	(0.545)		(0.585)
GOVEF		-0.245	-0.389**
		(0.160)	(0.186)
LN (EAHG)*GOVEF			-0.125**
			(0.0552)
Constant	-0.999	0.506	-1.026
	(1.855)	(0.640)	(1.926)
Country fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
R-squared	0.472	0.479	0.503
No. of country	10	10	10

Notes: LN = Natural Logarithm. Standard errors are denoted in parentheses. ***Significant at 1% level, **Significant at 5% level and *Significant at 10%. (-1) = lagged one period.

5. CONCLUSION

The objective of this paper is to examine the effects health expenditure on the health outcome of South East Asia region over the period 2000-2014, by endogenizing social, institution and political factors. We employ panel dynamic fixed effect model with a set of predetermined and control variables in order to control for endogeneity. We categorize heath care outcome into health goals and targets, and the breakdown of total health expenditure into government health expenditure from domestic sources, external assistance for health to the government, private out-of-pocket health expenditure and private not out-of-pocket health expenditure, has enabled to find the links between spending and health related SDGs. In the first stage of this paper, we find that the effectiveness of these components of health expenditure is statistical significance but with low elasticities. But most of the statistical significance is explained by POOP health expenditure and there is no significance impact of external assistance for health to the government on health outcome. We find that most of the health goals and target are explained by improving public services delivery, urbanization, political stability, female education and universal health care system.

At the second stage, we focus on the effectiveness of health expenditure on health targets, which includes immunization, nourishment, and treatment of specific diseases such as malaria, Tb. These proximate targets play the intermediate role in reaching ultimate health goals with the help of health expenditure find that POOP health expenditure reduces the prevalence of undernutrition, while other components of health expenditure have no impact for other health targets. Our finds imply that female education and mobile phone subscription have positive effects on achieving health targets. At the third stage, we focus on the effects of specific health intervention such as immunization coverage, malaria prevention, Tb detection and undernutrition on ultimate goals

such as IMR, CMR, and LEI. We find that prevalence of malaria control improves life expectancy and there has no significant impact on IMR and CMR. Overall, the impact of the proximate targets on the ultimate goals are low, despite higher public spending elasticity on the health goals. Finally, we address the issue of crowding effects of external assistance for health on domestically finance health expenditure. We find that external assistance for health to government is negatively related to GHEDS by controlling government effectiveness. It implies the efficient spending of health aid is likely to reduce the share of government budget on health. We have not found any significant relationship of other components of health expenditure as well as social and institutional factors.

In the light of recent SDGs, against the backdrop of the weak link between health expenditure and health outcome, this study offers interesting policy insights. First, the government should increase domestic sources of finance for health care and prioritization of health expenditure should promote in the budget making process. Because financing universal health care is a huge challenge in low-income countries and UHC is prominent of SDGs targets. Second, the emphasis on spending on non-health factors such as female education, awareness campaign of health intervention, improve urban infrastructure and sanitation & drinking water facilities. Because these non-heath factors associated with preventive care and most contributing factors for better health outcome. Third, the SDGs agenda to achieve healthy lives for all by 2030 cannot be achieve without concerning governance factors. So, institutional factors and quality of government services should be monitored to achieve the potential outcome. We find that government health expenditure share as the ratio of GDP as well as external assistance for health are very low or even insufficient in SEAR. Therefore, it shows the weak association or insignificant relationship between spending and health outcome. Although, private insurance has some marginal contribution on health outcome mostly it depends on private out of pocket health expenditure, which may lead to financial

hardship for the poor people. So, the pertinent challenge for SEAR is to raise funds from alternative sources in order to government finance for health care and reduce catastrophic expenditure. It is one of the limitations of our study, to analyses the channels through which government could raise finance in order to mobilize funds for health and non-health care services.

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APPENDIX A.

Table 6. *Variable definitions*

Variable	Definition
Ultimate Goals	
Life expectancy index	((Nation's Life Expectancy – 20)/85-20))*100 This formula computes the percentage of the potential range of life expectancy a given country has attained. This indicator use in 2010 human development report of UNDP.
Infant mortality rate	A number of infants dying before reaching one year of age, per 1,000 live births in a given year.
Child mortality rate	Probability per 1,000 that a newborn baby will die before reaching age five.
Proximate Targets	
DPT immunization	Percentage of children ages 12-23 months who received vaccinations against whooping cough (DPT: diphtheria, pertussis (or), and tetanus vaccine of three doses) before 12 months or at any time before the survey.
BCG immunization	Percentage of children aged 12-23 months who received vaccinations against tuberculosis (BCG: bacille Calmette-Guérin vaccine) before 12 months or at any time before the survey.
Measles immunization	Percentage of children ages 12-23 months who received vaccinations against measles of one dose of vaccine before 12 months or at any time before the survey.
Immunization coverage index	Average of the percentage of children vaccinated for DPT, BCG, measles, polio, Hib3, HepB3.
Malaria cases reported	A number of reported confirmed cases by slide examination or RDT and probable cases of malaria.
Tb cases detection rate	A number of new and relapse tuberculosis cases divided by estimate of the number of incident tuberculosis cases for the same year expressed as a percentage.
Prevalence of undernourishment	Percentage of the Population whose food intake is below the minimum level of dietary energy consumption.
Categories of Health Expenditure	
Health expenditure from domestic sources	Percentage of total health expenditure from domestic sources via government such as pooled health financing.
Health expenditure from external sources	Percentage of total health expenditure from international organizations, foreign donor agency, and NGOs such as developmental assistance to health.
Private not Out-of-Pocket	Percentage of total health expenditure spent on health sector private institutions i.e. insurance and local NGOs.
Private Out-of-Pocket	Percentage of total health expenditure spent on health sector by individuals/households, not private institutions.
Social/Institute/Economic factors	
Mobile cellular subscriptions	Number of subscriptions (i.e. postpaid and active postpaid account) to a public mobile telephone service per 100 people.
Gender parity index	Gross enrollment ratio in primary and secondary education is the ratio of girls to boys enrolled at a primary and secondary level in public and private schools.
Percentage of urban population	People living in urban areas to the total population as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects.
Universal Health Coverage Index	The WHO defines the 16 tracer indicators, which associated with four composite service coverage index such as reproductive, maternal, newborn and child health; infectious diseases; non-communicable diseases; service capacity, access, and health security. The UHC index ranges from 0% to 100% implying full coverage across a range of services.
Government effectiveness	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
Political stability	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism.
Real per capita GDP	Gross domestic product (GDP) divided by midyear population.

Note: All health expenditure and GDP values are in million constant (2010) US dollar.

APPENDIX B.

Table 7a. *Health goals of South-East Asia Region (SEAR) countries*

	2000			2014			CAGR in 2000-2014		
Country	LE	IMR	CMR	LE	IMR	CMR	LE	IMR	CMR
Bangladesh	65.3	64.4	88.0	71.6	32.1	39.5	0.66	-4.85	-5.56
Bhutan	60.7	59.0	79.6	69.5	28.3	34.4	0.97	-5.11	-5.82
India	62.6	66.4	91.2	68.0	39.3	49.8	0.59	-3.68	-4.23
Indonesia	66.2	41.1	52.3	68.9	23.6	28.2	0.28	-3.89	-4.32
Korea, Dem. People's Rep.	65.0	44.5	60.0	70.1	20.7	26.1	0.54	-5.32	-5.77
Maldives	70.1	35.6	44.4	76.8	7.8	9.2	0.66	-10.28	-10.63
Myanmar	62.1	60.7	82.3	65.9	40.7	51.7	0.42	-2.81	-3.27
Nepal	62.3	59.6	80.6	69.6	30.5	37.4	0.79	-4.67	-5.34
Sri Lanka	71.1	14.0	16.3	74.8	8.6	10.0	0.36	-3.42	-3.43
Thailand	70.6	19.1	22.5	74.4	10.9	12.6	0.37	-3.93	-4.06
Timor-Leste	59.3	86.3	110.2	68.3	46.1	54.5	1.00	-4.38	-4.90

Notes: LE = life expectancy. CAGR = Compound Annual Growth Rate.

Table 7b. *Health targets of South-East Asia Region (SEAR) countries*

	2000				2014				CAGR in 2000-2014			
Country	IMM	MALARIA	TB	UNPOP	IMM	MALARIA	TB	UNPOP	IMM	MALARIA	TB	UNPOP
Bangladesh	55.5	55599.0	26.0	23.1	93.7	10216.0	53.0	16.9	3.8	-11.4	5.2	-2.2
Bhutan	77.2	5935.0	80.0	…	98.5	19.0	80.0	…	1.8	-33.7	0.0	…
India	40.8	2031790.0	37.0	17.0	73.7	1102205.0	56.0	15.3	4.3	-4.3	3.0	-0.7
Indonesia	61.5	256993.0	8.9	17.2	72.0	252027.0	32.0	7.6	1.1	-0.1	9.6	-5.7
Korea, Dem. People's Rep.	50.8	90582.0	80.0	37.9	95.8	10535.0	80.0	41.8	4.6	-14.2	0.0	0.7
Maldives	81.7	…	80.0	11.8	99.0	…	80.0	5.9	1.4	…	0.0	-4.8
Myanmar	57.0	120083.0	16.0	52.4	78.8	152195.0	70.0	14.9	2.3	1.7	11.1	-8.6
Nepal	50.5	7981.0	76.0	22.2	92.5	1469.0	79.0	7.7	4.4	-11.4	0.3	-7.3
Sri Lanka	65.8	210039.0	68.0	29.9	99.0	23.0	69.0	22.9	3.0	-47.9	0.1	-1.9
Thailand	96.4	78561.0	23.0	19.0	99.0	37921.0	59.0	7.9	0.2	-5.1	7.0	-6.1
Timor-Leste	37.2	15212.0	59.0	43.9	76.7	342.0	63.0	27.9	5.3	-23.7	0.5	-3.2

Note: CAGR = Compound Annual Growth Rate.