Does a country's greater health care spending lead to better health outcomes for its population? -Evidence from African Health Accounts

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Summary

Objective: This report aims to determine whether health expenditure has increased generally and whether this increase, if any, led to improved health indicators in Africa

Methods: Countries were selected based on the availability of recent National Health Accounts following the new System of Health Accounts (2011) released by the World Health Organization in addition to retrospective data. The focus was on neonatal, under-five, lifetime exposure to and life expectancy at birth. Descriptive, and multivariate analyses were conducted with health indicators as dependent variables on one hand and public and private health expenditures as the main independent variables.

Results: The main sample covered the years 2002 to 2014 and 14 countries. Although real GDP increased in almost of those countries over the period, health spending (as a share of GDP) did not. The latter increased in most countries but actually decrease in a few. Specific focus on reproductive health suggested the absence of direct correlation between per capita health expenditures on reproductive health and life time risk of maternal mortality. Multivariate regression suggested that public health expenditures improved life expectancy at birth, and reduced neonatal and child mortality rates, but private health expenditures did not appear to have such a significant effect of neonate and neonatal mortality.

Discussion and conclusion: The results should be taken with caution as the sample size is still small considering that few countries have conducted their health accounts following the new methodology. It is notable public expenditures on health appeared to have a stronger effect than private expenditure.

1.0 Background

Among the Sustainable Development Goals (SDG)—targets that all countries agreed to try to achieve by 2030—is goal 3, which aims to "ensure healthy lives and promote wellbeing for all at all ages". More specifically, goal 3.c. calls for a substantial reduction in the global maternal, neonatal and under-five mortality rate as well as "substantially increase health financing" (WHO (2016)). Public expenditure on health represents one of the key drivers in meeting these important elements of the sustainable development goals. Against this background, the objective of this report is to determine if health expenditure has increased generally and whether this increases had led to improvement in health indicators in selected countries of Sub-Saharan Africa.

2.0 Literature review

Literature examining whether increased health expenditure led to or was associated with improved health outcomes globally found mixed results; depending on geographical location, time and the method of analysis. Earlier European Union data from 1980–1995 indicated that increases in health care expenditure were significantly associated with large improvements in neonatal mortality (under 28 days) and marginal increase in life expectancy (Hitiris and Posnett (1992)). Life expectancy at birth accounts for the mortality level and pattern across all age groups – under 1 year, under 5, older children, adolescents, adults and elderly. In the United States, a systematic review found that government health spending was associated with some improved health outcomes at population level between 1985 and 2012 (Singh (2014)). Among health outcomes considered in that study were neonatal mortality and deaths attributable to cardiovascular disease, diabetes, cancer, childhood immunization coverage rates, and infectious disease morbidity. In low and middle-income countries (LMIC), increased health expenditure was significantly associated with neonatal and under-5 child mortality. Moreover, government health spending had a significant effect on reducing neonatal and child mortality and the size of the effect depended on the quality of governance in the country as indicated by a panel data analysis from 133 countries for the years 1995, 2000, 2005, and 2006 (Farag et al (2013)). Another set of studies suggested that government health expenditure did not significantly improve health outcomes such as child mortality (see Bokahri et al (2007) for a review) but rather increasing national income improved those health outcomes. That result was even more nuanced in a study on India where current government health expenditure did not impact mortality but lagged variables did in rural areas (see Bokahri et al (2007)). Furthermore, a couple of studies using cross-sectional data found that the elasticity of government expenditure with respect to health depended on the method of analysis. When considered exogenous, public spending was associated with improved health outcomes. But countries might decide on a high level of expenditure because of negative health outcomes in a situation of reverse causality. In such cases, health expenditure would be

endogenous. Analyses when treating public health expenditure as endogenous found no significant effect of endogenous public expenditure on health (Wagstaff and Claeson (2004), Filmer and Pritchett (1999)).

A specific strand of literature has emerged that has specifically looked at infant/neonatal/child mortality as a health outcome and more specifically, on the link between child mortality and health expenditure. The literature in the area of determinants of infant mortality rate and more specifically, on the link between health expenditure/quality of care and infant mortality could be divided into two main strands. One strand is mainly focusing on cross-country variations of infant mortality rates. Within this strand, the majority of studies suggest a negative link between public health expenditure/quality of healthcare and infant mortality. In other words, improvement in the quality of healthcare as well as increase in the public expenditure on healthcare is associated with lower infant mortality rates. Farahani et al (2009), for instance, studied the short and long run determinants of infant mortality whilst paying particular attention to the change in the number of physicians per 1000 population. Their findings suggest that increasing the physicians' density by 1 per 1000 population decreases the infant mortality rate by 15% within 5 years and by 45% in the long-run with half the long-run gain being achieved in 15 years. Similarly, Palma-Soliet et al (2009) whilst studying the effect on the state downsizing (in terms of reducing the total available resources spent on health) was associated with increases in infant mortality, not achievement of the millennium development goal 4. By the same token, Muldoon et al (2011) relying on mixed effects linear regression found that health system strength (as proxied by higher physician density, higher sustainable access to water and sanitation and having a less corrupt government) were significantly associated with lower infant mortality rate and under-5 mortality rate. A special strand of the literature emerged which looked at the effect of the state's strength on infant mortality rate. In that respect, Shen and Williamson (2001) found that a state's strength contributes to infant mortality decline (as does women's education and autonomy). Besley and Masayuki (2006) also argue that higher health spending and more superior healthcare policy are associated with better health outcomes, though their argument states that the effect of these polices goes through the political system and it is stronger in democracy. Put simply, health policy interventions are superior in democracies, which in turn results in better health outcomes. Fayissa (2001) relying on OLS and 2SLS regression finds that public health expenditure is associated with lower infant mortality rate. Finally, in the context of US states, Shi et al (2004) found that improvements in primary care were associated with lower infant mortality and fewer low birthweight cases. Moreover, their study suggests that the assignment of one primary care doctor per 10000 people was associated with lower infant mortality and less low birthweight births. However, as we mentioned above, there are a couple of studies in this strand that found different results. Schell et al (2007), for instance, relying on data for 152 countries for 2003, found that per capita income, young female illiteracy and income inequality predicted 92% of the variation in national infant mortality rate (resonating the findings by

Rodgers (1979)), whereas public spending on health and poverty rate were non-significant determinants when adjusted for confounding. Similar findings are suggested by Shandra et al (2004) though their study is focused on the dependency/mortality link.

The second strand of the literature also focused on studying the determinants of infant mortality, however, it uses micro-data (i.e. household and individual data) rather than cross-country macro data unlike the previously mentioned strand. The findings from this strand also suggest that better quality of healthcare and better access to healthcare is associated with lower infant mortality rates. Relying on the data from the Demographic and Health Surveys, Leipziger et al (2003) found that apart from the traditional correlates of infant mortality (income, assets, education and direct health interventions), better access to basic infrastructure services has an important role to play in improving child health outcomes. Similar findings emerged from the study by Wang (2003) who suggests that access to health prevention policies (e.g. immunization) and higher public health expenditure can significantly decrease child mortality.

In the context of Sub-Saharan Africa, there is an emerging body of evidence that studied the link between health expenditure and health outcomes. Major studies that rely on data from the African setting include Okunade (1985), Gbesemete and Gerdtham (1992), Murthy (2004), Okunade (2005), Lawanson (2012), Anyanwu and Erhijakpor (2009), Akinkugbe and Mohanoe (2009) and Kamiya (2010). The Gbesemete and Gerdtham (1992) study, based on 1984 cross-sectional data of 30 Sub-Saharan and N. African countries, had limited observations and other econometric challenges. Murthy's (2004) work is too brief, and the latest published work, Okunade (2000), using 1995 cross-sectional data of 26 African countries, is also limited in the degrees of freedom for estimating the econometric model. Fayissa and Gutema (2005) estimated a health production function in Sub Saharan Africa. They used panel data analytical approach where time series data of each country was averaged over two years and a total of five periods were formed for each country. Their model was estimated by a method of one-way and two-way panel data analysis. Life expectancy at birth was the dependent variable with income per capita, illiteracy rate, food availability, ratio of health expenditure to GDP, urbanization rate and carbon dioxide emission per worker being the explanatory variables. The empirical results suggested that an increase in income per capita, a decrease in illiteracy rate, and increase in food availability were associated with improvement in life expectancy at birth. Health expenditure had a negative relationship with life expectancy at birth, however, this result might have been due to the methodology adopted. Finally and most recently, using a panel data analysis from 1995 to 2010 covering 44 countries also showed an association between increased health care expenditure on the one hand and reduced neonatal mortality rates and increased life expectancy at birth on the other (Novignon et al (2012)). Increased health expenditure were also

associated with decreased maternal mortality through increased utilization of skilled birth attendants and Caesarean section (Kruk et al (2007)).

Finally, there has been a strand of the literature that has looked at the link between health expenditure and health outcomes at national level or regional level. Ssewanayana and Younger (2004) found that, in Uganda, increase in health care expenditures, particularly on vaccination, will impact positively on infant mortality in Uganda by 2015. According to them, increasing vaccination rate to 100 percent would have the largest and probably most cost effective, impact, reducing infant mortality by 16 deaths per thousand live births. They, however, observe that given the strong impact of basic health care services on infant mortality rates, and the provision of public health services stagnated in the 1990s. At the regional level, Anyanwu and Erhijakpor (2009) in a panel data analysis and using a fixed effect model found that total health expenditures are a significant contributor to health outcomes with a 10% increase in total health care expenditure per capita resulting in 21% and 22% decrease in under-five and infant mortality rates respectively. Akinkugbe and Afeikhena (2006) also provided evidence that the effect of health care expenditure as a ratio of GDP on life expectancy, under-five mortality and infant mortality is positive and significant in SSA, Middle East and North Africa. Compa-Keyeke et al. (2013) find that public health expenditure is negatively related to infant mortality in Ghana but is insignificant after controlling for health insurance, per capita income and the number of physicians. They, however, find the elasticity coefficients of health insurance, per capita income and the number of physicians to be positive on infant mortality though per capita income was statistically insignificant.

National Health Accounts (NHA) offer a comprehensive analysis of THE (total health expenditure) by country and when available for many years can provide a trend on many health related expenditure in a country. The NHA methodology was updated in 2011 and the current framework rests on three main elements (OECD (2010)): health care 1) financing, 2) provision and 3) consumption. *Health care financing* covers a) financing schemes or mechanisms through which funds are raised, pooled and used to pay for healthcare; b) and financing institutions controlling financing schemes like government, non-profit institutions serving households, and households. An example of a financing scheme is the free maternal care initiative by the national government in Kenya whereby all pregnancy-related healthcare such as antenatal care, delivery and postnatal visit are free in public facilities. The financing institution in that case is the national government. *Health care provision* relates to providers of healthcare such as hospitals, health centers, dispensary etc. *Healthcare consumption* emphasizes beneficiaries of funds like patients with diseases/condition on which the funds were spent, age-group of beneficiaries, gender. Reports of health accounts are posted on the World Health Organization (WHO) website[11]. Most recent health accounts follow the System of Health Accounts (SHA) 2011 with detailed distribution of expenditure by disease.

However, NHA reports produced earlier—before the new framework—can be useful to determine and analyze trend in total expenditure.

3.0 Objectives

This study aims to investigate the effect of health expenditure on health outcomes in sub-Saharan Africa. More specifically, it intends to determine:

2.1 trends in GDP and proportion of the GDP allocated to health,

2.2 association between reproductive health spending and lifetime risk of maternal death (%)

2.3 the effect of government and private health expenditure per capita on the following set of health indicators: life expectancy at birth, under 5 mortality rate, and neonatal mortality rate.

4. 0 Methods

4. 1 Inclusion criteria and data sources

African countries were selected based on their development of recent National Health Accounts (NHA) following the System for Health Account (SHA) 2011 framework[1]. The following 14 countries met the above listed inclusion criteria: Benin, Burundi, Cameroon, Comoros, Democratic Republic of Congo, Congo, Gabon, Ghana, Kenya, Malawi, Mauritania, Niger, and Sierra Leone and Uganda. The analysis covered the years 2002 to 2014.

The data came from three sources. First, the Global Health Expenditure (GHE) databases available on WHO website. The GHE database provides internationally comparable numbers on health expenditures. WHO updates the data annually, adjusting and estimating the numbers based on publicly available reports (health account reports, reports from the Ministry of Finance, Central Bank, National Statistics Offices, public expenditure information and reports from the World Bank, the International Monetary Fund, etc.) The estimates are sent out to the Ministries of Health for validation prior to publication but users are advised that country data may still differ in terms of definitions, data collection methods, population coverage and estimation methods used. The second source of data also comes from the World Health Organization-, the reports on the National Health Accounts. http://www.who.int/healthinfo/global_burden_disease/en/. This source helps explain the process of preparation and reporting of the national health accounts. The third source is the World Bank databases

[1] System of Health Accounts (SHA) 2011 tracks all health spending in a given country over a defined period of time regardless of the entity or institution that financed and managed that spending. It generates consistent and comprehensive data on health spending in a country, which in turn can contribute to evidence-based policy-making. The core accounting framework is organised around a tri-axial system for the recording of health care expenditure, namely classifications of the functions of health care (ICHA-HC), health care provision (ICHA-HP), and financing schemes (ICHA-HF), as presented in the below figure. These three core classifications address the three basic questions: What kinds of health care goods and services are consumed? Which health care providers deliver these goods and services? Which financing scheme pays for these goods and services?

(World Development Indicators). This is the most widely used source of development statistics data. It contains over 1000 series grouped in various groups: macroeconomics, health, education, poverty and inequality etc. It has a good coverage for most of the countries in the world from 1960 until present. The three sources were combined for this report. Information for objectives 1 and 3 came mainly from the third source (World Development Indicators). For objective 2, expenditure on reproductive health were extracted from the NHA reports when possible as some reports did not disaggregate between child and maternal expenses while others did not post the final tables. When disaggregated, reproductive health is recognized by the code DIS.2. The number of women age 15 to 49 was extracted from the World Bank database as was the lifetime risk of maternal death defined as "the probability that a 15-year-old female will die eventually from a maternal cause assuming that current levels of fertility and mortality (including maternal mortality) do not change in the future, taking into account competing causes of death". The RH expense were divided by the estimate of the number of women of reproductive age. For consistency, data for the multivariate analyses was obtained from the World Bank database which provides additional explanatory variables not directly related to health but useful for this analysis. The World Bank data base receive some data from the NHA coordinated by the WHO http://databank.worldbank.org/data/databases.aspx.

4.2 Health indicators, other variables and sample size

As explained above, the health indicators used are life expectancy at birth, under 5 mortality rate, and under 1 mortality rate. The health indicator data series are not as complete as the health expenditure shown in Table 1 of the descriptive statistics.

4.3 Analysis: variables

First, total and government health expenditure trends were described. Then, a multivariate analysis with the listed health indicators as dependent variables was conducted. The main explanatory variables were public and private government expenditure as a percentage of the Gross Domestic Product (GDP) per capita, following Nonvignon et al (2012). Also included was the GDP per capita to enable comparison between countries with different population sizes. The value at a constant US dollar price for country comparison was used while accounting for inflation. Finally, findings were adopted and the log form in the multivariate regression was used. Other explanatory variables are index of the Country Policy and Institutional Assessment (CPIA). The intuition behind this variable is that it is not only the GDP per se that affects health but also the institutional framework (See Wagstaff and Claeson (2004) for more detail). The proportion of women who reach primary level of education is included to acknowledge its importance in care and in child survival. All regressions also had an indicator of the HIV prevalence due to its effect on mortality and thus on life expectancy at birth. For child mortality, an indicator on measles and DPT (diphtheria, Polio and Tetanus) vaccination was added as those can point to the functioning of

health system with respect to basic tenets of childcare. In addition, non-specific effects of vaccines—unrelated to the specific conditions they are supposed to prevent—have been documented (WHO (2015)).

The literature suggested that relationships between health outcomes and expenditure are not linear and use the log forms of the variables. In such a case, coefficients are elasticities ((Wagstaff and Claeson (2004), Filmer and Pritchett (1999)). This study followed suit while using panel data modeling.

The format of the multivariate regression was

$Y_{it}=A+ f(X_{it}) + E_{it}$

Where i stands for individual country at time t. Y is the dependent variable and X is a vector of explanatory variables[2]. A is the intercept, while E is the error terms.

Graphs have been done in Excel (MS Office, Seattle) and the multivariate analysis with STATA 14.

5.0 Results

5. 1 Trends in GDP and health expenditure as % of GDP

With the exception of Comoros, real total GDP per capita trended upward as the Figure 1 below indicate. Burundi was the country with the lowest GDP per capita (its highest GDP during those years was in 2014 at 152.65 USD). In contrast, Gabon has the highest GDP per capita during the period which stood at more than 48 times that of Burundi (7469.58 USD in 2014)[3].

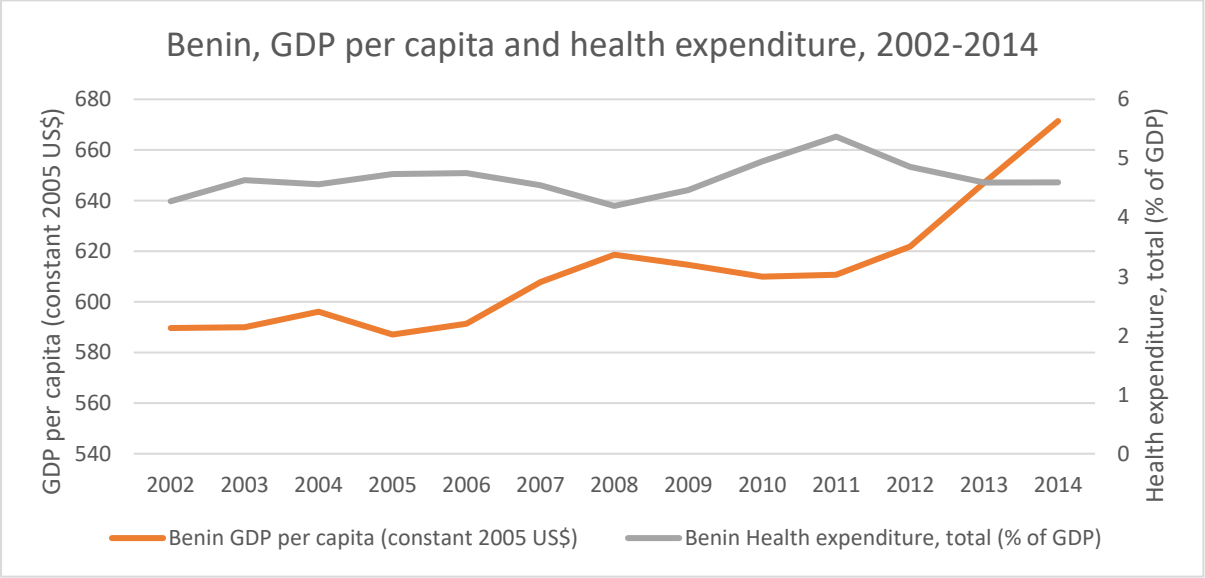
We fitted a linear trend to the health expenditure as a percentage of GDP. Surprisingly, no general trend emerged in the whole sample. Most countries actually increased the proportion of GDP allocated to health, even if only slightly while a few countries (Mauritania, Niger, Sierra Leone) reduced it. There are a few interesting results that emerge from the charts below.

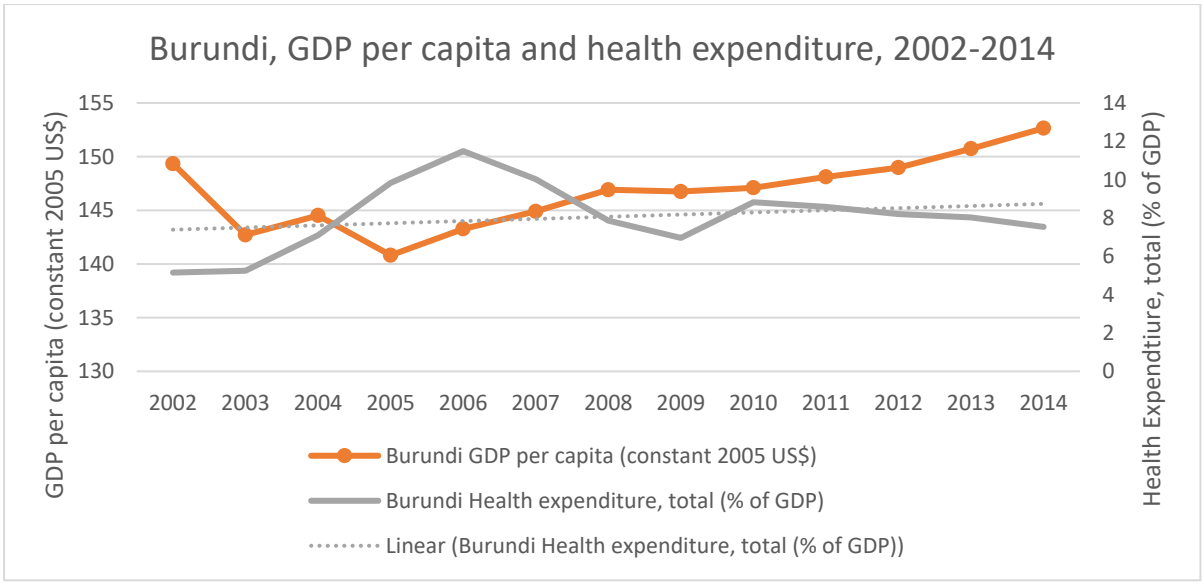
In the case of Benin, while the GDP per capita has been increasing, the health expenditure (in % of GDP) has been somewhat flat during the same period. Similar picture also emerges in the case of Burundi. Starting from mid-2000s onward, the GDP per capita of Burundi has been increasing, while the total health expenditure (in % of GDP) has been fairly stagnant in the same period. The situation has been somewhat reversed in the case of Comoros. From early 2000s until 2014, the overall GDP per capita has been decreasing, while the health expenditure (as % of GDP) has been marking a somewhat increasing trend. Unlike Comoros, but like Burundi and Benin, GDP per capita in the Democratic Republic of the Congo has been increasing, while the health expenditure (as % of GDP) has been fairly

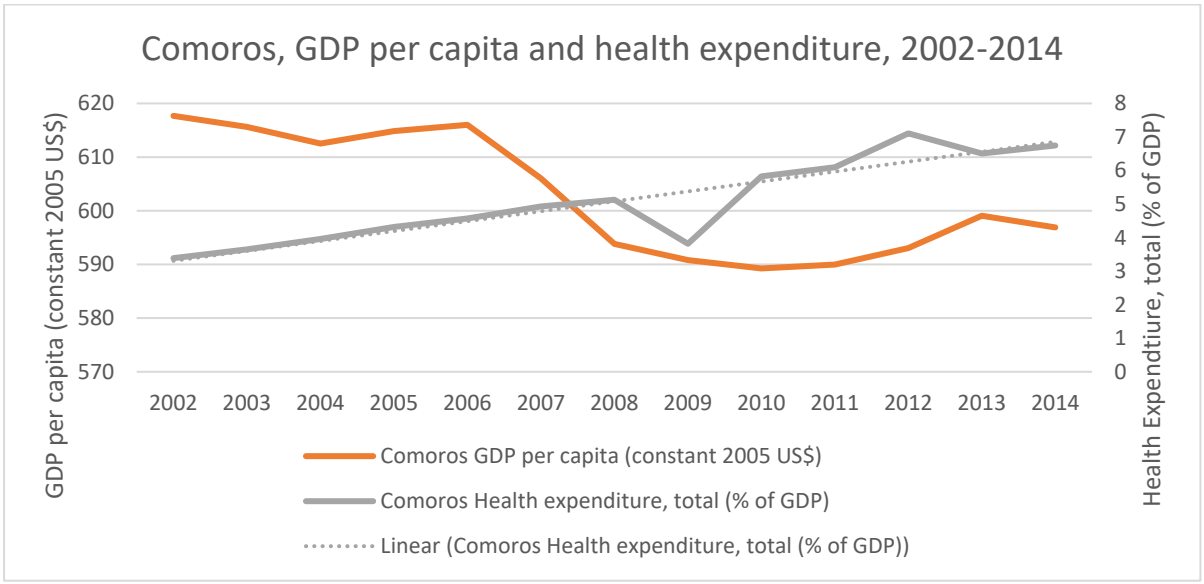
[2] All of the independent variables used in the modelling are reported in Table 1 – descriptive statistics.
[3] These numbers are in 2005 constant prices, thus removing the effect of inflation.

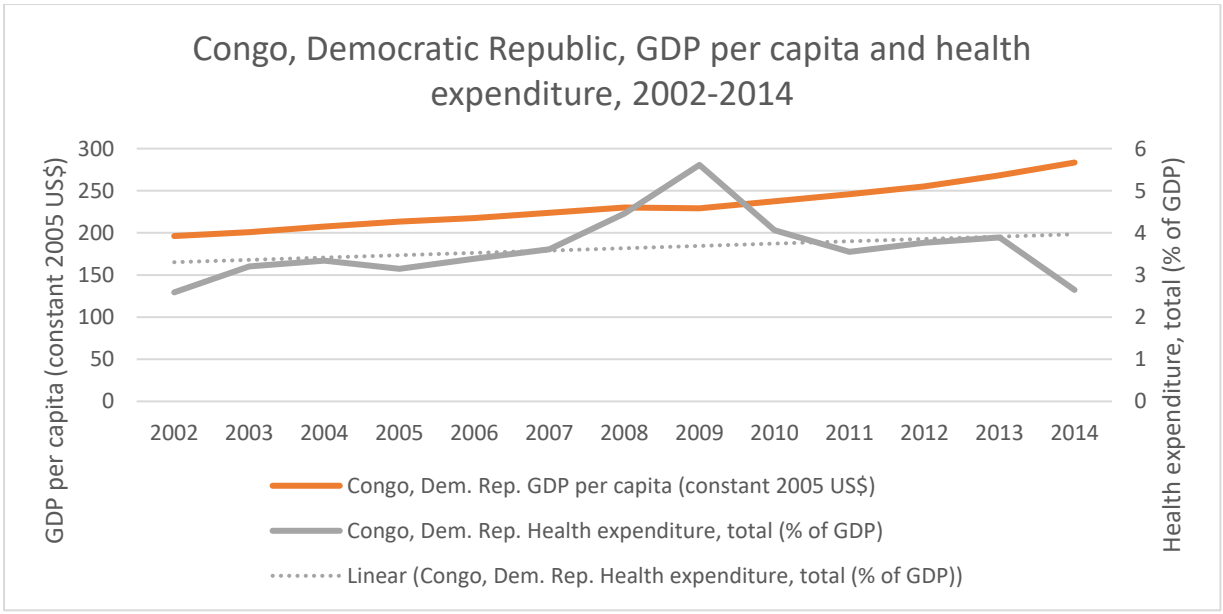
stagnant. Very similar trend of the two variables is also present in the Republic of Congo. In Gabon, both GDP per capita and health expenditure (in % of GDP) have been increasing in the last ten years, though at a slight trend. Similarly to the rest of the countries in the sample, the GDP per capita in Kenya has been increasing with a slight pace between 2002 and 2014, while the health expenditure (in % of GDP) has been fairly stagnant, teetering around the 3% point. Similar story emerges in the case of Kenya as well, where the health expenditure actually marked a slight drop in 2010. The case of Malawi is slightly different compared to the rest of the countries. First, GDP per capita has been growing at a steady pace during the last ten years. Moreover, health expenditure has also been growing, although with couple of drops (in 2007 and 2013). The situation in Mauritania and Niger is similar to most of the countries in the sample. While GDP per capita in both countries has been growing at a slight pace, the health expenditure (in % of GDP) has been fairly stagnant (or even decreasing) over the years. Very similar findings emerge from the summary results for Sierra Leone and Uganda.

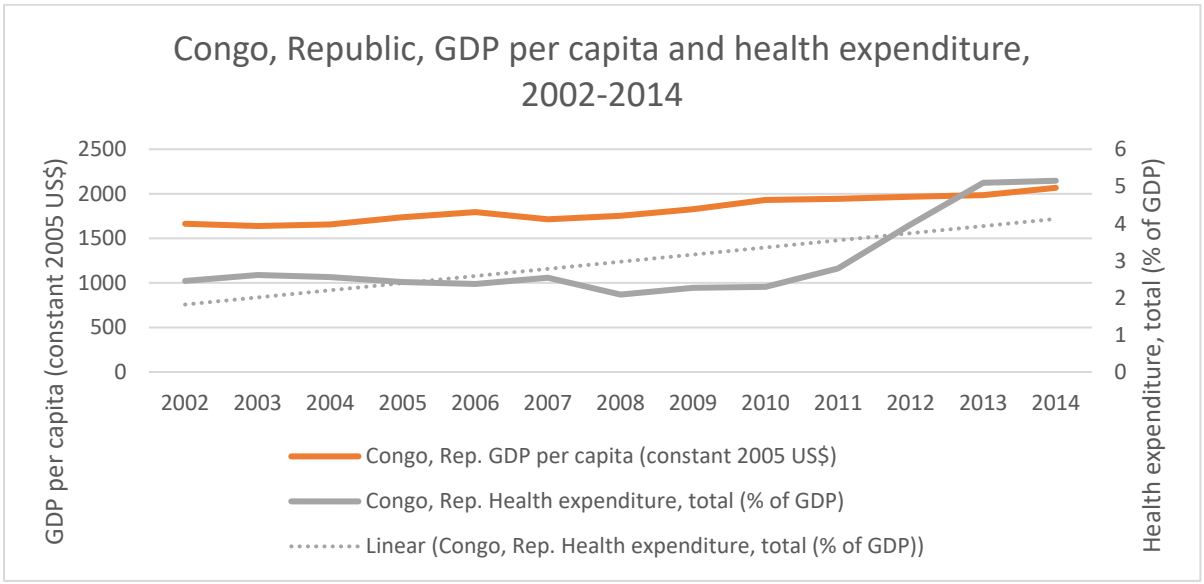
Figure 1

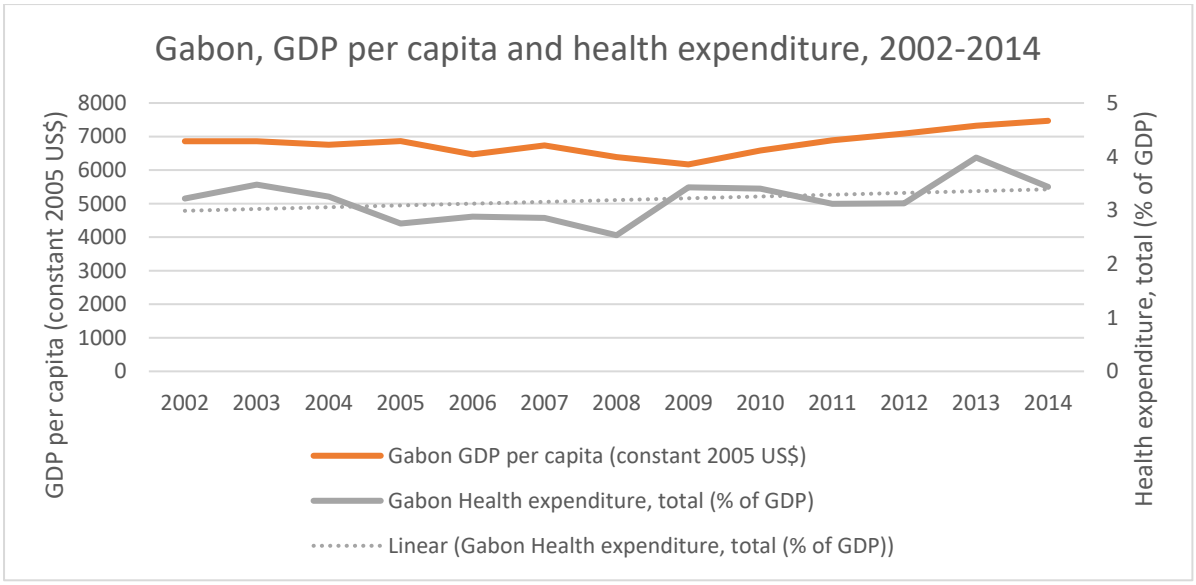


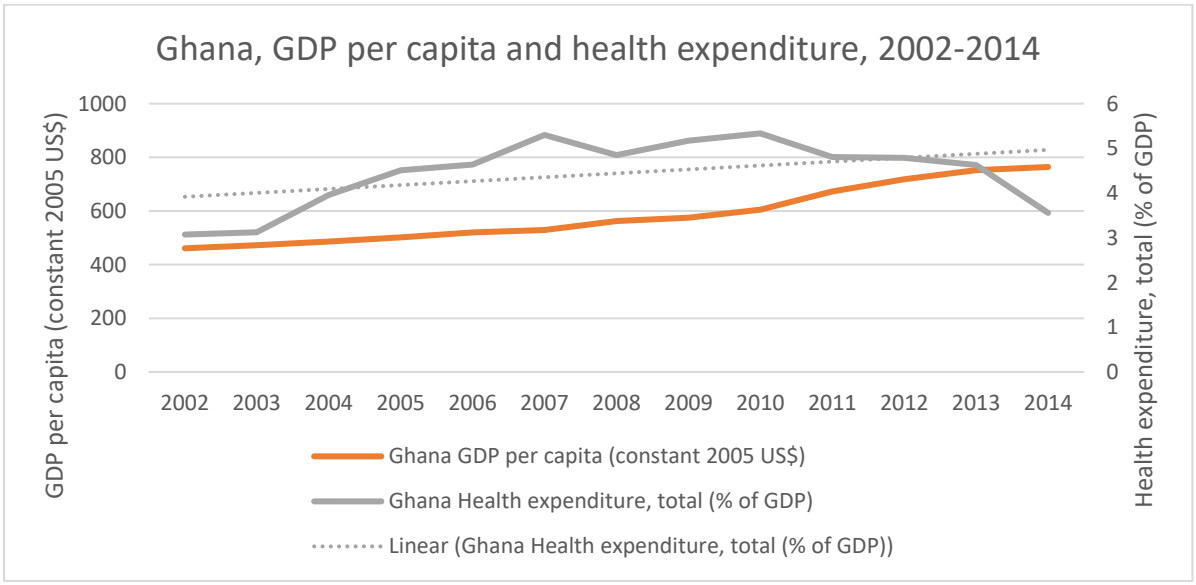

Burundi, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
155
150
145
140
135
130
14
12
10
8
6
4
2
0
Health Expendtiure, total (% of GDP)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Burundi GDP per capita (constant 2005 US$)
Burundi Health expenditure, total (% of GDP)
Linear (Burundi Health expenditure, total (% of GDP))

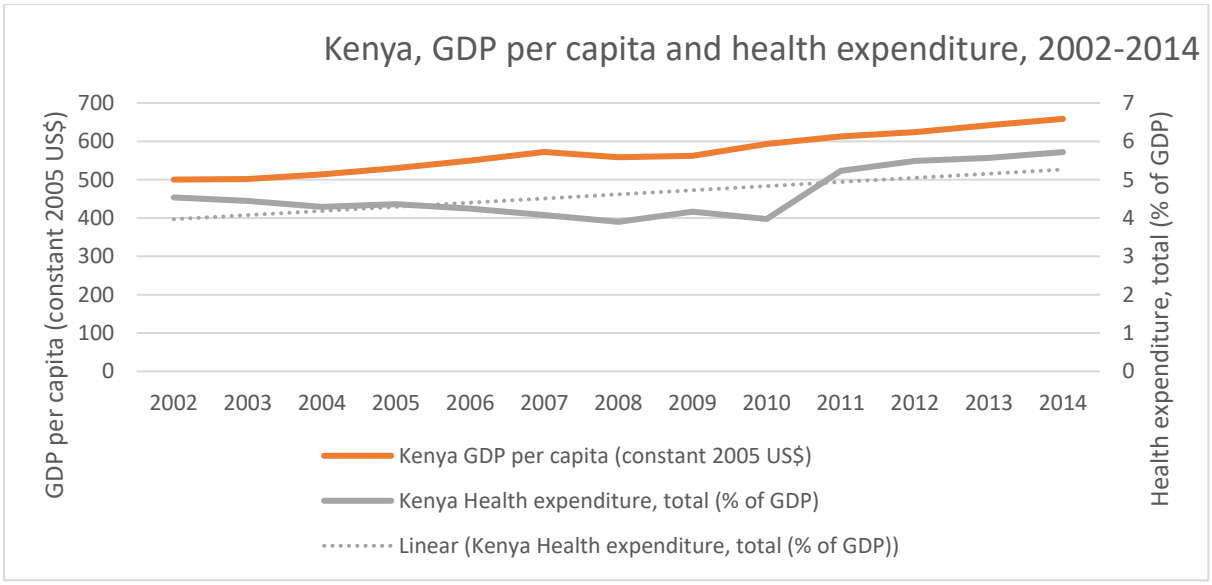

Comoros, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
620
610
600
590
580
570
8
7
6
5
4
3
2
1
0
Health Expendtiure, total (% of GDP)
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Comoros GDP per capita (constant 2005 US$)
Comoros Health expenditure, total (% of GDP)
Linear (Comoros Health expenditure, total (% of GDP))

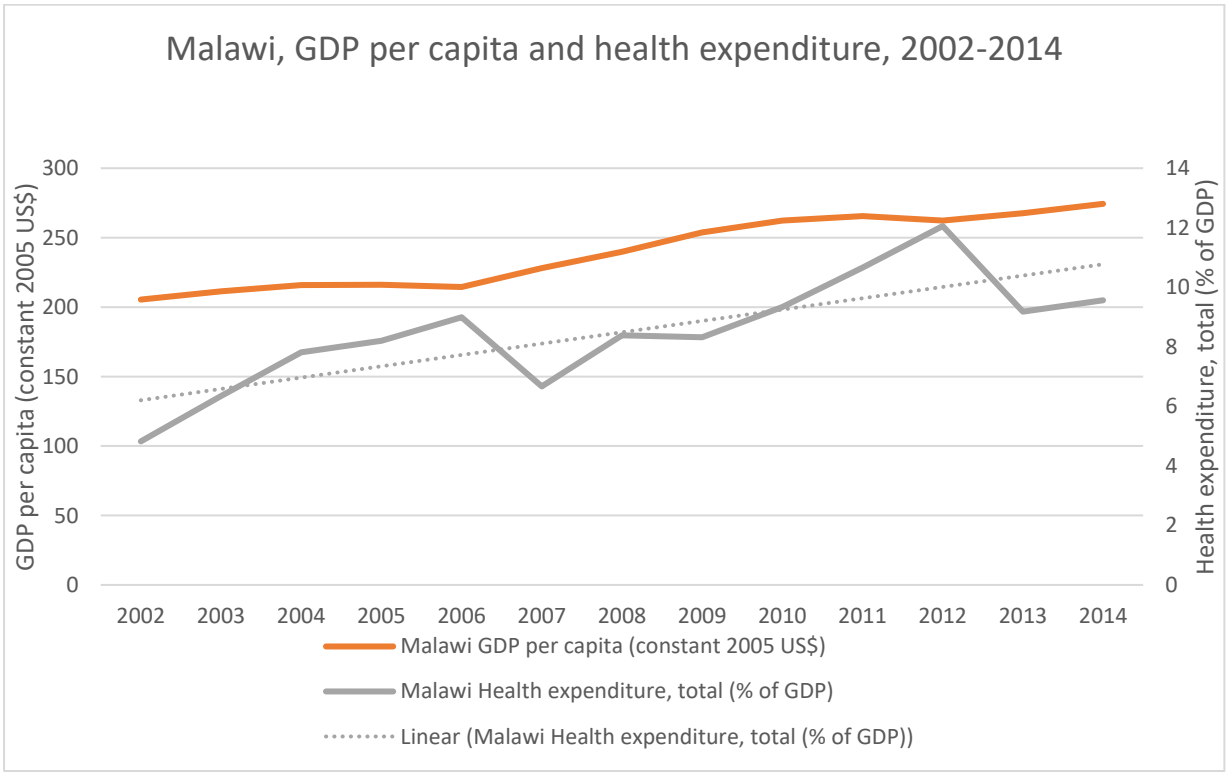

Congo, Democratic Republic, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
300
250
200
150
100
50
0
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Congo, Dem. Rep. GDP per capita (constant 2005 US$)
Congo, Dem. Rep. Health expenditure, total (% of GDP)
Linear (Congo, Dem. Rep. Health expenditure, total (% of GDP))

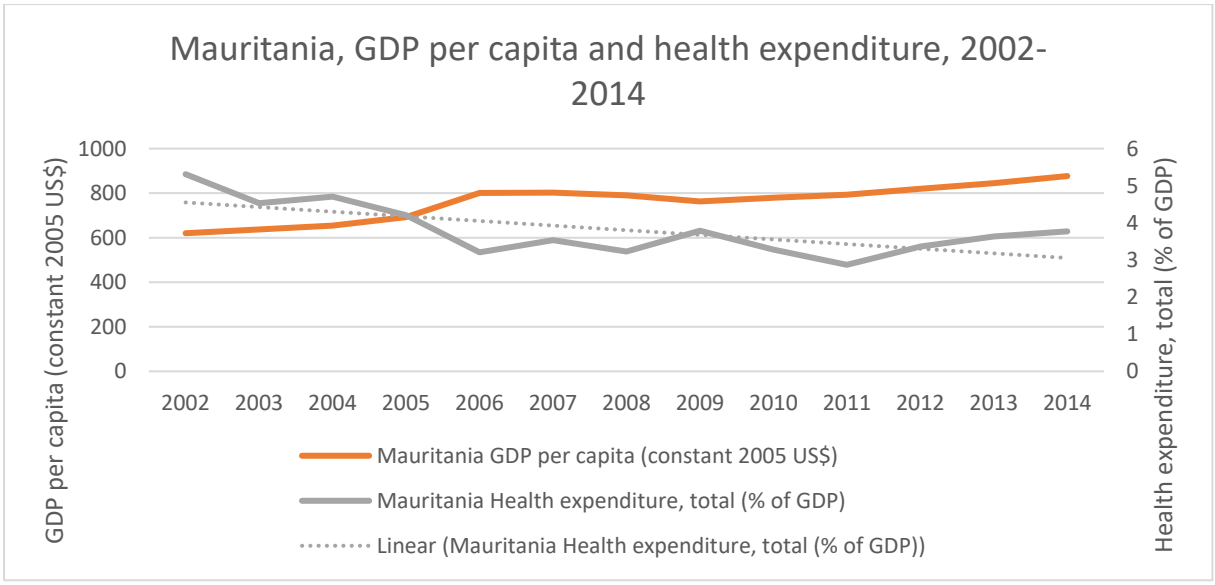

Congo, Republic, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
2500
2000
1500
1000
500
0
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Congo, Rep. GDP per capita (constant 2005 US$)
Congo, Rep. Health expenditure, total (% of GDP)
Linear (Congo, Rep. Health expenditure, total (% of GDP))

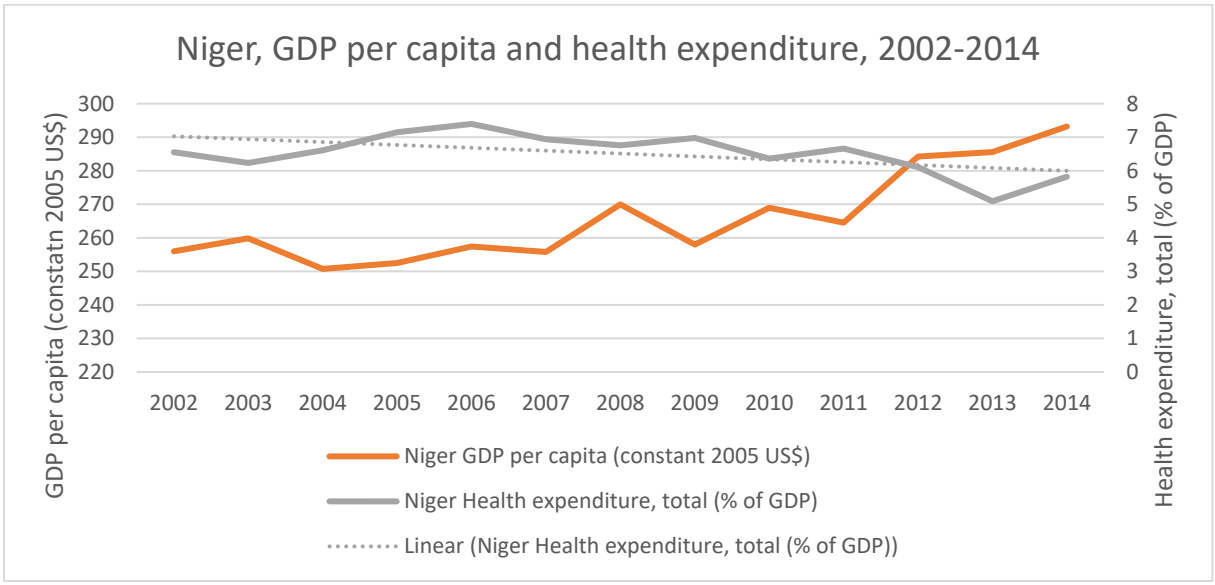

Gabon, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
8000
7000
6000
5000
4000
3000
2000
1000
0
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Gabon GDP per capita (constant 2005 US$)
Gabon Health expenditure, total (% of GDP)
Linear (Gabon Health expenditure, total (% of GDP))

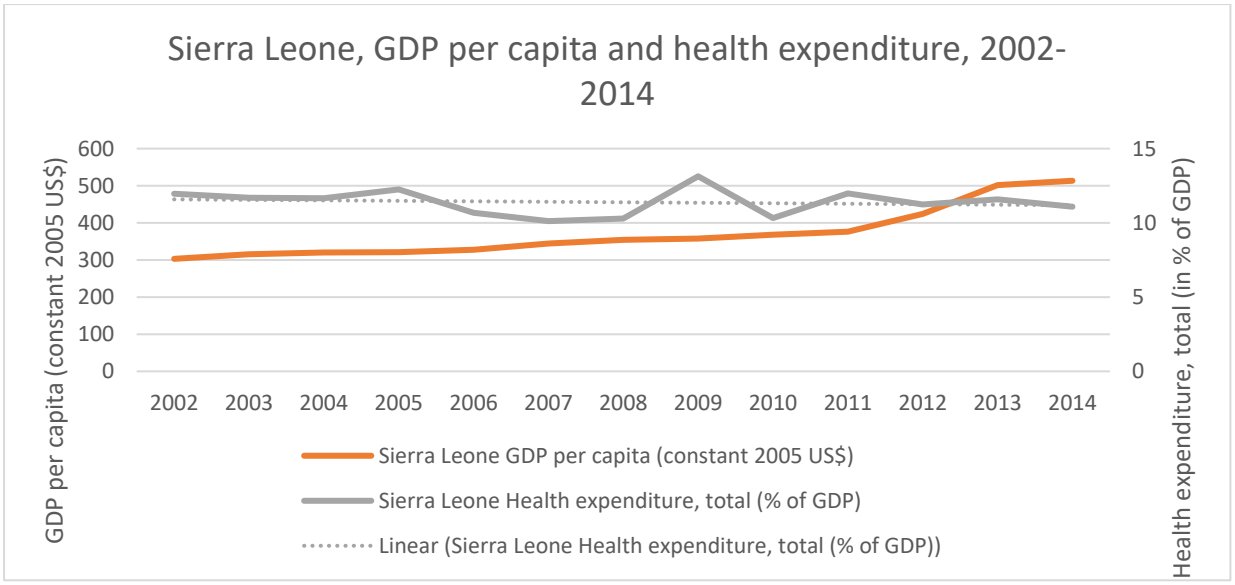

Ghana, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
1000
800
600
400
200
0
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Ghana GDP per capita (constant 2005 US$)
Ghana Health expenditure, total (% of GDP)
Linear (Ghana Health expenditure, total (% of GDP))

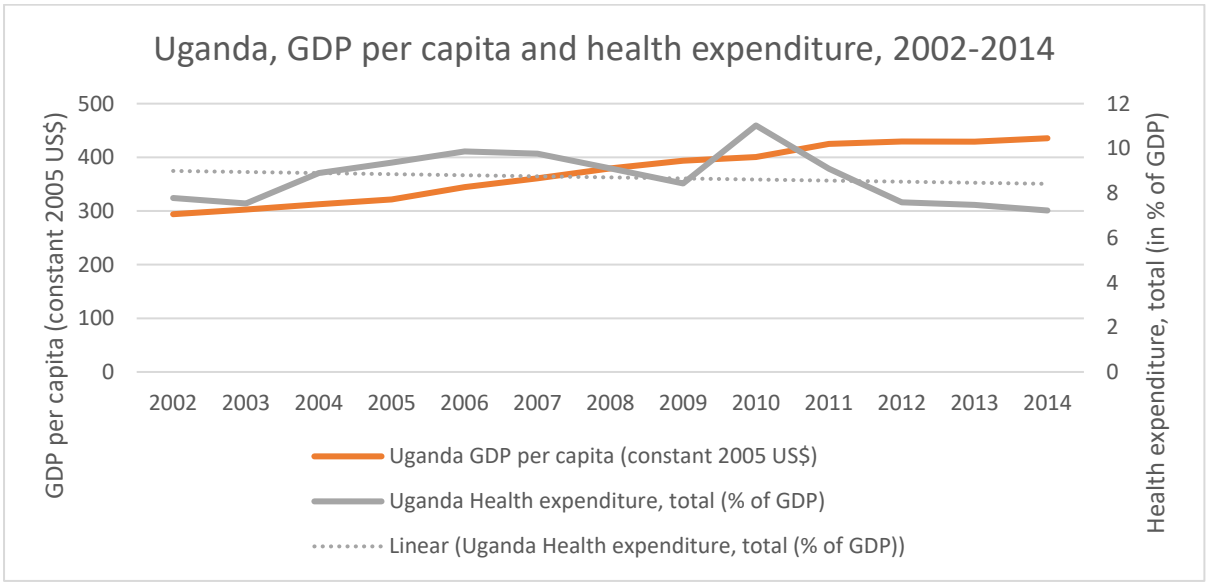

Kenya, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
700
600
500
400
300
200
100
0
7
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Kenya GDP per capita (constant 2005 US$)
Kenya Health expenditure, total (% of GDP)
Linear (Kenya Health expenditure, total (% of GDP))


Malawi, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
300
250
200
150
100
50
0
14
12
10
8
6
4
2
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Malawi GDP per capita (constant 2005 US$)
Malawi Health expenditure, total (% of GDP)
Linear (Malawi Health expenditure, total (% of GDP))


Mauritania, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (% of GDP)
1000
800
600
400
200
0
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Mauritania GDP per capita (constant 2005 US$)
Mauritania Health expenditure, total (% of GDP)
Linear (Mauritania Health expenditure, total (% of GDP))

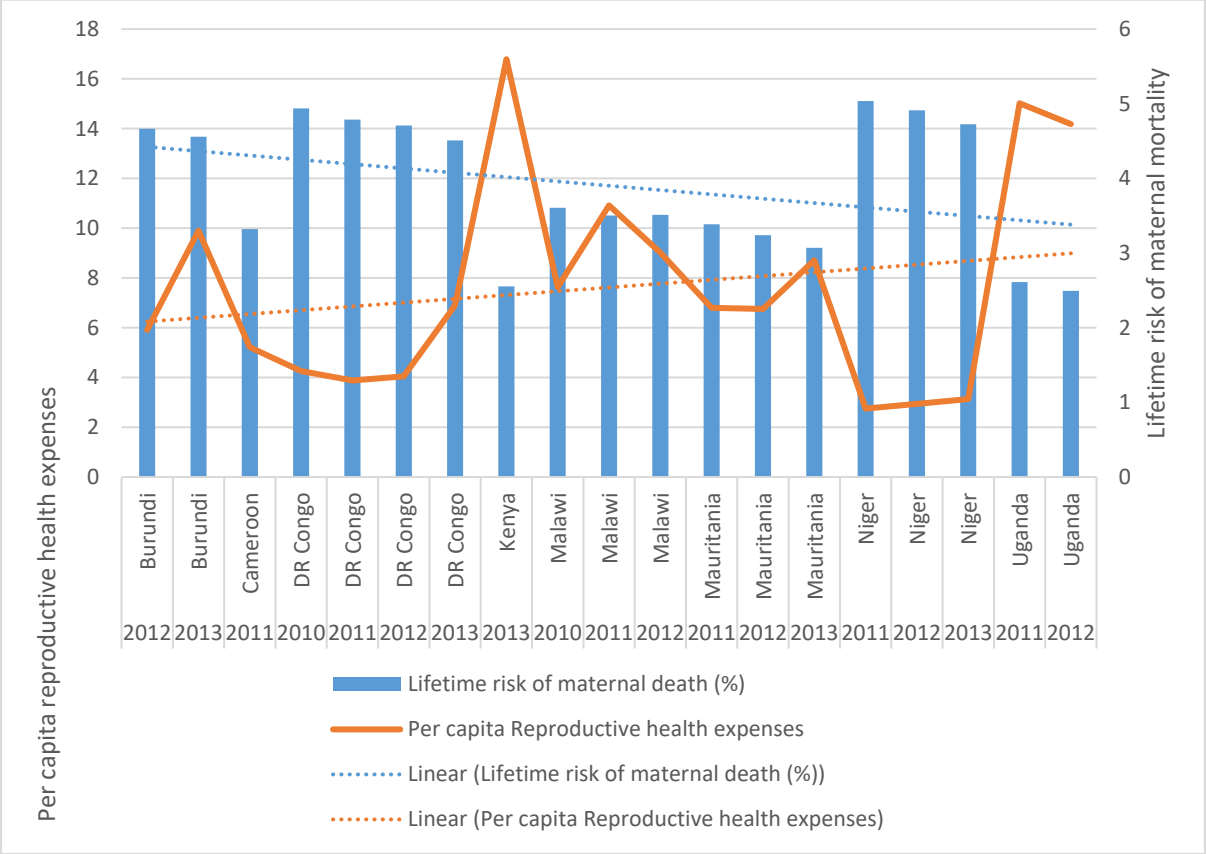

Niger, GDP per capita and health expenditure, 2002-2014
GDP per capita (constatn 2005 US$)
Health expenditure, total (% of GDP)
300
290
280
270
260
250
240
230
220
8
7
6
5
4
3
2
1
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Niger GDP per capita (constant 2005 US$)
Niger Health expenditure, total (% of GDP)
Linear (Niger Health expenditure, total (% of GDP))


Sierra Leone, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (in % of GDP)
600
500
400
300
200
100
0
15
10
5
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Sierra Leone GDP per capita (constant 2005 US$)
Sierra Leone Health expenditure, total (% of GDP)
Linear (Sierra Leone Health expenditure, total (% of GDP))


Uganda, GDP per capita and health expenditure, 2002-2014
GDP per capita (constant 2005 US$)
Health expenditure, total (in % of GDP)
500
400
300
200
100
0
12
10
8
6
4
2
0
2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014
Uganda GDP per capita (constant 2005 US$)
Uganda Health expenditure, total (% of GDP)
Linear (Uganda Health expenditure, total (% of GDP))

5.2 Association between reproductive health spending and lifetime risk of maternal death (%)

Figure 2 below depicts reproductive health expenses per capita (the line in red) and lifetime risk of maternal mortality (blue column). In addition, the graph includes the linear trend of the two variables. It is important to note that, given the data availability, the data points per country ranged from 1 to 3. The overall results for countries with more than one data point is that increase in the health expenditure on reproductive health is associated with decrease in maternal mortality. Moreover, the coefficient of correlation is -81.9, further suggesting that increasing the expenditures on reproductive health is associated with lower maternal mortality.



5.3 Effect of government and private health expenditure on health indicators: life expectancy at birth, under 5 mortality rate, and neonatal mortality rate.

Table 1 showed the descriptive statistics. It indicates that this is an unbalanced panel with some of the data available for all of the years (life expectancy, mortality, health expenditure and GDP per capita), while some of the data is available only for some of the countries over the years – CPIA building human resources rating, improved sanitation and water sources as well as primary completion rate for females. There are a few interesting findings that stem from Table 1. The average life expectancy is roughly 55 years (ranging from 40 to 63). Infant mortality is approximately 70 per 1,000 live births (ranging from 35.5 to 135.6). Neonatal mortality is somewhat lower, but under five mortality reaches 109.2 (and it ranges from 49.1 to 219.6). The average health expenditure is 5.73 (most of it is private 3.38% on average, while the public health expenditure is 2.37%). The average GDP per capita is 4120 USD, PPP, but it is

fairly widely distributed across countries (ranging from 550 to 18646). The immunization rate is fairly high both for DPT (average 75.2%) and for measles (72.7%). While, on average 25% of households have improved sanitation facilities, 67% have improved water source.

Table 1. Descriptive statistics

Variable	number of observations	Mean	standard deviation	minimum	maximum
Life expectancy at birth, total (years)	168	54.95	5.27	39.65	63.44
Infant mortality (per 1,000 live births)	168	69.97	20.73	35.60	135.60
Neonatal mortality (per 1,000 live births)	168	33.00	6.81	19.40	52.10
Under 5 mortality (per 1,000 live births)	168	109.25	35.89	49.10	219.60
Health expenditure, private (in % of GDP)	168	3.38	2.22	0.81	10.54
Health expenditure, public (in % of GDP)	168	2.37	1.08	0.16	5.96
Health expenditure, total (in % of GDP)	168	5.73	2.57	2.09	12.72
Health expenditure per capita, in USD (real)	168	122.04	128.76	10.80	734.68
GDP per capita, PPP (constant 2005 USD)	168	2952.54	4119.93	549.11	18646.40
CPIA building human resources rating (1=low, 6=high)	130	3.49	0.41	2.50	4.50
Immunization, DPT (% of children aged 12-23 months)	168	75.27	13.66	38.00	99.00
Immunization, measles (% of children aged 12-23 months)	168	72.70	12.35	37.00	98.00
Improved sanitation facilities (% of population with access)	152	24.66	12.95	6.90	47.50
Improved water source (% of population with access)	152	67.34	14.99	42.50	95.10
Population aged 15-64 (in % of total)	182	53.01	2.78	47.02	57.66
Primary completion rate, female (%)	118	58.09	17.98	17.01	104.13

5.4 Multivariate analysis

As the multivariate analysis was based on panel data, a Hausman test was conducted to determine which one of the random or the fixed effects models was most appropriate. Based on the test results, the fixed effects model was selected and this is the only analysis described below[4].

Table 2 captures the results of the fixed effects. Given that our main variables of interest is health expenditures, the table reports only these results (while the results also control for the additional control variables listed in Table 1). There are a few important findings that emerge from Table 2. First, when using log neonatal mortality, we find that public health expenditure is associated with lowering neonatal mortality. More specifically, a 1% increase in the public expenditure is associated with a 3.2% reduction in neonatal mortality. Similar findings (vis-à-vis the sign and significance) emerge when using infant mortality as a dependent variable. In the case of infant mortality, a 1% increase in health expenditure is associated with 4.2% decrease in infant mortality. Finally, when using under 5 mortality, the results also show a significant link between public health expenditure and under 5 mortality, also suggesting that a 1% increase in health expenditure is associated with a 3% decrease in under 5 mortality. Interestingly, the private health expenditure variable appears as insignificant in all specifications. When using log of life expectancy as a proxy for health outcomes, we find a positive link between public health expenditure and life expectancy. More specifically, a 1% increase in the public health expenditure is associated with a 6% increase in life expectancy.

[4] Moreover, a simple endogeneity test (comprising including residual of a first stage regression of the suspected endogenous variable (public health expenditure) on the rest of the exogenous regressors) reveals potential exogeneity of the regressor and hence allows for using panel fixed effects estimates.

Table 2. Multivariate regression analysis results, fixed effects

	Log of neonatal mortality	log of infant mortality	log of under 5 mortality	log of life expectancy
Log of public health expenditure (% of GDP)	-0.032**(0.011)	-0.042**(0.016)	-0.029**(0.013)	0.06** (0.03)
Log of private health expenditure (% of GDP)	-0.009 (0.025)	-0.001 (0.034)	-0.005 (0.031)	-0.014 (0.073)
Year dummies	YES	YES	YES	YES

The models also control for the following independent variables: log of GDP per capita in PPP, female primary completion rate (in %), CPIA human capita development rating, Immunization fo rmeasles (% of children aged 12-23), immunization for DPT (% of children aged 12-23), improved sanitation facilities as well as improved water access. Robust standard errors are reported in parantheses. *** significant at 1% level of significance, ** significant at 5% level of significance, * significant at 10% level of significance.

6.0 Discussion

Using cross-country data for 14 countries that have moved towards using NHA, the objective of this report was to: (i) document the trend of health expenditure (in % of GDP); (ii) to descriptively analyze the link between selected health expenditure (spending on maternal and newborn conditions) and selected health outcomes (maternal health); and (iii) finally, relying on fixed effects panel data analysis, to explore the link between different types of health expenditure and selected health outcomes (infant mortality, under 5 child mortality and life expectancy).

There are a few interesting results that stemmed from our analysis. First, we foundd ample evidence that in the selected sample of countries, the government expenditure on health kept up with the pace of economic development. This is important, as it also suggests increase of total funds to be spent on healthcare in absolute terms. However, there are still couple of countries in the sample, where the government expenditure on healthcare has been stagnant or even decreasing. This is alarming and could also leave some of the countries vulnerable to foreign donor funding (particularly in the area of health), which, with shifting donor preferences and sectors of intervention could further jeopardize the advancements made in improving the health outcomes in the selected countries. Second, we found a very robust link between specific healthcare expenditure (on maternal health) and the corresponding health outcomes. In that respect, our results are consistent with the main literature strand that found a negative link between public health expenditure and health outcomes (see for instance Farahani et al (2009) or Palma-Soliet et al (2009)). The message stemming from this exercise points to the need of further investment (via improved access to healthcare, improved quality of healthcare) so that the financial resources are used most efficiently. Indeed a forthcoming study by Nikoloski (2016) finds a clear link between quality of healthcare as measured by the SDI indicators and child mortality in Tanzania.

Finally, and most importantly, the results of our fixed effects analysis revealed a robust link between public healthcare expenditure and selected health outcomes. Moreover, the results of our analysis did not reveal the existence of a link between private healthcare expenditure and health outcomes. There could be a few reasons for the lack of robust link between private health expenditure and health outcomes. While the public health expenditure is usually directed towards improving health infrastructure (number of trained doctors, trained nurses, investment in facilities), the private expenditure (usually out of pocket) is usually a result of the inefficiencies of the system (e.g. unofficial payments etc) which doesn't directly translate into changes in health outcomes. Overall, however, these findings further solidify our second point raised above on the link between public healthcare expenditure and health outcomes. In addition, this finding further corroborates the growing body of literature that establishes a clear and robust link

between public health expenditure and health outcomes (see for instance Farysaa (2001)). Moreover, this finding further places our study in the first strand of the literature that finds a clear negative link between public health expenditure and health outcomes (see for example, Farahani et al (2009) or Palma-Soliet et al (2009)).

5.1 Limitations

This work focused on the few countries that have recently conducted national health accounts following the new system therefore resulting in a small sample size. As more countries develop the health accounts, finer disaggregation of expenditure by disease might be available. This analysis would benefit from inclusion of other variables such as malaria prevalence or the proportion of households that face catastrophic expenditure, although those variables do not yet exist for all countries. In addition, given the limited time span of the analysis, we could not use a more sophisticated analytical tool (system GMM) and we leave this for future exploration.

7.0 Conclusion

Using an international panel dataset of health and economic indicators, we have explored the link between public sector health expenditure and health outcomes. We forward our results with caution as we are aware of the limitations of cross country studies and the constraints that stem from patchy data coverage, yet we also maintain that this approach can provide important policy insight at the aggregate level as well as stimulating further research on this important topic. We stylize our reading of the key empirical evidence of this paper in the following way – we find robust evidence that higher public spending on health is associated with lower infant mortality rates in the Sub-Saharan African region. Moreover, our findings are robust to the use of alternative proxies for health status.

Our findings also carry significant policy weight. Increasing the public expenditure on health could further spur the reduction of infant mortality and overall improve general health outcomes in the Sub-Saharan African region. More importantly however, the public expenditure should also be well targeted and should also be geared towards improvement of the quality of both, primary and secondary healthcare in the subcontinent. In other words, the three main findings of the report suggest the following: (i) increase the funding on health; (ii) target it better; (iii) increase the funding on other determinants of health that might have an indirect impact on health.

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