The Impact of Government Health Expenditure on Health Outcomes in Southern Africa

Shilongo, Henock

Bank of Namibia

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Henock.shilongo@icloud.com

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by **Henock Shilongo**

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Abstract

Does government health expenditure lead to better health outcomes in southern African countries? Government health expenditure in these 10 countries (Angola, Botswana, Eswatini, Lesotho, Malawi Mozambique, Namibia, South Africa, Tanzania and Zambia) is greater than private sector health spending. A need arises to empirically estimate whether government health spending impacts health outcomes more than private spending. Using the fixed-effects regression method and a data set for the period 2000 to 2016, this paper finds that despite more health expenditure by government, it is private health expenditure, in comparison, that impacts health outcomes the most in southern African countries with mixed health systems. The results, however, show that after controlling for corruption, government health expenditure has no significant impact on life expenditure at birth but considerably improves mortality rates.

1. Introduction

Statistically, Organisation for Economic Co-operation and Development (OECD) countries spend more on health and have better health outcomes than African countries. The World Bank data specific to this study show that in 2016, government health expenditure per capita in OECD countries was on average USD3999 compared to Sub-Sahara African (SSA) countries that spent an average of USD500 per capita while southern African countries, specifically those used in this study, on average only spent USD257 per capita. In summary governments in the southern African region spend on average lower than government from the entire Sub-Saharan region. Total life expectancy (both male and female) at birth for OECD countries in 2016 was 80.2 years while it was 61.6 years for southern African countries. Similarly, in both sets of countries, governments spend more on health per capita than the private sectors of the respective countries. The disparities that exist can be attributed to the difference in income levels and social economic status between the two sets of countries.

Ideally investing in the health of a country's population should have positive returns. Good health allows children to learn and adults to live long, be productive and generate income. The expectation is that increasing public and private health spending will increase health capital and consequently human capital leading to economic growth of the country. Table 1 presents descriptive statistics of the data used in this study. In the southern African region, the average female life expectancy is 56.8 years which is greater than 52.5 years, the average male life expectancy. Among the southern African countries, the minimum government health expenditure per capita is USD1.69 while the maximum is USD600. Using the World Bank's a governance performance scale of -2.5 to 2.5, (with -2.5 being weak governance and 2.5 being strong governance) corruption control in the southern Africa region has an average rating of -0.24, with the lowest country average rating of -1.52 for Angola and the highest average rating of 1.22 for Botswana.

This paper aims to determine whether a causal relationship exists between government health expenditure and health outcome for 10 southern African countries and test whether government health expenditure has a greater impact on health outcome compared to private health expenditure. The study emulates the empirical work by Arthur and Oaikhenan (2017) who conducted a similar study but instead covered 40 SSA countries using World Bank data from 1995 to 2014. Their main findings indicated that health expenditure marginally reduced mortality rates and improved life expectancy. Specifically, they found that public health expenditure is more significant in influencing mortality rates in SSA, whereas private health expenditure is significant in influencing life expectancy at birth. The approach taken in this paper is different from that of Arthur and Oaikhenan (2017) in several ways. Firstly, it focuses solely on southern African countries with governments that spend more on health per capita than the private sector. Secondly, it uses an updated dataset and period from 2000 to 2016, omitting some variables used by Arthur and Oaikhenan (2017) that were found to have incomplete entries for the study period. Finally, it introduces *corruption control* as an additional independent variable to capture governance performance.

2. Data

The panel data is sourced from the World Bank's World Development Indicators and the World Governance Indicators for a sample of 10 southern African countries for the period 2000 to 2016. The dependent variables are life expectancy at birth (male and female) and mortality rates (infant and under 5). The main explanatory variable is government health expenditure per capita. Additional control variables used are described below and in more detail under the data appendix.

3. Empirical Model

The Human Capital Model proposed by Grossman (1972) provides a basis to estimate the effect of health care spending on health outcome. This approach has been used in similar studies such as Fayissa and Gutema (2005) and later by Arthur and Oaikhenan (2017):

$$H = F(Y, S, V, D) \quad (1)$$

H is a vector of health outcomes (life expectancy and infant mortality), Y is a vector of economic variables (GDP per capita and health expenditure); S is a vector of a social and governance variables (education and corruption control); V is a vector of environmental factors (prevalence of HIV and availability of water); and D represents health service utilization proxied by measles immunization. Some of the variables used by Arthur and Oaikhenan (2017) were omitted from the regression due to missing data. For the purpose of estimation, equation 1 translates to the following:

$$Ht = \beta 0 + \beta 1\text{gov} + \beta 2\text{pri} + \beta 3\text{lnGDPpc} + \beta 4\text{edu} + \beta 5\text{lnmeasles} + \beta 6\text{lnwater} + \beta 7\text{lnHIV} + \beta 8\text{Corr}\ (2) + \varepsilon t \quad (2)$$

Ht is health outcomes (life expectancy and infant mortality); *gov* is government health expenditure per capita; *pri* is private health expenditure; *lnGDPpc* is the natural log of GDP per capita; *edu* is gross primary education enrollment rate; *lnmeasles* is the natural log of measles immunization; *lnwater* is access to clean water; *lnHIV* is the natural log of prevalence to HIV; and *Corr* is control of corruption.

Equation (2) is estimated using the fixed-effects regression method to control for omitted variables, (such as cultural attitudes) that vary across the southern African countries but are constant over time. Some limitations of the fixed-effects regression method are unobserved heterogeneity and

the inability to control for variables that vary over time such as age or employment status of the people these African countries.

4. Discussion of Empirical Results

Figure 1 shows that government health expenditure per capita has positive effects on life expectancy at birth and negative effects on infant and under-5 mortality. These results confirm a causal link between government health spending and health outcomes.

The effect of government health expenditure on health outcomes was investigated using the fixed-effect model and the results are reported in Table 2. The coefficients of the explanatory variables indicate the change in health outcomes due to a one unit/percentage change in any of the explanatory variables, holding the other variables constant**.** According to the results from the estimation model, government health spending has no significant impact on life expectancy for both male and female at birth but at a 10 percent level of significance, however, a unit increase in government health spending per capita reduces both infant and under-5 morality rates by 0.02 and 0.03 respectively. In contrast, health spending by the private sector significantly improves both male and female life expectancies, and greatly reduces infant and under-5 mortality rates. Health service utilization proxied by measles immunization in the model also proved to be very important. Specifically, a 1 percent increase in the measles immunization rate increases life expectancy at birth of males by 9.3 years and females by 9.4 years while reducing the rate of infant and under-5 mortality by 0.46 and 0.54 units, respectively. The study further finds meaningful estimates from environmental factors. The results also indicate access to clean water significantly reduces both infant and under-5 mortality while the prevalence rate of HIV which was found to be significant at 1 percent level reduces life expectancy and increases infant mortality. Primary school enrollment rate (social variable) plays a significant role in improving life expectancy at birth but does not have a significant effect on mortality rates. Additionally, improving governance (proxied by control of corruption) interestingly enhances all health outcome variables at a 1 percent level of significance.

The average population of the southern African region used in this study is 1.7 billion with an average public health spending per head of USD182. Since public health spending only has a significant causal effect on mortality rate, the results suggest that on average USD3.65 per capita

is required to reduce infant mortality in southern Africa. This estimation is above the poverty line of USD1.90 a day which can be considered a big effect. This figure multiplied by the population suggests that USD6.2 billion in public funds is required to make a significant dent on the high infant mortality rates in the southern African region. With regards to the corruption results, the average corruption rate in southern Africa is -0.2 on a scale of 2.5 to -2.5. southern African countries should increase the corruption control on average by 0.8 to witness a huge increase in life expectancy at birth. The World Health Organization recommended that countries should spend 5 percent of their GDPs on health. On average southern African countries spend 3.9 percent of GDP on health which is below the recommended target but with the estimated health expenditure of USD6.2 billion, health outcomes might improve on condition that corruption within the region is also controlled.

5. Conclusion

In conclusion, the results imply that private sector spending significantly impacts health outcomes despite higher government health expenditure in the southern Africa region. Rooting out corruption can liberate more public funds intended to improve health outcomes and support the private sector's impact. Empirically, these results somewhat agree with the findings of Gupta et al. (2002) and especially those of Arthur and Oaikhenan (2017). The results were adjusted for heteroscedasticity by using robust standard errors. The coefficients of determination (R-squared) from all the estimates indicate that about 73 percent of the variation in the health outcome variables are due to variations in the explanatory variables used in the study.

Despite the use of panel data fixed-effect regression techniques to control for unmeasured heterogeneity and characteristics of countries that remain constant over time, there still exists the possibility of constant omitted variable bias such as cultural factors and political systems. Other country specific characteristics that evolve over time such as population growth, age, foreign aid, climate and the health system regulations might affect public and private health expenditure as well as the health outcome variables. In this regard, although the results in this paper are in line with similar studies, caution must be exercised when interpreting these results given the concerns raised above and the empirical approach used herein.

6. References

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Henock.shilongo@icloud.com

Appendix

Table 1. Descriptive statistics

Variables	Mean	Standard deviation	Min	Max
Dependent variables				
Life expectancy at birth, male	52.48	5.08	43.02	64.00
Life expectancy at birth, female	56.80	5.74	46.40	69.52
Infant mortality rate at birth	61.77	21.15	30.00	122.60
Infant mortality rate under 5	94.65	36.28	38.50	206.30
Main independent variable				
Government health expenditure per capita	182.40	185.39	1.89	599.92
Other variables				
Private health expenditure per capita	116.30	126.24	2.75	475.19
GDP per capita	5566.78	4332.89	572.89	16175.24
GDP annual growth rate (%)	2.87	2.95	-9.44	11.03
HIV prevalence rate	14.89	7.67	1.00	28.40
Measles immunization rate	80.72	13.77	29.00	99.00
Primary school enrollment rate	106.72	13.34	67.48	142.23
Clean water	59.50	16.70	22.21	84.70
Control of corruption	-0.24	0.62	-1.52	1.22

Henock.shilongo@icloud.com

Figure 1. Key Regression Results

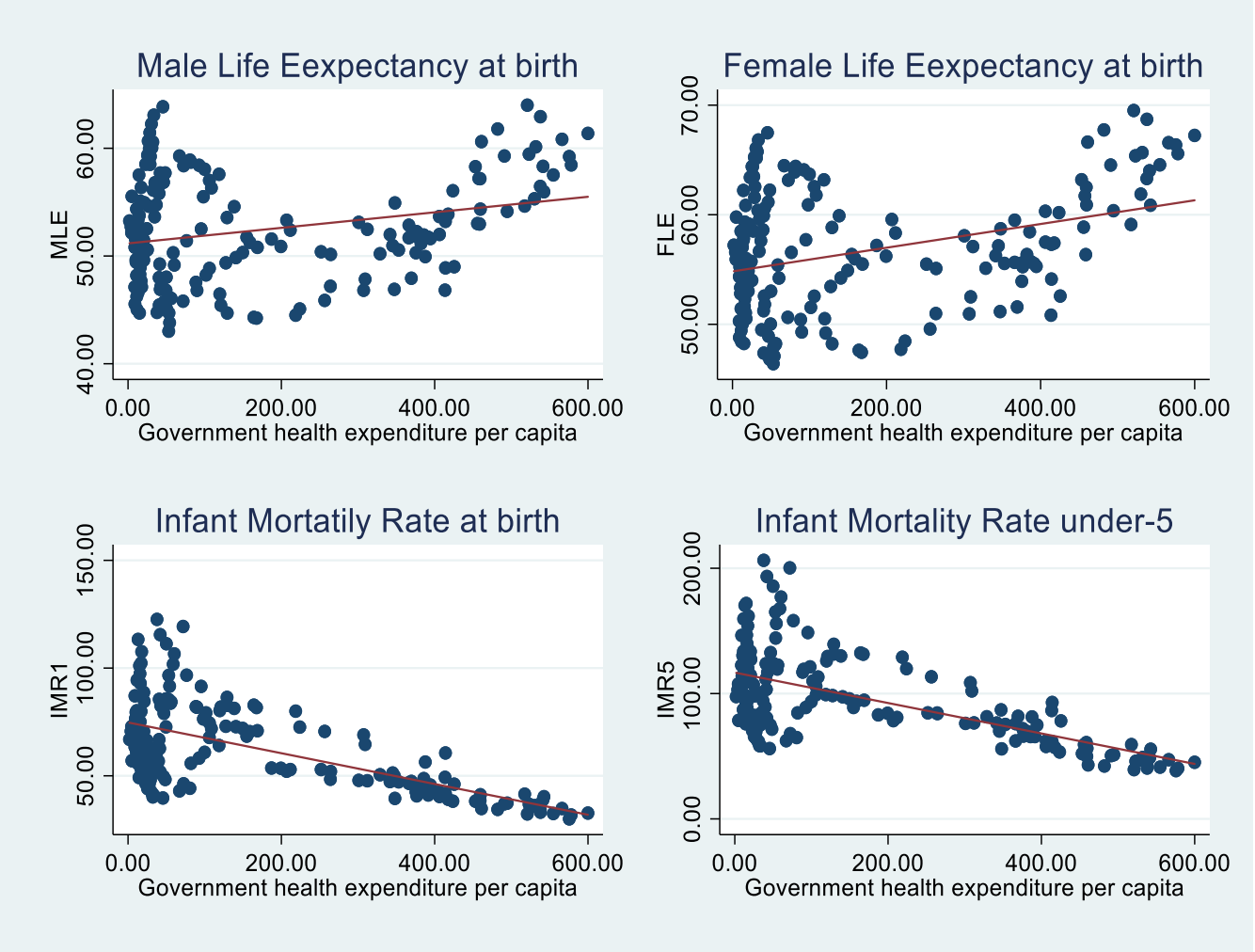

Table 2. Regression results: Government health expenditure and health outcomes

	Dependent variables			
Explanatory variables	MLE	FLE	IMR1	IMR5
Government health spending per capita	0.000148 (0.00150)	0.000359 (0.00154)	-0.0201* (0.00801)	-0.0257* (0.0106)
Private health spending per capita	0.0179*** (0.00233)	0.0235*** (0.00203)	-0.0656** (0.0199)	-0.0936** (0.0250)
(log) GDP per capita	-1.042** (0.312)	-0.486 (0.359)	2.168 (1.815)	4.905 (2.906)
Primary education enrollment	0.0386** (0.0105)	0.0661*** (0.0114)	-0.0865 (0.0630)	-0.0466 (0.0852)
(log) Measles immunization	9.829*** (1.710)	9.397*** (1.657)	-45.97*** (7.829)	-53.50*** (12.11)
(log) Clean water	-1.607 (0.957)	-3.487** (0.926)	-19.11** (4.848)	-24.65** (6.128)
(log) HIV prevalence rate	-6.195*** (0.183)	-5.982*** (0.206)	15.91*** (2.159)	20.12*** (2.835)
Control of corruption	3.865*** (0.524)	3.503*** (0.511)	-9.209** (2.774)	-21.12*** (4.920)
F-value	301.9	160.3	251.2	128.9
Prob > F	0.0000	0.0000	0.0000	0.0000
R-squared	0.753	0.773	0.689	0.716
Observations	140	140	140	140

Note: All the variables in Table 2 are described in the text. The dependent variables (1) male and (2) female life expectancy, and (3) infant mortality at birth and (4) infant mortality under 5. All the regressions in the Table are fixed-effect regression. The coefficients of the explanatory variables indicate the change in health outcomes due to a one unit/percentage change in any of the explanatory variables, holding the other variables constant. *shows significance at 10 percent level, ** shows significance at 5 percent level and *** shows significance at 1 percent level. Robust standard errors are in parentheses.

Data Appendix

The following variables were used in this paper:

Variable	World Bank Description
Life expectancy at birth (male and female)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.
Mortality rate, infant (per 1,000 live births)	Infant mortality rate is the number of infants dying before reaching one year of age, per 1,000 live births in a given year.
Mortality rate, under-5 (per 1,000 live births)	Under-five mortality rate is the probability per 1,000 that a newborn baby will die before reaching age five, if subject to age-specific mortality rates of the specified year.
Domestic general government health expenditure per capita, PPP (current international $)	Public expenditure on health from domestic sources per capita expressed in international dollars at purchasing power parity (PPP).
Domestic private health expenditure per capita, PPP (current international $)	Current private expenditures on health per capita expressed in international dollars at purchasing power parity (PPP).
GDP per capita, PPP (constant 2011 international $)	PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. Data are in constant 2011 international dollars.
School enrollment, primary (% gross)	Gross enrollment ratio is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Primary education provides children with basic reading, writing, and mathematics skills along with an elementary understanding of such subjects as history, geography, natural science, social science, art, and music.
Prevalence of HIV, total (% of population ages 15-49)	Prevalence of HIV refers to the percentage of people ages 15-49 who are infected with HIV.
Immunization, measles (% of children ages 12-23 months)	Child immunization, measles, measures the percentage of children ages 12-23 months who received the measles vaccination before 12 months or at any time before the survey. A child is considered adequately immunized against measles after receiving one dose of vaccine.
People using at least basic drinking water services (% of population)	The percentage of people using at least basic water services. This indicator encompasses both people using basic water services as well as those using safely managed water services. Basic drinking water services is defined as drinking water from an improved source, provided collection time is not more than 30 minutes for a round trip.
Control of Corruption	*Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.* Estimate of governance (ranges from approximately -2.5 (weak) to 2.5 (strong) governance performance).