

Original Article

Domestic General Government Health Expenditure (DGGHE) per capita on Maternal Mortality Rate Reduction; Financial Budgetary Projections in Sub-Sahara Africa

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Abstract

Background: The high maternal mortality rate (MMR) in many Sub-Saharan Africa (SSA) countries reflects inadequate health budgets, especially the annual domestic general government health expenditure (DGGHE). The yearly DGGHE does not ensure access to high-quality healthcare services and development in SSA.

Objectives: The objective of this study is to determine the impact of domestic general government health expenditure (DGGHE) per capita on the maternal mortality rate (MMR) and also to project the expected DGGHE per capita, along with the annual financial implications necessary to reduce the Maternal Mortality Rate (MMR) by 2044, benchmarked against the average statistics from Seychelles for the year 2020-2022.

Method: This study is a quantitative analysis based on World Bank data covering 22 years of DGGHE per capita, maternal mortality rate per 100,000 live births for 48 sub-Saharan African countries accessible via: <https://databank.worldbank.org/source/world-development-indicators>. We used Seychelles' outstanding performance as a benchmark for the other SSA countries, with a cumulative DGGHE per capital of 9,685.55 from 2000 to 2022 and a cumulative MMR of 310 per 2,200,000 live births over the same of 22 years period. . The analysis of the effect of DGGHE per capita on MMR was conducted using a regression model.

Results: DGGHE per capita has a significant impact on maternal mortality rate in sub-Sahara Africa.

Conclusion: Through a focused governance system, SSA countries are encouraged to yearly increase their DGGHE per capita in line with the budget projections of the study for 2044, aimed at reducing the high MMR. [*Ethiop. J. Health Dev.* 2024; 38(4): 00-00]

Keywords: Health Expenditure, Maternal Mortality Rate, Sub-Sahara Africa, Per Capita.

Introduction

Sub-Saharan Africa (SSA) is considered the world's most investment-friendly region for the twenty-first century due to its abundance of natural and human resources. However, SSA faces numerous socioeconomic difficulties, including poverty, a high maternal mortality rate (MMR), and corruption. Approximately 87% of the projected global maternal mortality in 2020 occurred in Sub-Saharan Africa and Southern Asia. Approximately 70% of maternal fatalities occurred in Sub-Saharan Africa alone. The high maternal death rate in some regions of the world, particularly in the SSA countries, highlights the wealth gap and results from differences in access to high-quality healthcare. In 2020, the MMR was 12 per 100,000 live births in high-income countries, and 430 per 100,000 live births in low-income countries (1, 2, 3,4). When compared with the health expenditure budgets of other regions, the DGGHE per capita and healthcare budgets in SSA appear inadequate. Maternal mortality has decreased in Africa, especially in the South African region. The only region that comes close to the UN targets is North Africa. The remaining regions in Sub-Saharan Africa's are still far from achieving these goals. The

West African region must exert even greater extraordinary effort to reach the UN targets. Prior research indicates a positive relationship between health spending and TFP (Total Factor Production) as well as between TFP and health spending per capita. Education and other non-health factors like information and communication technology (ICT) and corruption control, also have a considerable favorable impact on TFP (5)

In a related study, it was opined that to reduce fatality and improve maternal health, government policies should prioritize expanding women's access to family planning, early prenatal care, and education (6). Other relevant studies revealed that good governance may improve the conversion of health investment into improved maternal health outcomes by allocating resources fairly and efficiently (7, 8). Furthermore, other previous studies suggested that SSA countries should prioritize the reform of health systems through effective policy design and implementation, training, human resource development, governance and regulation, service delivery, and sustainable health financing (9, 10, 11).

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Also in a related study, it was opined that to enhance mobility in a way that promotes socioeconomic development, SSA countries must make invest more in health facilities both rural and urban areas (12). Previous studies also agree that reinvestment and pragmatic strategies ought to prioritize investments in the health sector to leverage expectations from other economic sectors (13, 14, 15, 16, 17, 18, 19). It appears that past studies on healthcare expenditures have not adequately addressed the issues around the impact of domestic general government health expenditure (DGGHE) per capita on maternal mortality rates in SSA countries, with expected yearly budget necessary to drastically reduce the MMR in all SSA countries by 2044, hence this study.

Methodology

Study Setting

This study was conducted in 48 SSA countries. The region of Africa south of the Sahara is known as the sub-Saharan Africa, and is divided into four large and diverse regions: Eastern Africa, Central Africa, Western Africa, and Southern Africa. As of 2022, it is predicted to have 1.2 billion people living there, covering an area of 9.4 million square miles (1, 2). The projected global maternal death rate in 2020 was 253,000, with Sub-Saharan Africa and Southern Asia accounting for over 87% of cases. In Sub-Saharan Africa alone, there were over 70% of maternal deaths

(202,000). In 2020, the MMR was 12 per 100,000 live births in high-income countries and 430 per 100,000 live births in low-income countries. The study, which tries to determine how the DGGHE per capita affects MMR, was spurred by this trend.

Data source

This study is quantitative research that utilized secondary data and sourcing essential global World Bank data over 22 years related to DGGHE per capita, and maternal mortality rate per 100,000 live births for the 48 sub-Saharan African countries. These metrics were combined for each country over 22 years period. We used Seychelles outstanding performance as a benchmark for the other SSA countries, with a cumulative DGGHE per capita of 9,685.55 from 2000 to 2022 and a cumulative MMR of 310 per 2,200,000 live births over the same period. Seychelles was chosen due to its status as a developed country among the underperforming economies of the majority of SSA nations and as well as being the country in SSA with the lowest MMR. Access to the sources of the indicators used can be found at <https://databank.worldbank.org/source/world-development-indicators>.

Data analysis

The study used a regression model in the analysis, the model specification /equation is as follows:

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$\text{MMR} = \beta_0 + \beta_1 \text{DGGHE per Capita} + \varepsilon$$

Where MMR= Maternal Mortality Rate, DGGHE=Domestic General Government Health Expenditure, β_0 is the MMR when DGGHE per capita = 0, and β_1 is the change in MMR when DGGHE per capita increases by 1 unit, ε = Error term or regression residuals.

Additionally, the projected annual DGGHE per capita (D) was calculated by dividing the deficit of DGGHE per capita, benchmarked against Seychelles' records of 9,685.55/310, by the 22 years period from 2000-2022. Then the projected yearly additional DGGHE in USD until 2044, necessary to meet the projected benchmark of an MMR to 310, is calculated by multiplying (D) by the population of each country.

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \varepsilon$$

$$M_{\text{aternal}}M_{\text{ortality}} = \beta_0 + \beta_1 \text{DGGHE per Capita} + \varepsilon$$

$$M_{\text{aternal}}M_{\text{ortality}} = 1348.5 + (-18.4) \text{DGGHE per Capita} + \varepsilon$$

The model described above is an econometric simple linear regression economic model that defines the effect of DGGHE per capita on maternal mortality in Sub-Sahara Africa. According to the model, a DGGHE per Capita of 18.4 with a significant value of

Here, A represents the total DGGHE per capita from 2020 to 2022, B is the maternal mortality rate per 100,000 live births, and C is the deficit of DGGHE per capita in total in USD, benchmarked against Seychelles' records of 9,685.55 and 310

Result

Effect of DGGHE Per Capita on Maternal Mortality

Table 2 is the result of the analysis that defined the effect of DGGHE per Capita on maternal mortality rate in Sub-Sahara Africa. The simple linear regression is given by the equation thus.

0.0001 impacts maternal mortality in sub-Sahara Africa. This indicates that DGGHE per capita has an 18.4% effect on maternal mortality in the region. So the effect of DGGHE per capita on maternal mortality in Sub-Sahara Africa is 18.4%.

Table 1: **MATERNALMORTALITY=C(1)+C(2)*AAA DGGHE per Capita R= -0.525**

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1348.487	912.6318	14.77581	0.0000
C(2)	-18.39297	0.440094	-4.179324	0.0001
R-squared	0.775211	Mean dependent var		11684.77
Adjusted R-squared	0.559455	S.D. dependent var		6477.758
S.E. of regression	5574.431	Akaike info criterion		20.13054
Sum squared resid	1.43E+09	Schwarz criterion		20.20851
Log likelihood	-481.1330	Hannan-Quinn criter.		20.16001
F-statistic	17.46675	Durbin-Watson stat		1.692400
Prob(F-statistic)	0.000129			

Source: Result of Analysis 2023.

Also, a closer look at Table 2 shows that countries that have higher DGGHE per capita have also the lowest MMR. For instance, countries that have cumulative DGGHE per capita of up to \$1,000 for the year under study also have less than 10,000 MMR for every 10,000 live births for the same period. See countries no. 47-39 in table 2. This is irrespective of their population variation. In the same vein countries with the lowest cumulative DGGHE per capita of \$100 for

the period under review (2000-2022) have the highest MMR of between 13,764 to 29,329 per every 100,000 live births. The countries under this category include countries no. 1 to 6. This trend is the same from countries no.7 to 38 which have cumulative DGGHE per capita of between \$102 and \$761.66 with a corresponding cumulative MMR per 100 live births of between 3611 and 25,350. These facts collaborate with the analysis in Table 1

Table 2: **Computation of Deficit DGGHE per Capita and Projected Yearly Additional DGGHE per Capita in USD Benched Marked by Seychelles DGGHE per Capita and Maternal Motility Rate.**

COUNTRY	DGGHE Per Capita: Total 2000-2022	Maternal Mortality Per 100,000 live Birth	Deficit of DGGHE per Capita in Total in USD Benchmarked by Seychelle's Record of 9,685.55/310	Projected additional DGGHE Per Capita in USD	Projected additional DGGHE in USD till 2044to meet the projected Benchmark of MM Reduction to 310 over 22yrs in USD	yearly additional
	A= 22yrs total	B= 22yrs total	C= 9685.55 - A	D=C/22	E= D x Population	
1 Somalia	0	20287	9,685.55	440.25	7,747,304,217.75	
2 South Su	18.43	29329	9,667.12	439.42	4,795,462,525	
3 Congo, D	38.46	13764	9,647.09	438.5	43,415,977,962	
4 Central	82.83	23824	9,602.72	436.49	252,790,564.56	
5 Ethiopia	93.78	13820	9,553.31	435.99	53,792,413,064.70	
6 Guinea	95.74	16689	9,589.81	435.9	6,041,286,741.90	
7 Eritrea	102.78	10792	9,685.55	435.58	1,604,690,659	
8 Burundi	108.62	14142	9,576.93	435.31	5,610,961,328.56	
9 Liberia	126.84	15689	9,558.71	434.49	2,303,961,867.69	
10 Sierra L	129.17	20465	9,556.38	434.38	3,738,151,784.84	
11 Uganda	138.96	8359	9,546.59	433.94	20,503,484,914.90	
12 Togo	139.52	10838	9,546.03	433.91	3,839,538,983.09	
13 Gambia,	150.91	14075	9,407.80	433.39	1,172,749,872.88	
14 Benin	156.52	12510	9,529.03	433.13	5,783,525,984.32	
15 Mali	158	12320	9,509.12	433.07	9,784,606,021.30	
16 Niger	158.04	14110	9,527.51	433.06	11,349,626,519.60	
17 Cameroon	160.25	11756	9,525.30	432.97	12,086,100,822.80	

18	Malawi	160.57	9916	9,429.24	432.95	8,843,140,995.15
19	Chad	162.04	27644	9,523.50	432.89	7,672,245,830.35
20	Guinea-B	168.89	19493	9,238.91	432.58	910,825,740.28
21	Madagasc	169.33	11539	9,387.05	432.56	12,808,843,007.80
22	Mozambiq	171.85	6940	9,417.96	432.44	14,257,338,363.90
23	Comoros	201.85	7189	9,483.70	431.08	360,716,535.92
24	Burkina	248.5	8261	9,437.05	428.95	9,725,910,209.90
25	Nigeria	252.67	25350	9,337.14	428.76	93,701,730,057.10
26	Tanzania	255.1	10430	9,430.45	428.66	28,076,264,658
27	Rwanda	279.44	10300	9,406.11	427.55	5,890,227,229.90
28	Zimbabwe	286.13	11221	9,399.42	427.25	6,972,949,433.25
29	Cote d'I	313.27	12431	9,372.28	426.01	11,996,672,497.40
30	Eswatini	2556.29	11418	9,092.84	426.01	511,927,041.71
31	Mauritan	339.35	12995	9,185.95	424.82	2,012,006,569.98
32	Senegal	364.03	9549	9,192.35	423.71	7,337,152,605.79
33	Sudan	399.81	9384	9,153.50	422.07	19,784,192,282.20
34	Zambia	433.26	5529	9,233.86	420.56	8,418,633,398
35	Congo, R	464.27	9797	9,221.28	419.15	2,502,503,219.60
36	Kenya	478.3	11639	8,921.12	418.51	22,611,043,584.30
37	Ghana	591.91	7711	8,600.44	413.35	13,837,250,864.50
38	Sao Tome	761.66	3611	8,763.64	405.63	92,232,149.40
39	Lesotho	997	16427	8,095.84	394.93	910,639,467.25
40	Angola	1010.14	9565	8,675.41	394.33	14,033,805,243.71
41	Equatori	1079.2	5598	8,606.35	391.19	655,207,260.52
42	Cabo Ver	2006.93	1410	7,678.62	349.02	207,020,863.98
43	Gabon	2491.26	5075	6,184.15	327.01	781,231,440.89
44	Mauritiu	4013.6	1185	5,358.68	257.82	325,503,679.86
45	Namibia	4218.7	8123	5,180.72	248.5	637,902,482
46	Botswana	4978.55	4116	4,707	213.95	562,751,829.20
47	South Af	5578.8	3944	3,808.25	186.67	11,180,391,512.90
48	Seychell	9685.55	310	-348.41	0	0.00

Source: Result of Analysis 2023

Discussion

Health Financing in Sub-Sahara Africa

Because of the large percentage of diseases that are more common in SSA than it is worldwide, a strong strategic strategy for financing health care is essential. SSA nations that have implemented health insurance programs to provide access to healthcare for their citizens encounter several design obstacles. A strong legal structure that guarantees payment arrangements to assist purchasers in getting the best value for their money is absent from some of these schemes. (19) (20). Nonetheless, the SSA's health care system is underfunded and suffers from neglect. To break the existing impasse in service delivery, the underdeveloped healthcare system in SSA needs bold solutions and innovative thinking. (21, 22). A creative evaluation of the SSA's health financing plans is required.

Potentially distorted interpretations resulting from publication bias and a higher frequency of publications are among the review's shortcomings. It is still crucial to establish multi-sector, evidence-based solutions that are adapted to national situations (23). All levels of government must increase the delivery of basic healthcare services, and these health funding organizations must reach future international health sector targets (24). Nonetheless, achieving health care development in the SSA will need tackling the obstacles to Fin-Tech adoption and minimizing the ethical and social

ramifications. FinTech has the potential to greatly improve healthcare funding and delivery in SSA, particularly in the areas of information exchange, financing, and delivery models (25).

Table 2 shows that Somalia, South Sudan, Congo D., and Central Africa have the worst cumulative DGGHE per capita for the years under review, with a yearly average deficit of 440.22, 439.41, 438.50, and 436.48 respectively. The records are in line with other studies on the geopolitics and socio-economic realities of these countries (26, 27, 28, 29, 30, 31, 32). However, the best-performing countries in SSA in terms of DGGHE per capita show South Africa rankings 2nd best after our benchmark Seychelles with an average yearly DGGHE per capita of 253.58, leaving a yearly deficit of 186.67 which represents 73.61% of her actual yearly DGGHE per capita. From the 3rd best ranked to the last in the order of performance does not show that SSA countries are taking their priorities right in terms of health financing and by extension DGGHE per capita (29,30,31,32)

Conclusion:

In Sub-Saharan Africa, DGGHE per capita has a significant effect on maternal mortality. According to the model, a DGGHE per Capita of 18.4, with a significant value of 0.0001, impacts maternal mortality in sub-Sahara Africa. So the effect of DGGHE per capita on maternal mortality in Sub-

Sahara Africa is 18.4%. Therefore health financing in SSA has become an urgent emergency. This study provides the projected yearly additional DGGHE in USD till 2044, as outlined in Table 2, to meet the projected benchmark of MMR of 310. This framework aims to drastically reduce MMR in SSA counties by 2044.

Declaration of Competing Interest: The authors declare no conflict of interest to this work.

Ethical Clearance

Not applicable

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