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# Health Spending and the Growth of Sub-Saharan Africa: A Causal Relationship Analysis

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**Abstract:- Using the panel granger causality test, this study examines the causal link between health expenditure and economic growth in Sub-Saharan Africa. The literature on the causal relationship between health spending and economic growth was varied and classified into four groups. The first set of findings shows that health spending stimulates the economy, while the second group suggests that health spending stimulates the economy. The third group believes there is a feedback effect between health spending and economic growth, but the fourth group believes the two factors are unrelated. However, this analysis discovered that public health spending and economic growth are linked in both directions. Similarly, health investment spending and economic growth have a bidirectional link. In Sub-Saharan Africa, a one-way relationship has been established between health expenditure per growth and GDP. The government and private organizations both are advised to go for more strategic and deliberate health spending and investments.**

***Keywords***:- *Health Spending, Granger Causality, Economic Growth, GDP Per Capita, Long Run.*

## I. INTRODUCTION

There have been debates concerning the nature of the connection concerning health care spending and the advancement of the economy. For example, Ali and Ogeto (2019) looked at the impact of health spending on economic growth in Sub-Saharan Africa from 2000 to 2016 and discovered that health spending significantly improves economic growth, whereas Nwaolisa & Okonkwo (2017) looked at the impact of government spendings such as general administration, defense, education, and health on GDP and discovered that health spending had an insignificant impact. Tsaurai (2014) investigated the validity of Wagner's hypothesis in clarifying Botswana's health spending. The first school of thought held that health-care spending is beneficial to the economy. The study, however, found Wagner's theory to be irrelevant to the Botswanan economy. The linkages between various components of health spending and the growth economic have been studied using traditional methods. The connection between capital government spending and the growth of economic in Nigeria to see how much government spending influences output growth was studied by Okoye, et al, (2019). The study found that lagged current expenditure had a considerable short-run negative influence on economic growth. It also shows that lagged capital investment has a considerable beneficial influence on growth. The effects of recurrent spending components on the growth of economic in Nigeria, specifically Management, Societal and Municipal Services, Economic Services, and Transfers were studied by Ejem and Ogbonna (2019). The findings reveal that a one standard-deviation(SD) shockwave to recurrent spending on both societal community services and transfer harms GDP. In Nigeria, Iheanacho (2016) looked at the long- and short-term relationships concerning government spending and the growth of economy. Recurrent expenditure has been the main engine of the growth of economy in Nigeria, according to the findings. In the case of capital expenditure, the analysis found that it has a deleterious and significant long-run influence on Nigerian the growth of economy.

The causal association concerning health spending and the growth of economy also hasn't been a one-way result for different countries. Researches done for different countries have their results due to their different peculiarities in healthcare. Tsaurai (2014) again tested the applicability of Wagner's theory in elucidating the health spending in Botswana and mentioned that there is no causality association concerning the two variables. Concerning the effects of recurrent spending constituents in Nigeria, Ejem and Ogbonna (2019) discovered that the Granger Causality test revealed that none of the recurrent spending constituents had a causal influence on GDP, both independently and jointly. Odhiambo (2021) looked into the connection concerning health care spending and the growth of economic. When public expenditure is employed as a surrogate, the study discovered that a clear unidirectional causality from health spending to growth of economy exists in less developed nations, while no connection exists in averagely developed ones. This research will add to empirical evidence in a more recent analysis by determining the causative association amid the growth of economy and health spending for 45 countries in Sub-Sahara Africa from 2000 to 2019.

## II. THEORETICAL AND LITERATURE REVIEW

### *A. Wagner's Law of Growing State Expenditure*

The operations of different tiers of government have an expected tendency to increase both intensively and broadly according to Wagner. The evolution of government operations and the evolution of the economy have a practical relationship, with the governmental sector developing quicker than the economy. According to Dominick (2002), Wagner developed his concept after studying countries throughout the end-of-the-nineteenth-century industrialization period Not all of his assumptions can be applied to the twentieth or even the twenty-first century. Many countries are currently in the process of post-

industrialization. Although the age of computers and global networks brought and continues to bring tremendous technological developments, it is acceptable to claim that instead of raising government spending, they tend to reduce the number of personnel and administrative work required in the public sector.

*B. Health spending and the growth of economy: causative association.*

Erdila and Yetkinerb (2009) worked on health care expenditure and output using a panel data and granger causality approach. Conclusions validate that the overriding sort of Granger-causality is bidirectional. One-way causality was found, the design is not regular. Odhiambo (2021) to study the causative association between health expenditure and economic growth, panel data from African countries (2008 -2017) was used. Public expenditure was employed as a substitute and unidirectional causation from health expenditure to economic growth is seen in less developed economies, but no causality is detected in averagely developed economies nations. Ogunjimi and Adebayo (2018) looked at the association between health spending, health outcomes, and economic growth in Nigeria. To investigate these connections, the Toda-Yamamoto causality paradigm was used. The Toda-Yamamoto causality tests revealed a unidirectional causality between health spending and infant death, but no causality between real GDP and infant death; a unidirectional causal association between health spending and real GDP, and a unidirectional causal association between real GDP and maternal death; and a unidirectional causal association between real GDP and health spending.

Khan, Khan, Razli, Shehzada, Krebs, and Sarvghad (2016) used panel cointegration and panel causality analysis to investigate the causality between Health expenditure and economic growth, in the selected South Asian Association for Regional Cooperation (SAARC) countries from 1995 to 2012. A new technique developed by Dumitrescu and Hurlin (2012) is used to examine panel causality between HCE and per capita GDP. Furthermore, in the short run, there is evidence of a unidirectional correlation between per capita GDP and HCE in South Asian countries. There is also a two-way causal relationship between per capita GDP, labor force, literacy rate, and the elderly population aged 65 and up. There was also two-way causation between the workforce, the senior population over 65, and health-care spending. Khan, Razali, and Shafie (2016) studied the drivers of health care expenditures (HCE) in Malaysia from 1981 to 2014, looking at the short-run, long-run equilibrium dynamic causal link between health care and per capita income. The Engle-Granger approach was employed for causality analysis. The findings are backed with a theory that health spending and per capita income are linked. Erdil and Yetkiner (2009) used a large dataset to study the Granger-causality relationship between real per capita GDP and real per capita health care spending The data show that bidirectional Granger-causality is the most common type of Granger-causality. When one-way causality is discovered, the pattern is not uniform; the analyses demonstrate that one-way causality in low- and middle-income nations generally goes from income to health, whereas the converse is true in developed countries.

*C. Model specification*

$$Yi,t = \beta_0 + \sum_{k=1}^{M} \beta_k \, Y_{i,t-k} + \sum_{k=1}^{N} \sigma_k \, X_{i,t-l} + U_{i,t}$$

Where,
$i = 1, \dots, N$ and $t = 1, \dots, T$,

$\beta_k$" represent the coefficients of the regression equation, "$\beta_0$" are constants and**"**$U_{1it}$ **"** are the error term where; The variables under consideration are Gross Domestic Product per capita (GDP_PC), capital health expenditure as a percentage of GDP (CAH_GDP), current health expenditure as a percentage (%) of GDP (CHE_GDP), total health expenditure as a percentage (%) of GDP (THE_GDP), total health expenditure per capita (THE_PC), private health expenditure as a percentage of GDP (PRHE_GDP), Public health expenditure per capita (PUHE_PC), public health expenditure as a percentage of GDP (PUHE_GDP), population growth rate (PGR), life expectancy at birth (LEB) and labor force (LF).

*D. Panel Granger causality test*

After ensuring that the variables were stationary the researchers looked at the causal effects between health spending and economic growth. This could be one-way or two-way communication. The investigation confirmed that the variables are non-stationary based on the results of IPS, Fisher ADF, and PP, which reveal that they are integrated of order 1 and significant at the 5% level.

**Table 1. Unit root Analysis**

| Variables | Fisher PP | | Fisher ADF | | IPS | | Remark |
|---|---|---|---|---|---|---|---|
| | Level | 1st difference | Level | 1st difference | Level | 1st difference | |
| LGDP_PC | 116.630 (0.0524) | 370.19 (0.000) | 86.399(0.645) | 211.37 (0.000) | 3.721(0.999) | -7.012 (0.000) | I (1) |
| CHE_GDP | 110.597(0.091) | 1195.32 (0.000) | 87.006 (0.628) | 271.78 (0.000) | 0.377 (0.647) | -9.560 (0.000) | I (1) |
| CAH_GDP | 64.483 (0.003) | 169.27 (0.000) | 43.722 (0.176) | 61.42 (0.000) | -0.226 (0.411) | -2.791 (0.003) | I (1) |
| PUHE_PC | 72.091 (0.938) | 665.46 (0.000) | 67.737 (0.973) | 304.55 (0.000) | 1.956 (0.975) | -11.194 (0.000) | I (1) |
| PRHE_PC | 78.886 (0.871) | 671.65 (0.000) | 86.057(0.655) | 259.45 (0.000) | 0.389 (0.651) | -9.901 (0.000) | I (1) |
| CHE_PC | 68.458(0.939) | 483.33 (0.000) | 75.862(0.819) | 249.49 (0.000) | 0.512 (0.696) | -8.787 (0.000) | I (1) |
| LLEB | 51.399(0.999) | 146.13 (0.000) | 73.616 (0.920) | 1098.14 (0.000) | 3.203 (0.999) | -28.576 (0.000) | I (1) |
| LGE | 166.615 (0.100) | -12.504 (0.000) | 109.008(0.084) | 324.49 (0.000) | 1.461(0.072) | -12.504 (0.000) | I (1) |

*The probability values are in parentheses*

***Source: Author's Computation***

*E. Correlation Matrix*

This section discusses the degree of association and the possible relationship that exists between the variables with 290 numbers observations. It also shows how variables are related and ascertain whether or not the explanatory variables are highly correlated as shown in table 1.

Table 4.3 shows that there is a positive relationship between the dependent variable GDP_PC which is a point of interest to this study and CAH_GDP, CHE_GDP, THE_PC, PUHE_PC, PRHE_PC, PGR, LEB, and LGE. The correlation between CAH_GDP and GDP_PC is 0.6055, indicating that they are positively and strongly correlated. The correlation between CHE_GDP, CHE_PC, and GDP_PC is 0.5855 and 0.491 respectively, indicating that there is a strong and positive correlation among the variables. Also, the correlation between THE_PC and GDP_PC is 0.7709 which implies that an increase in THE_GDP is positively correlated to GDP_PC.

Similarly, the correlation between PUHE_PC, PRHE_PC, and GDP_PC is 0.6735 and 0.6185 respectively, indicating that PUHE_PC and PRHE_PC are positively and strongly correlated to GDP_PC. In the same vein, the correlation between PGR, LEB, and GDP_PC is 0.5973 and 0.4666 respectively, which indicates that they are positively and strongly correlated, this implies that PGR and LEB are strongly correlated to GDP_PC. Lastly, the correlation between LGE and GDP_PC is 0.8459 indicating that there is a positive and strong correlation among the variables; this implies that LGE is strongly correlated to GDP_PC. Overall, GDP_PC has a positive and strong relationship with the variables of interest. There is also no problem of multicollinearity among the variables, indicating that the variables are amenable to further analysis.

**Table 2 Correlation Matrix**

| | GDP_PC | CAH_GDP | CHE_GDP | CHE_PC | THE_PC | PUHE_PC | PRHE_PC | PGR | LEB | LGE |
|---|---|---|---|---|---|---|---|---|---|---|
| GDP_PC | 1.000 | | | | | | | | | |
| CAH_GDP | 0.606 | 1.000 | | | | | | | | |
| CHE_GDP | 0.586 | 0.067 | 1.000 | | | | | | | |
| CHE_PC | 0.491 | 0.024 | 0.119 | 1.000 | | | | | | |
| THE_PC | 0.771 | -0.025 | 0.054 | -0.001 | 1.000 | | | | | |
| PUHE_PC | 0.674 | -0.043 | 0.093 | 0.007 | 0.971 | 1.000 | | | | |
| PRHE_PC | 0.619 | 0.017 | -0.035 | -0.018 | 0.870 | 0.726 | 1.000 | | | |
| PGR | 0.597 | 0.064 | -0.090 | -0.132 | -0.467 | -0.497 | -0.317 | 1.000 | | |
| LEB | 0.467 | 0.002 | -0.021 | 0.238 | 0.549 | 0.544 | 0.455 | -0.551 | 1.000 | |
| LGE | 0.846 | -0.030 | 0.167 | 0.130 | 0.313 | 0.301 | 0.277 | -0.188 | 0.222 | 1.000 |

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## III. METHODOLOGY AND DISCUSSION OF RESULTS

### *A. The causal relationship between health expenditure and economic growth*

To determine the direction of causality among the variables, Pairwise Granger Causality tests for a lag length of seven are conducted and the result is presented in Table 3. Generally, the estimation test result on the direction of causality reveals there is a bi-directional causal relationship between CHE_GDP and CAH_GDP, THE_GDP and CAH_GDP, LGDP_PC, and CAH_GDP, LGDP_PC and CHE_GDP, LGDP_PC and CHE_PC, PUHE_GDP and THE_PC, PUHE_PC and THE_PC. There is also a bi-directional relationship between PRHE_PC and THE_PC, PRHE_PC, and PUHE_PC between LGDP_PC and PUHE_PC. However, the results show that there exists a unidirectional relationship between CAH_GDP and PUHE_GDP, PUHE_PC and CAH_GDP, PRHE_GDP and CAH_GDP, CHE_PC and CHE_GDP, CHE_GDP and THE_PC, CHE_GDP and PUHE_GDP, CHE_PC and THE_GDP, CHE_PC and PRHE_GDP. Also, there exists a unidirectional relationship between THE_PC and THE_GDP, LGDP_PC and THE_PC, THE_PC and PUHE_GDP, PUHE_GDP, and PUHE_PC, PRHE_GDP and PUHE_GDP. Lastly, there is a unidirectional relationship between LGDP_PC and PUHE_GDP. Alternatively, the table shows that LGDP_PC granger causes CAH_GDP, CHE_GDP, CHE_PC, THE_PC, PUHE_GDP, and PUHE_PC. CHE_GDP granger causes CAH_GDP, THE_PC, and PUHE_GDP, THE_GDP granger causes CAH_GDP and PUHE_GDP, PRHE_GDP granger causes CAH_GDP and PUHE_GDP. Furthermore, the CHE_PC granger causes CHE_GDP, THE_GDP, and PRHE_GDP. PUHE_GDP granger causes THE_PC and PUHE_PC. However, PUHE_PC granger causes CAH_GDP and THE_PC. PRHE_PC granger causes THE_PC and PUHE_PC while THE_PC granger causes THE_GDP. Lastly, the CAH_GDP granger causes PUHE_GDP.

The result of the bi-directional causal relationship implies that as economic growth in the Sub-Saharan African region increases, it has a significant effect on the health sector to cover for capital health expenditure, gross current health expenditure, current health expenditure per capita, and public health expenditure. Also, adequate spending by the government to the health sector ensures timely treatment of patients, reduction in incessant strikes by doctors as wages and salaries are catered for and the smooth running of health facilities which would boost the productivity sector as they would be healthier working population which would, in turn, boost economic growth. Also, the unidirectional flow from LGDP_PC to THE_PC and LGDP_PC to PUHE_GDP implies that although economic growth influences total health expenditure per capita and public health expenditure, flows from total health expenditure per capita and public health expenditure do not have a significant effect on economic growth.

**Table 3 Causality Test Pairwise Granger (# stands for "does not Granger Cause")**

| Null Hypothesis: | Obs | F-Statistic | Prob. |
|---|---|---|---|
| CHE_GDP #CAH_GDP | 54 | 3.53274 | 0.0049 |
| CAH_GDP # CHE_GDP | | 1.98608 | 0.0819 |
| CHE_PC # CAH_GDP | 54 | 0.26654 | 0.9633 |
| CAH_GDP # CHE_PC | | 0.72389 | 0.6525 |
| THE_PC # CAH_GDP | 54 | 1.48034 | 0.2028 |
| CAH_GDP # THE_PC | | 0.20721 | 0.9818 |
| THE_GDP # CAH_GDP | 54 | 3.53274 | 0.0049 |
| CAH_GDP # THE_GDP | | 1.98608 | 0.0819 |
| PUHE_GDP # CAH_GDP | 54 | 0.65020 | 0.7119 |
| CAH_GDP # PUHE_GDP | | 1.97101 | 0.0842 |
| PUHE_PC # CAH_GDP | 54 | 1.87819 | 0.0997 |
| CAH_GDP # PUHE_PC | | 0.04869 | 0.9998 |
| PRHE_PC # CAH_GDP | 54 | 0.47383 | 0.8475 |
| CAH_GDP # PRHE_PC | | 0.14295 | 0.9940 |
| PRHE_GDP # CAH_GDP | 54 | 3.75928 | 0.0033 |
| CAH_GDP # PRHE_GDP | | 1.46507 | 0.2083 |
| LGDP_PC # CAH_GDP | 54 | 4.96741 | 0.0004 |
| CAH_GDP # LGDP_PC | | 2.38380 | 0.0396 |

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| | | | |
|---|---|---|---|
| CHE_PC # CHE_GDP | 518 | 3.34314 | 0.0017 |
| CHE_GDP # CHE_PC | | 1.62682 | 0.1254 |
| THE_PC # CHE_GDP | 542 | 0.63319 | 0.7286 |
| CHE_GDP # THE_PC | | 1.81941 | 0.0813 |
| THE_GDP #CHE_GDP | 542 | NA | NA |
| CHE_GDP # THE_GDP | | NA | NA |
| PUHE_GDP # CHE_GDP | 542 | 0.44195 | 0.8757 |
| CHE_GDP # PUHE_GDP | | 2.65986 | 0.0104 |
| PUHE_PC # CHE_GDP | 542 | 0.42409 | 0.8874 |
| CHE_GDP # PUHE_PC | | 1.11905 | 0.3494 |
| PRHE_PC #CHE_GDP | 542 | 0.51139 | 0.8262 |
| CHE_GDP # PRHE_PC | | 1.44023 | 0.1867 |
| PRHE_GDP # CHE_GDP | 542 | 0.44195 | 0.8757 |
| CHE_GDP # PRHE_GDP | | 1.03749 | 0.4036 |
| LGDP_PC # CHE_GDP | 541 | 1.97552 | 0.0685 |
| CHE_GDP # LGDP_PC | | 1.81418 | 0.0729 |
| THE_PC # CHE_PC | 518 | 0.71780 | 0.6570 |
| CHE_PC # THE_PC | | 0.78861 | 0.5971 |
| THE_GDP # CHE_PC | 518 | 1.62682 | 0.1254 |
| CHE_PC # THE_GDP | | 3.34314 | 0.0017 |
| PUHE_GDP # CHE_PC | 518 | 0.62769 | 0.7331 |
| CHE_PC # PUHE_GDP | | 0.29527 | 0.9557 |
| PUHE_PC # CHE_PC | 518 | 0.39786 | 0.9036 |
| CHE_PC # PUHE_PC | | 0.38720 | 0.9099 |
| PRHE_PC #CHE_PC | 518 | 0.67090 | 0.6968 |
| CHE_PC #PRHE_PC | | 1.13824 | 0.3375 |
| PRHE_GDP #CHE_PC | 518 | 1.50226 | 0.1640 |
| CHE_PC #PRHE_GDP | | 3.49925 | 0.0011 |
| LGDP_PC #CHE_PC | 517 | 4.56125 | 6.E-05 |
| CHE_PC #LGDP_PC | | 14.9966 | 8.E-18 |
| THE_GDP #THE_PC | 598 | 0.97635 | 0.4475 |
| THE_PC #THE_GDP | | 3.71410 | 0.0006 |
| PUHE_GDP #THE_PC | 542 | 2.24002 | 0.0298 |
| THE_PC #PUHE_GDP | | 1.91238 | 0.0655 |
| PUHE_PC #THE_PC | 542 | 3.79099 | 0.0005 |
| THE_PC #PUHE_PC | | 2.60425 | 0.0119 |
| PRHE_PC #THE_PC | 542 | 3.79099 | 0.0005 |
| THE_PC #PRHE_PC | | 3.30096 | 0.0019 |
| PRHE_GDP #THE_PC | 598 | 0.56266 | 0.7864 |
| THE_PC #PRHE_GDP | | 1.51976 | 0.1577 |

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| | | | |
|---|---|---|---|
| LGDP_PC #THE_PC | 597 | 3.04605 | 0.0099 |
| THE_PC #LGDP_PC | | 0.26544 | 0.9670 |
| PUHE_GDP #THE_GDP | 542 | 0.44195 | 0.8757 |
| THE_GDP #PUHE_GDP | | 2.65986 | 0.0104 |
| PUHE_PC #THE_GDP | 542 | 0.42409 | 0.8874 |
| THE_GDP #PUHE_PC | | 1.11905 | 0.3494 |
| PRHE_PC #THE_GDP | 542 | 0.51139 | 0.8262 |
| THE_GDP #PRHE_PC | | 1.44023 | 0.1867 |
| PRHE_GDP #THE_GDP | 598 | 1.52645 | 0.1554 |
| THE_GDP #PRHE_GDP | | 1.08161 | 0.3735 |
| LGDP_PC #THE_GDP | 597 | 0.87370 | 0.5270 |
| THE_GDP #LGDP_PC | | 0.77759 | 0.6063 |
| PUHE_PC #PUHE_GDP | 542 | 1.58911 | 0.1360 |
| PUHE_GDP #PUHE_PC | | 2.73376 | 0.0086 |
| PRHE_PC #PUHE_GDP | 542 | 1.20113 | 0.3002 |
| PUHE_GDP #PRHE_PC | | 0.92997 | 0.4827 |
| PRHE_GDP #PUHE_GDP | 542 | 2.65986 | 0.0104 |
| PUHE_GDP #PRHE_GDP | | 1.03749 | 0.4036 |
| LGDP_PC #PUHE_GDP | 541 | 2.18720 | 0.0280 |
| PUHE_GDP #LGDP_PC | | 0.74014 | 0.6380 |
| PRHE_PC #PUHE_PC | 542 | 2.60425 | 0.0119 |
| PUHE_PC #PRHE_PC | | 3.30096 | 0.0019 |
| PRHE_GDP #PUHE_PC | 542 | 0.17198 | 0.9907 |
| PUHE_PC #PRHE_GDP | | 0.15099 | 0.9938 |
| LGDP_PC #PUHE_PC | 541 | 3.14954 | 0.0040 |
| PUHE_PC #LGDP_PC | | 2.16162 | 0.0123 |
| PRHE_GDP #PRHE_PC | 542 | 0.95954 | 0.4601 |
| PRHE_PC #PRHE_GDP | | 0.41544 | 0.8929 |
| LGDP_PC #PRHE_PC | 541 | 0.25308 | 0.9711 |
| PRHE_PC #LGDP_PC | | 0.33163 | 0.9395 |
| LGDP_PC #PRHE_GDP | 597 | 0.92374 | 0.4874 |
| PRHE_GDP #LGDP_PC | | 1.38830 | 0.2075 |

***Source: Author's Computation***

## IV. CONCLUSION

According to Tsaurai (2014), empirical data in the literature on the causal relationship between health spending and economic (growth) evolution were mixed and split into four groups. The first set of findings shows that health spending stimulates the economy, while the second group suggests that health spending stimulates the economy. The third group believes there is a reaction effect between health spending and economic growth, but the fourth group believes the two factors are unrelated. However, this analysis discovered that public health spending and the growth of economy are linked in both directions. Similarly, health investment spending and economic growth have a bidirectional link. In Sub-Saharan Africa, a one-way association has been established between health spending per growth and GDP.

Odhiambo (2021) discovered a one-way causal association between public health spending and growth economy in low-income African nations, as well as a short-term causative connection amongst private health spending and the growth of the economy in averagely developed economies in Africa. This differs from Tsaurai's (2014) conclusion that there is no causal association between health spending and GDP in Botswana, implying that Wagner's hypothesis is no longer relevant. Similarly, the granger causality test results in Nigeria show no unidirectional or bidirectional link between public health spending and GDP (Olayiwola, Bakare-Aremu, &Abiodun, 2021). Ibe and Olulu-Briggs (2015), on the other hand, discovered the opposite, indicating that there is a unidirectional connection between GDP and all public health expenditures. Overall, the results are varied, with variations possible due to methodology or country-specific factors. The bi-directional causal link suggests that as the economy of Sub-Saharan Africa grows, so does its impact on the health sector. Other aspects of the economy should not be overlooked by the government since they will affect the health sector in some way, either directly or indirectly. To prevent misuse of funds, proper allocation and documentation should also be addressed seriously.

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