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ARTICLE

Inclusiveness in access to health services in Sub-Saharan Africa

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Abstract

Addressing social inclusion in sub-Saharan Africa (SSA) is a pressing concern because the region faces crippling socioeconomic inequalities. We consider it essential to explore the determinants of inclusion in the healthcare system, but that can be done more effectively by determining the drivers of inequality in health access. To this end, our research focused on 47 SSA countries from 2000–2019. First, we calculate the Inclusion Healthcare Index (IHI) based on socioeconomic characteristics specific to SSA countries. Then, we verify the selected determinants of the IHI, including the level of health expenditure and quality of government. Contrary to common wisdom, the results suggest that neither health expenditure levels nor the quality of government significantly affects the degree of inclusion of the healthcare system in SSA.

Keywords: inclusiveness, healthcare expenditure, sub-Saharan Africa, quality of government

JEL classification: B55, C58, I00, H11

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1. Introduction

Inclusiveness in accessing all public services is a key challenge for many governments. It is a manifestation of the symbiosis between economic development and social progress. Because health, and thus the quality of life, are basic social rights and a government duty, it is essential to research the level of inclusiveness and its determinants. The asymmetry between the scope and quality of medical services and the demand for them in the dynamic societies of sub-Saharan Africa (SSA) contribute to strong stratification and lower social welfare. The change for public services to enhance civilians' lives is often wasted.

The SSA region faces specific demographic, epidemiologic, social, and economic conditions that differ from the European or American continents. Of the 54 countries on the African continent, our research addressed 47 countries in the SSA region. It is a region of young societies with numerous variations in socioeconomic development and socio-political challenges. The median age of the SSA population in 2020 was 19.7, making the population of this region the youngest in the world, with the highest percentage (41%) of people under the age of 14 (Statista.com, 2021). The average life expectancy in the analyzed period (2000–2019) increased from 56 to 62 years. The average income per person in 2009 was 1,374$, rising until 2014 to 1,861$, when it began to drop drastically to 1,484$ in

2020 (macrotrends.net). Currently, the region is going through a period of much turbulence. In most countries, social inequalities, political instability, and enormous needs for healthcare development are even more pronounced. According to the Stockholm International Peace Research Institute Yearbook 2020, in the region of the 47 countries studied, there are a minimum of 15 active armed conflicts and 20 active peace-making processes per year. Such a situation is a manifestation of social inequalities, which leads to a higher level of exclusion from public services, including health services. In the last decade, the level of inequality measured by the GINI index has remained very high, far exceeding the European, American, and Asian levels (Connors et al., 2020). Notably, the 1948 Universal Declaration of Human Rights includes health as part of the right to a fair standard of living (Article 25). The right to health was re-recognized as a human right in 1966 in the International Covenant on Economic, Social and Cultural Rights (WHO, fact sheet 31).

According to data from the International Finance Corporation, the need for investment in healthcare in SSA is unsatisfied. Just 11% of the world's population lives in the region, but it accounts for 24% of the world's diseases, and only 1% of global healthcare expenditure is spent on their therapies (IFC, 2016). More than 408 million people in the region are deprived of health services, e.g., 58% of the population is deprived of such access in Chad and 51% in Somalia (Kellett, 2020).

The lack of human capital in the form of highly qualified medical personnel is a significant issue. Meanwhile, the development of healthcare should proceed synchronously by gradually increasing access to hospital infrastructure and educating staff, which in the long term would give the potential for the development of medicine in the studied region. According to the assertions of the United Nations Millennium Development Goals, there should be 2.5 healthcare workers per 1,000 inhabitants. The World Health Organization calculates that this minimum level should be 4.45 per 1,000 inhabitants (WHO, 2016). In the discussed region, the indicator was 0.8 in 2006. Estimates show that over one million health workers are needed for the health situation to improve (WHO, 2007). Although some countries, such as South Africa, Botswana, and Namibia, seem to have the infrastructure and financial resources for their maintenance and development, the lack of staff prevents the long-term development of the market. Research based on the extended Solow model of economic growth has shown that increasing the availability of human resources in the region's healthcare field may help these countries eliminate the problem of poverty (Wang et al., 2021).

The region's economic situation is further complicated by modern colonialism implemented mainly by Russia and China (U.S. Government Information, 2018; Kociemska, 2019). These countries invest in the region, but the return on the investments is often based on the export of valuable assets, i.e., ores, deposits, and material values. Investment programs do not educate local staff or invest in the region. In our opinion, this phenomenon will further aggravate the impoverishment of local societies and their lack of access to knowledge and technology. The consequence will be a progressive exclusion from public services, including health services.

Since the quality of the healthcare system determines the level of social welfare, it is reasonable to search for determinants of inclusion in the healthcare system. The research results will contribute to deepening the theory of public goods and the effectiveness of the process of their delivery. New public governance points out that the process of access to public services and the effect of their delivery are important for increasing social welfare. Therefore, to expect a positive impact from the provision of health services, in our opinion, is insufficient to offer health services and have the infrastructure necessary to provide them.

The described socioeconomic situation contributes to our research. We consider it essential to explore the determinants of inclusion in the healthcare system. Increasing the availability and quality of medical services is fundamental to improving social welfare in these countries.

To evaluate this issue, we posed the following research questions:

RQ1: What is the level of inclusion in the provision of medical services based on selected variables in the SSA region?

RQ2: How does the level of healthcare spending influence the Inclusion Healthcare Index (IHI) of the countries of the region in question?
RQ3: Does the quality of public management (measured by the World Governance Indicator) affect the value of the inclusiveness ratio?

Using data from The World Bank Database and an empirical strategy known as dynamic linear regression models, this study uses the IHI based on geographically specific socioeconomic factors. In addition, we verify whether the intuitively associated healthcare quality factors, such as the level of healthcare expenditure and the quality of public policy, impact the level of inclusiveness in the SSA region. The remainder of this study proceeds as follows. Section 2 surveys the literature on inclusiveness in healthcare and the inclusion index focusing on SSA. Section 3 covers the methodology of the dynamic linear regression model, including Spearman's rank correlation coefficient, and presents the results. Section 4 concludes with suggestions for future research in this field.

2. Literature Review

Research on measuring inclusiveness is vast. Studies on socioeconomic inequalities are categorized as those on sustainability and stratification. The essence of social inclusion in economic terms is the interrelation among participation, equity, growth, sustainability, and stability (Rockefellerfoundation.org). Important research indicates that communities, regardless of the level of social hierarchy, achieve higher levels of development in more equal societies. People at all levels of the social hierarchy do better in more equal societies (Wilkinson Pickett, 2009).

The United Nations' concept of Sustainable Development Goals is the most broadly accepted definition of inclusiveness. It is a set of frameworks, goals, and indicators to inspire governments to achieve more sustainable and inclusive results (U.N., 2015). However, this study does not indicate specific solutions in individual industries. Thus, it can be concluded that no uniform definition of inclusiveness has been developed. In our opinion, the description should constitute a compromise between ensuring the availability of public services and an increase in social welfare. We agree with the opinion that a mere assessment of economic growth, e.g., gross domestic product (GDP), does not provide a complete picture of the inclusion phenomenon (Nordhaus Tobin, 2018). Another definition, focusing on the human factor, recognizes that inclusiveness means equal access of an individual to social, political, and economic aspects of life based on respecting their expectations (Talmage Knopf, 2017). The inclusion index points to the multi-level nature of the issue and looks for the possibility of comparing the level of the indicator calculated based on the heterogeneous characteristics of countries (Doerffel et al., 2020; Blancard Hoarau, 2013). These are universal indicators and not based on specific features of access to specific public services, such as education and healthcare. The measure of inclusion in health services, using the methodology of calculating the indicator uniform for all countries, was presented by Verdier-Chouchane and Karagueuzian (2016). Thus, the inclusion rate is calculated based on the same variables for Qatar, Austria, Afghanistan, and Eritrea. We will debate this approach.

Interesting research on the implementation of diversity, equity, and inclusion in medical services was carried out by the Mayo Clinic team (Enders et al., 2020). Analysis has shown that racism and discrimination are important factors underlying the insufficient inclusion of certain social groups in the benefits system. These results constitute a case study based on one university treatment center in the United States. However, these factors have come to the fore, especially regarding access to treatment in a pandemic. In our study, we do not verify the context of racism as a factor determining the level of inclusion in the health services system. However, in our opinion, it is worth considering in later studies, particularly in the context of a highly ethnically diverse SSA region.

Until the 1990s, health was considered a by-product of economic growth. Some scientists point to the determinants of inclusive growth in the SSA region (Mutiiria et al., 2020; Nketia et al., 2021). They focus on assessing social inequalities, infrastructure development, and foreign aid as factors

determining the economic growth of the countries in the region. This is a different approach to the inclusion problem and is valuable from the perspective of economic policy, especially investment policy. The research results indicate that, among other things, public expenditure has a negative impact on inclusive growth. This is in line with the results of our work. Furthermore, it indicates the need for further search for factors for Africa (Obeng-Odoom, 2021).

It is necessary to mention Richard Titmuss, whose legacy was the justification for social policy based on moral, institutional, political, and economic foundations. The concept of social justice arises not only from fair allocation but also the nature of the institution doing the work (Titmuss, 1963). Anand and Ravallion (1993) showed that a significant part of social welfare depends on the level of public spending on health services. Some authors point to the existence of "medical poverty traps" (Whitehead et al., 2001), which result mainly from insufficient health expenditure. Sen (2004) argues that improving the healthcare system is not only a question of resource allocation but also of fairness in accessing public services. Health is a crucial driver of societies (Sen, 2002) and is therefore essential to take full advantage of economic and social opportunities. This is a basic requirement for the social welfare of economies. Health service provisions are expected to contribute significantly to the welfare of societies. The indicators most often cited in the context of prosperity and inclusiveness are the Human Development Index (HDI) and the Inclusiveness Development Index (IDI). The HDI measure was created by Mahbub ul Haq, a Pakistani scholar, under the organization of The United National Development Programme (UNDP, 1990). Furthermore, Sen (1999, 2022) anchored the research by formulating the measure. The main criticism is that the GDP index is included in HDI estimation (Obeng-Odoom, 2020). It is based on the statistical compilation of the following variables: life expectancy, education, income, and healthcare. The shortcomings of IDI are indicated, among others, by Dorffel and Schuhmann (2020). The main weakness is the lack of sufficient data about the market in the long run. Nevertheless, the authors propose the Multidimensional Inclusiveness Index (MDI), which makes it possible to compare inclusiveness in many countries with heterogeneous characteristics. However, this indicator does not focus on one area of public policy but 14 variables of national indicators.

A comparison of the variables in the most popular inclusiveness indicators is presented in Table 1.

Table 1. Opportunity Cost Analysis

Index: HDI	Index: IDI	Index: MDI
Income	GDP per capita	GDP per capita
Schooling	Labor Productivity	Savings
Health	Employment	Life expectancy
	Healthy Life Expectancy	Human Capital
	Median Household Income	Labor Productivity
	Income GINI	Employment ratio
	Poverty Rate	Adjusted Net Savings
	Wealth GINI	Carbon Intensity
	Adjusted Net Savings	Natural Resource Depletion
	Dependency Ratio	Dependency Ratio
	Public Debt as a share of GDP	Income Equity
	Carbon Intensity of GDP	Wealth Equity
		Education Equity
		Health Equity

Source: own assumptions based on the World Economic Forum, Inclusive Growth and Development Report 2017, and UNDP (1990)

These existing studies have implications for how we address the present research questions.

2.1 Methodology and Results

Bearing in mind that the issue of inclusiveness requires further research, we join the scientific debate by proposing a calculation of the level of inclusion specific to individual regions of the world (here for the region of SSA) and the type of public services (here for healthcare), the inclusion of which is to concern. To achieve the aim of the study and respond to RQ1, the inclusion rate in health services in all 47 countries of SSA in the years 2000–2019 was calculated. For this purpose, we used the following variables: school enrollment-tertiary; current health expenditure per capita; the mortality rate of infants; life expectancy at birth; population ages 65 and above, % of the total population; population ages 15–64, % of the total population; and GDP per capita. The data are sourced from Data Bank Micro Data of the World Bank (https://data.worldbank.org/indicator). We selected the variables based on those in similar econometric studies, general economic and health relationships known thanks to the medical scientific and practical experience of the cardiac surgeon who co-authored the research, and the operating theories of economics in the field of social welfare. The variables correspond to essential indicators in medicine used to assess the knowledge about the availability of health services, the demographic structure, and the country's potential to finance healthcare (Mbogo McGill, 2016).

The first step to calculating IHI was to standardize these variables. Strictly speaking, for each of these seven variables, we computed μj(i) with the following formula:

$$\mu_j(i) = \left(x_j(i) - \min\left(x_j\right)\right) / \left(\max\left(x_j\right) - \min\left(x_j\right)\right),$$

where *x*xi(i) denotes the value of the j-th variable and the i-th country, while min $\left(xj_j\right)$ and max(*xj*) denote the minimum and maximum value of j-th variable, respectively. Based on the calculated values of μ, mean values $\underline{\mu j} = \sum_i^N \mu_j(i)$ were calculated, where N is the number of countries. Next, we calculated the weights:

$$\omega_j = \ln\left(\frac{1}{\underline{\mu}_j}\right) / \sum_{j=1}^{7} \ln\left(\frac{1}{\underline{\mu}_j}\right)$$

and IHI of the i-th country was calculated as a weighted average in the following way:

$$IHI = \sum_{j=1}^{7} \omega_j \mu(Ji)$$

The variables selected for the determination of IHI are specific to the young population of the African region. According to World Bank data, SSA is undergoing significant demographic changes, including a sharp decline in mortality, especially among children. At the same time, the number of births is significantly increasing, thereby leading to a tripling of the region's population. Estimates indicate that the population increased from 186 million in 1950 to 670 million in 2000. The projected population for 2060 is 1.3 billion. A significant proportion of the African population is young, and the median age in Africa is much lower than in other regions (Canning et al., 2015). In our opinion, the inclusion rate should be determined by the characteristics of local societies. Then, the obtained values may constitute an element of a comparative analysis between countries from the same region, characterized by similar demographic and health phenomena.

Table 2 presents the values of the IHI level over 19 years. Visual inspection and our analysis in Table 3 indicate that in most countries, the level of integration of health services has worsened over time. Countries with an increase in the IHI index are Kenya, Ethiopia, Lesotho, Madagascar,

Mauritania, and Mozambique. The upward trend appeared only after 2015, preceded by a sharp decline in this ratio in the long term. Table 2 presents the consecutive values of the IHI level in the following years.

Table 2: IHI in the Years 2000–2019

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Angola	-	-	0.175	0.189	0.196	0.212	0.239	-	-	-	-	0.246	-	0.221	-	0.203	0.177	-	-	0.188
Benin	0.206	0.224	0.241	0.249	0.243	0.232	0.236	0.228	0.233	0.238	0.243	0.234	0.231	0.217	0.224	0.207	0.195	0.200	0.226	0.230
Botswana	0.579	0.561	0.565	0.588	0.622	0.554	0.535	0.566	0.546	0.621	0.630	0.540	0.526	-	0.516	0.504	0.474	0.486	-	0.443
Burkina Faso	-	0.132	0.138	0.144	-	0.146	0.149	0.130	0.149	0.149	0.147	0.148	0.147	0.123	0.133	0.128	0.126	0.138	0.144	0.175
Burundi	0.089	0.099	0.112	-	0.120	0.122	0.128	0.103	0.123	0.121	0.124	-	0.114	0.090	0.100	0.099	0.085	0.093	0.091	0.135
Cabo Verde	0.348	0.359	0.414	0.442	0.455	0.454	0.459	0.527	0.491	0.504	0.498	0.466	0.421	0.428	0.419	0.381	0.381	0.364	0.449	0.389
Cameroon	0.219	0.227	0.241	0.239	0.237	0.230	0.234	0.212	0.228	0.228	0.224	0.218	0.213	0.198	0.210	0.202	0.165	0.179	0.209	0.193
Central African Republic	0.170	-	-	-	0.167	-	0.160	-	0.156	0.158	0.149	0.149	0.154	-	-	-	-	-	-	0.181
Chad	0.105	0.111	-	0.113	0.124	0.129	-	-	0.129	0.130	0.128	0.124	-	-	0.114	0.110	-	-	-	0.145
Comoros	0.228	-	-	0.272	-	-	-	0.254		0.254	0.243	0.243	0.227	0.208	0.215	-	-	-	-	0.244
Congo, Dem. Rep.	-	-	-	-	-	-	0.178	0.153	0.176	0.173	-	0.175	0.174	0.141	-	-	0.144	-	-	0.192
Congo, Rep.	0.234	0.231	0.228	0.226	-	-	-	-	-	0.238	-	0.241	0.244	0.211	-	-	-	0.185	-	0.219
Cote d'Ivoire	-	-	-	-	-	-	-	0.220	0.236	0.234	0.218	0.181		0.174	0.188	0.188	0.171	0.191	-	0.220
Equatorial Guinea	0.317	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.368
Eritrea	0.174	0.197	0.208		0.223	-	-	-	-	0.206	0.202	-	-	-	-	-	-	-	-	-
Eswatini	0.305		0.293		0.385	0.377	0.376	-	-	-	-	0.370		0.295	-	-	-	-	-	0.285
Ethiopia	0.130	0.140	0.144	0.154	0.150	0.152	-	-	0.161	0.169	0.178	0.184	0.181	-	0.172	-	-	-	-	0.231
Gabon	-	0.594	-	0.603	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.377
Gambia. The	-	-	-	-	0.158	-	-	-	-	-	0.146	0.141	0.131	-	-	-	-	-	-	0.155
Ghana	-	-	-	-	-	0.238	0.245	0.248	0.262	0.254	-	0.262	0.243	0.251	0.245	0.236	0.222	0.223	0.262	0.248
Guinea	-	-	-	-	0.172	0.165	0.184	0.187	0.204	0.197	0.194	0.192	0.187	0.165	0.181	-	-	-	-	0.218
Guinea-Bissau	-	-	-	-	-	0.176	0.177	-	-	-	-	-	-	-	-	-	-	-	-	0.180
Kenya	0.141	0.147	0.151	-	0.151	0.147	-	-	-	0.163	-	-	-	-	-	0.168	0.180	0.181	-	0.224
Lesotho	0.225	0.236	0.232	0.243	-	0.257	0.259	-	-	-	-	-	0.291	0.272	0.279	0.268	-	0.269	0.306	0.304
Liberia	0.378	-	-	-	-	-	-	-	-	-	0.227	-	0.227	-	-	-	-	-	-	0.247
Madagascar	0.170	0.180	0.184	0.192	0.178	0.176	0.175	0.172	0.173	0.163	0.163	0.167	0.155	0.138	0.148	0.145	0.150	0.147	0.160	0.216
Malawi	0.117	0.116	0.120	0.110	0.110	0.106	0.110	0.084	-	-	0.116	0.118	-	-	-	-	-	-	-	0.162
Mali	0.154	0.163	0.167	-	-	-	-	-	0.169	0.170	0.160	0.152	0.154	0.119	0.128	0.123	-	-	-	0.159
Mauritania		0.244	0.248	0.255	0.246	0.241	0.248	0.246	0.246	0.235	0.235	0.228	0.217	0.197	-	0.195	0.189	0.187	0.201	0.254
Mauritius	0.766	0.839	0.861	0.858	0.872	0.837	0.829	0.898	0.887	0.908	0.914	0.828	0.789	0.814	0.829	0.809	0.797	0.800	-	0.791
Mozambique	0.159	0.166	0.164	0.162	0.158	0.157	0.159	0.131	0.153	0.150	0.146	0.147	0.150	0.125	0.139	0.140	0.128	0.144	0.157	0.180
Namibia	-	0.469	0.445	0.486	-	0.532	0.539	-	0.513	-	-	-	-	-	0.434	0.437	0.382	0.402	-	0.311
Niger	-	-	-	0.113	0.108	0.109	0.111	0.088	0.105	0.105	0.102	0.102	0.101	-	-	0.092	0.088	0.098	0.102	0.134
Nigeria	-	-	-	0.276	0.279	0.276	-	-	-	-	0.252	0.233	-	-	-	-	-	-	-	0.212
Rwanda	0.171	0.180	0.180	0.189	0.186	0.185	0.192	0.181	0.193	0.194	0.195	0.195	0.182	0.166	0.170	0.166	0.172	0.161	0.178	0.220
Sao Tome and Principe	-	-	-	-	-	-	-	-	-	0.224	0.217	-	0.205	-	0.204	0.207	-	-	-	0.228
Senegal	-	-	-	-	0.253	0.243	0.239	0.238	0.245	0.236	0.225	0.225	0.207	0.189	0.192	0.186	0.189	0.183	0.219	0.217
Seychelles	-	-	-	-	-	-	-	-	-	-	-	0.752	0.724	0.718	0.722	0.755	0.760	0.739	0.882	0.742
Sierra Leone	0.163	0.187	0.190	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.214
Somalia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.176
South Africa	-	-	-	-	-	-	-	-	-	-	-	-	0.594	0.545	0.522	-	0.444	0.474	0.587	0.422
Sudan	0.230	0.262	0.283	0.280	0.291	0.292	0.310	0.316	0.312	0.306	0.299	0.289	0.259	0.259	0.257	0.270	-	-	-	0.233
Tanzania	0.135	0.145	0.147	0.149	0.148	0.146	-	0.129	-	-	0.141	-	0.141	0.118	-	0.124	-	-	-	0.184
Togo	-	-	-	-	-	-	0.188	0.166	-	-	0.189	0.192	0.184	0.168	0.172	0.167	0.166	0.176	0.209	0.196
Uganda	0.104	0.110	0.121	0.114	0.115	-	0.116	-	0.115	0.127	0.127	0.117	0.108	-	0.093	-	-	-	-	0.129
Zambia	-	-	-	-	-	-	-	-	-	-	-	0.143	0.147	-	-	-	-	-	-	0.174
Zimbabwe	-	-	-	-	-	-	-	-	-	-	0.212	0.192	0.188	0.169	-	0.186	-	-	-	0.186

Based on the IHI values obtained, the authors pose the following research questions:

RQ2: How does the level of healthcare spending influence the IHI of the countries of the region in question?

RQ3: Does the quality of public management affect the value of the inclusiveness ratio?

We performed Spearman's rank correlation analysis (Dodge, 2010), which shows that any monotonic dependence is nonlinear and can be used for any distribution of comparable variables. We concluded that there are strongly negative and statistically significant correlations between IHI and year in Botswana, Cameroon, Namibia, Nigeria, and Senegal. Moreover, there are negative and statistically significant correlations between IHI and year in Madagascar, Mali, Mauritania, and Mozambique.

Generally, correlation means the interdependence of variables. Do they grow or decrease simultaneously, or is there no such relationship? A positive correlation implies an increase in IHI over time, a negative decrease. For example, the result for Cameroon represents a statistically significant decline in the value of the IHI index over time. Moreover, it can be said that the dynamics of this decline are high. For all these countries, IHI decreased within years. However, for Ethiopia, Kenya, and Lesotho, there were strongly positive and statistically significant correlations between IHI and a year; in such cases, IHI increased within years.

To verify the RQ2, a dynamic linear regression model of the impact of the expenditure on health variables on the level of the IHI was used. Dynamic linear regression models provide a generic framework to analyze time series data. The main idea is that these models can be considered general regression models wherein the coefficients vary across time. The rationale for choosing this method was to eliminate the fact that part of the variability of the IHI variable comes from "itself," i.e., the prediction of the current value of IHI may be significantly influenced by past values of this indicator (the so-called lag). Hence, by extracting the "lag," one can observe the health effects of spending in a more isolated way. Consequently, fewer models turn out to be meaningful without considering the lag; however, in our opinion, it more strongly confirms the dependence of health expenditure on the level of the IHI index.

In the case of linear regression models, to exclude statistical significance arising from the variability of the IHI time series itself (i.e., time lags), we performed dynamic regression modeling, which investigates the influence between variables in the presence of the outcome variable (first) time lag. Such a model assumes a linear relationship between a dependent variable y and the lag of an independent variable x. The equation is given by the following formula:

$$y_t = \alpha + \beta_0 x_t + \beta_1 x_{t-1} + e_t \tag{1}$$

This equation has the following interpretation. Coefficient β_1 is a 1-period delay multiplier, whereas coefficient β_0 denotes the direct impact of a change in x on y. If x increases by one unit today, the mean change in y is given by $\beta_0 + \beta_1$.

The results below display only statistically significant data. Statistically insignificant results were included in the appendix. The significant data are those for which the p-value was below the threshold (0.05).

Current health expenditure was a statistically significant predictor of IHI level in Chad. An increase in health spending by one percentage point increased the IHI level by 0.012 on average. In the following tables, the consecutive columns denote values of the estimated coefficient, 95% confidence intervals (2.5% and 97.5% percentiles), and p-value indicating the statistical significance of the coefficient.

Table 3 Rank Correlation Coefficient Between IHI And Years (2000–2019)n

Country	Correlation coefficient	P-value
Angola	0.079 0	.838
Benin	0.439	0.054
Botswana	0.723	0.001
Burkina Faso	0.067	0.792
Burundi	0.137	0.586
Cabo Verde	0.092	0.700
Cameroon	0.827	<0.001
Central African Republic	0.317	0.410
Chad	0.420	0.177
Comoros	0.503	0.143
Congo, Dem. Rep.	0.167	0.678
Congo, Rep.	0.406	0.247
Cote d'Ivoire	0.409	0.214
Equatorial Guinea	1.000	1.000
Eritrea	0.486	0.356
Eswatini	0.310	0.462
Ethiopia	0.945	<0.001
Gabon	0.500	1.000
Gambia. The	0.400	0.517
Ghana	0.178	0.542
Guinea	0.259	0.417
Guinea-Bissau	1.000	0.333
Kenya	0.927	<0.001
Lesotho	0.890	<0.001
Liberia	0.200	0.917
Madagascar	0.594	0.007
Malawi	0.127	0.714
Mali	0.615	0.037
Mauritania	0.608	0.009
Mauritius	0.412	0.081
Mozambique	0.510	0.023
Namibia	0.700	0.021
Niger	0.361	0.187
Nigeria	0.943	0.017
Rwanda	0.162	0.492
Sao Tome and Principe	0.029	1.000
Senegal	0.832	<0.001
Seychelles	0.433	0.250
Sierra Leone	1.000	0.083
South Africa	0.607	0.167
Sudan	0.191	0.461
Tanzania	0.203	0.528
Togo	0.210	0.514
Uganda	0.258	0.394
Zambia	1.000	0.333
Zimbabwe	0.771	0.103

Source: own calculations

Table 4. Dynamic Linear Regression Model Explaining IHI Level (Chad)

	Coefficient	2.5%	97.5%	*P*-value
Intercept	–0.101	–0.225	0.023	0.095
Current health expenditure per capita (% PKB)	0.012	0.002	0.022	0.026
First lag	1.382	0.706	2.058	0.002

Current health expenditure was a statistically significant predictor of IHI level in Comoros. An increase in health spending by one percentage point increased the IHI level on average by 0.033.

Table 5. Dynamic Linear Regression Model Explaining IHI Level (Comoros)

	Coefficient	2.5%	97.5%	*P*-value
Intercept	0.002	–0.113	0.117	0.964
Current health expenditure per capita (% PKB)	0.033	0.017	0.049	0.003
First lag				

Current health expenditure was a statistically significant predictor of IHI level in Ethiopia. An increase in health spending by one percentage point increased the IHI level on average by 0.009.

Table 6. Dynamic Linear Regression Model Explaining IHI Level (Ethiopia)

	Coefficient	2.5%	97.5%	*P*-value
Intercept	–0.011	–0.066	0.043	0.649
Current health expenditure per capita (% PKB)	0.009	0	0.018	0.046
First lag	0.836	0.636	1.036	< 0.001

Current health expenditure was a statistically significant predictor of IHI level in Namibia. An increase in health spending by one percentage point increased the IHI level on average by 0.041.

Table 7. Dynamic Linear Regression Model Explaining IHI Level (Ethiopia)

	Coefficient	2.5%	97.5%	*P*-value
Intercept	–0, 164	–0.473	0.145	0.242
Current health expenditure per capita (% PKB)	0.041	0.009	0.074	0.021
First lag	0.495	0.031	1.022	0.061

Current health expenditure was a statistically significant predictor of IHI level in Senegal. An increase in health spending by one percentage point decreased IHI level on average by 0.034.

Table 8. Dynamic Linear Regression Model Explaining IHI Level (Senegal)

	Coefficient	2.5%	97.5%	*P*-value
Intercept	0.247	0.094	0.399	0.004
Current health expenditure per capita (% PKB)	–0.034	–0.057	–0.01	0.01
First lag	0.471	0.15	0.792	0.008

To answer RQ3, does the quality level of public management affect the value of the inclusiveness ratio, we calculated the Spearman's rank correlation coefficients between IHI and a number of WGI

indicators (WGI World Bank Data) for every single year from 2000 to 2019. A statistically significant positive correlation coefficient has been found in 2002(p = 0.023), 2005 (p = 0.047), 2014(p = 0.005), 2015(p = 0.021), 2016(p < 0.001), 2017(p = 0.004), 2018(p = 0.027), and 2019(p = 0.01). The direction in the correlation (WGI vs IHI or IHI vs WGI) does not matter. The correlation tells us about the strength of the association between WGI and HGI for all investigated countries at a fixed moment of time, e.g., in 2016, we observed a statistically significant mutual increase in IHI and WGI, i.e., with an increase in one of these variables, an increase in the other took place.

Table 9. Correlation Coefficients Between IHI And WGI Indicator (In Every Single Year)

Year	WGI vs IHI	
	Correlation coefficient	*P*-value
2000	–0.007	0.973
2002	**0.455**	0.023
2003	0.282	0.181
2004	0.235	0.247
2005	**0.386**	0.047
2006	0.343	0.086
2007	0.215	0.335
2008	0.401	0.053
2009	0.162	0.410
2010	–0.038	0.839
2011	0.127	0.482
2012	0.314	0.075
2013	0.365	0.061
2014	**0.541**	0.005
2015	**0.442**	0.021
2016	**0.716**	< 0.001
2017	**0.590**	0.004
2018	**0.559**	0.027
2019	0.377	0.010

*Statistically significant positive correlation coefficient in bold

In the case of linear regression models, to exclude statistical significance arising from the variability of the IHI time series itself (i.e., time lags), we performed dynamic regression modeling, which investigates the influence between variables in the presence of the outcome variable (first) time lag. The results are statistically significant below.

WGI was a statistically significant predictor of IHI level in Benin. An increase in WGI by one unit increased IHI level on average by 0.056.

Table 10. Dynamic Linear Regression Model Explaining IHI Level (Benin)

	Coefficient	2.5%	97.5%	*P*-value
(Intercept)	0.138	0.047	0.229	0.006
Governance	**0.056**	**0.002**	**0.109**	0.043
lag.1	0.524	0.165	0.882	0.007

WGI was a statistically significant predictor of IHI level in Lesotho. An increase in WGI by one

unit decreased IHI level on average by 0.072.

Table 11. Dynamic Linear Regression Model Explaining IHI Level (Lesotho)

	Coefficient	2.5%	97.5%	*P*-value
(Intercept)	**0.202**	**0.064**	**0.341**	0.013
Governance	**–0.072**	**–0.126**	**–0.018**	0.018
lag.1	0.121	–0.475	0.718	0.623

WGI was a statistically significant predictor of IHI level in Mauritius. An increase in WGI by one unit decreased IHI level on average by 0.109.

Table 12. Dynamic Linear Regression Model Explaining IHI Level (Mauritius)

	Coefficient	2.5%	97.5%	*P*-value
(Intercept)	**0.525**	**0.179**	**0.871**	0.006
Governance	**–0.109**	**–0.21**	**–0.008**	0.037
lag.1	0.484	0.086	0.882	0.021

WGI was a statistically significant predictor of IHI level in Seychelles. An increase in WGI by one unit decreased IHI level on average by 1.031.

Table 13. Dynamic Linear Regression Model Explaining IHI Level (Seychelles)

	Coefficient	2.5%	97.5%	*P*-value
(Intercept)	**0.525**	**0.179**	**0.871**	0.006
Governance	**–0.109**	**–0.21**	**–0.008**	0.037
lag.1	0.484	0.086	0.882	0.021

WGI was a statistically significant predictor of IHI level in Tanzania. An increase in WGI by one unit increased IHI level on average by 0.095.

Table 2. Table 14: Dynamic Linear Regression Model Explaining IHI Level (Tanzania)

	Coefficient	2.5%	97.5%	*P*-value
(Intercept)	0.151	–0.039	0.341	0.076
Governance	**0.095**	**0.039**	**0.151**	0.018
lag.1	0.253	–1.012	1.518	0.48

In summary, one can notice a significant correlation between the WGI government quality index and the IHI after 2014. Moreover, in some countries, the calculated IHI increased significantly over time but decreased in many countries. These results are therefore not conclusive. Such relationships occurred in a few countries and not very clearly. The p-value indicates the contractually accepted significance but is sometimes close to the limit. This may suggest that there are other, more important factors influencing the level of IHI in the region than the value of investments in healthcare and the quality of government in the analyzed countries of the region.

3. Conclusion

Healthcare is a fundamental right for people worldwide. However, creating inclusive healthcare systems is a challenge for most countries. In SSA particularly, instability in government and economy makes effective inclusive healthcare more difficult.

The scientific discourse concerning social choice theory tends to oppose planned goals, thereby indicating that they tend only to produce profits for foreign governments or companies but do not translate into meeting the expectations of the final beneficiaries who are most affected by the disproportionate access to medical services. Hence, maximum impartiality and the presentation of research results are essential, irrespective of pressure from interest groups (Lauer, 2018). Lauer (2007) challenges the common opinion that development in Africa is impeded by bad governance. Our results encompass this as well.

In this study, we based our analysis on previous research findings regarding the interdependence of inclusion, quality of government, and the level of investment in healthcare. We incorporated the views of MacLachlan et al. (2012). The strategy of inclusion in the healthcare system should include healthcare for all. This approach should be based on strengthening the rights to use health services for all and emphasizing the need for active integration by recognizing that particular groups have specific needs. This is especially visible in the young societies of the SSA region. It is crucial to overcome these societies' sociodemographic and epidemiological challenges to adequately meet their healthcare needs. Furthermore, it is necessary to increase the diversity of human resources in healthcare, which are adjusted to the specificity of the region's population.

We assign importance to the region's specificity by pointing to specific socioeconomic processes determining the scope of inclusion in the healthcare system. This is especially important for individual regions that struggle with entirely different problems related to inclusion in medical services. This is confirmed by, among others, Van Rensburg and Fourie (1994). The authors emphasize that inequality in SSA is caused not only by socioeconomic factors but also by ethnic diversity and geographic conditions, such as population density and the predominance of urban or rural areas. In our opinion, the IHI level of Germany or Sweden cannot be compared with Nigeria or Ethiopia. It is necessary to search for measures specific to individual regions to assess their level of inclusion. Thus, the variables we selected are parameters specific to the region in question. Because socioeconomic development is conditioned by, among other things, the level of development of individual countries, their resources, and the quality of public management, we believe that it is reasonable to compare countries of one region that are exposed to similar challenges and characterized by similar economic parameters. We evaluated characteristics unique to the countries in these regions to determine how health expenditures and governance quality can improve inclusion in health services. Governance quality (here taken as the WGI) measures six dimensions: voice and accountability, political stability, absence of terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption.

The literature is consistent with the view that there is a need to enhance the inclusiveness in SSA. We challenge Anand and Revallion (1993) who suggest that social welfare depends on the level of public spending on health services. This study complements existing literature on findings that neither the quality of public governance (estimated by the WGI index) nor the level of healthcare expenditure affects the growth of the IHI index. Moreover, we point out that the level of inclusiveness (herewith calculated as IHI for SSA) should be based on typical specific socioeconomic features of the area concerned.

We based the calculation of the IHI index on the following variables: tertiary school enrollment; current health expenditure per capita; the mortality rate of infants; life expectancy at birth; population ages 65 and above, % of the total population; population ages 15–64, % of the total population; and GDP per capita. We aim to use the information on the number of physician and nurses available in the region's countries to calculate IHI for SSA as soon as data are available. Moreover, the level of

school enrollment would be necessary. Education is essential in increasing civic awareness of public services, including the importance of health in the development of societies (UNHC, 2022). Failure to use this data is a limitation in our research. Unfortunately, the availability of data in these two areas from the last 20 years for all SSA countries is highly insufficient.

We have shown the changes in the IHI index over almost 20 years and compiled this indicator based on the typical characteristics of the young societies of SSA. The results obtained may be somewhat surprising because we intuitively believe that increasing investment in the healthcare system can significantly contribute to increasing inclusiveness. Moreover, the quality of government determined by the WGI should significantly affect the level of inclusiveness. Further, the results are not unequivocal across the entire study group. Therefore, we agree with other researchers, who point to other determinants of inclusion in the healthcare system. These are human resources, i.e., qualified medical and support staff. In our research plan, we wanted to include this factor in the IHI calculation, but there are no such data.

Notably, we have our own experience of trying to implement medical investment in an SSA country. Unfortunately, despite the high IHI and WGI index, which show that the country is developing, and despite significant investments in healthcare infrastructure, investment in human resources has not been carried out. The main reason is the lack of medical personnel and willingness to finance. A well-known saying goes "Even the best medical equipment does not heal itself."

In our opinion, human capital may be a key factor determining the growth of inclusion. The results of our research confirm this. It is not the quality of public governance or the value of investments in medical infrastructure that determines the level of inclusion. "Walls do not heal." Human capital is vital, both in offering health services and in being aware of the importance of health, in shaping stable, young societies.

Investment in human capital is not easily measurable because it relates to intangible assets. It does not translate directly into GDP growth rate or state budget expenditures. Thus, investments in infrastructure, buildings, and medical equipment are more meaningful in public perception. However, again, "walls don't heal." Our research clearly shows that the quality of public management does not translate into healthcare integration. We hope that the results of our study will develop the creation of social well-being in all areas, including health. Understanding the importance of maintaining high-quality public governance, asset investment, and investment in human capital is, in our opinion, a meaningful way to achieve inclusiveness in the healthcare system.

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Conflicts of interest

The authors declare no conflict of interest.

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