

Determinants of Life Expectancy in Sub-Saharan Africa: Evidence from Miserable Countries. A Panel Data Analysis. (1980- 2023)

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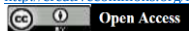
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ABSTRACT

This study examined the socio-economic determinants of life expectancy (LE) in top five miserable countries in Africa. The objectives were to investigate the impact of the socio - economic factors on life expectancy, investigate the long run socio – economic factors that determine life expectancy and to determine if any long run relationship exists between these socio-economic factors and life expectancy in miserable countries of Africa. Secondary data were sourced from the World Development Indicators for the period 1980-2023. It was found that, per capita income (PCI), secondary school enrollment, and health expenditure impacted positively on life expectancy for all the selected African countries while exchange rate, unemployment and carbondioxide (*Co2*) emission reduce life expectancy. Also, per capita income was significant determinant of life expectancy for all the countries, with $\beta = 0.083, < 0.01$; $\beta = 0.029, p < 0.01$, $\beta = 0.013, < 0.1$, $\beta = 0.114, p < 0.05$, and $\beta = 0.014, p < 0.01$ for South Africa, Nigeria, Egypt, Algeria and Mauritius respectively. However, *Co2* emission was not a major determinant of life expectancy in all the countries. Secondary school enrolment, health expenditure, exchange rate and unemployment rate are determinants of life expectancy but not in all countries. The study concludes that unemployment rate, *Co2* emission and exchange rate reduce life expectancy in the selected countries.

Introduction

According to (Oziengbe & Aigheyisi, 2020). Life expectancy means a person's age or the sum of years from a day old to the time he breathes his last breath. If change is held constant, and except for death resulting from suicide, abrupt death, assassination, terrorists' attack, life-taking accidents of various types and magnitude and activities of hoodlums and ritualists, etc., the standard of living of individuals is adequately portrayed to a significant extent by their life expectancies. Arum et al., (2019) viewed life expectancy as a projection of the number of years for which an individual will live. This number is established based on the statistical average, by putting many factors, including year and place of birth, race, educational attainment, disposable income, past and present health status into consideration. The United Nations' World Population Prospects 2015, revealed that worldwide, the average life expectancy at birth was 70.5 years (68 years and 4 months for males and 72 years and 8 months for females) for the period 2010–2015. Based on 2016 World Health Organization (WHO) data, women on the average live longer than men in all major regions and in all countries except for some African countries such as Mali and Swaziland.

A World Health Organization reports of 2022, show that improved life expectancy has been recorded in most of African countries. The life expectancy increased to 56 years in 2019 against the 46 years recorded in year 2000. It is obvious that this is below the expected worldwide average of 64 years. Over the same period, global life expectancy increased by only five years, This points to the fact that, although the continent is making efforts towards improving its life expectancy, there is a need to address

the protracted socioeconomic denial, health issues and miseries that continue to hurt the welfare of its teeming population (AfDB, 2025).

According to Steve (2019), misery index is an economic indicator calculated by summing up the unemployment, inflation and bank lending rates together. Although very simple to calculate, it is key in determining how the greater percentage of the citizens in a given country is faring, as higher rates of unemployment and inflation are associated with very important socioeconomic factors for a country.

Worthy of note among these factors are the life expectancy, low income per capita, sustained income inequality, sub-standard educational facilities, low agricultural yields, illiteracy, poverty and inadequate medical and healthcare facility. Hanke, (2019) identified five African nations which have the highest misery index. They include; South Africa, Nigeria, Egypt, Algeria and Mauritius (hereafter referred to as SNEAM). The major focus of the study was on the behaviors of life expectancy in these countries. Amadou (2015) found that Nigeria's rebasing, which increased its GDP from \$270 billion to \$510 billion in 2013, showed that not only did its economy exceed that of South Africa to become the largest in the continent, but that its portion of Sub-Saharan African total GDP rose from 21.3 percent to 31.7 percent.

A number of studies have been carried out on the determinants of life expectancy as a socio-economic issue both in the developed countries, emerging economies and the third world economies with various results (for example Rassella, 2013; Hami, 2016; Guisan & Exposito; 2016; Timothy, 2018; Afolabi, 2019; Ogunjesa, 2019; & Miladinov, 2020). Life expectancy is determined by many factors which are environmental, social, political and economic factors ranging from poverty, income level, income inequality, health status, etc. Understanding the conditions and policies which contribute to increased or decreased life expectancy is critical to improving population health globally, (Toby et al., 2020).

Thus, the question is what are the major factors that determine life expectancy in most countries? Do the factors that determine life expectancy differ among countries? According to Nkalu (2019), the world rate of decline in life expectancy is alarming, of which Africa is not exempted. Some studies are of the opinion that life expectancy in Africa is relatively high in comparison with other continents as a result of uncontaminated natural environments due to the low level of industrialization, qualities of natural food intake and nutritional values, geographical and the overall weather advantage. Conversely, some also argued that life expectancy in Africa is quite low compared to other continents due to a high level of environmental hazards such as carbon dioxide *Co2* emissions, insecurity and so on in some parts of the continent. Therefore, this paper tries to investigate the socio – economic factors that determine life expectancy in the miserable countries of Africa, namely, South Africa, Nigeria, Egypt Algeria and Mauritius.

The study is justified on the following grounds. First, it focused on top five miserable countries in Africa which studies over the years have not investigated. In terms of empirical studies, different researchers have come up with different factors that determine life expectancy over the years. Their results however have been controversial as some of the determinants of life expectancy identified by the authors failed to agree with other studies. The inconclusive findings in the literature show that further studies need to be carried out. The questions to ask are; what are the major determinants of life expectancy in the selected five countries? Do the factors responsible for life expectancy in a country affect other countries in the same magnitude? Hence the major objectives of the study will be to discover the;

- (i) major determinants of life expectancy in the miserable countries of Africa.
- (ii) relationship that exists between the socioeconomic factors and life expectancy.

The study is carried out on the determinants of life expectancy in top five miserable countries in Africa as ranked by the Hapkins index (2020). These countries are South Africa, Nigeria, Egypt, Algeria and Mauritius. The time frame for the study covers 1980 to 2023.

2 Conceptual Review

Per Capita Income

Per capita income reflects the average economic resources available to individuals and is an important determinant of living standards and population health. Higher income can improve access to nutritious food, quality healthcare, safe housing and other basic necessities, thereby reducing exposure to health risks and increasing life expectancy. Conversely, low income may constrain access to essential health services and increase vulnerability to preventable diseases. Thus, improvements in per capita income are generally expected to contribute positively to life expectancy (Horvey, 2024).

Secondary School Enrolment

Secondary school enrolment is an important indicator of human capital and can influence life expectancy through improved health knowledge, awareness and socioeconomic opportunities. Education enables individuals to make more informed decisions concerning nutrition, sanitation, disease prevention and healthcare utilization. Higher educational attainment can also improve employment and income opportunities, indirectly enhancing access to health-enhancing resources. Consequently, greater secondary school enrolment is expected to have a positive influence on life expectancy (Boachie & Adu-Darko, 2024).

Exchange Rate

The exchange rate can influence life expectancy through its effects on the prices of imported food, medicines, medical equipment and other healthcare inputs. Currency depreciation may increase the domestic cost of these goods, particularly in developing economies that depend heavily on imports, thereby reducing households' purchasing power and potentially limiting access to healthcare. Exchange-rate instability may therefore adversely affect health conditions and longevity, while greater stability can support access to essential health-related goods and services. The relationship between exchange-rate conditions and life expectancy is therefore potentially important in developing economies. (Bature, et al., 2022).

Health Expenditure

Health expenditure represents the financial resources devoted to healthcare services, including disease prevention, diagnosis, treatment, medical personnel and healthcare infrastructure. It covers all of the government commitment to environment maintenance, sanitation, management and ecological sustainability Yakubu et al., (2024). The Increased and efficiently allocated health expenditure can improve access to healthcare and reduce mortality from preventable and treatable diseases. Elijah et al., (2024), submitted that health expenditure contributes to longer life expectancy. However, the effect depends on the efficiency, accessibility and quality of healthcare spending rather than expenditure alone. Evidence from African countries also indicates that environmental conditions can influence health expenditure, particularly where pollution increases health-related costs (Horvey, 2024).

Unemployment

Unemployment can influence life expectancy through its effects on income, living conditions, access to healthcare and psychological and social well-being. Persistent unemployment reduces individuals' ability to afford nutritious food, adequate housing and healthcare services and may increase socioeconomic vulnerability. At the aggregate level, high unemployment can therefore be associated with poorer health outcomes and shorter life expectancy. Conversely, productive employment can provide income and social security that support healthier living conditions. (Byaro et al., 2023).

Carbon Emissions

Oyeranti, (2024), argued that carbon dioxide (CO₂) emissions represent an important indicator of environmental degradation and can affect life expectancy through their consequences for air quality and human health. Exposure to polluted air is associated with respiratory and cardiovascular diseases and other health problems that can increase mortality and reduce longevity. In addition, climate-related environmental changes may increase the incidence of disease and other health risks. Evidence from 47 African countries indicates that higher CO₂ emissions are associated with increased health expenditure, suggesting that environmental degradation can generate substantial health costs. Consequently, rising carbon emissions will generally expected to exert a negative influence on life expectancy. (Beşer et al., 2025).

Methodology

Data Requirement and Source;

The study sample is made up of 5 top miserable African countries, namely, South Africa Nigeria, Egypt, Algeria and Mauritius. The study period is from 1981 to 2019. The variables of interest include life expectancy at birth, per capita income, public health expenditure, exchange rate, unemployment rate and CO₂ emission. The data for this study were sourced from World Development Indicator (WDI).

Model Specification

In the literature, there has been several models employed in examining the determinants of life expectancy in Africa. The model requirement for the work is as stated below.

$$LE_x = f(PCI, SSE, HE, EXR, UE, CO_2)$$

Where: LEx = Life expectancy at birth.

PCI = Per capita income

SSE= Secondary School.

CO₂= Carbondioxide

UE = Unemployment rate

HE = Public health expenditure EXR = Exchange rate

In econometric term, the model is specified as $EX_t = \beta_0 + \beta_1 PCI_{it} + \beta_2 SSE_{it} + \beta_3 HE_{it} + \beta_4 EXR_{it} + \beta_5 UE_{it} + \beta_6 CO_{2it} + \epsilon_{it}$

Where ; β_0 = constant, $\beta_1 - \beta_6$ = coefficients of the independent variables and ϵ_t is the error term.

On apriori, the study expects as:

$$\beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0, \beta_5 < 0, \text{ and } \beta_6 < 0.$$

The above model is re-specified in a logarithm form as $LnLEX_{it} = \beta_0 + \beta_1 LnPCI_{it} + \beta_2 LnSSE_{it} + \beta_3 LnHE_{it} + \beta_4 LnEXR_{it} + \beta_5 LnUE_{it} + \beta_6 LnCO_{2it} + \epsilon_{it}$

Data Analysis

Descriptive Statistics

The descriptive statistics shows that the minimum life expectancy value was reported in Nigeria with 45.33 while the maximum value was recorded in Algeria with 76.89 followed by Mauritius 74.52 and Egypt 71.91. This shows that the life expectancy rate for Niger is low. The result may be due to poor health care services and other socio – economic factors. It is also clear that for Nigeria and South Africa, their life expectancy rate is below the SDG target of 71 years. No wonder both countries are regarded as top two miserable countries. As reported on the table, the minimum value for per capita income was recorded in South Africa with (\$187,97 billion), followed by Nigeria with (\$270,32 billion). However, the maximum value was reported in Mauritius with (\$12280 billion), followed by South Africa with (\$8007,47 billion). Regarding secondary school enrollment, the highest reported value was in South Africa with 86.79 followed by Mauritius with 73.39. The minimum value was found in Nigeria with 13.67. However, in terms of the maximum value, Algeria reported the highest number of secondary

school enrollment with 116.28 followed by South Africa with 109.44. Nigeria reported the least number with 56.27.

Table 1. Descriptive Statistics

Variable / Country	Mean	Median	Min	Max
<i>Life Expectancy</i>				
South Africa	58.54	60.21	53.44	64.13
Nigeria	48.20	46.20	45.33	54.47
Egypt	67.11	68.49	58.33	71.91
Algeria	70.19	70.41	60.81	76.89
Mauritius	71.26	71.66	66.97	74.52
<i>Per Capita Income</i>				
South Africa	4250.54	5486.73	187.97	8007.47
Nigeria	1369.28	892.37	270.22	5090.71
Egypt	1508.47	1188.75	498.55	3562.93
Algeria	2938.46	2442.36	1452.28	5592.22
Mauritius	5507.18	3970.00	1030.00	12280.00
<i>Secondary School Enrolment</i>				
South Africa	86.79	85.48	65.51	109.44
Nigeria	31.44	28.03	13.67	56.27
Egypt	72.35	74.37	49.26	89.48
Algeria	71.45	65.40	30.23	116.28
Mauritius	73.39	76.81	44.06	99.90
<i>Health Expenditure</i>				
South Africa	5.96	5.75	4.61	6.61
Nigeria	1.54	0.85	0.85	5.11
Egypt	4.22	4.41	3.29	5.01
Algeria	5.67	4.47	4.21	4.47
Mauritius	3.71	3.51	2.80	4.70
<i>Exchange Rate</i>				
South Africa	6.11	6.23	0.77	14.71
Nigeria	91.80	97.07	0.55	305.42
Egypt	4.81	3.43	0.70	17.78
Algeria	52.99	65.57	3.83	119.35
Mauritius	23.44	26.24	7.88	35.54
<i>Unemployment Rate</i>				
South Africa	6.89	6.50	5.43	18.78
Nigeria	4.23	3.73	3.59	8.64
Egypt	10.06	9.38	7.95	13.15
Algeria	18.14	16.72	9.82	31.84
Mauritius	8.91	8.48	2.84	20.56
<i>CO₂ Emission</i>				
South Africa	8.83	8.71	7.72	9.85
Nigeria	0.63	0.69	0.31	0.93
Egypt	1.85	1.80	1.04	2.59
Algeria	3.80	3.22	1.92	3.98
Mauritius	2.14	2.27	0.51	3.87

Source: Author's computation (2026) based on World Development Indicators data.

Time-series data may produce spurious regression when variables are non-stationary. Therefore, the Augmented Dickey-Fuller (ADF) unit root test was employed to examine the stationarity of the variables, with the results presented in Table 2. Life expectancy was stationary at level, I(0), in South

Africa and Algeria, but became stationary at first difference, I(1), in Nigeria, Egypt, and Mauritius. Per-capita income, unemployment rate, and exchange rate were stationary at first difference across all countries. Secondary school enrolment was stationary at level only in Nigeria and at first difference in the other countries. Health expenditure was stationary at level in South Africa, Egypt, and Algeria, but at first difference in Nigeria and Mauritius. Overall, the variables exhibit mixed orders of integration, I(0) and I(1).

Table 2. Augmented Dickey-Fuller (ADF) Unit Root Test Results

Country	Test	LE	PCI	SSE	HE	EXR	UE	CO ₂
South Africa	Level	-4.083*	-1.256	-1.740	-3.465**	-2.096	-1.892	-2.445
		(0.003)	(0.632)	(0.404)	(0.015)	(0.247)	(0.332)	(0.136)
	1st Diff.		-4.505*	-6.287*		-4.711*	-6.252*	-6.554*
			(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Nigeria	Level	-1.995	-2.231	-2.705***	-1.587	-1.949	-1.683	-2.047
		(0.287)	(0.109)	(0.082)	(0.483)	(0.307)	(0.444)	(0.266)
	1st Diff.	-4.321*	-12.525*		-5.099*	-5.099*	-4.641*	-6.459*
		(0.000)	(0.000)		(0.000)	(0.000)	(0.004)	(0.000)
Egypt	Level	-1.912	-1.574	-1.935	-3.135**	-1.092	-2.143	-0.323
		(0.323)	(0.486)	(0.314)	(0.032)	(0.709)	(0.229)	(0.588)
	1st Diff.	-3.421	-5.121	-5.053		-5.499	-5.499	-8.339
		(0.002)	(0.000)	(0.000)		(0.000)	(0.000)	(0.000)
Algeria	Level	-2.616***	-0.717	-2.115	-6.351*	-1.778	-0.771	-3.028**
		(0.099)	(0.831)	(0.831)	(0.000)	(0.385)	(0.816)	(0.041)
	1st Diff.		-5.347*	-4.549*		-4.026*	-5.421*	
			(0.000)	(0.000)		(0.000)	(0.003)	
Mauritius	Level	-1.788	-1.478	-0.614	-1.349	-1.153	-1.918	-0.143
		(0.381)	(0.999)	(0.855)	(0.597)	(0.685)	(0.321)	(0.937)
	1st Diff.	-4.758	-3.713	-3.879	-5.079	-6.082	-5.892	-6.252
		(0.008)	(0.000)	(0.006)	(0.000)	(0.000)	(0.000)	(0.000)

*Note: p-values are in parentheses. *, ** and *** denote significance at the 1%, 5% and 10% levels, respectively. LE = life expectancy; PCI = per capita income; SSE = secondary school enrolment; HE = health expenditure; EXR = exchange rate; UE = unemployment rate; CO₂ = carbon dioxide emission.*

Findings from table 3 show that the F- Statistics value for all the five countries selected were higher than the upper bound at 1% level of significance for South Africa, Nigeria and Egypt and 5% level of significance for Algeria and 10% level of significance, based on the result, we concluded that long-run relationship exist between life expectancy and the socio-economic variables selected.

Table 3. ARDL Bounds Test for Cointegration

Country	F-Statistic	10%		5%		1%	
		I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
South Africa	31.58*	2.12	3.23	2.45	3.61	3.15	4.43
Nigeria	15.57*	2.12	3.23	2.45	3.61	3.15	4.43
Egypt	31.25*	2.12	3.23	2.45	3.61	3.15	4.43
Algeria	4.03**	2.12	3.23	2.45	3.61	3.15	4.43
Mauritius	3.58***	2.12	3.23	2.45	3.61	3.15	4.43

*Note: Critical values are the lower bound I(0) and upper bound I(1) at the stated significance levels. *, ** and *** denote significance at the 1%, 5% and 10% levels, respectively.*

Regression Results

Table 4 present the outcome of the long run determinants of life expectancy in the selected countries. From the results it is shown that per capita income impacted positively on life expectancy. The result conforms with apriori expectation. Based on the result, 1 percent increase in per capita income improves life expectancy by 0.083%, 0.029%, 0.013%, 0.114% and 0.014% for South Africa, Nigeria, Egypt, Algeria and Mauritius respectively. The result was also significant with $\rho < 0.01$ for South Africa, Nigeria, and Mauritius while $\rho < 0.05$ for Algeria and $\rho < 0.1$ for Egypt. This shows that per capita income stands as a major determinant of life expectancy in the long run. Based on the findings also, per capita income improves life expectancy higher in Algeria followed by South Africa, Nigeria, Mauritius and Egypt.

In terms of secondary school enrolment, the result indicated that secondary school enrolment impacted positively on life expectancy. The result conforms with apriori expectation since literacy rate will help to improve the life pattern of individual. Based on the result, 1 percent increase in secondary school enrolment improves life expectancy by 0.478%, 0.068%, 0.088%, 0.105% and 0.012% for South Africa, Nigeria, Egypt, Algeria, and Mauritius respectively.

The result was also significant with $\rho < 0.01$ for Nigeria, $\rho < 0.05$ for South Africa, $\rho < 0.1$ for Egypt while $\rho > 0.1$ for Algeria and Mauritius. This shows that secondary school enrolment stands as a major determinant of life expectancy for South Africa, Nigeria, and Egypt but not major determinants for life expectancy for Algeria and Mauritius in the long run.

Based on the findings also, secondary school enrolment improves life expectancy higher in South Africa followed by Algeria then Egypt, Nigeria, and Mauritius. Health expenditure impacted positively on life expectancy. The result conforms with apriori expectation since improvement in health expenditure is likely to improves health care. Based on the result, 1 percent increase in health expenditure improves life expectancy by 0.380%, 0.016%, 0.022%, 0.023% and 0.456% for South Africa, Nigeria, Egypt, Algeria and Mauritius respectively. The result was also significant with $\rho < 0.01$ for Algeria, $\rho < 0.05$ for South Africa and Nigeria, $\rho < 0.1$ for Mauritius while $\rho > 0.1$ for Egypt and Mauritius.

This shows that health expenditure stands as a major determinant of life expectancy for South Africa, Nigeria and Algeria but not major determinants for life expectancy for Egypt in the long run. Based on the findings also, health expenditure improves life expectancy higher in Mauritius, followed by South then Algeria, Egypt and Nigeria respectively. Unemployment rate from the result shows an inverse relationship with life expectancy for all the countries. Based on the result, 1 percent increase in the rate of unemployment reduces life expectancy by 0.031%, 0.008%, 0.046%, 0.141% and 0.027% for South Africa, Nigeria, Egypt, Algeria, and Mauritius respectively.

The result was also significant with $\rho = 0.1$ for South Africa, Algeria, and Mauritius. This shows that unemployment rate stands as a major determinants of life expectancy in the long run for Nigeria and Egypt but not a major determinant in South Africa, Algeria, and Mauritius. CO2 emission from the result shows an inverse relationship with life expectancy for all the countries. Based on the result, 1 percent increase in CO2 emission reduces life expectancy by 0.174%, 0.011%, 0.035%, 0.018% and 0.042% for South Africa, Nigeria, Egypt, Algeria, and Mauritius respectively. The result was not significant for all the countries with $\rho > 0.1$ This shows that CO2 emission is not a major determinant of life expectancy for the selected countries based on the periods used.

Table 4. Long-Run Regression Results

Country	PCI	SSE	HE	EXR	UE	CO ₂
South Africa	0.083* (0.007)	0.478** (0.015)	0.380** (0.027)	0.067*** (0.060)	0.031 (0.587)	0.174 (0.170)
Nigeria	0.029* (0.000)	0.068* (0.000)	0.016** (0.035)	0.020* (0.001)	0.008** (0.039)	0.011 (0.315)
Egypt	0.013*** (0.075)	0.088** (0.036)	0.022 (0.246)	0.029* (0.000)	0.046** (0.012)	0.035 (0.126)
Algeria	0.114** (0.012)	0.105 (0.143)	0.023* (0.001)	0.002 (0.197)	0.141 (0.187)	0.018 (0.801)
Mauritius	0.014* (0.003)	0.012 (0.715)	0.456*** (0.074)	0.113 (0.142)	0.027 (0.388)	0.042 (0.944)

*Note: p-values are in parentheses. *, ** and *** denote significance at the 1%, 5% and 10% levels, respectively.*

Conclusion and Recommendations

The study concludes that in all the selected countries Per Capita Income impacted positively on life expectancy in the miserable countries for the period selected. There is need for countries to increase income of their citizens to allow them improve their standard of living. High cost of living which is often related to inflation and unregulated market have put the region in untold hardship, this has not only influenced their marginal propensity to consume but in addition affected their nutrition, leading to ill health and eventual fall in their life expectancy. This calls for urgent reduction in cost of living and increased supply of basic needs. It is often said that no nation or region can rise above the level of its education, the return on human capital is so appealing and palpable that a hunt for a meaningful development will not be successful without qualitative, uninterrupted and well-structured education. Hence, the paper suggests that the cost of education should be reduced to its barest minimum or made free to accommodate more students who are less privileged and hence increase literacy rate thereby enhancing life expectancy. Fluctuation in exchange rate has never smiled on importers and exporters of goods and services, it often creates shocks and unpredictability in international trade, importers of medicals and pharmaceutical inputs which are important requirements for ensuring healthy living are often put in dilemma as a result of volatile exchange rate. Exchange rate stability is therefore needed if life expectancy and longevity are anything to go by. This will to a large extent improve the standard of living and general welfare of the masses. Creation of more industries and provision of more employment opportunities to reduce the high rate of poverty will go a long way in reducing miseries in the economies.

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