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A Systematic Review of Life Expectancy Differences and the Disease Cycle as a Major Predictor in Africa: The Nigeria Scenarios

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Abstract

Life expectancy and longevity constitute a very vital indicator of life events and disease conditions that individuals may have been exposed to at some points in their lifetime. Just like in other climes, in the African region life expectancy differ across a number of other socio-economic variables. This paper was designed to delineate some morbid determinants of such differences as they relate to observed disease pattern in Nigeria and the relationship between life expectancy and the disease cycle was also presented. It was shown that since 1900s average life expectancy worldwide has more than doubled to between 70 and 72 years, while the figure for the African region still falters at about 62.5 years. On the global scale, Nigeria ranks 177/178 for current life expectancy at birth. Based on age-standardized mortality rate per 100,000 of population ranking of the causes of death in Nigeria, topmost conditions include tuberculosis (1st), fall (2nd), maternal conditions (3rd), Pertussis (4th), and Diarrhoeal diseases (4th). In terms of percentage ranking of the causes of death in Nigeria, top on the list are Influenza and Pneumonia (15.03%), Diarrhoeal diseases (9.16%), Tuberculosis (8.62%), HIV/AIDS (8.31%), Malaria (5.53%), Low Birth Weight (4.30%), Stroke (4.10%), Birth Trauma (4.01%), Coronary Heart Disease (3.76%) and Maternal Conditions (3.14%). All of these offer differential explanation and contributions to variations in life span of the Nigerian populace. Apart from disease factors, this review showed that life expectancy in less developed countries (LDCs) like Nigeria, is affected by political and socioeconomic factors like theeconomy as measured by gross domestic product (GDP), educational environment indicated by the literacy rate, and nutritional status, measured by the proportion of undernourished. Hence, it is recommended that as a matter of urgency, concerned authorities should deploy multi-faceted interventions aimed at addressing the issues with poor life expectancy in Nigeria.

Key words: *Disease cycle, Life expectancy, Nigeria.*

Introduction

It has been known since 1850s that increased human life span results from a decrease in exposure to infections and diseases during childhood (Crimmins& Finch, 2005). This decrease in early-life exposure to diseases has been shownto reduce chronic inflammation and later-life mortality rates from especially cardiovascular disease, cancer and stroke (Gurven et al, 2008, Hayward et al, 2016). It has also been shown that mortality rate in early-life cohort are predictors of later-life survival in humans, although such associations could also be attributable to factors other than disease exposure (Finch, 2010). In addition, the impact of early-life disease exposure

on reproduction is still largely not known, and as such previous works ignored an important aspect of fitness by which selection acts upon the life-history approach (Finch, 2010, Hayward et al, 2016).

In the last two centuries, impressive progress in health that led to increases in life expectancy has been achieved by people in all countries of the world. It doubled in the UK where it is now morethan eighty years. In Japan,there was subsequent improvement in health such thatit caught up with the UK and even surpassed it in the late sixties. Later there was tremendous improvement in in health in South Korea and the country recorded even greater progress than the UK and Japan. Life expectancy in South Korea has now surpassed that of the UK (Roser, 2018).

There are still huge differences between countries: large number of people in Sub-Saharan countries have a life expectancy of less than 50 years, while in Japan it exceeds 80 (Roser, 2018). In Africa, Algeria has the highest (76.078) average life expectancy at birth while Serra Leone has the lowest with 51.835 (The World Bank, 2018). With an average of 55.2 years life expectancy, Nigeria is among the lowest even in Africa (WHO GHO, 2018). These disparities in life expectancy among and within nations, and regions of the world have been largely attributed to both early or later life exposure to disease and the progress that nations have made in provisioning and attainment of qualitative healthcare services (Barlow &Vissandjée, 1999; Mahfuz, 2008 and Finch, 2010). Other explanations based on political and socioeconomic variables have been advanced (Lin et al, 2012). This paper therefore aimed to examine; 1) the concepts of life expectancy and the disease cycle, 2) life expectancy and differences in the African region and Nigeria 3) the disease determinants and predictors of life expectancy in Nigeria and 40 trend of life expectancy in Nigeria.

Materials and Methods

This article is essentially a review paper that adopted simple search methods to glean relevant literature from the search engine. Not less than 50 research articles, reports of national surveys, organizational databases, academic project or thesis reports among others were accessed. However, information from only 23 of them were extracted and used to develop this paper. Figures from the various databases cited and duly acknowledged were used to produce tables, graphs and charts presented and used to articulate arguments and discourse in line with the objectives of this paper. Key words and terms were carefully selected, typed and ran on Google search engine to located relevant materials on the cyber space. Such words and terms include, “Life expectancy”, “disease cycle”, “Africa”, “differences”, “Nigeria”, “determinants of”, “ranking” etc. were used either singly or combined in a Boolean fashion to couch appropriate phrases or sentences required to access specific information in line with the objectives of this paper.

The Concepts of Life Expectancy and the Disease Cycle

Life Expectancy

Different authorities have advanced slightly varied definitions of life expectancy. Merriam-Webster (2016) simply defined it as “the average life span of an individual”. According to Crimmins (2000), life expectancy isthe average number of years that a person of a given age or age group may be expected to live. This implies that the estimation of life expectancy is usually done across the different levels of the age structure. Of all, life expectancy at birth is the most commonly used because itis a clear indicator of mortality conditions across the age range that is not affected by the age structure of the entire population thereby making for comparability. This fact is clearly borne by the definition given by the Organisation for Economic Co-operation and Development (OECD) who defined life expectancy as “the average number ofyears that a person could expect to live if he or she experienced the age-specific mortality rates prevalent in a given country in a particular year” (OECD, 2011). This definition doesn’t take into account the effect of any future decline in age-specific mortality rates. The methodologies used in the calculation of life expectancy varyamong countries. These methodological differences can affect the exact comparability of reported estimates, as different methods can change a country’s measure of life expectancy slightly.

The WHO (2006) has defined Life expectancy at birth as the “average number of years that a newborn is expected to live if current mortality rates continue to apply”. It is assumed to be a reflection of the overall mortality rate of the population and a summary of

the pattern of mortality that obtains in all age groups; namely, children, adolescents, adults and the elderly. It is an immediate output ofa life table which is a set of tabulations that describe the likelihood of dying, death rate and the rate of survival for each age or age group. However, life expectancy at birth may not necessarily be a representative indicator of improvements in the remaining life expectancy enjoyed across the population, as discounted life expectancy can often only be approximated from extant data (Haackern.d.). It differs from Healthy life expectancy (HALE) which refers to the average number of years that a person is expected to live in the ideal healthbearing in mind the years lived short of full health as a result of disease and or injury (WHO, 2006).

The Disease Cycle

The disease cycle refers tothe chain of events that leads to the development of a disease which is often different from the pathogen's life cycle (Crop Pro, 2014). Thischain of eventstends to link the disease development process in a logical sequence. Intervention efforts are usually directed at removing or inhibiting one of these links (See fig. 1). And it is common knowledge in medical science that bacterial and viral infections elicit inflammatory immune responses, and chronic inflammation is associated with atherosclerosis, increased risk of stroke, cardio-vascular disease (CVD), and mortality (Vasto et al, 2007).

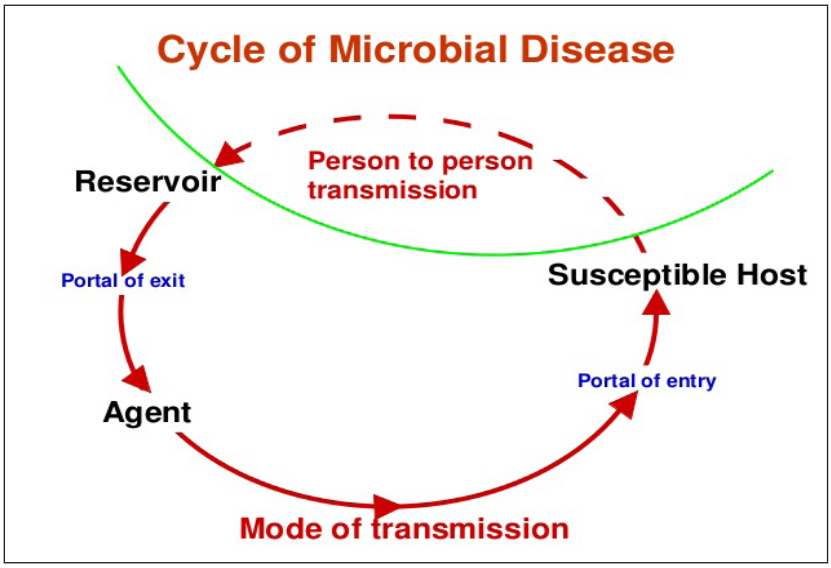

Figure 1. *The Disease Cycle.* Source: Anonymous, n.d.

Life Expectancy and Differences in the African Region and Nigeria

In Africa

According to Statista (2018) the global average of life expectancy at birth as at the year 2018 was 70 years for males and 74 years for females while the African figure was estimated at 61 years for males and 64 years for females. In a comparative study conducted in ten African countries including Nigeria, Bendavid et al (2011) observed that depending on the method of computation used, mortality estimations especially among people above 60 years, exhibit large variations. And the patterns observed seem to suggest that survival among adults older than 60 years in some African countriesmay be better than was assumed. However, it is pertinent to state that apart from North African countries whose life expectancy at birth averages 73 years, all the other sub-regions' life expectancies ranges between 59 and 64 years with an average of 63 years (see fig. 2). In sub-Saharan Africa, due to the impact of the HIV/AIDS epidemic, the regional average tends to maskthe divergent experiences regarding gains in life expectancy(Haacker, n.d.). And as expected, in Africa just as it obtains in other climes females tend to have higher life spans than their male counterparts. According to the causes of death, 56% deaths in the WHO African Region in 2015 were due to communicable, maternal, perinatal or nutritional conditions (WHO GHO Data, 2018).

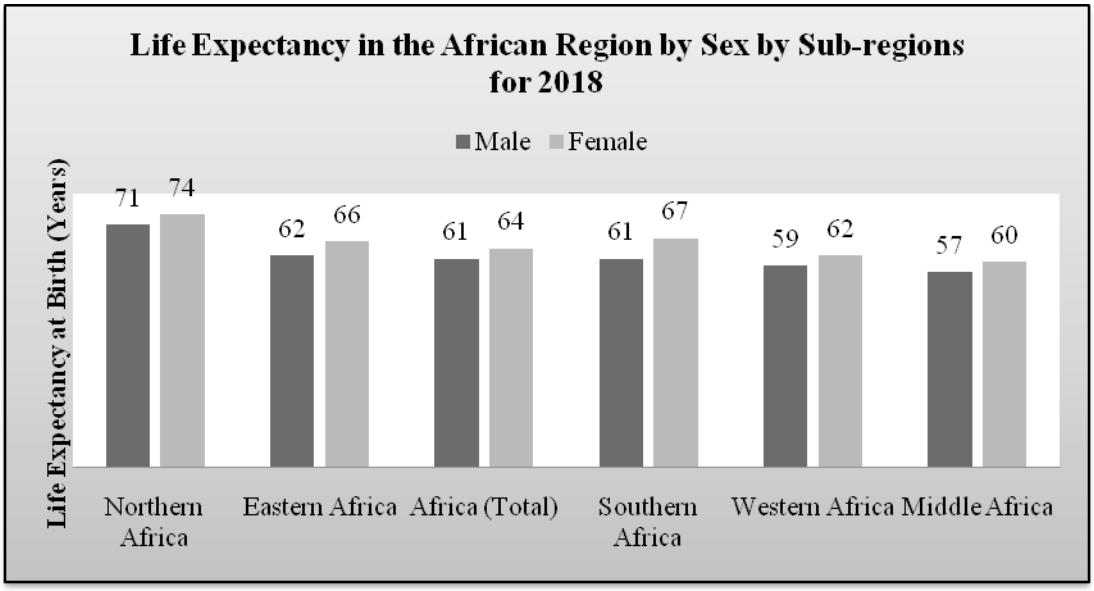

Figure 2. *Data Source-Statista, 2018*

Comparison of life expectancy by continent shows a wide gap in average life expectancy between Africa and other regions. Africa comes behind Asia, the continent with the second lowest average life expectancy, by 12 years for both males and females (Statista, 2018).

The Disease Determinants and Predictors of Life Expectancy in Nigeria

Of all determinants and predictors of life expectancy disease exposure appears to be the most potent. In 2009, HIV/AIDS-related deaths corresponded to about 7 percent in Nigeria, but to only 1.5 percent in the United States, presumably reflecting differences in the quality and accessibility of health services and specifically access to antiretroviral treatment (Haacker, n.d.). Ogbe (2011) observed negative correlation between demographic variables and life expectancy indicating that demographic variables may not always beregular predictors of life expectancy. Although it was noted that environment and preventive health variables were collectively predictors of life expectancy, individually they were not. And so it was recommended that Nigeria should draw lessons on reducing under-5 and infant mortality, continuous improvement on water, sanitation, expanded programme on immunization and increase use of treated mosquito net to improve life expectancy (Ogbe, 2011).

In Nigeria, as in other developing countries, variations in morbidity and mortality have been associated with a wide variety of measures of socio-economic status including per capita GDP, fertility rate, adult illiteracy rate, per capita calorie intake, health care expenditure, access to portable drinking water, urban inhabitants, unemployment rate and the nominal exchange rate (Sede&Ohemeng, 2015). However, there is the strong argument that scientific understanding and technological progress makes some very efficient public health interventions – such as vaccinations, hygiene measures, oral rehydration therapy, and public health measures – cheaper and brings these more and more into the reach of populations with lower incomes (Roxer, 2018). The foregoing would seem to portray that the age-long disease cycle or exposure theory is a key predictor of life expectancy and for regional and within country disparities in longevity in Africa and Nigeria.

Statista (2018) presents a lucid tabular picture of the top 50 causes of death ranked by aged standardized death rate per 100,000 population of Nigeria. Topmost conditions and causes include tuberculosis (1st), fall (2nd), maternal conditions (3rd), Pertussis (4th), and Diarrhoeal diseases (4th). In terms of percentage ranking of the causes of death in Nigeria, top on the list are Influenza and Pneumonia (15.03%), Diarrhoeal diseases (9.16%), Tuberculosis (8.62%), HIV/AIDS (8.31%), Malaria (5.53%), Low Birth Weight (4.30%), Stroke (4.10%), Birth Trauma (4.01%), Coronary Heart Disease (3.76%) and Maternal Conditions (3.14%).

Table 1. *Nigeria Top 50 Causes of Death Age-Standardized Death Rate Per 100,000 Population*

TOP 50 CAUSES OF DEATH		Rate	World Rank
1.	Influenza and Pneumonia	228.17	2
2.	Tuberculosis	190.61	1
3.	Diarrhoeal diseases	127.79	4
4.	Stroke	120.00	41
5.	HIV/AIDS	120.00	18
6.	Coronary Heart Disease	117.12	90
7.	Liver Disease	50.71	11
8.	Prostate Cancer	46.41	12
9.	Diabetes Mellitus	43.92	50
10.	Maternal Conditions	40.30	3
11.	Malaria	35.87	25
12.	Breast Cancer	30.08	7
13.	Meningitis	29.56	6
14.	Low Birth Weight	24.87	10
15.	Road Traffic Accidents	24.75	58
16.	Birth Trauma	23.20	8
17.	Other Injuries	22.63	8
18.	Falls	21.18	2
19.	Cervical Cancer	21.16	31
20.	Lung Disease	21.14	102
21.	Endocrine Disorders	19.56	10
22.	Congenital Anomalies	17.16	6
23.	Malnutrition	17.12	19
24.	Hypertension	15.17	79
25.	Suicide	14.79	33
26.	Alzheimers/Dementia	14.77	122
27.	Asthma	13.90	37
28.	Kidney Disease	13.32	98
29.	Liver Cancer	13.01	23
30.	Violence	10.41	47
31.	Measles	8.29	10
32.	Drownings	7.43	41
33.	Fires	6.57	27
34.	Inflammatory/Heart	6.49	74
35.	Drug Use	6.44	8
36.	Peptic Ulcer Disease	5.81	51
37.	Schistosomiasis	5.55	8
38.	War	5.44	10
39.	Epilepsy	5.20	28
40.	Lymphomas	4.65	102
41.	Rheumatic Heart Disease	4.41	45
42.	Colon-Rectum Cancers	4.21	147
43.	Other Neoplasms	3.96	46
44.	Tetanus	3.83	8
45.	Skin Disease	3.71	48
46.	Pertussis	3.48	4
47.	Ovary Cancer	3.05	143
48.	Syphilis	3.02	25
49.	Poisonings	2.89	21
50.	Hepatitis B	2.83	9

Source: Statista, 2018

Trend of Life Expectancy in Nigeria

There are slightly varying figures for life expectancy at birth in Nigeria amongst the different reporting authorities. However, all variations in the estimates remain within acceptable margins.According to the CIA (2018) database life expectancy at birth in Nigeria for the total population is 53.8 years, male: 52.8 years, female: 55 years.And the trend in Nigeria has witnessed a steady increase, albeit not quite impressive one, from 38.7 years in 1960 to 55.2 years in the year 2016 (See fig. 3). This slow pace in the gains in life expectancy may not be unconnected with some obvious factors.

In a study on the political and social determinants of life expectancy in the less developed countries (LDCs), Lin et al (2012) looked at four socioeconomic indicators: economy, measured by gross domestic product per capita at purchasing power parity; educational environment, measured by the literacy rate of the adult population aged 15 years and over; nutritional status, measured by the proportion of undernourished people in the population; and political regime, measured by the regime score from the Polity IV database. In Nigeria some of the possible reasons for the very poor gains in life expectacy include weak health system, poor funding of preventive health programmes, endemic corruption, poor administration of the public health and chronic poverty status of the populace. Ultimately,

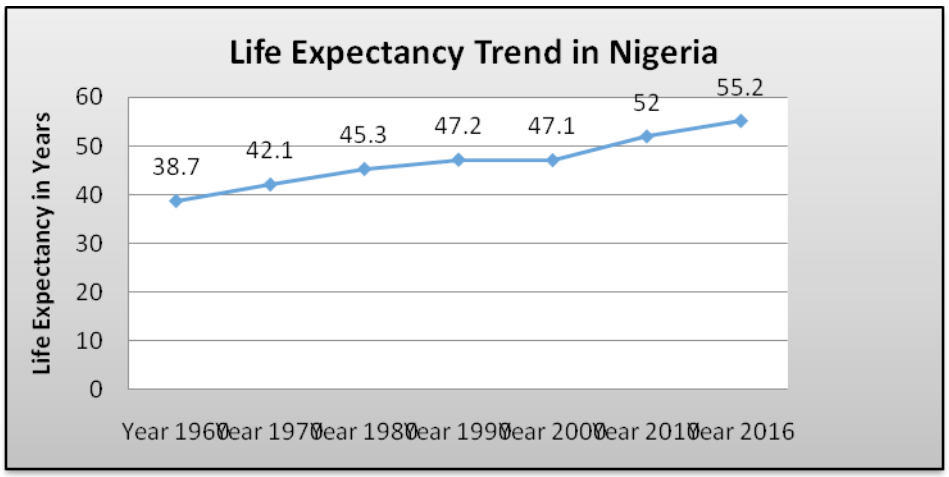

Figure 3. *Data Source- WHO, 2018*

these factors tends to have negative ripple effects on water, sanitation, hygiene, nutrition, maternal and child health as well and almost none social healthcare provision for the aged populace.

Table 2. *Nigeria Life Expectancy*

				World Rank		
	Male	Female	All	M	F	All
1960	37.2	40.3	38.7	157	151	153
1970	40.6	43.7	42.1	158	155	158
1980	43.8	46.9	45.3	160	159	159
1990	46.0	48.6	47.2	170	170	170
2000	46.2	48.1	47.1	174	175	175
2010	51.2	52.9	52.0	175	176	176
2016	54.7	55.7	55.2	177	178	178

Source:*WHO, 2018*

Conclusion

Life expectancy disparities in the African regionare common with a wide range of determinants responsible for sub-regional differences. Apart from the North Africa sub-region where life expectancy is at about the global average (72 years) for men and women, the figure across all African regions presents a gloomy picture with an average of 63 years. Comparison of life expectancy by continent shows a wide gap in average life expectancy between Africa and other regions. This paper examined such differences both among the various sub-regions and in Nigeria. The current life expectancy at birth in Nigeria is 55.2. This, pathetically, is one of the lowest even in the African region thereby calling for an urgent attention of the government and all stakeholders. A number of preventable and modifiable disease conditions have been identified as leading causes of mortality in the country, namely; tuberculosis, fall, maternal conditions, Pertussis, and Diarrhoeal diseases, Influenza and Pneumonia, HIV/AIDS, Malaria, Low Birth Weight, Stroke, Birth Trauma and Coronary Heart Disease.

South Korea has been celebrated globally as having about the highest average life expectancy and is projected to remain the highest by 2030 (Ezzati et al, 2017). This has been largely attributed to several factors which include; low blood pressure, new medical knowledge and technologies, low levels of smoking and good access to healthcare, good childhood nutrition. Nigeria may need to come up to speed on all these critical factors so as to close the yawning gap in the life expectancy of her people.

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