Population Growth and Life Expectancy: Predicting the Relationship

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Sanni Eneji Ademoh[1]
[1]*Maths and Statistics Department Rufus Giwa Polytechnic, Owo, Ondo State, Nigeria*

ABSTRACT

The debate on the relationship between life expectancy and population growth rate has been undergoing and varies across countries. This study provided a non parametric inference of the relationship between life expectancy and population growth rate on historical data for about 194 countries of the world reported in 2013. The first theory stated that population growth rate does not stimulate life expectancy. The second theory viewed population growth rate as a factor that adversely affects the life expectancy. The study employed the Statistical Package for Social Sciences (SPSS 19) to establish and identify the countries of the world that fall below the world 70.01 years standard. Hence, summary, conclusion and recommendations were given to the government and the entire public based on the findings towards for further study.

Keywords: *Life expectancy, Population, Growth, Rate, Relationship, SPSS19.*

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1. Introduction

Life Expectancy is a statistical measure of how long individuals or organisms may live, based on the year of their birth, their current age and other demographic factors including gender. At a given age, life expectancy is the average number of year that is likely to be lived by group of individuals (of age x) exposed to the same mortality conditions until they die. The most commonly used measure of life expectancy is life expectancy at age zero, that is, Live Expectancy at Birth (LEB), which can be defined in two ways: Cohort Life Expectancy at Birth and Period Life Expectancy at Birth.

Cohort LEB is the mean length of life of an actual birth cohort (all individual born in a given year) and can be computed only for cohorts that were born many decades ago, so that all their members died. However, Period LEB is the mean length of life of hypothetical cohort assumed to be exposed since birth until death of all their members to the mortality rate observed at a given year.

Bhargava (2003) uses a parametric panel data specification and found that the dynamics of demography indicators such as lagged life expectancy variable is a significant predictor of economic growth. Charkraborty and Idrani (2010) develops a theoretical model and checked its empirical consistency using a parametric cross-country regression. The author found that life expectancy has a strong and positive effect on capital accumulation.

The rate of growth of the African population since the middle of the century, compared to the rest of World is both alarming and distressing; especially when taken in the context of the deteriorating quality of life expectancy of ordinary people. It was observed, for instance that in 1953, Nigeria's population as one of the African countries was put at 31 million, and ten years later, the officially accepted estimated figure was 56 million. In 1985, the estimated figure was 98 million. Nigerian population drew from 91 million in 1991 to 160 million in 2006 and it is estimated to be 173 million in 2012. The increase is 90 percent for the period 1991 to 2012. Presently, the population estimated figure is also put around 179 million. It means that within 21 years, Nigeria population increased by 79% (CIA World Fact Books, 2011).

Although, several factors have been identified on the propelling variables, the needed condition for such excessive population growth must be looked for in several perspectives. While, some school of thoughts have considered the relationship between population growth and economic development among other social environment and political indicators, there are no known literature that has expressly anchored the relationship between life expectancy and population growth rate, which is the major issue of investigation in this study.

1.1. Statement of the Problem

There is continued divergence of opinions regarding the consequences of life expectancy and population growth. The debate between positive impact and negative impact of population growth rate on the life expectancy is still ongoing. On the positive side, population growth induces technological advancements and innovations. This is because population growth encourages competition in business activities and, as the country's population grows, the size of its potential market expands as well. The expansion of the market, in its turns, encourages entrepreneurs to set up new businesses (Simon, 1992).

A large population growth on the other side is not only associated with food problem but also imposes constraints on the development of savings, foreign exchange and human resources. The increase in demand for food leads to a decrease in natural resources, which are needed for a nation to survive. Other negative effects of population growth include poverty caused by low income per capita, famine, and disease since rapid population growth complicates the task of providing and maintaining the infrastructure, education and health care needed in modern economies, which reduce the life expectancy (Barro, 1991); (Mankiw *et al.*, 1992). Thus, this study intends

to make a significant contribution to the study of relationship between life expectancy and population growth rate on a general note.

1.2. Aim

The aim of this study is to predict the relationship between life expectancy and population growth rate. Hence, the specific objectives are:

i. to determine the relationship between life expectancy and population growth rate;
ii. to predict the relationship between life expectancy and population growth rate across countries based on certain classification;
iii. to postulate a law relating the life expectancy and population growth rate; and
iv. to identify policy implications from the study.

1.3. Literature Review

1.3.1. Introduction

The literature review focuses on both general and empirical studies carried out to examine the relationship between life expectancy and population growth rate.

2. General Literature

Malthus (1998) believes that the world's population tends to increase at a faster rate than its food supply whereas, population grows at a geometric rate, and production capacity only grows arithmetically. Therefore, in the absence of consistent checks on life expectancy and population growth, Malthus made the prediction that in a short period of time, scarce resources will have to be shared among an increasing number of individuals. However, such checks that ease the pressure of population explosion do exist, and Malthus distinguished between two categories: the preventive check and the positive one. The preventive check consists of voluntary limitations of life expectancy and population growth. Individuals before getting married and building a family, make rational decisions based on the income they expect to earn and the quality of life they anticipate to maintain in the future for themselves and their families. The positive check to population is a direct consequence of the lack of a preventive check. When society does not limit population growth voluntarily; diseases, famines and wars reduce population size and establish the necessary balance with resources.

In traditional African society, the wealth of an individual was accessed by the share size of his household. The household may include several wives, numerous children, many relatives as well as a significant number of labourers. Moreover, these activities of man therefore tend to reduce life expectancy.

However, this household together contributed his pool of labour for farming and other productive purposes. Another index of a man's wealth and status is the size of his herds of cattle, sheep and goats. Essentially then, the household is, in the past, the pivotal basis for assessing a man's social relevance and importance in the society.

Simplicity of this setting was further accentuated because the traditional African society either little or no financial cost of the now basic concerns of social existence such as education, housing, food, transport, health and similar infrastructural necessities which form the nexus of modern developmental activities. However, the population density was low, the life style of people was simple and the individual and society were equilibrium with each other.

Overtime, and especially with colonialism, the situation changed and Nigeria and indeed most African countries entered a new period where the emphasis of social existence became anchored on the modernization process and a modern science. This led to a sharp reduction infant, and a significant rise in life expectancy.

Traditional social arrangements, however, continued to favour polygamy on the basis of family formation and to indicate both tacit and explicit preference for large family sizes. In fact, a large family was seen as a form of social security and a safety value against the deleterious effect of high infant and material mortality and short life expectancy.

In the same manner, the barrenness of women was more often than not linked to heinous or diabolic influence within the household or society. This was in essence a high degree of social obsession with issues of fertility and the survival of the lineage.

There was in addition, a preference for and pre-occupation to have, male children. The number of children, especially male children that a woman had, in fact, came to determine, to some extent, her standing and importance within the extended family.

In recent times, the situation has been further aggravated by certain religious and social beliefs that frown at or discourage modern contraceptives and abortion. This added to the effects of universality of conjugal relations, high illiteracy, social inequality suffered by women and the subsistence mode of production which defined and allotted social, economic and political roles to different individuals in the society.

However, a large population cannot be said to be entirely bad or undesirable. There is the widely persuasive preposition of the pro-population school that high population density is pre-requisite for technological advancement and economic development (World Health Organisation, 2004).

Besides, in conventional economic terms, it has been argued that a large population meant a bigger market, a greater volume of production, higher productivity, smaller transport distance and a greater diversity of ideas for societal growth and development.

The conflict between the pro-population and the anti-population schools highlighted the complication of the conflicts arising from the difficulties of establishing any correlation between population growth and economic development in African countries especially on the basis of such parameter as per capital national income and other economic indicators.

The first consequence has to do with the deteriorating effects on the general development of the state. The growth in population tends to encourage migration to urban centres. Given the low level of our urbanization process, such massive migrations, as are now being witnessed in the continent, put a severe strain on the limited urban infrastructure and facilities through over-utilization, thereby giving rise to great inadequacy and frequent breakdowns.

These are also compounded by over-crowding, environmental population and degradation and increased anti-social behaviours, all of which lead to the deterioration of the standard of living and quality of life that frequently defy official solution, which however reduce life expectancy in the part of the community.

The proliferation of informal economic activities to help migrants find some gainful employment aggravates the level of environmental population. The nations or continent capacity to cope effectively with these problems become important.

African population is comparatively young and non-working. Those within 0 – 15 years age bracket constitute about half or more precisely 47% of these population, while those aged sixty four years above account for about 02%. The consequence is that every productive Africa is unwillingly saddled with the responsibility of feeding, housing, clothing and educating a child. This is in comparison to the situation in some developed countries where

on the average two or three economically productive person provide for only one non – productive citizen. The irony of the situation is deemed obvious given the low level of incomes and miserably low level of investment in developing countries. However, this can also reduce life expectancy.

It is also observed that in Nigeria as is the case with most developing countries, the practice of having large families was more prevalent among the poor than among the rich. This practice certainty constitutes a strong strain on resource and poses a real threat to the security which the extended family system offers.

Rapid population growth are multifarious and multi dimensional. The implication for two productive, for example, Nigeria would have to double the existing two supplies and significantly explain is infrastructure, utilities and service within the next twenty years just to maintain the present per capital standard and quality of life because of the increased demand generated by the burgeoning population. For instance, the United Nations Fund for Population Activities (UNFPA) population card, Nigeria's population today is projected to increase by about 11 persons per minute. This means an additional 660 hungry mouths to be fed every hour. Given the present estimated growth rate of 3 – 3.4% a year, the population of Nigeria is expected to double by the year 2020 to about 250 million. This is in spite of the unacceptable high infant mortality rate of 144 per thousand per year, a high maternal mortality rate of about 20 per thousand and a life expectancy of about 50 years.

In developed countries in Europe and Asia, the life expectancy across those nations is higher than African continent because of some likely factor like health diet, clean water supply, low rate of violence, less poverty, high medical care, good exercise, careful planning, among others contributed to their lengthy life span. Countries in Asia and Europe hold many of the top rank in the list of the world 15 healthiest countries with an average life span of between 80-84 years. Australia (81.9), Hong Kong (82.12), Andorra (82.5), Singapore (83.75), San Marino (83.07), Japan (83.91), Italy (81.86); (WFB, 2011).

Porter (1996) employed a Solow-Swan economic growth model with exogenous saving rate to determine the relationship between population growth and economic growth. The model assumed that both the saving rate and the consumption rate are given. Assuming, a household owns the input and manages the technology.

The production technology is assumed to take the form

$$Y = f(K, L), \tag{1}$$

Where Y is total output,

K is total physical capital,

And L is the size of the labour input

The production function exhibits positive and diminishing marginal products with respect to each input and also exhibits constant returns to scale. The economy is assumed to be a one-sector economy, where output can be either consumed or invested and capital depreciates at a constant positive rate (δ). The growth rate of population is exogenous. The model further assumes that this growth rate is a constant (n) and that labour supply per person is given. Normalizing the population size at time zero and the work intensity to one yield the following is the labour input

$$L = e^{n} \tag{2}$$

The net increase in per capita capital is:

$$\dot{k} = sf(k) - (n + \delta)k \tag{3}$$

The first term on the right-hand side (RHS) is saving per capita out of output per capita and the second term is the effective depreciation per capita. Defining a steady state as a situation in which the quantities, such as capital, population, and output, grow at constant rates. In the Solow-Swan model, a steady state exists if the net increase in per capita capital is equal to zero. Denoting steady state values with an asterisk the steady state values are given by:

$$sf(k^*) = (n + \delta)k^*, \; y^* = f(k^*) \text{ and } c^* = (1 - s)f(k^*). \quad (4)$$

Since the per capita values are constant in steady state, the levels of total output, total consumption, and total capital must grow at the same rate, which is the same as that of population growth (n). An increase in the rate of population growth in steady state does not affect the growth rate of the per capita variables, since these rates are equal to zero in steady state. However, an increase in fertility does lead to a decrease in the level of capital per capita and therefore to a decrease in output and consumption per capita. This is the capital dilution effect. An increase in the population growth rate leads to a decline in the growth rate of the per capita variables. For model with exogenous saving rates, higher population growth leads to lower standard of living per capita measured either as consumption or in growth of consumption.

Becker and Hoover (1998) develops altruistic models of intergenerational transfers where the behaviour of individuals is guided by a utility function that is increasing in own consumption and the utility achieved by one's offspring. The utility of the offspring depends, in turn, on their own consumption and the utility of their offspring. Through this inter-linking chain, the current generation consumes and transfers resources to its children influenced by its concern not only for its own children but for all future generations. An important implication of this model is that familial transfers will neutralize fiscal policy. When a government exercises expansionary fiscal policy, it stimulates the economy by increasing current spending financed by issuing debt. From the perspective of intergenerational transfers, the policy is an effort to stimulate spending by transferring resources to current generations from future generations. According to this model however, the public policy is undone by altruistic households. They compensate future generations by increasing their saving and accumulating wealth, exactly offsetting the increase in public debt. This model implies that public intergenerational transfers and private intergenerational transfers are perfect substitutes. A change in public transfers is matched dollar for dollar by a compensating change in private transfers.

3. Methodology

3.1. Introduction

This describes theoretical model, empirical model and the research design. The research design reveals the type of data and method of data collection.

3.2. Theoretical Framework

In this work, the following were postulated.

i. That x and y are directly proportional, where y is the life expectancy and x is the population growth rate, $y \; \alpha \; x$

ii. That, they are related by the function, $y = \alpha x^{\beta}. \varepsilon \quad (5)$

Where $y = \ln y$, β is the parameter and ε is the random error.

This gave rise to the non-linear model which can be made intrinsically linear using the log-log transformation. Following the log-log transformation, there was a form regression model which can be estimated using the ordinary least square (OLS).

3.3. Regression Analysis

3.3.1. Introduction

Consider the model specified in (5) above as $y = \propto x^{\beta} \varepsilon$

Under log transformation, $\quad lny = ln \propto + \beta lnx + ln\varepsilon \quad (6)$

Which can be represented as $y^* = \alpha^* + \beta x^* + \varepsilon^*$ (7)

By OLS, we estimate α and β by minimizing the sum of square error.

$Q = \sum_i \varepsilon^2$ (8)

$Q = \sum_{i=1}^{n} (y* - \alpha* - \beta x*)^2$ (9)

$\frac{\delta Q}{\delta \alpha} = 0$ and $\frac{\delta Q}{\delta \beta} = 0$, for which normal equation below are realised

$\sum_{i=1}^{n} y_i^* = n\alpha^* + \beta \sum_1 X_1^*$ (10)

$\sum_{i=1}^{n} y_i^* x_i^* = \alpha^* \sum_1^n X^* + \beta \sum_1^n X^{*2}$ (11)

Solving these equations simultaneously, we obtain

$\alpha^* = \overline{y^*} - \beta \overline{X^*}$ (12)

And $\beta = \frac{n \sum_{i=1}^{n} y_i^* X_i^* - \sum_i X_i^* \sum_i y_i^*}{n \sum_i X_i^{*2} - (\sum_i X_i^*)^2}$ (13)

3.32. Error and Hypothesis Testing

For model in (7) above, given the parameter in (12) and (13), we have the sum squared error

$Q = \sum_i (y_i^* - \alpha - \beta X_i^*)^2$

That the sum of squared error is given as

SSE = Q, where means square error is

$MSE = \frac{Q}{n-2}$

The root means squared error

RMSE is $\sqrt{MSE} = \sqrt{\frac{Q}{n-2}}$ and we test the Hypothesis

H_{01}: $\alpha^* = 0$

H_{02}: $\beta^* = 0$ versus the alternative that the criteria are significantly different from zero at α = 5% (say) level. The corresponding statistic is

$t_{c1} = {}^{\beta}/_{S(\beta)} \sim t_{\alpha/2}^{n-2}$, where $s(\beta) = {}^{MSE}/_{\sum X_i^{*2}}$, where $X_i^* = X_i^* - \overline{X^*}$

$t_{c2} = {}^{\alpha}/_{S(\alpha)} \sim t_{\alpha/2}^{n-2}$, where $s(\alpha) = (\frac{1}{X} + \frac{\overline{X^*}}{\sum_i X_i^{*2}})$.MSE

3.4. Correlation Analysis

Of interest is the correlation between y* and x* given as ρ, where is estimated by $r = \frac{COV(x^*, y^*)}{\sqrt{Var(X^*).Var(y^*)}}$

$= \frac{n \sum X_i^* y_i^* - \sum X_i^* \sum y_i^*}{\sqrt{n \sum_i y_i^{*2} - (\sum_i y_i^*)^2 . n \sum_i X_i^{*2} - (\sum_i X_i^*)^2}}$

This takes values $-1 \leq r \leq 1$

3.5. Data Type and Source

This study makes use of published data of the United Nations, Department of Economic and Social Affairs, Population Division in 2013.

4. Analysis and Estimation Results

4.1. Introduction

The analysis of this work was done by the use of Statistical Package for Social Sciences (SPSS 19). Firstly, Global Life Expectancy at Birth of 70.01 years was considered in order to identify countries that fall below the world standard of 70.01. Out of 194 countries of the world considered, only 74 countries (about 38.1%) met the world standard of 70.01. African countries were the country that mostly fell below the world standard.

Similarly, the study classified the population growth rate in terms of log (Growth) and with log growth < 1 and log growth ≥ 1 were segregated. Moreover, the study showed that about 123 countries (63.4%) had growth rate.

Table-1. The population growth rate and life expectancy of countries across seven continent, 2013.

Country	Population	growth	life expectancy	Log of	Log of Life	Class	Global		
	mid-2013	rate		Growth Rate	Expectancy		Standard		
Afghanistan	30,551,674	2.39	60.75	0.3784	1.7835	FALSE	TRUE	FALSE	TRUE
Albania	3,173,271	0.30	77.29	-0.5229	1.8881	TRUE	FALSE	TRUE	FALSE
Algeria	39,208,194	1.84	70.93	0.2648	1.8508	FALSE	FALSE	FALSE	FALSE
Angola	21,471,618	3.09	51.68	0.4900	1.7133	FALSE	TRUE	FALSE	TRUE
Antigua and Barbuda	89,985	1.03	75.87	0.0128	1.8801	FALSE	FALSE	FALSE	FALSE
Argentina	41,446,246	0.86	76.21	-0.0655	1.8820	TRUE	FALSE	TRUE	FALSE
Armenia	2,976,566	0.18	74.47	-0.7447	1.8720	TRUE	FALSE	TRUE	FALSE
Aruba	102,911	0.45	75.39	-0.3468	1.8773	TRUE	FALSE	TRUE	FALSE
Australia	23,342,553	1.31	82.4	0.1173	1.9159	FALSE	FALSE	FALSE	FALSE
Austria	8,495,145	0.37	81.05	-0.4318	1.9088	TRUE	FALSE	TRUE	FALSE
Azerbaijan	9,413,420	1.11	70.64	0.0453	1.8491	FALSE	FALSE	FALSE	FALSE
Bahamas	377,374	1.45	75.15	0.1614	1.8759	FALSE	FALSE	FALSE	FALSE
Bahrain	1,332,171	1.66	76.53	0.2201	1.8838	FALSE	FALSE	FALSE	FALSE
Bangladesh	156,594,962	1.19	70.46	0.0755	1.8479	FALSE	FALSE	FALSE	FALSE
Barbados	284,644	0.50	75.29	-0.3010	1.8767	TRUE	FALSE	TRUE	FALSE
Belgium	11,104,476	0.44	80.45	-0.3565	1.9055	TRUE	FALSE	TRUE	FALSE
Belize	331,900	2.38	73.78	0.3766	1.8679	FALSE	FALSE	FALSE	FALSE
Benin	10,323,474	2.69	59.2	0.4298	1.7723	FALSE	TRUE	FALSE	TRUE
Bhutan	753,947	1.60	68.04	0.2041	1.8328	FALSE	TRUE	FALSE	TRUE
Bolivia (Plurina	10,671,200	1.64	67.11	0.2148	1.8268	FALSE	TRUE	FALSE	TRUE

tional State of)									
Botswana	2,021,144	0.87	47.41	-0.0605	1.6759	TRUE	TRUE	TRUE	TRUE
Brazil	200,361,925	0.85	73.8	-0.0706	1.8681	TRUE	FALSE	TRUE	FALSE
Brunei Darussalam	417,784	1.35	78.45	0.1303	1.8946	FALSE	FALSE	FALSE	FALSE
Burkina Faso	16,934,839	2.84	56.14	0.4533	1.7493	FALSE	TRUE	FALSE	TRUE
Burundi	10,162,532	3.16	53.9	0.4997	1.7316	FALSE	TRUE	FALSE	TRUE
Cambodia	15,135,169	1.75	71.63	0.2430	1.8551	FALSE	FALSE	FALSE	FALSE
Cameroon	22,253,959	2.52	54.88	0.4014	1.7394	FALSE	TRUE	FALSE	TRUE
Canada	35,181,704	1.00	81.41	0.0000	1.9107	FALSE	FALSE	FALSE	FALSE
Cape Verde	498,897	0.83	74.92	-0.0809	1.8746	TRUE	FALSE	TRUE	FALSE
Central African Republic	4,616,417	1.98	49.93	0.2967	1.6984	FALSE	TRUE	FALSE	TRUE
Chad	12,825,314	2.98	50.98	0.4742	1.7074	FALSE	TRUE	FALSE	TRUE
Channel Islands	162,018	0.50	80.23	-0.3010	1.9043	TRUE	FALSE	TRUE	FALSE
Chile	17,619,708	0.88	79.85	-0.0555	1.9023	TRUE	FALSE	TRUE	FALSE
China	1,385,566,537	0.61	75.25	-0.2147	1.8765	TRUE	FALSE	TRUE	FALSE
China, Hong Kong SAR	7,203,836	0.74	83.28	-0.1308	1.9205	TRUE	FALSE	TRUE	FALSE
China, Macao SAR	566,375	1.78	80.29	0.2504	1.9047	FALSE	FALSE	FALSE	FALSE
Colombia	48,321,405	1.29	73.93	0.1106	1.8688	FALSE	FALSE	FALSE	FALSE
Comoros	734,917	2.40	60.77	0.3802	1.7837	FALSE	TRUE	FALSE	TRUE
Congo	4,447,632	2.55	58.63	0.4065	1.7681	FALSE	TRUE	FALSE	TRUE
Congo, Democratic Republic of the	67,513,677	2.72	49.84	0.4346	1.6976	FALSE	TRUE	FALSE	TRUE
Costa Rica	4,872,166	1.37	79.83	0.1367	1.9022	FALSE	FALSE	FALSE	FALSE
Curaçao	158,760	2.17	77.04	0.3365	1.8867	FALSE	FALSE	FALSE	FALSE
Cyprus	1,141,166	1.08	79.76	0.0334	1.9018	FALSE	FALSE	FALSE	FALSE
Czech Republic	10,702,197	0.42	77.59	-0.3768	1.8898	TRUE	FALSE	TRUE	FALSE

Côte d'Ivoire	20,316,086	2.31	50.51	0.3636	1.7034	FALSE	TRUE	FALSE	TRUE
Denmark	5,619,096	0.40	79.29	-0.3979	1.8992	TRUE	FALSE	TRUE	FALSE
Djibouti	872,932	1.52	61.62	0.1818	1.7897	FALSE	TRUE	FALSE	TRUE
Dominican Republic	10,403,761	1.23	73.29	0.0899	1.8650	FALSE	FALSE	FALSE	FALSE
Ecuador	15,737,878	1.57	76.36	0.1959	1.8829	FALSE	FALSE	FALSE	FALSE
Egypt	82,056,378	1.63	71.06	0.2122	1.8516	FALSE	FALSE	FALSE	FALSE
El Salvador	6,340,454	0.66	72.49	-0.1805	1.8603	TRUE	FALSE	TRUE	FALSE
Equatorial Guinea	757,014	2.77	52.88	0.4425	1.7233	FALSE	TRUE	FALSE	TRUE
Eritrea	6,333,135	3.20	62.59	0.5051	1.7965	FALSE	TRUE	FALSE	TRUE
Ethiopia	94,100,756	2.55	63.32	0.4065	1.8015	FALSE	TRUE	FALSE	TRUE
Fiji	881,065	0.73	69.72	-0.1367	1.8434	TRUE	TRUE	TRUE	TRUE
Finland	5,426,323	0.34	80.45	-0.4685	1.9055	TRUE	FALSE	TRUE	FALSE
France	64,291,280	0.55	81.71	-0.2596	1.9123	TRUE	FALSE	TRUE	FALSE
French Guiana	249,227	2.48	77.02	0.3945	1.8866	FALSE	FALSE	FALSE	FALSE
French Polynesia	276,831	1.07	76.12	0.0294	1.8815	FALSE	FALSE	FALSE	FALSE
Gabon	1,671,711	2.36	63.31	0.3729	1.8015	FALSE	TRUE	FALSE	TRUE
Gambia	1,849,285	3.18	58.7	0.5024	1.7686	FALSE	TRUE	FALSE	TRUE
Ghana	25,904,598	2.13	60.99	0.3284	1.7853	FALSE	TRUE	FALSE	TRUE
Greece	11,127,990	0.03	80.69	-1.5229	1.9068	TRUE	FALSE	TRUE	FALSE
Grenada	105,897	0.38	72.69	-0.4202	1.8615	TRUE	FALSE	TRUE	FALSE
Guadeloupe	465,800	0.50	80.84	-0.3010	1.9076	TRUE	FALSE	TRUE	FALSE
Guam	165,124	1.27	78.71	0.1038	1.8960	FALSE	FALSE	FALSE	FALSE
Guatemala	15,468,203	2.51	71.96	0.3997	1.8571	FALSE	FALSE	FALSE	FALSE
Guinea	11,745,189	2.54	55.92	0.4048	1.7476	FALSE	TRUE	FALSE	TRUE
Guinea-Bissau	1,704,255	2.39	54.17	0.3784	1.7338	FALSE	TRUE	FALSE	TRUE
Guyana	799,613	0.54	66.2	-0.2676	1.8209	TRUE	TRUE	TRUE	TRUE
Haiti	10,317,461	1.38	62.96	0.1399	1.7991	FALSE	TRUE	FALSE	TRUE
Honduras	8,097,688	2.00	73.7	0.3010	1.8675	FALSE	FALSE	FALSE	FALSE
Iceland	329,535	1.14	82.01	0.0569	1.9139	FALSE	FALS	FALS	FALSE

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India	1,252,139,596	1.24	66.28	0.0934	1.8214	FALSE	TRUE	FALSE	TRUE
Indonesia	249,865,631	1.21	70.72	0.0828	1.8495	FALSE	FALSE	FALSE	FALSE
Iran (Islamic Republic of)	77,447,168	1.30	73.9	0.1139	1.8686	FALSE	FALSE	FALSE	FALSE
Iraq	33,765,232	2.89	69.43	0.4609	1.8415	FALSE	TRUE	FALSE	TRUE
Ireland	4,627,173	1.13	80.58	0.0531	1.9062	FALSE	FALSE	FALSE	FALSE
Israel	7,733,144	1.30	81.72	0.1139	1.9123	FALSE	FALSE	FALSE	FALSE
Italy	60,990,277	0.21	82.29	-0.6778	1.9153	TRUE	FALSE	TRUE	FALSE
Jamaica	2,783,888	0.52	73.45	-0.2840	1.8660	TRUE	FALSE	TRUE	FALSE
Jordan	7,273,799	3.50	73.78	0.5441	1.8679	FALSE	FALSE	FALSE	FALSE
Kazakhstan	16,440,586	1.04	66.44	0.0170	1.8224	FALSE	TRUE	FALSE	TRUE
Kenya	44,353,691	2.67	61.56	0.4265	1.7893	FALSE	TRUE	FALSE	TRUE
Kiribati	102,351	1.54	68.75	0.1875	1.8373	FALSE	TRUE	FALSE	TRUE
Korea, Dem. People's Republic of	24,895,480	0.53	69.9	-0.2757	1.8445	TRUE	TRUE	TRUE	TRUE
Korea, Republic of	49,262,698	0.53	81.37	-0.2757	1.9105	TRUE	FALSE	TRUE	FALSE
Kuwait	3,368,572	3.61	74.24	0.5575	1.8706	FALSE	FALSE	FALSE	FALSE
Kyrgyzstan	5,547,548	1.35	67.48	0.1303	1.8292	FALSE	TRUE	FALSE	TRUE
Lao People's Democratic Republic	6,769,727	1.86	68.08	0.2695	1.8330	FALSE	TRUE	FALSE	TRUE
Lebanon	4,821,971	3.04	79.81	0.4829	1.9021	FALSE	FALSE	FALSE	FALSE
Lesotho	2,074,465	1.08	49.5	0.0334	1.6946	FALSE	TRUE	FALSE	TRUE
Liberia	4,294,077	2.58	60.25	0.4116	1.7800	FALSE	TRUE	FALSE	TRUE
Libya	6,201,521	0.90	75.21	-0.0458	1.8763	TRUE	FALSE	TRUE	FALSE
Luxembourg	530,380	1.35	80.45	0.1303	1.9055	FALSE	FALSE	FALSE	FALSE
Macedonia	2,107,158	0.07	75.13	-1.1549	1.8758	TRUE	FALSE	TRUE	FALSE
Madagascar	22,924,851	2.79	64.51	0.4456	1.8096	FALSE	TRUE	FALSE	TRUE

Malawi	16,362,567	2.85	55.1	0.4548	1.7412	FALSE	TRUE	FALSE	TRUE
Malaysia	29,716,965	1.61	74.93	0.2068	1.8747	FALSE	FALSE	FALSE	FALSE
Maldives	345,023	1.89	77.68	0.2765	1.8903	FALSE	FALSE	FALSE	FALSE
Mali	15,301,650	3.01	54.82	0.4786	1.7389	FALSE	TRUE	FALSE	TRUE
Malta	429,004	0.30	79.66	-0.5229	1.9012	TRUE	FALSE	TRUE	FALSE
Martinique	403,682	0.24	81.3	-0.6198	1.9101	TRUE	FALSE	TRUE	FALSE
Mauritania	3,889,880	2.45	61.48	0.3892	1.7887	FALSE	TRUE	FALSE	TRUE
Mauritius	1,244,403	0.37	73.54	-0.4318	1.8665	TRUE	FALSE	TRUE	FALSE
Mayotte	222,152	2.71	79.05	0.4330	1.8979	FALSE	FALSE	FALSE	FALSE
Mexico	122,332,399	1.21	77.38	0.0828	1.8886	FALSE	FALSE	FALSE	FALSE
Micronesia (Fed. States of)	103,549	0.16	68.93	-0.7959	1.8384	TRUE	TRUE	TRUE	TRUE
Mongolia	2,839,073	1.49	67.36	0.1732	1.8284	FALSE	TRUE	FALSE	TRUE
Montenegro	621,383	0.05	74.76	-1.3010	1.8737	TRUE	FALSE	TRUE	FALSE
Morocco	33,008,150	1.41	70.84	0.1492	1.8503	FALSE	FALSE	FALSE	FALSE
Mozambique	25,833,752	2.47	50.2	0.3927	1.7007	FALSE	TRUE	FALSE	TRUE
Myanmar	53,259,018	0.84	65.08	-0.0757	1.8134	TRUE	TRUE	TRUE	TRUE
Namibia	2,303,315	1.87	64.34	0.2718	1.8085	FALSE	TRUE	FALSE	TRUE
Nepal	27,797,457	1.15	68.19	0.0607	1.8337	FALSE	TRUE	FALSE	TRUE
Netherlands	16,759,229	0.27	80.94	-0.5686	1.9082	TRUE	FALSE	TRUE	FALSE
New Caledonia	256,496	1.32	76.19	0.1206	1.8819	FALSE	FALSE	FALSE	FALSE
New Zealand	4,505,761	1.02	81.04	0.0086	1.9087	FALSE	FALSE	FALSE	FALSE
Nicaragua	6,080,478	1.44	74.67	0.1584	1.8731	FALSE	FALSE	FALSE	FALSE
Niger	17,831,270	3.85	58.14	0.5855	1.7645	FALSE	TRUE	FALSE	TRUE
Nigeria	173,615,345	2.78	52.29	0.4440	1.7184	FALSE	TRUE	FALSE	TRUE
Norway	5,042,671	1.00	81.42	0.0000	1.9107	FALSE	FALSE	FALSE	FALSE
Oman	3,632,444	7.89	76.43	0.8971	1.8833	FALSE	FALSE	FALSE	FALSE
Pakistan	182,142,594	1.66	66.48	0.2201	1.8227	FALSE	TRUE	FALSE	TRUE
Palestine, State of	4,326,295	2.51	73.12	0.3997	1.8640	FALSE	FALSE	FALSE	FALSE

Panama	3,864,170	1.62	77.46	0.2095	1.8891	FALSE	FALSE	FALSE	FALSE
Papua New Guinea	7,321,262	2.14	62.31	0.3304	1.7946	FALSE	TRUE	FALSE	TRUE
Paraguay	6,802,295	1.70	72.2	0.2304	1.8585	FALSE	FALSE	FALSE	FALSE
Peru	30,375,603	1.26	74.68	0.1004	1.8732	FALSE	FALSE	FALSE	FALSE
Philippines	98,393,574	1.71	68.63	0.2330	1.8365	FALSE	TRUE	FALSE	TRUE
Poland	38,216,635	0.01	76.32	-2.0000	1.8826	TRUE	FALSE	TRUE	FALSE
Portugal	10,608,156	0.04	79.83	-1.3979	1.9022	TRUE	FALSE	TRUE	FALSE
Qatar	2,168,673	5.90	78.3	0.7709	1.8938	FALSE	FALSE	FALSE	FALSE
Rwanda	11,776,522	2.74	63.62	0.4378	1.8036	FALSE	TRUE	FALSE	TRUE
Reunion	875,375	1.16	79.52	0.0645	1.9005	FALSE	FALSE	FALSE	FALSE
Saint Lucia	182,273	0.83	74.69	-0.0809	1.8733	TRUE	FALSE	TRUE	FALSE
Saint Vincent and the Grenadines	109,373	0.01	72.41	-2.0000	1.8598	TRUE	FALSE	TRUE	FALSE
Samoa	190,372	0.76	73.01	-0.1192	1.8634	TRUE	FALSE	TRUE	FALSE
Sao Tome & Principe	192,993	2.58	66.24	0.4116	1.8211	FALSE	TRUE	FALSE	TRUE
Saudi Arabia	28,828,870	1.85	75.37	0.2672	1.8772	FALSE	FALSE	FALSE	FALSE
Senegal	14,133,280	2.90	63.28	0.4624	1.8013	FALSE	TRUE	FALSE	TRUE
Seychelles	92,838	0.55	73.12	-0.2596	1.8640	TRUE	FALSE	TRUE	FALSE
Sierra Leone	6,092,075	1.88	45.34	0.2742	1.6565	FALSE	TRUE	FALSE	TRUE
Singapore	5,411,737	2.02	82.2	0.3054	1.9149	FALSE	FALSE	FALSE	FALSE
Slovakia	5,450,223	0.09	75.32	-1.0458	1.8769	TRUE	FALSE	TRUE	FALSE
Slovenia	2,071,997	0.24	79.47	-0.6198	1.9002	TRUE	FALSE	TRUE	FALSE
Solomon Islands	561,231	2.09	67.53	0.3201	1.8295	FALSE	TRUE	FALSE	TRUE
Somalia	10,495,583	2.87	54.88	0.4579	1.7394	FALSE	TRUE	FALSE	TRUE
South Africa	52,776,130	0.78	57.11	-0.1079	1.7567	TRUE	TRUE	TRUE	TRUE
South Sudan	11,296,173	4.02	54.97	0.6042	1.7401	FALSE	TRUE	FALSE	TRUE
Spain	46,926,963	0.44	82	-0.3565	1.9138	TRUE	FALSE	TRUE	FALSE
Sri Lanka	21,273,228	0.81	74.23	-0.0915	1.8706	TRUE	FALSE	TRUE	FALSE

Sudan	37,964,306	2.11	61.92	0.3243	1.7918	FALSE	TRUE	FALSE	TRUE
Suriname	539,276	0.88	70.9	-0.0555	1.8506	TRUE	FALSE	TRUE	FALSE
Swaziland	1,249,514	1.49	49.19	0.1732	1.6919	FALSE	TRUE	FALSE	TRUE
Sweden	9,571,105	0.65	81.74	-0.1871	1.9124	TRUE	FALSE	TRUE	FALSE
Switzerland	8,077,833	1.02	82.51	0.0086	1.9165	FALSE	FALSE	FALSE	FALSE
Syrian Arab Republic	21,898,061	0.67	74.37	-0.1739	1.8714	TRUE	FALSE	TRUE	FALSE
Taiwan	23,329,772	0.24	79.26	-0.6198	1.8991	TRUE	FALSE	TRUE	FALSE
Tajikistan	8,207,834	2.43	67.14	0.3856	1.8270	FALSE	TRUE	FALSE	TRUE
Tanzania, United Republic of	49,253,126	3.02	61.36	0.4800	1.7879	FALSE	TRUE	FALSE	TRUE
Thailand	67,010,502	0.30	74.27	-0.5229	1.8708	TRUE	FALSE	TRUE	FALSE
Timor-Leste	1,132,879	1.66	67.3	0.2201	1.8280	FALSE	TRUE	FALSE	TRUE
Togo	6,816,982	2.57	56.41	0.4099	1.7514	FALSE	TRUE	FALSE	TRUE
Tonga	105,323	0.43	72.59	-0.3665	1.8609	TRUE	FALSE	TRUE	FALSE
Trinidad and Tobago	1,341,151	0.28	69.81	-0.5528	1.8439	TRUE	TRUE	TRUE	TRUE
Tunisia	10,996,515	1.10	75.77	0.0414	1.8795	FALSE	FALSE	FALSE	FALSE
Turkey	74,932,641	1.22	75.09	0.0864	1.8756	FALSE	FALSE	FALSE	FALSE
Turkmenistan	5,240,072	1.27	65.39	0.1038	1.8155	FALSE	TRUE	FALSE	TRUE
Uganda	37,578,876	3.33	59.02	0.5224	1.7710	FALSE	TRUE	FALSE	TRUE
United Arab Emirates	9,346,129	2.52	76.75	0.4014	1.8851	FALSE	FALSE	FALSE	FALSE
United Kingdom	63,136,265	0.57	80.45	-0.2441	1.9055	TRUE	FALSE	TRUE	FALSE
United States of America	320,050,716	0.81	78.86	-0.0915	1.8969	TRUE	FALSE	TRUE	FALSE
United States Virgin Islands	106,627	0.10	80.05	-1.0000	1.9034	TRUE	FALSE	TRUE	FALSE
Uruguay	3,407,062	0.34	77.14	-0.4685	1.8873	TRUE	FALSE	TRUE	FALSE
Uzbekistan	28,934,102	1.35	68.19	0.1303	1.8337	FALSE	TRUE	FALSE	TRUE

Vanuatu	252,763	2.21	71.48	0.3444	1.8542	FALSE	FALSE	FALSE	FALSE
Venezuela (Bolivarian Republic of)	30,405,207	1.49	74.55	0.1732	1.8724	FALSE	FALSE	FALSE	FALSE
Viet Nam	91,679,733	0.95	75.87	-0.0223	1.8801	TRUE	FALSE	TRUE	FALSE
Western Sahara	567,315	3.21	67.61	0.5065	1.8300	FALSE	TRUE	FALSE	TRUE
Yemen	24,407,381	2.30	63.02	0.3617	1.7995	FALSE	TRUE	FALSE	TRUE
Zambia	14,538,640	3.21	57.66	0.5065	1.7609	FALSE	TRUE	FALSE	TRUE
Zimbabwe	14,149,648	2.81	59.84	0.4487	1.7770	FALSE	TRUE	FALSE	TRUE
		-0.483193453		-0.44939451					

Source: Department of Economic and Social Affairs, United Nations, 2013.

4.2. Scatter Diagram

Scatter diagram for life expectancy against population growth rate and log of life expectancy against log of population growth rate were considered to see the behaviour of the countries under consideration. The study discovered that the behaviour of both diagrams were the same, but the negative slope in both diagrams implied that, population growth increased ,then the life expectancy at birth decreased. See Fig. 1 below.

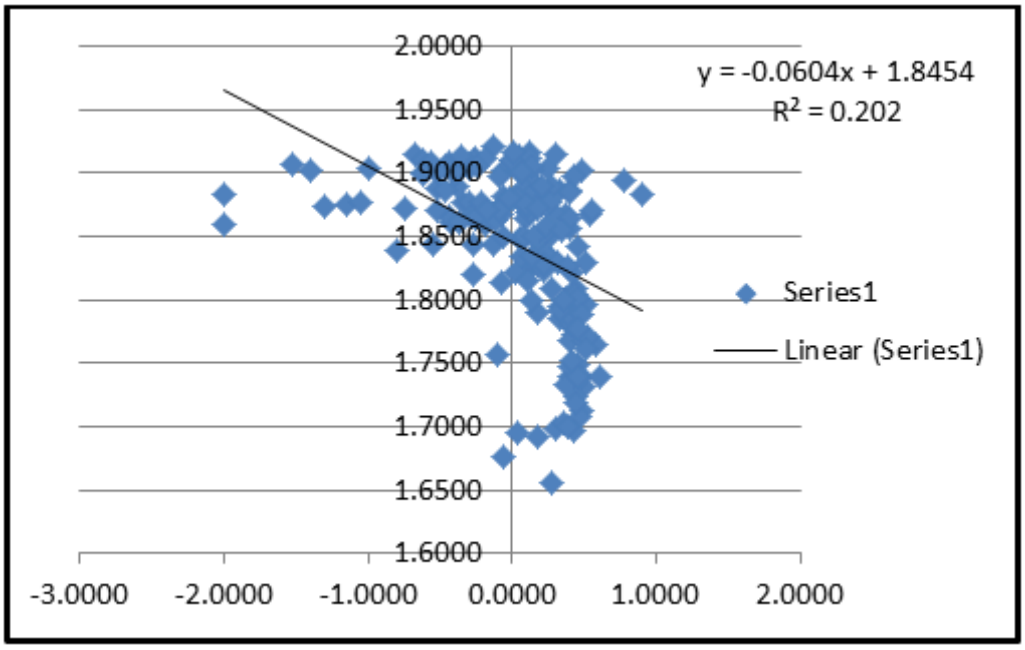

Fig-1. Scatter Diagram of Life Expectancy against Growth Rate
Source: Department of Economic and Social Affairs, United Nations, 2013.

4.3. Regression Analysis

The Estimated Regression model is of the form

Log growth rate = 6.20-3.34 log life expectancy

This Rate of growth given by $\beta^* = -3.3411$ indicated a negative rate of change which also suggest that as log growth rate increases, log life expectancy decreases. Consequently, life expectancy decreases with population growth. This is further collaborated by the hypotheses

H_o: $\beta_1 = 0$

H_1 .$\beta_1 = 0$

Where $t = \frac{-3.3411}{0.4937} = -6.77$

Where $H_o$is reported, the negative effect on life expectancy is very significant.

4.4. Regression Analysis: log of Population Growth Rate Versus Log of Life Expectancy

The regression equation is

loggrate = 6.20 - 3.34 lohlexp

Predictor	Coef	SECoef	T	P	VIF
Constant	6.1997	0.9102	6.81	0.000	
lohlexp	-3.3411	0.4937	-6.77	0.000	1.000

S = 0.409637 R-Sq = 20.2% R-Sq(adj) = 19.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	7.6860	7.6860	45.80	0.000
Residual Error	181	30.3722	0.1678		
Total	182	38.0582			

4.5. Correlation Analysis

The correlation analysis of the study showed that when comparing the relationship between life expectancy and population growth rate, there is a negative relationship

(-0.4832) between the two variables satisfying the postulation that increase in growth rate decrease life expectancy.

5. Summary

5.1. Introduction

This aspect summarizes the study and makes conclusion based on the result. The policy implications from the findings are also presented.

5.2. Summary

The relationship between the life expectancy and the population growth rate has therefore been fundamental to the policy makers in different countries of the world. However, there has been no consensus whether population growth is beneficial or detrimental to the life expectancy since the relationship of the two varies among countries. But, the study can summarily established that while the population growth rate increases then the life expectancy tends to decrease and vice versa through the use regression and correlation approach.

5.3. Conclusion

Conclusively, the finding of the study supported the first stage of demographic transition called pre-Malthusian regime, which predicts the relationship between the population's growth rate and life expectancy to remain parallel since the increase in one leads to decrease in the other.

5.4. Recommendations

In view of the findings that life expectancy will increase, if the population growth rate decreases and vice-versa. Therefore, life expectancy will definitely decrease in view of the fact that the continuous practice of raising large family will affect life expectancy on raising large family involve a lot of stress in providing necessary benefit for their up keeping, feeding, clothing, provision of better health facilities, education and other care, which bring along stress, agitation especially in paying bills for education, health, feeding, and clothing among others. Health wise, the stress and related cause will affect the life expectancy.

It is hereby recommended that:

a. The citizen especially African should be encouraged desisting from raising large family.
b. The introduction of a legislature improving sanction on whoever raises large family as it is practiced in China and Indian.
c. Introduction of preventive measures during sexual relationship to curb unwanted pregnancies by the government.
d. Enforcing and introducing abortion or other measure to curb raising large family, though the government has to have a political will as many religious bodies will definitely kick against the policy.
e. Proper orientation should be given to would – be newly wedded couples, married and singles about the benefits and disadvantages of not raising large family.
f. Hospital should be used as a measure to advise or even sanction any family that go against national figure of the family.
g. Pregnant mother should be enlightened on the benefits of raising small family during ante– natal clinics.

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