

Assessment of demographic factors in Africa's development.

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Abstract

Background: An enabling environment is an important element for economic development. African countries rank low on indices of development. The low level of development is rhetorically partly attributed to demographic factors, but quantitative assessment of the relationship is hardly produced to back up the rhetoric.

Data Source and Methods: Data sourced from the United Nations, UNAIDS, the World Bank, Health and Nutrition and Population Statistics of the World Bank were utilized in the study. The analysis consisted of bi-variate and multivariate regression.

Results: The results suggest that the level of child dependency is significantly negatively associated with the level of development in African countries controlling for other demographic factors.

Conclusion: The study found no evidence that total fertility rate and population growth have significant effect on gross national income per capita.

Keywords: African development, Economic development, Population growth, Fertility, Child dependency, Migration.

Introduction

An enabling environment is an important element for economic development. From the list of tables provided by The World Bank, of the 29 countries listed as low-income countries in 2021, 25 were African countries. Furthermore, of the 50 countries listed as lower-middle income economies, 21 were African countries. The World Bank classified 46 of 54 African countries as either low-income economies or lower-middle income economies in 2021 (The World Bank 2021). According to the United Nations Population and Development's (UNDP) 2020 Human Development Index, of the 33 countries classified as low human development globally, 30 of these were in Africa (UNDP 2020). Thus, the African continent experiences challenges in economic development.

Perspectives on development argue that there is a link between demographic factors and economic development. The role of population factors in development was formally affirmed in the Cairo 1994 International Conference on Population and Development (United Nations Population Fund (UNFPA) 1994). It was affirmed at the conference that globally demographic parameters such as

population growth, structure and spatial distribution have influences on poverty and social inequalities (UNFPA 1994). The objective of the programme of action therefore, was to raise the quality of life of all people through appropriate population and development policies and programmes aimed at achieving poverty eradication and economic growth (UNFPA 1994). Some of the actions specified at the conference included increased access to family planning. Since the 1994 population conference, and despite lack of quantitative evidence to support the view, some researchers advocate this view. Development ideology that is not empirically based can mislead policy makers in the enactment of intervention programs aimed at improving development in Africa. The literature below highlights several facets of the theoretical link between demographic factors and development.

Literature review

Yousif (2009:12) indicated that demographics are important for measuring and assessing Africa's

progress and development. Durevall and Lindskog (2016:232) suggested the 'course of fertility is likely to be a major determinant of economic development of a country'.

The Population Crisis Committee (1985) observed that the financial assistance to Third World population and Family planning programmes by the United States and other industrialised donors is based in part on the belief that rapid population growth in the developing world dilutes and, in some cases, impede economic development. Easterline (1967) argued that high population growth rates create pressure on limited resources as resources that may have been invested are diverted to caring for a fast-growing population. According to Casterline (2010) there is negative correlation between fertility and economic growth as a high proportion of children puts pressure on certain sectors of the economy such as education and health, increases dependency burden, reduces the capacity to save, and hence capital formation and investment. Among other factors, high child mortality potentially fuels fertility (the replacement effect, Juarez 1993).

Based on Amartya Sen's concept of development as freedom, reduction of child mortality is a significant contribution to development insofar as premature death constitutes a basic denial of the most fundamental freedom of human beings (Perez-Moreno, Blanco-Arana, and Barcena-Martin 2013).

Despite the perceived negative consequences of high population growth, Todaro and Smith (2012) have drawn attention to the following arguments:

- a) Population growth is not a problem to development but other issues;
- b) Population is a false issue created by rich countries to keep poor countries in their dependent condition; and
- c) Population growth in many developing regions is desirable to stimulate economic development – larger population provide consumer demand necessary to economies of scale in production.

Regarding migration, although positive emigration/immigration fuels population (when it is more than emigration/outmigration) the Organisation for Economic Co-operation and Development (OECD) (2014) points out that: Migrants increase the workforce and contribute substantially to labour market flexibility. They contribute more in taxes and social contributions than they receive in benefits and hence have positive impact on the public purse. They boost the working age population, arrive with skills and contribute to human capital development of receiving countries (OECD 2014).

Though logically and technically, sound, the quantitative basis of the above perspectives is largely

untested. These contrasting perspectives still dominate today's discourse on the relationship of population factors on development. For example, recently, Mberu and Ezeh (2017) provided trends in some demographic and economic indicators for certain global regions and focusing specifically on Botswana and Zambia. From these trends they concluded that population factors play a role in achieving key development goals. They then recommended among others, as in the 1970s/80s rhetoric, investment in family planning to alleviate pressures caused by rapid population growth. The recommendation gives the impression that family planning is the panacea for Africa's development. South Africa's unadjusted total fertility rate of 2.6 in 2016 (NdoH, Stats SA, SAMRC, ICF 2016) is the lowest in sub-Saharan Africa after Mauritius, yet about 60% of the youth population are unemployed (expanded definition) and thus, a challenge to youth development (Udjo 2021). Mberu's and Ezeh's conclusion was not based on a quantitative assessment of the relationship between demographic factors and development. One may ask: Beyond theoretical rhetoric, what is the evidence of the quantitative assessment that population factors impede Africa's development?

Objectives of the study

The purpose of this study therefore was to provide statistical assessment of the relation between demographic factors (population growth, child dependency, total fertility rate, infant mortality rate, migration, HIV/AIDS) and development among African countries.

Data and methods

Like other regions of the world, the quantity and quality of statistical data vary from one African country to another because countries world-wide are at different levels of statistical development. In research comparing different regions of the world, it is not practical to approach each country's statistical office to gain access to their data. However, various United Nations agencies routinely compile estimates of indicators based on the information provided to these agencies from each country's statistical agency. Where the information is lacking, the agencies through modelling, provide estimates to fill the gap. This study therefore utilized demographic indicators for the period 2015, or nearest date to 2015 sourced from the following: (1) the United Nations (2015) World Population Prospects: The 2015 revision. (2) UNAIDS (2016) HIV estimates. (3) World Bank's estimates of Gross National Income per capita

(current US\$) for African countries in 2015 (4) Health Nutrition and Population Statistics – World Bank (2017), or nearest year to 2015 for eight African countries (Burundi, Djibouti, Eritrea, Gambia, Libya, Mauritania, Somalia and United Republic of Tanzania) in the absence of 2015 figures for those countries. There might be reservations about the accuracy of some of the indicators but since these agencies attempt to use uniform methodology in compiling the indicators, these databases appeared to be the most practical source for making comparisons of the levels of indicators across different countries globally. While the true levels of the indicators may be debatable, they nevertheless may be regarded as indicative. The first part of the analytical methods in this study consisted of selecting and graphing the demographic indicators relevant to this study for the most current year for which the data were available as well as employing descriptive statistics to analyse the indicators. The second part consisted of bi-variate linear regression to assess the relationship of each demographic factor and a measure of development among African countries.

Reviewing the literature, Nielson (2011) observed that there is no criterion grounded in theory or based on an objective benchmark that is generally accepted in classifying countries into their level of development. However, despite its weaknesses, The World Bank cited in Nielson (2011) considers Gross National Income per capita (GNI/n) to be the best single indicator of economic capacity and progress. For this reason, GNI/n was used in this study as a proxy measure of development.

In view of the above, the bi-variate linear regression may be expressed as:

$$\text{Log (GNI/n)} = B_0 + B_{1D_i} \dots\dots\dots(1).$$

Where Log (GNI/n) is the log of the gross national income per capita, B_0 is a constant and B_{1D_i} is the coefficient of change in a fitted demographic factor, D_i for a dollar change in log (GNI/n).

The log transformation of gross national income per capita was because of their large values relative to values of each demographic indicator. The bi-variate linear regression was followed by multiple regression analysis which may be expressed as:

$$\text{Log (GNI/n)} = B_0 + B_{1D_1} + \dots\dots\dots B_{nD_n} \dots\dots\dots(2).$$

Where $D_1, \dots\dots D_n$ are the demographic factors. The inclusion of the demographic factors in equation (2) was based on factors that were statistically significant (with a probability $p < 0.001$) in equation 1.

Results

Background demographic indicators on Africa.

As a background, this section presents some key demographic indicators on Africa. To contextualise the magnitudes of the indicators, they were compared with the levels in selected groups of regions: more developed regions, Eastern Asia, Latin America, and the Caribbean. The selection of the regions was arbitrary to provide contrast in the case of the more developed regions (Europe, Northern America, Australia/New Zealand and Japan). Variations within the African region in terms of countries with the lowest and highest levels of indicator were also highlighted for contrast. The bar graphs depicting the levels of the indicators were ordered from lowest to highest for easier interpretative visualisation.

Population growth

As seen in figure 1, each of the sub-regions of Africa had higher annual population growth rates (ranging between 1.2% per annum in South Africa to 3.0% in Middle Africa) than in Latin America and the Caribbean, the more developed regions, and Eastern Asia during the period 2010-2015.

At country level within Africa, the annual rate of population growth ranged between 0.04% per annum (Libya) and 4.1% per annum (South Sudan) during the period 2010-2015

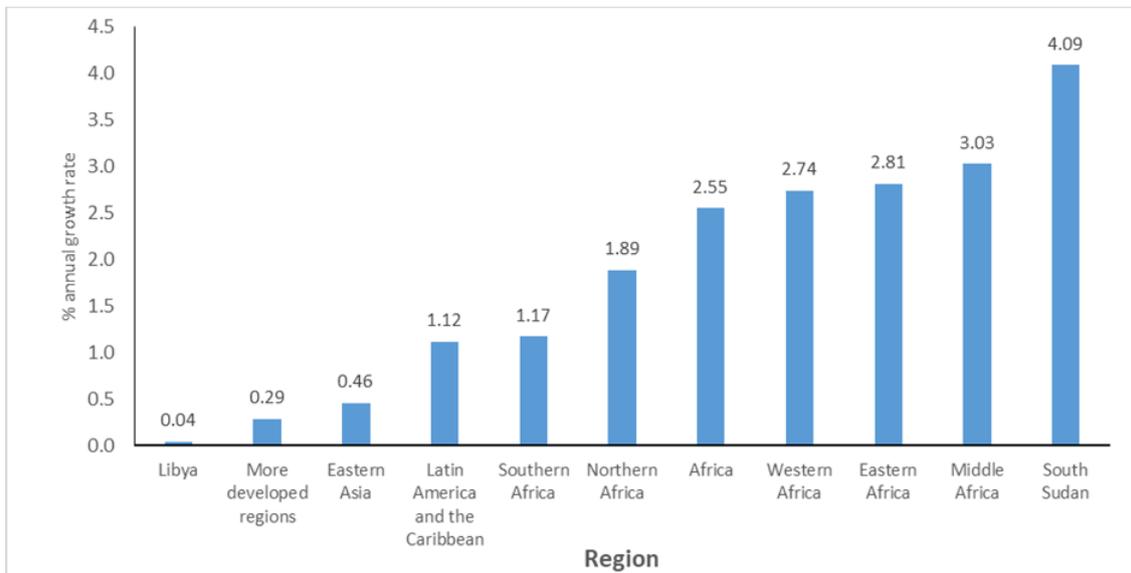


Figure 1. Population growth in selected regions/countries 2010-2015.

Source: Graphed from United Nations World Population Prospects: 2015 revision

Child dependency ratio

Figure 2 indicates that whereas there were about 74 children aged 0-14 per 100 persons in the working age group 15-64 years in Africa in 2015, the corresponding numbers for the more developed

regions and Eastern Asia respectively were 25 and 23 in the same period. Of all the countries in Africa, Mauritius had the lowest child dependency ratio (27) while Niger had the highest (108) in 2015.

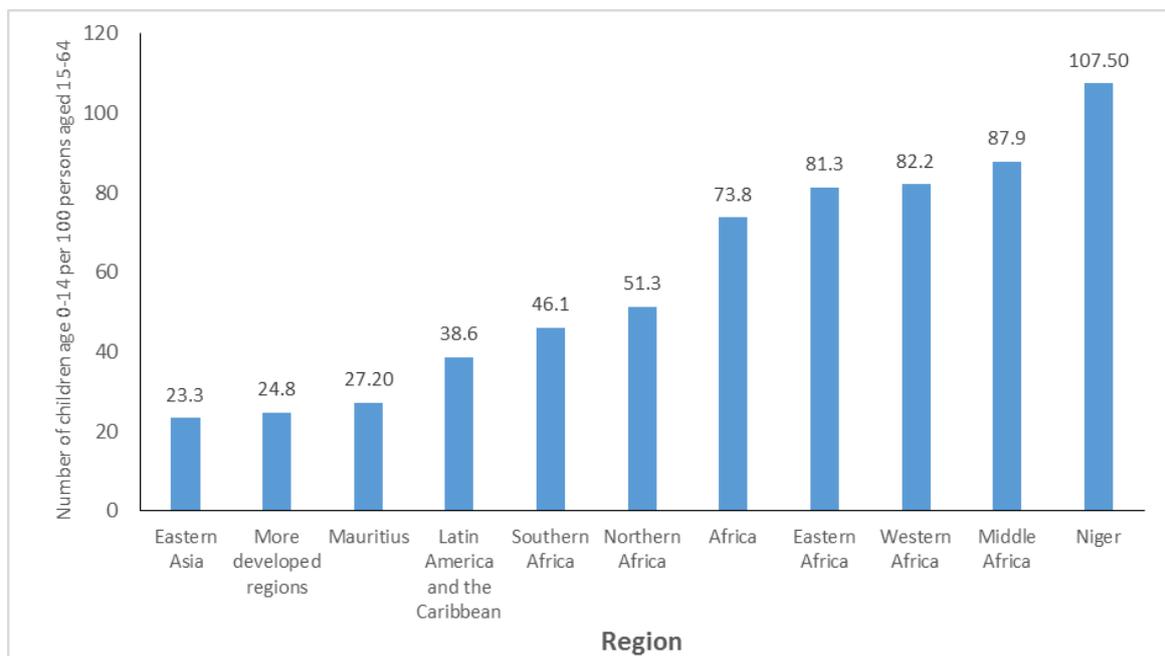


Figure 2. Child (aged 0-14 years) dependency ratio in selected regions/countries, 2015

Source: Graphed from United Nations World Population Prospects: 2015 revision

Total fertility rates

Total fertility rate is the number of children a woman would have at the end of her reproductive life if she survived up to age 50 and experienced a certain set of fertility rates in the reproductive ages.

A total fertility rate of 2.1 means the population is replacing itself (replacement level of fertility) whereas a total fertility rate greater than 2.1 means the population is more than replacing itself. The region with the highest total fertility rate in the world is Africa.

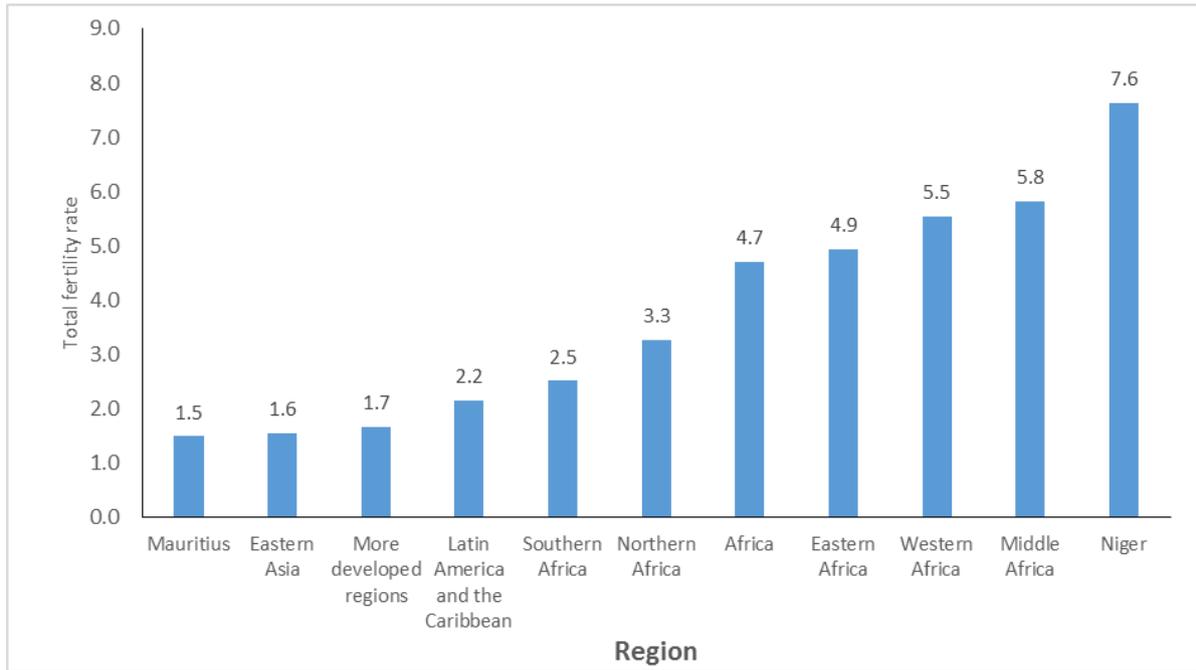


Figure 3. Total fertility rates in selected regions/countries 2010-2015.

Source: Graphed from United Nations World Population Prospects: 2015 revision

Figure 3 shows the total fertility rates during the period 2010-2015 for selected regions. Whereas total fertility rate was about 1.7 in the more developed regions during the period, it was 4.7 in Africa, ranging between 2.5 in Southern Africa to 5.8 in middle Africa with Niger having the highest total fertility rate (7.6) of all the African countries during the period. It is noteworthy that Mauritius has below replacement level of fertility (1.5) – lower than the average total fertility rate for the more developed regions.

Infant mortality rates

Life expectancy at birth is often used not only as an indicator of the health status of a country but also as a social indicator of the level of development. See for example, the Human Development Index constructed by the United Nations (2020). In this study however, we used Childhood mortality, specifically, infant mortality as one of the demographic indicators of the health status and level of economic development of a population. The reason for preferring infant mortality to life expectancy at birth is because the numerical value of life expectancy at birth in a population is partly driven by the level of infant mortality rate in that population.

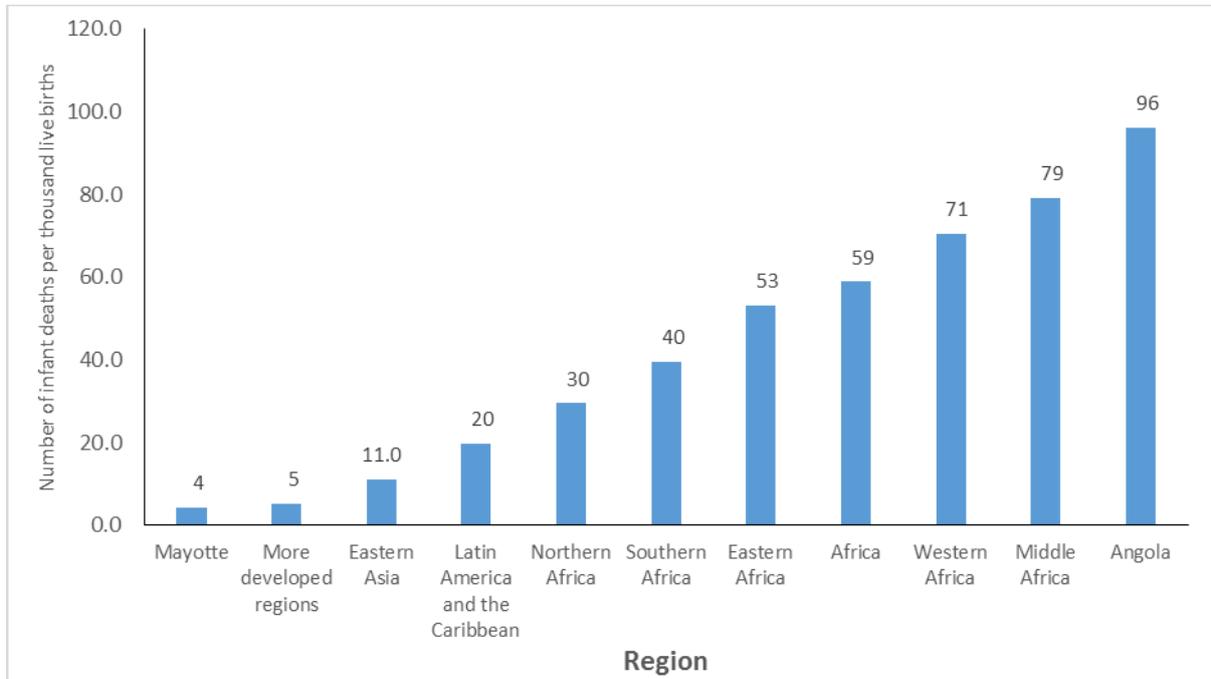


Figure 4. Infant mortality rates in selected regions/countries 2010-2015.

Source: Graphed from United Nations World Population Prospects: 2015 revision

As seen in Figure 4, infant mortality rate in Africa (59 per thousand live births) was about 12 times higher than the level in the more developed countries (5 per thousand live births), five times higher than the level in Eastern Asia, and three times higher than the level in Latin America and the Caribbean during the period. Within the sub-regions of Africa, infant mortality rates ranged between 30 per 1000 live births in Northern Africa to 79 per 1000 live births in Middle Africa during the period 2010-2015. Among African countries, it ranged between 4 per 1000 live

births (Mayotte) and 96 per 1000 live births (Angola) during the period 2010-2015.

Migration

Figure 5 shows the average annual net number of migrants per 1,000 population in selected regions/countries during the period 2010-2015. The graph indicates that there was a net loss of people from Africa as a whole and from each of the sub-regions of the continent (except southern Africa) to the more developed regions of the world and southern Africa.

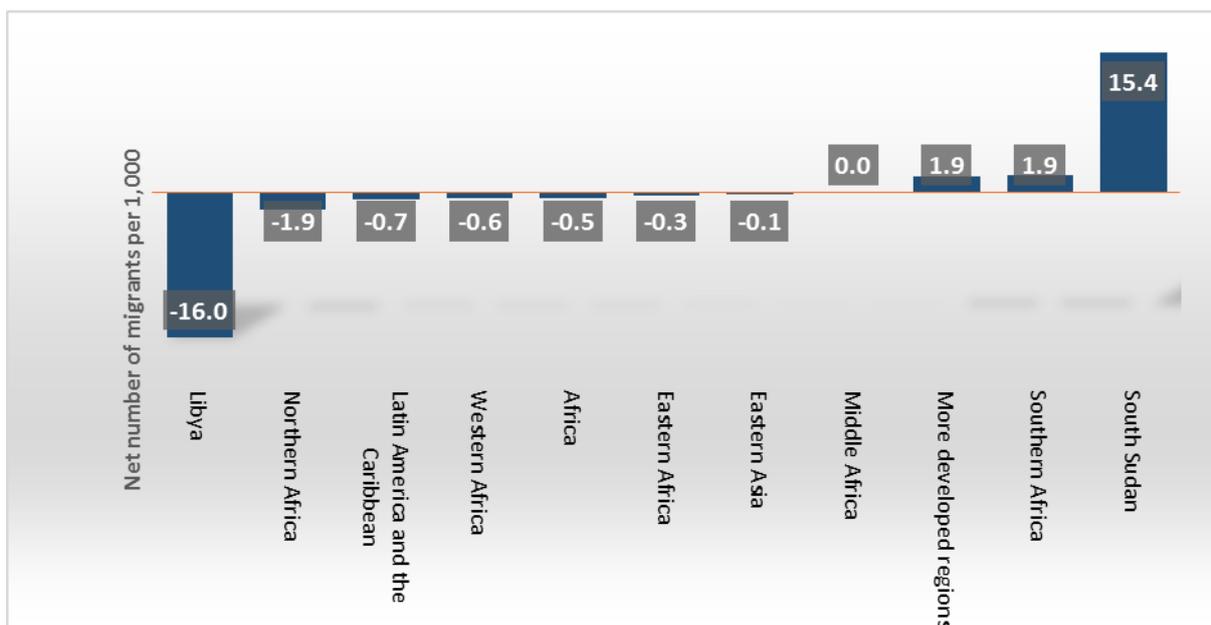


Figure 5. Average annual net number of migrants per 1000 population in selected regions/countries 2010-2015.

Source: Graphed from United Nations World Population Prospects: 2015 revision

HIV/AIDS

According to the UNAIDS (2016) estimates, there were about 36.7 million people globally living with HIV in 2015. UNAIDS 2016 estimates (graph not shown) indicates that of all the regions in the world, sub-Saharan Africa had the highest HIV prevalence among adults aged 15-49 – the prime working age group – in 2015. According to UNAIDS 2016 estimates, Madagascar had the lowest HIV prevalence (0.4%) of all the sub-Saharan African countries in 2015 while Swaziland had the highest (28.8%). Furthermore, the estimates reveal the top four countries with the highest adult HIV prevalence in the world in 2015 namely Swaziland, Lesotho, Botswana, and South Africa were in southern Africa.

Assessment of the relation between demographic factors and development in Africa

As noted above, the first step in the statistical assessment of the relation between demographic factors and development among African countries was a bi-variate linear regression. For brevity of presentation, the scatter plot arising from this is illustrated only for one of the demographic factors (Figure 6). The illustration suggests that there is a relationship between child dependency and gross national income among African countries without controlling for other demographic factors.

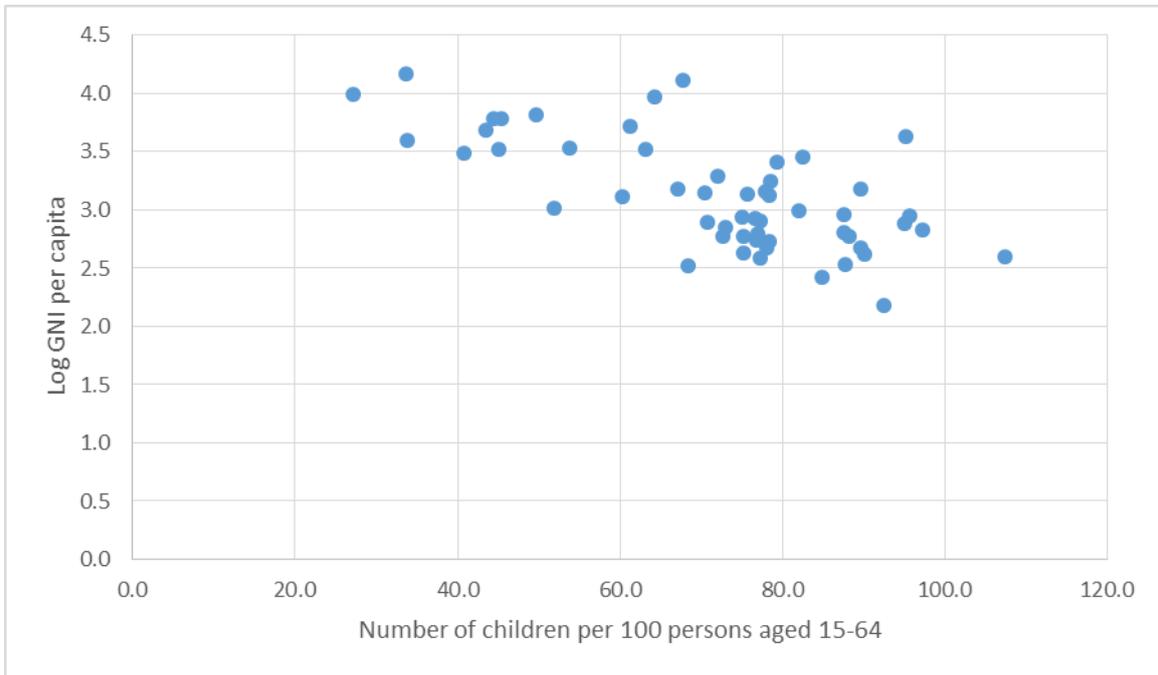


Figure 6. Scatter Plot of log Gross National Income per capita and Child Dependency Ratio Among African Countries 2015

Source: Computed from International data bases.

The results of the bi-variate linear regression are summarised in Table I (model I). As seen in the table, values of r (the correlation coefficient) appear to suggest that there is a correlation between the level of each demographic factor and level of development in African countries except HIV

prevalence and net migration. Furthermore, the regression coefficients in Table I suggest that the relationship is negative and statistically significant ($p < 0.001$) except for HIV prevalence and net migration.

Table 1: Bi-variate regression of Gross National Income per capita and Demographic Factors among African Countries 2015.

Gross National Income Per Capita Current US\$ Regressed on each:		
Model 1		
INDEPENDENT VARIABLES	r	Coefficient
Child dependency ratio	0.667	-0.017 (0.003)*
Infant mortality rate	0.462	-0.010 (0.003)*
Annual population growth rate	0.497	-0.297 (0.077)*
Total fertility rate	0.632	-0.222 (0.041)*
HIV Prevalence (adults 15-49 years old)	0.286	0.020 (0.010)
Net migration rate	0.214	0.031 (0.021)

*Statistically significant $p < 0.001$.

Standard errors of estimates in parenthesis.

Source: Computed from International data bases.

For example, Table 1 suggests that a 1.7% increase in child dependency ratio was associated with a dollar decrease in log gross national income per capita in African countries in 2015 without controlling for other demographic factors.

The effect of controlling for other demographic factors are shown in the multivariate results summarised in Table 2. Since net migration and HIV prevalence were not statistically significant in the bi-variate regression, they were excluded for the multivariate analysis. Two models are shown in Table 2. In model 2, the effects of child dependency, infant mortality rate and total fertility rate were considered but excluded the effect of population growth while in model 3, the same variables as in model 2 were considered but excluded total fertility rate and included population growth. The results in both models indicate that controlling for other demographic factors, the level of child dependency is significantly negatively associated with the level of development in African countries ($p < 0.05$). Furthermore, controlling for other demographic factors, the level of infant mortality rate is negatively associated with the level of development in African countries. However, the negative correlation is not statistically significant ($p > 0.38$). In contrast, controlling for other demographic factors, the level of

total fertility rate is positively associated with the level of development in African countries, though not statistically significant ($p > 0.56$). As seen in Table 2, a similar relationship was found regarding population growth. Given some arguments in the literature, the latter results might seem counter intuitive. However, an examination of the correlation matrix tables (not shown) revealed that there are large statistical inter-correlations (> 0.5) between child dependency with infant mortality and total fertility as well as with child dependency and population growth rate. From a demographic viewpoint, the numerator for the computation of child dependency is based only on children (aged 0-14 years) alive at a particular point in time, dead children are not included in the computation whereas regarding infant mortality and total fertility rates, dead children (usually less than one year old) are included in their computations. Furthermore, fertility level is the primary driver of child dependency. Regarding population growth, fertility is one of the drivers (the others being mortality – of which infant mortality is a component – and net migration). It would appear from the above that in the context of Africa, child dependency is a more important demographic factor in development than any of the other demographic factors considered in this study.

Table 2: Multi-variate regression of Gross National Income per capita and Demographic Factor among African Countries 2015.

Gross National Income Per Capita Current US\$ Regressed on:		
	Model 2	Model 3
INDEPENDENT VARIABLES	Coefficient	Coefficient
Child dependency ratio	-0.022 (0.010)*	-0.020 (0.006)**
Infant mortality rate	-0.003 (0.003)	-0.002 (0.003)
Total fertility rate	0.089 (0.151)	
Annual Population growth		0.084 (0.116)
R^2	0.490	0.491
<i>Constant</i>	4.453**	4.456**

*Statistically significant $p < 0.05$.

**Statistically significant $p \leq 0.002$.

Standard errors of estimates in parenthesis.

Source: Computed from International data bases.

Discussion and conclusion

This study attempted a quantitative assessment of the relation between demographic factors and development among African countries. There was no evidence from this study that total fertility rate, population growth controlling for other demographic factors have significant effect on gross national income per capita among African countries. This is contrary to popular view. The r^2 values obtained from the multivariate regression indicate that the combined effect of child dependency, infant mortality rate, total fertility/annual population growth accounted for only about 49% of the variation in log gross national income in African countries in 2015. This suggests that unobserved heterogeneity i.e. factors correlated with development and on one or more of the demographic factors which were not included in the study must be at play in African countries. The unobserved heterogeneity could be economic, social or political. Further studies are required to empirically examine these additional factors in the discourse on African development.

Initiatives linking population factors and development as well as setting of development goals and targets have usually been driven by the west through the UN. The Millennium Development Goal (MDG) for example, with the inclusion of a few more targets, to some extent was a re-enactment of the Organisation for Economic Corporation and Development (OECD) 1996 development goals (Udjo and Lalthapersad-Pillay 2015). Among the criticisms of the MDGs was articulating development priorities in a manner that are not functional to countries and excluding certain development

priorities (Waage et al. 2010 cited in Udjo and Lalthapersad-Pillay 2015). Africa's development priorities are still largely dictated from outside from historical rhetoric of the 1970s/80 and through the UN rather than from within. This includes the new 2030 Sustainable Development Goals (SDGs) with 17 goals and 169 targets that include demographic goals and targets.

However, Africa now has Agenda 2063 which is Africa's shared vision defining its own sustainable development path for the socio-economic transformation of the continent based on past and current initiatives. The health aspect of the agenda focuses on the health needs of the young and chronic degenerative diseases of the old. However, it is doubtful that the targets indicated in Agenda 2063 of reducing to zero, deaths from HIV/AIDS, malaria, TB by 2030 as well as ending maternal and under five child mortality by 2030, are realistic and achievable.

It remains to be seen whether the priority areas and indicative strategies identified in the Agenda would be able to harness demographic trends in the continent to boost rather than hinder socio-economic development. As in the MDGs and SDGs, sometimes one wonders how the targets for Agenda 2063 were set – what was the thinking around the targets? Were there adequate consultations with relevant experts in the various disciplines?

The African Agenda 2063 is a laudable initiative on paper and could improve demographic outcomes for Africa's development. However, the challenge is the implementation. While there could be partnerships with the west, Africa should not expect that real socio-economic development will come from the west. To harness the demographic trends in boosting

socio-economic development, African countries rather than displaying attitude of superiority complex, should learn from each other through collaboration in terms of how certain levels of demographic magnitudes were achieved by some countries. For example:

- a) African countries could learn from Mauritius how it was able to achieve a 19% of its total population being in the age group 0-14 years as well as a low unemployment rate of 7%.
- b) East and southern African countries could learn from Senegal and North African countries how they have been able to keep HIV prevalence very low (below 1%)

The notion of collaboration and sharing of intelligence and ideas around demographic issues can only benefit African countries. It would prevent each individual country from reinventing the wheel. Learning from those that are successful in understanding and dealing with their demographic issues would enhance the development of the region at a much faster pace.

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Ethics statement

Ethics approval for this study was granted by the Unisa College of Economic and Management Sciences Research Ethics Review Committee with the ERC Reference #: 2019_CRERC_015(SD).

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