Education, Demography and Development in Africa: Emerging Trend and Policy Implications

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Abstract
This article examines the effects of education on demography in Africa within the context of development. Educational enrolments at all levels of education are relatively low in Africa and most countries on the continent have low human development. The cross-country evidence shows that educational attainment reduces infant mortality and total fertility rates. From a regional perspective, educational effects on mortality and fertility are strongest in East and Southern Africa and relatively weak in North and Central Africa. The major development policy implication of our study is that the interplay of sustained efforts at improving education levels, especially of the girl-child, health services availability and employment opportunities could help reduce mortality and fertility rates on the continent.

1. Introduction

A major issue in the development aspirations of countries in developing economies especially in sub-Saharan Africa is the relatively high growth rates of population compared with the pace of economic growth. Between 1996 and 2000, Africa recorded an annual average population growth rate of 2.5%, while real growth of domestic output was 3.6%. This puts per capita real product growth at about 1.1%. Though this compares favourably with the negative per capita growth of about 1% recorded between 1991 and 1995, progress towards development, arguably, could have been much faster with relatively lower population growth rates.

The prevalence of high population growth reflects the high fertility preferences in these economies and is conditioned by educational attainments, engagement in economic activity and child morbidity factors, among others. Thomas and Muvandi (1994) observe that fertility in sub-Saharan Africa is the highest in the world. What is even more worrisome, is the little evidence that sustained declines in fertility which have been observed in other developing countries are imminent for most countries on the subcontinent.

There is concern for reducing further the current levels of fertility especially in an attempt to reduce the incidence of poverty on the continent. To evolve appropriate policies to help reduce fertility and mortality rates of children, it is important to understand their determinants and their relative importance. Of particular relevance are the effects of schooling completion.

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This paper aims at extending the existing literature on education and demographic pattern in developing countries by considering the impact of educational attainment on two demographic outcomes, namely, total fertility and child mortality rates. We also characterize the demographic and human development pattern prevailing in Africa, an approach which has received little attention in the existing literature. We hypothesize that education reduces the average number of births and the mortality rate of children.

The rest of the paper is organized as follows. In the second section we provide the educational, demographic and development context for Africa. This section addresses issues of school enrolments, correlation between fertility and development and examines movements from one demographic-human development classification to another. Section three focuses on modeling demographic outcomes in Africa. This section considers the empirical approach for the study and presents the results of estimations. The final section deals with conclusion and policy implications.

2. The African Context

2.1 Education and Development

Growth and development depend primarily on the stock of physical and human capital and technological improvements. The human capital of a nation comprises the education, skills, experience and adaptability of human resources to the production process. Arguably, the benefits of education are not only personalized but also tend to spillover to society at large. Notwithstanding the documented evidence on the positive effects of education on earnings, economic growth, health standards, and labour force participation, especially of females, Africa still appears to be grappling with sustaining school enrolments for all levels of education.

TABLE 1: ECONOMIC AND SOCIO-DEMOGRAHIC PERFORMANCE IN AFRICA

|	All Africa		West Africa		East & Southern Africa	
	1991-95	1996-00	1991-95	1996-00	1991-95	1996-00
Income and growth indicators						
GDP per capita (Const. 1995 US$)	701.8	726.5	366.7	374.6	676.2	687.6
Real GDP growth (%)	1.5	3.6	2.0	3.5	1.0	3.1
Socio-demographic indicators						
Crude birth rate (per 1000 pop)	39.6	37.6	42.5	40.3	42.1	40.2
Crude death rate (per 1000 pop)	13.9	14.2	15.2	15.4	15.5	16.1
Population growth rate (%)	2.6	2.5	2.9	2.6	2.5	2.6
Infant mortality rate (per 1000 births)	92.5	89.0	94.2	91.0	101.0	97.4
Life expectancy at birth (years)	52.6	52.2	49.5	49.7	49.6	48.3
Illiteracy rate (% aged 15 years plus)	46.9	41.1	52.8	45.9	42.3	37.1
Gross primary school enrolment (%)	79.6	80.8	79.1	81.2	74.4	76.5
Gross secondary school enrolment (%)	32.6	33.6	24.2	26.6	26.4	27.5

Source: Author's calculations based on data from World Bank's Africa database 2002.

Educational attainments have been relatively low in Africa than most parts of the developing the world, though school enrolment ratios appear to be on the increase. Primary enrolment ratios in Africa have risen from 79.6% in the first half of the 1990s to

80.8% in 1996-2000 as shown in Table 1. Thus, between these two periods, gross primary enrolment ratios increased by 1.5% in Africa. From a sub-regional perspective, and for the two periods under consideration, the percentage change in gross primary school enrolments were 2.8% for East and Southern Africa and 2.7% for West Africa. There seems to be some 'catching up' from the sub-regions with relatively lower initial enrolment ratios.

Case studies of some countries in Africa in terms of primary and secondary school enrolments are shown in Figures 1 and 2. One portrait which emerges is the wide variation in school attainment across countries. For some countries like Algeria and Namibia, gross primary enrolment rates for 1998/99 and 2001/02 were above 100%, while for others like Niger and Burkina Faso the rates were below 40%. Primary school drop-out rates are relatively high and this is reflected in the gap between gross and net enrolment rates. The millennium development goal of achieving universal primary education by 2015 appears to be a big challenge for some countries in the region. For example between 1998 and 2001, Burkina Faso registered a two percentage point increase in gross primary enrolment ratios. Assuming there is consistency in performance and enrolment ratios continue to rise at the same pace for successive periods, then gross primary enrolment ratios will be about 50% by 2010. While some countries like Ghana have put in a place a program of free, compulsory, universal access to basic education, it appears institutional structures and other socio-economic factors tend to work against the realization of complete accessibility and full enrolments. In the case of Ghana, using a similar growth scenario applied to Burkina Faso, gross primary enrolment ratios will be about 91% 2010.

FIGURE 1
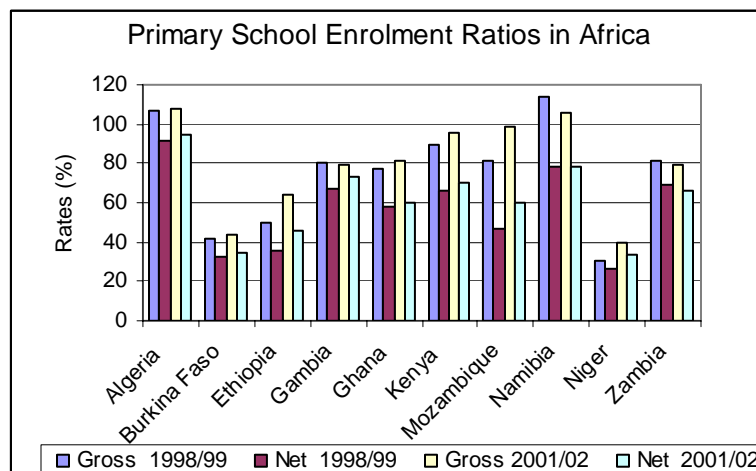
Source: UNESCO's database.

Secondary school enrolment rates as shown in Table 1 have been below 35% for Africa as a whole. Regional variations are seen with West, East and Southern Africa having, on average, gross enrolment ratios of below 30%, while North Africa has over 35% secondary school enrolment ratios. These patterns tend to be directly associated with the standards of living in these regions.

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FIGURE 2
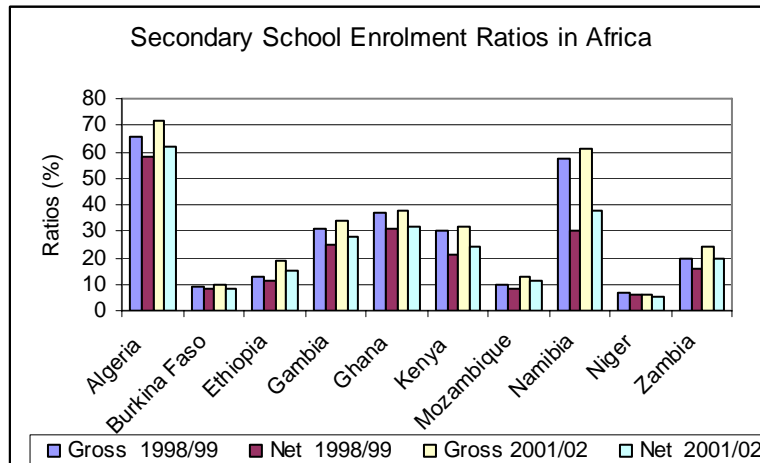
Source: UNESCO's database.

Measuring the quality of education is not an easy task. Various measures are currently being used to measure education quality. Notable among these are student-teacher ratio and government education expenditure per capita. Our study uses the former measure due to data constraints. The quality of education, using primary education student-teacher ratio as a proxy, tends to be relatively higher in North Africa (represented by Algeria in Figure 3) than in sub-Saharan Africa. Primary school quality appears to be fairly stable in Algeria, Namibia, Niger and Zambia. However, there are fewer pupils to a teacher in Algeria than in the other countries with stable ratios. For other countries like Ethiopia and the Gambia, class sizes appear to be rising leading to rising pupil-teacher ratios. The question is what is the 'ideal' pupil-teacher ratio? This is a difficult question to answer. A simple way out is to use the average of ratios as the 'ideal' pupil-teacher ratio. If we use this measure, then most of the countries under consideration can be said to be having high pupil-teacher ratios with negative implications for pupil-teacher interaction and general education quality.

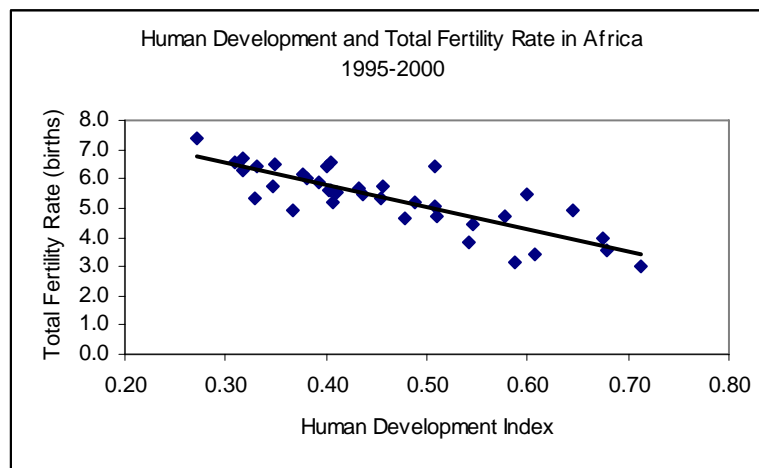FIGURE 3

Source: UNESCO's database.

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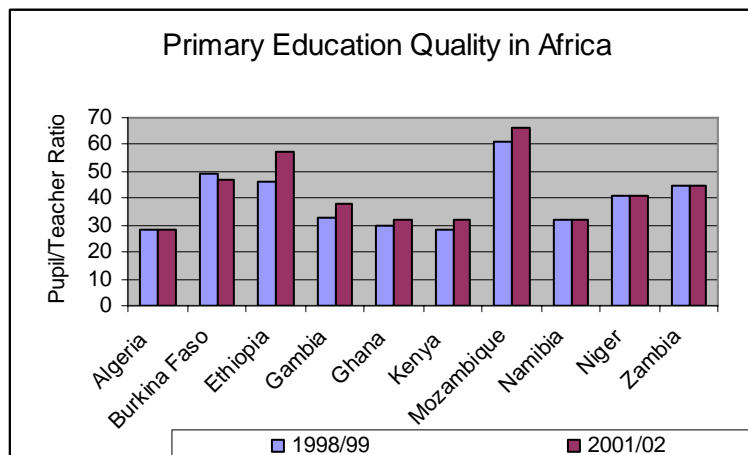
The human and economic indicators of development shown in Table 1 suggest that Africa's development performance has not always been consistent. Life expectancy fell from 52.6 years in 1991-1995 to 52.2 years in 1996-2000. This situation is even worse for East and Southern Africa where there was a fall from about 50 years to 48 years. This is partly due to the HIV crisis. Life expectancy is higher for females than males, and is partly explained by the relatively high-risk types of jobs carried out by males. Infant mortality rates and adult illiteracy rates have also decreased for all Africa as well as the sub-regions on the continent.

2.2 Human Development and Demography

Educational attainment plays an important role in the conceptualization of human development. The United Nations Development Program's human development index which gives an indication of the extent of human development in any given country is a composite index spanning education and adult literacy rates, per capita income and life expectancy. This index has been used in our study as the measure of human development in Africa.

There appears to be a negative correlation between total fertility rate in Africa and human development. Figure 4 gives credence to this relationship and the estimated correlation coefficient is -0.82. Generally countries in the sub-region with high per capita income tend to have lower fertility rates, while the opposite occurs for low income countries. Between 1995 and 2000, the lowest per capita income of $110 was recorded for Ethiopia and this country had an average of 6.4 births, while Algeria which had a per capita income of $1548 had 3.6 births on average. During the same period, literacy rates were 36% for Ethiopia but 65% for Algeria.

FIGURE 4

Source: UNESCO's database and World Bank 2002 Africa database.

While crude death rates have been rising slightly since the 1990s, birth rates in Africa have been falling, as shown in Figure 5. The overall effect has been positive but falling net birth rates. The net birth rates have fallen from 2.7% to 2.5% in West Africa, 2.7% to 2.4% in East and Southern Africa and 2% to 1.9% in North Africa between 1991-1995 and 1996-2000. Figure 6 shows the trend in net birth rates for the various

regions in Africa. It appears West Africa has the highest net birth rates compared to the other regions on the continent. The prevailing pattern appears to be related to the extent of development in the various sub-regions. Real GDP per capita has been relatively higher in North Africa than the other two sub-regions. Between 1995 and 2000, the annual average real GDP per capita was $374.6 for West Africa, $687.6 for East and Southern Africa and $1,503.3 for North Africa. Also educational enrolments have been relatively higher in North Africa. The interplay of these factors, among other factors, tend to give rise to sub-regional differences in demographic and socio-economic outcomes.

FIGURE 5
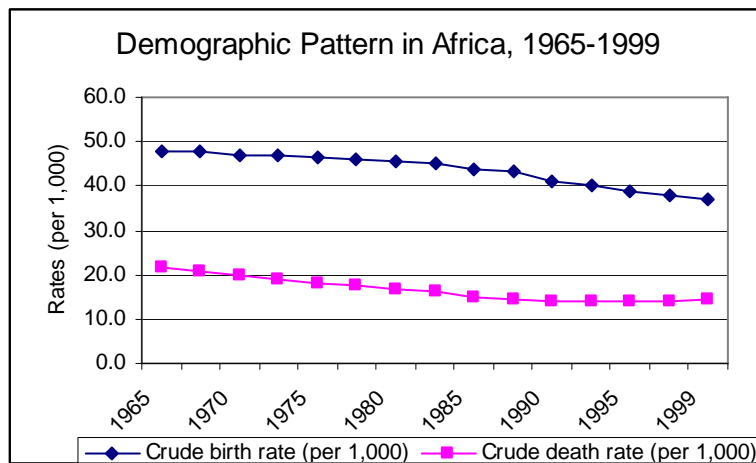
Source: Estimates based on data from World Bank's Africa Database 2002.

FIGURE 6
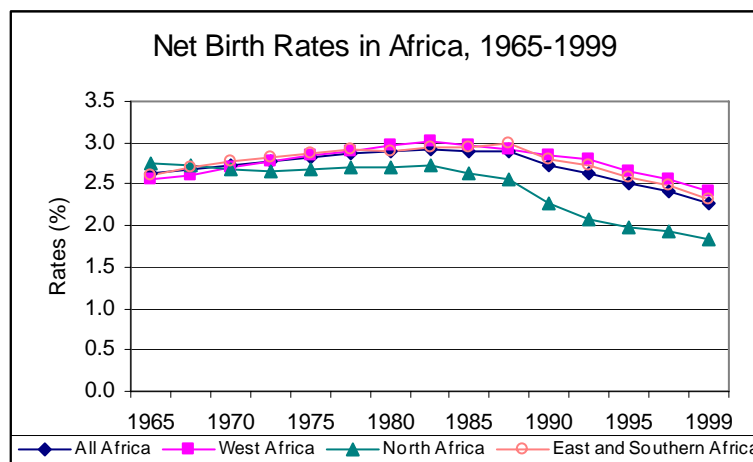
Source: Estimates based on data from World Bank's Africa Database 2002.

TABLE 2: NET BIRTH RATE AND HUMAN DEVELOPMENT PERFORMANCE IN AFRICA

High Net Birth Rate & Medium Human Development				High Net Birth Rate & Low Human Development			
1981-1990		**1991-2000**		**1981-1990**		**1991-2000**	
Algeria	(2.7, 0.6)	Cameroon	(2.7, 0.5)	Benin	(3.1, 0.4)	Benin	(2.8, 0.4)
Botswana	(3.3, 0.7)	Congo, Rep.	(2.8, 0.5)	Burkina Faso	(2.8, 0.3)	Congo, Dem. Rp.	(3.1, 0.4)
Cameroon	2.8, 0.5)	Swaziland	(2.7, 0.6)	Burundi	(2.8, 0.3)	Mali	(3.0, 0.3)
Congo, Rep.	(2.9, 0.5)	Madagascar	(3.1, 0.5)	Congo, Dem. Rp.	(3.3, 0.4)	Niger	(3.3, 0.3)
Ghana	(3.1, 0.5)	Cape Verde	(2.9, 0.7)	Cote d'Ivoire	(3.1, 0.4)	Uganda	(2.9, 0.4)
Kenya	(3.3, 0.5)	Nigeria	(2.7, 0.5)	Ethiopia	(3.0, 0.3)	Mauritania	(2.7, 0.4)
Swaziland	(3.0, 0.6)			Madagascar	(3.2, 0.4)	Chad	(2.9, 0.3)
Togo	(2.9, 0.5)			Malawi	(3.1, 0.4)	Burkina Faso	(2.7, 0.3)
Zambia	(3.3, 0.5)			Mali	(3.0, 0.3)	Ethiopia	(2.7, 0.3)
Zimbabwe	(2.9, 0.6)			Niger	(3.1, 0.3)	Senegal	(2.7, 0.4)
				Nigeria	(3.0, 0.4)		
				Rwanda	(2.7, 0.4)		
				Senegal	(2.8, 0.4)		
				Tanzania	(3.1, 0.4)		
				Uganda	(3.2, 0.4)		
No. of countries	*10*		*6*	*No. of countries*	*15*		*10*

Low Net Birth Rate & Medium Human Development				Low Net Birth Rate & Low Human Development			
1981-1990		**1991-2000**		**1981-1990**		**1991-2000**	
Cape Verde	(2.7, 0.6)	Botswana	(2.1, 0.6)	Central Afr. Rep.	(2.4, 0.4)	Zambia	(2.5, 0.4)
Egypt	(2.4, 0.6)	Algeria	(2.1, 0.7)	Chad	(2.6, 0.3)	Burundi	(2.3, 0.3)
Equa. Guinea	(2.4, 0.5)	Ghana	(2.3, 0.5)	Guinea	(2.6, 0.3)	Cote d'Ivoire	(2.2, 0.4)
South Africa	(2.4, 0.7)	Kenya	(2.4, 0.5)	Mauritania	(2.6, 0.4)	Malawi	(2.5, 0.4)
Morocco	(2.5, 0.5)	Morocco	(1.9, 0.6)	Mozambique	(2.6, 0.3)	Rwanda	(2.0, 0.4)
		Togo	(2.5, 0.5)	Sudan	(2.4, 0.4)	Tanzania	(2.6, 0.4)
		Zimbabwe	(2.0, 0.5)			Central Afr. Rep.	(1.9, 0.4)
		Egypt	(1.9, 0.6)			Guinea	(2.4, 0.3)
		Equa. Guinea	(2.5, 0.6)			Mozambique	(2.3, 0.3)
		South Africa	(1.8, 0.7)				
		Sudan	(2.1, 0.5)				
No. of countries	*5*		*11*	*No. of countries*	*6*		*9*

Notes:

(i) The expressions 'high' and 'low' are used to show 'above average' and 'below average' respectively. For each of the two variables, the cut-off is determined by the 20 year average (i.e., 1981-2000) for all countries in the sub-region using cross-country time series data. In the case of net birth rate, the average was about 2.7%. The categorization of the human development index (HDI) is quite similar to that of the UNDP which classifies an index value of less than 0.5 as 'low human development', and an index between 0.5 and 0.79 as 'medium human development'.

(ii) The net birth rate is defined as the difference between crude birth rate and death rate. This is expressed as per 1,000 population but we have converted this into percentage. Therefore, the net birth rates are in percent.

Source: Author's calculations based on data from the UNDP's Human Development Reports and World Bank's Africa Database 2002.

Table 2 shows the emerging pattern between net birth rates (i.e., demography) and the human development index (made up of education and adult literacy rates, life expectancy and per capita income). A sample of 36 countries in Africa chosen on the basis of data availability has been used to show demographic-human development 'movements' from 1981-1990 to 1991-2000. For example, the Table shows that Ghana moved from a high net birth rate and medium human development category in 1981-1990 to a low net birth rate and medium human development category in 1991-2000.

To summarize the information we have used a matrix in Table 3 which is based on the country specific performance shown in Table 2. Our results show that 6 out of 36 African countries in our sample (i.e., about 17%) moved (temporal or permanent) from a high net birth rate and medium human development category to a low net birth rate and medium human development category between the two-ten year period.

TABLE 3: AFRICA'S NET BIRTH RATE AND HUMAN DEVELOPMENT PERFORMANCE MATRIX

	From			
	1981-1990			
	HNB & MHD	HNB & LHD	LNB & MHD	LNB & LHD
To				
1991-2000				
HNB & MHD	**3**[a]	2[b]	1[c]	0
HNB & LHD	0	**8**[d]	0	2[e]
LNB & MHD	6[f]	0	**4**[g]	1[h]
LNB & LHD	1[i]	5[j]	0	**3**[k]

Notes:
  (i)   HNB, MHD, LNB and LHD represent high net birth rate, medium human development index, low net birth rate and low human development index respectively.
  (ii)   The values in the Table refer to the total number of countries.
  (iii) The countries in the cell labeled 'a' are Cameroon, Congo and Swaziland; 'b' represents Madagascar and Nigeria; 'c' represents Cape Verde; 'd' is made up of Benin, Burkina Faso, Congo Democratic Republic, Ethiopia, Mali, Niger, Senegal and Uganda; 'e' represents Chad and Mauritania; 'f' comprises Algeria, Botswana, Ghana, Kenya, Togo and Zimbabwe; 'g' represents Equatorial Guinea, Egypt, South Africa and Morocco; 'h' represents Sudan; 'i' is Zambia; 'j' comprises Burundi, Cote d'Ivoire, Malawi, Rwanda and Tanzania; and 'k' represents Central African Republic, Guinea and Mozambique.
Source: Based on Table 2

Five countries (i.e., 14% of countries) have moved from high to low net birth rates but are still in the low human development category. Plausibly these countries are in an intermediate phase as part of the process of moving into a medium human development category. The numbers shown in bold along the diagonal show the number of countries which have not experienced any movements from one classification to another. For example, 3 countries have maintained their status as experiencing high net birth rates and medium human development; 8 countries are still in their initial classification as high net birth rate and low human development countries.

3. Modeling Demographic Outcomes in Africa

3.1 Empirical Approach

There is a growing literature on demographic patterns in general and fertility in particular as seen in the works of authors like Brookins and Brookins (2002), Lam and Luryea (1998), Robinson (1997), Benefo and Schultz (1996), Brass (1996), Ainsworth *et al.* (1996), Montgomery *et al.* (1995), Schultz (1994), Murphy (1992), McNicoll (1992), Hirschman and Guest (1990) and Sprague (1988). This literature on demographics has its roots in the work of Becker (1960). The household production model provides a microeconomic framework for considering the issue of time allocations especially the importance of women's work outside the home and its competition with her time allocated for child rearing activities. It has also provided the impetus for considering 'quality' and 'quantity' issues in modeling the demand for children.

Our empirical approach dwells on modeling two demographic outcomes, namely, total fertility and infant mortality rates. Each of these dependent variables is regressed on a common set of independent variables, notably, educational attainments and urban population ratio. The latter is used as a measure of development. In urban Africa, standards of living are relatively higher than in rural Africa. The unbalanced nature of economic and social infrastructural provision, notably, highways, schools, hospitals, safe drinking water and electricity, puts urban localities ahead of rural localities. Poverty incidence tends to be lower in urban than rural areas. Arguably, using the urbanization ratio as a proxy for development in our model could help reflect the impact of development on mortality and fertility rates in Africa. In terms of educational attainment, we use secondary education enrolment ratio as a proxy.

The models for the two demographic variables are estimated using a cross-country framework. A total of 39 African countries are included in our sample. Three ten-year average data sets for each country spanning 1970 through 1999 were used. This gives a sample size of 117. The list of specific countries included in our sample is shown in the appendix. We include time dummy variables to capture fixed effects. We also capture regional effects through the use of regional dummy variables.

We augment the cross-country analysis with a country-specific analysis using household datasets from the Ghana living standards survey. This approach makes it possible to consider the effects of different levels of education on the survival rates of children, while at the same time controlling for household characteristics such as ethnicity, household headship and religion. These models are estimated by ordinary least squares with heteroskedasticity-corrected standard errors. The results from the estimations are presented in the next section.

3.2 Model Results and Interpretation

Our cross-country analysis shows the importance of education and urbanization (i.e., development) in reducing fertility and infant mortality rates. These variables are statistically significant for our pooled model on Africa. The time dummy variables also show that, relative to the 1970s, the 1990s have been associated with reductions in total fertility on the continent. The regional dummy variables show that, relative to West Africa, other sub-regions (i.e., Central Africa and East and Southern Africa) have

experienced reductions in fertility and infant mortality in a statistically significant way. This is not to say that fertility and infant mortality rates have not decreased in West Africa. It only shows that these reductions appear to be much higher in the other regions than in West Africa. This confirms our earlier observed trend in net birth rates.

TABLE 4: FERTILITY DETERMINANTS IN AFRICA

Dependent variable: Total fertility rate
Estimation method: OLS

	All Africa		West Africa		East & Southern Africa		North & Central Africa	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Secondary education	-0.039	-6.33*	-0.024	-2.44**	-0.056	-5.27*	-0.020	-1.92***
Urban population ratio	-0.022	-2.88*	-0.020	-2.11**	-0.017	-1.22	-0.033	-2.24**
Dummy 1980-1989	0.149	0.95	0.136	0.71	0.251	0.90	-0.109	-0.36
Dummy 1990-1999	-0.497	-2.93*	-0.546	-2.50**	-0.278	-0.94	-0.913	-2.87*
Dummy Central Africa	-0.353	-1.73***						
Dummy East & Southern Africa	-0.296	-1.85***						
Dummy North Africa	-0.139	-0.59						
Intercept	7.799	39.54*	7.527	35.37*	7.615	30.71*	7.672	19.13*
F statistic	31.86		14.22		22.53		15.96	
Adj. R-squared	0.651		0.582		0.647		0.674	
No. of observations	117		39		48		30	

Note: *, ** and *** represent statistical significance at the1%, 5% and 10% levels respectively. The reference category for the regional dummy variables is West Africa (i.e., Dummy West Africa).

TABLE 5: INFANT MORTALITY DETERMINANTS IN AFRICA

Dependent variable: Infant mortality rate
Estimation method: OLS

	All Africa		West Africa		East & Southern Africa		North & Central Africa	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Secondary education	-1.015	-5.08*	-1.155	-2.71*	-1.614	-5.13*	-0.328	-1.32
Urban population ratio	-0.759	-3.03*	-1.007	-2.40*	-0.399	-0.95	-0.752	-2.07**
Dummy 1980-1989	-12.283	-2.42**	-11.415	-1.36	-6.078	-0.73	-23.058	-3.08*
Dummy 1990-1999	-20.896	-3.80*	-25.088	-2.63**	-6.561	-0.75	-37.604	-4.83*
Dummy Central Africa	-7.401	-1.12						
Dummy East & Southern Africa	-9.261	-1.79***						
Dummy North Africa	3.151	0.41						
Intercept	163.452	25.58*	173.541	18.65*	151.556	20.53*	152.984	15.55*
F statistic	25.29		15.52		19.33		18.02	
Adj. R-squared	0.594		0.605		0.609		0.701	
No. of observations	117		39		48		30	

Note: *, ** and *** represent statistical significance at the1%, 5% and 10% levels respectively. The reference category for the regional dummy variables is West Africa (i.e., Dummy West Africa).

Disaggregating the data on regional basis, gives similar results obtained in the pooled model. Schooling effects tend to be strongest in East and Southern Africa. However, the urbanization ratio does not appear to be a statistically significant determinant of fertility and infant mortality in East and Southern Africa, even though the variable bears the expected negative sign.

Our Ghana country case study, which is based on married couples between the ages of 31 and 49 years shows the importance of educational attainments.[2] For this group, the average age for couples is 39.3 years. The average survival rates of children is 89%. There are however, educational differences. For those without any schooling, the survival rates of children is 86%; this rises to 89% for those with primary school education; and 91% for those with either middle school or junior secondary education. Looking at both general education and specific education, we observe the significant effects of these variables on the survival rates of children.

TABLE 6: THE IMPACT OF EDUCATION AND OTHER DEVELOPMENT INDICATORS ON CHILD SURVIVAL RATES IN GHANA (1999)

Dependent variable: Child Survival Rate Estimation technique: OLS				
	Model 1		Model 2	
	Coef.	t-value	Coef.	t-value
General Education				
Primary school	0.034	1.75***	0.028	1.47
Middle school/Junior secondary	0.022	1.24	0.012	0.67
Senior secondary	0.105	5.42*	0.084	3.45*
Polytechnic	0.083	3.33*	0.056	2.15**
University	0.104	4.31*	0.073	3.06*
Specific Education				
Vocational training	0.046	1.50	0.016	0.52
Technical training	0.086	3.83*	0.054	2.30**
Teacher training	0.059	2.37**	0.047	1.89***
Nursing training	0.092	2.10**	0.076	2.10**
Development Indicators				
Urbanization incidence			0.021	2.24**
Electricity availability			0.034	3.48*
Child immunization incidence			0.033	2.89*
Constant	0.964	23.50*	0.901	19.66*
Sample size	1438		1438	

Note: *, ** and *** represent statistical significance at the1%, 5% and 10% levels respectively. The models control for religion, household headship, ethnicity, migrant status, and age.
a: Education levels are dummy variables with a value of 1 if respective level is applicable, and a value of zero if otherwise. Excluded is the 'no schooling' category.
b: Urban variable is a dummy variable with a value of 1 if household lives in an urban locality and zero if otherwise.
c: Electricity availability is a dummy variable with a value of 1 if household has electricity and zero if otherwise.
d: Child immunization is a dummy variable with a value of 1 if child has been immunized.

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[2] We are grateful to the Ghana Statistical Service for the household level data from the 1998/99 Ghana living standards survey.

The levels of schooling shown in Table 6 are to be interpreted in relation to the 'no schooling' category. In terms of general education, higher levels of education tend to be associated with stronger and significant impact on the survival of children. The channel of impact could be seen as both direct and indirect. Education provides knowledge that could be applied in the home setting to ensure safe and healthy environments for children. Educational attainment also matters in labour market participation and earnings obtained from such participation. Empirical studies show that earnings are a direct function of years of schooling. Such higher earnings obtained by those with relatively higher levels of education tend to provide the financial resources needed for the much needed nutritional balance for children, among others. In terms of specific training, it is not surprising to finding that nursing training is not only statistically significant in increasing child survival but also exerts the strongest marginal impact compared to other types of specific training, *ceteris paribus*.

The availability of electricity, relative to non-availability, matters in child survival. As an indicator of economic development for a developing economy like Ghana, its availability tends to contribute towards the creation of an enabling environment for the recipient communities or regions. Its presence tends to be associated with more non-farm economic activities and relatively higher earnings and standards of living. Further analysis of our data shows that in regions where more households have access to electricity, poverty incidence is low and where electricity is almost non-existent as in rural areas poverty incidence is high. Again regions with high accessibility to electricity tend to register relatively higher survival rates of children.

TABLE 7: DEVELOPMENT AND GENDER EDUCATIONAL EFFECTS ON CHILD SURVIVAL IN GHANA (1999)

Dependent variable: Child Survival Rate
Estimation technique: OLS

	Model 1		Model 2		Model 3	
	Coef.	t-value	Coef.	t-value	Coef.	t-value
Married Woman's Educational Level[a]						
Primary school	0.036	2.53**	0.036	2.58**	0.034	2.46**
Middle/Junior secondary	0.025	2.01**	0.027	2.16**	0.023	1.85***
Post Junior Secondary	0.048	2.58**	0.051	2.68*	0.045	2.34**
Husband's Educational Level						
Primary school	0.030	2.10**	0.026	1.83***	0.027	1.87***
Middle/Junior secondary	0.011	1.15	0.008	0.84	0.006	0.63
Post Junior Secondary	0.043	4.22*	0.038	3.75*	0.034	3.34*
Development Indicators						
Urban locality [b]	0.038	4.67*	0.039	4.72*	0.027	2.88*
Electricity availability [c]					0.023	2.43**
Child immunization incidence [d]			0.031	3.34*	0.031	3.36*
Constant	0.851	51.34*	0.832	47.12*	0.833	47.11
No. of observations	2266					

Note: *, ** and *** represent statistical significance at the 1%, 5% and 10% levels respectively. The models control for religion, household headship, age and ethnicity.

Equally important for child survival is child immunization. Our results show that, child immunization, relative to no immunization, increases child survival rate. Given the

relative advantaged situation of urban areas, it is no surprise that such localities, relative to rural localities, are associated with positive impact on the survival rates of children, other factors constant.

An alternative specification involving an examination of married women's education and that of their husbands' on the child survival is shown in Table 7. Education effects for both females and their spouses on the survival rates of children are positive, as expected. Relative to no schooling, the effect of married women's primary school completion on the survival rate of their children is about 1.2 times larger than that of their husbands'. In the case of post junior secondary school completion, the effects are quite similar for women and their spouses, holding all other factors constant.

4. Conclusion and Policy Implication

Our major objective in this paper has been to examine the relationship between education, demography and development in Africa. Notwithstanding the increase in gross primary and secondary enrolment ratios in Africa, these are relatively lower than the average for the developing world. A negative correlation exits between human development and total fertility rate. The evidence shows that so far 17% of countries in Africa have moved from high to low net birth rates and at the same time maintained their medium human development status. There are also 11% of countries which have not moved from their original classification as 'low net birth rate and high human development performers'. Educational attainment reduces total fertility and infant mortality rates in a significant way. This is true for Africa as a whole, as well as the sub-regions.

A major development policy implication of our study is that the interplay of sustained efforts at improving education levels, especially of the girl-child, health services availability and employment opportunities could help reduce both fertility and infant mortality rates at a faster pace. While encouraging more educational enrolments is a step in the right direction, it is important for social policy to address the issue of capacity to contain rising trend in enrolments. Educational infrastructure needs to be put in place. Investing in trained teachers to keep pace with rising enrolments is important to ensure school quality. Provision of teacher incentives to attract and retain teachers on the continent cannot be overlooked. A policy on community involvement in educational service delivery can also be used to sustain community interest in the education of their children.

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