

Does increase in proportion of educated women rise modern contraceptive use in sub-Saharan Africa?

1. Background

A comprehensive review of ICPD five years to the end of the ICPD and MDG programme cycles (2014 and 2015 respectively) shows that many sub-Saharan African (SSA) countries are lagging behind in terms of SRH indicators (UNECA, UNFPA, & AUC, 2009; The World Bank, 2010; Cleland, Ndugwaa, & Zulu, 2011). Both within and across countries, differentials and changing modern contraceptive use patterns have been explained largely as resulting from socio-economic and sometimes socio-cultural differences among groups. Particularly, large body of research has emphasized the importance of women's education in contributing to increase the use of modern contraceptive methods both directly at the individual level and indirectly through the diffusion process (Rutenberg, Ayad, Ocho, & Wilkinson, 1991; Jejeebhoy, 1995; Ainsworth, Beegle & Nyamete, 1996; Kravdal, 2002).

Hopefully, SSA is performing well on education targets. Overall, between 2000 and 2010, Education Index in sub-Saharan Africa increased from 0.34 to 0.39. Likewise, from 2000 to 2010, the number of expected years of schooling in sub-Saharan Africa rose from 3.9 to 4.4 years.

Against this background, this study aims to: (1) Describe trends in modern contraceptive prevalence by female education; and (2) Identify the source of educational changes in modern contraceptive use (changes in structure or changes in population behavior). Understanding these compositional effects will be important to comprehending mixed patterns in fertility trends in SSA. Indeed, despite increase in proportion of women with secondary education, several SSA countries are still at an early stage of fertility transition (e.g. Tanzania, Rwanda, Mozambique and Guinea), while some others are at pre-transition fertility levels (e.g. Mali, Niger and Uganda). About 15 African countries are experiencing stall in fertility decline (Ezeh, Mberu, & Emina, 2009).

2. Data and methods

Data

The analyses rely on data from the Demographic and Health Surveys conducted in sub-Saharan Africa since the 1980s. We select all countries of sub-Saharan Africa where at least two comparable surveys have been conducted. Table 1 in appendix lists the 25 countries (80 surveys) included in this study. They are representative of SSA countries: East, West, Central and South. In addition, they are at different stage of their demographic transition. For instance, TFR at the last survey varies between 3.6 children per woman in Namibia (2007) and 7.0 children per woman in Niger (2006).

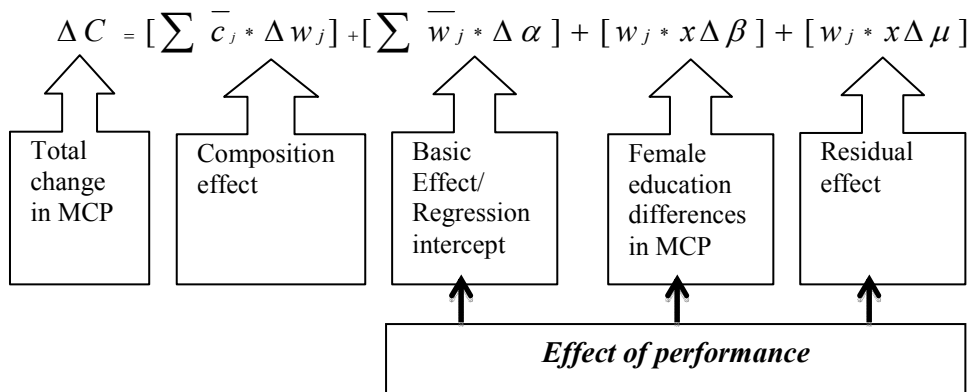
This study uses three types of variables:

- One exposure variable: female education which includes three categories: non-educated, has primary education and has secondary education or higher;
- One dependent variable: modern contraceptive prevalence (MCP).

3.2 Statistical methods

This study relies on three complementary methods: descriptive, decomposition and longitudinal multivariate models. Descriptive analysis allows reporting of trends in modern contraceptive use by female education over time.

The decomposition approach divides the trends in modern contraceptive prevalence into change in population composition and change in behavior using information from the first and the last survey. The historical change in contraceptive use depends on: (1) trends in proportion of women per education level (composition effect); (2) Overall change in contraceptive use or the basic effect that is the regression intercept when $x=0$ (α); (3) Variation of contraceptive use by education category measuring the increased in MCP associated with a unit increase in women education (β), and the residual effect of other variables not considered as e error term (μ). This change can be presented as follow:



Last, we use fixed-effect (FE) regression model to explore the relationship between female education and modern contraceptive use within country. The equation for the fixed effects models is displayed below:

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it}$$

Where:

- α_i ($i=1\dots n$) is the unknown intercept for each entity (n entity-specific intercepts);
- Y_{it} is the dependent variable (modern contraceptive use) where i =entity and t =time;
- X_{it} represents the independent variable (female education);
- B_1 is the coefficient for the independent variable;
- μ_1 is the error term.

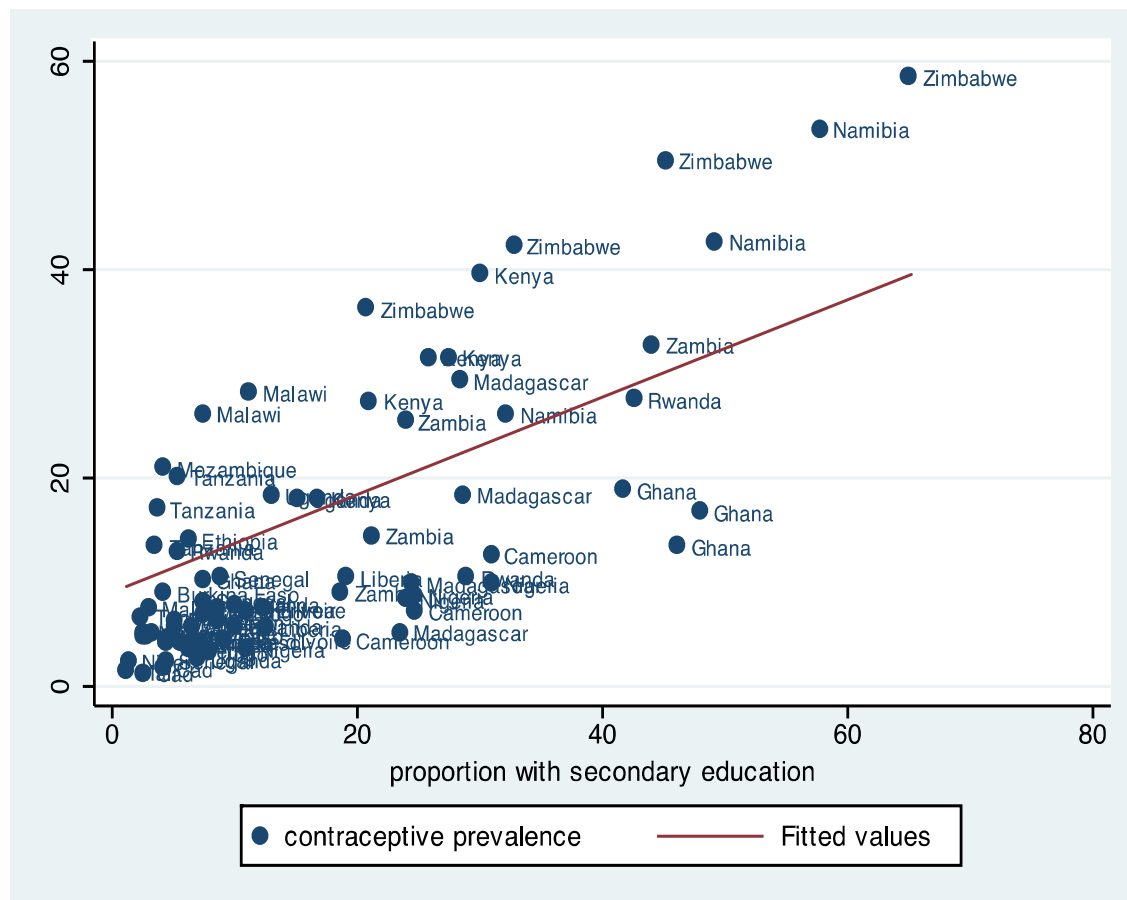
3. Results

3.1 Women education and trends in modern contraceptive in sub-Saharan Africa

Table 3 presents trends in contraceptive use by women education in the countries under study. Findings suggest that on average between the first surveys and the last one, modern contraceptive use in SSA increased from 7.5 percent to 18.0 percent. The high MCPs are observed in Zimbabwe (36 percent) in the first survey (1988) and 58 percent in the last survey (2006). Consistent with previous studies, MCP is highest among the most educated women. Though proportion of women with secondary education or higher is positively associated with modern contraceptive, the intensity of the relationship depends on the context. For instance with about 50 percent of women with secondary education, prevalence

of modern contraception is estimated at less than 20 percent in Ghana, around 30 percent in Rwanda and Zambia, whereas it is above 40 percent in Namibia and Zimbabwe (Figure 1).

Figure 1 – Trends in modern contraceptive use and proportion of women with secondary education in sub-Saharan Africa.



3.2 Source of changes in women education differences in modern contraceptive use

Overall increase in MCP over the study period is due to adoption of new reproductive behavior than the decrease in proportion of non-educated women (effect of composition) (see Table 3 in appendix). However, composition effect is the main source of MCP changes in Chad and Eritrea. Furthermore, the effect of composition on MCP changes is greater than 30 percent in Cameroon, Liberia, Nigeria and Zimbabwe.

3.3 Fixed effects of trends in proportion of women with secondary education on trends in contraceptive use in sub-Saharan Africa

Findings from regression models (Table 4 in appendix) confirm positive association between proportion of women with secondary education and contraceptive use ($\beta=0.87$, $P<0.00$). However, the magnitude of this effect varies across countries. Compared to Zimbabwe (country with higher contraceptive prevalence), the effect of female education is greater and significant in Kenya, Malawi, Mozambique and Tanzania. Probably, the diffusion effect is small in these these countries. The opposite results are observed in Chad, Ghana and Nigeria. This could be explained by homogeneity in contraceptive use, low proportion of

women with secondary education, and/or low prevalence of modern contraception in the country.

Change in female education differences in contraceptive use trends is not significant in 17 countries. These countries could be grouped into two categories. The first group including Namibia is characterized by increase in contraceptive use regardless of category of education level. In the long terms, education will stop being a major factor of difference in contraceptive use in this group. Trends in the second group encompassing Niger could be explained by stalled or low performance in contraceptive use among the most educated women.

Conclusion

Using descriptive methods, decomposition analysis and fixed effect regression models, this study aimed to: (1) describe trends in modern contraceptive prevalence by female education; and (2) Identify the source of educational changes in modern contraceptive use (changes in structure or changes in population behavior). Analyses are based on data from 25 countries with at least two Demographic and Health Surveys.

Overall proportion of women using MCP has increased over the study period. The observed change is due to adoption of new reproductive behavior than to the decrease in proportion of non-educated women (effect of composition). However, composition effect is the main source MCP changes in Chad and Eritrea. Furthermore, the effect of composition on MCP changes is greater than 30 percent in Cameroon, Liberia, Nigeria and Zimbabwe.

Though increase in proportion of women with secondary education or higher is positively associated with change in modern contraceptive use, the intensity of the relationship and the sources of changes vary across countries. For instance with about 50 percent of women with secondary education, prevalence of modern contraception is estimated at less than 20 percent in Ghana, around 30 percent in Rwanda and Zambia, whereas it is above 40 percent in Namibia and Zimbabwe.

Therefore, to achieve universal access to family planning in sub-Saharan Africa, condition to slowing down demographic growth, increase in proportion of women secondary education should be associated with large economic, cultural and geographical access to modern contraceptive methods.

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Appendix

Table 1 – Sample description

Country	Period (1 st – last)	TFR Last survey	Region
Benin	1996-2006	5.7	West
Burkina Faso	1993-2003	5.9	West
Cameroon	1991-2004	5.0	Middle
Chad	1997-2004	6.3	Middle
Cote d'Ivoire	1994-1998	5.2	West
Eritrea	1995-2002	4.8	East
Ethiopia	2000-2005	5.4	East
Ghana	1988-2008	4.0	West
Guinea	1999-2005	5.7	West
Kenya	1989-2008	4.6	East
Liberia	1986-2009	5.8	West
Madagascar	1992-2003	5.1	South
Malawi	1992-2004	6.0	East
Mali	1987-2006	6.5	West
Mozambique	1997-2003	5.6	South
Namibia	1992-2007	3.6	South
Niger	1992-2006	7.0	West
Nigeria	1990-2008	5.7	West
Rwanda	1992-2008	5.5	Middle
Senegal	1986-2009	4.9	West
Tanzania	1992-2009	5.7	East
Togo	1988-1998	5.2	West
Uganda	1988-2006	6.7	West
Zambia	1992-2007	6.2	South
Zimbabwe	1988-2005	3.8	South
Average	1993-2005	5.0	
Standard deviation		1.0	
Coefficient of variation		0.20	
Minimum	1986 - 1998	4.0	
Maximum	2000-2009	7.0	

Source: STATcompiler website (www.measuredhs.com)

Table 2 – Trends in modern contraceptive use by women education in sub-Saharan Africa

	Survey 1				Survey 2				Trends ratio Ref=secondary	
	1	2	3	4	5	6	7	8	9	10
Country	None	Primary	Secondary	Total	None	Primary	Secondary	Total	None	Primary
Benin	2.1	7.0	11.1	3.4	5.3	8.9	19.7	7.2	1.6	0.4
Burkina Faso	1.9	12.7	31.6	4.2	3.2	13.1	36.6	4.8	3.5	0.2
Cameroon	1.2	4.5	11.8	4.3	1.8	7.4	14.4	7.1	2.0	2.5
Chad	0.5	2.5	12.8	1.2	0.5	2.6	18.1	1.6	0.0	0.1
Cote d'Ivoire	2.2	7.6	13.2	4.3	4.4	10.4	19.6	7.3	1.8	0.8
Eritrea	1.0	8.8	26.8	4.0	3.2	11.3	19.2	7.3	-3.5	-0.7
Ethiopia	3.7	13.2	33.0	6.3	9.8	21.9	45.9	13.9	3.0	1.5
Ghana	2.8	5.3	6.2	4.2	10.8	18.0	19.4	16.6	1.2	1.1
Guinea	2.9	8.0	17.0	4.2	4.3	9.3	18.4	5.7	5.0	1.9
Kenya	9.7	19.2	29.3	17.9	12.0	38.3	52.1	39.4	0.4	1.2
Liberia	2.5	6.6	22.1	5.5	7.4	10.4	18.0	10.3	-5.3	-2.2
Madagascar	1.0	3.6	12.6	5.1	17.6	30.9	34.4	29.2	2.9	2.1
Malawi	4.8	8.2	37.9	7.4	22.9	28.0	41.0	28.1	19.9	15.6
Mali	0.4	5.5	20.3	1.3	4.0	10.1	25.6	5.7	9.9	2.6
Mozambique	2.5	6.3	27.1	5.1	15.3	23.8	48.9	20.8	3.1	2.3
Namibia	14.2	17.3	46.4	26.0	31.5	44.6	62.6	53.4	2.7	3.2
Niger	1.5	7.1	28.5	2.3	3.4	11.3	28.9	5.0	58.7	33.3
Nigeria	1.3	5.4	13.7	3.5	2.6	12.0	18.9	9.7	2.2	2.5
Rwanda	11.1	13.0	27.5	12.9	19.0	28.7	42.7	27.4	1.2	1.8
Senegal	1.0	5.9	22.1	2.4	5.4	18.3	29.7	10.3	5.7	3.8
Tanzania	1.8	8.9	33.1	6.6	8.3	23.6	38.2	20.0	10.7	6.8
Togo	1.7	3.9	12.2	3.1	4.3	9.0	15.3	7.0	4.1	3.7
Uganda	0.9	2.7	11.3	2.5	9.1	17.2	34.7	17.9	2.1	1.7
Zambia	2.7	6.3	23.9	8.9	27.1	28.9	44.2	32.7	3.8	2.5
Zimbabwe	24.9	34.0	52.1	36.1	30.3	52.0	65.2	58.4	0.9	1.9
Average	4.0	8.9	23.3	7.3	10.5	19.6	32.5	17.9	5.5	3.6
Standard deviation	5.5	6.7	11.6	8.1	9.2	12.4	14.9	15.3	12.1	7.0
Coeff. of variation	1.4	0.8	0.5	1.1	0.9	0.6	0.5	0.9	2.2	1.9
Minimum	0.4	2.5	6.2	1.2	0.5	2.6	14.4	1.6	-5.3	-2.2
Maximum	24.9	34.0	52.1	36.1	31.5	52.0	65.2	58.4	58.7	33.3

Source : STATcompiler website (www.measuredhs.com)

Notes : (9) = $\frac{((\ln 5 - \ln 1) / (\text{year of survey 2} - \text{year of survey 1}))}{((\ln 7 - \ln 3) / (\text{year of survey 2} - \text{year of survey 1}))}$
 (10) = $\frac{((\ln 6 - \ln 2) / (\text{year of survey 2} - \text{year of survey 1}))}{((\ln 7 - \ln 3) / (\text{year of survey 2} - \text{year of survey 1}))}$

Table 3– Changes in modern contraceptive use by women education. Results from decomposition analysis

Country	Period	Performance effect				Composition effect	Global Change
		Base	Differentiation	Error	Total		
Benin	1996-2006	22%	56%	10%	88.1%	11.9%	2.71
Burkina Faso	1993-2003	4%	96%	2%	102.4%	-2.4%	4.59
Cameroon	1991-2004	-77%	146%	0%	69.1%	30.9%	8.16
Chad	1997-2004	-592%	547%	90%	45.5%	54.5%	0.44
Cote d'Ivoire	1994-1998	-14%	101%	5%	92.9%	7.1%	2.93
Erithrea	1995-2002	272%	-211%	-21%	39.9%	60.1%	3.25
Ethiopia	2000-2005	32%	56%	2%	90.1%	9.9%	7.60
Ghana	1988-2008	49%	40%	0%	89.4%	10.5%	12.35
Guinea	1999-2005	95%	0%	2%	97.1%	2.9%	1.43
Kenya	1989-2008	-27%	96%	7%	75.8%	24.3%	21.57
Liberia	2007-2009	221%	-144%	-9%	67.8%	32.2%	4.77
Madagascar	1992-2003	0%	49%	48%	98.3%	2.6%	24.00
Malawi	1992-2004	138%	-61%	9%	86.2%	13.8%	20.81
Mali	1987-2006	111%	-19%	-11%	81.0%	19.0%	5.61
Mozambique	1997-2003	53%	45%	0%	98.1%	1.9%	15.71
Namibia	1992-2007	78%	-5%	2%	75.0%	0.0%	27.44
Niger	1992-2006	133%	-31%	-29%	74.2%	25.8%	2.75
Nigeria	1990-2008	8%	52%	-6%	53.5%	46.5%	6.14
Rwanda	1992-2008	39%	43%	7%	88.7%	11.3%	14.49
Senegal	1986-2009	63%	26%	-15%	74.0%	26.0%	7.89
Tanzania	1992-2009	76%	-9%	18%	85.2%	14.8%	13.43
Togo	1988-1998	80%	9%	-3%	86.0%	14.0%	3.88
Uganda	1988-2006	1%	87%	-2%	86.8%	13.2%	15.35
Zambia	1992-2007	112%	-18%	0%	94.2%	5.8%	23.76
Zimbabwe	1988-2005	20%	39%	6%	65.3%	34.7%	22.32

Source: STATcompiler website (www.measuredhs.com)

Table 4 - Effect of proportion of trends in women with secondary education on contraceptive use by country in SSA

	Coeff..	P>t	95% confidence interval	
			0.74	0.99
<i>Proportion with secondary education</i>	0.87	0.00	0.74	0.99
Benin	-1.24	0.29	-9.25	6.77
Burkina Faso	2.53	0.05	-5.44	10.49
Chad	-13.73	0.33	-22.27	-5.18
Cameroon	-1.61	0.79	-11.35	8.14
Cote d'Ivoire	-2.05	0.35	-11.85	7.75
Eritrea	-2.90	0.29	-12.71	6.91
Ethiopia	5.11	0.07	-4.66	14.87
Ghana	-13.44	0.02	-20.66	-6.21
Guinea	-0.81	0.37	-10.58	8.96
Kenya	8.31	0.00	1.43	15.19
Liberia	-6.00	0.37	-15.94	3.94
Madagascar	-7.40	0.03	-15.04	0.25
Malawi	14.17	0.01	6.17	22.17
Mali	0.58	0.16	-6.33	7.49
Mozambique	9.87	0.12	0.12	19.61
Namibia	0.17	0.00	-9.71	10.06
Niger	1.82	0.18	-6.14	9.77
Nigeria	-12.30	0.16	-19.76	-4.84
Rwanda	-4.93	0.04	-12.35	2.48
Senegal	0.79	0.05	-6.15	7.72
Tanzania	10.86	0.01	3.96	17.76
Togo	-3.22	0.50	-13.03	6.59
Uganda	1.70	0.10	-5.33	8.73
Zambia	-3.26	0.01	-10.95	4.42
Zimbabwe	Reference			