

ORIGINAL RESEARCH ARTICLE

Estimating the Impact of Birth Control on Fertility Rate in Sub-Saharan Africa

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ABSTRACT

Using a cross-country data drawn from 40 countries and a multiple regression analysis, this paper examines the impact of birth control devices on the rate of fertility in sub-Saharan Africa. Our *a-priori* expectations are that the more women used birth control devices, the less will be the fertility rate in sub-Saharan Africa. The result obtained from the study indicates that except for withdrawal method that fall contrary to our expectation other variables (methods) like the use of pills, injection, intra uterine device (IUD), condom/diaphragm and cervical cap, female sterilization and periodic abstinence/rhythm fulfilled our *a-priori* expectations. These results notwithstanding, the paper suggests measures, such as the need for massive enlightenment campaign on the benefit of these birth control devices, the frequent checking of the potency of the devices and good governance in the delivery of the devices (*Afr J Reprod Health* 2009; 13[4]:137-145).

RÉSUMÉ

Evaluation de l'impact du contrôle des naissances sur le taux de fécondité en Afrique subsaharienne. Cette étude examine l'impact des méthodes du contrôle des naissances sur le taux de fécondité en Afrique subsaharienne à l'aide des données à travers champs recueillies dans 40 pays et d'une analyse de la régression multiple. Nos espérances **a priori** sont que plus les femmes emploient les méthodes du contrôle des naissances, plus le taux de fécondité en Afrique subsaharienne baissera. Le résultat obtenu montre qu'à part la méthode du coït interrompu qui a baissée contrairement à ce que nous nous attendions, les autres variables (méthodes) comme l'emploi des pilules, l'infection, le dispositif intra-utérin (DIU), le préservatif, la stérilisation féminine et l'abstinence périodique/le rythme ont satisfait toutes nos espérances **a priori**. Malgré ces résultats, l'étude propose des mesures telles la nécessité de lancer une grande campagne de sensibilisation sur les bienfaits de ces méthodes du contrôle des naissances, la vérification fréquentes de l'efficacité des méthodes et la bonne gouvernance en matière de la prestation de ces méthodes (*Afr J Reprod Health* 2009; 13[4]: 137-145).

KEYWORDS: Birth Control, Fertility, Sub-Saharan Africa

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Introduction

The increase in the rate of fertility in less developed countries is worrisome that all measures including contraceptive devices suggested or put in place at national, community and household levels in reducing it seem not to have had much impact. Several reasons are deduced for the increase in fertility rate. Key among them are: (i) the proportion of women in sexual unions which in turn is affected by other demographic factors including the age at first marriage or union, the pervasiveness of marriage and other unions, rates of divorce, separation and remarriage and male mortality levels; (ii) the percentage of women using contraceptives like surgical sterilization, oral birth control pills/implants, intrauterine devices (IUD), condom/diaphragm and cervical cap, traditional methods (like abstinence, withdrawal, rhythm and sympto-thermal method); (iii) the proportion of women who are breastfeeding an infant since exclusive breastfeeding of an infant can lengthen the period of time before menstruation resumes; and (iv) the level of induced abortion which is used to end pregnancy by removing the unborn fetus^{1, 2, 3,4, 5, 6, 7, 8,9}.

A number of studies also linked the reasons for the increase in fertility rate to the theory of fertility which assumed that in many ways children are consumption and investment goods. It follows therefore that the demand for children at the household level can be influenced by family preferences for a certain number of surviving children i.e. in regions of

high mortality, parents may produce more children than they actually desire in the expectation that some will not survive. As investment good, children especially in poor societies, are seen as economic investment goods to the extent that there is an expected return in the form of child labour and the provision of financial support for parents in old age when their children reach adulthood and earn a living^{10, 11, 12}.

In sub-Saharan Africa, increase in fertility rate is linked to a number of factors. For instance, to become a socially recognized adult, fertility enhances female and male status while infertility can result in severe anxiety and particularly for women can be socially and economically devastating. Widespread practice as polygamy and women marrying considerably older men are also case in point since they tend to increase women's eventual economic and social dependence on their children and hence their willingness to bear many children. The preference for many children is also linked to economic consideration. In many communal land tenure systems, the amount of land allocated for farming in a family by the community (through its head) is a function of the family's ability to clear and cultivate land. With hired labour in most settings being rare, it is family size or more correctly family labour that determines land allotment¹³.

Other traditional reasons attached to high fertility rate are the status and wealth attached to it (i.e. the more children you have the wealthier you are regarded); the religious values linked to it, since reproductive failure is associated

to sin; and the moral responsibility of every child bearing person to strengthen their clan or family numerically. Generally, in the African context, to limit family size is a selfish act of individuals unwilling to make personal sacrifices for the good of the larger society^{11, 14}.

The consequences that comes with the increase in fertility rate include among others; an improvement in the status and wealth of the individuals or families, and an increase to social security at old age of parents in the society, since increase in fertility rate implies that the family, the community or the society is assured of sufficient manpower to provide defense for the community and more working hands in farm and non-farm activities. On the contrary, the increase has lead to increase in poverty, deterioration of social and physical infrastructures due to pressure on the use of the facilities, rising unemployment especially among youths, social unrest, rise in the rates of crime and rise in the cost of living, malnutrition, ill health, environmental degradation, increase primary and secondary school enrolments that never commensurate with the available facilities in schools^{15, 16, 17}. As indicated in Table 1, the rate of fertility in some countries in the sub-region has continued to put pressure on government expenditure in education, the use of land and increased the rate of urban population. For instance, Cameroon witnessed an increase in its urban population from 35.5 percent in 1985 to 53.7 percent in 2006.

Drawing from these consequences, to what extent has the existing birth control devices impacted on the rate of fertility in sub-Saharan Africa? And what measures would be required to improve the use of these devices? Answers to these questions are sought for using a cross-country data from some selected countries in sub-Saharan Africa and a multiple regression analysis.

The rest of the paper is structured as follows: Section two provides the materials and method of analysis. Section three provides and discusses the results. Conclusion and recommendations are contained in the last section.

Materials and Methods

Unlike the studies by a number of scholars that examined the proximate determinants of fertility rate (which not only considered the use of contraceptives but other socio-economic factors like age structure, educational level, religion and occupational status among others factors), this study is only concerned with the impact of some key birth control devices on fertility rate in sub-Saharan Africa^{5, 6, 7, 9}.

In this study thus, fertility rate is referred to as the average number of children that would be born alive to a woman during her lifetime, if she were to bear children at each age in accordance with prevailing age-specific fertility rates^{1, 2, 15, 20}. On the other hand, birth control is the conscious effort of couples to regulate the number and spacing of births by preventing the fertilization of the egg by a male sperm in the fallopian tubes of a female. Also

Table 1: Rate of Fertility and some Social Indicators in Selected Countries in Sub-Saharan Africa (1985 and 2006)

Country	Fertility Rate (%)		Primary School Enrolment (Gross) (%)		Total Education Expenditure (% of GNI)		Land Use as % of Land Area		Urban Population % of Total Population	
	1985	2006	1985	2006	1985	2006	1985	2006	1985	2006
Angola	7.2	6.6	106.5	91	5.1	-	97.3	97.4	23.1	38.6
Benin	7.0	5.5	67.8	99	-	3.3	84.5	78.1	30.8	46.9
Botswana	5.3	3.0	105.3	105	6.2	-	99.3	96.8	25.6	53.0
Cameroon	6.2	4.4	102.2	117	2.9	4.0	84.6	82.8	35.5	53.7
Cape Verde	6.1	3.5	115.5	111	3.6	7.4	89.6	89.8	32.9	58.4
Central African Republic	5.7	4.7	75.1	56	2.1	-	96.8	96.8	35.6	44.3
Democratic Republic of Congo	6.7	6.3	86.5	62	1.0	-	96.5	93.3	28.2	33.4
Cote d Ivoire	7.1	4.6	71.7	72	6.3	-	81.7	75.4	35.2	46.3
Equat. Guinea	5.0	5.4	114.0	127	-	-	91.8	91.4	29.8	50.9
Ethiopia	6.8	5.3	37.7	77	3.0	4.6	87.3	80.2	11.8	16.5
Gabon	5.5	3.1	171.5	130	5.0	-	98.2	94.4	59.2	85.7
Ghana	6.3	3.9	75.0	81	2.6	-	82.0	70.7	31.9	46.8
Kenya	6.8	5.0	99.0	111	6.4	7.3	92.1	89.2	19.9	42.7
Lesotho	5.3	3.5	111.6	131	4.3	7.3	88.1	89.0	16.5	18.4
Madagascar	6.3	4.9	111.6	134	2.9	3.4	94.7	93.0	20.2	27.3
Mauritius	6.2	2.0	109.4	103	3.8	3.3	47.8	47.5	41.3	44.0
Mozambique	6.3	5.2	87.4	95	2.9	-	95.8	92.5	20.0	39.1
Namibia	6.2	3.3	135.0	101	6.6	7.5	99.2	98.9	26.2	34.0
Nigeria	6.0	5.4	103.6	99	1.2	-	65.0	84.8	31.5	49.1
Senegal	6.0	5.3	56.0	76	4.2	3.7	87.8	85.2	37.5	51.8
South Africa	4.1	2.7	110.2	105	4.2	5.4	88.5	87.3	45.3	58.3
Tanzania	6.4	5.3	75.1	101	3.5	-	95.0	88.3	17.3	38.5
Togo	6.7	4.9	93.0	101	4.9	2.7	60.7	49.5	26.9	37.0
Uganda	7.1	6.7	73.2	125	3.1	5.3	65.1	51.9	10.0	12.5
Zimbabwe	6.1	3.8	136.0	-	7.0	-	92.3	90.4	24.5	36.4

Source: ^{2, 18,19}

known as birth planning, family planning, fertility control, planned parenthood or contraception, some of the devices used includes surgical sterilization, oral birth control pills/implants, intrauterine devices (IUD), condom/diaphragm and cervical cap, traditional methods (like abstinence, withdrawal, rhythm and sympto-thermal method) and abortion. Surgical sterilization can be performed in both

men and women. It is a method that makes conception impossible by blocking the sperm ducts in men or the fallopian tubes in women. Such an operation is called vasectomy on a male and on female it is called laparoscopic sterilization, tubal ligation or tubectomy depending on the procedure used. The disadvantage of this method is that it is not reversible if a couple later desires to have children. The oral birth control pills

contain the sex hormones estrogen and progesterone. The drugs also called oral contraceptives hinder both the normal release of an egg once a month and the attachment of an egg to the uterus. In addition are contraceptive implants that consist of tiny capsules that are surgically place under the skin. The capsules slowly release hormone drugs into the body. Intrauterine devices, also called IUD's are tiny devices made of plastic and metal which are inserted into the uterus. The condom is a thin sheath worn over the penis during sexual intercourse. Sperm are trapped inside the condom. Related to condom is diaphragm and the cervical caps which are devices inserted into the vagina so that they cover the opening of the uterus. Used together with diaphragm is a spermicidal, a drug that kills sperm. The traditional methods include abstinence, withdrawal, and rhythm. Abstinence is not having sexual intercourse and the withdrawal method is when the male attempt to withdraw the penis from the vagina before the sperms are released. The rhythm method calls for avoidance of intercourse during the estimated period each month when an egg can be fertilized. Another traditional method is sympto-thermal method which combines the taking of temperature with the testing of mucus and other observation of changes in the cervix. The used of abortion is when pregnancy is terminated by removing the unborn fetus
16, 17, 21, 22, 23

In the course of estimating the impact of birth control on fertility in sub-Saharan Africa, a cross-country data drawn from 40 countries in sub-Saharan

Africa for the period 2005 and a multiple linear regression analysis of the Ordinary Least Square (OLS) were used (see Appendix 1). The data were obtained from the African Development Bank Selected Statistics on African Countries for the year 2007¹⁸, and African Development Bank Gender, Poverty and Environmental Indicators for African Countries for the year 2007¹⁹ and Population Reference Bureau World Family Planning Worldwide Data for the year 2007²⁴ and Population Reference Bureau World Population Data Sheet for the year 2008².

The first step in the use of OLS method is the specification of the model as indicated below:

$$FR = f(BC) \dots\dots\dots(1)$$

$$BC = f(\text{Pill, IUD, CDC, Fste, Pabs, Withd}) \dots (2)$$

When equation (2) is substituted into equation (1) it then becomes:

$$FR = f(\text{Pill, IUD, CDC, Fste, Pabs, Withd}) \dots (3)$$

When transformed into a multiple linear equation the model thus becomes:

$$FR = \beta_0 + \beta_1\text{Pill} + \beta_2\text{IUD} + \beta_3\text{CDC} + \beta_4\text{Fste} + \beta_5\text{Pabs} + \beta_6\text{Withd} + U \dots\dots\dots(4)$$

where FR = fertility rate (percentage of women of childbearing age 15-49years), BC = birth control devices, Pill = percentage of women that used pills as contraceptive, IUD = percentage of women that used intra uterine method of contraceptive, CDC = percentage of women that used condom/diaphragm and cervical cap as contraceptive, Fste = percentage of women that used sterilization method of contraceptive, Pabs = percentage of women that used periodic abstinence, Withd = percentage of women that

used withdrawal methods, β_0 = the intercept, $\beta_1 \dots \beta_6$ = the estimation parameters associated with the impact of the independent variables [birth control devices (Pill, IUD, CDC, Fste, Pabs, Withd)] on the dependent variable [fertility rate (FR)], and U = error terms.

To estimate the model, a multiple linear regression analysis was used in order to reflect the explanatory nature of the variables. To verify the validity of the model, two major evaluation criteria were used: (i) the *a-priori* expectation criteria which is based on the signs and magnitude of the co-efficient estimates of the variables under investigation; and (ii) statistical criteria based on statistical theory which in other words is referred to as the First Order Least Square Test consisting of R-square (R^2), F-statistic and t-test. The R-square (R^2) is concerned with the overall explanatory power of the regression analysis, F-statistic is used to test the overall significant of the regression analysis and the t-test is used to test the significant contribution of each of the independent variable on the dependent variable^{25, 26}.

Drawing from the model, our *a-priori* expectations or the expected pattern of behaviour of the independent variables (Pill, IUD, CDC, Fste, Pabs, Withd) on the dependent variable (FR) are Pill < 0, IUD < 0, CDC < 0, Fste < 0, Pabs, < 0, Withd < 0. An indication that the more the women used the birth control devices, the less the fertility rate in sub-Saharan Africa. The test is conducted at 5 percent level of significance.

Results and Discussion

The results of the multiple regression analysis of the model conducted at 5 percent level of significance are presented in Table 2.

Table 2: Regression results of birth control devices and fertility rate in sub-Saharan Africa

Variables	Co-efficient Estimates and t-value
Intercept (t)	6.61 (30.79)
Pill (t)	-4.86 (-1.94) **
Inj (t)	-2.64 (-0.64)
IUD (t)	-0.11 (-1.39)
CDC (t)	-0.009 (-1.93) **
Feste (t)	-0.0074 (-1.26)
Pabs (t)	-0.93 (-2.39) *
Withd (t)	0.46 (0.73)
R^2	.69
Adjusted R^2	.63
F	10.75

t-values in parenthesis

* Statistically significant at 5 percent level

**Statistically significant at 10 percent level

The regression results shows that the R^2 is 69 percent, which is the variation by which the dependent variable (fertility rate) is explained by the explanatory variables (birth control devices), while the error term take care of the remaining 31 percent which are variables in the study that can not be included in the model because of certain qualitative features. At 5 percent level of significance, the F-statistic show that the model is useful in determining if the explanatory variables (birth control devices) have any significant influence on the dependent variable (fertility rate), as the computed F-statistic which is 10.75 is greater than the tabulated F-statistic valued at 2.25.

In terms of the independent variables, the co-efficient estimates and the associated t-values of the use of pills, injection, intra uterine device (IUD), condom/ diaphragm and cervical cap, female sterilization and periodic abstinence/ rhythm forms of birth control have the expected signs, (thus fulfilling our a-priori-expectations). When viewed statistically only periodic abstinence is significant at 5 percent level, while the use of pill, condom/diaphragm and cervical cap are significant at 10 percent level. However, the use of injection, intra uterine device (IUD), and female sterilization are statistically insignificant. The co-efficient estimates and the associated t-value of the withdrawal method did not have the expected sign, thus contradicting our a-priori expectation. Statistically the method is also insignificant.

The expected signs of the use of pills, injection, intra uterine device (IUD), condom/ diaphragm and cervical cap, female sterilization and periodic abstinence/rhythm are indication that as more of these devices are used to control birth, the less the fertility rate in sub-Saharan Africa. This result further indicates that these devices are the most commonly used method of birth control, given the people's easy access to them and the uncontrolled numbers of patient medicine stores that sell some of them in the sub-region.

This assertion is also in accordance with the view of a number of scholars who found that most couples used either or a combination of these birth control devices in order to limit or space their

children for economic, social and medical reasons. The economic reasons are mostly linked to the recent economic hardships experienced in less developed countries because of the restrictive economic reforms introduced in these countries. In addition, governments of the countries in the sub-region have over the years been encouraging couples to limit the size of their families in order to prevent a rapid growth in the nation's population and to avoid some of the consequences of increase in fertility, like increase in poverty, rise in unemployment (especially among youths), social unrest and rise in the rate of crime and in the cost of living^{9, 15, 16, 17, 21, 23}.

Conclusion and Recommendations

An empirical study on the impact of birth control on fertility rate in sub-Saharan Africa was carried out using a cross-country data and a multiple regression analysis. Of all the birth control devices considered in this study only the withdrawal method ran contrary to our a-priori expectation, thus indicating that it did not have much impact in reducing fertility rate in sub-Saharan Africa. That the other devices (pills, injection, intra uterine device (IUD), condom/diaphragm and cervical cap, female sterilization and periodic abstinence/ rhythm) fulfilled our a-priori expectations does not mean that efforts should not be made to improve and sustained their usage, thus the governments in the sub-region must continue to show commitment in the implementation of their policies on birth control and make sure that the

implementation go hand-in-hand with enough enlightenment campaigns on the benefits of birth control.

The governments should also provide financial and logistic support to agencies responsible for the implementation, the monitoring and the evaluation of the successes of birth control programmes. The implementation, monitoring and evaluation of successes of the programmes must also be a matter of good governance with accountability and transparency in the delivery of funds and birth control devices serving as the guiding principles.

Resistance and skepticism that goes with the use of some of these devices should be put off the mind of the women and their husbands. The women and their husbands that always opposed the use of some of these devices should be made to understand that it is not all the devices that would lead to marital infidelity and that diseases from their usage can be avoided if the devices are properly applied and frequently checked for their potency and hygiene by medical practitioners.

Appendix 1: Countries Selected for the Study in Sub-Saharan Africa

Benin	Kenya	Namibia
Botswana	Lesotho	Sudan
Burkina Faso	Gambia	Sierra Leone
Central African Republic	Ghana	Rwanda
Chad	Guinea	Senegal
Burundi	Mali	South Africa
Cameroon	Mauritania	Zambia
Cape Verde	Liberia	Swaziland
Eritrea	Madagascar	Tanzania
Ethiopia	Malawi	Togo
Comoros	Niger	Uganda
Democratic Republic of Congo	Nigeria	Guinea Bissau
Cote d' Ivoire	Mauritius	Zimbabwe
	Mozambique	

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