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A Multivariate Decomposition Analysis

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ABSTRACT

Rwanda has experienced a dramatic increase in contraceptive use during the last several years. The contraceptive prevalence rate has increased from 17 percent to 52 percent between 2005 and 2010. Unmet need for family planning has declined from 38 percent to 19 percent; and the total fertility rate from 6.1 to 4.6 births. These achievements occurred in the context where the Rwandan government has been promoting family planning through various strategies. This study described the family planning initiatives in Rwanda and analyzed the 2005 and 2010 RDHS data to identify factors that contribute to the increase in contraceptive use. The Blinder-Oaxaca technique was used to decompose the contributions of women's characteristics and their effects.

With a mean predicted increase of 0.342 in contraceptive prevalence rate between 2005 and 2010, the most increase (77 percent) results from changes in effects of women's characteristics compared with changes in these characteristics (17 percent). Variables showing significant contribution in effects are women's education, experience of child mortality, and place of residence. Regarding the compositional differences, effects are relatively greater for woman's education, exposure to family planning messages in the media or at health facilities, husband's desire for children compared with wife's, and woman's child mortality experience. Additional research is needed to assess the contribution of supply side factors that would have been also important for the increased contraceptive use in Rwanda.

INTRODUCTION

Rwanda has experienced a dramatic increase in contraceptive use during the last several years. The contraceptive prevalence rate (CPR) has increased three-fold, from 17% in 2005 to 52% in 2010. The increase in CPR was accompanied by a large decline in unmet need for family planning, from 38% to 19%, and a decline in the total fertility rate (TFR), from 6.1 to 4.6 births per woman between 2005 and 2010 (NISR and ORC Macro, 2005, NISR and ICF International, 2010). Such success is noteworthy. No neighboring country has had a comparable achievement (see Table 1). In Tanzania, where changes were higher than in Uganda and Kenya during the same period, the CPR increased only from 26% to 34% between surveys in 2004/05 and 2009, and the TFR declined only slightly, from 5.7 to 5.4 births per woman. Moreover, unmet need in Tanzania increased. Elsewhere, a rapid increase in contraceptive use similar to that in Rwanda has occurred in only a few countries, including Cuba, Iran, Mauritius, Spain, and countries of East Asia (Leahy 2011).

Table 1. CPR, Unmet need and TFR in Rwanda, Uganda, Tanzania, and Kenya

Indicator	Rwanda 2005 to 2010	Uganda 2006 to 2011	Tanzania 2004/05 to 2009	Kenya 2003 to 2008/09
CPR (%)	17.1 – 51.6	23.7 – 30.0	26.4 – 34.4	39.3 – 45.5
Unmet need (%)	37.4 – 19.2	40.6 – 34.3	21.8 – 25.3	24.5 – 25.6
TFR	6.1 – 4.6	6.7 – 6.2	5.7 – 5.4	4.9 – 4.6

Source: http://statcompiler.com/, accessed 28 November 2012

This achievement has gone far beyond Rwanda's national objectives. According to the national family planning policy, contraceptive prevalence in 2010 was projected to reach 26.3% for all methods and 18.5% for modern methods (Rwanda Ministry of Health 2006). The 2010 Rwanda Demographic and Health Survey (DHS) indicates that the country achieved nearly double these projected levels of contraceptive use. However, the Rwandan vision 2020 target is much higher: at 70% contraceptive prevalence by 2012 (EDPRS 2007). The TFR in the five years prior to the survey was expected to decrease by 10%, from 6.1 births in 2005 to 5.5 births in 2010, but dropped by a much larger 25% instead.

Using the extensive data on family planning in the 2005 and 2010 DHS datasets, this paper describes levels and changes in contraceptive use in Rwanda and investigates factors that have contributed to the dramatic increase in CPR between the two periods.

First this paper briefly describes the background of family planning programs in Rwanda, including an overview of earlier and recent initiatives, followed by data and methods section defines the framework and the methodology of the study. Furthermore the research results are shown separately in descriptive results and regression-based decomposition results using various tables. Subsequently discussion and conclusions are presented at the end of the paper.

BACKGROUND

Overview of Family Planning Programs in Rwanda

Despite the fact that rapid population growth, with its various effects on the economy and living conditions of the population, has been recognized as a problem in Rwanda since the colonial period, family planning activities in Rwanda did not start until 1981, with the creation of the *Office National de la Population* (ONAPO). Two years later, the first National Fertility Survey (NFS) was conducted, providing the first estimate of the country's fertility level. In the same year, ARBEF[1] started its activities. Based on the 1983 NFS results, in 1990 the government formulated a National Population Policy aiming to reduce population growth. The goals were to cut the TFR by half , from 8.6 recorded in the 1983 survey to 4.0 in 2000, and to increase the CPR from 2% in 1983 to 48% in 2000 (Muhoza 2009). ONAPO's activities were intensified to provide modern contraceptives throughout the country.

With the 1994 genocide, family planning activities were suspended, and ONAPO was dissolved in 2000. The issue of rapid population growth did not resurface until after the 2000 DHS and the 2002 census revealed the persistence of high fertility, and the highest population density in Africa.

A significant campaign against population growth began after the 2005 DHS indicated an increase in TFR from 5.8 in 2000 to 6.1 in 2005. In 2005 the Ministry of Health created the Maternal Child Health unit to respond to the issues of higher infant and maternal mortality rates and to the low level of contraceptive use. In 2006 it elaborated a family planning policy aiming to reduce fertility and also to improve infant and maternal health. In addition, by showing a high level of unmet need for family planning (37%), the 2005 DHS results reinforced the need to strengthen family planning services. DHS analysis showed that actual fertility was 1.5 children more than wanted fertility, with an actual TFR of 6.1 children per woman compared with a TFR of 4.5 if women had only the number of childen they desired.

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[1] Association Rwandaise pour le Bien-Être Familial, first private association providing family planning services.

Strategies to Promote Family Planning

Recognizing that population growth is the major barrier to achieve the ambitious 2020 Rwandan vision[2] for development, the Rwandan government has supported and encouraged family planning with a high level of commitment (Leahy 2011*)*. Strategies for a strong family planning campaign include training providers, conducting mass media campaigns, and strengthening health facilities by making contraceptives more widely available and affordable.

Strong Political Commitment with a Massive Family Planning Campaign

Since 2007, family planning has been a stated priority program to help reduce the high rate of population growth that compromises government development efforts (Rwanda Ministry of Health 2009). Thus, an intensive public education campaign was launched to raise awareness of the necessity to reduce the population growth rate. It was focused on the importance of having fewer children, with longer birth intervals, as an imperative way to reduce national population growth and poverty. All key personnel and leaders including local administrators and RALGA members[3], all public health sector personnel, secondary school teachers, and journalists were trained on these issues (Rwanda Ministry of Health 2006). The Rwandan Parliamentarians' Network on Population and Development, created in 2003, has played a determinant role. Various channels used included television and radio, monthly talks after Umuganda[4], opinion leaders sensitized, etc.

To increase family planning coverage, the Rwandan government increased the budget for family planning activities and extended the number of partners, initially represented only by USAID and UNFPA. The main partner was the Twubakane project, which played a determinant role by supporting the government in different trainings, construction of secondary posts, etc. Between 2004 and 2007, the budget was increased six-fold, rising from 91,231 USD to 5,742,112 USD (Ministry of Health 2009).

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[2] The general objective of the 2020 vision is to transform the country into a middle-income country by the year 2020, Rwanda Vision 2020, Kigali, July 2000.
[3] Rwanda Association of Local Government Administrators
[4] Umuganda = community service done every last Saturday of the month

Decentralized Health Services System and Community Mobilisation

Among various initiatives implemented by Rwanda in 2006 is the decentralization of service delivery. The objective is to gain popular participation and empowerment, transparency, accountability and responsiveness of public administration, and enhancement of effectiveness and efficiency in service delivery (MINALOC 2001). By bringing services closer to the community level, decentralization has encouraged community participation in family planning. The extension of family planning provision to communities through the direct involvement of community members has also been important for winning the support of men and other family members, in addition to women. It also permits a strong partnership with religious and traditional leaders, whose support is valuable for the success of the program. Furthermore, to reach more people, in 2010 community-based provision (CBP) of contraceptives was initiated (MoH 2010-11).

Providers' Capacity Strengthened through a System of Training

Effectiveness and efficiency of service delivery require trained staff. To ensure the quality of services and to expand use of longer-acting contraceptive methods, which require proficiency to provide, developing a system of training providers was an additional strategy. By 2010, the training of providers covered 28 districts out 30; and training of trainers in community-based distribution was ininiated in three pilot districts. Moreover, selected medical doctors were trained as master trainers on how to perform non-scalpel vasectomy (MoH 2010-11). A total of 1,258 providers were trained (USAID-Rwanda 2008).

Geographical Barriers Reduced

A particular challenge of the Rwandan health system in regard to family planning is that a significant proportion of health facilities (40% in 2001) are 'faith-based' and as a consequence do not offer modern contraceptives. In order to overcome this barrier, the government decided to construct "secondary posts" not far from religious-affiliated health facilities to meet the needs of clients of those areas. A total of 31 secondary posts were constructed between 2006 and 2009

(USAID-Rwanda 2008). To serve other regions that had been without services, five new hospitals and 15 new health centers were constructed between 2005 and 2011.

Provision of Health Facilities Increased

Since 2007, great efforts have been made to increase availability of a range of modern contraceptive methods and to promote long-acting methods, including male sterilization, by extending them up to the level of health centers. By 2008, the distribution of family planning commodities reached 96% of health facilities and 92% of district hospitals. However, sterilization was performed by only 27% of district hospitals. Between 2005 and 2009 the percentage offering long-acting methods grew from 7% to nearly 100% for implants, and from 1% to 36% for IUDs (MOH 2008; USAID-Rwanda 2009*)*. Likewise, access to condoms was increased by making them more available in public areas and workplaces, as well as in family planning clinics and health facilities.

Literature Review and Conceptual Framework

According to the research literature, the increase in contraceptive use is a result of two types of intervention: demand and supply programs. In other words, women adopt contraception either because they strongly need contraceptives (demand side) or because contraceptives are easily accessible (supply side). Regarding the demand side, three main interventions are: mass media, interpersonal communication, and development approaches (Mwaikambo et al. 2011). These interventions raise awareness of the adverse consequences of high fertility and the benefits of having fewer children, thus creating demand for fertility control, either for limiting or postponing births. The implication is that women exposed to family planning messages through media, colleagues, family planning workers, or authorities, and women seeking better socioeconomic conditions (education, wealth, occupation, etc.) will have greater demand for contraceptives.

On the supply side, programs can improve access to family planning services through availability of a wide range of contraceptive methods and multiple service-delivery channels (Richey and Salem 2008). This approach also focuses on improving quality of care and on

reducing direct costs related to contraceptive use. Supply side interventions ensure that women and couples are able to practice family planning effectively. An analysis by Solo et al. (2008), on the success of family planning programs in Malawi, Ghana and Zambia may be considered as evidence.

A debate exists on which approach is better to increase contraceptive use and reduce fertility. Some, like Pritchet (1994), emphasize the demand approach, arguing that once there is demand, whatever the provision services may be, more people will adopt family planning. In this view, rising demand results mainly from socioeconomic development rather than the efforts of family planning programs. In contrast, other researchers (Bongaarts et al. 1990; Phillips et al., 1995; Freedman 1997) highlight the predominant role of supply policies in increasing contraceptive use. An excellent case is Bangladesh, where the family planning program has promoted the distribution and sensitization for family planning by women themselves, overcoming the cultural norms that subordinate women (Schuler et al. 1995). Contraceptive use has increased substantially among women with little education, as well as women of higher socioeconomic status.

Other studies argue that both approaches are complementary (Gertler and Molyneaux 1994). Without an increase in demand, the impact of supply programs is limited, but without family planning programs latent demand may not result in actual contraceptive use. For instance, Lapham and Mauldin (1985) found that the contraceptive prevalence was highly associated with socioeconomic conditions, but also that the association was much stronger if there have been organized family planning programs. In a review of findings from many studies, Mwaikambo et al. (2011) found that family planning programs have been most successful when they have used a variety of approaches, mixing those that improve the quality of services with those that address sociocultural barriers or that focus on winning community and social support for family planning use.

From this literature, what may have been the key factors that explain the recent dramatic increase in contraceptive use in Rwanda? Rather than choose one or another side, whether demand or supply, we would like to have a full framework representing all potential factors. However, information regarding supply side factors is very limited in our datasets. We therefore

present the following framework, mainly restricted to the demand side, as it includes both socioeconomic factors and factors related to family planning.

Figure 1. Conceptual Framework
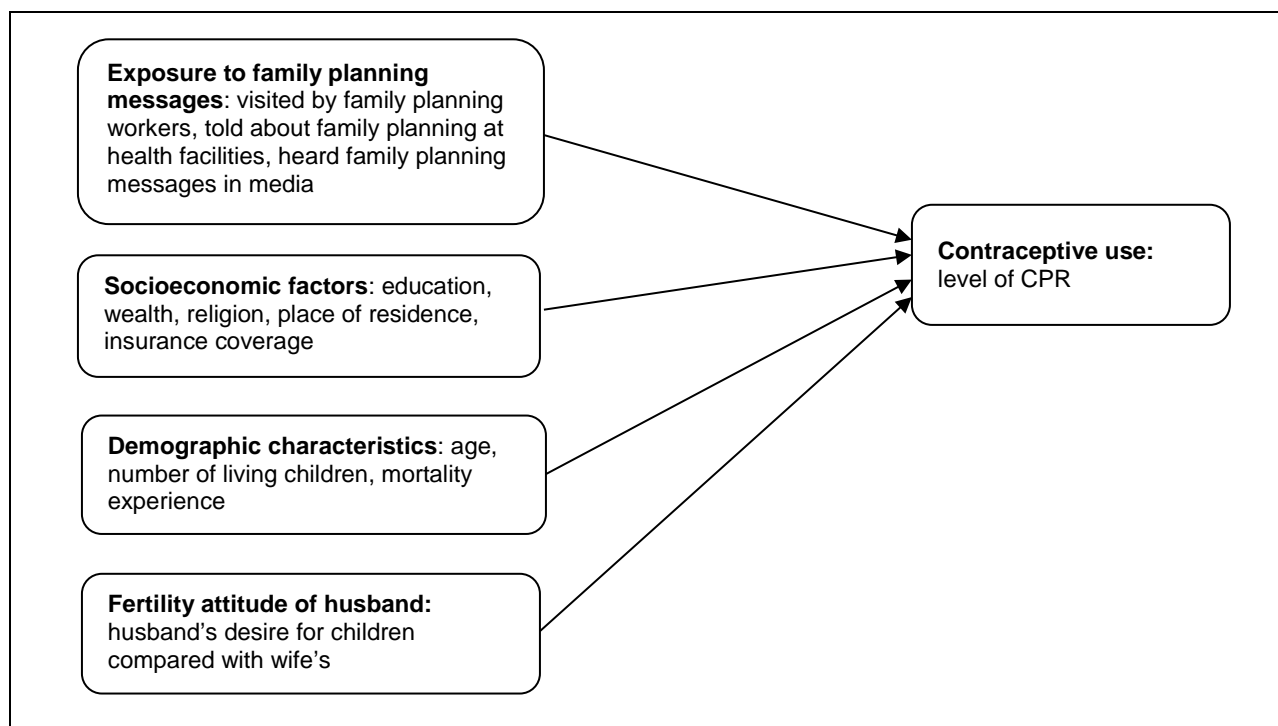
Research Question and Hypotheses

The general research question of this study is to answer which factors have contributed to the recent increase in contraceptive use in Rwanda. More specifically, this research will be focussed on the following question: What was the relative contribution of family planning initiatives and socioeconomic development to increased levels of contraceptive use in Rwanda between 2005 and 2010?

The above research question leads to the following hypotheses:

- The increase in contraceptive use in Rwanda between 2005 and 2010 is explained by the compositional change in socioeconomic and demographic characteristics of women.

- The increase in contraceptive use in Rwanda between 2005 and 2010 is explained by women's increased exposure to family planning program initiatives.

- The increase in contraceptive use in Rwanda between 2005 and 2010 is explained by the mediating effects of the above sets of factors on women's use of contraception.

Significance of the Study

Findings from this study will contribute to understanding the drivers of success of the Rwandan family planning effort that may guide policymakers and planners to further improve the program in Rwanda and in other countries with a simliar context.

DATA AND METHODS

Data

This research uses the 2005 and 2010 Rwanda DHS (RDHS) women's datasets. The study population is all married women interviewed, as used in the calculation of CPR. The RDHS sample of currently married[5] women was 5,510 women in 2005 and 6,897 in 2010. The two datasets were pooled together for the decomposition analysis.

The outcome variable is "current use of contraception," with two categories (*yes* or *no*):

- *Yes*: the respondent is using a method of contraception
- *No*: the respondent does not use any method of contraception.

Explanatory variables are grouped in four categories:

- Demographic variables: age, number of living children, child mortality experience

- Socioeconomic factors: education, wealth, religion, place of residence, health insurance

- Exposure to family planning messages: visited family planning worker, told about family planning at health facility, media messages (radio, television or newspapers)

- Husband's fertility attitude: husband's desire for children compared with his wife's.

Statistical Analysis

Descriptive Analysis

We start the analysis with descriptive results. First, in Table 2 we provide the frequencies of respondents for each independent variable and each survey, from which we show, in percentage points, the changes between surveys. In Tables 3 and 4 we indicate the contraceptive method mix and the distribution of respondents according to whether or not they use contraception.

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[5] In the DHS, women are considered to be currently married if they report that they are "married or living with a man as if married."

Multivariate Decomposition Model

Widely known as Blinder-Oaxaca (Oaxaca-Blinder) decomposition (Blinder 1973; Oaxaca 1973), or as multivariate decomposition, decomposition techniques, component analysis, shift-share analysis or regression decomposition as detailed by Powers and Yun (2009), this approach provides a way to analyze the outcome of two different groups. The differences between two groups could be explained either in the composition or characteristics of the groups (endowments) or by the effects of those characteristics (coefficients). This means that the Oaxaca-Blinder technique will allow displaying the real contribution of each independent variable in the total difference in characteristics or the effects of characteristics. The multivariate decomposition techniques were used in the 1970s by many researchers for linear regression models and later extended to nonlinear models with an in-depth discussion on how to address the related weaknesses (Fairlie 2005; Powers and Pullum 2006).

We have chosen to use decomposition techniques for this study for two main reasons. The first is related to the study, which compares two time periods, 2005 and 2010. The second is that this technique allows a distinction of the difference in contraceptive use between 2005 and 2010 partioned into components attributable, first to the changes in composition, second to the changes in effects of the selected explanatory variables, and third to the interaction between them.

The formula can be presented as follows:

$$\Delta Y^{2010-2005} = (X^{2010} - X^{2005})\, \beta^{2010} + X^{2005}(\beta^{2010} - \beta^{2005}) + [(X^{2010} - X^{2005})(\beta^{2010} - \beta^{2005})]$$

ΔY: Difference in mean prediction between 2010 and 2005, $X_i....X_k$: Different characteristics and $\beta_i....\beta_k$: estimated regression coefficients

$(X^{2010} - X^{2005})\, \beta^{2010}$: represent the difference due to endowment

$X^{2005}(\beta^{2010} - \beta^{2005})$: represent the difference due to coefficients

$[(X^{2010} - X^{2005})(\beta^{2010} - \beta^{2005})]$: represent the difference in interaction between endowment and coefficients.

The Blinder-Oaxaca decomposition outputs provide details on endowments, coefficients, and interaction between the two time periods. As in the results (Table 5), the interaction part is not statistically significant at the level of 5%, only the two major parts of the results will be presented:

- Endowments: part of the changes in contraceptive use due to differences in characteristics.

- Coefficients: part of the changes in contraceptive use due to effects of explanatory variables.

RESULTS

Descriptive Results

Table 2 presents the percentage of women included in each category of selected variables in 2005 and 2010, and the changes between the two periods. Overall, there were few changes in women's characteristics, such as place of residence, current age, or number of living children. There was a small decrease in the percentage of younger women, women with many children, and urban residents compared with older women, women with fewer children, and rural residents. Women's educational attainment increased between 2005 and 2010, particularly for some education (primary) versus none. The category of Protestant religion slightly increased, while Catholic and Muslim and others decreased. Child mortality decreased. The percentage of women without experience of a dead child rose by 11.2 percentage points compared with a decline among women who experiences the loss of some children. A convergence of fertility attitudes between spouses occurred over the survey period. Couples who wanted the same number of children rose by 21 percentage points, while the percentage of couples with different views or who did not know the other's fertility preferences declined.

Table 2. Percent distribution of currently married women by selected variables and changes in these variables, RDHS 2005 and 2010

Variable	Category	2005	2010	Change in % points
Woman's age	15-24	19.0	15.8	-3.2
	25-24	42.9	46.8	3.9
	35+	38.1	37.4	-0.7
Number of living children	0-1	21.6	22.8	1.2
	2	18.5	19.3	0.8
	3	17.1	16.3	-0.8
	4	14.4	14.6	0.2
	5	10.0	11.5	1.5
	6+	18.4	15.5	-2.9
Woman's educational level	No education	29.8	19.7	-10.1
	Primary	61.5	69.8	8,3
	Secondary	8.1	9.0	0.9
	Higher	0.6	1.5	0.9
Residence	Urban	13.5	13.4	-0.1
	Rural	86.5	86.6	0.1
Religion	Catholic	46.1	41.9	-4.2
	Protestant	36.5	40.4	3.9
	Adventist	13.2	14.3	1.1
	Others	4.2	3.4	-0.8
Woman's mortality experience	No child death	50.7	61.9	11.2
	Last child died	7.0	3.7	-3.3
	One death, not last	20.8	17. 8	-3.0
	Two or more deaths	21.5	16.6	-4.9
Husband desire for children compared with wife's	Same number as wife	36.8	57.9	21.1
	More than wife	13.0	10.2	-2.8
	Fewer than wife	18.5	17.2	-1.3
	Don't know	31.7	14.7	-17.0
Visited by family planning workers	Yes	5.3	30.9	25.6
	No	94.7	69.1	-25.6
Told about family planning at health facility	Not told	26.2	27.1	0.9
	Told	15.5	44.8	29.3
	Not been at HF	58.3	28.1	-30.2
Heard family planning message on radio, television, or newspaper	Yes	46.1	70.4	24.3
	No	53.9	29.6	-24.3
Have health insurance	No	53.4	24.0	-29.4
	Yes	46.6	76.0	29.4
Total		100.0	100.0	
Total number of women		5,510	6,897	

The percentage of women exposed to family planning messages, regardless of the source of message, inceased significantly, by 25 to 30 percentage points. This increase would reflect family planning efforts realized between 2005 and 2010.

Table 3 shows current contraceptive use among married women. Between 2005 and 2010, contraceptive use greatly increased, by 34.2 percentage points, for use of any method. The increase was exclusively for modern methods, with a 34.8 percentage point increase, while use of traditional methods declined by 0.7 percentage points. Irrespective of year, the modern methods most commonly used are injections and pills, with implants at in third place in 2010.

Table 3. Percent distribution of married women age 15-49 by contraceptive method currently used, RDHS 2005 and 2010

Contraceptive method	2005	2010	Change in % points
Any method	17.4	51.6	34.2
Any modern method	10.3	45.1	34.8
Injections	4.7	26.3	21.6
Pills	2.4	7.1	4.7
Implants	-	6.3	6.3
IUD	-	0.5	0.8
Female sterilization	0.5	0.8	0.3
Male condom	0.9	2.9	2.0
LAM	0.8	0.5	-0.3
Any traditional method	7.1	6.4	-0.7
Periodic rhythm	4.2	2.9	-1.3
Withdrawal	3.0	3.5	0.5
Total	100.0	100.0	-
Number	5,510	6,897	-

While contraceptive use increased among all women between 2005 and 2010, the increase varied by women's characteristics. Table 4 indicates that the increase was higher in rural than urban areas, among less educated than more educated women, and among women with fewer children than women with many children. The difference is striking with regard to women's experience with child mortality. While the percentage of women with no child deaths using contraceptives rose by almost three times, from 20% to 57%, between 2005 and 2010, contraceptive use among women who lost their last birth was lower and increased less, from 13% to 29%. Contraceptive use was also most common if a husband desired fewer or the same number of children as his wife. Women exposed to family planning messages in the mass media were more likely to use contraception than women with no exposure, but the difference narrowed between 2005 and 2010.

Table 4. Percentage of currently married women using contraception in 2005 and 2010, by selected variables

		2005		2010	
Variable	Category	%	N	%	N
Woman's age	15 – 24	12.1	1,045	43.5	1,087
	25 – 34	18.7	2,366	55.2	3,230
	35 +	18.4	2,098	50.4	2,579
Number of living children	0 - 1	8.6	1,189	36.1	1,572
	2	16.2	1,020	56.6	1,333
	3	20.4	940	57.8	1,125
	4	21.7	794	58.6	1,006
	5	20.3	553	56.0	791
	6+	20.9	1,011	51.7	1,066
Place of residence	Urban	31.6	743	53.1	926
	Rural	15.2	4,766	51.4	5,970
Woman's educational level	No education	10.8	1,639	43.3	1,354
	Primary	17.3	3,391	52.6	4,815
	Secondary	38.8	448	60.1	621
	Higher	60.0	30	61.0	105
Wealth status	Lowest	11.0	1,136	43.2	1,351
	Second	15.1	1,123	47.4	1,387
	Middle	15.7	1,111	52.8	1,394
	Fourth	14.8	1,144	57.2	1,415
	Highest	31.8	995	57.1	1,348

Cont'd..

Table 4. Cont'd

Variable	Category	2005 %	2005 N	2010 %	2010 N
Woman's religion	Catholic	19.4	2,539	55.8	2,891
	Protestant	13.8	2,013	47.1	2,784
	Adventist	18.1	728	52.2	985
	Others	23.2	228	51.1	235
Woman's mortality experience	No death	20.2	2,791	57.4	4,270
	Last birth died	13.0	386	28.6	259
	One death other than last birth	19.1	1,148	54.4	1,225
	Two or more deaths	10.3	1,184	31.5	1,142
Husband's desire for children compared with wife's	Same number	22.2	2,027	55.0	3,990
	More than wife	12.4	718	47.0	705
	Fewer than wife	22.1	1,017	57.0	1,185
	Don't know	11.0	1,746	34.8	1,014
Heard family planning messages on radio, television, or newspaper	No	11.5	2,972	45.2	2,038
	Yes	24.2	2,537	54.5	4,838
Visited by family planning workers	No	17.2	5,217	48.9	4,765
	Yes	20.9	292	57.5	2,132
Told about family planning at health facility	Not told	20.0	1,446	46.4	1,869
	Told	26.1	852	57.3	3,088
	Not been at HF	13.9	3,211	47.4	1,939
Have health insurance	No	15.3	2,938	51.4	1,665
	Yes	19.7	2,571	51.6	5,231
Total		17.4	5,510	51.6	6,897

Regression-Based Decomposition Results

Table 5 reports the mean prediction of contraceptive use in 2005 and in 2010 and also shows how much of the difference is attributable to changes in women's characteristics (endowments), variation attributable to the effects of these characteristics (coefficients), and their interaction.

Overall from 2005 to 2010, there has been an impressive increase in contraceptive use. The mean prediction has increased three times, from 0.174 to 0.516, resulting in an increase in prediction of 0.342. It is clear that the gap explained by the effects of selected explanatory variables is more important (0.265) than the gap explained by the changes in these characteristics (0.0567). The interaction term (0.020) is not significant.

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Table 5. Mean values of contraceptive use predicted for 2005 and 2010

Mean prediction 2010	0.516***
Mean prediction 2005	0.174***
Total Difference	0.342***
Difference due to Endowments	0.0567***
Difference due to Coefficients	0.265***
Difference due to Interaction	0.020

*** p<0.01

However, even though the overall increase explained by the effects of the coefficients is higher than the gap explained by the endowment, the contribution of independent variables varies substantially from one variable to another and, according to categories of within variables (Table 6).

In regard to the overall increase in contraceptive use between 2005 and 2010 attributable to the changes in coefficients, the most important independent variables that provide significant contribution are women's education level, mortality experience, and place of residence, accounting for 16.5%, 10.6% and 9.0% of the total difference between 2005 and 2010, respectively.

Results show that the contribution of changes in effects of education is the most important, accounting for 21.3% of changes due to coefficent[6]. The change in contraceptive use between 2005 and 2010 is mainly explained by the categories of women with no education and those with primary education, at 9.8% and 12%, respectively.

The second factor that displays significant contribution to change in family planning use is women's experience with child mortality (13.7%). Women with all their children alive are most likely to have increased contraceptive use (10.9%), followed by women who lost only one child, at 3.5%. In contrast, women who lost the last child or those who lost more than one child have progressed slower than the average with respectively -2.7% and -1% reducing the overall increase.

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[6] This is the percentage of the variable education in the total percentage due to coefficients (16.2/77.5)

Table 6. Contribution of explanatory variables to the difference in contraceptive use between 2005 and 2010

	Endowment		%	Coefficient		%
Woman's age						
15 - 24	-0.0004389		-0.1	0.000189		0.1
25 - 34	-0.0002233		-0.1	0.003534		1.1
35 +	0.0000551		0.0	-0.00351		-1.1
S/Total	**-0.0006071**		**-0.2**	**0.000208**		**0.1**
Number of living children						
0 - 1	-0.00143		-0.4	0.006454		2.0
2	-0.00022		-0.1	0.005362		1.7
3	-0.00014		0.0	-0.00068		-0.2
4	0.0000523		0.0	0.001155		0.4
5	0.000624	**	0.2	-0.00087		-0.3
6+	-0.00161	***	-0.5	-0.00995	***	-3.1
S/Total	**-0.0027195**		**-0.8**	**0.001469**		**0.5**
Place of residence						
Urban	-0.000018		0.0	-0.00534	***	-1.7
Rural	-0.000018		0.0	0.034188	***	10.6
S/Total	**-0.0000366**		**0.0**	**0.028852**		**9.0**
Woman's educational level						
No education	0.010305	***	3.2	0.024498	***	7.6
Primary	-0.00443	***	-1.4	0.029764	**	9.3
Secondary	0.000176		0.1	-0.00058		-0.2
Higher	0.001328	***	0.4	-0.00068	*	-0.2
S/Total	**0.0073784**		**2.3**	**0.053005**		**16.5**
Wealth Index of household						
Lowest	0.000256		0.1	-0.00427		-1.3
Second	0.0000502		0.0	-0.00463		-1.4
Middle	0.00000109		0.0	0.003097		1.0
Fourth	0.000452		0.0	0.013146	***	4.1
Highest	0.00067	*	0.2	-0.00637	*	-2.0
S/Total	**0.00102148**		**0.3**	**0.000977**		**0.3**
Woman's religion						
Catholic	-0.00052		-0.2	0.009912		3.1
Protestant	-0.00108	**	-0.3	0.004249		1.3
Adventist	-0.000017		0.0	0.000334		0.1
Others	-0.00013		0.0	-0.00148		-0.5
S/Total	**-0.0017447**		**-0.5**	**0.013014**		**4.0**

Cont'd..

Table 6. Cont'd

	Endowment		%	Coefficient		%
Heard family planning messages in the media						
No	0.008465	***	2.6	0.016757	***	5.2
Yes	0.008465	***	2.6	-0.01431	***	-4.5
S/Total	**0.016929**		**5.3**	**0.002448**		**0.8**
Visited by family planning worker						
No	-0.00065		-0.2	-0.01423		-4.4
Yes	-0.00065		-0.2	0.000798		0.2
S/Total	**-0.0012946**		**-0.4**	**-0.01343**		**-4.2**
Told about family planning at health facility						
Not told	-0.000015		0.0	-0.00512		-1.6
Told	0.009836	***	3.1	-0.00186		-0.6
Not at health facility	0.009572	***	3.0	0.018358	***	5.7
S/Total	**0.0193923**		**6.0**	**0.011382**		**3.5**
Have health insurance						
No	-0.00013		0.0	0.003792		1.2
Yes	-0.00013		0.0	-0.00332		-1.0
S/Total	**-0.0002536**		**-0.1**	**0.000474**		**0.1**
Husband's desire for children						
Same	0.00898	***	2.8	-0.00435		-1.4
More	0.001311	***	0.4	0.006792	***	2.1
Fewer	-0.00048	*	-0.1	-0.00054		-0.2
Don't know	0.005733	***	1.8	-0.01184	**	-3.7
S/Total	**0.0155465**		**4.8**	**-0.00994**		**-3.1**
Woman's mortality experience						
No death	0.00180	*	0.6	0.03492	***	10.9
Last birth died	-0.00055		-0.2	-0.00690	***	-2.1
One death other than last birth	-0.00039		-0.1	0.00870	**	2.7
Two or more deaths	0.00224	***	0.7	-0.00263	***	-0.8
S/Total	**0.00311**		**1.0**	**0.03409**		**10.6**
Change in intercept				*0.142301*		
Total	**0.056674**		**16.6%**	**0.264852**		**77.5%**

*** p<0.01**p<0.05 *p<0.1

In regard to urban-rural residence, the results of the regression decomposition model display substantial positive changes among rural women (13.7%) compared with the average, but small and negative changes among urban women, as they contributed less than the average (-2.2%). The gap between rural effects and urban effects is 15.9%.

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It should be noted that the intercept (0.142301) accounts for more than half of the change due to coefficients (0.2648520). This suggests that the model fit presented some limitations in explaining the increase in contraceptive use between 2005 and 2010.

The compositional differences in sample groups also shows interesting results in that woman's education, exposure to family planning messages in the media or at health facilities, husband's desire for children compared with his wife's, and the woman's child mortality experience are taking almost all the shares in the contribution of endowment. It appears that most (68%) of the contribution of endowment is attributable to the compositional differences for women exposed to family planning messages in the media (31.9%) or at health facilities (36.1%). Factors related to family planning are followed in endowment contribution by the fertility attitude of husbands (29.5%), particularly for women whose husbands' desire the same number of children as the women desire (16.9%), and women who do not know the fertility preferences of their husbands (10.8%).

Although statistically significant, the compositional effects related to women's educational level and women's mortality experience are less important, at 13.9% and 6.0%, respectively.

DISCUSSION AND CONCLUSIONS

Contraceptive use in Rwanda has increased far more than the Ministry of Health projected for the year 2010. Moreover, other indicators of progress, such as women delivering in health facilities and reductions in infant and maternal mortality have also exceeded expectations.

Comparing the 2005 and 2010 RDHS, this study has described the Rwandan family planning initiatives and identified factors that have contributed most to the increase in contraceptive use between 2005 and 2010. The study used the Blinder-Oaxaca technique to decompose the contribution of changes in women's characteristics and changes in effects of these characteristics.

The contribution of education displays a clear increase in contraceptive use among women whose education is primary or lower level compared with the average. Women with the upper level of education exhibit a lower than average change in contraceptive use. This means that, even though normally contraceptive use has a positive association with women's level of education, the focus of the family planning initiative may have reached even women with a low education level. The results from the multivariate decomposition techniques show that in terms of contraceptive use between 2005 and 2010 the change or increase associated with place of residence contributed a lot to the overall change. Contraceptive use increased particularly among rural women but decreased among urban women, compared with the average.

Exposure to family planning messages on radio, television, and in newspapers also affected levels of contraceptive use between 2005 and 2010, but in a limited way. Women who were exposed to family planning messages showed a lower than average change in contraceptive use, while women who were not reached by family planning messages showed an above average change. This could mean that women who did not get family planning messages in the media may have been reached with information by other means, or that supply side factors not measured in the RDHS (increased access to family planning services, for example) have been more important determinants of increased contraceptive use. Overall socioeconomic improvements in the population during the post-genocide era may have indirectly contributed to the success in improving the uptake of family planning.

For the compositional differences in groups, it appears that most of the endowment in contraceptive use between 2005 and 2010 may be attributable to differences for women with no education, women exposed to family planning messages in the media or at health facilities, and women whose husbands desire the same number of children as they do. This may be simply translated into the family planning initiatives that the government and stakeholders embarked on. However, the fact that a large proportion of the CPR change is explained by the contribution of women who were not exposed to family planning messages may reflect the limitation of this research for its inability to take take into account all the aspects of family planning initiatives such as monthly meeting at the "Umudugudu" level.

In addition, we note that, since factors related to family planning messages may have influenced others factors, part of their effects may be taken by socioeconomic and demographic variables. The fact that poor women have made much more progress than the richer supports this assumption.

Limitations of the Study

The analysis is limited for not being able to measure many other important factors, for example, those related to family planning service availability and quality, which also affect contraceptive use. Also, by pooling datasets, the study could not analyze some important variables that were not available in both datasets. While decomposition analysis is a promising tool to analyze contributions of various factors to changes in outcome, our model is constrained by limited availability of data to explain the difference. Further research is needed including alternative methodology to the decomposition analysis.

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