

Research Article

Fertility Decline in Rwanda: Is Gender Preference in the Way?

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In 2007 Rwanda launched a campaign to promote 3 children families and a program of community based health services to improve reproductive health. This paper argues that mixed gender offspring is still an important insurance for old age in Rwanda and that to arrive at the desired gender composition women might have to progress beyond parity 3. The analyses are twofold. The first is the parity progression desire given the gender of living children. The second is gender specific replacement intention following the loss of the last or only son or daughter. Using the Demographic and Health Surveys of 2000, 2005, and 2010, we show that child mortality does not lead to extra parity progression beyond three, while having single gender offspring does and even more so when this is the result of the loss of the last son or daughter.

1. Introduction

In 2007, the Government of Rwanda started a discussion about the introduction of legislation that should regulate family size to a maximum of three children. The debate has continued ever since. The government emphasizes that, given Rwanda's very high population density and its agricultural based economy, the poverty reduction strategies are hampered by the current high population growth of nearly 3% per year [1]. While the government is still working on the legislation, policies were already introduced to encourage fertility decline through sensitization campaigns in the media and through dialogues at community level. The latter played a crucial role in implementing the integrated Population Health and Environment Policy. The dialogues on program objectives and community needs took place in traditional forums that have been (re)invoked after the genocide, more specifically during the umuganda (community service), the ubudehe (participatory planning meetings), and the urugwiro (national dialogue sessions) [2]. The policies do not include specific goals with respect to preferences for sons or daughters, but strongly promote gender equity in every life domain, including education and political participation.

Gender equality is a constitutional right [3] and is enforced in many laws [4–7]. Besides the sensitizing campaigns, community based health care services, including contraceptive provision, have been implemented to improve the reproductive health status of the population in every part of the country [8].

As a result Rwanda is making a substantial progress in reaching its Millennium Development Goals [9]. The recently released Demographic and Health Survey results (RDHS 2010) [10] show that the aim to reduce the infant mortality rate from 107 in 2000 to 50 in 2020 was already achieved in 2010. This reduction is linked with progress towards another important demographic target, a decline of the total fertility rate (TFR) from 5.8 in the year 2000 to 4.6 children in 2010, which is not far from the previously set target of 4.5 for 2020 [1]. A further decline seems possible because the average ideal family size (IFS) decreased substantially from 4.9 in 2000 to 3.3 children in 2010.

Considering the change in the demographic variables summarized in Table 1, Rwanda is at the beginning of the last phase of the demographic transition. Between 2000 and 2005, the TFR has fluctuated around 6 children per woman, indicating a stalling fertility decline over this period. Even

TABLE 1: Changes in child mortality, fertility, and desired family size in Rwanda.

	2000	2005	2010
Infant mortality	107	86	50
Under five mortality	196	152	76
Total Fertility Rate	5.8	6.1	4.6
Ideal family size	4.9	4.3	3.3
Unmet need for contraceptive	36%	38%	24%
Use of modern contraception	4%	10%	45%

Source: RDHS 2000 [11], RDHS 2005 [12], and RDHS 2010 [10] reports.

though the TFR dropped after 2005, the current TFR level of 4.6 still remains 1.6 children higher than the government's aspired level of only 3 children and also higher than the average IFS of 3.3 children calculated for 2010. One can wonder if a fast further decline from 4.6 to 3 children is a realistic target with or without a strict legislation, or that the government has to reckon with possible resistance among Rwandan couples. Resistance could be rooted in existing norms or attitudes with respect to the ideal family size, in the ideal gender composition of the offspring, and/or in perceived mortality risks.

In this contribution the link between fertility and gender preference as well as between fertility and mortality will be analyzed. By using three Demographic and Health Survey cross-sectional datasets (DHS-2000 [11], DHS-2005 [12], and DHS-2010 [10]) this paper questions whether gender preference stimulates fertility beyond parity three.

Studies about replacement or insurance effects on fertility behavior have been published also for African countries, but hardly any study is published about the link between the gender composition of the offspring and fertility intentions [13, 14]. The reason for this omission is obvious: this approach was not yet functional because in general Sub-Sahara Africa was characterized by high levels of fertility that result in families with children of both sexes. When African fertility levels continue to decline gender preferences can become a more distinct issue (see [15] for Bangladesh; and [16, 17] for India), and therefore meaningful in an analysis of fertility attitudes and behavior. Seen its government policy and the rapid fertility decline since 2005, Rwanda is an interesting case to study the possible effects of gender preference on fertility decline.

This paper has the following research objectives:

- (i) to show the extent to which women with at least three living children, but lacking sons or daughters are more likely to desire extra births to achieve a more balanced gender composition of their offspring;
- (ii) to highlight the effect of the loss of the only or last son or daughter on women's desire to continue childbearing at parity 3 or over in Rwanda.

The outline of this study is organized as follows. Section 2 presents the theoretical and regional setting and is followed by Section 3 that discusses the data and methods used in the analyses. Section 4 deals with the results followed by a discussion and conclusion in the final section.

2. Theoretical and Regional Context

Like elsewhere in the world, people in Rwanda prefer to have both sons and daughters. This is shown in one of the traditional blessing by family and friends to new couples after the wedding ceremony when people say *Muzarumbuke, Muzabyare Hungu na Kobwa* (translation: "be fruitful and give birth to both sons and daughters"; Sempabwa and Hoemeke 2006 cited in Solo [8]). When the number of children per family is declining, the gender composition can become an important matter of concern if the perceived utility of sons and daughters differs largely, but even more so if people are convinced that it is better to have both. At the current TFR in Rwanda of 4.6 children, statistically only 7.5 percent of the couples have a single gender offspring (given the sex ratio at birth of 102 in Rwanda). At a TFR of 3 children, this percentage will increase to 25%. In case of a strong gender preference or preference for a balanced offspring, these couples will probably opt for a new pregnancy to achieve their desired family composition. Sheps (cited in Park and Cho [18]) has calculated theoretically that if all couples continued childbearing till they have at least two sons, the TFR will end up at 3.88 children. This TFR is closer to four children than to three, the desired family size by the Rwandan Government.

A strong gender preference among parents, in particular son preference, is related to nonexchangeable gender roles in a society which stem from economic, social, cultural, religious, and/or psychological contexts ([13, 17, 19–21]). In particular in areas where rigid patrilineal and patrilocal kinship systems regulate inheritance, allocation of productive assets (such as land) and old age support and where a strict labor division exists, sons are preferred above daughters [20]. In the terms used by Arnold and his colleagues [17] it is the higher economic utility of sons compared to that of daughters that causes a strong son preference found in countries in Asia.

The few available studies for Sub-Sahara African countries on gender preference point at a slight son preference (see [22]), but as stated in the introduction the countries in Africa have still relatively high fertility levels and consequently the gender composition of the offspring is not an important issue. What will happen with gender preferences as the three children policy is implemented in Rwanda?

Traditional culture and customs in Rwanda are based on a patrilineal kinship system and lineage-based kinship relations are still important for mutual support [23]. This cultural context points at a possible preference for sons, in particular among fathers. This gender preference was enforced by the resource allocation system, in particular the one regulating access to land. This system changed several times during previous centuries, continually in favor of men by reducing property rights of women who lost their access to land held by the lineage of her father in law and could not enter into formal client relations with land owners in the patronage system [24]. As a result having sons was important for both men and women. Having sons protected a widow against the claims of her brothers in law or patron who demanded the land back that she and her deceased husband cultivated. A

good relationship with her son(s) guaranteed a mother access to labor and subsistence security during old age [24].

On the other hand, certain farming and marriage practices illustrate that in Rwanda wives and daughters have an important economic value for their family as well. Like in many Sub-Saharan African countries farming work in Rwanda is performed by both men and women, although the so-called gender specific and gender sequential activities also exist [25]. Women focus more on food crops and men on cash crops such as coffee and tea [26]. Girls, like boys, are also seen as a source of wealth “because their parents are given a bride-price when they get married” [23, page 101]. Clay and Vander Haar [27], on the basis of the 1988 nonfarm Strategies Survey of Rwanda, evidenced that sons are more likely to give support in cash, whereas daughters were more likely to give support in kind, which suggest that Rwandan parents improve their social security by having both sons and daughters.

After 1994, the Government of Rwanda has been formulating and implementing new laws geared to equal rights for men and women. As a consequence, institutional and social systems are in transition. The new Inheritance Law of 1999 does not distinguish anymore between sons and daughters. For the inheritance of land, a scarce production asset in the Rwandan context, this means that land may pass to daughters. However, another law inhibits land fragmentation in parcels below a certain size. It is expected that in that case, fathers will prefer to give their land to sons, following former customary tenure systems (Bledsoe 2003 cited in Lastarria-Cornhiel [28]). After the latest change in tenure regulations, twice as many men got official land titles compared to women [28]. Despite the policy of the Rwandan government geared to gender equity, practices and attitudes rooted in traditional backgrounds do not change overnight. Seen in this light some preference for sons over daughters can be expected in relation to the gender composition of the offspring. This can be tested by analyzing the parity progression, while taking into account the gender composition of the living children. Studies for Korea [29], Bangladesh [30], Vietnam [31], and India [17] that used this approach have shown that in case of a strong son preference, parity progression is higher among women with no or only one son. The results also showed that people prefer to have at least two sons and one daughter. One wonders whether this preference for at least two sons also affects the link between mortality level of children and fertility behavior as part of the insurance strategy.

A more in-depth insight in the gender preferences—fertility behavior linkage will be gained if experiences with child mortality according to gender are added to the analysis. The impact of infant and child mortality on fertility behavior has been studied extensively, also for Africa [32–35]. It is assumed that, based on mortality experiences, parents adopt conscious strategies intending to realize their ultimate family size. Two behavioral responses to mortality of children are distinguished: first the *replacement* response when one's child dies it is replaced by an additional birth, and second the *insurance* response that leads to more births than the ideal number of children in order to avoid future risks of losing one or more children. The insurance response is the most “tricky” one of the two responses to study. For individual couples,

assessing the mortality risks faced by their children is far from simple. Difficult issues in studying the insurance hypothesis are the measurement of perceptions of mortality levels and trends and the extent to which such perceptions enter into fertility decisions-issues. These matters are hard to derive from available datasets as DHS sets [36, 37]. However, for our objective to study the impact of gender preference on fertility behavior we can include the impact of the loss of either sons or daughters in combination with the gender composition of the surviving children. Both replacement and insurance responses could be valid if we find that parents with at least three living children and with mortality experiences have a higher parity progression ratio compared to parents who did not lose their last son or daughter. We do not intend to check explicitly for replacement or insurance behavior, but as we control for the number of living children, a higher gender-loss specific parity progression will be closer to insurance.

In case of son preference and perceived or experienced risk of infant/child mortality one expects that subsequent births will occur more often after the loss of sons compared to the loss of daughters. For India, Das [38] found that parity progression rates (PPRs) were influenced by mortality experiences and that at parity 2, women with one girl left, had a higher mean PPR than women with one son left. The results of the study of Gyimah and Rajulton [22] for Ghana and Kenya pointed in the same direction: in case the surviving children were all girls the probability of a subsequent birth was higher compared to the situation when all surviving children were boys.

3. Study Setting, Data, and Method

3.1. Data and Methodology. For the analyses in this study three cross-sectional secondary datasets from the Rwanda Demographic and Health Surveys are used (DHS held in 2000, 2005, and 2010). The DHS dataset is known to be an international reliable database because it follows strict sampling, surveying, and data file procedures and are made by well-trained enumerators and experienced staff. The women's questionnaire is used to collect information on all women in the age 15–49 years and covers a wide range of topics including the background of the respondents, her reproductive history, her knowledge and use of contraceptive methods, the antenatal, child-birth, and postpartum care received, vaccination, and childhood illnesses to mention a few of them.

The dependent variable in our analyses is the desire to have a next child. We used the answers to two questions related to fertility intentions in the questionnaire. Women who were either not pregnant or unsure about their status were asked the question: “*Would you like to have another child or would you prefer not to have any more children?*” A different question was asked to women who were pregnant at the time of the interview: “*After the child you are expecting, would you like to have another child or would you prefer not to have any more children?*”

As we wanted to test the impact of the composition of the offspring according to gender on women's desire to have another child and the impact of gender-specific mortality experiences, we restricted our analysis to women with at

least three living children at the moment of the interview. In total 12831 women, subdivided in 3745 women for the year 2000, 4219 women for 2005, and 4867 for 2010, fulfilled these selection conditions.

Key independent variables in this study are the gender of living children and the loss of all children of a specific gender prior to the dates of interview. We did not include the parity of the deceased infant(s) in our model, consequently we did not check if (one of) the dead child (ren) was the index child (last born). Women were subdivided into those having both sons and daughters alive, or those having only girls or only boys alive. In reference to prior infant and child mortality experience by gender, women were classified into those with three or more living children of mixed gender with and without any mortality experience. For those who have daughters only, we distinguish the ones that never had a son from those that lost their last or only son. The same distinction was made for those that have sons only. In a bid to highlight the strength covered by gender specific replacement desire, we have included in our model demographic, socio-economic, and sociocultural control variables.

The first demographic variable is the number of living children. As the chances of arriving at mixed gender increase with parity, controlling for this variable implies that we are not confusing gender imbalance effects with overall desired parity progression.

Age over 30 years is used as a continuous variable in the analysis. This demographic variable is important to take into account as it is related to fecundity and fertility experiences and therefore to the capability and wish to have a next child or not.

For marital status we divided the women in two categories: those in formal (married) or informal unions (living together) and those without a partner (single, separated, or widowed). Informal unions are accepted and common in Rwanda. Becoming pregnant without an identifiable partner is a strong taboo in Rwanda. These types of pregnancies or births are commonly known as IKINYENDARO, which means a pregnancy/birth coming from a lodge and not from a normal and socially accepted home. We expect that for this reason marital status influences the answers given by women on the main question (dependent variable) about wanting another child. A woman without a partner at the time of the interview could have a wish for a next child, but might not go to further parities given the taboo on children out of wedlock and because of the unfavorable conditions that she has to raise her children without economic and time support of a partner [39].

As an overall indicator of the socioeconomic status of the household of the mother, the living, housing, and hygienic conditions were preferred to the usual wealth index in the Demographic and Health Surveys Reports, for two reasons. Living and hygienic conditions have a direct relationship with the health (morbidity and mortality risks) of family members. Besides, the DHS wealth index does not distinguish between the poorest of the poor from other poor households [40].

For that reason we used an index constructed on various assets mentioned by respondents in the Individual Questionnaire. This questionnaire includes questions concerning

the household's ownership of consumer items (telephone, radio); dwelling characteristics such as flooring material; type of drinking water source; toilet facilities, available energy sources, and so forth. We classified the respondents without the listed consumer goods and with poor hygienic (no access to safe drinking water and bad hygienic toilet facilities) and poor housing conditions (uncovered floors) as extreme poor. The category of poor women includes the ones with few possessions, with poor or moderate housing conditions, and with no connection to the water mains. We classified respondents that are living in houses with ceramic tiles, cement or carpet, were in possession of a radio and telephone, and with access to safe drinking water (piped system into their dwelling) as nonpoor.

The variable women's occupation was divided into four categories, house-wives (those who are not employed), women who are employed in agriculture, women who are employed as unskilled or manual workers (blue collar) and those in managerial, clerical or services positions (white collar). We control for this variable to see if work activities of the mother—a well-known but counterfactual socio-economic determinant of fertility behavior [41] is related to the wish to have another child.

The exposure to media is known to be an important channel for behavioral change in general and in family planning in particular [42]. In this study, media exposure is defined as having heard about family planning on the radio or on television. A number of studies have also shown a positive association between women's years of formal education, use of maternal and child health services, and subsequently a reduced family size [43–45]. Education is therefore included in our model. Urban/rural differentials in fertility are not only related to occupational and educational composition, but also to differences in modernization and in labor market opportunities [46]. We therefore added the urban/rural variable on top of occupation and education.

Religion is another sociocultural factor in shaping fertility preferences and behavior [47]. The RDHS distinguishes Catholics, Protestant, Adventists, and Muslims, the latter being a very small community based mainly in the capital Kigali. Unfortunately this information is not available in the 2000 RDHS and we had to drop this variable in the multivariate model. From the descriptive results in Table 2 it is clear that the percentage of Protestants, that want another child after having three, is slightly higher.

3.2. Analytical Model and Tool. A bivariate design was used to check the effect of gender composition and the loss of sons and daughters with $y_i = 1$ if the mother expresses the desire to have another child and $y_i = 0$ if she does not have this desire. We used the binary logistic regression from the Statistical Package for Social Sciences (SPSS 20.0 for windows) to estimate the model. Results are presented as adjusted (logged) odds ratios. The results are based on the pooled data set, using year of the interview as one of the explanatory variables. We checked for interaction effects of year of the interview with the other exogenous variables, but none came up as being significant. We also ran the model

TABLE 2: The percentage of women with three or more living children who want to have another child.

Variable name	2000		Year 2005		2010	
	Yes %	Total#	Yes %	Total#	Yes %	Total#
Gender balance and mortality						
Mixed offspring: no mortality (Ref)	34.7	1479	29.7	1705	16.3	2312
Mixed offspring: lost either sex	23.2	1850	19.7	2006	9.7	1933
Sons only: no loss of daughter(s)	53.6	151	38.7	181	26.0	242
Daughters only: no loss of son(s)	58.1	129	42.7	157	34.1	205
Sons only: lost daughter(s)	36.7	60	34.9	86	23.8	84
Daughters only: lost son(s)	38.2	76	35.7	84	20.9	91
Marital status						
Married or living together	40.3	2676	31.9	3284	17.8	3954
Widowed/divorced/separated	6.6	1069	5.6	935	3.3	913
Media exposure						
No exposure (Ref)	30.3	3009	25.5	3265	15.0	3183
Radio and newsletter	34.5	357	30.5	609	14.2	402
TV	30.3	379	23.5	345	15.8	1282
Housing and hygienic conditions						
Destitute	28.9	1414	24.0	1414	15.3	1180
Poor	32.1	1494	27.3	1942	15.2	2426
Nonpoor	31.1	837	26.3	863	14.8	1261
Education						
None	25.3	1613	20.8	1493	10.5	1248
Primary	35.2	1772	29.3	2354	17.1	3151
Secondary and higher	32.8	360	26.1	372	13.9	468
Respondent's occupation						
No occupation	29.4	520	27.3	718	17.3	446
Agriculture	31.5	2894	26.4	3102	14.6	3863
Blue collar jobs (unskilled)	25.8	217	23.1	273	17.1	462
White collar jobs (managers; clerks ...)	23.7	114	16.7	126	14.6	96
Residence						
Urban (Ref)	25.9	691	22.0	829	14.1	623
Rural	31.8	3054	27.0	3390	15.2	4244
Mothers' religion						
Catholics (Ref)	NA	NA	24.7	1951	12.1	2151
Protestants	NA	NA	27.7	1504	18.8	1860
Adventists	NA	NA	27.1	564	15.8	676
Muslims	NA	NA	17.7	96	5.6	72
No Religion	NA	NA	26.7	75	14.0	100
Total		3745		4219		4867

Sources: RDHS 2000 [11], RDHS 2005 [12], and RDHS 2010 [10].

separately for each year and, apart from the constant, the parameters did not differ substantially.

4. Results

Our first results describe the change in gender preferences over the years (Table 3). A striking result is the clear preference for gender balance, shown on the diagonal. Having the same number of boys and girls is preferred by more

women than any other combination, and the percentage on the diagonal is larger than any other within each row and each column. This pattern changes in 2010, when the combination of having two sons and one daughter is slightly more popular than having one son and one daughter.

In 2000 the modal category is having a combination of three or more of each (28%), directly followed by having two of each (25%). In 2005 the ideal family size dropped and having two sons and two daughters is the most preferred

TABLE 3: Preferred gender combinations in 2000, 2005, and 2010 of women having three children or more.

Year	Preferred number of boys	Preferred number of girls				Total
		No preference	1 daughter	2 daughters	3 or more daughters	
2000	No Pref.	471 (12.6%)	8 (0.2%)	9 (0.2%)	2 (0.1%)	490 (13.1%)
	1 son	8 (0.2%)	178 (4.8%)	67 (1.8%)	33 (0.9%)	286 (7.6%)
	2 sons	4 (0.1%)	129 (3.4%)	962 (25.7%)	351 (9.4%)	1446 (38.6%)
	3 and more	5 (0.1%)	76 (2.0%)	393 (10.5%)	1049 (28.0%)	1523 (40.7%)
	Total	488 (13.0%)	391 (10.4%)	1431 (38.2%)	1435 (38.3%)	3745 (100%)
2005	No Pref.	645 (15.3%)	4 (0.1%)	5 (0.1%)	5 (0.1%)	659 (15.6%)
	1 son	9 (0.2%)	246 (5.8%)	80 (1.9%)	23 (0.5%)	358 (8.5%)
	2 sons	15 (0.4%)	188 (4.5%)	1428 (33.8%)	285 (6.8%)	1916 (45.4%)
	3 and more	10 (0.2%)	92 (2.2%)	394 (9.3%)	790 (18.7%)	1286 (30.5%)
	Total	679 (16.1%)	530 (12.6%)	1907 (45.2%)	1103 (26.1%)	4219 (100%)
2010	No Pref.	1137 (23.4%)	3 (0.1%)	5 (0.1%)	2 (0.0%)	1147 (23.6%)
	1 son	16 (0.3%)	470 (9.7%)	256 (5.3%)	23 (0.5%)	765 (15.7%)
	2 sons	10 (0.2%)	555 (11.4%)	1331 (27.3%)	187 (3.8%)	2083 (42.8%)
	3 and more	19 (0.4%)	75 (1.5%)	283 (5.8%)	495 (10.5%)	872 (17.9%)
	Total	1182 (24.3%)	1103 (22.7%)	1875 (38.5%)	707 (14.5%)	4867 (100%)

(34%) composition, which is also the case in 2010, but in that year having no preference for either sons or daughters is the second most popular response.

At an uneven number of offspring, boys are clearly preferred to girls. In each year, twice as many women prefer having two sons and one daughter over having two daughters and one son. In later years the (smaller) numbers that want five or more children prefer three sons and two daughters over three daughters and two sons.

At first sight one may therefore conclude that pressure to limit the maximum number of children to three will shift the gender preference balance towards male offspring. Yet the number of women who state not to have any preferences is growing very rapidly and nearly doubled in 10 years of time, and fifteen percent of our population see the combination of one son and one or two daughters as an ideal alternative. Close to fifty percent could probably live with having three children, but half of these want to have at least one son and one daughter.

In our multivariate model (Table 4) we first investigate the impact of the composition of the living offspring according to gender on a couple's wish to stop having children. We expect that in case of a strong preference of any gender (daughters or sons), women with at least three children of the same sex are not satisfied with the gender composition of their offspring and have a higher probability of wanting a next child compared to women with a mixed offspring. Besides we expect that women who have lost a child will more often desire another child compared to women who did not lose one or more children, in particular if the loss of children would mean losing the last or only son or daughter.

As previous studies have hypothesized, women's reproductive behavior (fertility) is influenced by existing mortality patterns in terms of replacement and insurance strategies. But, in many cases, studies have focused on the replacement of the index child who dies before parents reach the desired

number of children [48, 49]. Apart from this conscious strategy related to the loss of the index infant, we expect that parents' response on child mortality becomes more accentuated when they have lost a child of a specific gender, in particular when the surviving children have the same gender.

The results in Table 4 show that at parity of 3 living children and above, the desire for an extra child of parents who did not lose any child or who mourned the loss of one or more children does not vary significantly in case the surviving children have a mixed gender composition. The odds ratio (0.945) is close to 1. As we control for the number of living children, replacement might already have occurred, which would indicate that there are no insurance effects of prior child mortality experience.

Insurance effects may be expected if sons or daughters are lacking, in particular in absence of replacement. The third and fourth category of our variable defines the women with sons and daughters only, without having lost children of the opposite gender. Parity progression after three is higher in both cases, but insignificant for those that have sons only. Support in old age seems to be more dependent on the presence of a son than of a daughter.

Both replacement and insurance effects are bound to occur, when people lose their last or only son or daughter. The results of the model show that this is indeed the case. The ones that had at least one daughter but lost all have higher odds to continue childbearing. The effect is also strong among women that had at least one son but lost all the odds ratio is close to 1.5.

The effect of the year of the interview is very prominent, with an odds ratio of 0.234 for 2010 over 2000. The fact that we did not find any interaction effect of this variable with the variable on gender balance and mortality (not shown) indicates that the slight preference for having and replacing sons has not increased significantly over the years. However

TABLE 4: Binary logistic regression of the desire to have another child for women with at least three children (pooled data 2000, 2005, and 2010).

Variable	<i>N</i>	<i>B</i>	S.E	Odds Ratios
Gender balance and mortality	12831			
Mixed offspring: no mortality (Ref)	5496			
Mixed offspring: lost either sex	5789	-.056	.058	.945
Sons only: no loss of daughter(s)	574	.102	.108	1.108
Daughters only: no loss of son(s)	491	.365**	.114	1.441
Sons only: lost daughter(s)	230	.371*	.171	1.449
Daughters only: lost son(s)	251	.395*	.168	1.485
Year of interview				
2000 (Ref)	3745			
2005	4219	-.483***	.060	.617
2010	4867	-1.452***	.067	.234
Number of living children (-3)		-.473***	.024	.623
Current age of the mother (-30)		-.099***	.005	.905
Marital status				
In a union (Ref)	9914			
Single/separated/widowed	2917	-2.094***	.093	.123
Media exposure				
No exposure (Ref)	9457			
Radio and newsletter	1368	-.027	.080	.974
TV	2006	.023	.082	1.023
Housing and hygienic conditions				
Destitute (Ref)	9457			
Poor	1368	.125*	.059	.033
Nonpoor	2006	.028	.078	.721
Respondents' education level				
None (Ref)	4354			
Primary	7277	.015	.059	1.015
Secondary and higher	1200	-.025	.111	.975
Respondents' occupation				
None (Ref)	1684			
Agriculture	9859	.054	.077	1.056
Blue collar	952	.034	.116	1.034
White collar	336	-.417*	.185	.659
Place of residence				
Place of residence (Urban)Ref	2143			
Place of residence (Rural)	10688	.464***	.083	1.590
Constant		.401	.119	1.493

Significance: * <0.05; ** <0.01; ***0.001.

it also means that losing the last son or daughter has the same strong effect on parity progression in 2010 as in 2000.

For a second check of significant changes over time we ran the model separately for the year 2010. The estimated odds ratios for the gender balance and mortality variable are slightly higher (1.003; 1.162; 1.668; 1.838; 1.686 not shown here), but not significantly different from the odds ratios in the pooled set.

The control variables have the expected sign, with the exception of poverty and education that show limited or no significant relation. The absence of an interaction effect with the year of the interview indicates that the strong

campaign to limit childbirth has touched upon each segment of the population in Rwanda, but does not mean that having three children is now favored by everybody. The existing heterogeneity in parity progress remains stable over time, albeit at a lower overall level.

5. Conclusion

The lack of a significant difference in the desire to stop at parity 3 between mothers of a mixed offspring with or without a loss of a child indicates that the insurance effect in concern of future mortality is not strong. Mothers do not want at

least two children of each gender to be sure that they—seen the experienced risk of child mortality—will be left with a single gender family in the future. Mothers with a single gender family of three children who have lost the only or last child of the opposite sex do have a strong wish to replace that child. In other words, replacement is strongly related to the gender composition of the living children. Still having a mixed gender family does not lead to replacement, but being left with a single gender family does. These results are in keeping with conclusions of others who state that the effect of replacement on mortality is “modest in magnitude” [32, page 61] and that decisions about fertility behavior in relation to child mortality must not be seen in isolation [49]. The determinants of fertility decisions constitute a complex framework in which various components and goals play a role. Health of the mother could be a factor to stop child bearing, costs of children as well according to these researchers, and as our study shows gender composition of the family does also.

Sons and daughters are almost equally important for mothers in Rwanda. We interpreted this as a fertility decline-gender preference trade off, a situation where women find a threat in echoes appealing them to stop childbearing before leveling the gender preference among their living offspring. Even though the total fertility rate has fallen from 6.1 to 4.6 between 2000 and 2010, attitudes towards filling the gender gap for families with 3 single gender living children or replacing dead infants of a specific gender for families who reported having lost all sons or all daughters have not changed over this decade.

The output of this study evidences that, even though the government might focus its effort to reduce the total fertility rate to 3 children through the provision of family planning services or sensitization campaigns, the gender composition of living children remains a corner stone to parity progression for Rwandan women even after reaching the third or higher parities. A gender specific replacement strategy driven by the desire for a mixed family composition was identified to be a strong motivation for parity progression.

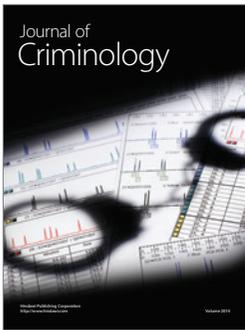
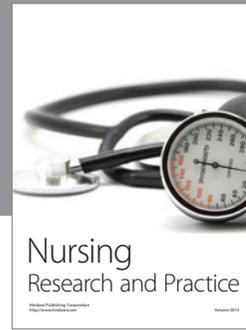
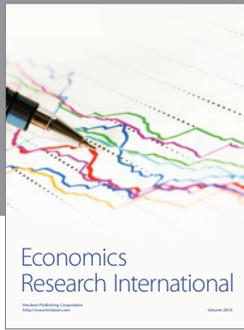
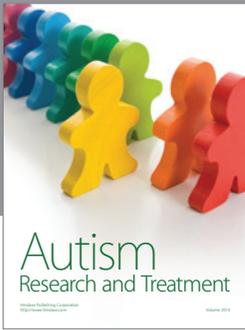
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