Child Survival and the Fertility of Refugees in Rwanda after the Genocide

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Abstract

In the 1960s and 1990s, internal strife in Rwanda has caused a mass flow of refugees into neighbouring countries. This paper explores the cumulated fertility of Rwandan refugee women and the survival of their children. To this end, we use a national survey covering 6420 former refugee and non-refugee households conducted between 1999 and 2001. The findings support old-age security theories of reproductive behaviour: refugee women had higher fertility but their children had lower survival chances. Newborn girls suffered more than boys, suggesting that the usual sex differential in child survival observed in most populations changes under extreme living conditions.

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1. Introduction

The last decade of the 20th century was probably the most turbulent Rwanda has ever seen. A combination of economic crisis, civil war, genocide, internal displacement, mass emigration, political transition and return of refugees ravaged the country. Every Rwandan household was affected by at least one of these events. These events have scarred the Rwandan population at multiple levels: loss of family members through violent death, rape, disease, hunger, loss of dignity, loss of property, loss of land, fleeing in neighbouring countries, renewed onslaught, absence of respect for human rights, imprisonment. It is not farfetched to ask if a country or a population can overcome such a devastating decade.

The scare inflicted on the population of a country engulfed in violent conflict is reflected in its mortality pattern. This is a well-researched area of inquiry for the case of Rwanda as well as for other countries. Less researched is the effect of violent conflict on the reproductive behaviour of affected populations. That is the topic that we want to address in this paper. What can we tell about the fertility of refugee women and about the survival chances of their children in Rwanda during the 1990s? More specifically, we compare the reproductive pattern of women who lived and stayed in their own residence in Rwanda during their entire life with the reproduction of women who either were forced to flee Rwanda, fled voluntary, were internally displaced or came to Rwanda for the first time after 1994.

2. Forced migration, fertility, and child survival

According to the 1951 UN Convention, refugees are persons who are outside their country of nationality due to a well-founded fear of being persecuted for reasons of ethnicity, religion, nationality, membership in a particular social group, or political opinion. Conventionally, they are distinguished from internally displaced persons (IDP's). The latter include people who have been obliged to flee or to leave their homes as a result of armed conflict and situations of generalised violence, but who have not crossed an internationally recognized state border (see UN OCHA, 1998). Both refugees and IDP's fall under the more general heading of forced migration.

The available literature mentions contradictory theoretical positions about the impact of forced migration on fertility. One relevant line of demographic theory is the risk-insurance or old-age security approach, which emphasizes the insurance role of children under conditions of economic insecurity. This theory implies that fertility rises among refugees as a response to lower child survival: high child mortality entails a pressure to replace deceased children. The opposite stance is that fertility falls because the stress and uncertainties of refugee life are not conducive to childbearing. According to this hypothesis, couples will try to delay births in response to sudden declines in income or increased uncertainty (Lindstrom & Berhanu, 1999; McGinn, 2000).

The old-age security approach is advanced in the literature on the reproductive behaviour of rural populations in peacetime as well. It is assumed that children contribute to the economic and social well-being of parents, especially when they get older. Nugent (1985) writes that the absence of well-functioning financial, product, and labour markets, increases the importance of children as old-age support. Clay & Vander Haar (1993) find

support for this in Rwanda. Using the 1988 Non-farm Strategies Survey of Rwanda, they find that 69% of parents in the sample with children living outside the household report that they receive support from their children. Support is received in the form of labour, in kind or in cash. In the study, sons are more likely to give support in cash, whereas daughters gave support in terms of labour or gifts in kind. This suggests that Rwandan parents improve their social security by having more children, male as well as female. Together with this economic rationale for having many children, May et al. (1990) report that social norms and attitudes of Rwandan women are very pro-natalist. They consider it their duty to transmit life. Having a lot of children gives honour and prestige to the family.

A number of empirical studies have found increased fertility among refugee populations. This is the case for Afghan women in refugee camps in Pakistan (Yusuf, 1990), Palestinian refugees living in Gaza and the West Bank (Al-qudsi, 2000), and Indochinese refugees resettled in the US (Weeks et al., 1989). In these cases, high fertility is associated with low reproductive health: Sachs (1997) argues that dislocation, inadequate shelter, minimal food rations, poor sanitation and physical danger typical of refugee life make safe motherhood almost impossible. One should be cautious, however, of deriving general observations from case studies. Reproductive health in general, and fertility behaviour in particular, may vary a lot in refugee situations depending on the overall conditions in the camps, the length of stay, the access to health care and so on. In a comparative study of more than 600,000 people living in 52 post-emergency phase camps in seven countries, Hynes et al. (2002) found better reproductive health outcomes (lower fertility, lower neonatal mortality, lower maternal mortality, and higher birth weight)

among refugees and internally displaced populations in these camps compared to the populations in their respective host country and country-of-origin populations. They attribute their findings to better access by camp residents to preventative and curative health care services, and to food and non-food items, as well as improvements in water supply and sanitation.

In a non-refugee setting, Clay & Johnson (1992) used a 1988 survey held among Rwandan households and found that households with larger farms have more children. They also found that it is not the demand for labour that drives fertility, since the farm size was unrelated to the number of household members of labour force age. The causal mechanism appears to be a rise in the supply of children that a larger farm seems to make possible. One must add that Rwandan customary law, before 1994, divides the land owned by the father equally over all sons. Daughters and wives could not own land (exception made for special circumstances). This is not unrelated to Nugent's (1985) assertion that the loyalty of children to provide support to their parents depends on the amount of land and other wealth that they will inherit.

In times of violent conflict and forced migration, physical capital (fixed assets which have to be abandoned during refuge) such as the size of a household's farm may play a less important role in reproductive behaviour compared to the social capital, education and relationship status of the mother, among other variables. On top of this, traditional methods of birth control used by Rwandans, such as birth spacing, may be more difficult to practice in the stressful, unhealthy and coercive situations refugees are living (May et al., 1990). A short time span between two births impairs the survival chances of the penultimate child because this one has to be weaned early, risking illness, malnutrition

and psychological distress.

Research on the health situation of displaced populations finds excess mortality, especially among children under age five, as a prime fact (Médecins Sans Frontières - MSF, 2003). In a survey held among former UNITA members (900 households, 6599 family members) in refugee camps, MSF found malnutrition, fever or malaria, and war or violence as the three most frequently reported causes of death. The Danish Epidemiology Science Centre (1999) found severe malnutrition and high mortality in a survey of 422 refugee children in Guinea-Bissau. They report higher malnutrition and higher mortality for children living in a non-camp setting, compared to children living in a camp. The Goma epidemiology group (1995) found high prevalence of child mortality as well as acute malnutrition among children in refugee camps in Eastern Zaire, especially in female headed households.

Apart from the living conditions, Mbago (1994) uses the 1988 Tanzanian census to examine other factors associated with child mortality in three regions populated with refugees from Burundi. He finds that low levels of maternal schooling are associated with high child mortality for both the Tanzanian nationals and the refugees. Mother's employment affected child mortality among the Tanzanian population but was statistically insignificant among the refugees.

Was the fertility of Rwandan refugee mothers higher than the fertility of their non-refugee counterparts? And how was child survival related to the fertility of refugee mothers? Before section four introduces the data we have used in order to answer these questions, the next section first outlines the historical background of civil war, genocide, and mass migration in Rwanda. Section five presents the results of our study.

3. Civil war, genocide and mass migration in Rwanda

Between April and July 1994, at least 500.000 Tutsi (Des Forges, 1999)[3] or about 75% of the Tutsi population together with many Hutu who were known to be opponents of Habyarimana were killed by the Rwandan military (FAR), local police, national guard and militia called Interahamwe. A few years before, in October 1990, a group of rebels consisting of Tutsi refugees who had left Rwanda during the 1959-1962 revolution, together with their offspring, attacked Rwanda from Uganda. What followed was a civil war between the Rwandan armed forces (Forces Armées Rwandaises, FAR) and the rebel army (Rwandan Patriotic Front, RPF) in which the civilian population in the north of Rwanda was the main victim. While the RPF claimed to fight against the dictatorship of president Habyarimana, the latter claimed to represent the majority of the people. The battles between both armies were paralleled by peace negotiations and third party interventions. In order to understand the drama of this period, it is essential to know its history.

The ethnic composition of the population had been a major issue in Rwandan politics since the time of colonisation. The Belgian colonizer had first favoured the Tutsi ruling class because they were considered racially superior to the Hutu, who were considered a people of cultivators. In the 1950's, with the spread of anti-colonial and independence movements, the ruling Tutsi began to claim the independence of Rwanda. At that time a Hutu counter-elite was given the chance to study at catholic seminars. With Belgian

[3] Other scholars, such as Prunier (1995), put the death toll between 500.000 and 800.000.

military and political aid, this new elite of Hutu leaders succeeded in overturning the ruling Tutsi regime and replace it by the leadership of the *Parmehutu*, the party for the emancipation of the Hutu. G. Kayibanda, a seminarian, became the first president. The ethnic divide however remained and was even strengthened. The new rulers, at the national as well as at the local level established their power by removing all Tutsi from positions of power. Ordinary Tutsi who were not associated with political power were also targets of reprisal and murder. For detailed treatment of the history of Rwanda, we refer to books written by G. Prunier (1995), C. Newbury (1988), D. De Lame (1996), F. Reyntjens (1994) and J.P. Chrétien (2000), among others.

In 1973 a group of army officers around Juvénal Habyarimana took power by a coup d'état. They were frustrated by the monopolisation of power by the group around Kayibanda, whose power base was the central prefecture of Gitarama. The group around Habyarimana, originating from northern Rwanda, saw all benefits of power go to the people from Gitarama. After the coup d'état, Habyarimana became the new president. He established the MRND (Mouvement Révolutionnaire National pour le Dévéloppement), the single party whom every Rwandan was supposed to belong to by birth. Aided by high prices for the coffee, the country's main export crop, in the late seventies and generous donor support, Habyarimana was liked, or at least not contested, by a large part of the population. He did not abolish the ethnic identity cards and he forbade officers and soldiers to marry Tutsi wives. In order to control population movements, he set up a detailed system of registration and reporting of demographic changes at the local level. He also had every adult participate in the *Umuganda* (weekly communal labour), and institutionalized weekly animation sessions in honour of himself (Verwimp, 2003).

A key characteristic of the Habyarimana regime was its doctrine on the relation between population and land. The president had never been an advocate of a family planning policy. On several occasions he declared that children were the wealth of every Rwandan family. Groups set up by the Ministry of the Interior attacked pharmacies that sold condoms. The president was fully supported by the Catholic Church, which was omnipresent in Rwanda. The fertility rate of Rwandan women was among the highest in the world and the average size of cultivated land per family was shrinking rapidly from 1.2 ha in 1984 to 0.9 ha in 1990 (National Agricultural Surveys, 1984 and 1989-1991). Many families had not enough land to earn a living and feed their families. In 1986, when discussing the fate of the 1959-1962 refugees, the Central Committee of the MRND said that their return was not possible because the country was overpopulated.

During the civil war preceding the genocide (1990-1994), a number of local massacres occurred in which a total of 2.000 Tutsi were killed. These massacres were not spontaneous outburst of violence from a poor peasant population but were organised by the national power elite. On April 6th, 1994 Habyarimana's plane was shot down. After that, the genocide broke out.

A substantial part of the FAR together with several hundreds of thousands of civilian refugees fleeing the war were pushed into neighbouring Zaire, Tanzania and Burundi. For two years, a mix of civilian refugees and warrior-refugees (ex-FAR) resided in refugee camps along the border between Zaire on the one hand and Uganda, Rwanda and Burundi on the other hand. The Goma Epidemiology Group (1995) estimated that between 6% and 10% of all refugees died during the first month of their arrival in eastern Zaire, 85-90% of these because of diarrhoeal disease. Such death rate is two to three times higher

than the highest previously reported rates among refugees in Sudan, Somalia or Thailand. In November 1996, the Rwandan patriotic army (RPA, successor of the RPF) attacked the Zairian camps thereby killing both thousands of armed ex-FAR as well as unarmed civilians. The majority of the surviving refugees then returned to Rwanda. A sizable part of ex-FAR, interahamwe and genuine refugees fled deeper into Zairian territory. During the subsequent years, 1997-2000, most remaining refugees had either died or were repatriated.

4. Data and methods

4.1 Data Sources

In order to investigate the effect of these subsequent refugee crises, we use a nationally representative household survey, conducted in Rwanda between 1999 and 2001. The Household Living Conditions Survey, also known under its French acronym EICV (Enquête Intégrale des Conditions de Vie), was conducted by the Statistics Department of the Government of Rwanda and covered 6.420 households in rural areas, in small cities as well as in the capital Kigali. The survey was multipurpose and collected information on education, health, family composition, migration, employment, agricultural and non-agricultural activities, expenditures and transfers from over 32.000 household members. The sample of households was selected by stratified, two stage cluster sampling. First, primary sampling units (zones in cities, cells in rural areas) were selected with probability proportional to size. From a complete list of households in the selected units, a systematic sample was drawn. The demographic and health data in the EICV are not of the same depth as one sees in the well-known Demographic and Health Surveys. For example,

information on the date of birth of deceased children is missing, making it impossible to analyze birth spacing or to measure the direct impact of child mortality on fertility. Also, the survey did not include a retrospective mortality count of family members. Entire families of men, women and children who died in Rwanda or abroad were not taken into account. Given these limitations, the coverage of the migration pattern of households and individuals in this survey makes it very suitable for our present purpose, which is to see what difference a woman's refugee status makes for her reproductive behaviour. The Statistics Department of the Rwandan Ministry of Finance compared the data with other data sources and checked for internal consistency. They conclude that one can have a good degree of confidence in the overall quality of the data (Ministry of Finance of Rwanda, 2002).

Table 1 presents a comparison of the demographic profile of Rwandan women at the start and at the end of the decade. High levels of fertility combined with decreasing levels of mortality in the seventies and eighties made Rwanda a case of an exceptional high level of population growth (3.7% per year, May et al., 1990). Given the scarcity of land, this population growth led to an equally exceptional level of population density (300 persons per square km in the early 1990s). At the end of the decade, fertility remained high, even though there was some decline. Infant and child mortality went up, but this is probably only temporary due to the aftermath of the genocide, civil war and mass migration.

Table 1: Demographic Profile of Rwandan Women aged 15 to 49 years

Demographic indicator	1992	2000
% of women with no education	38.0	29.4
Total Fertility Rate	6.2	5.8
Median age at first marriage	20.0	20.7
Median age at first birth	21.5	22.0
Mean ideal number of children	4.2	4.9
% of women who want no more children	36.0	33.0
Median breastfeeding duration (months)	27.9	30.6
Infant mortality rate (per thousand)	85.0	107.4
Under-five mortality rate (per thousand)	150.8	196.2

Source : Demographic and Health Survey 1992 and 2000, Final Reports

4.2 Reconstruction of refugee status

The EICV featured several questions on the migration history of households. We combined these questions to arrive at five categories currently composing the Rwandan population according to their migration and refugee status. Table 2 gives an overview of the categories that we distinguished and the number of women in each category.

In the first category are women who never migrated, neither voluntary nor forcefully. The second group consists of short term, temporary migrants, i.e. those who were displaced in Rwanda for less than six months or who found themselves abroad for less then six months after 1990. A large majority of the women in this group sought shelter elsewhere in Rwanda for a short period of time, often a few weeks, in order to escape violence in their home region. They were not considered refugees in the EICV. Categories three and four are women who fled for a considerable period, i.e. for at least six months. Category three consists of women who were internally displaced or who fled Rwanda for at least six months after 1990. Many women from northern Rwanda, for example, were first

displaced in camps around Kigali for several months prior to the genocide and then fled to Zaire in July 1994. The fourth group are the so-called old caseload refugees. These people, practically all Tutsi, were expelled from Rwanda in the sixties. They lived in neighbouring countries and returned to Rwanda before or after 1994. The fifth and last group of women are new to Rwanda: they are the offspring of refugees who lived in the Diaspora and came to Rwanda after 1994.

Table 2: Migration History of Rwandan women aged 15 to 49 years

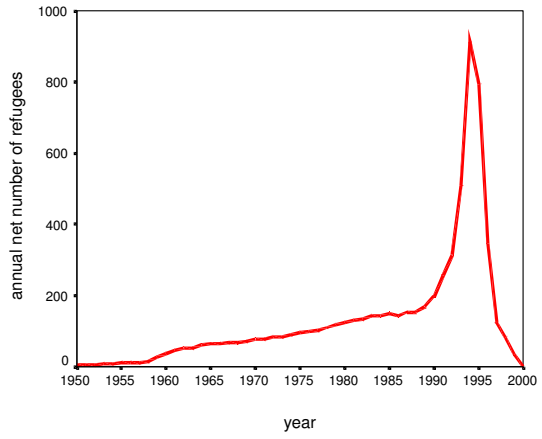
Categories	N	%	Mean: Age	Children born alive	Per cent still living
(1) Never migrated	4968	60.1	26.8	2.36	80.9
Refugees after 10/1990:					
(2) Refugees or IDP's<6 months	1522	18.4	27.8	2.48	81.9
(3) Refugees or IDP's≥6 months	1103	13.4	27.3	2.66	79.0
Refugees before 10/1990:					
(4) Returned before or after April 1994	180	2.2	34.8	4.40	76.3
(5) Never lived in Rwanda before	468	5.7	25.7	2.03	87.5
Migration history missing	19	0.2			
Total	8260				

Source: EICV, 1999-2001, authors' calculations

Figure 1 presents the migration history of old and new caseloads (categories (3) and (4) in Table 2) taken together. It is the duration of their flight (at least 6 months) which distinguishes this group from the other groups. The large majority among them were refugees in the Congo, Tanzania, Burundi or Uganda. A limited number of persons in these two categories were internally displaced persons. However, the data do not allow to distinguish between refugees and internally displaced persons. In the subsequent analysis therefore, we consider categories 3 and 4 as 'refugees'. One sees a gradual but steady

increase of refugees from 1960 to 1990. These are Tutsi, also called old caseload refugees, who fled the Hutu Republics under presidents Kayibanda and Habyarimana. The refugee flow continued in the 1990s with a peak in 1994 when 13.4% of all women between 15-49 years old in our sample fled Rwanda. This time, Rwandan Hutu fled the country in mid-1994 when the RPF was gaining control. They were to become the new caseload refugees. From mid-1994 onwards, we get a return of old caseload refugees, followed by, from the end of 1996 onwards, a mass return of new caseloads.

Figure 1: Number of women aged 15 to 49 years who were a refugee or internally displaced for at least 6 months (old and new caseloads), N=1283



Source: EICV, 1999-2001

An overview of fertility and child survival by age and refugee status is presented in table 3. Panel (2) of the table shows that refugee women had higher cumulated fertility than non-refugee women: at all ages above age 20, Rwandan women who had been a refugee for part of their lives, reached a higher parity on average than women who did not flee. However, refugee women lost a higher proportion of their children, as panel (3) shows.

Table 3: Descriptive statistics on fertility and child survival of Rwandan women, 1999-2001

Variables	Age 15-19	20-24	25-29	30-34	35-39	40-44	45-49
(1) number of women	2488	1553	1104	874	806	812	539
not refugee	2171	1342	925	735	691	656	457
refugee	317	211	179	139	115	156	82
(2) number of children ever born alive							
mother not refugee	0.04	0.74	2.10	3.37	5.04	6.43	7.05
mother refugee	0.02	1.00	2.22	3.84	5.36	6.69	7.38
(3) children still living in % of born alive							
mother not refugee	91.9	86.3	85.9	83.0	79.7	77.4	73.3
mother refugee	72.2	85.0	82.4	80.2	78.9	73.4	68.1

Source: EICV, Household Survey, 1999-2001

These descriptive data seem to support the risk-insurance approach. The main reason for the insurance-hypothesis to predict higher fertility among refugees seems to apply: mothers who were forced to flee from Rwanda lost more children. This raises three questions. First: is the difference in fertility between refugee and non-refugee women really due to their forced migration history, or is this a spurious effect? Second: are the lower survival chances of refugee children due only to adverse living conditions or is there also an effect of their mothers' fertility? Third: do the differences in fertility and child survival depend on the different circumstances of their migration or life in exile, more specifically on whether or not they were new or old caseload refugees?

4.3 Modeling fertility and child survival

The survey data do not include the dates of all births, but the number of children ever born (B_i in the following) is available for each woman. Because this is a count variable,

the natural approach then is to assume that it has a Poisson distribution. The Poisson regression model assumes that the observed number of events B_i is determined by an underlying, unobserved rate μ_i, so that B_i has a conditional mean that depends on a vector of women's characteristics X_i,.

A critical assumption of the Poisson model is that the probability of an event occurring is constant within a given time unit, and independent of other events during the same period. If this assumption is true, the variance of the count variable will be equal to its mean. However, due to contagion, this assumption rarely holds in the social sciences. Contagion means that the likelihood of an event occurring is influenced by the occurrence or non-occurrence of another event. As a result, the variance may be bigger than the mean number of counts or the variance may be lower. In the first case, we will observe more high and low counts than expected in the Poisson model. This is known as overdispersion. In the second case, when the variance of the count is smaller than its mean, we will observe a greater number of births right around the mean. This is known as underdispersion (McCullagh & Nelder, 1989).

It is possible to account for over- and underdispersion with respect to the Poisson model by introducing a dispersion parameter φ that captures the difference between the mean μ_i and the variance (McCullagh & Nelder, 1989).

$$Var(B_i|X_i) = \mu_i\varphi = \exp(\beta X_i)\varphi \quad (1)$$

When φ=1, model (2) reduces to the Poisson model. Underdispersion implies that φ<1, while φ>1 indicates overdispersion. McCullagh and Nelder (1989) suggest to estimate

the value of the dispersion parameter φ as a ratio of the deviance to its associated degrees of freedom. This is the approach taken here.

Our dataset includes women between ages 15 and 49. The exposure time varies accordingly from close to zero for the youngest women to the maximum of 35 years for the oldest. We therefore need to use the exposure time as an offset variable in the Poisson regression. We have calculated the exposure time for all women by subtracting 14 years from the current age. So the real dependent variable in our regression is not the number of live births B_i, but a fertility rate, i.e. the number of live births divided by the length of the risk interval. What we are doing is to model women's average yearly fertility rate under the assumption that the risk interval starts at the age of 14. This amounts to the classic approach to fertility rates in demography. So the model we actually fitted can be written as:

$$\log \hat{\mu}_i = \log\left(\frac{B_i}{age_i - 14}\right) = \beta X_i + \varepsilon_i \Rightarrow \log(B_i) = \log(age_i - 14) + \beta X_i + \varepsilon_i \quad (2)$$

The vector of predictor variables X_i includes woman's age, civil status, schooling, occupational sector, place of residence, and migration history. First, age is included in the form of five dummies for six age categories in order to allow for a non-linear relationship between age and the number of children ever born. Second, we do have information about current relationship status, but not about when the relationship started. We use women who are currently married as a reference category, and compare them with single, unmarried but cohabitating, divorced or separated, and widowed women. Unfortunately, the data provide only information about the civil status at the survey time and not during

women's previous migration and fertility history. Third, the woman's educational status is measured in number of years of schooling. Fourth, we distinguish between women who report the cultivation of their own farm as their principal occupation and all other occupations Because of the importance of the rural-urban divide in the literature, we also incorporate residential dummies.

In order to assess the net effect of the migration history on child survival, we estimated a logistic regression model with the proportion of surviving children as the dependent variable. Technically, we count the number of live births as 'trials', and the number of currently surviving children as binomially distributed 'successes' (see Long, 1997). In addition to the covariates used in our fertility model, we added the average fertility rate to the list of covariates of child survival because the level of fertility is known to be an important determinant of infant and child mortality (Reher, 1999). The fertility rate was, of course, the endogenous variable in the Poisson model, while it is treated as exogenous in the analysis of child survival.

5. Results

5.1 Impact of Migration on Fertility

Table 4 reports the estimates of the Poisson regression model. The fact that Bayesian Information Criterion (BIC, at the bottom of the table) is negative is usually taken as an indicator of a good fit (Long, 1997). This is confirmed by the ratio of the deviance to the number of degrees of freedom being 0.67, which is close enough to one to indicate that the model fits the data reasonably well (Pedan, 2001). This ratio is also the estimate of the dispersion parameter. The fact that it is lower than one indicates that our data are

underdispersed. This implies that the number of births predicted by the model for any particular combination of the independent variables is strongly concentrated around the mean $E(B_i|X_i)$. Possibly, this is the result of compelling reproductive values and norms in Rwanda.

Table 4: Poisson regression of cumulated fertility, Rwanda 1999-2001

Variable	Coeff.	S.E.
Age (ref=14-24)		
25-29 years	0.103***	0.029
30-34 years	0.148***	0.028
35-39 years	0.213***	0.028
40-44 years	0.225***	0.027
45-49 years	0.142***	0.028
Relationship status (ref=married)		
Cohabitating	-0.033**	0.016
Divorced	-0.335***	0.026
Single	-2.319***	0.048
Widow	-0.178***	0.015
Education and occupation		
Years of schooling	-0.024***	0.002
Principal occupation is farming	0.050*	0.028
Paid work in the last 12 months	-0.004	0.017
Displacement/Refuge/migration (ref=never displ./refugee or migr.)		
short term IDPs or refugees (cat.2)	-0.016	0.016
new caseloads (cat.3)	0.041**	0.017
old caseloads (cat.4)	0.040	0.030
new to Rwanda (cat.5)	0.077***	0.028
Place of residence (ref=rural area)		
Residing in Kigali	-0.089***	0.031
Residing in a small city	-0.067**	0.029
Constant	-1.566***	0.039
Dispersion parameter	0.669	n.a.
N observations	8089	
Deviance	5406.0	df = 8070
BIC [Deviance - df·ln(N)]	-67210	

*** sign. at the 1% level, ** at the 5% level, * at the 10% level

Turning immediately to the estimated impact of migration history, which is the main issue in this paper, one can see in Table 4 that the new caseload refugees had significantly higher fertility than women who never migrated, even after controlling for the other variables in the model. To repeat, the new caseload refugees are the women who were internally displaced or became refugees after 1990 for a relatively long period of time (at least 6 months). The exponentiated effect parameters can be interpreted as factor effects, so exp(0.041)=1.04 means that the expected fertility rate for the new caseload refugees is 1.04 times the mean rate for the reference group.

Women who were new to Rwanda after the genocide had significantly higher fertility than the reference group as well. For women who never lived in Rwanda before, the estimated factor effect is exp(0.076)=1.08. After controlling for the other covariates, the fertility of short term IDP's or refugees and of the old caseload refugees was not significantly different from the fertility of women who never migrated inside or outside Rwanda.

Age has the expected effect in the regression: older women have significantly higher cumulated fertility than younger women. As women approach the age of menopause, the number of additional births declines, making the average number of births during the overall risk interval (defined to start at age 14) decrease again.

With respect to relationship status, the estimates indicate that married women had the highest and single women the lowest fertility. Marriage in Rwanda, as in other countries, is an important determinant of fertility. The numbers of years spent in school as well as the practise of farming as one's principal occupation also have a profound and statistically

significant effect on fertility. More educated mothers have fewer children. Farming women have, all else equal, exp(0.05)=1.05 times more children compared to non-farming women.

One could argue that multicollinearity between farming and residence in the rural areas could be a problem in this regression. Econometric theory tells us that multicollinerarity becomes a problem when the data set has very few cases in which the two correlating variables have different values (Wooldridge, 2003). This is not the case in our data. In case of substantial overlap between variables, as is the case in our data set, including all variables helps to identify which one actually mattered. In this case, both farming and place of residence had an independent and statistically significant effect on fertility. Measured against residence in the rural areas as a reference category, a woman living in Kigali or in one of the other urban centres of Rwanda has significantly fewer children.

The off-farm variable, measuring the fact whether or not the women have performed paid work outside the family farm for the last 12 months, is not statistically significant. The off-farm variable is a very broad category, including wage work on someone else's farm as well as the management of business, small or large.

So far, our multivariate analysis shows that the migration history of refugees had the effect of raising their fertility. The descriptive statistics in table 3 indicated, however, that fewer children of refugee mothers survived. The next section analyzes the covariates of child mortality with multivariate logistic regression.

5.2 Child survival and refugee status

Table 3 already showed that Rwandan refugees (categories 3 and 4) saw more of their

children die than non-refugees. This is no surprise, although higher mortality among refugee children should not be taken for granted (see Khawaja, 2004).

In most populations, infant and child mortality for boys is higher than for girls under normal conditions. However, when conditions are extremely bad and mortality is very high, the sex differential in mortality may become smaller or even disappear. There is evidence of this in the Rwandan data: among refugees, 23.6% of the sons and 21.8% of the daughters had died at the time of the survey, which is a difference of 1.8 percentage points. The figures for non-refugee sons and daughters are 21.0% and 17.6%, respectively, which is a difference of 3.4 percentage points. *Excess* mortality in response to bad living conditions seems to have been higher among girls than among boys, thereby effectively reducing the sex differential. This finding is reminiscent of sex differences in infant and child mortality before the mortality transition in Europe: as a consequence of improving living conditions, the mortality difference between boys and girls increased during the nineteenth century (Pinnelli & Mancini, 1997).

The results in table 5 show that new caseload refugees suffered a significantly larger loss of children than any other category. However, this only holds for the mortality of daughters. There was no statistically significant effect of refugee status on the survival of sons. One possible interpretation for this sex difference is the following. Given the adverse living conditions in terms of health as well as stress and violence during their refuge in Eastern Congo, Burundi or Tanzania, refugees were not able to keep all their offspring alive. When choices about food, health and bare survival had to be made in these extreme conditions, Rwandan refugees chose to spend the scarce resources on the survival of their sons more than on their daughters. To be sure, we have no data on the

allocation of food and other resources within refugee families, so we cannot test this interpretation directly. The effect for short duration refugees and IDP's is significant but smaller than the effect for the long term refugees.

Table 5: Logistic regression of the proportion of live births currently surviving, by sex of the live births

Variables	All children		Daughters		Sons	
	Coeff.	S.E.	Coëff.	S.E.	Coeff.	S.E.
Age (ref=15-24)						
25-29	-0.227**	0.097	-0.256*	0.144	-0.197	0.131
30-34	-0.330***	0.093	-0.363***	0.138	-0.306**	0.126
35-39	-0.441***	0.090	-0.464***	0.134	-0.424***	0.122
40-44	-0.531***	0.089	-0.552***	0.132	-0.518***	0.120
45-49	-0.723***	0.091	-0.728***	0.136	-0.722***	0.123
Relationship status(ref=married)						
Civil union	-0.222***	0.047	-0.208***	0.069	-0.247***	0.065
Divorced	-0.332***	0.077	-0.296**	0.116	-0.351***	0.102
Single	-0.297*	0.156	-0.533**	0.208	-0.048	0.237
Widow	-0.350***	0.043	-0.347***	0.063	-0.355***	0.059
Education and occupation						
Years of schooling	0.060***	0.007	0.069***	0.010	0.053***	0.009
Principal occup. (*farming=1*)	-0.381***	0.090	-0.238*	0.132	-0.510***	0.126
Paid work in the last 12m	-0.044	0.051	-0.119	0.073	0.023	0.071
Mothers fertility						
Average fertility rate	-1.303***	0.177	-1.056***	0.250	-1.536***	0.251
Displacement/Refuge/migration (ref=never displ./refugee or migr.)						
short term IDPs or refugees	-0.064	0.047	-0.126*	0.070	-0.001	0.064
new caseloads	-0.172***	0.048	-0.274***	0.070	-0.082	0.067
old caseloads	0.004	0.089	0.003	0.129	-0.006	0.122
new to Rwanda	0.284***	0.095	0.270*	0.142	0.308**	0.128
Place of residence (r=rural area)						
Residing in Kigali	0.300***	0.107	0.453***	0.156	0.143	0.148
Residing in a small city	0.105	0.091	0.181	0.138	0.037	0.123
Constant	2.361***	0.142	2.231***	0.208	2.40**	0.195
Numbers of observations	4600		3919		3921	
Deviance (-2 Log L)	21048.5	Df=4581	9937.8	df=3900	11038.6	df=3902
BIC	-17586		-22329		-21246	

***sign. at the 1% level, **at the 5% level, *at the 10% level

A mother's relationship status significantly affects the survival of her children. Although not all widowed, divorced or single women are at the same time head of households, our findings correspond with those of the Goma Epidemiology Group (1995). In their study in Eastern Congo, they found a greater loss of children in female headed households. This also corresponds to Mbago's findings (1994) on Burundian refugees in Tanzania.

Finally, the regression shows that a high number of births during the reproductive span had a negative and statistically significant effect on child survival, for boys as well as for girls.

6. Conclusion

This paper has explored the repercussions of forced migration of Rwandan mothers on their fertility and on the survival chances of their children. Essentially, our analysis was comparative in nature: since our data included women who never left Rwanda, we were able to compare these women with several groups of refugee women. Unfortunately, our data do not allow us to analyse the timing of birth and death of deceased children, because the survey we used only mentions the number and sex of deceased children. The main strength of our data lies in its relatively detailed recording of individual migration histories.

As a result of several Rwandan conflicts, including revolution, massacres and exile in the 1960s, followed by civil war, genocide and mass migration in the 1990s, the population of Rwanda has known several waves of refugees seeking refuge in the neighbouring countries. Our data allowed us to distinguish between these groups and analyse the

difference in their reproductive behaviour. Of course, fertility and child survival are not only determined by a persons' refugee status but also by a series of exogenous characteristics. We applied multivariate regression analysis in order to control for the effects of these characteristics.

From the regressions, a clear pattern emerged that allowed us to shed light on the reproductive behaviour of different waves of refugees. Two groups stand out, meaning that their demographic history is significantly different from the non-refugees. The first group are the so-called new caseload refugees: mostly Rwandan Hutu who had fled the country in mid-1994. From our fertility and child survival analysis we derive that these refugees, at all ages, have given birth to more children than non-refugees. This, together with our results showing significantly higher mortality of children of this group of refugees, is in line with the risk-insurance theory of reproductive behaviour: given high excess mortality during their stay in the refugee camps in Eastern Congo, the refugees compensate the loss of children by having more children. The result for the refugee category stands, even after controlling for the speed of childbearing, which has by itself an independent negative effect on child survival.

Furthermore, for the same group of refugees, the analysis of child survival shows that girls suffered more than boys from the crisis conditions refugee mothers were living in: the survival chances of daughters of refugee mothers were significantly lower than the survival chances of daughters of mothers who did not have to flee. There was no such difference for boys. This suggests that parents may have been investing more in newborn boys than in girls, possibly in order to insure that at least one son would survive. This could be because of paternal inheritance rights, especially the inheritance of land. Until

1994, women and daughters could not inherit land, though exceptions were made in special circumstances.

To be sure, the data did not allow us to test directly for intra-household allocation of resources and thus for a possible sex discrimination during crisis. However, the negative and statistically significant effect for daughters is also visible in the analysis of child survival for mothers who sought short term (les than six months) shelter from violence. The estimated effect is smaller than the effect for the long term refugees, but its significance vis-à-vis the reference group of non-refugees offers additional support for our interpretation.

Mothers in the fifth group, who have not resided in Rwanda before the genocide, form a second interesting group with features that are significantly different from women who never migrated. We recall that we did not consider this group as refugees. These women had more children and lost fewer than the women in the reference group. This applies to boys as well as to girls. At first sight, the risk-insurance explanation for reproductive behaviour does not seem to apply to this group: they have more children even if fewer of them die. In contrast to this intriguing result, the old caseload refugees are not significantly different from the reference group of non-migrants. Neither in fertility nor child survival does this group stand out. These old caseload refugees were mostly Rwandan Tutsi who fled Rwanda between 1955 and 1990. Apparently, they took with them the reproductive behaviour that they had known, seen or experienced in Rwanda long before they came back.

It seems to us that the women who came to Rwanda for the first time only after the genocide, i.e. the daughters of the old caseload refugees, followed the same fertility

strategy as their mothers. Yet, they eventually came to live under less adverse conditions. As a result, they had somewhat higher fecundity and natural fertility. At the same time and for the same reason, they were able to keep more of their offspring alive than they had expected.

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