

Long term effects of reproductive history on female and male mortality in a rural area of Senegal

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Introduction

Levels of mortality at adult and older ages are difficult to estimate in developing countries, due to a lack of data. Differentials of mortality at these ages are even less known. We are interested here by the relation between achieved fertility and mortality for adults who have passed the reproductive ages and if there are gender effects.

The relation between fertility and health is complex. During the reproductive ages, pregnancies and deliveries are risks for women health, depending on the age, the duration spent since the last pregnancy and the total number of the children (Rutstein 2000 ; Unicef *et al.* 2002). But, apart from maternal mortality, indirect effects of reproductive events are difficult to estimate (Khlal and Ronsmans 2000 ; Ronsmans *et al.* 2001).

At older ages, the reproductive history has impact on causes of death with less frequent breast cancer among women who have children, but more cardiovascular diseases among those who had many deliveries (Kelsey *et al.* 1993 ; Ness *et al.* 1994). Maternal depletion syndrome would contribute to alter the health of women who had repeated pregnancies (Winkvist *et al.* 1992) but its effect is not proved on mortality (Menken *et al.* 2003). Prior to the reproductive period, some selection effects can also contribute to the capacity of women to give birth. And, the study of women health, after their reproductive period, means to exclude all those died during this period, which leads also some bias, especially when maternal mortality is high.

When children grow up and get older, they may have a protective effect on their mother's health in contributing on living conditions by working and taking care of them. This socioeconomic factor can also be true for men. Actually, for those, biological factors don't contribute so much and differentials can mainly be explained by social factors. In this way, Lisa Hurt *et al.* show that in Matlab, in rural Bangladesh, after age 45, the higher the number of children of the women, the lower the mortality of their husband (2004). Comparing men and women in such analysis could contribute to distinguish some social effects from biological factors which are confounding in a study focused only on women.

Then, for a woman, to have many pregnancies may result or produce some opposite effects on mortality, some which can be positive (healthier at the beginning, protection against some diseases, support of children, etc.) and others negative (stress, major risks of certain diseases, reduction of the health capital, etc.). With the multiplicity of the factors, to discern a universal pattern on the impact of the fertility of female mortality after the reproductive period appear to be unrealistic, the relation would correspond to local patterns (Hurt *et al.* 2006).

In developing countries, demographic surveillance systems, though not representative at national level, contribute to a better understanding of population levels and trends, notably in relation to adult mortality and fertility, thanks to accurate measurement. In this paper, we focus on a rural community of Senegal: Mlomp, whose population has been monitored for twenty years. We study differential mortality among men and women by the reproductive history characteristics we dispose.

Population

- *The demographic surveillance system of Mlomp*

The demographic surveillance system started in 1985 in Mlomp with an initial census listing the inhabitants of the area and recording information on the union and reproductive histories of adult women. The demographic events (births, deaths, migrations and unions) are recorded annually. The union and reproductive histories is asked for all immigrants who have had at least one union. Furthermore, for deceased persons, detailed information about symptoms and diseases prior to death are obtained from a close relative through verbal autopsies. On the basis of these reports, in addition to medical information from health institutions, physicians establish the cause of death whenever possible (Pison *et al.* 2002). This DSS now provides more than 20 years of data on mortality and fertility.

- *Population characteristics*

Mlomp is located in South-West Senegal, in the Casamance area. At the end of 2004, the population totalled 8,000 persons. The population is rural. Most people belong to the Jola ethnic group. They are animist or Catholic. Rice cultivation is the main local economic activity during the rainy season.

In Mlomp, the total fertility was 4.2 children per woman over the period 1985–2004, decreasing from 5.5 at the end of the 1980s to 3.4 between at the beginning of the 2000s. This level is relatively low compared with more than 6 in rural Senegal (Ndiaye and Ayad 2006). Women in Mlomp have their first child quite late for a rural area of Sub-Saharan Africa (average age 23). This first birth occurs most often before marriage, which generally occurs between ages 25 and 30, and not necessary with the father of the first child.

Over the period 1985–2004, life expectancy at birth in Mlomp was 61 years for both sexes. That is high for a rural area of Sub-Saharan Africa. The difference between males and females is large: life expectancy was 57 years for men and 65 years for women. In Mlomp, the local health care system has been functioning since the early 1960s, with a dispensary and a maternity clinic. All women give birth at the maternity clinic, and children are fully immunized (Pison *et al.* 1993).

For a live born child, the probability of dying before age five was 0.100 in 1985–2004, compared with more than 0.160 in rural Senegal as a whole over 1995–2004 (Ndiaye and Ayad 2006). Among adults, the probability of dying between ages 15 and 60 was near 0.310 for men and 0.167 for women for the observed period. In Mlomp, female mortality is much lower than male mortality. Maternal mortality was estimated at 268 per 100,000 live births¹ in 1985–2004, a lower level than observed in the two other rural sites in Senegal and habitually in rural Africa (Pison *et al.* 2000).

Data reliability

- *Mortality*

Regarding data reliability, the dates of the events that occurred during the surveillance are correctly registered. Although, there are classical bias resulting of retrospective information in Africa. A special effort was made to prevent the classic problem of bias in age determination of the persons registered during the initial census using different information sources (dispensary and maternity registers, marriage years, identity cards...), but the age of the very old population (at ages 80 plus) may be of poor quality.

¹ 95% CI =[111–528].

- *Fertility*

Reproductive histories are registered for each woman followed by the surveillance system, one part is retrospective information reported at the initial census in 1985 or after an immigration in Mlomp. With the information registered by the health services since the 1960s, we assume a relatively good registration of the past reproductive histories for rural Africa, but older the event, lower the reliability. Then, for women who do not have finished their reproductive history at the time of their census or their immigration, the prospective follow-up with the registration of the pregnancies, deliveries and births, complete the retrospective data. For men, we consider all their live born children registered through the reproductive histories of the women. We suppose that for a man, all his partners are known.

Analysis

- *Age group*

We focus on mortality after age 45, which is the usual age for considering the end of the reproductive history of the women. But, for those who have pregnancies older, we take them into account only one year after the last delivery to avoid potential direct factors of the pregnancy on mortality. Mortality level and reproductive characteristics of the oldest are less reliable and we limit the study to the age group 45-59.

Because men have their children in average 5 five years older than women, we consider the age group 50-65 for studying differential male mortality. For those who have children older than 50, we take them into account at the birth date of the last live born child.

- *Characteristics*

All available characteristics on reproductive history are considered : number of pregnancies, deliveries, live newborns, stillborns, abortions, age at first and last pregnancies. To discern some social and gender effects, we consider the sex of the children and if they are still alive at age 5 (for those born before 2000). Female characteristics are applied to males, excluding abortions and stillborns.

We also consider marital status which has a strong impact on mortality level, as well as the number of the partners. As socioeconomic covariates, we use the presence of latrines in the household and the nature of the roof (straw/corrugated iron).

- *Method*

To analyze differential mortality, we use the multivariate Cox proportional hazards model which measures the differentials on hazard to die (Cox et Oakes, 1984).

Results

Data analysis show a strong effect of the number of liveborns, which decreases the female risks of dying between the ages 45 and 60. But the impact is only significant for the number of boys when we distinguish the sex of the child. In a patriarchal system where women leave their family for their husband's one, that supposes for the mother a protective effect of having sons when they get older.

The older they have their last child, the lower the mortality risks : that shows a "healthy pregnant effect" for these women. Factors contributing to a lower male mortality after the reproductive life are not related to it, socioeconomic status seem to have the strongest impact for men.

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