

# Differences in mortality of children in Bandafassi (Senegal): is it due to ethnic or geographic inequalities?

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## Introduction

The child mortality ratio is an indicator of progress or lack of progress. The question is to determine if health progresses reduce or increase inequalities in child mortality in rural Sub-Saharan Africa. For that, we study the evolution of child mortality in the region of Bandafassi in Senegal which the population has been followed for over thirty years, by annual periodicity (Pison, 2006).

## 1. The study area of Bandafassi

### 1.1. The study population

The demographic surveillance site of Bandafassi is in the south-east of Senegal, about 750 km from the capital Dakar. On March 2007, the Bandafassi site has a population of 12,079 inhabitants. There are 3 ethnic groups (Mandinka: 17 %, Bedik: 25 % and Fula: 58 % of the population) who live separately in 42 villages.

### 1.2. The health care services

In Bandafassi area, two modern medical systems (public and private) coexist side by side with traditional medicine.

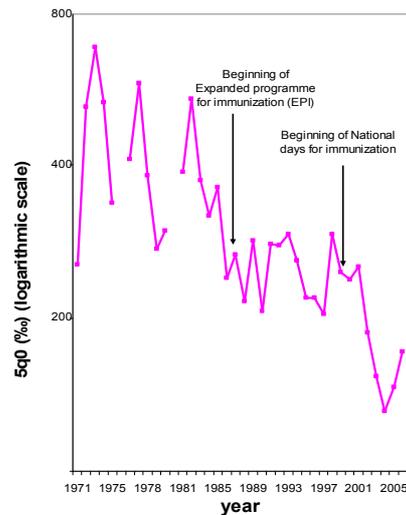
The private system is assured by some religious of the private dispensary of the Catholic mission of Kedougou. The nurse visits once a month the Mandinka villages and the Bedik villages located in the North, 11 of the 42 villages of the zone. She gives some care by the vaccination of children and the prenatal cares of women.

The public system is managed by the nurse of the public dispensary of Bandafassi who provides care services in the majority of the survey villages, 31 of the 42 villages of the zone. According to monthly or quarterly visits of vaccination, the nurse covers only the villages considered as “accessible”, the villages located in plain and less than 15 km of the dispensary of Bandafassi that is 13 of 31 villages. The other villages are visited during campaigns of immunization or in case of epidemic.

## 2. The evolution in child mortality

The annual risk of mortality before five years in Bandafassi fluctuates one year on another. For example, the high mortality in 1973, 1977, 1982 and 1985 is due to measles epidemics (Pison, 1986; Desgrées du Loû and *al.*, 1995a). The decrease in mortality, started in 1983, has been accentuated by the Expanded programme for immunization (EPI) in the zone in 1987. It is followed by stagnation for over a decade (from 1989 to 2000), then a new decrease in the early 2000s.

Figure: Child mortality trends ( ${}_5q_0$ ) between 1971 and 2006<sup>1</sup>  
(Probability of dying between birth and age five:  ${}_5q_0$ )



Source : Bandafassi database, 2007

To better examine the impact of health programmes on inequalities in child mortality, we are interested on the period from the early 1980s to 2006 because vaccinations began during this period. The adoption of a division in four periods associating the evolution of health programmes reveals phases of decline and increase of mortality before five years.

Mortality before five years ( ${}_5q_0$ ) by period, 1981-2006

	1981-1986	1987-1990	1991-1999	2000-2006	1981-2006
${}_5q_0$ (p. 1000)	376,3	245,2	255,5	182,6	253,7

Source : Bandafassi database, 2007

We examine now the variations of mortality before five years by characteristics of child (its year, its sex, its ethnic group, its type of birth: simple or twin et its status in the household by the presence or the absence of parents), of parents (age of mother and age of father), of village of residence (its sanitary system and its distance from the dispensary of Bandafassi) and the season of the year.

The study objectives were to analyse inequalities in mortality between children or villages and also to explain reasons of ceasing the child mortality decline during the 1990s.

### 3. The inequalities in mortality: the multivariate analysis

#### 3.1. The method of analysis: the model of proportional risks de Cox

The Cox model measures the differences of risk of dying according to the characteristics of each child by considering the dynamic in the regression (Cox and Oakes, 1984).

To measure the impact of different factors on child mortality, the period will not be considered an explanatory factor and also we consider the four periods defined before.

<sup>1</sup> Between 1971 and 1975, only Mandinka were considered; between 1976 and 1980, there are Mandinka and Fula; since 1981, the three ethnic groups (Mandinka, Fula and Bedik) were considered.

### **3.2. The infant mortality**

The type of birth, the status of child in the household, the age group of mother, the season of the year and the village of residence are the most discriminated factors explaining differences in infant mortality.

The risk of death during the rainy season is, at each period, significantly higher than the dry season<sup>2</sup>. In like manner, his risk is highest for the twin births in comparison with simple births and so children living without their parents (father and mother) comparatively with others.

The age of the mother is also a discriminated factor on infant risk of death. The children of young mothers have a high probability of dying before their first birthday in comparison with children of older mothers.

The location of the village is a significant effect on differences in infant mortality in Bandafassi. Children living in villages located in altitude or distant of the dispensary of Bandafassi have a high risk of dying in comparison with others. Finally, the village of residence is the most discriminated factor, inhibiting the effect of ethnic group on the risk of death before one year when those factors are introduced together in the same model.

### **3.3. The child mortality**

The status of the child in the household, the season of the year and the village of residence are the most discriminated factors explaining differences in child mortality.

Children living in the absence of the father and mother or with only the father have significantly the high risk of death between one to five years in comparison with others. This risk is also higher during the rainy season compared to the dry season. The female child excess mortality is significant only during the period 1981-1986; it is the same for twins comparatively with singles. During next periods, differences in risk of death were not significant by sex and type of birth.

The village of residence represents also a high risk factor of death for children living in the mountain villages or distant of the dispensary of Bandafassi compared to other childrens.

At least, the age of parents in particular the age of mother does not significant on the risk of death between one and five year.

## **4. Discussion**

In Bandafassi, differences of mortality are associated of characteristics of the child, its parents and its village of residence and of the season of the year. These factors play more or less heavily on the risk of death for children one period to another. The multivariate analysis showed that the type of birth, the status of the child in the household and the season of the year influence significantly throughout the period. For others, the analysis reveals that the effect of the ethnic group disappeared when this factor is introduced together with the village of residence.

The difficulties of access to mountain villages and distant of the dispensary of Bandafassi, situation aggravated by the bad state of roads during the rainy season, maintain a high mortality in these villages from other villages in the zone. The most significant differences of mortality are been registered during the 1990s. So, the vaccination decline and the spread of chloroquine resistance may have impact on the increase of mortality in most of villages of the zone. But, this increase is higher among children living in altitude and distant of the dispensary of Bandafassi. The decline in mortality since the 2000s, situation may be due to the improvement of health care services in Bandafassi (campaigns of immunization (National

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<sup>2</sup> Nevertheless, the risk isn't proportional on the period 1991-1999. This situation is maybe linked to the effect that most important at the beginning of the period and not at the end.

days for immunization or others), training of community health workers, change of treatment protocol against the malaria and opening of the private hospital of Ninéfescha), has reduced inequalities in mortality between children. Nevertheless, children in inaccessible villages keep an excess mortality compared to others children in the zone.

Other factors also influence on differences in mortality between children in the zone. Thus, the male infant excess mortality is not clear in Bandafassi area. At older ages, there is also no clear differences between the sexes. The excess mortality of girls in some areas in sub-saharan Africa, North Africa and Asia (Mbacké and LeGrand, 1992; Tabutin and Gourdin, 1997; Attané and Guilmoto, 2007) is not observed in Bandafassi and more broadly in the Senegale context. Differences were also observed by age of children. Thus, the high mortality in the 1990s is linked with an increased of risk among children over one year old particularly during the rainy season. Other factors also influence the risk of death in Bandafassi: the status of children in the household, the age of parents or the rank of birth, the marital status of mother (Desgrées du Loû and *al.*, 1995b). At last, the absence of mother is an important risk factor of death for children in Bandafassi area.

## 5. Conclusion

The inequalities in mortality by ethnic groups in Bandafassi are associated with the localisation of villages of residence: ethnic groups with higher mortality living in mountain villages and distant of the dispensary of Bandafassi. Nevertheless, efforts to vaccinate all children, including those of villages of heavy access, as in 1987 (Expanded programme for immunization) and since 1999 (National days for immunization), changing the geography of mortality: it is the same when efforts fall against as is the case during the 1990s. Finally, programmes to immunize all children contribute to reduce inequalities in mortality.

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