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The Demographic Impact of a Mild Famine in an African City: The Case of Antananarivo, 1985–7

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Famines have been recurrent throughout human history. Their occurrence has diminished only recently because of increases in food production, improved management of food stocks, the diminishing isolation of most parts of the world, greater international trade, better and faster transport, as well as increased international awareness, higher sensitivity towards human rights, and greater international solidarity. However, even in the second half of the twentieth century severe famines occurred in South Asia, China, and sub-Saharan Africa. If earlier famines were primarily due to climatic factors, plant diseases and poor crisis management, recent famines seem mostly to have been due to serious mismanagement by the state (i.e. bad governance) and to the voluntary or forced isolation of a country—often the consequence of international or civil war. The latter scenario applies particularly apropos famines in sub-Saharan Africa during the past quarter of a century.

The demographic impact of major famines has been well documented. In relation to nineteenth-century Europe, key studies have dealt with the 1846–50 famine in Ireland (Boyle and Ó Gráda 1986), the 1866–8 famine in Sweden (Pitkänen and Mielke 1993), and the local famines during World War II in Holland and the Warsaw Ghetto (Livi-Bacci 1993). The largest famines in the twentieth century occurred as a consequence of severe mismanagement in the so-called 'communist' countries—in Russia during the early days of Stalinism (Blum *et al.* 1997; Livi-Bacci 1993) and in China during the Great Leap Forward of 1959–61 (Kane 1988; Peng 1987). A large number of studies have dealt with recurrent famines in the Indian Subcontinent (Alamgir 1980; Chowdhury and Chen 1977; Das 1949; Dyson 1991; Sen 1981). Work has also been conducted on more recent crises in sub-Saharan Africa, such as the 1973–4 famine in the Sahel (Caldwell *et al.* 1988) and events in southern Sudan (de Waal 1989), Malawi (Vaughan 1987), and Somalia (Seaman 1987).

Beyond the total number of deaths attributable to famines, several demographic issues have been debated—in particular, as regards the age and sex patterns of famine mortality, and to a lesser extent the causes of famine deaths. In absolute numbers famines seem to affect primarily the young and the elderly, changing the level, but not the overall age pattern of mortality. However, it is often found that relative increases in mortality are higher among young adults than among other age groups. In her

comprehensive study of famine mortality by gender that is found elsewhere in this book, Macintyre finds fairly consistent evidence for excess male mortality—that is, a relative advantage for females during famines—even when the opposite applies before and after the crisis. Changes in cause of death patterns during famines have been poorly studied. However, beyond severe malnutrition and exhaustion, attention has been drawn to increases in deaths from certain infectious and parasitic diseases which are closely linked to nutritional status—in particular diarrhoeal diseases, and two other ailments that are typical of famines: osteomalacia (i.e. bone demineralization) and hypothermia. In addition, it has been a recurrent observation that malaria makes a come-back after famines in tropical countries. This has been seen in India and in the Sahel after the droughts of 1973–4 and 1983–4. Such a resurgence of malaria may be due to epidemiological factors (e.g. populations of mosquitoes are reconstituted when the rains return after a drought), but it may also be linked to decreased resistance of the people after a prolonged period of low food intake.

If major famines have fascinated researchers, very little work has been conducted on the demographic impact of mild famines. Yet such food shortages have commonly existed in rural areas prior to industrialization. And nowadays they seem to occur even in urban areas of developing countries, and especially amongst the most deprived groups of people, as a result of poverty, changing economic policies, fluctuating prices, and other causes of economic change. Consequently, the aim of the present study is to document a mild famine and its demographic impact in Antananarivo, the capital city of Madagascar.

HISTORICAL CONTEXT

Madagascar is a fairly large island, about the size of France, located in the Indian Ocean off the coast of Mozambique. It has been populated over the past 10 centuries or so by people coming from both Indonesia and Africa, and it was colonized by France for a short period of time (1896–1960).

Since Independence in 1960 Madagascar has experienced a series of political crises, including several coups, student riots, and farmer rebellions. Its political regime has not been stable since Independence, and there have been major changes in both the country's political orientation and its economic policies. The first 12 years following Independence (i.e. 1960–71) were relatively stable politically, but with poor economic management this period ended with student and farmer riots. In the second period (i.e. 1972–83), power was assumed by a series of Marxist-like radicals, often arising out of the military. During this time, the country's official economic policy was modelled on that of China and Russia. This period also ended in a severe economic crisis with a serious rebellion by farmers in rural areas and radical protests among students in the cities. A third period started in 1984. This involved re-establishing links with Western countries (especially France), opening the economy to international trade, and the introduction of a series of economic reforms (i.e. structural adjustment policies) which were still proceeding during the late 1990s (Pottier 1993).

Since 1960 Madagascar's economic performance has been very poor (Pottier 1993). Macro-economic data suggest that the gross national product (GNP) per capita, corrected for parity purchasing power (PPP), declined by half between 1960 and 1995. Thus, the World Penn Table gives a figure of US$1,191 per capita in 1960 and only US$608 in 1992 (measured in constant 1985 prices). However, the fall has not been steady. During the first phase (i.e. 1960–71) GNP per capita stayed at about the same level; during the second phase (1971–83), it fell by about a third; and in the third phase (1983–92), it declined by about a further quarter. These macro-economic estimates have been confirmed by an analysis of household expenditure in the capital city. Using various consumption surveys, Ravelosoa and Roubaud (1996) have estimated that household consumption declined by about 45 per cent in constant prices over the period 1960–95. They also found little change during the first period (i.e. between 1961 and 1969), but a major decline in the 1970s and 1980s which seems to have continued until 1995.

Falling incomes translated into declining levels of food consumption in Antananarivo. Although the share of household income devoted to food increased significantly, from 32 per cent in 1961 to 48 per cent in 1993–4, total food consumption fell. Thus, over the period 1961–95 consumption of rice—the main staple food—declined by 21 per cent, that of bread by 42 per cent, that of fruit by 32 per cent, that of vegetables by 40 per cent, and that of meat by 51 per cent (Ravelosoa and Roubaud 1996). Not only did total food intake go down, but the quality and balance of the diet deteriorated too. As a result, total calorific intake was estimated at only 1,661 kcal in 1995, that is, 21 per cent below the minimum international recommendation. A large part of the population of Antananarivo was therefore living far below international food intake norms, indeed quite close to those required for bare survival.

In addition to these long-term declines in income and food intake, there were major fluctuations in food prices which probably further worsened the nutritional status of the population for short periods. Unfortunately, these short-term changes in nutritional status have not been studied. However, a time series of market prices for rice is available for Antananarivo. Of particular significance is a major price rise lasting for about 2 years—from July 1985 to June 1987. Outside this period, the price of rice averaged about 217 units of the local currency unit. The price started to increase steeply in July 1985 and reached 640 units in December, that is, about three times above the usual price. Given that in these years about 47 per cent of the average household budget was used to buy food, and that about 35–45 per cent of the food budget was devoted to rice, it is clear that many households were not able to cope with the price increase. We do not have a breakdown of income by social group; however, it can be anticipated that among the poorest strata of the population the price increase far exceeded their economic capacity to pay.

In addition to the food crisis, Madagascar experienced a major surge in malaria at about the same time. The disease was highly prevalent on the island before 1945, but it came near to eradication after the major anti-malarial campaigns of the late 1940s and the early 1950s. As a result, malaria mortality remained very low until about

1983. However, the incidence of malaria started to increase markedly in 1984 and peaked in 1988. Subsequently, the incidence of and mortality from the disease have decreased somewhat and stabilized, but at much higher levels than was the case prior to 1984.

As will be seen below, these broad economic, nutritional, and epidemiological changes are reflected quite clearly in the mortality statistics of Antananarivo.

DEMOGRAPHIC DATA

Mortality data for Antananarivo—a city of about three quarters of a million people in 1995—come from the vital registration system (VRS). Vital registration in Madagascar was started in the nineteenth century at the initiative of Queen Ranavalona II following a severe epidemic of plague. The system was improved during the period of French colonization and today registration of births and deaths is known to be virtually complete in the large cities, although less so in rural areas. Unfortunately, the vital registration data are poorly documented and little analysed.

For Antananarivo city, the research team of Cantrelle, Ralijaona, and Waltisperger organized the data entry of all death certificates for the whole period from 1976 to 1995 with financial assistance from UNICEF and Le Centre Français sur la Population et le Développement. Data from the later part of the period (1984–95) have been documented and analysed in a recent publication (Waltisperger *et al.* 1998). However, the data used for the present analysis cover the whole period 1976–95.

Death rates were computed by dividing registered deaths (by age and sex) by the population at risk. For the numerators, only deaths registered in Antananarivo of people resident in the city were kept for the final analysis (i.e. about 82 per cent of the total deaths registered). Denominators were estimated from the two available censuses—that is, those of 1975 and 1993. Populations by age and sex were interpolated between these two enumerations by assuming a constant rate of growth for each 5-year age group and separately for each sex. The data used here differ only slightly from the earlier estimates of Waltisperger *et al.* (1998). The hypothesis of a constant rate of population growth is consistent with what is known about the population dynamics of the city. Annual age specific death rates were computed for each of the 20 years between 1976 and 1995. Yearly life tables were then computed by applying standard formulae to the age specific death rates.

Causes of death were coded using the ninth revision of the International Classification of Diseases. A total of 1,970 individual causes of death were identified in the registration records and these were then grouped in 60 smaller categories for purposes of analysis. However, most of the tables presented here are based upon an even smaller number of grouped categories.

Standard errors were computed for certain life table values—in particular, the estimated life expectancies. The statistical testing of differences was systematic. Standard formulae were used to test for differences between means (for life expectancy), probabilities (for quotients), and risk ratios (for sex ratios and ratios of death rates)

DATA QUALITY

As previously noted by Waltisperger *et al.* (1998) vital registration in Antananarivo appears to be virtually complete, both for births and for deaths. However, as an independent check child mortality estimates relating to the age group 0–4 years from the VRS were compared with estimates obtained from the two demographic and health surveys (DHS) which were conducted in Madagascar in 1992 and 1997. The DHS estimates were recomputed by us for quinquennia ending in the years 0 and 5 during the 15 years prior to each DHS. The results are presented in Table 10.1. The estimates from vital registration are always slightly higher than those of the DHS, although most differences are not significant due to the small number of deaths that were captured by the DHS (with the exception of the earliest period of the second DHS (i.e. 1981–5)). In fact, it seems that the vital registration data permit an estimate of the level of underestimation in each DHS survey. Thus both surveys appear to have been virtually complete apropos the 5-year period immediately preceding the survey. The 1992 DHS seems to have missed only a few deaths in earlier periods: about 7 per cent during the period 6–10 years before the survey, and 12 per cent in the period 11–15 years prior to the survey. However, the 1997 DHS seems to have missed somewhat more deaths: about 10 per cent in the period 6–10 years before the survey, and 25 per cent in the period 11–15 years before. In any case, there is no evidence of under registration of child deaths in the vital registration data for Antananarivo.

The quality of the data on cause of death is harder to gauge—since there is no single 'gold standard' for purposes of comparison and also because each population has its own cause of death profile and associated trends. However, in general, it can be said that the cause of death profile indicated by the registration data for Antananarivo appears to be consistent with what is known about the city. And the major recorded

Table 10.1. *Comparison of Death Rates Computed from Vital Registration Data with Estimates Obtained from the DHS of 1992 and 1997, Antananarivo*

Period	DHS		VRS		Comparison (DHS/VRS)	
	q(5)	Deaths	q(5)	Deaths	Ratio	*t*-Test
DHS, 1992						
76–80	0.121	52	0.137	10,767	0.88	−0.912
81–5	0.162	79	0.174	15,115	0.93	−0.624
86–90	0.132	64	0.136	12,924	0.97	−0.248
DHS, 1997						
81–5	0.130	65	0.174	15,115	0.75	−2.338*
86–90	0.122	67	0.136	12,924	0.90	−0.900
91–5	0.111	72	0.100	10,309	1.11	0.861

Note: The comparisons relate to the 15-year time periods prior to each of the surveys.
*$P < 0.05$.

epidemics (e.g. of measles, whooping cough, and malaria) show up clearly in the cause of death trends. The proportion of deaths of undetermined cause was moderate (8.4 per cent for children, 8.9 per cent for adults aged 15–59 years, and 18.5 per cent for the elderly (i.e. those aged 60+)). Only one registered cause of death was a source of concern: 'Alveolitis of the jaws' (ICD-9 code = 526.5). In developed countries, this is a rare cause of death, usually resulting from complications arising after the extraction of teeth (often the third molar). However, this was clearly not the situation in Antananarivo. Instead, this cause of death appeared in large numbers in the death records, mostly for children, but it was also common for young adults. And this cause was epidemic—being concentrated during the 1985–7 crisis. At the moment we do not have an explanation for the prominence of 'alveolitis of the jaws' in the cause of death data for Antananarivo. But a preliminary investigation suggests that it may have been a consequence of the severe malnutrition that was experienced during the period. A similar disease occurs to animals when they eat inappropriate foods, such as tough plants. What people may have eaten during the 1985–7 food crisis is unclear and needs further investigation. However, this cause has been added to that of malnutrition in the following analysis.

RESULTS

Antananarivo experienced major changes in mortality over the 20 years from 1976 to 1995 (see Table 10.2). Between 1976 and 1984, mortality increased slowly but steadily, more for children than for adults, and among adults more for men than for women. Over this period life expectancy for both sexes combined dropped by about 6 years, from an estimated value of 59.7 years in 1976 to 53.6 years in 1984. The short period of 1985–7 was a time of deep crisis, both for children and for adults, and there was a further rapid drop in life expectancy of about 5 years during the peak crisis year (average life expectancy was only 49.0 years in 1986). The following years (1988–91) were a time of rapid recovery, with estimated life expectancy reaching 60.0 years in 1991. The four years of 1992–5 saw stagnation, with the last estimated value for both sexes combined being about 60 years in 1995. In summary, during the final three years of the period (i.e. 1993–5) life expectancy in Antananarivo was about the same as it had been during the first 3 years (i.e. 1976–8).

The impact of the 1985–7 famine

During the main famine years of 1985–7 life expectancy was far below the prior declining trend ($P < 0.05$), indicating a very serious mortality crisis. Compared to the baseline period (here taken as an average of both of the periods 1976–8 and 1989–95) mortality in 1986 was 57 per cent higher for males and 41 per cent higher for females. The highest mortality increase for both sexes occurred at ages 30–34 (+161 per cent for males, and +49 per cent for females) and at ages 5–9 (+161 per cent for males, and +146 per cent for females).

Table 10.2. *Trends in Demographic Estimates Obtained from Vital Registration Data, Antananarivo, 1976–95*

Year	Life expectancy at birth e(0) (years)		Mortality of children 0–14 years, $_{15}q_0$		Mortality of adults 15–59 years, $_{45}q_{15}$	
	Males	Females	Males	Females	Males	Females
1976	58.2	61.3	0.137	0.123	0.274	0.230
1977	57.2	60.6	0.149	0.135	0.277	0.237
1978	57.8	61.1	0.135	0.120	0.301	0.224
1979	52.5	56.5	0.187	0.165	0.344	0.281
1980	54.3	58.0	0.176	0.154	0.303	0.242
1981	52.8	56.9	0.197	0.178	0.330	0.250
1982	52.6	57.5	0.184	0.171	0.353	0.239
1983	51.9	58.2	0.208	0.178	0.326	0.224
1984	50.8	56.5	0.192	0.176	0.380	0.261
1985	47.3	54.8	0.216	0.198	0.437	0.259
1986	44.9	53.2	0.216	0.196	0.511	0.316
1987	51.3	56.8	0.160	0.147	0.430	0.308
1988	53.2	56.3	0.175	0.168	0.344	0.288
1989	56.7	60.3	0.135	0.132	0.314	0.252
1990	55.6	61.5	0.140	0.125	0.362	0.231
1991	57.5	62.6	0.121	0.109	0.332	0.240
1992	57.5	62.9	0.114	0.098	0.346	0.237
1993	55.9	61.1	0.130	0.120	0.348	0.241
1994	58.8	63.3	0.113	0.105	0.301	0.217
1995	56.9	62.1	0.110	0.104	0.371	0.237

Comparing the observed number of deaths in 1985–7 with the expected number—that is, those that would have happened on the assumption of the mortality profile of the baseline period—allows us to estimate the net effect of the crisis, that is, the mortality attributable to the famine (see Table 10.3). The difference between the observed and the expected number of deaths indicates an excess of 7,636. A majority of these deaths occurred among children aged under 15 years (3,873) and among adults aged 15–59 years (2,625).

Sex differences

For broad age groups Table 10.4 summarizes the relative increases in deaths and changes in the sex ratio of deaths during 1985–7 compared to the baseline period. In a little more detail, during the year 1986 the difference between male and female mortality increased compared to the baseline period, and was the greatest among those aged 30–34 years. The sex ratio of death rates (i.e. male death rate/female death rate) increased from 1.32 to 1.81 among those aged 15–44 years ($P < 0.05$), indicating

Table 10.3. *Estimates of the Excess Number of Deaths Caused by the 1985–7 Crisis, Antananarivo*

Age group	Males			Females			Both sexes, excess
	Observed	Expected	Excess	Observed	Expected	Excess	
Children 0–14 years	5,526	3,470	2,056	4,889	3,072	1,817	3,873
Adults 15–59 years	4,749	2,815	1,934	2,798	2,107	691	2,625
Adults 60+ years	2,948	2,234	714	2,702	2,278	424	1,138
Total	13,223	8,519	4,704	10,389	7,457	2,932	7,636

Note: Observed = number of deaths registered; expected = number of deaths in the population if mortality had been that of the baseline period (i.e. 1976–8 + 1989–95).

Table 10.4. *Relative Increase in Mortality and Sex Ratios of Deaths during the 1985–7 Crisis, Antananarivo*

Age group	Relative increase in deaths (crisis/baseline)			Sex ratio of deaths (male/female)		
	Males	Females	Both sexes	Crisis mortality	Baseline mortality	Excess mortality
Children 0–14 years	1.59	1.59	1.59	1.13	1.13	1.13
Adults 15–59 years	1.69	1.33	1.53	1.70	1.34	2.80
Adults 60+ years	1.32	1.19	1.25	1.09	0.98	1.68
Total	1.55	1.39	1.48	1.27	1.14	1.60

that excess mortality was higher for men than for women during the crisis. The sex ratio of death rates also increased among adults aged 45 and over, although to a lesser extent (from 1.45 during the baseline period to 1.67 during the crisis years, $P < 0.05$). There was virtually no change in the sex ratio of death rates among children (which was 1.13 in the baseline period and 1.14 in the crisis years).

Similarly, the excess number of deaths was much higher among adult males than among adult females. Thus as Table 10.3 shows computation of deaths attributable to the famine in 1985–7 compared to the baseline experience indicates that three times more young adult men died (1,934 deaths) than did young adult women (691 deaths), whereas the numbers were of similar magnitude among children (2,056 boys and 1,817 girls). Of course, such excess male mortality among young adults is typical of famines.

Causes of death

The trend in mortality attributed to malnutrition on the death certificates reveals the nutritional crisis very clearly indeed (Fig. 10.1). Among adults, in particular,

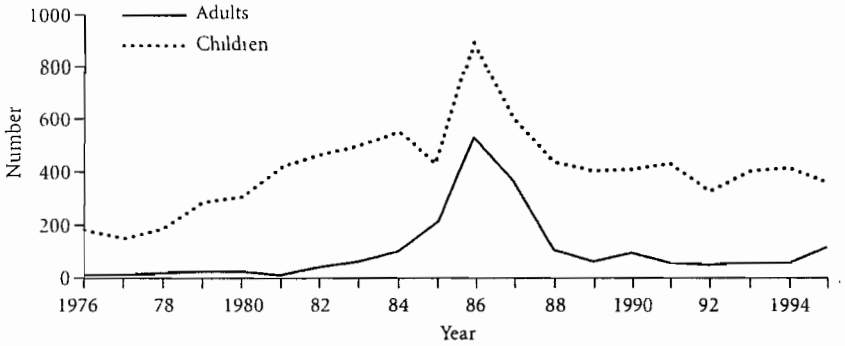

Figure 10.1. *Trends in Registered Deaths Attributed to Malnutrition, Antananarivo, 1976–95*

Source: Vital registration records.

deaths due to malnutrition were rarely recorded prior to 1984. But they increased dramatically thereafter and peaked in 1986 before then virtually disappearing after 1988. Among children deaths from malnutrition existed even in 1976–8, as is the case in most developing countries at such a level of mortality. However, they increased steadily from 1979 to 1984 and also peaked in 1986. Child deaths from malnutrition then declined quickly after the crisis year, and in 1991–5 regained the level experienced during the early 1980s. Many other causes of death also peaked in 1986—in particular, diarrhoeal diseases and acute respiratory infections, two conditions which are often closely associated with malnutrition.

The excess mortality during the 1985–7 food crisis, compared to the baseline period, can be decomposed by cause of death (Table 10.5). For children aged less than 15 years most of the increase can be attributed to malnutrition (41.9 per cent) and to related diarrhoeal diseases (25.8 per cent), acute respiratory infections (11.1 per cent) and other infectious and parasitic diseases (18.0 per cent). However, other causes contributed as well, although they were of lesser importance; in this group are violent deaths other than motor vehicle accidents (MVAs) (2.0 per cent), malaria (0.6 per cent), and tuberculosis (0.7 per cent). For adults (i.e. those aged 15 years and over) the picture was somewhat similar, with the largest share also being attributable to malnutrition (35.0 per cent) and its correlates like diarrhoeal diseases (23.4 per cent) and acute respiratory infections (10.6 per cent). Other diseases also played an important role among adults, in particular cardiovascular diseases (14.0 per cent), tuberculosis (7.6 per cent), malaria (3.4 per cent), and maternal mortality (1.8 per cent). As among children, violent deaths other than MVAs also contributed to excess mortality (3.5 per cent).

In summary, the 1985–7 crisis appears to have been primarily due to the direct effects of food shortage and its consequences for malnutrition, diarrhoeal diseases, acute respiratory infections, and other infectious and parasitic diseases. In addition, indirect effects relating to cardiovascular diseases, deaths from violence and maternal mortality also added to the overall picture for adults.

Table 10.5. *Causes of Death Responsible for the Mortality Increase in the 1985–7 Crisis, Antananarivo*

Causes of death	Number of deaths in 1985–7			(%)
	Observed	Expected	Excess	
Children aged 0–14 years				
Malnutrition	2,254	931	1,323	41.9
Diarrhoea, dysentery	2,389	1,575	814	25.8
Acute respiratory infections	1,417	1,067	350	11.1
Tuberculosis	70	47	23	0.7
Malaria	138	119	19	0.6
Other infectious and parasitic	908	341	568	18.0
Violent deaths (other than MVA)	272	209	63	2.0
Other and unknown	2,967	2,254	712	—
Total	10,415	6,542	3,873	100.0
Adults aged 15+ years				
Malnutrition	1,190	120	1,069	35.0
Diarrhoea, dysentery	1,137	421	716	23.4
Acute respiratory infections	872	547	324	10.6
Tuberculosis	509	278	231	7.6
Malaria	413	308	105	3.4
Other infectious and parasitic	146	127	19	0.6
Maternal causes	231	176	56	1.8
Cardiovascular diseases	3,505	3,078	426	14.0
Violent deaths (other than MVA)	612	504	108	3.5
Other and unknown	4,583	3,874	708	—
Total	13,197	9,434	3,763	100.0

The malaria epidemic

Malaria mortality in Antananarivo was very low until 1984. This was true both for children and for adults (Fig. 10.2). It then started to increase rapidly and peaked in 1988. Registered deaths from malaria then fell quickly, stabilizing at an intermediate level after about 1991. Malaria seems to have played only a minor role during the 1985–7 crisis. However, it seems to have played a big role in the mortality experienced during 1988 (see Table 10.6). Compared to the baseline period, in 1988 malaria accounted for 24.6 per cent of the excess mortality among children, and 69.3 per cent of the excess mortality among adults (i.e. those aged 15 years and over). Indeed, referring to the absolute numbers one can argue forcefully that virtually all of the excess adult mortality which occurred during 1988 (411 deaths) was attributable to malaria (Table 10.6).

In the three main epidemic years (i.e. 1987–9) malaria caused the deaths of 708 people (526 adults and 182 children). And the epidemic did not stop then; rather the disease remained an important cause of death during the period 1990–5.

Figure 10.2. *Trends in Deaths from Malaria, Antananarivo, 1976–95*

Source: Vital registration records.

Table 10.6. *Causes of Death Responsible for the Mortality Increase in 1988, Antananarivo*

Causes of death	Number of deaths in 1988			(%)
	Observed	Expected	Excess	
Children 0–14 years				
Malaria	190	41	149	24.6
Malnutrition	474	322	152	25.2
Diarrhoea, dysentery	638	545	92	15.3
Acute respiratory infections	454	369	85	14.0
Tuberculosis	10	16	−6	−1.0
Other infectious and parasitic	248	118	130	21.4
Violent deaths (other than MVA)	75	72	3	0.5
Other and unknown	1,154	781	373	—
Total	3,242	2,264	978	100.0
Adults 15+ years				
Malaria	514	104	409	69.3
Malnutrition	117	40	77	13.0
Diarrhoea, dysentery	202	143	59	10.0
Maternal	105	60	46	7.7
Acute respiratory infections	168	186	−19	—
Tuberculosis	68	94	−26	—
Other infectious and parasitic	41	43	−2	—
Cardiovascular diseases	885	1,045	−160	—
Violent deaths (other than MVA)	160	171	−11	—
Other and unknown	1,458	1,420	38	—
Total	3,717	3,306	411	100.0

Excess mortality in the country as a whole

Similar trends in excess mortality in 1985–7 and in 1988 can also be seen in the DHS data for children aged less than 5 years of age—not only for Antananarivo, but also for the country as a whole. This indicates that both these crises were apparent nationwide. Unfortunately, however, detailed data by age, sex, and cause of death are not available for the rest of the country.

DISCUSSION

Madagascar presents a typical case of mismanagement and bad governance lasting for many years. Such was typical of the situation found in many African countries during the post-colonial era. However, decreases in GNP per capita and food intake were probably more severe in this country than was the case in many others. One result of this mismanagement was the 1985–7 famine, which severely hit the capital city. The famine seems to have occurred mostly as a consequence of a sharp increase in the price of rice—which was too rapid and pronounced for most households to be able to cope with. This happened at the time of price liberalization—that is, when government subsidies were stopped and the rice market was being left to the private sector after more than a decade of state control. The crisis lasted 2 years and it had major demographic consequences. It appears that no mechanism existed to help people cope with the price changes until a new equilibrium was reached.

Instances of economic changes leading to famine and excess deaths in a large city have rarely been documented. However, it is probable that similar developments have occurred in other locations, at least among the urban poor.

The 1985–7 food crisis in Antananarivo bears all the characteristics of famine mortality as observed elsewhere: in absolute numbers, more deaths occurred among young children; in relative terms, the greatest increase in mortality happened among young adults; there was a stronger mortality impact on males than on females, and in particular a much stronger impact on young men than on young women. Higher famine mortality among young men may be attributable to biological effects, in particular relating to male body composition which contains much less fat than that of females and may thereby provide males with less resistance to nutritional stress. That said, there may also be a behavioural component—for example, if in desperate situations men tend to move about more, or are more prone to adopt risky forms of behaviour.

Sex differences in mortality during famines merit greater attention. Of particular importance in the present case was the excess mortality of young men in 1985–7, followed by a period of their experiencing lower than expected mortality *vis-à-vis* females during 1988–9. This could be due to a 'harvesting effect', that is a selection of vulnerable males during the famine crisis. Other examples of sex selective harvesting effects have been documented for respiratory infections (such as the 1918 influenza), but they do not seem to have been described for circumstances of severe malnutrition.

During the 1985–7 crisis, other than deaths linked to malnutrition, the causes of death did not change with only a few exceptions. Maternal mortality increased, probably as a direct consequence of the food shortage. More surprisingly, violent deaths (other than MVAs) increased. This was primarily due to suicide and various types of poisoning. This may well be a consequence of situations of extreme poverty, where desperate people commit suicide, or where people in severe distress eat toxic foods. Excess mortality during 1985–7 was estimated at about 7,600 deaths. In relative terms the impact of this famine was comparable to that of the 1974–5 famine in Bangladesh which has been widely discussed. However, the Antananarivo famine has been largely ignored.

It is striking that malaria came back at about the same time in Madagascar's recent history. Although this may have been independent of the famine, there may have been some links. For instance, reorganization of the state and the public health system may have had consequences for various measures to control malaria. More importantly, organisms weakened by 2 years of food shortage may have been more receptive to malaria and this may have been conducive to an epidemic explosion.

Perhaps more striking still, the 1987–9 malaria epidemic, which killed about 700 people in the city in three years, has been well documented and studied. Indeed, several scientific publications and many articles in local and international newspapers have appeared on the subject. However, the more silent food shortage which killed perhaps 11 times more people has been ignored. News coverage and scientific publications do not always follow a demographic logic, although demographic numbers are widely used in the press. Diseases or causes of death which for some reasons are considered to be shameful tend to be ignored, another classic example being cholera in Africa.

Unfortunately, the overall economic situation in Madagascar does not inspire optimism, even though economic growth has been positive in later years (1996–8). A situation similar to the 1985–7 crisis could occur again, since the political circumstances of the country are far from stable and the economic situation remains fragile. That said, the market is freer now, the country is less isolated, and it is probably more able to cope with a crisis than was the case a decade or two ago. In order to mitigate the demographic impact of a possible future food shortage Madagascar will need to establish mechanisms to monitor economic and nutritional changes, and to organize assistance for the most deprived sections of the society. This will require recognition of the rights of the poor to a decent food intake, what Sen (1981) calls an 'entitlement'. Actions to mitigate the effect of famines have been described for more than two centuries, and used with some success in places like India. In this respect, recognition of the magnitude of the problem is critical to the organization of action. And denial is arguably the most serious difficulty which needs to be solved before a society can cope efficiently with such an important challenge to public health.

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