THE DEMOGRAPHY OF INDIAN FAMINES: A HISTORICAL PERSPECTIVE

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ABSTRACT

This is a study of demographic responses to Indian famines in a historical perspective. During the closing decades of the nineteenth and in the early twentieth centuries four major famines occurred in the Indian subcontinent. These famines - precipitated by droughts - involved large-scale excess mortality. After the early twentieth century India was relatively free of major famine until a severe famine, affecting mainly the eastern province of Bengal, occurred in 1943-44 largely because of the War. Since Independence in 1947 India, though it never experienced any major famine of comparable scale, has continued to be vulnerable to occasional droughts and food crises. This study exploits the fact that the wealth of historical materials available for India presents an opportunity for investigating famine demography from a historical perspective.

A decline in the frequency and severity of famines since the 1870s can be observed. This appears to have corresponded with the evolution of relief policy towards greater effectiveness and liberality, although improved communications and diversification of the economy seem also to have played a part. The characteristic features of demographic responses to famine have been much the same throughout, however.

Chapter 1 provides a survey of the major issues of famine demography; it also describes the setting for the present study, and includes a discussion of the usefulness of India's registration data. In Chapter 2 demographic responses to the major historical famines have been investigated at the province level. Chapter 3 examines the demography of some historical famines which involved relatively small numbers of deaths, while regional variation in the demographic impact during the major famines has been analyzed in Chapter 4. Chapters 5 and 6 are devoted to the demography of the Bengal famine of 1943-44. In Chapter 7 demographic consequences of the Bihar famine of 1966-67 and the Maharashtra drought of 1972-73 have been analyzed. Chapter 8 presents the conclusions of the study.

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CHAPTER 1

INTRODUCTION

1.1 FAMINE DEMOGRAPHY: THE MAJOR ISSUES

There is no single definition of famine. As one author succinctly remarked, "famine is .. hard to define but glaring enough when recognized".[1] Some scholars have defined famine as a state of extreme hunger, starvation, and malnutrition affecting a substantial proportion of the population of some sizeable area.[2] Another approach toward defining famine emphasizes excess mortality, thus drawing a distinction between hunger, starvation and malnutrition on the one hand and famine on the other.[3] In another approach famine is defined as a community syndrome consisting of early signals, societal manifestations leading to starvation, and/or excess mortality on a wide scale.[4] In fact the multiplicity of definitions of famine clearly suggests that it is a complex socio-economic phenomenon. On the conceptual plane, famine is of course an "event" in the sense of being "an exceptional episode standing apart from the course of everyday life that surrounds it."[5] Yet the occurrence of famine cannot be

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[1] A.E. Taylor quoted in Currey (1978), p.87.

[2] See e.g. Masefield (1963), p. 2, Bhatia (1967), p. 1, and Keys et al. (1950), p.784.

[3] See e.g. Masefield (1963), p.3-4, Mayer (1975), p.572, Aykroyd (1974), p.1, and Blix et al. (1971), p.190, Johnson (1973), p.58. See also Sen (1981), p.40.

[4] See Currey (1978).

[5] See Arnold (1988), p.6.

understood meaningfully without reference to the economic, social and political structures of a specific society.

However, the existing literature on famine abundantly indicates that demographic considerations are central to an understanding of famine. In fact, famine is often viewed as a demographic crisis, especially its adverse mortality effect.[6] Critically reviewing different approaches to the definition of famine, Alamgir considers famine as "a general state of prolonged foodgrain intake deficiency per capita giving rise to a number of accompanying substates (symptoms) involving individuals and the community that ultimately lead, directly or indirectly, to excess deaths in a region or in a country as a whole."[7] The different substates, according to Alamgir, include: increase in interregional migration, increase in crime, increase in incidence of fatal disease, loss of body weight, changes in nutritional status, eating of alternative "famine foods", mental deterioration, uprooting of families, separation of families, transfer of assets, and breakdown of traditional bonds. Thus, while famine is a complex socio-economic phenomenon, its demographic impact is rarely restricted to mortality. Famine, in Chen and Chowdhury's words, "is a complex syndrome of multiple interacting causes, diverse manifestations, and involving all three demographic variables - mortality, fertility and migration".[8]

While demographic processes are central to the famine

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[6] See Arnold (1988), pp. 19-20, and Alamgir (1980), p. 5.

[7] See Alamgir (1980), p.7.

[8] See Chen and Chowdhury (1977), p. 409.

phenomenon, our understanding of their inter-relationships is rather limited. In fact investigations - both analytical and empirical - of demographic responses to famine are rare. Reviewing the literature on demographic responses to famine, Hugo concluded in 1984 that "demographers have generally neglected the response to famine as a field of study".[9] This is probably partly related to the fact that food crises still occur in the developing world where adequate systems of demographic data collection are often non-existent. Relatedly, need for an adequate conceptual framework for examining the inter-relationships between demographic processes and famine has also remained largely unfulfilled. Apart from being useful for planning and disaster-intervention programmes and policies, development of such models of demographic responses to famine may also produce insights into the nature of demographic behaviour in general. Indeed, in the recent past a few attempts have been made towards identifying model patterns of demographic processes during famine.[10]

In considering demographic effects of famine a distinction between short-term and long-term responses is commonly made. The model patterns of demographic responses to famine, advanced by Bongaarts and Cain, include the hypothesis that during famine elevated mortality and reduced fertility are two short-term responses involving population loss. However, for reasons discussed below, the post-famine period

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[9] Hugo (1984), p.28.

[10] See Hugo (1984), Bongaarts and Cain (1982), and Watkins and Menken (1985).

is hypothesized to experience a lower death rate and higher birth and population growth rates than in the pre-famine period. One can even distinguish here between the immediate and longer term post-famine periods.

Elevation in mortality during a subsistence crisis is expected because of the adverse influence of acute undernutrition on morbidity and mortality.[11] The social disruption (e.g. aimless wandering, congregation in relief camps, breakdown of sanitary arrangements) caused by famine conditions is also thought to contribute to the spread of epidemic diseases, and hence to a mortality crisis. An above-normal level of mortality may be expected to continue a little longer after famine because of its debilitating and disruptive effects.[12] The most commonly used concept for measuring the mortality impact of famine is "excess deaths" which is "the number of deaths over and above those that would have occurred if previous nutritional conditions had prevailed".[13]

Reduction in fertility, on the other hand, is hypothesized to occur during a famine through several mechanisms. First, acute undernutrition and psychological stress associated with the crisis have fecundity-reducing effects. Below a critical minimum nutritional level, women stop ovulating and male sperm mobility and longevity are reduced.[14] And psychological stresses induced by the crisis

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[11] Reviewing relevant medical literature, Foege concludes that "multiple nutritional deficiencies enhance the ability of infectious agents to produce disease"; see Foege (1971), p. 71.

[12] See Bongaarts and Cain (1982), p. 45.

[13] See Bongaarts and Cain (1982), p. 45.

[14] See e.g. Bongaarts (1980).

may also partly cause amenorrhea and anovulation.[15] Second, a reduction in the frequency of intercourse may result from a combination of factors, namely decline in libido, general physical weakness and also spousal separation consequent upon temporary migration of males. Fear and anxiety in the wake of the famine may also exert negative influence on the coital frequency.[16] Third, there may be a reduction in the number of new marriages during the famine. Postponement of marriages may occur partly due to the elevated mortality and consequent familial bereavement, and partly due to financial strains within individual households (e.g. because of depletion of resources and savings in coping with the crisis). Moreover, there is evidence of increased numbers of divorces and separations during the crisis.[17] Fourth, the crisis may induce an increase in voluntary birth control efforts through contraception, abstention, or induced abortion. However, this effect may be expected to be rather minor especially in countries with a normally low prevalence of birth control practices (e.g. poor countries). Thus a reduction in conceptions in the face of famine conditions seems, in large part, to be a forced outcome, rather than a result of deliberate decisional response.

However, as Bongaarts and Cain suggest, "[t]here is no apparent lasting damage to the population's ability to

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[15] See Bongaarts and Cain (1982), p.48.

[16] See Chen and Chowdhury (1977), p.422.

[17] See Hugo (1984), p. 21. Mortality crises may well have longer-term effects on fertility especially through increased marital disruption. For an elegant case study of an influenza pandemic in the Indian context and its implications for fertility, see Mills (1986) especially pp.26-32.

reproduce".[18] Indeed, an above-normal level of fertility (or what is called "excess fertility") is expected to occur in the immediate post-famine period for the following reasons: first, the decline in fertility and raised infant mortality rate during famine reduces the proportion of women that are pregnant or anovulatory due to breastfeeding. This in turn implies a greater than normal proportion of women in the exposed ovulatory state (i.e. fecund and susceptible to pregnancy) during the immediate post-famine period. Thus, this phenomenon of "excess fertility" is not due to any deliberate change in fertility behaviour, and its explanation rather lies in the biology of the reproductive process. Second, there may well be a larger than normal number of marriages in the immediate post-crisis years because many marriages postponed during the famine are likely to be added to the normal number of marriages occurring just after. On the other hand, a fall in overall mortality in the immediate post-famine years is hypothesized to occur because the surviving population just after famine is presumably selected in such a way (i.e. on the Darwinian "survival of the fittest" principle) as to be fitter and hence experience comparatively higher survival chances. Thus both the expected surge in the fertility rate and the depression in the death rate during the immediate post-famine years result mainly from biological processes rather than any behaviourial changes.

Compared with the other demographic variables, the migration response to famine depends more on particular

[18] See Bongaarts and Cain (1982), p.48.

circumstances and thus it is much less predictable. One may generally expect a considerable out-migration from the famine-affected areas during famine and a return migration in the months afterwards. The magnitude of out-migration should vary directly with the availability of food or work in nearby areas (e.g. towns, cities, unaffected rural areas, and sometimes neighbouring countries). Large-scale population movement may reduce the mortality impact of famine by reducing local food shortages through reduction of the number of local consumers as well as via inflow of remittances. On the other hand, extensive movement of people facilitates the spread of infectious diseases and epidemics. Thus, migration may influence the regional variation in the demographic consequences of the famine. However, if large areas are affected by famine and few relief centres are within the reach of the famine victims, migration may be relatively small. The extent of post-crisis in-migration depends on the prospects for a return to normal economic conditions. If the famine is due to an unusual crop failure and the future potential for agricultural production is not damaged, then most out-migrants may be expected to return.

There may also be longer-term implications of famines for birth, death and population growth rates. In the post-famine period population is likely to contain a larger proportion of people in the main reproductive years; this is hypothesized because of fertility reduction during the famine as well as relatively high mortality of young children and elderly people. This can be expected to cause an elevation in the birth rate over the pre-famine level. At the same time, since some of these age groups, those in the prime adult years, are also normally less vulnerable to death, such a change in population structure may tend to lower the death rate below the pre-famine level. Consequently, lower death and higher birth and population growth rates than those in the pre-famine period may continue for some years after the famine. All these longer-term post-famine demographic responses thus may be expected to offset the loss of population which occurs during famine. If the majority of out-migrants return after the crisis, the expected immediate and longer-term post-famine effects on the population growth rate can be summarized as follows: in the year immediately following the famine the growth rate should fall below the pre-famine level, as the birth rate declines markedly, but growth thereafter should rise to a high level when excess births combine with reduced mortality; this above-normal growth rate should then continue for some time. Thus population loss that famine entails for a relatively brief period is likely to be compensated for by a rather quick resumption of a higher than pre-famine growth rate in post-famine years. Reviewing the likely demographic responses to famine Bongaarts and Cain have concluded that "changes in mortality and fertility have provided little in a way of a check on longer-term trends in overall size of the affected population".[19]

The time required for recovery to the pre-famine population level would, in fact, depend on several factors: the normal rate of population growth in the pre-famine period,

[19] Bongaarts and Cain (1982), p.52; see also Watkins and Menken (1985).

extent of mortality increase during the famine, the famine duration and the magnitude of the effects of changes in age-composition. In an interesting simulation exercise Watkins and Menken have demonstrated that the effects on recovery time of changes in age composition are much smaller than those of famine duration and magnitude and of the initial population growth rate.[20] However, the time to recovery is further shortened by allowing for an increase in fertility (other than that due to the changed age structure of the population). In fact it has been argued that under the most plausible circumstances pre-famine population seems to be recovered fairly rapidly (except, for example, in a situation of a very thinly-spaced occurrence of successive famines). To give some idea of the recovery time: if a famine reduces population by 5 per cent in a society with an initial annual population growth rate of one per cent, the recovery time as indicated by this simulation model (with the assumption of age-neutrality of famine) is found to be five years.[21]

While most of the above "short-term" demographic responses to famine (except migration and postponement of marriages) can be viewed as biological, one may expect some long-term behaviourial responses in an environment characterized by a high frequency of famine and other natural disasters. Such high-risk environments are likely to induce the long-term response of high fertility, because under these circumstances (where alternative forms of insurance against

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[20] See Watkins and Menken (1985).

[21] Note that the assumption of age-neutrality of famine, if anything, overestimates the recovery time; see Watkins and Menken (1985), p.663.

crisis are either unavailable or inadequate) children are viewed as a form of insurance.[22] During crises, mature sons provide opportunities for spreading risk and preventing property loss and even starvation through diversified earnings and temporary migration for work. Another long-term behaviourial response to famine may be an increased level of permanent emigration from famine-prone areas and a larger flow of rural-urban migration.

Also of considerable interest in connection with famine demography is the interaction between famine conditions and epidemics. Although famine entails large-scale undernutrition, famine mortality does not consist only of direct starvation deaths. In fact the vast majority of people die of various diseases. It is traditionally held that undernutrition lowers human resistance and leaves the affected population relatively defenceless against infectious disease, thus increasing their vulnerability to death (i.e via increased susceptibility to infection). Thus, although the recorded cause of death may be an infectious disease, nutritional crisis remains the root cause of mortality. But recently the existence of such a simple nutrition-epidemic relationship has been challenged. First, in the medical literature the relationship between under/malnutrition and infectious disease is well established as synergistic.[23] Since famine causes a considerable decline in food consumption, undernutrition presumably initiates the synergy leading to

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[22] See Bongaarts and Cain (1982), p.54.

[23] See Scrimshaw et al. (1968). See also Taylor (1985).

increased mortality.[24] However, famine represents not only acute nutritional crisis, but it also entails severe social dislocation (e.g. population movements, overcrowding in relief camps, breakdown of sanitary standards). Indeed, evidence on the subsistence crises of 18th century Europe suggests that the breakdown of social relations - and the resulting migration, vagrancy and overcrowding in insanitary conditions, without the benefit of adequate welfare provisions - was a major cause of mortality elevation even from diseases (like smallpox) which are not normally identified synergistically with malnutrition.[25] If a higher mortality rate is found for the more undernourished classes, this may, it has been argued, result from poor living conditions (e.g crowded shelter) and higher risk of exposure to diseases rather than undernutrition *per se*.[26] Moreover, the nutritional status of a population depends not only on availability of food but also on other non-food inputs including health care, basic education, quality of drinking water and sanitary conditions.[27] Thus, increase in mortality during famine can occur either through an increase in susceptibility to potentially fatal diseases or through an increase in exposure to them or a combination of the two. Thus while undernutrition and associated debilitation appear to play some role in raising

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[24] In fact among scholars, including medical scientists, there is a continuing debate (and controversy) on the interrelationship between the level of malnutrition and risk of infection and death; see e.g. Chen et. al (1980), Tomkins (1986), and Martorell and Ho (1984).

[25] See Post (1990).

[26] See Walter and Schofield (1989) especially p. 19, and de Waal (1989b) especially p.116.

[27] See Drèze and Sen (1989), p.44.

susceptibility to fatal infections, increased exposure during famine - through various social dislocations (e.g. population movements and large congregations of people at relief camps) - seems to contribute to spreading epidemic diseases. Indeed, there is a continuing debate on the nature and significance of the famine-nutrition-disease-epidemics-mortality relationship.

Another important aspect of the famine-mortality relationship is the differential mortality impact of famine upon different sub-groups in the population and in different sub-regions of the area affected. Differences by age and sex will be considered first. The age-sex composition of famine mortality is usually the outcome of two factors, namely, physiological vulnerability and social protection. Infants (whose mortality rate is normally very high anyway in poor countries) might be expected to be particularly vulnerable to the protein-calorie malnutrition associated with famine and to be adversely affected by birthweight declines. In analyzing the impact of famine on infant mortality, one may distinguish between the effects of "prenatal exposure" and "postnatal exposure".[28] The former work through maternal nutritional stress and associated maternal infections while the latter include infants' own nutritional deficiency, poor care etc. However, infants can be relatively protected from extreme mortality during famine as they depend on breast milk, the infant's ideal form of nutrition. Moreover, many neonatal deaths in poor countries are due to chronic maternal malnutrition, tetanus, and inadequate perinatal care -

[28] See Stein et. al. (1975), Chapter 12.

variables which seem unlikely to be influenced by acute events such as famine.[29]

Indeed, it may be young children rather than infants who are physiologically most vulnerable to nutritional deprivation as they, in their period of body growth, have comparatively small reserves of nutrients and energy. As Rivers writes, "the child seems to become more vulnerable to all manner of diseases as it falls further and further behind its expected size".[30] However, young children's extreme physiological vulnerability to food shortage may partly be offset by cultural norms which tilt intra-family food distribution during crisis in their favour and of course at the expense of adults' share.[31] Conversely children's vulnerability during food shortage may be worsened by "a cultural pattern in which adult males eat first and women and children eat what is left".[32] The old people too can be expected to be physiologically vulnerable to famine. They generally show the signs of famine osteomalacia (gradual softening and deformation of the bones) and they are particularly vulnerable to hypothermia (below-normal body temperature).[33] Difficulty in meeting the heavy additional nutritional demands makes pregnant and lactating women vulnerable to famine. However, decline in fertility during famine causes a corresponding

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[29] See e.g. Chen and Chowdhury (1977), p. 415.

[30] Rivers (1988), p.91.

[31] On this possibility and relevant empirical evidence for various places, see Drèze and Sen (1989), pp. 79-80, and the references cited there.

[32] See McAlpin (1983), p. 57 and the references cited.

[33] See Rivers (1988), p. 91.

decline in deaths related to pregnancy and child birth. Thus although the death rate of women of prime childbearing age is normally high compared to males, the increase in female mortality in this age group during famine may be comparatively small. While adult males are physiologically less vulnerable to nutritional stress, they may be expected to move out of their villages in search of food or work, thereby exposing themselves to the dual risks of coming into contact with more diseases and of exhaustion from wandering.

Since some age (and also sex) groups are highly vulnerable to death even in normal times (e.g. infants, young children, women in the prime reproductive years, and the elderly), during crisis they may be expected to experience relatively large absolute increases in mortality, compared with other age groups. But, because of the very high normal levels of death rates of these age groups, the scope for further increases in death rates in proportionate terms during famine may be comparatively limited. Thus it seems possible that the age-sex pattern of proportional mortality increases does not always coincide with the corresponding pattern in terms of absolute increases.

Turning to the mortality impact of famine on the two sexes it should be noted first that females are physiologically less vulnerable to death than males. Abundant evidence shows that male infants have higher mortality than female infants.[34] In addition, females have hormonally determined higher immune resistance to infections.[35]

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[34] See Waldron (1976), p.349.

[35] Ibid., p. 355.

Moreover, because of certain physiological advantages relating to body-fat content females have greater biological capacity to withstand temporary nutritional stress than males.[36] But sex differentials in mortality are also influenced by socio-cultural factors including sex-discrimination. For example, there is evidence of systematic anti-female discrimination in the distribution of food and medical care even in normal times in parts of South Asia.[37] It might be expected that such discrimination against women would worsen during crisis situations.

As regards socio-economic differentials in famine mortality, it is generally expected that increases in mortality and decreases in fertility would be disproportionately large for the poor and landless.[38] Regional variation in the demographic impact of famine is understandably much less predictable because it depends upon specific circumstances. Moreover, regional variation is likely to be the result of the interaction of several factors including intensity of crop failure, food availability, pre-famine economic conditions, migration, ecological factors, transport networks and relief allocation.

1.2 FAMINES IN INDIA: THE SETTING FOR OUR STUDY

It is true that present-day India appears to be

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[36] See Drèze and Sen (1989), p.55 and references cited there; see also Rivers (1982), pp. 259-263.

[37] See Drèze and Sen (1989), pp. 51-55 and the references cited there.

[38] For limited and also scattered evidence on this, see Currey and Hugo (1984), pp.18-19, 28.

relatively free of major famines (especially when compared with many countries of contemporary Africa). But severe famines abound in India's past.[39] Indeed, failure of rain and consequent crop loss has been known in India from ancient times. Although famines have been recurrent in India throughout recorded history, demographic data are extremely scant and probably unreliable for the period before the 1870s, since censuses and vital registration were established only after the 1860s.[40] However, during the closing decades of the nineteenth and the first decade of the twentieth century India experienced four large-scale famines, each of which caused several million excess deaths. The first crisis was the famine of 1876-78 which has sometimes been labelled as the "Great Famine". This crisis was particularly severe in southern, central and western parts of India. Indeed, the severity of this famine (especially in terms of excess deaths) partly prompted the establishment of the first Indian Famine Commission (of 1880), which, in turn, laid the foundation of India's subsequent relief system, namely the Famine Codes (i.e. guidelines to the local administration for anticipation, recognition and relief of famines).[41] During the period between 1880 and 1896 several local famines occurred but they

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[39] For detailed chronologies and brief descriptions of South Asian famines (often including estimates of excess mortality), see Census of India, 1951, vol.1, India, Part 1B- Appendices to the Census Report 1951, New Delhi, 1955; see also Greenough (1982), Appendix A, Bhatia (1967), and Dando (1980).

[40] For the possible sources of information (and their difficulties) about the famines prior to the 1870s in the context of south India, see Murton (1984). Two useful studies of India's famines and food crises since about 1860 are Bhatia (1967) and Srivastava (1968).

[41] The first "Draft Famine Code" was submitted along with the Famine Commission Report of 1880. Each province was asked to frame its own code by adapting the model contained in the Draft Code to its own circumstances.

did not develop into major large-scale crises. Then, in quick succession, the famines of 1896-97 and 1899-1900 devastated wide areas of the sub-continent. They also were respectively followed by the establishment of the Indian Famine Commissions of 1898 and 1901.[42] The next major famine was that of 1907-08. This was probably not as widespread as the preceding two; but its effects were particularly acute in United Provinces of Agra and Oudh (henceforth called United Provinces).[43]

The reasons behind the emergence of such large-scale famines have understandably been the centre of a long-standing debate. Factors like colonial exploitation, population pressure etc are sometimes held as responsible for these disasters.[44] However, it is widely agreed that failure of monsoon rains (i.e. so-called drought) was the single most important "proximate" or precipitating factor in all of these major historical famines in the Indian sub-continent.

Fairly heavy rains during the three monsoon months of July, August and September, and some further rains in December and January, are generally considered to be necessary for good harvests in most parts of India. The former rains, resulting from the southwest monsoon, give what is known as the "kharif" cropping season; the latter rains result from the northeast monsoon, and give the "rabi" season. Given the weather-

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[42] For discussion of the modifications that these subsequent Famine Commission reports included compared with the first report, see Srivastava (1968), chapters 6-8, Bhatia (1967), Drèze (1990), especially pp. 25-32, and Klein (1984).

[43] Note that until 1901 the name of this province was North-Western Provinces and Oudh.

[44] For the different views on this question, see,for example, Bhatia (1967), McAlpin (1983), Klein (1984), Hebert (1987).

dependence of South Asia's agriculture, the failure of monsoon can mean crop losses, decline in food availability and sharp rises in prices of staple foodgrains (exacerbated by hoarding) and the threat of famine conditions and associated distress. Indeed, severe droughts in late nineteenth century India used to shatter the rural economy. The drastic reduction in the area cultivated or sown and the resultant loss in farm activities left the mass of rural labourers jobless and deprived of their basic entitlements to food. On the other hand, the sharp price rises generally contributed to the overall deterioration in exchange entitlements too. Indeed, such major decline in economic well-being of the agricultural population also adversely affected the conditions of rural artisans.[45] Consequently aimless wandering and migration in search of work and food was a common response during famine. The sale of assets was a resort of the relatively less vulnerable groups.

The chief governmental effort to tackle famine consisted of relief provision. There was no governmental control over prices, supplies and distribution of food, which were basically left to market forces and private traders.[46] Organisation of relief measures was the responsibility of the

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[45] Descriptions of these devastating consequences of drought on the rural economy abound in contemporary official documents; see also Drèze (1990), pp. 16-19. On this see also Ghosh (1982).

[46] While governmental participation in trade and distribution of food during the subsistence crisis is sometimes seen as an effective means of protecting the food entitlement of vulnerable sections of population, the British administration was almost obsessively against the policy of state intervention in free market operations and private trading; on this see Drèze (1990), pp.27-28. For a discussion on the influence on the British famine relief policy of the classical ideas favouring operation of free market forces and its implications, see Ambirajan (1978), especially pp. 69-100 and also Sen (1981), pp.160-162.

local-level administrations.[47] For example, a district was entitled to government relief provision only after local-level administrators had declared the existence of famine conditions. Official declaration of famine in a locality was usually based on some "tests". For example, "test works" (i.e provision of paid works on a very small scale) were set up initially to test whether or not the provision of large-scale relief work in that locality was justified. Sometimes provision of relief (either gratuitous or relief work) was opened in far-flung places to test whether people were desperate enough to go to such distant centres for relief. Relief measures were in two basic forms: direct and indirect. The most important measure of relief was the provision of massive public works at subsistence wages (paid in cash) for those who came forward for it. Complementary to public works was gratuitous relief for those who were unable to work. Gratuitous relief usually took the form of either cash doles or cooked food in the relief kitchens and also poor houses. Indirect relief measures usually included remissions from land revenue, and agricultural loans for both subsistence and production.[48]

However, acute undernutrition on a large scale seems to have been a usual consequence in the affected regions. The widespread undernutrition - combined with various disruptions - paved the way for epidemic diseases to take their toll.

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[47] For a useful discussion of the basic principles and rationale behind the relief policy - and also its evolution - during the closing decades of the nineteenth and early twentieth century, see Drèze (1990), pp. 25-32, and also Srivastava (1968).

[48] The hardship loan to agriculturists was called *taccavi*.

Sometimes analysts denote the first situation described above as the "starvation" phase, while the latter is termed the "epidemic phase" of famine.[49]

An examination of the quantum of overall excess mortality caused by the four major famines referred to above would provide an understanding of temporal trend in famine mortality over the period of late nineteenth and early twentieth century. In this context, Table 1.1 provides some rough estimates of the excess deaths during the four major famines. It should be noted that determination of the mortality attributable to famine is not a very easy task. It involves several issues - both conceptual and statistical. For example the number of excess deaths during famine has to be measured with reference to some non-famine (or pre-famine) mortality level. This non-famine mortality level may or may not represent the "normal" situation, because there seem to have been occasional bad mortality years (often due to epidemics). Thus it is possible to derive different estimates of excess deaths during famine, depending on what is taken as the normal level. Another issue is the period for which excess deaths should be attributed to famine, since an elevation in mortality may sometimes continue after the famine as such.

While the estimates provided by Visaria and Visaria and by Seavoy have actually been derived from the official estimates made separately for different regions[50], the detailed procedure in the production of these estimates has

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[49] See, for example, Sen (1981), especially Appendix D, and also Lardinois (1985).

[50] The official estimates were made by either the relevant government department or the Famine Commission Reports.

Table 1.1 Estimates of excess mortality in the major famines in India during the late nineteenth and early twentieth century

Famine	Seavoy	Visaria and Visaria	Present author	
			Lower estimate	Upper estimate
1876-1878	6,135,000	5,550,000	8,217,692	8,217,692
1896-1897	5,150,000	5,150,000	2,624,574	4,055,396
1899-1900	3,250,000	n.a.	2,968,757	4,399,579
1907-1908	n.a.	n.a.	2,148,788	3,218,776

Notes: 1) The all-India figures provided by Seavoy and Visaria and Visaria have been derived by adding the official estimates for only those areas which were officially declared as famine-affected. According to Seavoy his figures are the "highest [officially] estimated mortalities".

2) The approach adopted here consists in calculating the excess death rate for the whole of India for each famine year over a pre-famine baseline average annual figure for five years. Two estimates of excess death rates have been made according to two baseline average figures used - one including all the five years preceding famine, and the other excluding some abnormal years. Applying these excess death rates to the respective populations under registration, total registered excess deaths during the famine period were obtained. To take account of under-registration of deaths, registered excess deaths were inflated by a correction factor. The correction factor for each relevant intercensal decade was derived by taking the ratio of the average of four different estimates of the decadal CDR (those by Indian census actuaries, Davis, Visaria and Das Gupta) to the average decadal CDR calculated from registration data. The estimated correction factors for the 1870s, 1890s and the decade beginning in 1901 were respectively 1.74, 1.45 and 1.27.

3) n.a. = not available

Sources: R.E. Seavoy, Famine in Peasant Societies, London: Greenwood Press, 1986, Figure 10, p.242; L. Visaria and P. Visaria, "Population (1757-1947)" in D. Kumar (editor), The Cambridge Economic History of India, Volume 2 :c. 1757-c.1970, Cambridge: Cambridge University Press, 1983, Appendix 5.2, pp. 530-531. For various estimates of CDR for each intercensal decade, starting from 1871, and also the relevant references see Visaria and Visaria (1983), p. 501.

not been made explicit. Consequently, new estimates have been attempted here. Any attempt to estimate excess deaths during these famines is fraught with difficulties. The major problem, of course, relates to the determination of the level of under-registration of deaths. Some of the newly discovered methods, namely growth balance method and inter-censal survivorship method were tried. But none of these methods worked well because of serious deficiencies in the census data on age distribution. However, in order to gain an understanding of the temporal trend in famine mortality, the level of death-under-registration (i.e. the correction factor) was estimated for each decade with major famines by comparing decadal estimates of the all-India death rate with the corresponding decadal death rates derived from registration data.[51] Using these correction factors, we have provided two estimates of excess mortality: lower estimates have been derived on the basis of baseline averages involving all the five years preceding famine, and upper estimates from baseline averages excluding some years with abnormal mortality.

One possible source of discrepancy between the official figures (provided by Visaria and Visaria and by Seavoy) and our estimates is that the former figures stem from the summation of excess deaths occurring only in those areas which were officially declared as famine-affected. In addition, the reference level of mortality for calculating excess deaths, famine period employed, adjustment for under-registration of deaths - none of these was made explicit either by Visaria and

[51] For various estimates of decadal death rate for all India, see Visaria and Visaria (1983), p. 501.

Visaria and or by Seavoy - may well be different.

Despite considerable discrepancy between official figures and our estimates, Table 1.1 suggests a somewhat declining trend in the magnitude of famine mortality over the period of the late nineteenth and the early twentieth century. This has sometimes been attributed to a more effective and rational relief policy, perhaps helped by both improved transport networks and diversification of the economy.[52]

Indeed, for about four decades after the famine of 1907-08, India was relatively free of major famines. Although some local crop failures occurred during 1908-1940, they involved few excess deaths. However, interestingly, during the three decades preceding the Second World War per capita food-output in India was not increasing. It has sometimes been argued that improved communications and more effective policies of famine relief played a crucial role in the absence of major famines during this period.[53]

However, any complacency that major famines had become a thing of India's past was suddenly smashed by the occurrence of the "great" Bengal famine of 1943-44 which again caused a large number of excess deaths. Unlike earlier major famines this crisis, however, was not precipitated by drought. It occurred under unusual circumstances related to war. The main impact of this famine was restricted to the large eastern province of Bengal, though Orissa and Madras were also somewhat affected. Thus, this crisis, though it certainly caused very many excess deaths, probably did not assume quite

[52] See e.g. Klein (1984), McAlpin (1983).

[53] See Drèze (1990), McAlpin (1983, 1985).

the same scale at the all-India level as the late nineteenth century famines. It appears that the number of excess deaths during the famine of 1943-44 was somewhat above 2 million.[54]

However, the famine of 1943-44 is widely believed to be the last major famine in the Indian sub-continent. Indeed, since independence in 1947 India has never experienced a major famine of a scale and severity comparable with that of the previous major famines. However, India's per capita foodgrain output has changed little from the "dangerously low" pre-Independence level.[55] Per capita food availability has also remained stagnant over the post-independence period. Indeed, India is by no means free of occasional visitations of droughts and food scarcities (often within some specific states). In fact the relative stagnation in agricultural output over the large unirrigated tracts still hold these locations potentially vulnerable to famine. The most important crises that have occurred since independence are the Bihar famine of 1966-67 and the Maharashtra drought in 1971-73. Both these events have caused some excess mortality, but the magnitude is small compared to past major famines.[56] Massive food imports (particularly during the 1960s), comparatively effective measures of relief (sometimes combined with effective state control over food supplies and prices), use of a considerable buffer stock (that has been accumulated

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[54] The quantum of excess deaths in the Bengal famine has been a hotly debated issue. However, our own re-estimation of excess deaths in Bengal (with hitherto unutilized registration data for the whole of Bengal) provides a figure of 2.1 million; see Dyson and Maharatna (1991a), and also Chapter 5 below.

[55] See Drèze (1990), pp. 36-37.

[56] See Chapter 7 below.

by the 1980s) are among the main factors that have contributed to preventing such crises from developing into large-scale famines.

The foregoing discussion suggests a broad long-term decline in the frequency and severity of famines in India since the 1870s. The chief purpose of the present study is to examine the characteristics of demographic responses to Indian famines since the late nineteenth century. Hopefully this should throw light on the question of why famines have disappeared in India.

1.3 THE DEMOGRAPHIC DATA IN OUR STUDY

The study will use detailed demographic information provided by India's vital registration system. Since the inception of the registration system (i.e since the 1870s), the Sanitary Commissioner of each province was responsible for producing an annual report, containing quite detailed registration data. On the basis of this provincial information, an annual report for the whole of India was produced by the Sanitary Commissioner with the government of India. The information on vital events was collected by village watchmen (or *chowkidars*), each being responsible for a particular jurisdiction. Vital rates in these official reports were almost always based on constant denominators - being the respective enumerated population under registration according to the preceding census.

There were, of course, several deficiencies of registration data, the most apparent of which was the under-registration of births and deaths. This problem was particularly pronounced during the early days of the registration system. It is possible that there has been a long-term improvement in registration after its inception. If, over time, we find a rising trend in registered vital rates, it is impossible to separate out the relative influence on this increase of real causes and of improvements in registration. However, since the level of under-registration is unlikely to have changed drastically within short periods, registration data can be used for the purpose of examining the demographic impact of a famine.[57] It should also be remembered that there has been a significant provincial variation in quality of registration. For example, the registration system was relatively good in Central Provinces, Hyderabad Assigned Districts (henceforth called Berar), Madras Presidency, Punjab, United Provinces, and Bombay Presidency. However, during periods of social disruption such as accompanied famine, it is possible that the quality of registration sometimes deteriorated. Difficulties of recording deaths among wandering people on distant roads or in jungles have sometimes been mentioned by administrators.[58] Increased work pressure of *chowkidars* in the wake of famine and the attendant mortality crisis may also be responsible for deterioration in registration coverage.[59] This said, it seems doubtful that registration coverage invariably deteriorated during famines.

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[57] See also McAlpin (1983), p. 50-51.

[58] See Dyson (1991a), p.10 and references cited.

[59] For this and other related possibilities, see Census of India, 1911, United Provinces, Volume XV, Part 1-Report, Allahabad, 1912, pp.46-55.

In fact, one stated motive behind the establishment of the registration system in India was to monitor mortality trends during periods of crisis.[60] Available official documents suggest that famine conditions often led to augmented registration efforts. For example, the Sanitary Commissioner of Bombay Presidency, while attributing a large part of the increased mortality in 1877 to the existence of famine, added that "..there can be no question that the increased attention paid to the registration by the large staff of village inspectors throughout famine districts had led to much greater accuracy in the number of deaths returned in 1877. With exception of the comparatively few cases of persons dying far away from any village, I believe that great majority of deaths was reported."[61] The 1901 census report on Punjab, while discussing the quality of registration data during the 1890s, writes that " [i]t is not necessarily true that the completeness or accuracy of data are adversely affected by the dislocation of the administrative agencies in the famines...the presumption is that they were not affected one way or the other...any laxity would be counterbalanced by the extra supervision necessitated in times of scarcity".[62]

However, there is a difficulty basing the analysis on vital rates based on constant denominators (as was the

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[60] To quote from a monograph on India's civil registration system, "An important landmark in the development of vital statistics was the stress laid by the Indian Famine Commission on the importance of these statistics"; see Office of the Registrar General, India, Civil Registration System in India - a perspective, New Delhi, 1972. See also Dyson (1991a), p.10.

[61] See Annual Report of the Sanitary Commissioner for the Government of Bombay, 1877, Bombay: Government Press, 1878, p.139.

[62] See Census of India, 1901, Punjab, Volume XVII, Part 1-Report, Simla, 1902, pp.41-42.

practice of the Sanitary Commissioners). As famine entails a reduction in population size, use of constant denominators may introduce a downward bias in both death and birth rates for the famine and post-famine years. Again if there was a positive growth of population between the census and the occurrence of the famine, the "pre-famine" vital rates will be biased upwards. Thus while changes in the constant-denominator vital rates reflect essentially the changes in the numerators i.e. registered vital events, the implications of such "numerator based" analysis should be borne in mind. For example, a change in population size (e.g. through excess deaths and/or migration) may partly be responsible for a change in the total registered vital events. Thus one should be careful while interpreting the changes in total number of registered events.

Registered deaths were usually classified under five major causes: cholera, dysentery/diarrhoea, smallpox, fevers, injuries and all others. Subsequently plague and respiratory diseases were also included. Distribution of registered deaths from each specified cause - both by district and by month - is available. There is no doubt that cause of death data are not accurate especially because village officials can hardly be assumed to have had much skill in assigning deaths to appropriate categories. However, statistics for categories such as cholera, smallpox, plague are generally thought to have been relatively reliable because of their very distinctive symptoms. Fevers - under which normally most deaths are classified - seem to have been a catch-all category in the sense that several diseases which cause temperature are likely to have been included under this heading. As the Sanitary Commissioner of the Bombay Presidency in his annual report for 1894 writes, "..in every case where fever occurs as a symptom of the illness which terminates in death, this death is recorded as due to fever."[63] On that count, a certain degree of misclassification of deaths between fever and dysentery/diarrhoea seems possible. Some serious past investigations of malaria have also shown that malaria becomes particularly fatal for children below five years, and it often predisposes to respiratory diseases and dysentery/diarrhoea.[64] As the official report on the United Provinces famine of 1896-97 also noted, "[t]his heading [fever] is very general and probably includes most cases of pneumonic and lung diseases, so fatal to people of reduced stamina (especially the young and very old) employed on relief works and elsewhere".[65] However, malaria is generally taken to have been the most important component of the fevers category. A usual surge in fever mortality during the monsoon and post-monsoon months has often been attributed to the increased incidence of malaria following the rains. Since the early 1920s "fever" began to be divided into different sub-heads, viz., malaria, enteric fever, measles, relapsing fever, kala-azar, and other fevers. Although a degree of misclassification of deaths between these fever sub-heads seems also likely, malaria generally

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[63] See Thirty-First Annual Report of the Sanitary Commissioner for the Government of Bombay, 1894, Bombay: Government Press, 1895, p.63.

[64] See Census of India 1911, vol.XV, United Provinces of Agra and Oudh, Part I, Report, Allahabad, 1902, p. 45.

[65] See Resolution on the Administration of Famine Relief in the North-Western Provinces and Oudh during 1896 and 1897, Allahabad: Government Press, 1897, p. 135.

constituted the most dominant share in the fever category.[66]

However, these problems of using registration data should not be exaggerated. Putting the issue of under-registration aside for a moment, most of the possible defects of the registration system (e.g. misclassification of both ages at and causes of deaths) were common to the periods before, during and after a famine. Thus the probable unchanging nature of some reporting biases leaves registration data useful for examining the basic patterns of demographic changes during famines.

However, there are rather strong indications that the civil registration system in the post-independence India has been deteriorating.[67] Estimates of under-registration for the period 1941-50 have been found to be lower than estimates for more recent periods.[68] Reasons for this deterioration include, among others, a large increase in population which has caused an increased work load of the village headman.[69] Since the mid-1950s the reorganisation of states and subsequent efforts to unify the divergent provisions prevailing in different parts of the country have also apparently contributed to its further deterioration. Again, "[t]he *Panchayats*, village-level civic bodies that took over the work of registration in most states, had neither the

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[66] See e.g. Chand (1939), p.119.

[67] India became independent from British rule in 1947. Note that since then connotation of India in territorial terms is not the same as that of pre-independence period. Pakistan and Bangladesh were parts of pre-independence India.

[68] See Mari Bhat et al. (1984), p.29.

[69] For the reasons, see Mari Bhat et al. (1984), pp.28-29 and the references cited.

necessary personnel nor the zeal to undertake the arduous task."[70] In terms of under-registration, the civil registration system is especially poor in Rajasthan, Bihar and Uttar Pradesh, and only moderate in West Bengal, Karnataka, and Andhra Pradesh. However, Punjab, Maharashtra, and Tamil Nadu are the states with a more complete registration system.

However, in the absence of any sign of quick recovery of civil registration in most parts, the Sample Registration System (SRS) was initiated by the Registrar General of India in 1964-65 (initially in certain states) as an alternative. This is a dual-record system with the main objective of providing reliable vital rates at national and sub-national levels. The data collection process of the SRS consists of continuous enumeration of births and deaths from sample populations by an enumerator and an independent survey of every six months by an investigator-supervisor. In addition to the fact that the SRS provides neither detailed demographic data (only the CBR and CDR) nor disaggregated vital rates (say, by district), the SRS data are not entirely free from deficiencies. However, it is generally agreed that SRS vital rates are fairly reliable - though usually slight underestimates of the true rates.[71]

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[70] See Mari Bhat et al. (1984), p.29.

[71] For details, see Mari Bhat et al. (1984), pp.29-34.

CHAPTER 2

THE DEMOGRAPHY OF SOME MAJOR HISTORICAL FAMINES IN THE INDIAN SUBCONTINENT

2.1 INTRODUCTION

Systematic and detailed demographic study of Indian famines cannot be undertaken for a period before the 1870s (i.e. until the establishment of the censuses and vital registration). However, several large-scale famines that occurred during the last few decades of the nineteenth and early twentieth centuries (i.e. those of 1876-78, 1896-97, 1899-1900 and 1907-08) provide a good opportunity for examining demographic characteristics of Indian historical famines. First, they were major famines both because of their acute severity (and associated excess mortality) and widespread effects, and it is reasonable to expect that during such major famines characteristic demographic responses would be comparatively pronounced. Second, these famines are all comparatively well documented. Indeed, a demographic study of these historical famines may provide a useful perspective for a better understanding of more recent and contemporary subsistence crises and their demographic implications. In this chapter we examine the demographic characteristics of these major historical famines.

Although Indian historical demography is a very new field of research, some demographic aspects of the late nineteenth century major famines have been examined in a few studies.[1] However, a recent analysis by Dyson appears to be the most comprehensive and systematic demographic study.[2] Consequently here we summarise Dyson's main findings.

Using mostly registration data, Dyson analyses three major nineteenth-century famines in particular locations: the famine of 1876-78 in the Madras Presidency, and the famines of 1896-97 and 1899-1900 in both Central Provinces and Bombay Presidency. Thus northern parts of the subcontinent are not represented in this study. One of the issues addressed rather thoroughly is the evolution through time of fertility and mortality responses to famine.[3] Average monthly prices of staple food-grains are used to trace the development of famine distress.[4] The monthly numbers of conceptions are taken to be equal to the monthly births displaced backwards by nine months. Thus, Dyson assumes that only a small proportion of conceptions result in fetal loss.[5] A decline in conceptions

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[1] For a review of the literature on Indian historical demography and also for some recent researches in this area, see Dyson (1989b), Chapter 1.

[2] See Dyson (1991a). Few other studies on some specific demographic aspects of the late 19th century Indian famines, sometimes in the context of particular locations, are those by Lardinois (1985), McAlpin (1983) Chapter 3, Guz (1989).

[3] Note that longer-term demographic responses are beyond the scope of Dyson's study.

[4] The concern for, and the attempt to establish, such relationships among the fertility, mortality and food price was rather elaborately shown long back by W.R. Cornish, the Sanitary Commissioner for the Madras Presidency, in his reports covering the Madras famine of 1876-78; see <u>Fourteenth Annual Report of the Sanitary Commissioner for Madras, 1877</u>, Madras, 1878; <u>Fifteenth Annual Report of the Sanitary Commissioner for Madras, 1878</u>, Madras, 1879.

[5] On the validity of this assumption that the births displaced backwards by nine months represent the conceptions even during a famine situation especially because of the insignificance of the variations in the number of fetal loss, see Chen and Chowdhury (1977).

corresponding to the rise in food-prices - even at an early stage of famine with little or no elevation in death rate - appears to be a common feature. Dyson describes such fertility effects "at a far earlier stage in the build-up to famine" than the mortality effects as "anticipatory". In addition to the several well-known famine-fertility links (e.g. fertility-reducing effects of nutritional stress, spousal separation, deferment of marriages) Dyson suggested (albeit "cautiously") an element of planned decision behind such reductions in conceptions.[6] However, the peak mortality phase seems to have exerted an additional independent short-term fertility-reducing effect.

The monthly movements of death rate during these famines show that the main mortality peak not only occurred late, but it also lasted for a short span. As Dyson writes, "In each case it happened in or around August and was almost certainly related to the resumption of monsoon rains".[7] Thus, the peak of famine mortality appears to have matched the normal seasonal mortality pattern - occurring during and just after the rains.

Among the few classified causes of death, the importance of "Cholera" and "Fever" mortality was apparent. "Dysentery and diarrhoea" also seemed significant in some cases. The famine mortality due to cholera (and dysentery and diarrhoea) usually peaked somewhat earlier, broadly corresponding to the phase of maximum starvation and social disruption (e.g.

[6] On this issue see also Caldwell et al. (1992), Greenough (1992), and also Dyson (1992).

[7] See Dyson (1991a), p. 22.

wandering and crowding). Assuming that malaria constituted the major part of "fever" mortality, the seasonal pattern of fever deaths in most cases suggested that "malaria was probably the most important single component of the main death rate peaks which accompanied the return of the rains..when field activities were resuming, employment prospects were improving, relief works were being run down and people were returning home."[8] However, as Dyson notes, the occurrence of such a peak in famine mortality in a year following drought did not depend entirely upon the resumption of rains - since mosquitoes breeding and disease transmission also depended on the "particular conditions of precipitation, temperature, atmospheric humidity etc." Another possible mechanism for outbreaks of epidemic malaria particularly after the resumption of both rains and normal farm activities (which in turn are supposed to improve the nutritional status of the population) has been proposed to be "malaria refeeding". According to this hypothesis severe undernutrition may obstruct the multiplication of malaria parasites in the human body and brake both the development and transmission of the disease; conversely improvements in nutritional status induces parasite multiplication, and hence contributes to major outbreaks of malaria.[9]

In the baseline periods age-specific death rates were found to be highest in infancy, childhood and old ages. The largest absolute increases in death rates during the famines

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[8] Dyson (1991a), p.22.

[9] See Dyson (1991a) p.24., and also the references cited by him.

occurred in these age groups. This certainly implies absolute vulnerability of these groups compared with other age categories in both normal and crisis times.[10] However, proportional increases in deaths in the peak mortality year were relatively small for infants and old people. This was usually the case for young children (aged 1-4 years) too. But the proportional increases in mortality in most of these famine locations tended to peak in later childhood (i.e. the 5-9 or 10-14 age groups). Thus, these findings suggest, in Dyson's words, "comparatively small proportional increases in famine mortality in age groups where death rates were already high, and, conversely, comparatively large proportional increases at ages where death rates were relatively low".[11]

In all famine locations in Dyson's study, the male population from the teenages through to about 50 years experienced greater proportional increases in mortality. Most other ages showed insignificant sex differentials. But in each of these famines the female infant mortality rate increased by a larger proportion than that for males. However, the net result was a higher proportional rise in the male deaths (all ages combined). In accounting for this Dyson stresses the importance of greater male mobility and the reduced number of maternal deaths (consequent upon the considerable falls in conceptions).

While Dyson's study provides some interesting findings on the short-term demographic responses to Indian historical

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[10] McAlpin has reported the similar finding in the context of the Bombay famine of 1876-78; see McAlpin (1983), p. 59.

[11] See Dyson (1991a), p. 21.

famines, there still remains much scope to extend this study. We would make our demographic study of major historical famines more detailed on at least three counts: first, covering larger geographical area; second, examining some issues in greater detail (e.g. interaction between famine and epidemics), and also investigating several additional issues (e.g. longer-term demographic responses, interaction between relief provision and demographic responses); third, using alternative methods of analysis, when appropriate. Moreover, in addition to the three pre-eminent famines of the late nineteenth century (i.e. those of 1876-78, 1896-97, 1899-1900), we would include in our study the famine of 1907-08.

Since vital registration system was at its nascent stage during the 1870s, demographic analysis of the famine of 1876-78 should be made with particular caution. In fact, for the famine of 1876-78 the Bombay and Madras Presidencies have been selected for two major reasons: one, the south-west of the Indian sub-continent was most severely affected by this famine; and second, the quality of demographic data was relatively superior for these provinces as early as the 1870s.[12] For the famine of 1896-97 Bombay Presidency, Central Provinces and Berar have been chosen partly because they were severely afflicted, and partly because the registration system was working relatively well in these parts during the 1890s. For broadly similar reasons Central Provinces, Berar, Bombay

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[12] On the issue of the severity of this famine, see e.g. Bhatia (1967), pp. 89-98; on the vital registration system in Madras Presidency, see <u>Fourteenth Annual Report of the Sanitary Commissioner for Madras, 1877</u>, Madras, 1878 and also <u>Fifteenth Annual Report of the Sanitary Commissioner for Madras, 1878</u>, Madras, 1879; on the registration system in Bombay Presidency, see McAlpin (1983), p. 50.

and Punjab have been studied for the famine of 1899-1900.[13] While the famine of 1907-08 was probably not as widespread as the others, its effects were particularly acute in the United Provinces.[14] The selection of Punjab and United Provinces has partly been influenced by our desire to include northern areas within the study. Consequently, our study covers much of the north, central, west and southern regions of the Indian sub-continent (see Figure 2.1).[15] Analysis of these major famines at the province-level has the advantage that migration should not appear to be important in influencing the demographic impact.

Table 2.1 provides the broad census-based information for each of these provinces. As can be seen, most of these famine locations involved large populations (except Berar). Near-zero or negative rates of population growth occurred in these provinces during the decades of the famines (probably except in Punjab), while growth rate was considerably higher in both preceding and subsequent decades.[16] Although it is not easy to demonstrate the exact contribution of famine to the reduction in population size during the intercensal decade, the considerable scale of excess mortality in these famines

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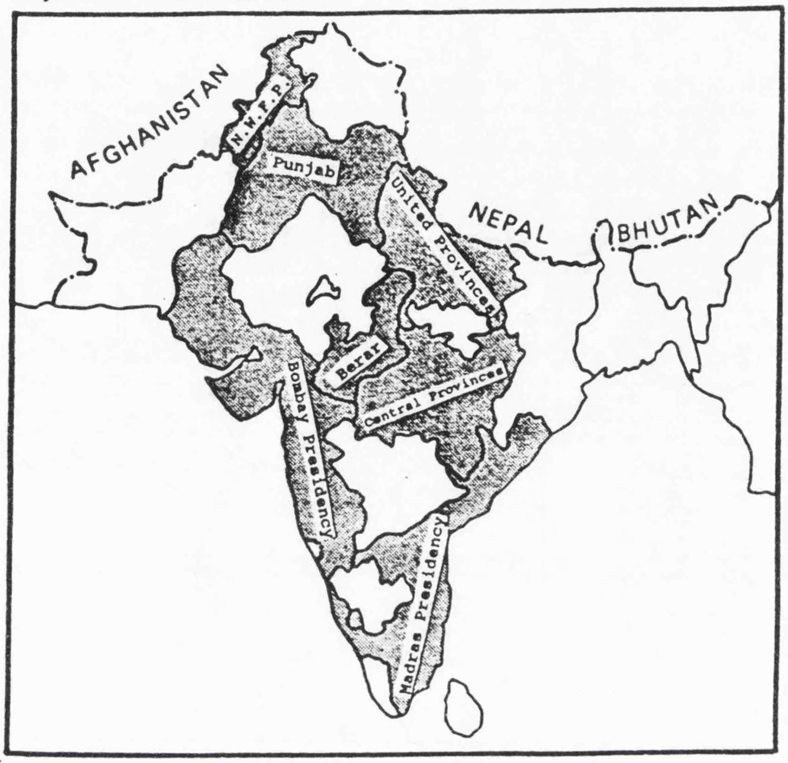
[13] On the question of the geographical spread of the severity of the famines of 1896-97 and 1899-1900, see Bhatia (1967), pp. 239, 250-253; on the vital registration system in Central Provinces and Berar, see Dyson (1989a), and also Dyson (1989b), Chapter 6. The registration system in Punjab improved significantly since 1892 because of the introduction of a more effective supervision; see Census of India 1901, Punjab, vol. XVII, Part I, Report, Simla, 1902, pp. 41-42.

[14] On the severity of this famine, see Bhatia (1967), pp. 265-266.

[15] Although eastern region is not represented in this chapter, we would have occasion to make a detailed study of eastern province of Bengal later on (see Chapters 5 and 6 below).

[16] Negative growth rate during 1911-1921 in United Provinces occurred due to the severe influenza epidemic of 1918.

Figure 2.1 Famine locations



Note: N.W.F.P.= North-West Frontier Province (which was included in Punjab till 1901).

cannot be doubted (see below). It may also be noted that the sex-ratio (male/female) declined in all locations during the decade of famine except the north Indian provinces, namely, Punjab and United Provinces; in Bombay, Madras, Central Provinces and Berar the decline seems to have been significant. Note too a considerable decline in the dependency-ratio in the census following famine in Bombay, Central Provinces, Madras and Berar; however, this seems to have remained unchanged in Punjab and United Provinces.

2.2 AGGREGATIVE SHORT-TERM AND LONG-TERM EFFECTS ON THE FERTILITY AND MORTALITY: AN ANALYSIS WITH ANNUAL VITAL RATES

Table 2.2 presents estimated crude birth, death and natural increase rates (respectively CBR, CDR and CRNI) during

Table 2.1 Census-based information on the major historical famine locations in the Indian subcontinent

Census year/ Provinces	Population enumerated	Annual growth rate(%)	Sex-ratio (m/f)	Dependency ratio
Bombay				
1872	16,228,774	-	1.095	0.78
1881	16,454,414	0.15	1.068	0.62
1891	18,820,346	1.34	1.072	0.66
1901	18,481,362	-0.18	1.065	0.59
1911	19,587,383	0.58	1.084	0.60
Madras				
1867	27,004,452	-	1.005	
1871	30,749,401	3.30	1.006	0.70
1881	30,835,771	0.03	0.980	0.54
1891	33,733,121	0.90	0.980	0.69
Cental Provinces				
1881	8,817,185	-	1.019	0.72
1891	9,501,401	0.75	1.000	0.67
1901	8,926,934	-0.62	0.966	0.41
1911	10,518,330	1.64	0.982	0.50
United Provinces				
1881	44,107,869	-	1.081	0.65
1891	46,904,791	0.61	1.075	0.64
1901	47,691,782	0.17	1.067	0.60
1911	46,835,108	-0.18	1.094	0.60
1921	45,375,787	-0.31	1.073	0.62
Punjab				
1881	18,850,437	-	1.181	0.64
1891	20,553,982	0.87	1.160	0.65
1901	22,159,414	0.75	1.160	0.64
1911	23,550,749	0.61	1.215	0.66
Berar				
1881	2,672,673	-	1.070	0.67
1891	2,852,825	0.65	1.060	0.67
1901	2,721,342	-0.47	1.026	0.53
1911	3,057,162	1.16	1.029	0.54

Notes: 1) All data refer to the enumerated population under vital registration system. 2) Dependency ratio is defined as the ratio of population aged 0-9 & 50+ to those aged 10-49 years. But for Bombay Presidency in 1872 dependency ratio is calculated as a ratio of population aged 0-11 and 50+ to population aged 12-49; this was necessary because of different age categories adopted in the 1872 Census. For Berar in 1911, it is taken as the ratio of population aged 0-9 and 60+ to those aged 10-60 years. 3) The population of North-West Frontier Province which was a part of Punjab before the 1901 census, has been included in the Punjab populations for both 1901 and 1911 censuses; this is done simply for the purpose of calculating growth rates during 1891-1901 and 1901-1911.

Sources: Annual Report of the Sanitary Commissioner for Madras, Madras: various years; Annual Report of the Sanitary Commissioner for the Government of Bombay, Bombay, various years; Report of the Sanitary Commissioner of the Central Provinces, Nagpur, various years; Annual Report of the Sanitary Commissioner for the Government of Punjab, Lahore, various years; Report on the Sanitary Administration of the Hyderabad Assigned Districts, Hyderabad, various years; Annual Report of the Sanitary Commissioner of the North-Western Provinces and Oudh (from 1901 United Provinces of Agra and Oudh), Allahabad, various years.

the pre-famine, famine and post-famine periods for the different major famine locations examined here. The registered vital rates for the 1870s seem to be distinctively low compared with those during the following decades, reflecting the difficulties of the newly introduced registration system. However, in almost all cases (except Punjab during 1896-97), the CDR in the prime famine year is substantially higher than in the pre-famine normal period; and all these famine years involved substantial population losses as indicated by negative CRNIs.

Table 2.3 summarises the broad demographic effects in both famine and immediate and longer-term post-famine periods. In most cases, there seems to have been a reduction in CBR (sometimes considerable) during the prime famine year (i.e. peak mortality year). Given the lag between conceptions and births, this partly implies the existence of the fertility-reducing effects of nutritional stress and other disruptions during the early phase of famines.[17] In all cases, the CBR seems to be significantly reduced in the year immediately following the year of peak famine mortality, implying a reduction in conceptions during the prime famine period. It then usually shows a sudden upward jump (in the second year following famine, t+2), reaching much higher level than the baseline average (see Table 2.3). This implies that in the year immediately following famine, the registered conception rate very often shot up above the baseline level, confirming the hypothesis of the existence of "excess fertility" in the

[17] Here we, of course, assume that famine conditions had insignificant influence on the registration of births.

Table 2.2 The crude birth rates (CBR) and crude death rates (CDR) and crude rates of natural increase (CRNI) during pre-famine, famine and post-famine periods: Major historical famine locations in the Indian sub-continent.

	Madras			Bombay		
	CBR	CDR	CRNI	CBR	CDR	CRNI
Pre-famine:						
1872-75	19.12	18.22	0.90	18.83	21.37	-2.54
Famine:						
1876	20.91	22.51	-0.60	21.29	22.69	-1.40
1877	16.38	53.39	-37.01	19.56	39.40	-19.84
Post-famine:						
1878	12.15	28.27	-16.12	15.54	34.04	-15.54
1879	16.70	19.19	-2.49	18.50	24.91	-6.41
1880	22.90	15.76	7.14	23.77	21.06	2.71
1881	25.52	16.24	9.24	27.94	23.18	4.76
1882	25.92	16.24	9.68	29.58	20.67	8.91
1883	27.07	18.53	8.54	30.05	25.17	4.88
1884	28.10	22.09	6.01	31.78	24.27	7.51
1885	27.78	20.75	7.03	33.81	22.51	11.58
1886	28.51	18.47	10.04	33.93	22.23	11.70
1887	28.07	19.99	8.08	36.26	26.27	9.99
1888	27.31	19.57	7.74	36.27	26.75	9.52
1889	28.23	21.51	6.72	34.15	29.49	4.68
1890	28.83	24.12	4.71	36.08	26.09	9.99
1891	27.44	22.19	5.25	36.27	27.26	9.01

	Bombay			Punjab			Central Provinces		
	CBR	CDR	CRNI	CBR	CDR	CRNI	CBR	CDR	CRNI
Pre-famine:									
1891-95	35.09	29.30	5.79	39.88	32.37	6.51	37.41	33.43	3.98
Famine:									
1896	35.85	30.91	4.94	41.83	30.64	11.19	31.87	49.53	-17.66
1897	32.84	39.11	-6.27	40.90	29.84	11.06	28.16	72.76	-44.60
Post-famine:									
1898	30.32	28.57	2.05	38.99	29.56	9.43	25.35	31.90	-6.55
Famine:									
1899	35.66	34.97	0.69	45.23	27.65	17.58	50.84	40.23	10.61
1900	27.27	71.64	-44.37	38.64	44.88	-6.24	33.24	87.86	-54.62
Post-famine:									
1901	25.20	37.13	-11.93	35.40	36.10	-0.70	28.83	23.46	5.37
1902	34.32	39.22	-4.90	43.95	44.28	-0.33	47.51	25.40	22.11
1903	31.75	44.66	-12.91	43.34	49.49	-6.15	43.10	30.39	12.71
1904	35.91	42.35	-6.44	42.22	49.93	-7.71	50.19	29.19	21.00
1905	33.79	32.53	1.26	45.36	48.55	-3.19	47.42	31.32	16.10
1906	34.62	35.87	-1.25	44.28	37.47	6.81	44.52	34.80	9.72
1907	33.79	33.57	0.22	42.46	64.37	-21.91	45.07	33.12	11.95
1908	36.20	27.52	8.68	43.71	53.08	-9.37	45.25	33.12	12.13
1909	35.75	27.50	8.25	36.57	32.17	4.40	42.85	27.30	15.55
1910	37.22	30.22	7.00	44.09	34.33	9.76	46.97	35.99	10.98
1911	36.00	28.35	7.65	43.90	34.10	9.80	49.43	34.20	15.23
1912	34.96	34.88	0.08	43.60	25.63	17.97			

	Berar		
	CBR	CDR	CRNI
Pre-famine:			
1891-95	38.29	38.62	-0.33
Famine:			
1896	38.70	44.30	-5.60
1897	40.77	54.03	-13.26
Post-famine:			
1898	31.90	23.83	8.07
Famine:			
1899	50.84	40.23	10.61
1900	33.24	87.86	-54.62
Post-famine:			
1901	30.82	27.63	3.19
1902	55.56	31.96	23.60
1903	46.69	40.47	6.22
1904	52.54	35.48	17.06
1905	51.30	40.19	11.11
1906	50.69	52.18	-1.49
1907	49.77	48.19	1.58
1908	49.75	34.14	15.61
1909	49.85	32.53	17.32
1910	47.97	46.41	1.56
1911	49.61	36.32	13.29

	United Provinces		
	CBR	CDR	CRNI
Pre-famine:			
1901-05	43.46	35.67	7.79
Famine:			
1907	40.09	42.30	-2.21
1908	37.02	52.11	-15.08
Post-famine:			
1909	33.06	37.05	-3.99
1910	40.58	38.27	2.31
1911	43.84	44.95	-1.11
1912	44.69	29.45	15.24
1913	46.37	33.88	12.49
1914	43.22	32.18	11.04
1915	41.28	28.52	12.76
1916	40.38	27.65	12.73
1917	42.86	35.25	7.61
1918	38.63	79.75	-41.12
1919	31.64	40.72	-9.08
1920	34.78	36.43	-1.65
1921	34.39	39.57	-5.18

Notes: 1) CRNI = CBR - CDR. 2) The annual CBR and CDR have been calculated on the annual populations estimated by bringing forward the preceding census population, depending upon the natural increase (or decrease) determined by the difference between the registered numbers of births and deaths. However, the adjustment, when necessary, has been made for the differential in the level of registration coverage between births and deaths. The adjustment factor for annual natural increases or decreases during an inter-censal decade has been determined by the ratio of census (or actual) population size to the derived population brought forward from the preceding census. When the ratio is higher than one, which means lower level of registration coverage for births than the deaths, it is used as the multiplier for each of the positive annual natural increase during the decade. 3) The year 1892 has been excluded from the average CDR and CBR during 1891-95 for Punjab as it was a year of malaria epidemics.

Sources: See Table 2.1.

immediate post-famine period. Absence of a sudden rise in births in the second immediate year after mortality peak in 1877 (in both Bombay and Madras) seems largely due to the persistence of mortality crisis during 1878, which resulted from a successive drought in 1877 itself. Thus, a large part of the negative effects on conceptions during 1878 were reflected in the births of 1879. But looking at the CBR for 1880 the phenomenon of a sharp rise in fertility in immediate post-famine period seems to be supported also by the famine of 1876-78 (see Table 2.2). In most cases the CBR also remains higher than normal for roughly a decade following the famine itself. [The main exception to this seems to be Bombay Presidency during the first decade of the present century when the CDR remained high due to outbreaks of plague and famines; this probably helped depress the CBR]. Low average CBR in the long-term post-famine period in the United Provinces seems largely due to the influenza epidemic of 1918 which is known to have had significant negative fertility effects.[18] On the whole, however, all this largely supports the hypotheses relating to the immediate and longer term post-famine fertility effects.

While direct data for examining the hypothesized mechanisms behind immediate post-famine effects on the CBR are lacking (namely, TFR, proportion of fecund women, number of marriages etc.), we may enquire whether there were longer-term indirect effects produced by any change in the age-structure of population. An increase in the proportion of people in the

[18] For a case study of an influenza pandemic in the Indian context and its implications for fertility, see Mills (1986), especially pp.26-32.

Table 2.3 Indices of Birth and Death Rates and Rates of Natural Increase During Famine and Immediate Post-Famine Years and Subsequent Period: Ten major famine locations

Famine Locations	Year of maximum deaths	Indices				
	t	t	t+1	t+2	t+3 to t+7	t+8 to t+12
				Birth Rates		
Madras	1877	86	64	87	135	146
Bombay	1877	104	83	98	152	185
Central Pro.	1900	88	77	127	123	123
Berar	1900	87	80	145	131	129
Bombay	1900	78	72	98	97	102
Punjab	1900	97	87	110	109	106
United Pro.	1908	85	76	93	101	87
Central Pro.	1897	75	68	136	NA	NA
Berar	1897	106	83	132	NA	NA
Bombay	1897	94	86	103	NA	NA
				Death Rates		
Madras	1877	293	155	105	97	110
Bombay	1877	184	159	117	107	119
Central Pro.	1900	262	70	76	95	98
Berar	1900	227	72	82	112	97
Bombay	1900	244	127	139	129	101
Punjab	1900	139	111	137	154	100
United Pro.	1908	146	104	107	95	234
Central Pro.	1897	217	95	120	NA	NA
Berar	1897	140	62	104	NA	NA
Bombay	1897	133	98	119	NA	NA
				Rates of Natural Increase		
Madras	1877	-38	-17	-3	7	7
Bombay	1877	-17	-13	-4	8	12
Central Pro.	1900	-58	1	18	10	9
Berar	1900	-54	3	24	7	48
Bombay	1900	-50	-17	-10	-9	0.5
Punjab	1900	-13	-7	-7	-13	0
United Pro.	1908	-23	-12	-5	2	-15
Central Pro.	1897	-48	-10	6	NA	NA
Berar	1897	-12	8	10	NA	NA
Bombay	1897	-12	-4	-5	NA	NA

Note: The proportional indices of birth and death rates are constructed with reference to the respective baseline average figures being set equal to 100; and indices of rates of natural increase show absolute changes from the respective baseline figures being set equal to zero.
NA = Not applicable because of the occurrence of the second famine.
Sources: Based on Table 2.2

main reproductive years is expected to result in the post-famine period because of fertility reduction and relatively high mortality of young children and elderly people during the famine. And this can be expected to cause an elevation in the birth rate over the pre-famine level. In this context Table 2.4 presents census based results on the proportion of population aged 20-49 years both before and after famines. It is clear that in all locations there seems to have been some rise in the proportion of population in the reproductive period in the post-famine census. For Madras, Central Provinces and Berar this rise was quite sharp. Note too that in four out of six cases this rise appears to have been larger for female population. This may at least partly explain our finding of a post-famine long-term elevated CBR in most cases. While this explanation for the longer-term CBR elevation is biological, there are also some indications of conscious societal responses. For example, a reduction in age at marriage in the post-famine period has been noticed in many of the most affected districts during the Madras famine of 1876-78. The possibilities of a rise in marital fertility as well as an increased incidence of widow remarriage have also been suggested.[19]

As Table 2.3 shows, in 5 out of 10 cases the CDR in the year just following the famine seems to show a sudden drop from its pre-famine level. Given the high proportion of infant deaths to total overall mortality, this seems to be a

[19] See Guilmoto (1991), pp.10-11.

Table 2.4 **Proportion of population aged 20-49 years to total population in censuses both preceding and following the famine.**

	Proportion of population aged 20-49 years to total population			
	Total	**(Change)**	**Female**	**(Change)**
Bombay				
1872	0.414		0.412	
1881	0.425	(+0.011)	0.425	(+0.013)
1891	0.426		0.424	
1901	0.431	(+0.005)	0.431	(+0.010)
Madras				
1871	0.391		0.389	
1881	0.439	(+0.050)	0.446	(+0.057)
Central Provinces				
1891	0.404		0.406	
1901	0.432	(+0.030)	0.436	(+0.030)
Berar				
1891	0.436		0.419	
1901	0.458	(+0.020)	0.447	(+0.028)
Punjab				
1891	0.398		0.404	
1901	0.408	(+0.010)	0.408	(+0.003)
United Provinces				
1901	0.425		0.411	
1911	0.433	(+0.008)	0.439	(+0.028)

Notes: Most of these ratios refer to the census-enumerated population under registration system; in few cases, they refer to total census population.

Source: See Table 2.1.

likely outcome of a reduction in CBR in that year.[20] This explanation is also consistent with an observed rise in CDR in a majority cases in the second post-famine year (t+2) - a year which usually contains a jump in CBR. However, raised mortality in 1878 (which is year (t+1)) in both Bombay and Madras Presidencies was primarily due the effects of the successive drought occurring in 1877. However, in Bombay and Punjab famines of 1899-1900, the elevated mortality (largely due to epidemics of plague and malaria) continued for few post-famine years. Thus, the persistence of elevated mortality in the immediate post-famine years does not appear to be a rule. On the other hand, recovery to pre-famine normal mortality in the longer-term post-famine period is also not always apparent. At least two reasons may be suggested for this: first, a possible secular rise in the registration coverage over time, especially during the early days of registration system, may have influenced the long-term vital rates. Thus, this possibility may be particularly strong for the 1876-78 famine when the whole registration system was in a nascent stage. Second, and probably more importantly, the hypothesized longer-term post-famine demographic responses may have been obscured by occasional independent outbreaks of epidemics (e.g. the outbreak of plague epidemics during the 1901s and the influenza pandemic of 1918). Thus, on balance it may be suggested that the data for the major historical famines in India do not generally support a lower CDR in the

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[20] A simple calculation may illustrate this point: about 8 point reduction in birth rate in the year following the Berar famine of 1899-1900 seems to have caused a reduction in total deaths by about 4,900 (given the normal IMR = 233.33, being the average for 1891-95), which is equivalent to 5 per cent of total average annual deaths during 1891-95.

longer term period after famine.

In the year just following a famine, the CRNI appears, as hypothesized, to be lower than the pre-famine normal level in most cases (7 out of 10 cases). But in some cases (e.g. Berar and Central Provinces in 1901) a quick recovery to the pre-famine natural growth rate is also clear. In the second year (t+2) after famine, however, the CRNI was still low in 6 cases out of 10, reflecting the persistence of elevated mortality. But in the longer-term periods, the CRNI in most cases (except United Provinces during period 1915-1920, which involved influenza pandemic of 1918) exceeds the pre-famine rate, confirming the hypothesis of a fairly quick recovery of the pre-famine rate of population growth. However, in the context of the late nineteenth and early twentieth century India, this recovery of population growth seems to have resulted mainly from a higher (than pre-famine) level of birth rate, rather than lower death rate, during longer-term post-famine period.

2.3 THE TIME PATH OF FAMINE DISTRESS, FERTILITY AND MORTALITY RESPONSES: AN ANALYSIS USING MONTHLY DATA

In this section, we trace the evolution through time of demographic responses. In so doing, basically, the time path of fertility and mortality effects in the course of the development of famine is examined. The following famine locations have been selected for such detailed analysis: Bombay Presidency for the famine of 1876-78; Berar for the famines of 1896-97 and 1899-1900; Punjab for the famine of 1899-1900; and United Provinces for the famine of 1907-08. We have selected these locations partly because they have not been adequately studied so far and partly because of the availability of reasonably good data.[21] As has been mentioned earlier, an additional reason for selecting Punjab and United Provinces is to include in our analysis the northern regions.

Table 2.5 summarises the rainfall data for both the pre-famine and famine years. As can be seen, considerable shortfalls in monsoon rains were the proximate triggers for each of these famines. While the development of famine distress is perhaps better described in terms of food-intake, distress sale of assets etc., the time-series data on such variables are unavailable. The sole economic index used here to reflect the build-up of famine is the monthly movement of average provincial price of a staple food-grain, namely, jower (large millet). Although rise in food-grain prices is not a necessary condition for the existence of famine,[22] dramatic price rises (causing deterioration in exchange entitlement and associated distress) appear to have been a common feature of these historical famines.[23] And, rises in the prices of staple food have widely been used as proxies for the timing and severity of famines. Weekly prices of different food-grains for the districts of these provinces are available in

[21] Each of these provincial governments published quite detailed official reports on these famines.

[22] In fact there is substantial literature on the extent to which rises in food prices reflect famine distress; see e.g. Sen (1981), especially chapters 1-5.

[23] See Drèze (1990), pp.16-17, and also Bhatia (1967).

Table 2.5 Annual rainfall in the pre-famine normal period and famine years, five major historical famine locations

Province/period	Rainfall (inches)	Province/period	Rainfall (inches)
Bombay		**Punjab**	
Pre-famine		Pre-famine	
1872-75	58.49	1891-95	31.72
1875	60.12	1898	23.27
Famine years		Famine years	
1876	36.06	1899	14.30
1877	38.57	1900	25.45
1878	71.76		
Berar		**United Provinces**	
Pre-famine		Pre-famine	
1885-95	40.57	Normal Average	41.84
1895	27.31	1906	42.09
Famine years		Famine years	
1896	26.62	1907	27.03
1897	31.34	1908	33.23
Pre-famine			
1898	28.09		
Famine years			
1899	12.92		
1900	33.07		

Notes: 1) The number of years involved in calculating the normal average is not always clearly specified in the official sources. However, sometimes the averages are based on the 25 normal years. We have used the normal pre-famine average as given in the government Gazettes for United provinces.

Sources: Punjab: Census of India 1901, Vol. XVIII, Punjab, Part 1, p.42 (original data were collected from the meterological department); United Provinces: The United Provinces Government Gazettes, Part II, Allahabad, various years; Bombay: The Bombay Government Gazettes Part II, Bombay, various years, Berar: Report on the Sanitary Administration of the Hyderabad Assigned Districts, Hyderabad, various years.

the respective provincial Gazettes (except for Berar).[24] Accordingly averages of these district-level prices for the weeks ending in the middle of each month have been calculated, and they are taken here as the monthly provincial food-grain prices.

When analyzing short-term demographic responses to famine it is important to recognise seasonality in the "normal" annual distribution of births and deaths. The monthly data shows a distinct seasonal variation in the registered numbers of both births and deaths during the pre-famine baseline period (see Appendix A). To discount for such seasonal influences on the monthly fertility and mortality effects during the famine we have constructed monthly conception and mortality indices (CI and MI).[25] These are respectively the monthly ratios of numbers of conceptions and deaths to the respective pre-famine baseline average figures (the base being taken as 100). Consequently our indices reflect proportional (rather than absolute) changes in conceptions and deaths from the respective baseline monthly numbers. Monthly average numbers of persons on relief have also been plotted in order

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[24] The sources of price data are as follows: Bombay Presidency: The Bombay Presidency Gazette, Part III, Supplement: Bombay (various years); Punjab: The Punjab Gazette, Supplement, Statistical, Part I: Lahore (various years); United Provinces: The United Provinces Gazette, Part II: Allahabad (various years). For Berar (for which we could not find any provincial Gazettes), see Report on the Sanitary Administration of the Hyderabad Assigned Districts: Hyderabad (relevant years). It may be noted that prices were expressed in terms of *seers* (about two lbs weight) per rupee.

[25] While constructing the CI, we also assume, like Dyson, that the number of registered births for a month is approximately the number of conceptions nine months previously. For sources of demographic data, see Table 2.1.

to better describe the course of each famine.[26] The number of persons on relief includes those who were on relief works and also those relieved gratuitously.[27]

The Bombay famine of 1876-78

The Bombay famine of 1876-78 began with the failure of both the summer and autumn monsoon rains during 1876. The summer monsoon of 1877 also failed (see Table 2.5). Drought in two consecutive years resulted in a severe and prolonged famine in much of the Presidency. Figure 2.2 traces the monthly evolution of the average price of an important staple food, jower (large millet), the mortality and fertility indices, and the average daily number of persons receiving relief. Because the prices of food-grains were expressed in terms of quantities (*seers*) per one rupee, we have reversed the direction on the Y-axis when plotting these prices.

It appears from Figure 2.2 that the average price of jower was already high by the beginning of 1876 compared with the same period of 1875. It then rose steadily to reach a peak in September of 1877 and stayed very high until the end of 1879. In contrast it was only at the end of 1876 that the

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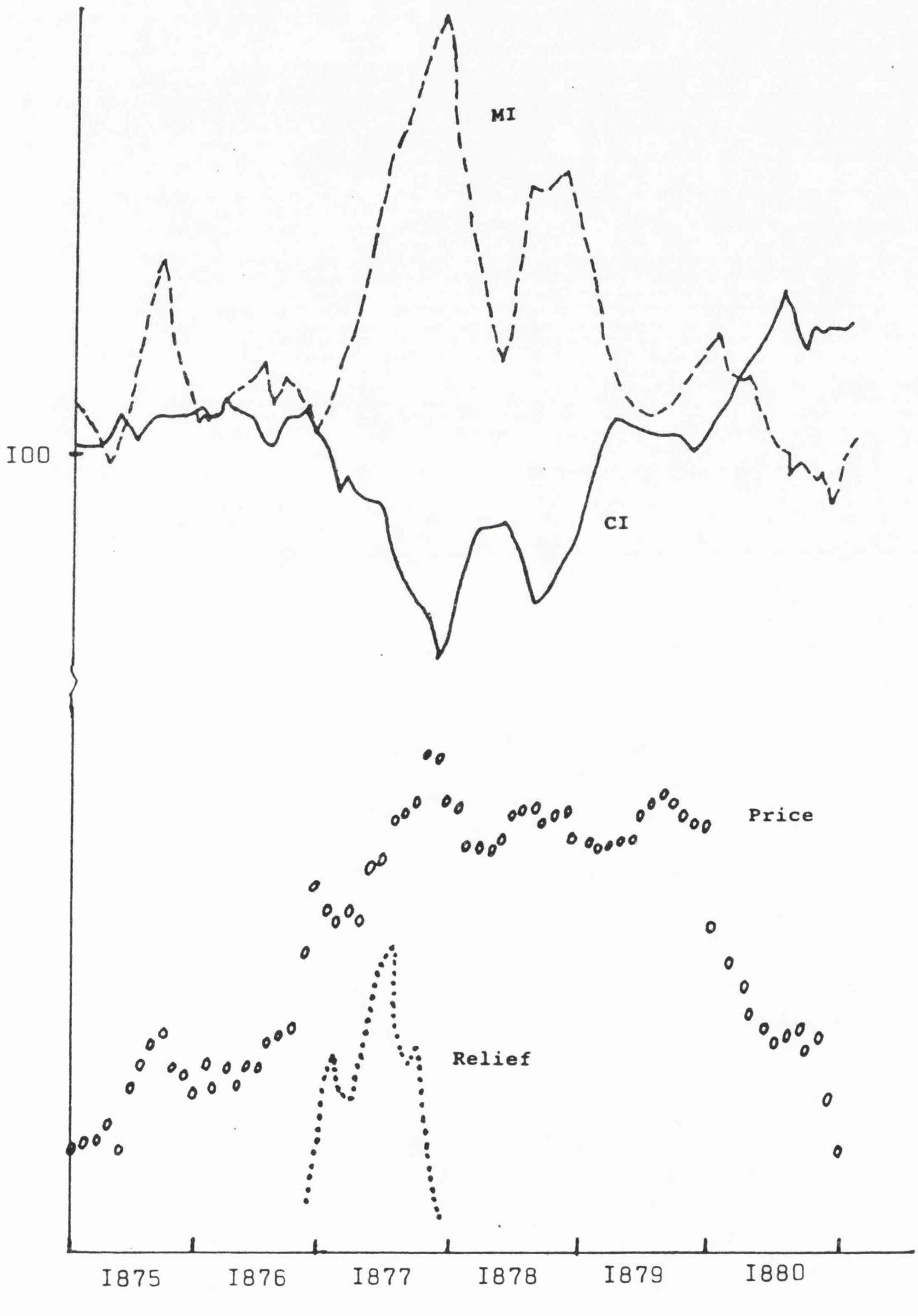
[26] Sources of monthly data on the numbers of persons on relief are as follows: Bombay Presidency: The Bombay Presidency Gazette for 1878, Part III, Supplements: Bombay, 1879; Berar: J. A. Crawford, Report on the famine in the Hyderabad Assigned Districts during 1899 and 1900, vol.I and II: Nagpur, Chambers Press, 1901; Punjab: The Punjab Famine of 1899-1900, vol.1, Lahore, 1901; United Provinces: Resolution on the Administration of Famine Relief in the United Provinces of Agra and Oudh during 1907-1908: Allahabad, 1908.

[27] To facilitate comparison, monthly movements of price and relief (of course, with different scales) have been plotted alongside demographic measures. Although these scales are not shown on the diagrams, the range of variation for each measure is provided in the note.

Figure 2.2 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, Bombay, 1875-80.



Ranges of variation: MI, 94 (Oct. 1880) to 261 (Sept. 1877); CI, 65 (Oct. 1877) to 165 (May, 1880); jower price, 26.12 (Janu. 1875) to 8.3 seers per rupee (Sept. 1877); average daily number of persons on relief, 98,422 (Nov. 1876) to 528,951 (June, 1877)

Sources: See Table 2.1 and footnotes 24 and 26.

CI dropped below its normal level. It then fell rather sharply during 1877 along with a similar (inverted) rising trend in mortality. It is noteworthy that both the highest food-price and MI coincided in the month of September 1877 while the lowest CI occurred just one month later (in October). Although the closing months of 1877 and the first three months of 1878 witnessed both a reduction in MI (from its peak) and a rise in CI (from its trough), these two indices both moved in a sharply adverse direction again during June-September of 1878. Indeed these two series seem to be mirror images of each other, especially (though not exclusively) during 1877-78. On the other hand, conceptions did not fall below their normal level at an early stage of the famine when food-prices were rising and excess mortality was still slight.[28] Therefore, the "anticipatory" nature of fertility response to the impending crisis - as was suggested by Dyson - was not pronounced in this case. Instead Figure 2.2 suggests that the greater part of the reduction in conceptions was related to the excess mortality and its associated presumed elevated morbidity. It is also interesting that in the pre-famine year of 1875, an above-normal level of conceptions co-existed with an above-normal level of deaths. Even if better registration in 1875 is partly responsible for this, it seems clear that the considerable excess mortality peak in 1875 did not bring forth

[28] In a similar study of movement of births through time along with the progress of famine distress (measured in terms of calories) during the Dutch famine of 1944-45, a lag between the onset of famine and the fertility reduction was also found, and this was explained in terms of the time required for exhausting the "nutritional resources of couples"; see Stein and Susser (1978), p.128.

a corresponding decline in conceptions. A plausible inference may be that excess mortality (and morbidity) does not always exert a perceptible negative influence on conceptions. Instead it may be that conditions of acute food shortage and nutritional stress are an important ingredient in explaining conception (and fertility) decline. We return to this below.

Relief operations in this famine started only around November of 1876. Given the employment losses and high prices from the beginning of the *kharif* season (June), the very scant start of relief in November may well be considered as late (see Figure 2.2). As can be seen, relief provision reached a peak in July of 1877. It then began to fall, although mortality and food-prices were both still rising. Relief operations were closed by the end of 1877.

Table 2.6 presents the changes in the cause-specific death rates and their relative importance. It shows that deaths from cholera were proportionately more important in the excess mortality of both 1877 and 1878 than in the baseline period. But fever deaths constituted the largest share of mortality in both normal and famine years - especially 1878. Figure 2.3 plots the monthly numbers of deaths from cholera, fever and bowel-complaints. It shows that deaths from these causes were all rising from the beginning of 1877. Cholera deaths peaked around April and began to decline from about August; deaths from bowel-complaints peaked in September; and the fever deaths two months later in December of 1877. Thus, while cholera mortality mostly occurred during the pre-monsoon and early monsoon months, mortality from bowel-complaints and fever (presumably in part malarial) tended to peak during and

Table 2.6 Cause-specific death rates in the pre-famine baseline and famine years, five major historical famine locations

Cause of death	Bombay		Berar			Punjab		United Provinces	
	1871-75	1877*	1891-95	1897*	1900*	1891-95	1900*	1901-04	1908*
Cholera	0.35	3.53	1.83	3.49	6.34	0.14	1.37	0.91	1.75
	(1.79)	(16.51)	(4.81)	(12.08)	(10.40)	(0.45)	(7.31)	(2.66)	(4.56)
Smallpox	0.80	1.69	0.13	0.21	0.29	0.27	0.51	0.15	1.26
	(4.12)	(4.62)	(0.34)	(0.58)	(0.37)	(0.87)	(1.42)	(0.44)	(6.02)
Fever	11.92	20.76	18.66	22.64	29.00	21.24	33.37	24.55	41.31
	(61.40)	(45.90)	(48.96)	(28.97)	(23.84)	(68.75)	(72.20)	(71.57)	(90.94)
Dysent./Dia.	1.85	3.71	6.02	10.20	22.04	0.76	1.26	0.63	0.41
	(9.52)	(9.66)	(15.81)	(30.42)	(36.94)	(2.45)	(3.00)	(1.84)	(-1.19)
Plague								2.16	0.48
								(6.30)	(-9.12)
Injuries/acc.	0.38	0.46	0.38	0.46	0.54	0.33	0.37	0.50	0.57
	(1.97)	(0.42)	(1.00)	(0.58)	(0.36)	(1.06)	(0.29)	(1.40)	(0.37)
All other	4.12	8.53	11.07	14.84	23.25	8.16	10.80	5.40	6.95
	(21.21)	(22.90)	(29.06)	(27.44)	(28.08)	(26.42)	(15.78)	(15.74)	(8.41)
All causes	19.42	38.68	38.11	51.85	81.46	30.89	47.69	34.30	52.73
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Notes: 1) The years marked (*) are the prime famine years. 2) All these rates are based on constant denominators being the respective enumerated population under vital registration according to the last census prior to famine. 3) For all baseline periods, the figures in parentheses are the respective percentage shares to total average deaths while for all the famine years they are the respective shares to the total excess deaths. Total excess deaths for each cause of death in a famine year have been calculated over the respective average number of death during baseline period. 4) As 1902 was an epidemic year in Punjab it has been excluded from the baseline average figures for 1891-95. 5) In United Provinces plague began to be included as separate cause of death only from 1902; so, baseline period average for plague is based on three years, 1902-04. Respiratory diseases were included as a separate cause of death only from 1905. Its percentage share to total excess deaths in 1908 was below 1 per cent.
Sources: See Table 2.1.

after the monsoon. This said, it also seems significant that all major causes of death show a similar rising pattern from the beginning of 1877. Although the fever mortality peak in November of 1877 may be related to the unusually heavy rains of October (see Figure 2.4), its sharp rising trend throughout the year is noteworthy. Misclassification of deaths is likely, especially at this time when the registration system was still in its infancy. It seems probable that some deaths from cholera, dysentery/diarrhoea were recorded under fevers category. However, as the Sanitary Commissioner of Bombay Presidency in his annual report for 1877 writes, "... [it] is impossible therefore to say how many of these [fever] deaths were due to malarial fevers, though I think there is but little doubt that the mortality recorded under this heading in the famine districts, was at all events during the latter half of the year, principally due to remittent fever."[29] By "remittent fever" he seems to have had malaria in mind.

Thus, excess mortality from fevers (which has sometimes been expected to occur after the resumption of rains following a drought year) can happen even in a second successive year of drought. As Figure 2.4 shows, in terms of rainfall 1877 was little better than 1876. Assuming that fever mortality represented much of the malarial deaths, this implies that the malaria epidemic in 1877 was largely related to famine and undernutrition. In 1878, the MI initially peaked in May - though it rose slightly higher still during the period up to September (see Figure 2.2). In 1878, the cholera deaths peak

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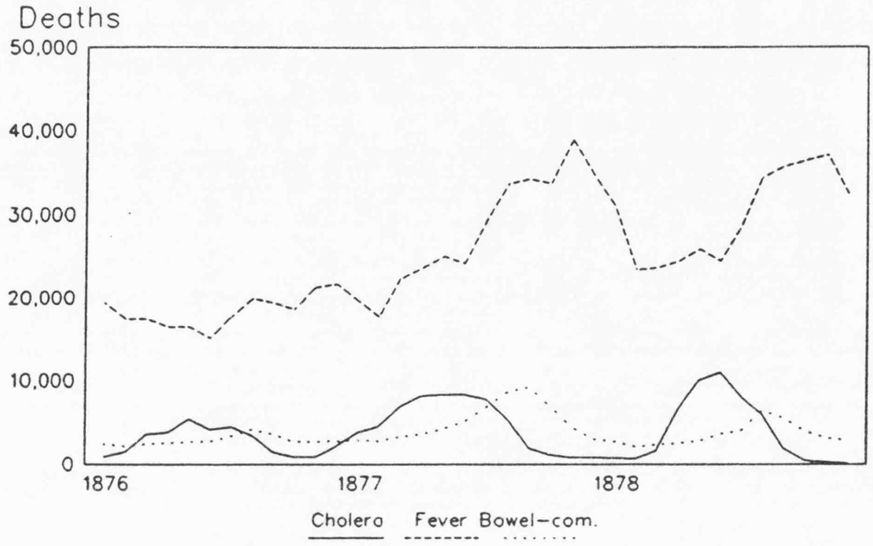
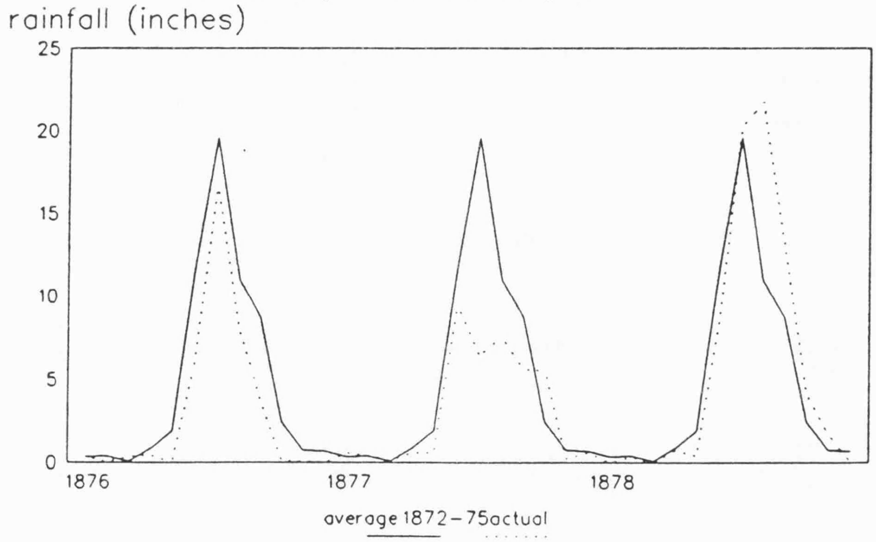
[29] Annual Report of the Sanitary Commissioner for the Government of Bombay, 1877, Bombay: Government Press, 1878, p. 176.

Figure 2.3 Monthly distribution of deaths by cause Bombay 1876-78



Sources: See Table 2.1.

Figure 2.4 Monthly distribution of rainfall in normal and famine years, Bombay 1876-78



Sources: See Table 2.4.

in June was followed by bowel-complaints deaths peak in August, which was followed by fever deaths peak in November (see Figure 2.3). The delayed fever-mortality peak in 1878 was probably related to the above-normal rainfall especially in August and September (see Figure 2.4). Figure 2.3, thus, suggests that in both 1877 and 1878 cholera deaths tended to peak around the beginning of monsoon; bowel-complaint deaths peaked in the mid-monsoon period; and fever deaths peaked after the end of the monsoon.

The number of persons on relief was rising along with MI until the middle of 1877 (see Figure 2.2). The beginning of the monsoon period in June probably reduced the demand for relief works; but this monsoon of 1877 was also largely a failure (see Figure 2.4). Therefore a steady decline in the relief provisions from June of 1877 presumably did not correspond to a recovery of the normal farm activities. Thus overall relief provision was on decline during the months when the MI was still rising dramatically (see Figure 2.2). About the class composition of recipients of relief, the Governor of Bombay reported that "[t]hose who received relief mainly belonged to the humbler castes of Hindu Community and to the classes of field labourers, of rude artisans, and of village menials..".[30]

The Berar famines of 1896-97 and 1899-1900

The Famine Commission of 1880 described Berar as "one of

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[30] Quoted in Government of Bombay Gazettes for 1878, Bombay, 1879, p.114.

the parts of India particularly free from apprehension of calamity of drought".[31] However, in 1896-97, the province fell under the grip of a serious famine. Berar experienced a considerable shortfall of rain in 1895; and the successive drought and consequent crop failure in 1896 brought famine conditions (see Table 2.5). Unfortunately, Berar experienced another and more severe drought in 1899 when annual rainfall amounted to less than one-third of its normal level (see Table 2.5). The crop output during 1899-1900 was estimated to be only 2.5 percent of the average outturn during the preceding ten years (excluding 1896-97).[32] The famine of 1896-97 was described as a "famine of high prices rather than of scarcity of food".[33] However, the 1899-1900 famine was both much more severe and widespread throughout the province.

Figure 2.5 presents the monthly series of the MI and the average price of jower during 1895-1901. Unfortunately monthly data on births are not available for the famine years; also price information before September of 1896 and after December 1900 could not be found. The MIs in 1895 show some excess over the baseline level. However, such pre-famine excess mortality does not seem to have affected fertility, since the CBR in 1896 was not below either that of 1895 or the baseline average for the period 1891-95 (see Table 2.2). Again, the beginning of 1896 witnessed a sharp rise in mortality which peaked around May and then fell fairly fast.

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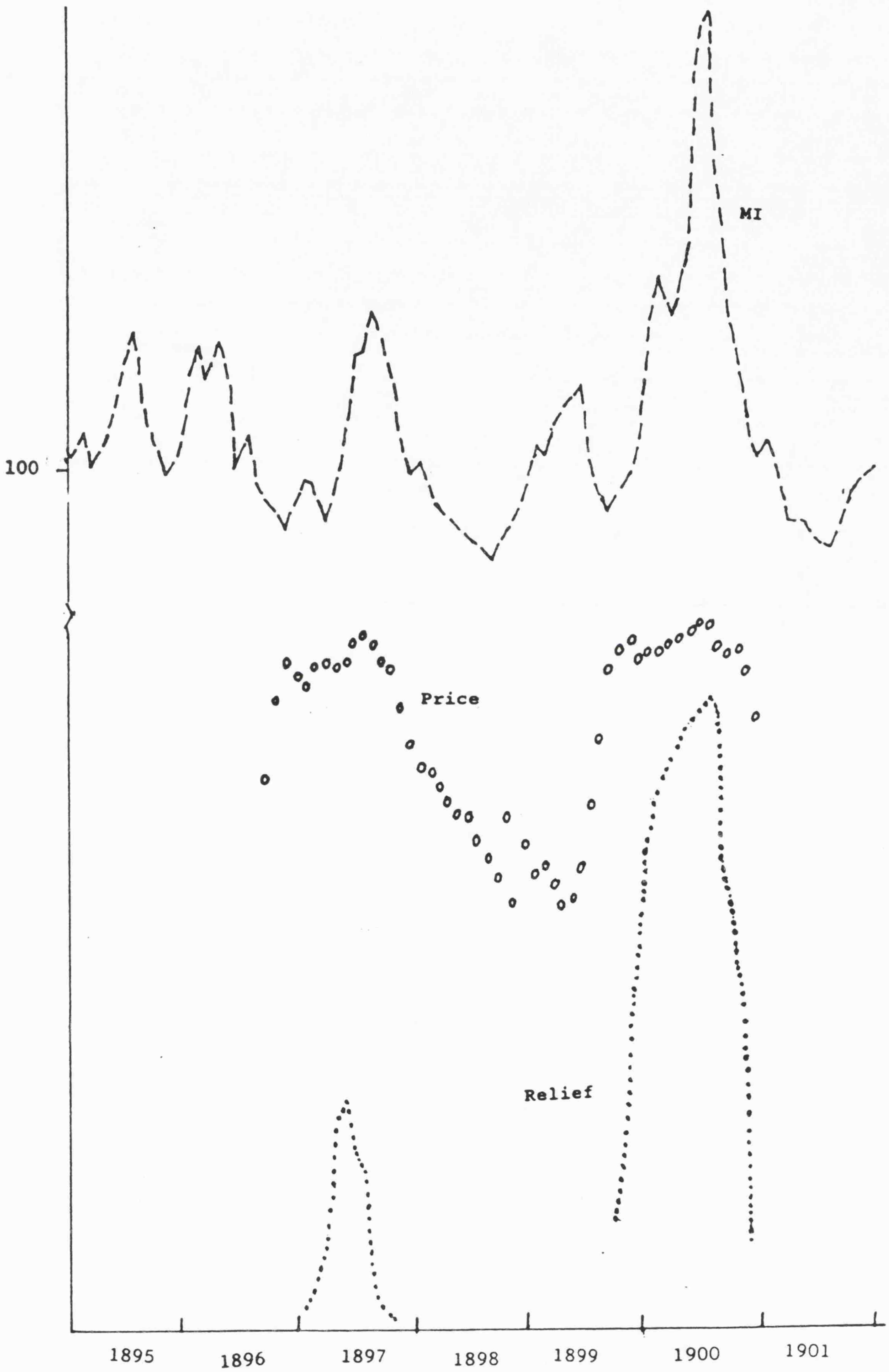
[31] Quoted in Census of India 1901, Report on Berar, Volume VIII, Part 1, Allahabad, 1902, p. 30.

[32] See Census of India 1901, Report on Berar, Volume VIII, Part I, p.31.

[33] See Crawford (1901), Volume I, p. 2.

Figure 2.5 Price of jower, mortality index (MI), and average daily number of persons on relief, by month, Berar, 1895-1901.



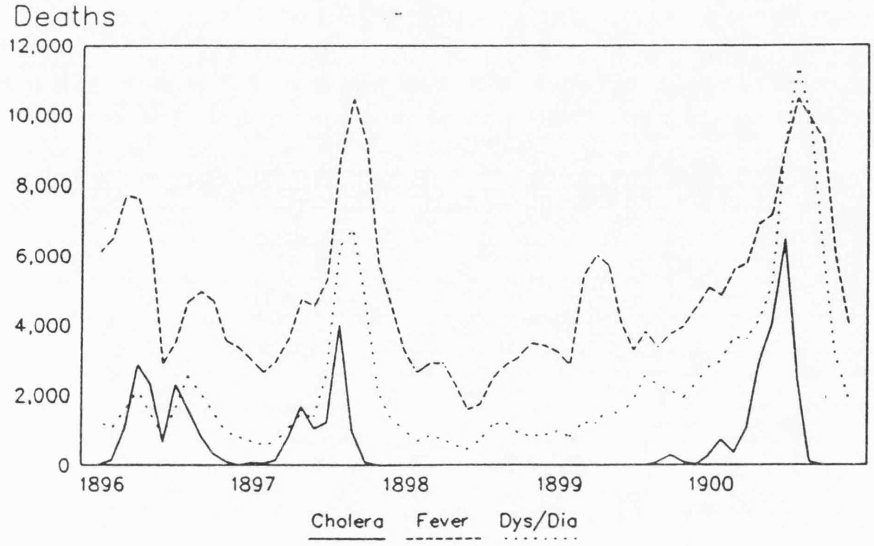
Ranges of variation: MI, 43.9 (Aug. 1898) to 423.5 (July, 1900); jower price, 33 (April, 1899) to 7 seers per rupee (July, 1897); average daily number of persons on relief, 788 (Dec. 1896) to 601,424 (July 1900).

Sources: See Table 2.1 and footnotes 24 and 26.

However, mortality during the closing months of 1896 and the first three months of 1897 was below its pre-famine baseline level - although food prices were rising dramatically (see Figure 2.5). The MI peaked rather sharply during the monsoon period of 1897, and reached a maximum in September when food prices also peaked. Peak famine mortality, thus, seems to have lasted for only a short duration, mainly, the latter half of 1897. Relief works which began at the end of 1896, peaked in April of 1987. In fact, as Figure 2.5 indicates, relief provision declined drastically from the first monsoon month (June 1987), while at the same time the MI was rising.

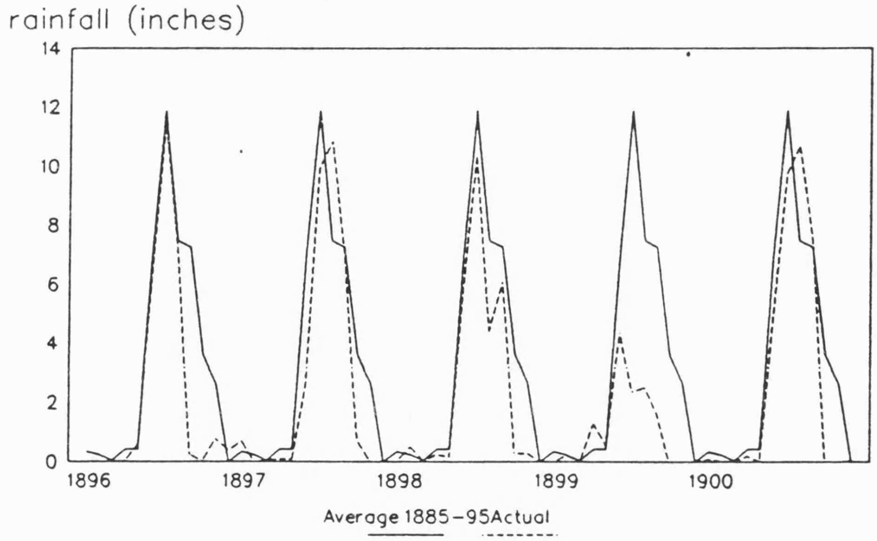
Among the specified causes of death, cholera, dysentery/diarrhoea, and fever were the major killers during the baseline period (see Table 2.6). However, comparing relative shares of different causes indicates an increased importance of cholera, smallpox and dysentery/diarrhoea in total excess deaths in 1897 and also a fall in the relative importance of fever deaths. Figure 2.6 shows monthly movements in the number of deaths from these three major causes. It suggests a quite similar time pattern of deaths from all these diseases in the main mortality year. While deaths from dysentery/diarrhoea, and from fever, peaked in September of 1897, the cholera peak occurred just one month before in August. As Berar's Sanitary Commissioner in his report for 1897 writes, "[i]t was the experience at all our relief centres that after the rains set in sickness greatly increased, especially fevers and bowel-complaints. Indeed, the most common termination of life in those debilitated by famine was diarrhoea or dysentery, aggravated by damp and

Figure 2.6 Monthly distribution of deaths by cause Berar 1896–1900



Sources: See Table 2.1.

Figure 2.7 Monthly distribution rainfall in normal and famine years, Berar 1896–1900



Sources: See Table 2.4.

exposure after the setting in of the South-West monsoon. Cold and damp had a most detrimental effect upon the starving poor, and those in a physically reduced condition from chronic insufficiency of food".[34] The Report also noted that "the number of deaths from starvation returned by village registrars numbered 377. These take no account of the deaths at poor-houses due to diarrhoea, dysentery etc, primarily the cause of chronic deprivation of food".[35] It is also notable that in 1897 - a year of huge fever-mortality - there was a marked decline in admissions from fever in several medical institutions of the province. According to the Sanitary Commissioner for Berar, this largely reflected the fact that most of the excess fever mortality in that year occurred "amongst the famine-stricken poor, with whom the question of medical relief was secondary to that of food..".[36] All these considerations suggest that the general course of mortality rise during the famine was largely determined by the general course of famine distress and its lagged effects on human survival, being, of course, partly mediated by both environmental factors (e.g. post-monsoon surface water, humidity) and social disruptions (e.g. congregation at relief camps, population movements).

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[34] See Report on the Sanitary Administration of the Hyderabad Assigned Districts for the year 1897, Hyderabad: Government Press, 1898, p.7.

[35] Ibid. p.32. It also states that "the official definition of death from starvation signifies that so long as a person has food before him, or the means of procuring it, he cannot die from starvation. This is a mistake, for physiologically the human body may be starved of every essential to its vitality in spite of the most nutritious food if digestion has been so impaired by the effects of chronic starvation that nutrient cannot be assimilated and this form of starvation caused directly or indirectly many deaths throughout the province and explains the excess mortality under 'other causes'"; pp.32-33.

[36] Ibid., p.16.

The mortality was below its baseline level throughout the post-famine year of 1898. While mortality was somewhat higher than its normal level during the early months of 1899, interestingly, it was below its baseline level in late 1899 - when the food price had risen dramatically (see Figure 2.5). As in 1896, this mortality improvement during the initial phase of famine may, as suggested by the Sanitary Commissioner in his report for 1900, have been due to the dryness of the weather and the consequent lower incidence of fever.[37] Moreover, there may well be a time lag between the onset of famine and it excess mortality outcome. Note that the price of food remained extremely high throughout 1900.

From the beginning of 1900 the MI rose drastically to reach a huge climax within a few months - peaking in July (see Figure 2.5). It then declined with similar rapidity and by the end of 1900 mortality came down to its baseline level - remaining below this level throughout 1901. The relief provision reached a maximum in June of 1900, after which it fell sharply - probably due the resumption of rains and normal farm activities. In contrast to the famine of 1896-97, in this second famine the rise in the number of persons on relief better corresponds to the rise in the MI (see Figure 2.5).

As Table 2.6 suggests, there has been, like the former famine, an increased importance of cholera, dysentery\diarrhoea, and a reduced role of fever mortality in accounting for overall excess deaths in 1900. Indeed, as Figure 2.6 shows, deaths from cholera, dysentery\diarrhoea and

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[37] See Report on the Sanitary Administration of the Hyderabad Assigned Districts for 1900, Hyderabad, 1901, p.10.

fevers all tended to rise steadily from the closing months of 1899. According to the Sanitary Commissioner for Berar many cholera deaths (about 10,000 by his estimate) were registered under other heads.[38] While cholera deaths peaked in July of 1900 - coinciding exactly with the highest MI - the other two causes reached a maximum just one month later in August, when deaths from dysentery/diarrhoea actually exceeded the number of fever deaths. Therefore, the indications are that the huge elevation in mortality which lasted throughout 1900 did not result mainly from an outbreak of malaria following the resumption of rains. In an extract from the Proceedings of the Resident at Hyderabad No. 2936 dated 12 August 1901, much of the famine mortality was attributed to the prevalence of cholera and bowel-complaints due to "excessive consumption of rank vegetables and foul water after the first heavy rain of the monsoon".[39] In fact, Mr J. A. Crawford, the Commissioner of Berar in his Forward to the Sanitary Commissioner's report for 1900 specifically stated that "[t]he death rate in Berar in 1900 was increased largely by the famine".[40]

The scanty rainfall and the related dryness of weather may have suppressed the expected post-monsoon peak in fever mortality in both 1896 and 1899. However, the occurrence of peak fever mortality during the pre-monsoon months in 1900 is of interest. This, as reported by the Sanitary Commissioner of Berar, was due in large part to influenza and other simple

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[38] See Report on the Sanitary Administration of the Hyderabad Assigned Districts for 1900, Hyderabad, 1901, p.8.

[39] Quoted in Crawford (1901), Volume I, p. 2.

[40] Quoted in Report on the Sanitary Administration of the Hyderabad Assigned Districts for 1900, Hyderabad, 1901, (no page number).

fevers. As he wrote in his report for 1900, "[a]s the year 1900 advanced, "influenza" became prevalent, and deaths from it were registered under the head "fevers", and the number of cases of fevers also gradually commenced to increase - mostly of the type of simple continued..". This, according to him, was largely due to "unwholesome water and food" consumed by people who lost stamina and were exposed to heat and rains. But after the resumption of rains, the malarial fever with hepatic complications and jaundice symptoms increased till the end of the year.[41] Thus, like the former famine, the monthly data on cause-specific deaths during the famine of 1899-1900 also indicate the effects (presumably lagged) of the general course of nutritional deprivation on the general course of mortality increase, although environmental and other factors seem to have influenced the exact timing of the peaks from specific causes. In this connection, note excess rainfall in August of both 1897 and 1900 - a fact which may have contributed to mortality peak in the following months.

Although in these famines we are unable to examine monthly variations in conceptions, it is clear that both famines affected aggregate births in the short-run. The CBR fell from an average of 38.29 during the baseline period (1891-95) to 31.90 in 1898 and 30.82 in 1901 (see Table 2.2). However, this does not give a precise estimate of the fertility-impact of the famines. Comparing these major famines in Berar, that of 1899-1900 appears to have been far

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[41] See Report on the Sanitary Administration of the Hyderabad Assigned Districts for 1900, Hyderabad, 1901, pp. 10-11. Indeed there is more evidence in the context of other locations that famine may cause deaths from "some fatal types of fever other than malarial fevers, aggravated by the debilitating effects of want of food"; see Guz (1989), p.204.

more severe in respect of monsoon failure, crop losses and excess mortality, (e.g. see Figures 2.5 and 2.7).[42] The percentage of still births to total live births in 1897 (4.7) was little different from the average figure of 4.5 during the baseline period 1891-95. But it rose to 5.2 in 1900.[43] However, interestingly, the extent of the food price rise was similar in these famines. This probably suggests that the extent of food price rises during a famine does not necessarily reflect the degree of nutritional stress and associated subsequent excess mortality. Indeed, the extent of failure of food entitlements for the majority of the rural population depends crucially on employment opportunities, which, in turn, are determined largely by rainfall in such weather-dependent agriculture. A slightly higher birth rate in 1897 - compared to a significantly lower birth rate in 1900 - than the baseline level suggests little overall "anticipatory" fertility reduction in the former famine (see Table 2.2). This, however, partly reflects the both greater severity and very closely spaced occurrence of the latter famine.

The Punjab famine of 1899-1900

Following drought in 1896, Punjab experienced a severe

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[42] The relatively greater severity of the famine of 1899-1900 than in 1896-97 is also affirmed by the data on sales and mortgages of land: the number of land sales rose from 12,683 in 1895-96 to 12,981 in 1896-97, and to 13,850 in 1899-1900; the respective numbers of land mortgages are 11,931, 13,342 and 21,661; see Crawford (1901), Volume II, Appendix Table XXI, p.51.

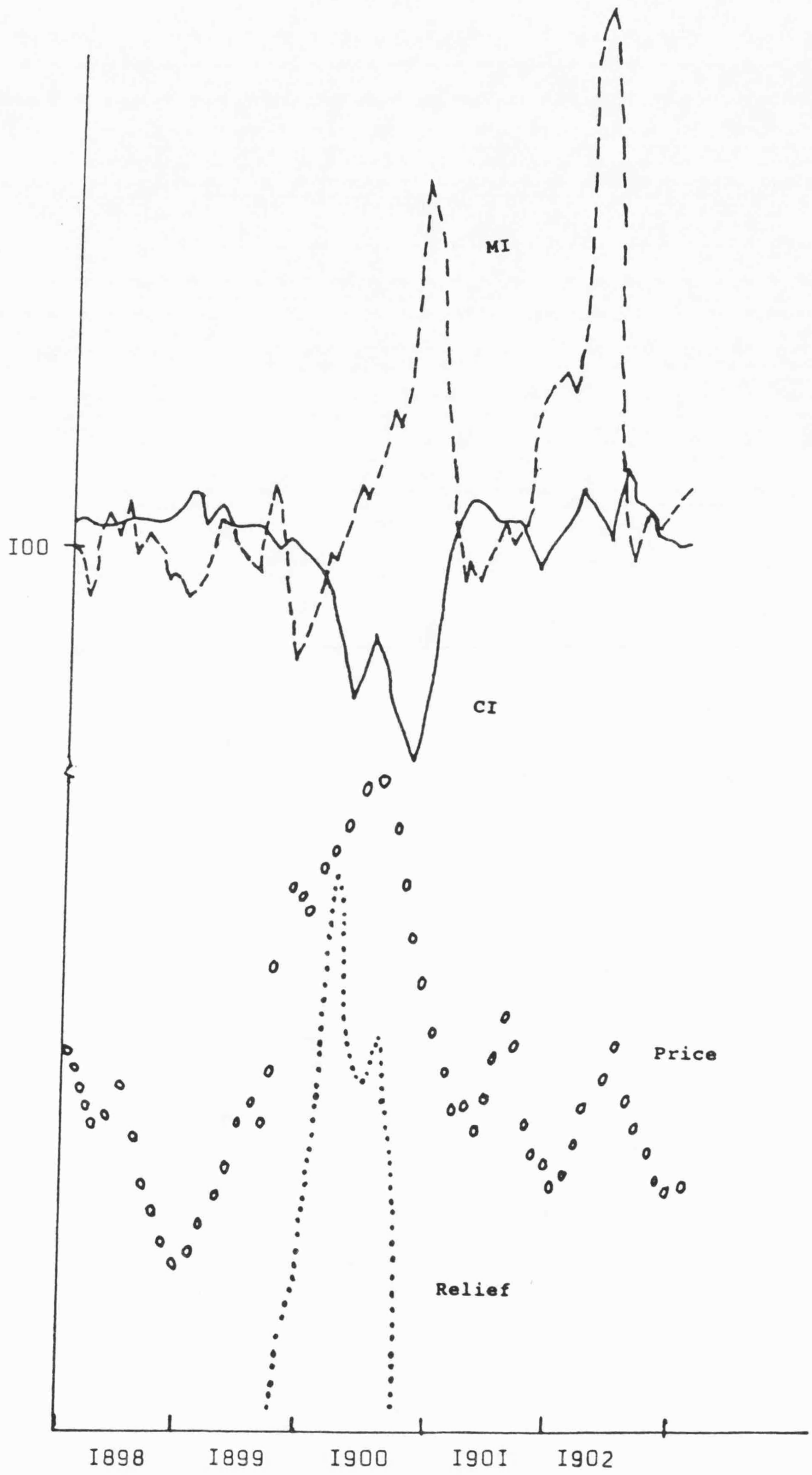
[43] See Census of India 1901, Report on Berar, Volume V111, Part 1, p.44.

monsoon failure in 1899, which plunged large parts of the Province into crisis. The area in which the *kharif* harvest failed was about 51 per cent of the total sown area in 1899 and 81 per cent during the rabi harvest of 1900. Food prices rose rapidly and relief measures became necessary in some parts as early as the beginning of the summer of 1899. However, the monsoon rains of 1900 were favourable and field activities resumed on a normal scale (see Table 2.5). Prices began to fall during the second half of the year and by November the relief operations were withdrawn.

Figure 2.8 plots the monthly CI, MI, average price of jower and the relief provision during the period 1898 to 1902.[44] The food prices showed a dramatic rise from the middle of 1899 and peaked in the middle of 1900. Conceptions - which were marginally above baseline levels for most of 1898 and 1899 - began to decline during the last months of 1899, the year of drought. This decline continued with some minor fluctuation, to reach a minimum in October of 1900. However, conceptions rose above the baseline level from the beginning of 1901 and stayed above normal until the end of 1902. On the other hand, mortality levels especially in the latter part of 1899 were somewhat lower than the corresponding baseline levels (see Figure 2.8). This again may have been due to the drought being less conducive to malaria (see also Figure 2.10). The MI, however, shows a steady rising trend from the

[44] On 25 October 1901 some areas were taken out of Punjab to constitute a separate province called North-Western Frontier Province. So, for the sake of comparability the registered numbers of births and deaths in Punjab from that date onwards have been inflated by a factor which is the inverse of the proportion of total population remaining in truncated Punjab according to the 1901 census.

Figure 2.8 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, Punjab, 1898-1902.



Ranges of variation: MI, 77 (Oct. 1899) to 309 (April, 1902); CI: 61 (Oct. 1900) to 132 (June, 1902); jower price, 26 (Dec. 1898) to 11 seers per rupee (July, 1900); average daily number of persons on relief, 29,763 (Sept. 1899) to 242,755 (March, 1900).

Sources: See Table 2.1 and footnotes 24 and 26.

start of 1900 to reach a peak in October, coinciding with the trough in the CI. Mortality then sharply improved - reaching normal levels by early 1901. A strong correspondence between rising mortality and falling conceptions can again be discerned in Figure 2.8.

While mortality was elevated throughout 1900, the main peak in famine mortality was restricted to the latter half of the year. As Table 2.6 suggests, cholera and fever both gained in relative importance during 1900. But fever alone, in fact, seems to have accounted for an overwhelming share of total excess mortality in 1900. Figure 2.9 presents monthly distribution of deaths by major causes. It shows that although there were outbreaks of several diseases like cholera, dysentery/diarrhoea in 1900, the outbreak of epidemic malaria - as reflected in the huge elevation in fever mortality in the latter part of 1900 - appears to have been largely responsible for the main body of excess mortality.

It is difficult to be sure whether the heavy excess mortality of late 1901 and early 1902 can reasonably also be attributed to the famine conditions (see Figure 2.8). There was a fresh outbreak of malaria during September-December of 1901; and bubonic plague was largely responsible for the heavy excess deaths of the pre-monsoon months of 1902. According to the Sanitary Commissioner for Punjab, "the deteriorated condition of the population from previous privations" was a contributory factor towards the unusual increase in fever mortality (which was of a cerebro-spinal type) during the first quarter of 1902 in some districts.[45] However, the case for attributing the increased prevalence of plague to the nutritional stress during famine may be weak.[46] Note that the CI was largely unaffected by the steep rise in the MI in 1902. This again shows that occurrence of epidemics (and consequent elevation in mortality) unaccompanied by a famine affects fertility very little compared to the fertility-reducing effect produced by the famine-induced mortality peak.

The number of persons on relief reached a peak in March of 1900 when mortality was scarcely above its pre-famine level (see Figure 2.8). Subsequently in 1900 the relief provision declined as the MI rose. In fact, relief provision was insignificant when the MI was at its peak. This is partly because in this famine excess mortality (mainly due to epidemic malaria) began to peak rather late, especially after the resumption of rains in 1900. The resumption of rains after a year of drought is usually seen as the beginning of the resumption of normal conditions. Yet the maximum number of persons on relief appears to have occurred much earlier than the resumption of rains, although it was still rather large until July of 1900. After that, relief works were virtually closed while gratuitous relief, though diminished, continued in response to rising mortality until September. Mortality was much higher among those on gratuitous relief. The Deputy Commissioner of Hissar district stated that "the increase in mortality was mainly among those in receipt of

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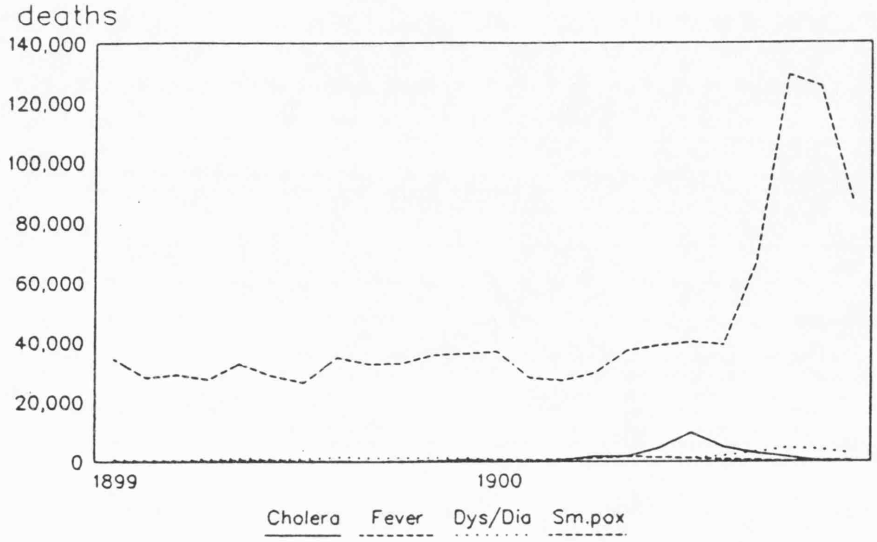
[45] See Annual Report of the Sanitary Commissioner for the Government of Punjab for the year 1902, Lahore, 1903, p. 11.

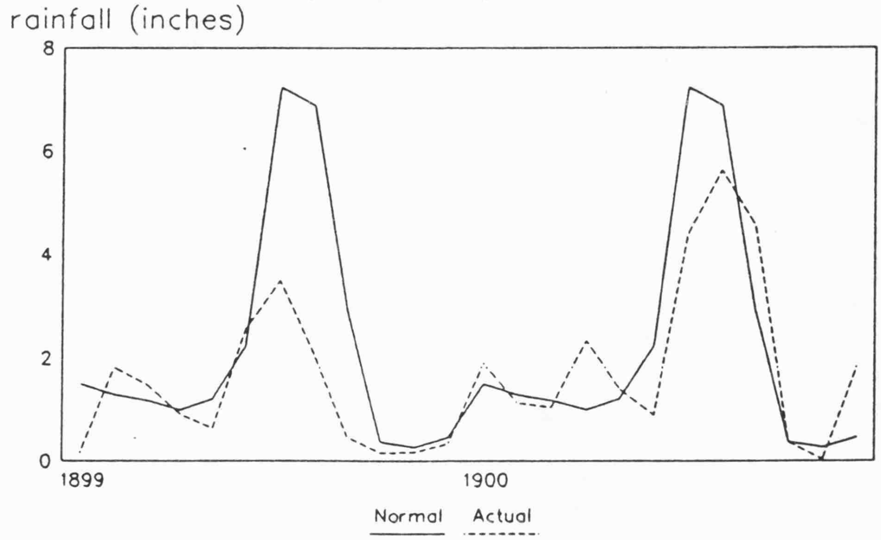
[46] See Post (1976). McAlpin also excluded the plague deaths from the estimates of famine mortality in the Bombay Presidency; see McAlpin (1983).

Figure 2.9 Monthly distribution of deaths by cause: Punjab 1899-1900



Sources: See Table 2.1.

Figure 2.10 Monthly distribution of rainfall in normal and famine years, Punjab, 1899-1900



Sources: See Table 2.4.

relief.." especially those in poor houses and those receiving gratuitous relief.[47] This implied that, as he himself argued, "privation and consequently decreased vitality played a considerable part" in the excess mortality. There may be several reasons for the decline in relief provision as early as March 1900. Outbreaks of cholera at relief camps were a common source of epidemics "when people fled the works and took cholera with them to their home villages and other locations".[48] Moreover, owing to deepening nutritional stress, people also lose their capacity to work. For example, as one district engineer in his official letter dated 20th April, 1900 wrote, "people ... are in a starving condition and half of them [are] unfit to work...they were living skeletons and crying from hunger".[49]

The United Provinces famine of 1907-08

The famine of 1907-08 in United Provinces was brought about by the premature cessation of monsoon rainfall in August of 1907, following a generally poor start to the monsoon (see Table 2.5). In large parts of the Province the rains lasted for only 5 to 8, instead of their usual 12 weeks. The failure of the *kharif* season in 1907 against the backdrop of some partial weather failures in the preceding two years ultimately

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[47] The Punjab famine of 1899-1900, Lahore, 1901, Vol.II, Appendix XVIII, pp. 163-164.

[48] See McAlpin (1985), p.167.

[49] See The Punjab famine of 1899-1900, Vol.II, Lahore, 1901, p.145.

produced famine conditions.[50] Drought continued until January of 1908, and there was a very small rabi crop in early 1908 as well. According to the official report on the famine the *kharif* harvest was only 31 per cent of normal output and only about 60 per cent in the case of *rabi* production.[51] The net loss in food crops in the Province in 1907-08 was estimated to be 7 million tons.

The prices of food grains, which were already high during the early part of 1906 (owing to the partial drought and famine during 1905-06) declined until early 1907, but then rose sharply to reach a peak around December (see Figure 2.11). Due to the persistence of high prices during the pre-famine period, people who were net purchasers of food grains, probably were already distressed and thus less able to cope with this fresh round of price rises in 1907. There was somewhat delay in the commencement of relief operations. As Figure 2.11 shows, these did not start until the end of 1907. This was because of the official assumption that large advances given early in the autumn (for the sowing and irrigation of the spring crops) and the "prompt and liberal" suspensions and remissions of land revenue encouraged people to continue the sowing of spring crops until a much later period than was usual.[52]

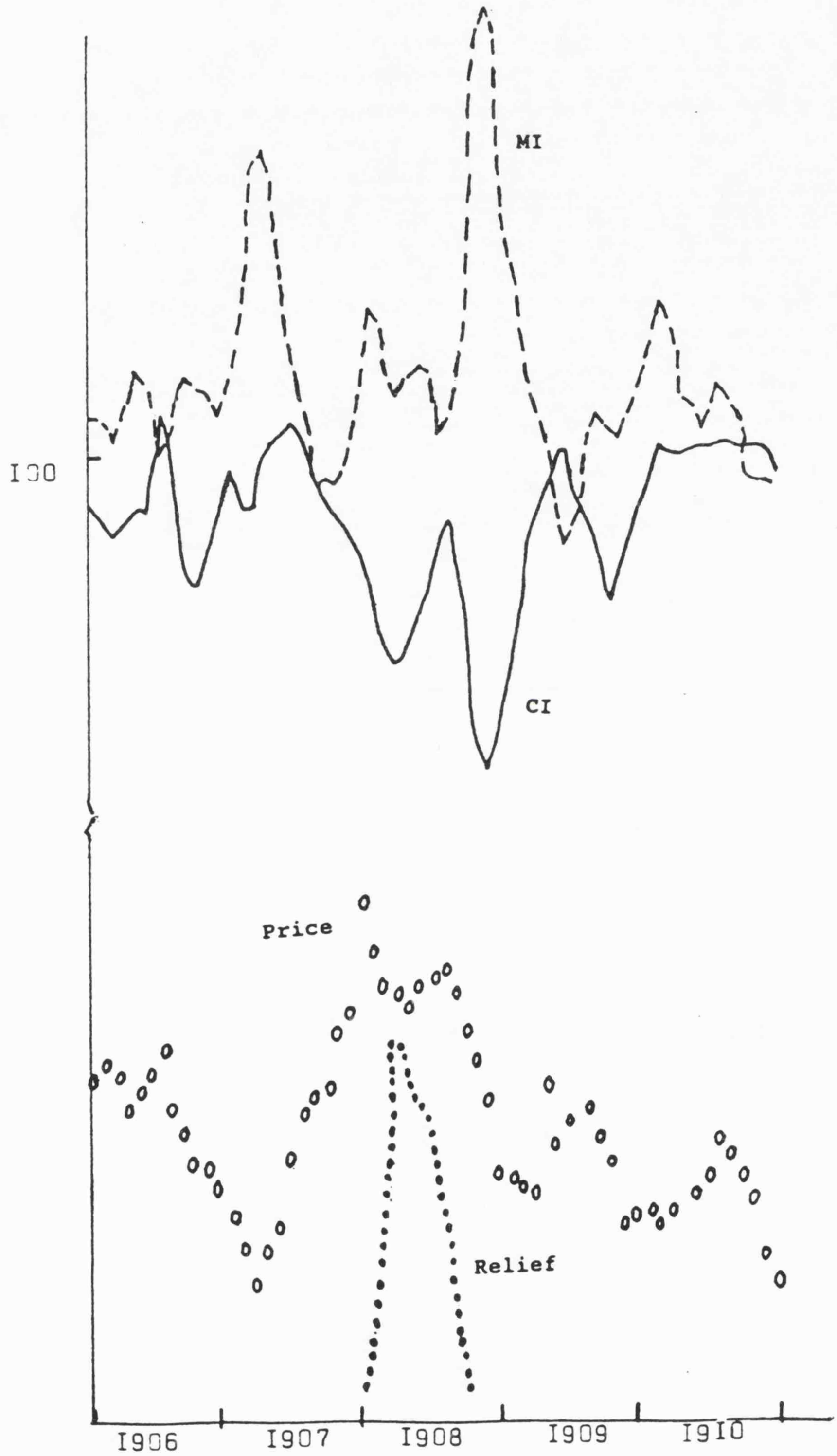
As Figure 2.11 shows, mortality was somewhat above the

[50] For details of the antecedents and partial weather failures before this famine, see Resolution on the Administration of Famine Relief in United Provinces of Agra and Oudh during the years 1907 and 1908, Allahabad: Government Press (1909), Chapter 1.

[51] Ibid., p.18.

[52] Ibid., p.28.

Figure 2.11 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, United Provinces, 1906-10.



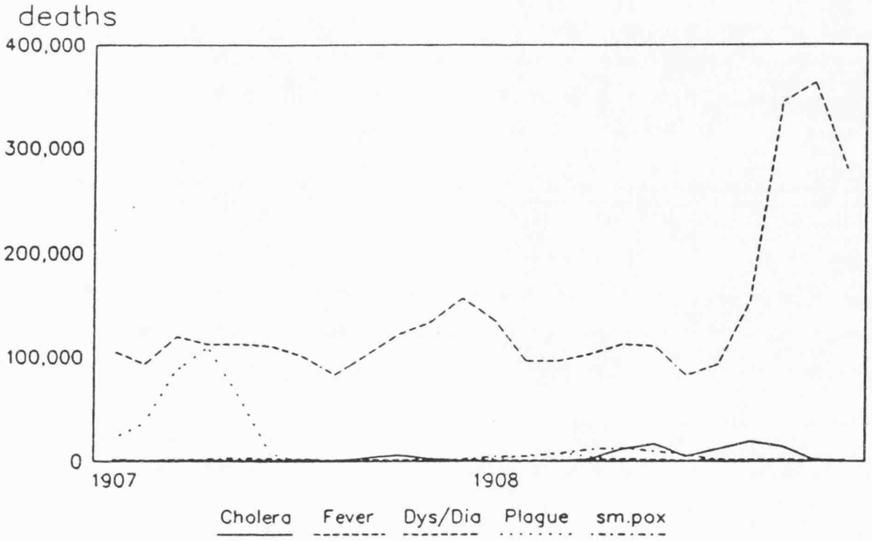
Ranges of variation: MI, 84.5 (June, 1909) to 244.5 (Nov. 1908); CI, 46.2 (Nov. 1908) to 104.3 (July, 1910); jower price, 19.6 (March, 1907) to 7 seers per rupee (Dec. 1907); average daily number of persons on relief, 5,883 (Nov. 1907) to 1,411,576 (March, 1908).

Sources: See Table 2.1 and footnotes 24 and 26.

baseline normal level during most of 1906 and the CI was slightly below baseline level. There was a considerable MI peak during the first half of 1907 - largely due to the prevalence of plague. Interestingly, this peak occurring during the pre-famine months of 1907 seems to have had no significant effect upon the level of conceptions. This lends support to the view (indicated earlier in the contexts of the Bombay famine of 1876-78 and the Punjab famine of 1899-1900) that the negative effect of epidemic diseases on conceptions and subsequent fertility was minor if unaccompanied by famine conditions. There seems to have been a considerable reduction in conceptions during late 1907 when food prices were rising and (proportional) excess mortality was not yet great. However, as Figure 2.11 shows, in the main famine period there was a clear correspondence between the extent of excess mortality and the amount of conception short-fall. Indeed, the minimum CI occurred in November of 1908 when the MI reached its peak. By the middle of 1909 both conceptions and deaths recovered to baseline levels. It is also notable that conceptions declined below the baseline level late in 1909.

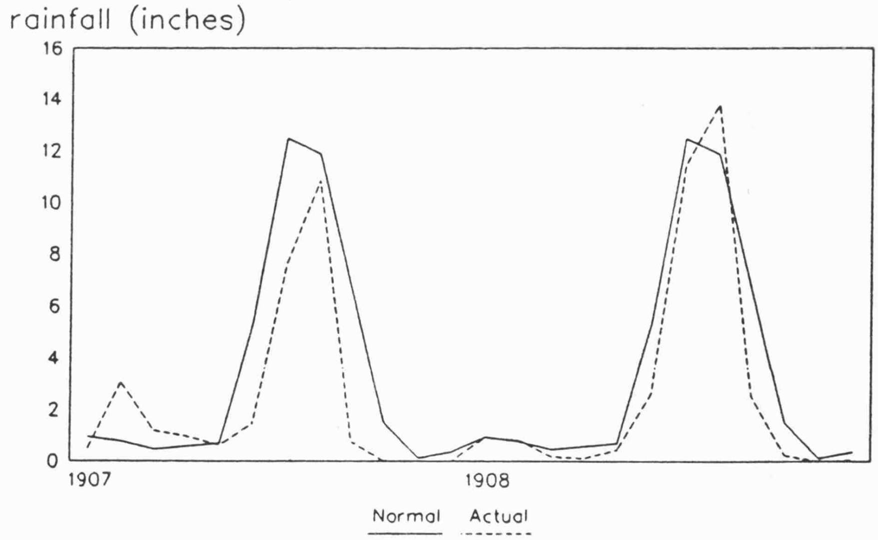
It is clear both that the MI peak of this famine was of rather short duration and that it was largely accounted for by a sharp rise in fever mortality during the last months of 1908, i.e. after the resumption of monsoon rains (e.g. see Figures 2.11, 2.12 and 2.13). As Table 2.6 also shows, although there was an increase in the relative importance of cholera in 1908, about 91 percent of the total excess deaths were recorded under the fever category. Note too that there was no rise in the mortality from dysentery/diarrhoea, and

Figure 2.12 Monthly Distribution of Deaths By Cause United Provinces 1907–08



Sources: See Table 2.1.

Figure 2.13 Monthly distribution of rainfall in the normal and famine years, United Provinces, 1907–08



Sources: See Table 2.4.

according to the Sanitary Commissioner for United Provinces "this no doubt to some extent is due to the measures adopted and to the judicious feeding of the people on the relief works especially young children and suckling mothers".[53] Cholera deaths peaked in September, which usually marks the end of the monsoon; fever mortality rose steeply in September and peaked in November (see Figure 2.12). Although the cholera death peak thus preceded the fever mortality peak, both seem to have followed the same broad time pattern and occurred rather late, and note also that it occurred at a time when relief was nearly over. The sharp and huge fever deaths peak, according to the official reports,[54] corresponds to a malaria epidemic. There has, indeed, been an enormous rise in the attendance of malaria patients at hospitals and dispensaries: it rose from an average annual figure of 625,885 during 1904-07 to 1,369,583 in 1908.[55] It is also notable that the number of persons on relief peaked in February of 1908 and subsequently declined during the main period of excess mortality. Here again we find evidence that the beginning of the decline in relief operations did not always coincide with the resumption of the rains. Indeed, the number of persons on relief was insignificant by the time of the huge peak in excess mortality. This was (as in the Punjab famine of 1899-1900) probably because the main mortality peak (largely as a result

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[53] See Annual Report of the Sanitary Commissioner of the United Provinces of Agra and Oudh for 1908, Allahabad, 1909, p. 14.

[54] See ibid., p.11; see also Report on the Administration of the United Provinces of Agra and Oudh 1908-1909: Allahabad, 1910.

[55] See the Sanitary Department Resolution dated 7th July, 1910 in Annual Report of the Sanitary Commissioner of the United Provinces of Agra and Oudh for 1909, Allahabad, 1910, p. 1.

of epidemic malaria) started later months, especially after the resumption of rains.

2.4 MONTHLY MOVEMENTS OF PRICES, MORTALITY AND CONCEPTIONS: A STATISTICAL ANALYSIS USING TIME-SERIES DATA FOR TEN MAJOR FAMINE LOCATIONS

The previous diagrams generally suggest that the monthly CI and MI respectively have had somewhat negative and positive relationship with monthly movements of food price. Also very clear was an inverse relationship between the monthly MI and CI movements. However, coming to a precise view about the appropriate lags involved in these relationships is difficult on the basis of diagrams alone.[56] Cross-correlation coefficients may help us to explore the precise nature of lags in the various time-series data on food prices, the MI and CI.

A cross-correlation function describes the extent of correlation between two time series X_t and Y_t, allowing for different lags in the series. For each integer k (positive or negative), the cross-correlation measures the correlation between Y_t and the shifted series X_{t-k} (or equivalently, between Y_{t+k} and X_t).[57] The calculation of the cross-correlation function is as follows:

r_{xy} (k) = sample cross-correlation coefficient of lag k

$$= \frac{\sum_{t=1}^{T-k}(X_t - \bar{X})(Y_{t+k} - \bar{Y})}{\sqrt{\sum_{t=1}^{T}(X_t - \bar{X})^2} \cdot \sqrt{\sum_{t=1}^{T}(Y_t - \bar{Y})^2}}$$

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[56] See Figures 2, 3 and 4 in Dyson (1991a) for diagrammatic presentations for the Madras famine of 1876-78 and for the famines of 1896-97 and 1899-1900 in Central Provinces and Bombay Presidency.

[57] See Fornum and Stanton (1989).

$k = \ldots -3, -2, -1, 0, 1, 2, 3 \ldots$
T = series length
$\bar{X}$ = mean for X_t
$\bar{Y}$ = mean for Y_t

However, it is important to note that the cross-correlation function can only be easily interpreted if both time-series are made stationary.[58] Working with first differences is one way of making the series stationary for this purpose. Moreover, the cross-correlation coefficient only describes the linear association between the two series. However, the estimated cross-correlations obtained with different lags help one to make inferences about the direction of causality and, of course, the approximate length of the appropriate lags.

It has become clear from all the famines examined so far that the lag in the time-series of food price is only expected to produce correlations with both the CI and MI series, and not the other way round. In other words, the direction of causation is fairly clear. Since excess mortality in the wake of famines appears to have exerted additional negative effects on fertility, the lag in the MI is expected to produce cross-correlation with the CI, and not the reverse. However, these relations do not seem to hold in the context of non-famine period too. For example, we have noted some occasions of considerable excess mortality in non-famine years which were unaccompanied by price rises or fertility reductions (e.g. United Provinces in 1907, Bombay in 1875, and Punjab in 1902).

[58] "Broadly speaking a time series is said to be stationary if there is no systematic change in mean (no trend), if there is no systematic change in variance, and if strictly periodic variations have been removed"; see Chatfield (1984), p. 14.

Consequently, we have restricted ourselves here to time series data mostly for the officially declared famine years when calculating cross-correlations. We present estimates based on differenced time series data for ten major famine locations (i.e. those that have been considered in section 2.2).[59] And the main results are summarized in Table 2.7.

Table 2.7 shows that the magnitude of the cross-correlation coefficients is somewhat considerable (in many cases), and they all are in the expected directions. However, the correlations between food prices and the MI (r_1) are relatively weak; also the results suggest that fairly long lags (of at least several months) are sometimes involved. Indeed in some famines this relationship appears to be very weak (e.g. the United Provinces famine of 1907-08 and Central Provinces famine of 1899-1900)). As we have seen, peak famine mortality often occurred within a relatively short time span when prices, though high, were not rising any further. In contrast, movements in prices and CI (r_2) and the MI and CI (r_3) appear to be much more tightly related and operate with relatively minimal lags. The relatively weak cross-correlation found between food prices and the CIs (r_2) in the Punjab and United Provinces famines may partly be due to the fact that in both cases the first famine year witnessed a fertility-recovery (or "excess fertility"), as a demographic

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[59] The demographic data and also the data on food prices for the Madras famine of 1876-78, and the famines of 1896-97 and 1899-1900 both in Bombay Presidency and Central Provinces were collected from Tim Dyson; for relevant information, see Dyson (1991a), especially Table 1, and also footnotes 25, 26, 28, 29. For the monthly data on relief provision in the latter two locations, see Report on the Famine in the Bombay Presidency, 1899-1900, Volume II, Bombay, 1903, Table 10, p.21; Report on the Famine in the Central Provinces in 1899-1900, Volume II, Nagpur: Secretariat Press, 1901, Statement VI, p. 47.

Table 2.7 Estimates of cross-correlations with monthly time-series (differenced) data on food-prices, conception indices and mortality indices: Ten major historical famine locations.

Famine locations	Highest cross-correlation coefficients with the corresponding lags (in months).					
	r_1	lag	r_2	lag	r_3	lag
1. Madras famine, 1876-78, n=36	0.39*	2	-0.52*	1,2	-0.47*	1
2. Bombay famine, 1876-78, n=36	0.28	0	-0.56*	1	-0.51*	1
3. Berar famine, 1896-1897, n=16	0.28	6	n.a		n.a	
4. Bombay famine, 1896-1897, n = 24	0.32	2	-0.63*	0	-0.41	0
5. Central Prov., 1896-1897, n = 24	0.42	0	-0.66*	0	-0.60*	0
6. Berar famine, 1899-1900, n = 24	0.28	4	n.a		n.a	
7. Bombay famine, 1899-1900, n = 24	0.38	6	-0.63*	0	-0.58*	1
8. Central Prov., 1899-1900, n = 24	0.20	0	-0.53*	3	-0.62*	0
9. Punjab famine, 1899-1900, n=29	0.33	3	-0.46*	2,3	-0.68*	0
10. United Prov., 1907-08, n=30	0.26	3	-0.41*	2,3	-0.61*	0

r_1 = cross-correlation coefficient between monthly variations in food-prices and mortality indices (MI).
r_2 = cross-correlation coefficient between monthly variations in food-prices and conception indices (CI).
r_3 = cross-correlation coefficient between monthly variations in mortality indices (MI) and conception indices (CI).

Notes: 1) * significant at less than five per cent level. 2) Only the cross-correlation coefficients with the expected directions in lags are considered here. 3) n = number of observations. **Sources:** For demographic data, see Table 2.1; for data on food prices, see footnotes 24 and 59.

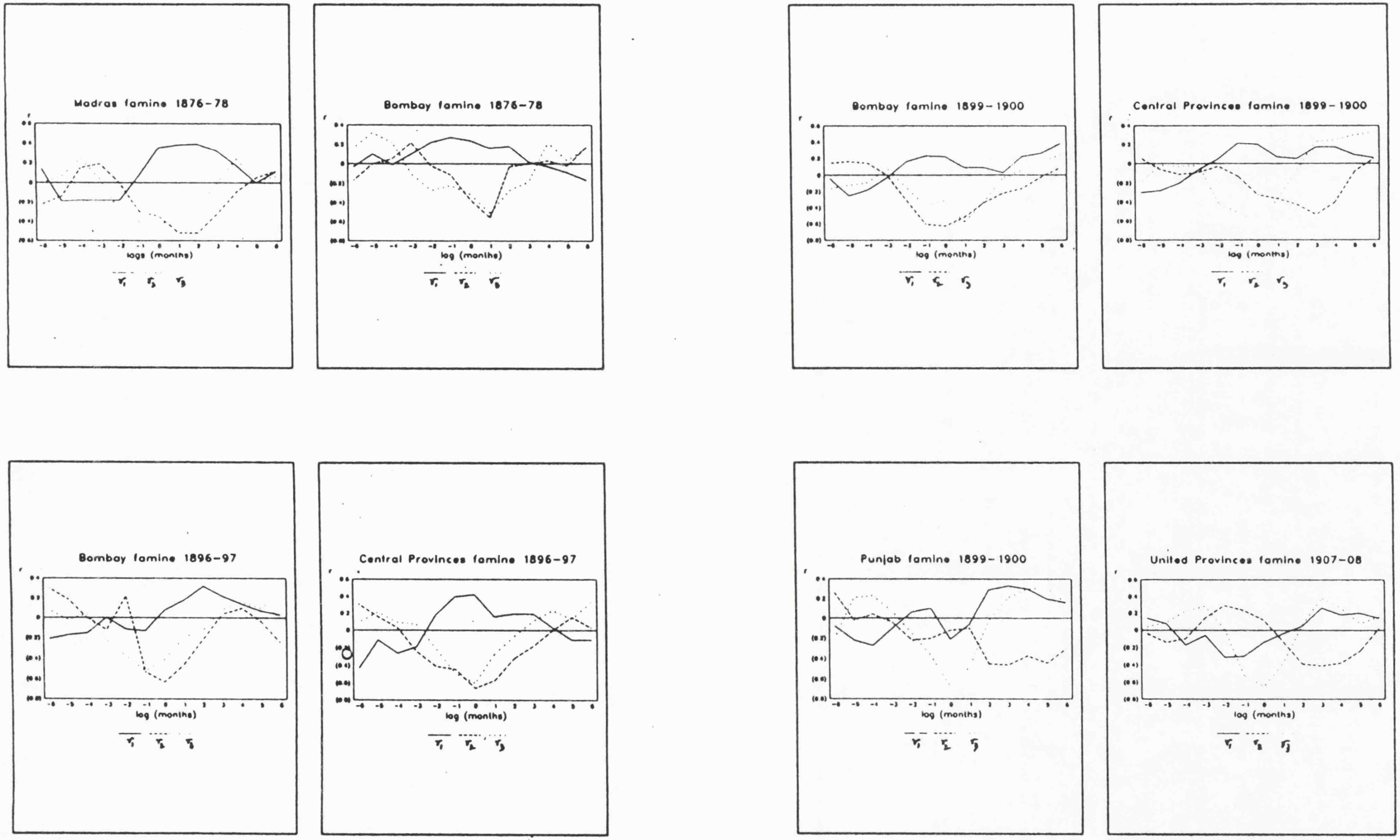
response to a considerable fertility reduction in the preceding year of famine.

In Figure 2.14 we present diagrams (for eight famine locations) plotting the cross-correlation coefficients (i.e. "cross-correllograms") involving lags of up to 6 months. As can be seen, the cross-correllogram for r_1 (based on food prices and mortality) over different lags for the famines of 1876-78 and 1896-97 generally has a quite consistent pattern, attaining their highest positive values around lags of roughly 0 to 2 months. However, the famines of 1899-1900 and 1907-08 show relatively weak and longer lag effects of food price movements on the mortality time path. This weakening in the immediate response of mortality to price rises after the 1870s may be thought of as consistent with an increasing growth and benevolence of relief policy. Indeed, it has been argued by several authors that a temporal moderation of excess famine deaths can at least partly be attributed to increasing liberalisation and enhancement of relief policy through time in India.[60]

The correllograms for r_2 and r_3 not only show patterns which are more systematic, coherent and close to our expected relationships, but they also show much stronger associations on the whole than those for r_1. For example, the cross-correlation coefficient between food prices and the CIs shows a pattern reaching the highest negative value around a positive lag (in price) of 0 to 1 month, and then declining

[60] On the role of relief policy in the trend in the famine mortality over time see Klein (1984); see also McAlpin (1983) especially Chapter 6, and Drèze (1990). The clear weakening of the association between price and mortality over several centuries has also been observed in the historical context of England; see Lee (1981).

Figure 2.14 Cross-correllograms for eight famine locations.



rather steadily over the higher positive lags. Indeed, this pattern is found rather consistently for all the famines considered here. This provides considerable support for the view that food price rises in course of drought-related famines reflect the increasing distress, and thus affects fertility adversely rather immediately. On the other hand, the similar consistent and coherent pattern of cross-correlation coefficient between the MIs and the CIs (r_3) for almost all of these famines confirms the hypothesis that excess mortality (and morbidity caused by nutritional stress and related epidemics) works to reduce fertility with immediate effect.[61]

2.5 AGE AND SEX DIFFERENTIALS IN FAMINE MORTALITY

As has already been noted the age and sex pattern of mortality is an important aspect of famine demography. Table 2.8 provides the age-specific death rates for both sexes during the pre-famine and famine periods. It shows that during the baseline periods infants, young children and older age groups were most vulnerable to death. These age groups appear to have experienced relatively large absolute rises in mortality during the famines. This of, course, demonstrates their great vulnerability - compared with older children and adults - during both normal and crisis years.

Proportional rises in mortality over pre-famine normal

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[61] Statistical measurement of the relative strength of the influences of food price and mortality on fertility seems rather difficult, particularly because of the very limited number of observations we are dealing with here. With such small sample sizes it was also not possible to apply any causality tests either.

Table 2.8 Crude death rates by age and sex in the pre-famine baseline and the prime famine years, five major historical famine locations in India.

Province/ year		IMR	1-4	5-9	(1-11)	10-14	(12-49)	15-19	20-29	30-39	40-49	(50+)	50-59	60+	CDR
Bombay															
1872-74	M	172.6			10.92		14.08					161.55			19.22
	F	161.55			11.05		13.03					97.47			18.07
1877	M	281.23			20.19		34.31					399.30			41.21 (2.14)
	F	275.38			19.44		27.18					209.86			35.47 (1.96)
Punjab															
1891-95	M	215.71	48.30	10.24		7.22		8.18	11.53	15.08	23.52		36.97	105.01	30.35
	F	242.18	49.72	10.94		8.25		9.30	12.53	16.29	21.28		31.95	104.03	31.26
1900	M	280.39	94.97	20.29		13.10		13.31	14.64	20.21	31.03		49.76	146.37	45.53 (1.50)
	F	311.26	106.24	21.96		16.20		17.63	17.84	23.23	29.71		45.24	154.37	50.20 (1.59)
United Provinces															
1901-04	M	246.99	64.57	14.11		9.44		11.79	14.09	16.91	22.97		37.58	67.12	34.20
	F	239.82	65.01	13.63		10.09		16.58	17.02	17.00	21.13		33.84	55.59	34.73
1908	M	336.52	115.96	25.98		13.60		16.12	20.58	25.14	38.32		66.66	130.22	51.79 (1.50)
	F	354.56	117.78	24.30		13.56		19.92	22.97	25.03	35.40		62.90	117.13	53.73 (1.55)
Berar															
1891-95	M	233.33	97.16	16.94		8.84		9.78	12.72	16.96	26.70		48.62	105.12	39.80
	F	216.39	84.76	14.90		9.32		12.54	15.78	17.94	18.10		38.06	95.68	37.79
1897	M	307.98	101.10	24.80		14.30		15.30	19.80	27.80	46.80		79.60	150.30	55.30 (1.39)
	F	302.26	91.00	21.60		15.30		16.80	20.60	24.80	28.20		55.70	127.20	49.90 (1.32)
1900	M	492.52	190.00	48.50		27.90		29.10	33.50	47.20	72.20		116.30	194.50	86.10 (2.16)
	F	487.35	166.20	41.70		27.40		30.70	33.40	41.10	44.80		92.20	186.50	79.30 (2.10)

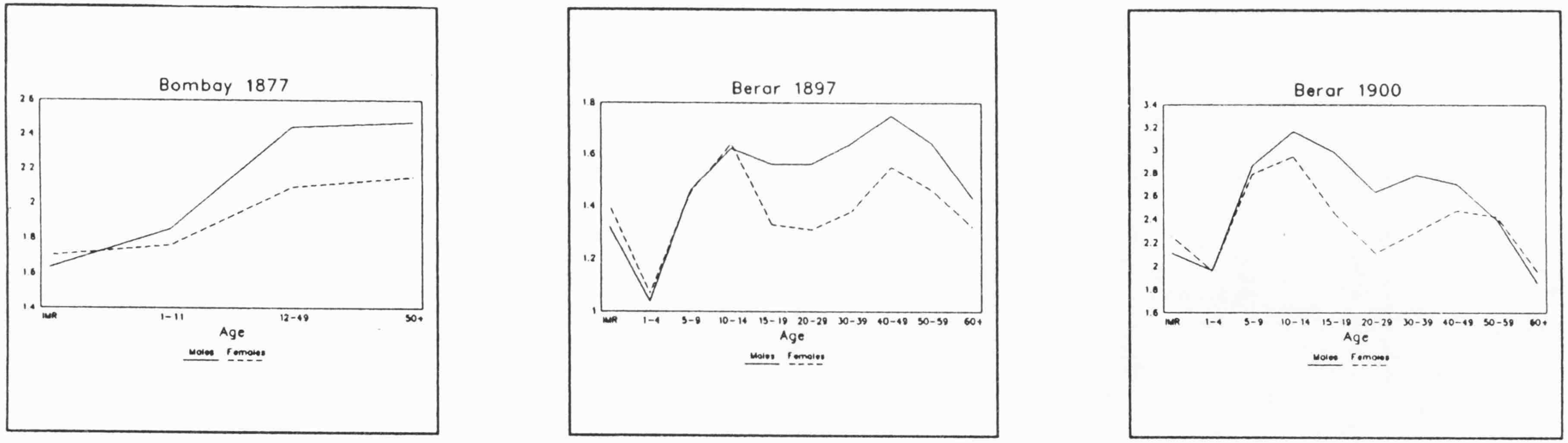
Notes: 1) IMR = Infant mortality rate (per 1000 live births). The IMRs have been calculated by dividing the number of infant deaths by the number of live births registered in the same year. Strictly speaking, this ratio (which is aptly called the "infant death rate") is neither an age-specific death rate nor the infant mortality rate in the life table sense. But data constraints do not allow any adjustments for rectifying this defect; see Barclay (1958), p.141. 2) The year 1871 has been excluded from the baseline period owing to incomplete data on deaths by age and sex for Bombay Presidency. 3) As 1892 was an epidemic year in Punjab, it has been excluded from the baseline period. 4) For calculating death rates (expressed per 1000 population) denominators have been taken from the censuses preceding the famines. 5) Figures in parentheses are the respective ratios of the CDR in prime famine year to that during the baseline period.
Sources: See Table 2.1.

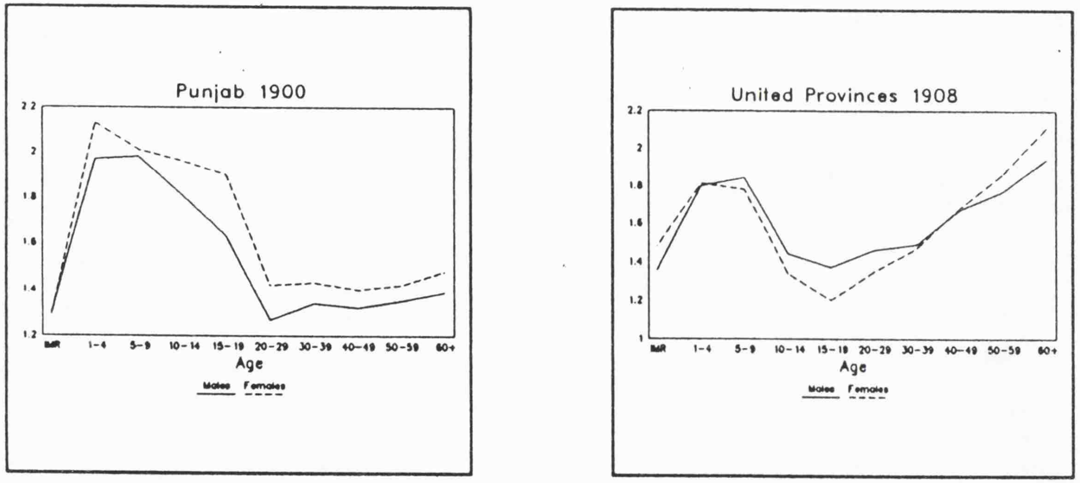
levels by age and sex are plotted in Figure 2.15. In the case of the Bombay famine only four wide age groups can be considered. In both the famines in Berar young children (aged 1-4 years) were less vulnerable compared with older (5-10 years) and even teenaged (10-15 years) children. In contrast, in the Punjab and United Provinces famines young and even older children experienced larger proportional rises in mortality than did teenaged children and adults. In most of these famines young adult age groups (say 20-30 years) were relatively less vulnerable especially compared with older adults. In the Bombay and Berar famines, old people (aged 60+) experienced a mortality advantage compared to younger adults, while the reverse held true in the Punjab and United Provinces famines.

In almost all cases, the infant mortality rate for females rose by a higher proportion than did that for males. Turning to a consideration of sex differentials in the overall proportional change in mortality, two regional patterns emerge. In the Bombay and Berar famines - interestingly those in the western region of India - male mortality (all ages combined) rose more (in proportionate terms) than did female mortality (see Table 2.8). But in the United Provinces and Punjab famines - those located in the northern region - females experienced higher proportional rises in mortality. Indeed, as Figure 2.15 shows, in the Punjab famine of 1899-1900 even females in the prime reproductive ages experienced larger proportional mortality rises than did males.[62]

[62] In a study of the late nineteenth century famines in the most severely affected Hissar district of Punjab, Guz also reported a distinct female disadvantage in mortality; see Guz (1989), especially p.208.

Figure 2.15 Ratios of registered deaths in prime famine years to baseline years, by age and sex, five major historical famine locations.





Sources: Based on Table 2.8

Elsewhere, however, females in this age range generally experienced smaller proportional mortality increases than did males - a feature which seems to be found in other famine locations.[63] This suggested north-south dichotomy in sex-differentials in famine mortality is also supported by the census-data on the changes in sex-ratios from pre-famine to post-famine censuses. We have already seen that most of southern and western locations exhibit a decline in sex-ratio in the census following famine while northern provinces show a distinct rise (see Table 2.1).

2.6 CONCLUDING DISCUSSION

We now can summarize the main findings on the demography of the major historical famines. The precipitating factor was almost always monsoon-failure, resulting in significant losses of agricultural output and employment. But the marginal existence of a large section of the population, who usually had almost nothing in store to withstand threats of subsistence crisis, can hardly be discounted. According to the 1880 Famine Commission's estimate, "one-third of the land-holding classes were deeply and inextricably in debt".[64] All these famines involved both substantial excess mortality on the one hand and significant reduction in conceptions on the other; so considerable losses of population seem to have resulted. However, there appears to have been a compensating

[63] See also Dyson (1991a).

[64] Quoted in Srivastava (1968), p. 330. For more evidence of rural poverty and indebtedness during the late 19th century, see Srivastava (1968), pp. 328-335; see also Bhatia (1967).

above-normal rise in conceptions in the immediate post-famine period in most cases, while mortality in some cases declined even its below pre-famine baseline level.

Over the longer term in the post-famine period a continued elevation of the birth rate has generally been found, although the reduction in mortality did not occur in some famine locations. In the post-famine period death rates seem to have been rather less stable than birth rates; this was probably due to a greater responsiveness of mortality to weather and other environmental fluctuations, especially in the past (when India was vulnerable to occasional outbreaks of epidemic diseases such as plague, malaria, smallpox, and cholera). However, in the longer-term post-famine period of 5-10 years the crude rate of natural increase in most cases appears to have exceeded the pre-famine levels. Elevated birth rate over longer term period after famine seems to have played more important role in this, and this excess birth rate appears to have partly been due to the change in age-composition of population, especially for females. The implication is that despite considerable population losses during famines, the longer-term post-famine demographic responses tended to promote the recovery of the pre-famine population sizes.

The major findings from our analysis of the monthly time-series data - both diagrammatic and statistical - can now be reviewed.[65] First, an early indication of the development of famine has almost always been reflected in soaring food

[65] Despite several issues involved in the interpretation of the estimated cross-correlations, the findings in Table 2.7 generally confirm the conclusions drawn on the basis of the diagrams.

prices. This period of rising prices represents onset of the "starvation phase" when people presumably pass through acute economic distress, and various social disruptions ensue. In this connection we may note the relatively weak positive link between the movements of food prices and MI during famine. The reason seems to lie in the fact that the main famine mortality peak usually occurred relatively late in the process (with some lag after the beginning of distress), and it also occurred within a relatively short span of time (i.e. epidemic phase) when food prices were either stabilised at a high level or were only starting to decline. Moreover, food prices often continued to remain quite high when mortality went back to normal levels.

Second, fertility (or more strictly conceptions) responds rather quickly to the rise in both food prices and mortality movements. A significant fertility reduction occurring sometimes (but not always) somewhat earlier than the elevation of mortality can hardly be described as "anticipatory" in the sense of a conscious decisional response. Because nutritional stress and social disruption during the period of rising prices (i.e. in the peak starvation phase) can considerably reduce conceptions through the well-known mechanisms (e.g. the nutrition-fecundity link or through increased spousal separation). Moreover, a fairly strong negative association has been found between movements of the MI and CI, especially during the prime period of famine. Thus, in addition to the MI and CI movements being partly associated with the development of distress, they also demonstrate the negative effects of increased morbidity and mortality on conceptions.

However, interestingly, we have discovered occasions when outbreaks of epidemics resulted in an apparent mortality crisis, independent of any immediate subsistence crisis and with relatively little negative effect on conceptions. The suggestion is that epidemics and related excess morbidity and mortality exert much stronger fertility-reducing effects when they follow a subsistence crisis than when they do not. This, in turn, probably implies that a reduction in fertility, rather than a rise in mortality, is a more robust index of the existence of famine distress, perhaps especially during the starvation phase.

This is not to suggest that the outbreaks of epidemics that accompanied famine can be treated as independent of famine and the associated mass nutritional stress. The occurrence of epidemics appears to have partly been caused by widespread acute nutritional deficiency and weakened resistance, and partly by the contamination of food and drinking water, increased exposure (to various diseases) associated with "wandering" and migration, crowding in relief camps and deterioration of sanitation.[66] Epidemics of some diseases are rather easily recognised as famine-caused: for example cholera and dysentery/diarrhoea. On the question of epidemic malaria, which seems to have accounted for the bulk of excess mortality in most of the famines considered here, three hypotheses (which are not mutually exclusive) have been suggested:

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[66] The question of how undernutrition enhances the risk of mortality seems to be complex one. For a summary of the several issues involved, see Walter and Schofield (1989), pp.17-21. For possible mechanisms linking social disruptions and outbreaks of diseases in the Indian historical context, see Arnold (1991).

(a) A relatively low incidence of malaria owing to dryness during the drought year reduces the population's immunity level; and this enhances the chances of a malaria epidemic when the rains resume in the following year.[67]

(b) Since a fever mortality peak appears to have often occurred after the resumption of rains when (along with the beginning of normal farm activities) people presumably begin to experience an improvement in their nutritional level, it may be an outcome of the "refeeding of malaria".[68]

(c) In view of a strong correlation found (historically) between food scarcity and fever (or malaria) mortality in parts of the Indian sub-continent, the occurrence of malaria epidemics in wake of famines may be related to acute nutritional stress and its debilitating effects.[69]

Several issues arise in assessing relevance of the above hypotheses. First, the absence of malaria as a separate category of death in the reports of the Sanitary Commissioners always leaves some doubt as to whether the fever mortality peak does indeed represent epidemic malaria. As already indicated, several other diseases may have been misreported and included in the fever category. For example, on the basis of very careful diagnostic investigation of famine victims admitted to hospitals during the Madras famine of 1876-78, Dr A.Porter found that a considerable number of registered fever deaths were actually due to pneumonia - which was not a

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[67] See Dyson (1991a), and also de Waal (1989b) especially p.92.

[68] For evidence in support of this hypothesis especially in the African context see Murray et al. (1975, 1976, 1990), and also de Waal (1989b), especially pp.104-106.

[69] See Christophers (1910), Zurbrigg (1988).

recognised cause of death in the registration system. Indeed, in the postmortem room he found pneumonia ("in a more or less advanced stage") in more than 25 percent of all cases.[70] In the case of the Berar famines, we have also seen that the highest number of deaths recorded during the month of peak MI was under the dysentery/diarrhoea category rather than that of fever. However, all this is not to ignore the fact that a large number of the registered fever deaths very often represented malaria mortality, especially during the post-monsoon months. Also, some malaria deaths may have been entered under other headings.

The hypothesis (a) above can be subjected to doubt in the light of our evidence on two counts. First, the Bombay famine of 1876-78 shows that a fever mortality peak can certainly occur even in a year of drought (e.g.1877) (see Figures 2.3 and 2.4). Second, the experience of the Berar famines of 1896-97 and 1899-1900 shows that the time path of mortality movements was similar for all major causes of death (see Figure 2.6). This implies the existence of a more general time pattern of famine mortality rather than the seasonality of malaria mortality *per se*. In fact, a broad general time pattern of rising mortality in course of the prime famine year seems to have often been shared by the major causes of deaths, although the exact timing of peak mortality from specific diseases such as cholera, dysentery/diarrhoea, and fever does not necessarily coincide.

There are also some difficulties regarding hypothesis

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[70] See Porter (1889), p.131.

(b). First, since food prices almost always appear to have stayed very high during and even beyond the monsoon months in the year following drought, and since normal harvesting does not take place until late of that year, it seems uncertain whether a perceptible improvement in nutritional status of the affected population occurred during the period of peak fever mortality. Besides, the available evidence on the malaria refeeding hypothesis suggests that even though the attack rate rises with refeeding (and the consequent recovery in nutritional level) the actual mortality rate probably depends considerably on the previous level of undernutrition. Reviewing the relevant literature, Tomkins and Watson have recently concluded that while a low plasma nutrient level seems to inhibit the rate of (malaria) pathogen multiplication, "in every situation this has to be balanced against the effect of malnutrition on the immune host response."[71] In fact there is no evidence that malnutrition is advantageous during the recovery from infection.

Indeed, there are indications that poor people were more vulnerable to malaria mortality. For example, much greater malaria death rates were reported by Christophers for the poorer classes in the late nineteenth and early twentieth century Punjab.[72] The report of an investigation of the epidemic of malarial fever in Assam during 1896 concluded that "the poor suffer in a disproportionate degree, and have less chance of recovery, owing to their living in more crowded

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[71] See Tomkins and Watson (1989), p.24.

[72] Christophers (1910), pp.38-38.

dwellings, and to a deficiency of nourishing diet especially of a nitrogenous nature".[73] In a recent study of young children admitted to hospitals in the context of an African food crisis, undernutrition, though seemingly protective against clinical malaria, appeared to be associated with a higher overall risk of death.[74] Although information about the class composition of mortality during India's past famines is particularly scant, relief records and contemporary accounts indicate that the main rural victims were often the poor classes - small cultivators, agricultural labourers and petty artisans.[75]

All this, however, does not mean that the malaria epidemics that accompanied several of these major Indian famines occurred solely due to famine-caused food shortage and undernutrition - unrelated to rainfall, temperature, and other environmental and epidemiological conditions. The huge post-monsoon elevation of fever mortality in several Indian famines - appearing often as a magnification of the normal seasonal pattern - suggest a mediating role played by environmental factors. In many cases, low mortality in the drought year itself has been attributed to a relative absence of mosquitoes and malaria. In turn, lowered malaria immunity in the population during a drought year may help aggravate malaria

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[73] See Rogers (1897), p. 37.

[74] See de Waal (1989b), especially p.103. In this connection attention may be drawn to the findings of an early celebrated study with 100,000 English prisoners over 4 years - a study which is probably considered to be an important event in the history of the "refeeding hypothesis". This study reported that those receiving least food had four times higher mortality than those consuming most food, although the sickness rate was far higher for the better-fed group; see Murray and Murray (1977), pp.472-473.

[75] See Currie (1991) and also Ambirajan (1989).

epidemics after the resumption of rains.[76] Furthermore, the fact that some famines appear to have involved very small malaria epidemics is sometimes used to cast doubt about the inevitability of a link as is proposed in (c).[77]

However, resolving this question fully is probably impossible. And it may indeed involve controlling for several factors such as the severity of failures in both rains and crops, the nature of relief, and so on. For example, in the Punjab famine of 1899-1900, although rainfall recovered in the year of peak mortality (i.e. 1900), the crop-output turned out to be even lower than in the preceding year of drought.[78] Christophers, while discussing the major factors determining the recurrence of epidemic malaria in Punjab, states that "[t]he facts certainly support the view that scarcity is a factor determining to a large degree the situation, extent and intensity of epidemics."[79] He also recognised the role of rainfall in creating favourable conditions for mosquito-breeding. The basic argument is succinctly summarised by the following statement: "Rainfall made the mosquitoes more abundant; famine made the people more susceptible".[80] This seems to be quite consistent with our finding of peak fever mortality occurring often after the resumption of rains

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[76] See e.g. Dyson (1991a), p.24.

[77] See Whitcombe (1990)

[78] While in the drought year, 1899, the cropped area in the whole Punjab was 22.75 million acres, it declined even further to only 15 million acres in the following year (i.e. 1900), the year of peak famine mortality; see Census of India 1901, Volume 18, Part I, p.42.

[79] See Christophers (1910), p.39. S.R. Christophers was one of the leading malariologists in the colonial public health service. He made a celebrated study of malaria epidemic in Punjab.

[80] See Harrison (1978), p.202.

following drought and famine.

To sum up: while a general course of rising mortality seems to have often been shared by most diseases especially during the year following drought, reflecting broadly the lagged effects of nutritional stress on human health and survival, the exact timing of peak mortality from specific epidemics was probably partly shaped by environmental factors (monsoon in the case of malaria, heat and lack drinking water in the case of cholera) and partly by other influences (e.g. period of maximum congregations at relief camps causing maximum spread of cholera and dysentery/diarrhoea).

We now turn to the time path of relief operations. Direct relief measures were in two basic forms: relief works (both large scale and some village works) and gratuitous relief (in several forms).[81] Relief operations were usually adopted after some administrative tests and were often rather late. While drought conditions usually begin from around June-July, in most cases relief did not assume significance until very late in the year (e.g. Figures 2.2, 2.5, 2.8 and 2.11). This late start of relief presumably had especially adverse implications especially for those who had few reserve stocks of food or assets. In turn, there is a strong implication that a large number of people were already debilitated by considerable nutritional stress when they joined relief works.

As we have also noted, while relief works were to provide

[81] For the detailed account of different kinds of relief that were in operations during these famines, see Bhatia (1967), Srivastava (1968), Drèze (1990), and also the official reports on the famines in different provinces.

employment and income for those who suffered job losses in the wake of drought, the timing of the decline in relief provisions did not always correspond closely to the resumption of the monsoon rains. Official documents sometimes attribute the early decline of relief provision to villagers' unwillingness to join relief works. For example, the reduction in the number of persons on relief work during the pre-monsoon months (i.e. March-April,1900) in Hissar - one of the most affected districts in the Punjab famine of 1899-1900 - was reported to be "due in the first instance to the employment afforded to large numbers by the harvesting of canal crops and to many earning sufficient in this way to save them from having to return to the works, and later to jungle fruits being available for food and to the great heat coupled with the conditions of our relief works driving off such as were not in absolute want."[82] But it is also likely that people, being already debilitated, found the relief works extremely harsh; often they may have acquired diseases in relief camps and thus lost their chances of continuing with their job.[83] Moreover, the fall in the number of relief workers was often the result of deliberate government policy to discourage relief, rather than the workers' willingness to return home.[84] There is evidence that the government often made the relief system oppressive by enforcing distance tests,

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[82] See The Punjab famine of 1899-1900, vol.I, Lahore, 1901, pp.9-11.

[83] For example, as Reverend C. Harding in his replies to the Famine Inquiry Commission (1878-1880) wrote about the Bombay famine of 1876-78, "People were constantly dying, some labour gangs near Kaladgi were so weak that they could hardly walk. I thought many people on the works should have been in hospital"; quoted in Currie (1991), p.48.

[84] See Srivastava (1968), especially pp. 210, 255-57.

high standard of tasks, and deductions from wages due to shortfalls from tasks. In order to keep down the number of people on relief, especially when severity of famine was on increase (i.e. when more people flocked to relief works), the government sometimes appears to have raised the stringency of relief policy (e.g. higher standards of work, reduced wage rates).[85] As a result, the relief policy often made a worker unfit "for work [and] at the same it lays him open to the attack of famine diseases."[86]

However, on the other hand, in some cases the provision of relief works seems to have continued to rise until the early monsoon months or even a bit later (e.g. Berar and Central Provinces in 1900). Such a relatively prolonged maintenance of relief works may have partly reflected a comparatively liberal policy.[87] Figure 2.16 presents scatter plots of monthly data on the numbers of deaths and persons on relief. The overwhelming dominance of relief works in total relief operations should be borne in mind. Two broad patterns seem to emerge. In the first pattern (as depicted in Figure 2.16 (A)), mortality level and provision of works increased together up to certain point, and then came down roughly hand in hand. This first pattern corresponds to a relatively gradual process of mortality increase (rather than an abrupt

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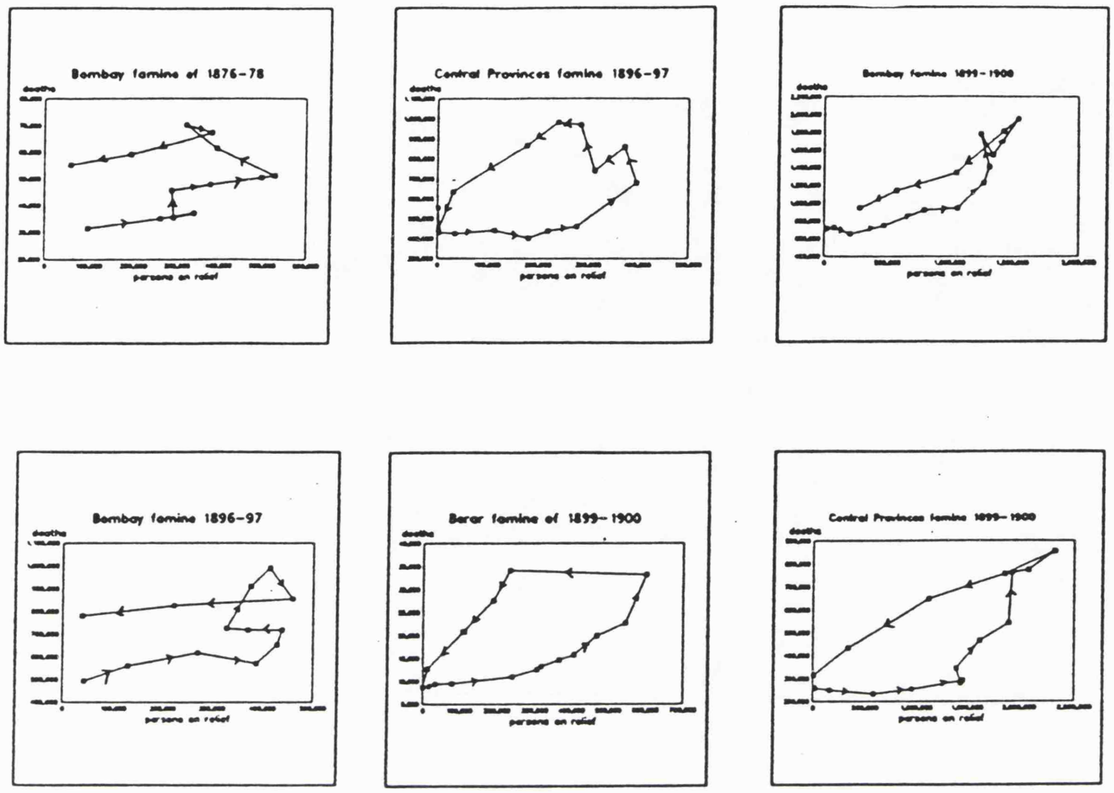
[85] See Bhatia (1975), pp.589-590, and also Guz (1989).

[86] This comment was made by a special representative of the Manchester Guardian, Vaughan Nash, while covering the famine of 1899-1900; it is quoted in Bhatia (1975), p.590.

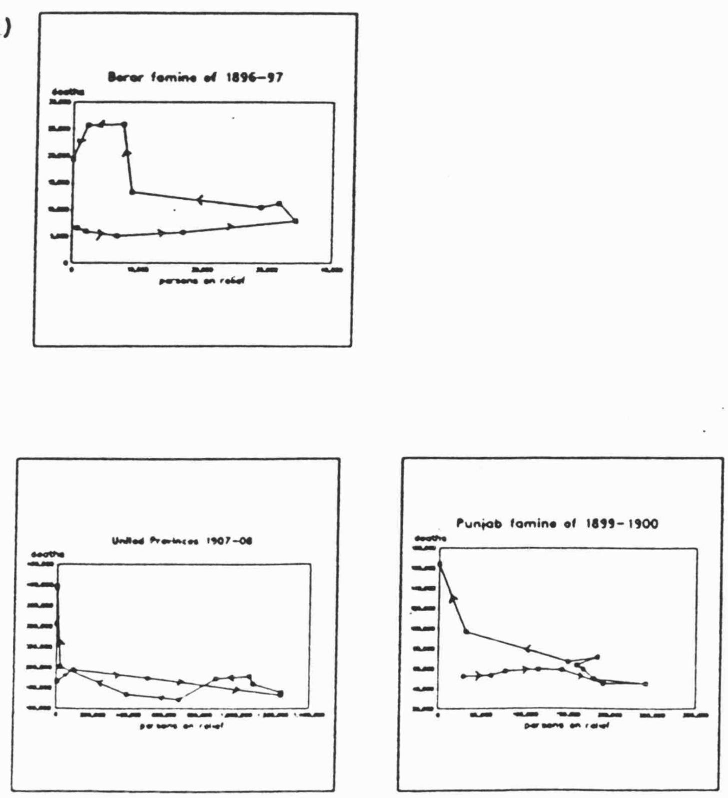
[87] Bhatia cites the experience of Madras famine of 1896-97 where relief policy was comparatively liberal, and relief works continued to employ increasing number of workers until late July of 1897. According to Bhatia the relatively liberal relief policy was partly the reason why there was only a small rise in mortality (4 percent) during this famine; see Bhatia (1975), p.590.

Figure 2.16 Scatter-plot of monthly average numbers of persons on relief and corresponding monthly numbers of registered deaths during the prime famine period, major famine locations

(A)



(B)



Sources: See Table 2.1 and footnotes 26 and 59 rise in mortality due one or two epidemic diseases) over the year following drought. When deaths from almost all major causes simultaneously showed a considerable upward trend, relief seems to have risen especially until the arrival of the monsoon.

The second pattern (as shown in Figure 2.16 (B)) is when relief works were increasing while there was hardly any significant rising trend of mortality, but mortality rose rather sharply at a time (usually late in the year following major drought) when relief works were almost closed down. This pattern was experienced most clearly in the Punjab crisis of 1899-1900 and the United Provinces famine of 1907-08. In both these cases famine mortality was in large part accounted for by a malaria epidemic which occurred late in the year (i.e. during the post-monsoon months). The suggestion probably is that time span of relief measures was partly influenced by the mortality situation; when mortality does not seem to have been rising (particularly before the arrival of the monsoon in the year following drought), relief measures were probably run down early (e.g. Punjab and United Provinces). Conversely, when mortality showed a steady increase over time relief works were continued even until the early part of the monsoon (e.g. Central Provinces and Bombay).

In this connection the role played by gratuitous relief is worth noting. Gratuitous relief (e.g. cash or food doles, poor houses etc) usually tended to become important in relative terms rather late in the famine process, when outbreaks of major epidemics had already caused a considerable elevation of mortality. Poor houses, for example, continued to exist very often well beyond the arrival of the monsoon (when provision of relief works was on rapid decline).[88] Thus, in the Bombay famine of 1876-78, the ratio of persons on public works to those on gratuitous relief declined from 94.92 in December 1876 to 6.17 in June 1877, and further to 1.32 in November 1877.[89] Exactly similar time pattern of gratuitous relief *vis-a-vis* relief works has been found in most of the famines locations. This was partly because during the prime epidemic phase people in large numbers qualified for gratuitous relief as they appeared to be unfit or incapable to do works. This is consistent with the evidence of a very high mortality rate among recipients of gratuitous relief and those in poor houses. The suggestion therefore is that the timing of gratuitous relief to assume relative prominence often coincided with the phase of famine-induced mortality crisis (i.e. the epidemic phase).

Differentials in famine mortality by age and sex can be viewed in both absolute and proportionate terms. Infants, young children and older age groups are usually subject to greater absolute vulnerability compared to older children and adults, even during normal times (see Table 2.8). This pattern is typical of a society where widespread undernourishment coexists with very poor public health facilities. But in terms of proportional rise in deaths during famine infants (i.e those under one year) appear to

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[88] See e.g. official reports on famine administration in several locations.

[89] See Minute by the Governor of Bombay, dated 24th December 1877; quoted in The Bombay Government Gazettes for 1877, Part III, Supplements, 1878, p.118.

have experienced a relative advantage compared to other ages. However, our findings on the other age differentials in proportionate terms do not fully conform to Dyson's view that young children are relatively less affected by famine mortality compared to older children and adults. Instead, our results suggest two patterns broadly corresponding to two major Indian regions. First, in the Berar famines we find a pattern similar to the famines in the western, southern and central regions considered in Dyson's study i.e. young children and old people appear to be proportionately less vulnerable compared to older children and adults. Second, young and even older children turn out to be more vulnerable compared to teenagers and adults in the Punjab and United Provinces famines, both of which are located in north India. In these two northern famines the prime adult age groups experienced relatively small proportional mortality increases (see Figure 2.15). Moreover, in the south, west and central Indian famine locations adults seem to have had a relative mortality disadvantage compared to older ages,[90] while the famines in the northern region showed the reverse. Since all these famines were very widespread, and also the registration areas were very large (except Berar), the above age patterns of proportional mortality rises do not seem to have been due to biases introduced by migration.

Infants' relative advantage in terms of proportional rise in famine mortality (compared to other ages) seems to result partly from their extremely high death rate even in normal

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[90] See also Dyson (1991a), p.21.

times, and partly from a relative insensitivity of infant mortality to acute food-shortage and environmental factors.[91] At other ages patterns of age differentials in famine mortality are the net result of several complex forces. For example, age differentials in biological vulnerability to nutritional stress may work against children; but social disruptions and associated changes (e.g migration) during famines may act to favour them relative to adults. Adults are more likely to move in search of food or work during a subsistence crisis and hence are more likely to be exposed to diseases. There may also be changes in the distribution of food within families in such a manner as to protect children.[92] However, the normal functioning of a family in the face of a severe famine is likely to be threatened as different members may be scattered in search of either relief or work. In fact the extent to which intra-household distribution of food and other inputs varies during an acute food crisis is not clear. Moreover, some epidemic diseases have sometimes been found to be age-selective.[93]

On the question of sex-differentials in famine mortality, we again observe two regional patterns. In the south, west and central Indian famine locations the proportional rise in overall mortality was higher for males than for females (see

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[91] See Behar et al. (1958) on this issue.

[92] During the Greek famine of 1941-42 young children and women seem to have been relatively protected by cultural traditions favouring those house-hold members; see Valaoras (1946). There is also evidence in the context of other famine locations to show greater protection given towards children; see Drèze and Sen (1989), pp.79-80 and references cited.

[93] For example, the 1918 influenza pandemic in India appears to have killed the adult population much more than children and the elderly. For the relevant evidence and some possible explanations, see Mills (1986).

Table 2.8).[94] But the reverse was found in the north Indian famine locations, especially Punjab. As noted before, the relative female advantage, or disadvantage, in famine mortality is the result of two divergent forces: because of certain physiological advantages, women may be able to withstand famine situations better than men. On the other hand, the anti-female pattern of intra-household distribution of food, health care etc. may change further against women during a food crisis.[95] Moreover, the relative female mortality disadvantage in the wake of malaria - due to their greater staying at home, which increases their risk of attack - was recognised long ago.[96] This said, reduction in the number of maternal deaths due to a reduction in fertility and also male-dominated distress migration can be some examples of how female populations derive some relative protection in famine mortality.[97] However, it is extremely difficult to separate out the relative influences of all these factors involved in the determination of sex differentials in crisis mortality.

However, the existence of a considerable amount of recent research on India's demography has tended to establish a north-south regional dichotomy.[98] There appears to be a distinct female mortality disadvantage in the northern states

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[94] See also Dyson (1991a), Table 4, p.20.

[95] See Drèze and Sen (1989), pp.55 and also the references cited; on this see also Rivers (1982).

[96] See e.g. Census of India 1911, Volume 1, India, Part 1, Report, p. 212.

[97] See e.g. Mohanty (1989).

[98] On the "north-south" divide in India see Sopher (1980).

as compared to the states of India's south.[99] A strong preference for males and related female neglect - reflected in mortality differentials by sex - seems to be an old phenomenon in northern parts of India.[100] The contemporary literature clearly indicates an anti-female bias in the distribution of food and health care, especially in Punjab.[101] Thus the available evidence suggests that the anti-female changes in the pattern of distribution of food and health care during major famines in northern parts, unlike southern, western and central regions, probably outweighed the potential biological and other female advantages in coping with such crises. Also, a relative mortality advantage for adults (compared with young children) in north Indian famines may be consistent with the extremely patriarchal nature of the region.

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[99] See Miller (1981) and the literature cited, and also Kynch and Sen (1983) and Harriss (1989, 1990). There is substantial amount of literature on the possible explanations for such north-south patterns of sex differences in the mortality; see Bardhan (1974), Miller (1981), Dyson and Moore (1983), Basu (1989a) and also Kumar (1989). In fact recent researches have shown an intrinsic North-South cultural difference in the matter of women's status; see Basu (1989b) and Dyson and Moore (1983). See also Langford and Storey (1991) and Langford (1984).

[100] See the early census reports and other official publications on this possibility.

[101] See Dasgupta (1987), and also Dhillon et al. (1979). See also Harriss (1989, 1990). It is, however, interesting to note that the anti-female bias especially in the matter of food and medical care has been probably becoming more widespread throughout India over the recent past; see, for example, Miller (1989); see also Dyson (1988).

CHAPTER 3

THE DEMOGRAPHY OF LESSER-MORTALITY HISTORICAL FAMINES IN THE INDIAN SUBCONTINENT

3.1 INTRODUCTION

In the last chapter we analyzed, at the provincial level, the demography of several major historical famines which involved large-scale excess mortality. But there is evidence of famines in different Indian locations, which did not kill at all, or killed very much less. In other words, the excess number of deaths over the average "normal" number was small. While a famine is often defined to involve excess mortality as an essential element, study of famines with comparatively small excess deaths may provide us with understanding regarding the essence of famines in general, and also insights about issues such as the interaction of famine conditions with epidemics and the provision of relief. As we saw in the last chapter, it is famine-induced outbreaks of epidemics that generally account for most famine mortality. If in some famines relatively small (or no) excess mortality is accompanied by all the other features of a typical famine (namely, high food prices, scarcity, fertility reduction etc), then the absence of heavy mortality should largely be due to the absence of major epidemics. Obviously, it is of interest to know why there were no major epidemics in the wake of some famines. For example, was it due to a less severe drought or crop failure in the first place ? Or was it due to better relief provision ? Indeed, in circumstances where excess mortality was minimal, are we justified in using the word "famine" at all ? Consequently, this chapter focuses on the detailed demographic responses during some famines which involved relatively little excess mortality.

We have included the following four famines which caused relatively little excess mortality: the Punjab famine of 1896-97; the United Provinces famine of 1896-97; and the famines of 1905-06 and 1911-12 which both occurred in Bombay Presidency. These were all officially declared famines, and for each location a fairly lengthy report was produced by the respective provincial governments. In fact, as mentioned earlier, the famine of 1896-97 was a major famine with widespread effects in the subcontinent. But it did not produce major loss of life everywhere. As we have already noted in the preceding chapter, the vital registration system was comparatively good in each of the above locations. The census-based demographic information on these locations has also been given in the last chapter (see Table 2.1).

Table 3.1 shows that each of these famines was related to a monsoon failure. Indeed, the extent of monsoon failure appears to have been considerable, and even comparable with that for the famines of the preceding chapter (see also Table 2.5). However, Table 3.2 shows that the elevation of mortality in these famines was marginal and certainly much smaller than those considered in the last chapter (see also Table 2.2). Interestingly, during the Bombay famine of 1905-06 overall mortality seems to have <u>improved</u> from its pre-famine level. Perhaps the "best candidate" for famine excess

Table 3.1 Annual rainfall in the pre-famine period and famine years, four lesser-mortality famine locations

Province/period	Rainfall (inches)	Province/period	Rainfall (inches)
Punjab		**Bombay**	
Pre-famine		Pre-famine	
1890-95	31.72	1893-1903	48.36
1895	23.72	1904	36.19
Famine years		Famine years	
1896	19.46	1905	33.06
1897	24.80	1906-07	36.10
United Provinces		**Bombay**	
Pre-famine		Pre-famine	
Normal Average	41.84	1893-1903	48.36
1895	39.43	1910-11	39.56
Famine years		Famine years	
1896	26.99	1911-12	24.68
1897	43.92	1912-13	61.61

Notes: 1) The number of years included for calculating "average normal" rainfall for the United Provinces is not made explicit in the official report.
2) For Bombay Presidency, the years from 1906-07 onwards begin on the 1st of June and end on the 31st of May. Since most of the rains of a calender year fall during June-September, the use of these two accounting definitions of a year does not cause much difficulty in our understanding here.

Sources: Punjab: Census of India 1901, Punjab, Volume XVIII, Part 1, p.42; United Provinces: Based on monthly averages given in United Provinces Government Gazettes, Part II, Allahabad: Government Press, various years; Bombay: Annual Report On the Administration of the Bombay Presidency, Bombay: Government Press, various years.

mortality in Table 3.2 is United Provinces in 1897; however, even in that year the CDR was only elevated by about 7 points over its baseline level.

3.2 SHORT TERM FERTILITY AND MORTALITY RESPONSES DURING LESSER-MORTALITY FAMINES: AN ANALYSIS USING MONTHLY DATA

It is of interest to analyze the time path of short-term fertility and mortality responses in relation to the development of these famines. Monthly movements of food prices are again used as indices of the development of famine distress. In fact, we have calculated monthly averages of district-level prices of a single staple foodgrain, namely, jower.[1] The short-term demographic effects are captured, as before, in terms of monthly conception and mortality indices (CI and MI). These have been constructed with reference to respective averages for pre-famine baseline periods of about five years (for details see Table 3.2). Monthly average numbers of persons on relief (all kinds) have also been plotted alongside these demographic measures.[2] As before, scales of all these measures are not shown on the Y-axis, but the range of variation for each variable is indicated in the

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[1] The sources of price data are as follows: Punjab: The Punjab Government Gazette, Supplement, Statistical, Part I: Lahore (various years); United Provinces: The United Provinces Gazette, Part II: Allahabad (various years); Bombay Presidency: The Bombay Presidency Gazette, Part III, Supplement: Bombay (various years). It may be noted that prices were expressed in terms of *seers* (about two lbs weight) per rupee.

[2] The sources of monthly data on relief provision are as follows: Punjab: Report on the Famine of Punjab in 1896-97, Lahore: Government Press, 1898; United Provinces: Resolution on the Administration of Famine Relief in the North-Western Provinces and Oudh during 1896 and 1897, Allahabad: Government Press, 1898; Bombay: Report on the Famine in the Bombay Presidency 1905-06, Bombay, 1907, and Report on the Famine in the Bombay Presidency 1911-12, Bombay, 1913.

Table 3.2 Registered provincial vital rates in the baseline, famine and post-famine periods: four lesser-mortality famine locations

Province	Period				
	Baseline	Famine		Post-famine	
Punjab	**1891-95**	**1896**	**1897**	**1898**	**1899**
CBR	39.2	43.0	42.6	41.0	48.4
CDR	30.9	31.5	31.1	31.1	29.6
United Provinces	**1890-94**	**1896**	**1897**	**1898**	**1899**
CBR	38.0	35.4	31.1	37.1	48.1
CDR	33.8	33.3	40.5	27.4	33.2
Bombay	**1901-04**	**1905**	**1906**	**1907**	**1908**
CBR	31.4	33.1	33.8	33.3	35.7
CDR	40.4	31.8	35.1	32.8	27.2
Bombay	**1907-10**	**1911**	**1912**	**1913**	**1914**
CBR	35.4	36.0	34.9	34.9	37.4
CDR	29.4	30.4	36.9	26.6	28.6

Notes: 1) Because 1892 was a year of epidemic with heavy excess mortality in Punjab, it has been excluded from the baseline period,1891-95. 2) The vital rates shown are based on constant denominators, being the respective enumerated populations according to the last census prior to the famine. An exception to this is the Bombay famine of 1911-12 for which we have used the 1901 census population as denominator when calculating rates during 1911-14; this was done for reasons of comparability.

Sources: Annual Report of the Sanitary Commissioner for the Government of Bombay, Bombay, various years; Annual Report of the Sanitary Commissioner for the Government of Punjab, Lahore, various years; Annual Report of the Sanitary Commissioner of United Provinces of Agra and Oudh Allahabad, various years.

note.

The Punjab famine of 1896-97

The early cessation of both the summer and autumn rains of 1896, and the much delayed winter rains of 1896-97 - as reflected in lower annual rainfall averages - were responsible for a considerable failure of at least two harvests in substantial parts of Punjab (see Table 3.1). These harvest failures in Punjab, though not uniform across all districts, coincided with widespread crop failures in many other Indian provinces. All this caused a very sharp rise in food prices, bringing famine conditions to much of the province. According to the estimates of the Punjab's Director of Land Records and Agriculture, the province's autumn harvest of 1896 fell short of the normal level by about one-third. In Hissar district the failure was nearly complete. Excepting two districts (Jhang and Muzaffargarh) in which there was almost no harvest failure, output declines ranged between 5 and 50 per cent below normal.[3] Relief measures, especially test works, were opened in the affected districts around November of 1896.[4] In the second week of March of 1897 the average daily numbers relieved by all means reached its maximum (which amounted to about 4 percent of the population in the affected areas).[5] With the reaping of the rabi harvest (Feb-Mar) of 1897, which

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[3] See Report on the Famine of 1896-97 in Punjab, pp.5-6.

[4] However, owing to a localised failure of fodder supplies and a partial failure of the *rabi* harvest of 1896, relief works were opened as early as August of 1896 in Phalia Tahsil of Gujrat district; Ibid.

[5] Ibid. p.14.

was thought to have reduced both the famine severity and the demand for relief in most districts, relief works began to be curtailed and were virtually closed by May of 1897. With the arrival of the monsoon rains in July food prices tended to decline and the famine started to draw to a close.

Figure 3.1 plots monthly movements of the price of jower, and the CI and MI during 1895-98. The daily average numbers of persons on relief at the end of each month in the course of the famine have also been plotted. The food prices show a rising tendency starting in 1895. Prices rose rather sharply throughout 1896 and reached a maximum in August of 1897. In comparison with the major mortality Punjab famine of 1899-1900 (examined in the last chapter) the peak food price during the 1896-97 famine appears to have been somewhat higher.[6] However, the CI did not show any clear declining trend until February of 1897. Strikingly, conceptions were <u>above</u> baseline levels during April-August of 1896 when food prices were rising markedly; indeed the CI simply fluctuates rather than evincing any clear trend during 1896. However, monthly conceptions were substantially below baseline levels during much of 1897.

It is interesting that a significant reduction in conceptions occurred at a time (during March-August 1897) when overall mortality seems to have <u>improved</u> compared to its baseline level. The MI remained considerably below its baseline level during the prime famine period (November 1896 to September 1897). However, a peak in the MI occurred in the

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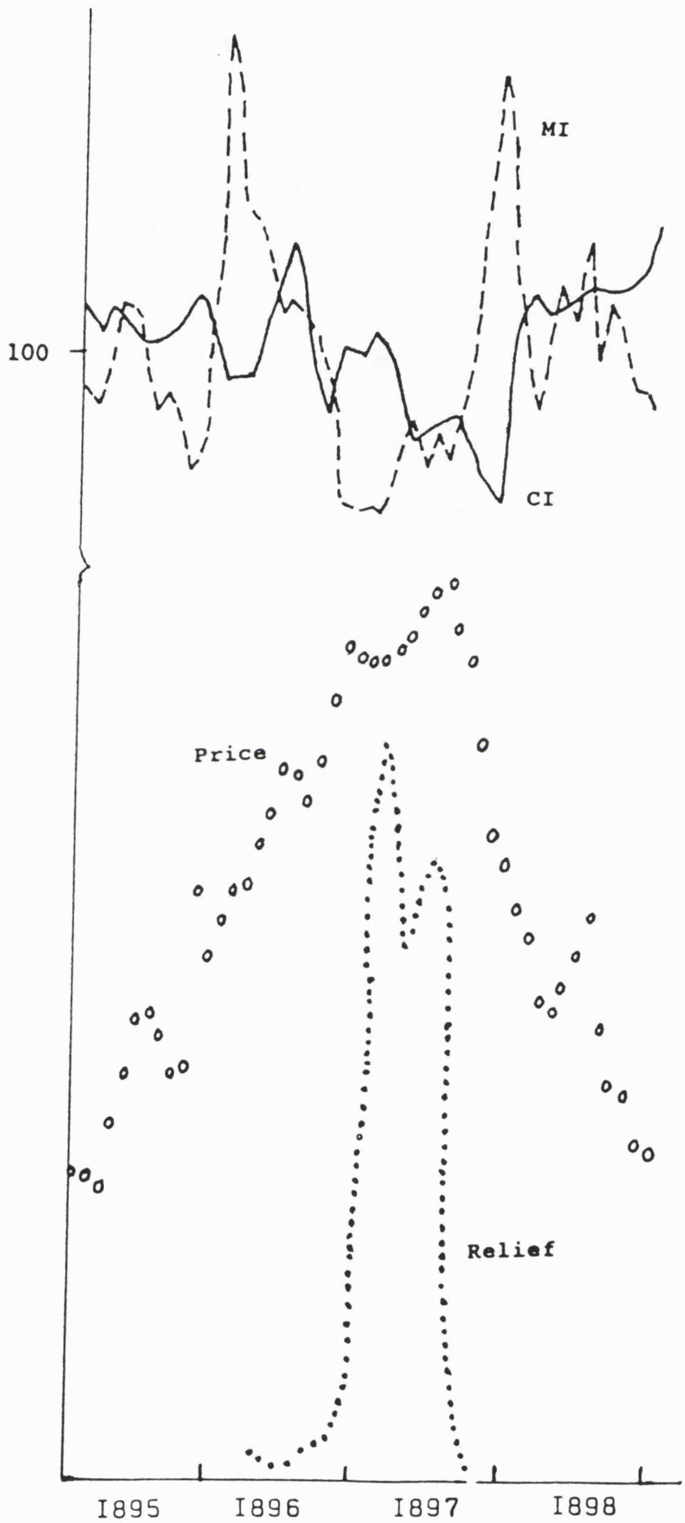
[6] In a study of the situation in Hissar - the most severely affected district - price rises in 1896-97 are also reported to have been larger than in the famine of 1899-1900; see Guz (1989), p.216.

Figure 3.1 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, Punjab, 1895-1898.



Ranges of variation: MI, 81.1 (Oct. 1895) to 145.7 (Nov. 1895); CI, 77.3 (Nov. 1898) to 123.9 (Dec. 1898); jower price, 27.8 (March, 1895) to 8.27 seers per rupee (July 1897); average daily number of persons on relief, 5, 638 (Sept. 1897) to 128,940 (Feb. 1897).

Sources: See Table 3.2 and footnotes 1 and 2.

closing months of 1897, and this was largely due to a sudden jump in fever mortality in October and November of that year. This peak in the MI, however, is of both smaller size and shorter duration compared with the MI peak in late 1900 (compare Figures 2.8 and 3.1). Indeed, the annual death rate for 1897 does not appear to have risen above the average rate for the previous five year period (see Table 3.2). Note, however, that the timing of the fever-mortality peak seems to have been very similar to what occurred on a much larger scale in 1900. Fever deaths in Punjab normally peaked during October-December.[7] But the occurrence of the MI peak during the post-monsoon months of 1897 implies that even though on a smaller scale, the peak was partly shaped by post-monsoon conditions favourable to mosquito breeding and malaria transmission (e.g. increased surface water build up and humidity). Thus although overall annual mortality during the famine did not exceed the pre-famine normal level, an excess mortality peak in the post-monsoon months - similar to what happened in 1900 - does seem to have occurred.

It is also worth remarking that although overall annual mortality did not rise above its baseline level, conceptions appear to have declined in response to the famine distress and associated disruptions (e.g. nutritional deprivation, wandering etc). And the lowest CI, as in most of the major famines examined in the last chapter, coincided with the maximum MI, signifying independent and additional negative effects of excess mortality on fertility. Figure 3.1 also

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[7] See also Zurbrigg (1988), p.7.

shows that during the <u>early</u> months of 1896 a significant peak in the MI occurred - actually slightly larger than that in late 1897; but its effect on conceptions was slight compared to the reduction in conceptions in the course of the famine. This seems to confirm our view that a significant elevation in mortality exerts a stronger negative effect on fertility in the wake of a famine than it does in isolation from famine conditions. Moreover, a smaller fertility reduction in this 1896-97 famine (compared to that of 1899-1900 which involved many excess deaths) probably reflects both less intense distress and less excess mortality. Also, note that conceptions rose rather sharply above the baseline level from the beginning of 1898 and continued high thereafter. This conforms with our hypothesis regarding excess fertility in the immediate post-famine period.

Interestingly, the average daily number of relieved persons reached a maximum in a month (February of 1897) when conceptions were near to the normal level, and mortality was actually below its baseline level by about 25 per cent. However, the number of persons on relief stayed rather high until the beginning of the monsoon in June; at that time the resumption of both the rains and normal farm activity marked a drastic reduction in relief operations (especially relief works). The MI peak occurred at a time when virtually all the relief operations had been closed. This (as also in the famine of 1899-1900) was largely due to the fact that peak mortality occurred very late in 1897, being essentially a magnification of usual peak fever mortality. Nevertheless, the overall mortality cost of this famine still seems have been negligible. Table 3.3 shows that the cause composition of deaths did not undergo any perceptible change during the main famine year. Thus, presumably, any famine-induced epidemics were also much less severe.

Part of the explanation for all this may indeed lie in a comparatively low level of distress. In terms of drought intensity, crop losses and their spread, the famine of 1896-97 appears to have been less severe, especially compared with the famine of 1899-1900. Reviewing both famines in the context of Hissar - one of the most severely affected districts - Guz attributes lower excess mortality in 1896-97 partly to a lesser degree of production failure. She argues that despite the higher food prices of 1896-97, the crop failure was less drastic and thus entailed a smaller number of people losing their food entitlements.[8]

This said, the famine of 1896-97 was not exactly light. Indeed, the number of people on relief was relatively high. As the Report on the famine states, ".... judged by the number of persons relieved, the expenditure incurred, the extent of crop failures, the duration of the drought and dearth of fodder and the high prices which prevailed, the Punjab famine of 1896-97 was probably as severe as any famine which preceded it since annexation, yet as compared with other parts of India the Province must be regarded as having escaped somewhat lightly".[9] Compared with other provinces the severity of

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[8] See Guz (1989), p.216.

[9] See Report on the Famine in 1896-97 in Punjab, Lahore: Government Press, 1898, p.3.

Table 3.3 Cause-specific death rates in the pre-famine (baseline) and famine years, four historical famines of lesser mortality

	Punjab		United Provinces		Bombay		Bombay	
Cause of death	**1891-95**	**1897***	**1890-94**	**1897***	**1901-04**	**1906***	**1907-10**	**1912***
cholera	0.14	0.03	2.70	0.94	0.43	2.50	0.56	3.49
	(0.46)	(0.09)	(7.98)	(2.32)	(1.07)	(7.13)	(1.90)	(9.44)
smallpox	0.27	0.78	0.42	1.86	0.20	0.22	0.19	0.34
	(0.88)	(2.25)	(1.24)	(4.60)	(0.50)	(0.63)	(0.65)	(0.91)
fever	21.15	20.57	24.83	31.20	14.53	14.86	13.41	15.49
	(68.76)	(66.25)	(67.50)	(77.11)	(35.99)	(42.38)	(45.60)	(41.91)
dysent\dia.	0.75	0.77	1.05	1.25	3.19	3.34	2.39	3.08
	(2.43)	(2.48)	(3.10)	(3.09)	(7.90)	(9.53)	(8.13)	(8.33)
plague	n.a	n.a	n.a	n.a	11.07	2.79	2.30	1.57
					(27.42)	(7.96)	(7.82)	(4.24)
respiratory dis.	n.a	n.a	n.a	n.a	3.21	3.28	3.05	3.83
					(7.95)	(9.36)	(10.37)	(10.36)
injuries/acc.	0.33	0.35	0.56	0.71	0.37	0.37	0.38	0.39
	(1.07)	(1.12)	(1.66)	(1.75)	(0.92)	(1.06)	(1.29)	(1.06)
all other	8.12	8.54	3.48	4.48	8.17	7.71	7.13	8.78
	(26.40)	(27.50)	(10.29)	(11.07)	(20.23)	(21.99)	(24.24)	(23.76)
All causes	30.76	31.05	33.82	40.46	40.37	35.06	29.41	36.96
	(100)	(100)	(100)	(100)	(100)	(100)	(100)	(100)

Notes: 1) The years marked (*) are the prime famine years. 2) The above cause-specific death rates (expressed per 1000 population) are based on constant denominators - being the respective populations under registration system according to the census prior to the famine. The rates for Bombay Presidency for 1912 are based on the population according to the 1901 census (instead of the 1911 census) for considerations of comparability. 3) The figures in parentheses are the respective percentage shares to total deaths. 4) n.a = not available.

Sources: See Table 3.2.

distress in Punjab was probably somewhat less acute.[10] Part of the explanation may indeed lie in the relatively good provision of relief. In comparison with the famine of 1899-1900 relief was certainly more liberal.[11] For example, relief works in connection with the construction of the Jhelum Canal in Gujrat district, which provided employment to a large number of villagers from surrounding areas, paid the dependents an "extraordinarily high" proportion of the total amount spent on workers (more than 20 per cent); moreover, there were said to be an "excessive" number of non-working children, constituting about 46 per cent of workers (in day units), while "in no province has it exceeded 25 per cent".[12] Such relatively liberal relief in Punjab may have been responsible, in part, for "less acute" distress and hence almost no overall excess mortality. This view is also shared by Guz who in her study concludes that "[t]he strict and inclement attitude of the relief administration probably accounted, in part, for the greater mortality of the latter famine [of 1899-1900]".[13] However, the less severe malaria epidemic of 1897 was probably in part due to some specific climatic factors.[14]

The United Provinces famine of 1896-97

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[10] As Higham writes, "Distress in Punjab was less widespread and of shorter duration than in other provinces and even where it existed was probably less acute"; see Higham (1897), p.11.

[11] See Bhatia (1963), p.253.

[12] See Higham (1897), p.7.

[13] See Guz (1989), p.218.

[14] See Whitcombe (1990)

The drought of 1896 and consequent crop losses also initiated famine in much of the United Provinces (see Table 3.1). In fact for about three years preceding 1896 United Provinces experienced somewhat unfavourable weather conditions, which caused partial failures of some crops.[15] There was deficient rainfall in 1895 (especially during the autumn and winter rains), which partially affected the rice districts. And food exports into North-Western Provinces and Oudh from Punjab declined in the latter half of 1895. All these developments raised food prices in 1895; by early 1896 prices were about 25 per cent higher than normal (see Figure 3.2).[16]

Against this background the monsoon failure of 1896 seems to have been a final blow which plunged the province into a serious famine. An estimate by the Director of Land Records and Agriculture was that the magnitude of short-falls over normal levels in the autumn food crop of 1896 and spring crop of 1897 (owing to erratic winter rains in 1896-97) were respectively about 60 and 40 per cent.[17] Thus in terms of both drought and production losses, the famine of 1896-97 seems to have been as severe as that of 1907-08 (which was examined in the last chapter).

Figure 3.2 shows that the price of jower rose fairly

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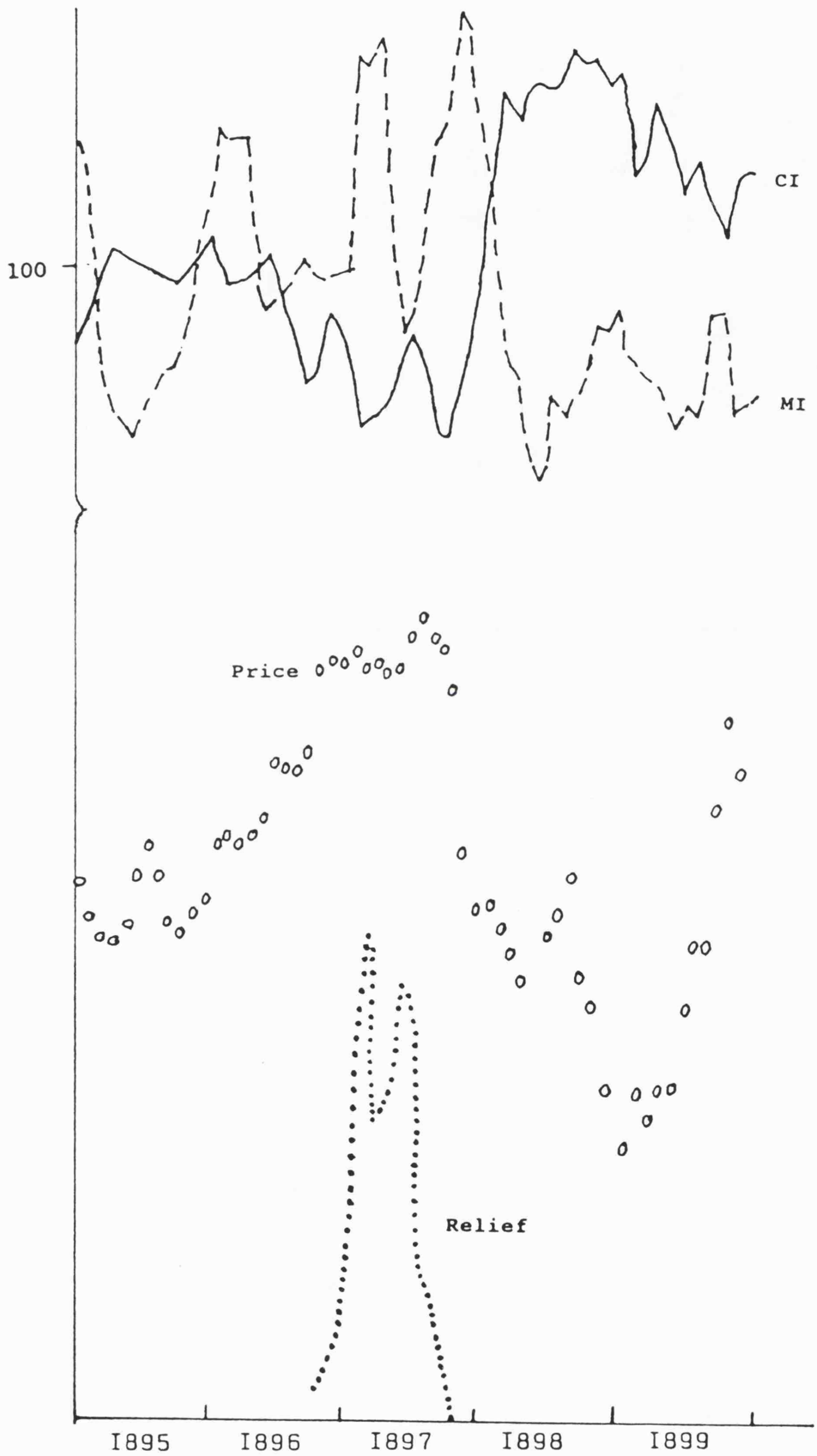
[15] For details of the antecedents of famine see Resolution on the Administration of Famine Relief in the North-Western Provinces and Oudh during 1896 and 1897, Allahabad: Government Press, 1898, Chapter 1.

[16] Ibid, p.7. Test works were opened during the summer of 1895 in Rai Bareli, Sitapur and Hardoi districts; also large remissions and reductions of revenues were made in 1895 by the government for the famine-prone Bundelkhand region.

[17] Ibid., p.65. It may be noted that damage to crops was mostly on unirrigated lands; pp. 64-65.

Figure 3.2 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, United Provinces, 1895-1899.



Ranges of variation: MI, 72.7 (May, 1899) to 145.5 (Oct.1897), CI, 71.6 (Aug. 1897) to 138 (Aug. 1898), jower price, 28.7 (Dec. 1898) to 8.43 seers per rupee (July 1897); average number of persons on relief, 6,097 (Oct. 1897) to 1,696,722 (Feb. 1897).

Sources: See Table 3.2 and footnotes 1 and 2.

rapidly throughout 1896, reached a maximum in July of 1897, and then declined rather swiftly thoroughly the closing months of the year. In fact the price rises seem to have been comparable with those of the 1907-08 famine (compare Figures 2.10 and 3.2). From the middle of 1896 conceptions were below their baseline levels; and they remained so up to the end of 1897. During the first few months of 1897 mortality rose above its baseline level; but it fell back drastically during May and June. Then the MI rose again and finally peaked in October of 1897. Thus there were two mortality peaks in 1897; and also two corresponding troughs of the CI. The below-normal conception levels during the latter half of 1896 were probably in response to famine distress (as reflected in rising food prices), while the peaks in (proportional) excess mortality reduced conceptions even further to reach minimum levels twice during 1897. However, the peak in the MI during this famine appears to have been much smaller than in the famine of 1907-08. This is also reflected in the smaller trough in the CI (compare Figures 2.11 and 3.2). This confirms the view that the extent of fertility reduction during a famine is largely determined by the severity of distress and the associated excess mortality. However, conceptions returned to normal levels by the end of 1897. But at the start of 1898 the CI rose rather abruptly much above its baseline level and did not return to near normal until late 1899. This again conforms to the hypothesized above-normal level of fertility ("excess fertility") in the immediate post-famine period. And mortality - in accordance with the hypothesis about post-famine demographic responses -

remained significantly below its baseline level, at least for the two years following the year of peak mortality.

The average daily number of persons on relief (of all kinds) reached a maximum in February of 1897, and then started to decline. There was virtually no relief being provided at the time of peak MI in October of 1897. Thus in this famine we find another example where relief provisions began to decline much earlier than the resumption of monsoon. However, it is notable that overall relief provision during this famine was both relatively timely and large compared to the disaster of 1907-08 (compare Figures 2.11 and 3.2). Table 3.3 shows that most of the excess mortality in 1897 (the main mortality year) was accounted for by excess fever deaths, although there was also some rise in deaths from dysentery/diarrhoea, smallpox and other causes. Interestingly, there was a significant decline in cholera mortality compared to normal. As the Sanitary Commissioner of the United Provinces remarked in his report for 1897: "Inasmuch as the reduced condition of the people and the accumulation of immense bodies of workers on relief works might have been expected to result in a heavy mortality and extensive diffusion of the disease [i.e. cholera], this result must be regarded as extremely satisfactory".[18] The official report on the relief administration notes, "It is impossible to attribute this [i.e. the comparative lack of mortality from cholera] to any other cause than the extraordinary attention paid to sanitation and in particular to securing a pure water-supply

[18] Ibid., p.18.

on all relief works in poorhouses."[19] However, the MI peak in early 1897 was mainly due to mortality from dysentery and diarrhoea. Since this epidemic of dysentery and diarrhoea is likely to have greatly affected people in relief camps, the drastic fall in the number of persons on relief in March may partly have reflected this excess mortality (see Figure 3.2).

The MI peak in October seems to be a magnification of usual fever (malaria) mortality in the post-monsoon months. But this MI peak appears to have been much smaller than that which occurred in late 1908 (compare Figures 2.11 and 3.2). Thus, while the famine of 1896-97 does not appear to be less severe with respect to food price rises, crop loss, and relief provision than the famine of 1907-08, the scale of overall excess mortality is <u>much</u> smaller. Furthermore, the time patterns of the MI and CI also appear to be broadly similar, except for much smaller respective peaks and troughs in the 1896-97 famine. This, in turn, implies that the famine of 1896-97 involved both less severe distress and associated epidemics. The timing of MI peaks may have partly been shaped by environmental factors and social disruptions (which assist disease transmission) - factors which were probably common in both the famines. But explanation for the lesser severity of distress and smaller scale of adverse demographic effects in 1896-97 may partly be ascribed to better relief provision too.

Compared to the famine of 1907-08, the relief measures

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[19] Ibid. p.137. The <u>Report</u> goes on to stress that "where.. cholera made its appearance, as it repeatedly did in certain districts, it was on each occasion successfully met by prompt transfer of the workers or poor-house inmates to another locality, by isolation of the infected gangs, and by the protection and disinfection of the new water-supply. Over and over again were outbreaks of cholera suppressed by these measures on the appearance of the first few cases", p.137.

provided in 1896-97, especially the large-scale provision of works, seem to have been particularly timely. For example, while in the last week of October 1896 - the drought year - the number of persons on relief was about 100 thousand, in the later famine there was virtually no provision of relief until the end of November of 1907; and a comparable number of persons on relief was not reached until January of 1908. The total number of persons (including dependents) on public works during 1896-97 was nearly twice the number recorded during 1907-08.[20] According to the official report on relief administration in 1896-97, relatively small number of excess deaths, "especially of an epidemic character in the relief centres" should be ascribed to "the measures taken to secure sanitation and a good supply of pure water and to check epidemic disease on its first appearance".[21] Moreover, expenditure on gratuitous relief (i.e. on dependents and doles) constituted a higher proportion of total relief expenditure (12 per cent) in the 1896-97 than in 1907-08 (8 per cent). Such differences in the timing, magnitude and nature of relief policy thus probably accounted for a large part of the differential severity of famine-induced epidemics. The Famine Commission of 1898 praised the Government of North-Western Provinces for showing "incessant activity and watchfulness" during the famine 1896-97; and it also described its organisation of relief as "a conspicuous success and a

[20] The ratio is 1.85; see Resolution on the Administration of famine relief in the United Provinces of Agra and Oudh during the years 1907 and 1908, Allahabad: Government Press, p. 150.

[21] See Report on the Famine of Punjab in 1896-97, p.130.

great administrative feat".[22]

The Bombay famines of 1905-06 and 1911-12

After a year of less than normal rainfall in 1904, the premature cessation of the monsoon, and the almost complete failure of winter rains in 1905 initiated famine conditions in much of Bombay Presidency (especially the famine-prone Deccan region)(see Table 3.1). Crops in 1905-06 failed in more than 50 per cent of the area sown; and the agricultural outturn was only one quarter of the normal level.[23] However, according to the official Report on the famine, crop failures and famine distress were confined to the following 8 districts: Nasik, Ahmednagar, Poona, Sholapur, Satara, Bijapur, Belgaum and Dharwar. There were fair harvests in other parts of the Presidency and in adjacent native States, to where a large number of agricultural labourers probably migrated. Relief measures were opened in the affected areas around December of 1905, and they continued in operation until the end of October 1906. On the whole, in terms of both rainfall and crop failure, this famine seems to have been quite severe even when compared to the earlier major famines in Bombay Presidency.[24]

Figure 3.3 presents monthly conception and mortality indices, prices of jower and average daily numbers of persons on relief for Bombay presidency. It shows that food prices

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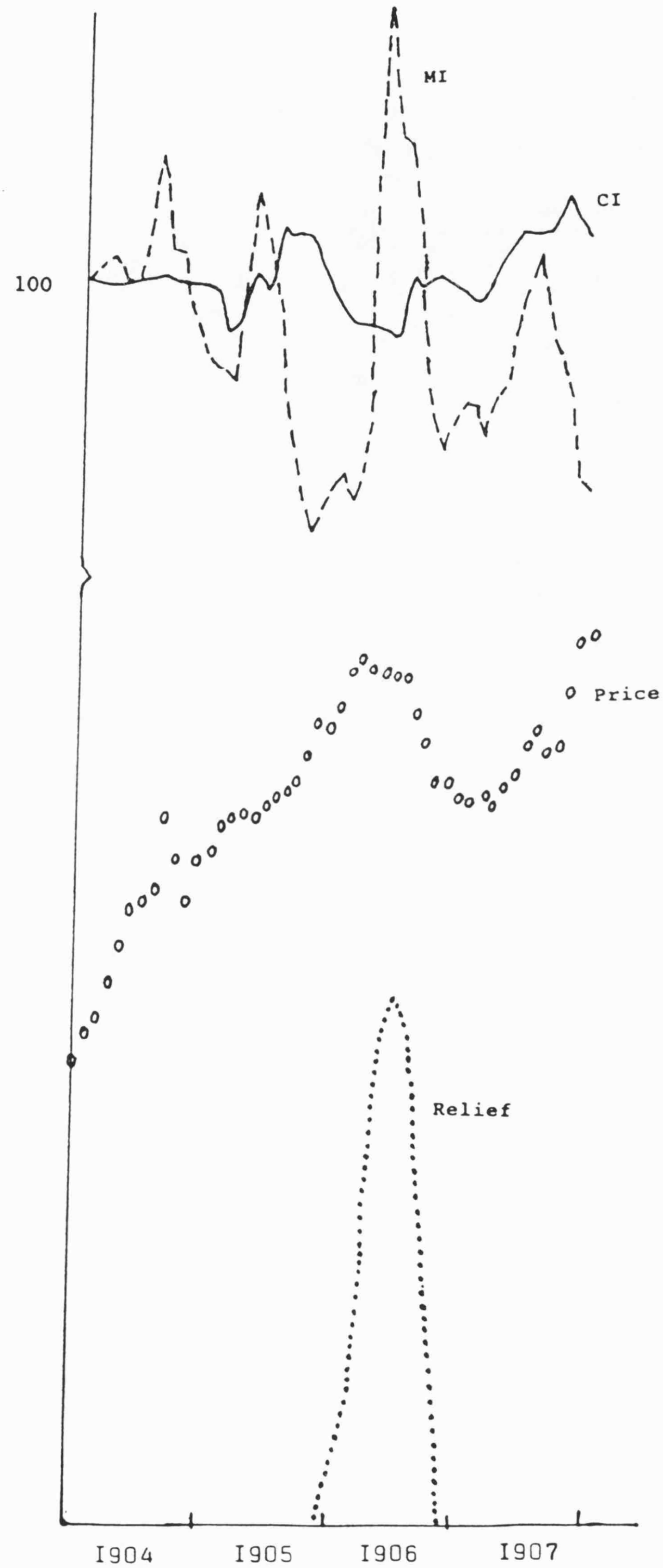
[22] Quoted in Bhatia (1967), p.247.

[23] See Report on the Famine in the Bombay Presidency 1905-06, Bombay: Government Press, 1907, p.2.

[24] See McAlpin (1983)

Figure 3.3 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, Bombay Presidency, 1904-1907.



Ranges of variation: MI, 56.1 (Oct. 1905) to 148.9 (May, 1906); CI, 90.1 (June, 1906) to 116 (Sept. 1907); jower price, 25.7 (Janu. 1904) to 11.5 seers per rupee (Dec, 1907), average daily number of persons on relief, 4,893 (Dec. 1905) to 92,158 (June, 1906).

Sources: See Table 3.2 and footnotes 1 and 2.

were increasing from early 1904, and they rose quite dramatically in 1905; the maximum price prevailed early in 1906. Although food prices declined from this peak in the latter half of that year, they remained very high. Indeed, prices went up again during 1907.

Conceptions did not fall below baseline levels until late in 1905 (when prices were extremely high) and the CI reached its minimum in the middle of 1906 (see Figure 3.3). This implies that reduction in fertility did not occur until the prime starvation phase. Mortality, however, was far <u>below</u> its baseline level especially during the latter half of 1905 and early 1906. This said, the MI peaked rather abruptly in May of 1906 and returned sharply to around normal in August, before becoming relatively low again. Thus, except for the very short-lived elevation of the MI around the middle of 1906, mortality levels for most of the famine period - and 1907 - were markedly <u>lower</u> than the respective baseline levels. The sharp MI peak in May was largely related to an outbreak of cholera.

The data on relief show a sharp rise in numbers of people from around February 1906. The numbers then peaked in June and subsequently declined with the resumption of the monsoon. The social disruption associated with relief works (i.e. population movements and congregation) probably played a part in the outbreak of the cholera epidemic. It is also notable that there was no elevation in the MI during the post-monsoon period (i.e the later months of 1906) - the time when an outbreak of malaria might normally be expected. Indeed, to reiterate, mortality during late 1906 was lower than during the baseline period (see Figure 3.3). Table 3.3 shows an increase in mortality from cholera in 1906, while the number of fever deaths was similar to the baseline level. In fact there appears to have been a definite improvement in overall registered mortality during the famine (see Table 3.2). This seems to stem solely from the drastic reduction in plague mortality (see Table 3.3). The connection between food shortage and increased plague mortality is probably very weak. In her study of famines in the Bombay Presidency McAlpin also excluded plague deaths while estimating excess deaths due to famine. Excluding plague from her calculations she arrived at a figure of 2.4 excess deaths per 1000 population in the famine of 1905-06 for the whole of Bombay Presidency.[25] This is indeed a very small quantum of excess mortality compared to earlier major famines. In this connection small rises in deaths from cholera, smallpox, fevers, dysentery/diarrhoea and respiratory diseases are shown in Table 3.3. It may be then that a drastic fall in plague mortality in 1906 outweighed modest increases in mortality from some other causes.

However, it is not very clear whether a drastic reduction in deaths from plague was connected with the drought and famine of 1905-06. Outbreaks of plague are related to a variety of environmental conditions. For example, as one authority writes, "Cold limits the fleas's [i.e. the rat flea X. cheopis] activity, while heat retards its productivity, and humidity of less than 70% kills it."[26] It seems plausible,

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[25] See McAlpin (1983), Table 3.13, p.76.

[26] See Gottfried (1983), p.9.

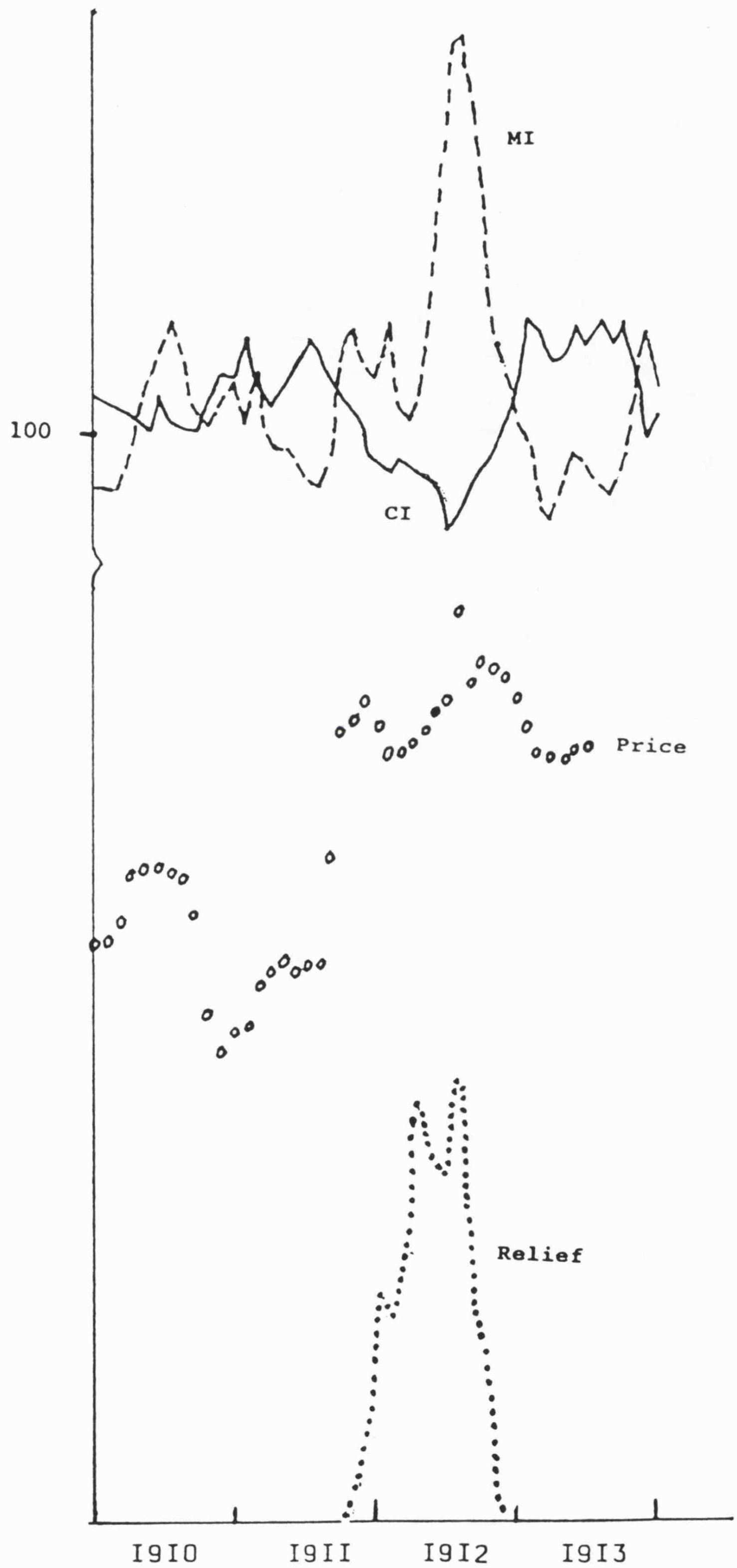
then, that deficient rainfall for the three consecutive years of 1904, 1905, and 1906 (see Table 3.1) helped suppress plague mortality. In any case, even putting plague mortality aside, the very moderate mortality effect of this famine is clear.

The failure of monsoon rains in 1911 again precipitated famine in much of the Presidency. As Table 3.1 suggests, this later famine entailed a somewhat larger shortfall of rains. And it was probably more widespread than the previous famine; 11 districts were officially declared as famine-affected.[27] The cropping outturn during 1911-12 in the most affected tracts (i.e. Gujrat, Deccan and Karnataka) dropped by about 50 per cent compared with the preceding agricultural year. Figure 3.4 shows that food prices were on a rising trend from the beginning of 1911, and they rose very sharply after the middle of the year, reaching a maximum in July of 1912; prices remained very high subsequently. Conceptions were somewhat above normal until the closing months of 1911, when they began to fall below baseline levels; the maximum proportional reduction in conceptions occurred in June of 1912; and conceptions then went back above normal levels by the end of the year. Throughout 1913 conceptions were well above baseline levels, again consistent with immediate post-famine excess fertility.

As can be seen from Figure 3.4 mortality was marginally elevated during the second half of 1911. The MI rose dramatically after the first few months of 1912, reaching a peak in June-July; then mortality improved to reach baseline

[27] The overall percentage of population affected, according to the official estimates, was 29 in the 1905-06 famine while it was 38 for the famine of 1911-12; see McAlpin (1983), p.168.

Figure 3.4 Price of jower, mortality index (MI), conception index (CI), and average daily number of persons on relief, by month, Bombay Presidency, 1910-1913.



Ranges of variation: MI, 84.8 (March, 1913) to 164.7 (July 1912); CI, 83.9 (June, 1912) to 113.2 (May, 1913); jower price, 14.5 (Feb. 1910) to 9.1 seers per rupee (July, 1911); average daily number of persons on relief, 115 (Dec. 1912) to 108,888 (April, 1912).

Sources: See Table 3.2 and footnotes 1 and 2.

levels by the end of the year. Thus peak famine mortality can be said to have lasted from April to November of 1912. Once more there is a clear inverse correspondence between the MI and CI movements. Both the 1911-12 and 1905-06 famines share broadly the same time path of MI and CI movements.

Test works were started in some parts of the Presidency in August 1911; and relief measures of all kinds gradually became more widespread. The average daily number of persons on relief peaked in June 1912, and then declined rather sharply, presumably with the resumption of normal farm activities just after the monsoon's arrival. The provision of relief had virtually ceased by the end of 1912 (see Figure 3.4). As in the preceding famine, relief operations can be considered to have been relatively timely.

Table 3.3 shows that, not surprisingly, fever was the single most important specified cause of death during the pre-famine period. But increased mortality from cholera, dysentery/diarrhoea (epidemic outbreaks of which were often associated with social disruptions) and fevers together accounted for most of the excess famine mortality. Indeed, the proportional (and absolute) rise in mortality from cholera was much greater than for fever: cholera's share to total excess deaths in 1912 was 41 per cent, while its share of total deaths during the baseline period was less than 2 per cent. The corresponding figures for fever were respectively 29 and 46 per cent. The fact that in both famines cholera appears to have been the most prominent cause is also consistent with the early occurrence of the MI peaks. This link between cholera's relative predominance and early occurrence of peak mortality during a famine has also been noted in the last chapter.

Although the famine of 1911-12 led to a somewhat larger number of excess deaths than did the famine of 1905-06, the overall excess mortality associated with both famines can be regarded as modest, especially compared to the major late 19th century famines (compare Table 2.2 and Table 3.2). This has also been noted by McAlpin who has clearly demonstrated that the relatively small excess mortality associated with these famines of the first decade of the 20th century was not related to severity of drought and production failure. Close scrutiny of relevant data suggests that these famines were no less severe in terms of both the degree and extent of crop failure.[28]

Relatively prompt and liberal relief, then, seems to have contributed towards averting large scale mortality in these famines in Bombay Presidency. As the Report on the famine of 1905-06 notes, "The relief measures adopted were on the whole timely, adequate and successful".[29] For example, during the famine of 1905-06 59 percent of the average daily number of persons relieved were on gratuitous relief (even excluding from the statistics the dependents of relief workers).[30] Relief was also given in the form of suspension or remission of land revenue, and through *taccavi* loans. The emigration of people from the affected districts to relatively unaffected parts (e.g. Khanesh, Berar and Hyderabad) and to the growing

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[28] See McAlpin (1983), especially p.171.

[29] See Report on the Famine in the Bombay Presidency 1905-06, p.13.

[30] See Bhatia (1963), p.262.

metropolis of industrial Bombay also helped prevent famine distress from developing into major mortality. The official Report on the famine of 1905-06 states that in 1906 "the exodus [from the affected districts] was on an unprecedentedly large scale." Of course, this large-scale emigration was made possible by demand for labour induced by relatively good harvests elsewhere (e.g. Khandesh, Berar, and Hyderabad) and industrial development (especially increase in ginning factories) in more favoured parts of the province (i.e. in Bombay and other industrial cities). For example, in spite of huge immigration of labourers into Khandesh, "the wages of unskilled labour rose by half."[31] The Report on the 1905-06 famine remarked that "[t]his exodus proved to be of great service. Although the distress was severe, the numbers on relief were very low and a great saving in expenditure to the State resulted. The emigrants left their dependents behind them and a large proportion of these, who were helpless, had to be brought on the dole lists and relieved gratuitously. On the other hand the returning emigrants brought back with them savings sufficient to carry them on till normal times returned".[32] And the Report finally concluded by emphasising these twin beneficial features (i.e. of emigration and relief) for the better tackling future famines. It stated that:

> "[e]migration on a large scale of the able-bodied population will, if any conclusions can be drawn from the experience of 1905-06, be one of the most important

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[31] See Report on the Famine in the Bombay Presidency 1905-06, p.11.

[32] Ibid, p.11.

economic factors in future Deccan famines, and the organisation which will require the most careful attention in future will be that of systematic village inspection and the distribution of gratuitous relief to those who are unfit for work and have no means of support, combined of course with measures which pertain to all famines with a view to keeping the cultivator on his legs and enabling him save his useful cattle and sow his land in the year succeeding that of famine".[33]

The relief policy during the famine of 1911-12 was also comparatively liberal; 55 per cent of the total relieved persons received gratuitous relief. Another important feature of the policy was its emphasis on the provision of village works alongside large public works. As the Report on the famine states:

"The population to be provided for belonged to wild and backward tribes for whom it has been recognised that village works are most suitable. Village works were accordingly from the first made the backbone of the system of relief. A number of such works were opened in each *taluka*, but, as the famine gradually became more acute and the attendance increased, groups of village works were replaced each by a big central work and other village works were opened in order to close up the gaps. Thus the number of village works remained more or less constant, while the increase in the number of workers was met by an increase in the number of public works. This

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[33] Ibid, p.14.

policy was maintained until the approach of the monsoon, when it became advisable to replace some of the public works by village works."[34]

One implication of this policy was less congregation of people in relief camps and consequently less population movement; both factors presumably acting to limit the outbreak and transmission of epidemic diseases. Moreover, even people engaged on public works apparently preferred to come from their villages every day and return home every evening rather than residing continuously in camps located at work sites. This was also backed by a programme by which "[t]he dependents of workers on public works were not relieved at the works but by grant of dole in their villages" - a policy which marked a distinct and welcome deviation from "the ordinary rules of the Famine Relief Code".[35] Thus increased gratuitous relief - especially in form of more care for dependents on the village dole - and large disbursements of *taccavi* loans not only provided a favourable environment for organised migration in search of employment, but also helped create alternative sources of employment. Thus relief provisions during the famines appear to have been moderately successful in preventing these major subsistence crises from developing into large-scale mortality crises.[36]

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[34] See Report on the Famine in the Bombay Presidency 1911-12, p. 4.

[35] See Report on the Famine in the Bombay Presidency 1911-12, p. 5.

[36] The success of relief policy in mitigating excess mortality during these famines was partly helped by new employment opportunities created by the expansion of the economy. As McAlpin writes, "In the first decade of the twentieth century, the interaction of the general expansion of the economy, the increasingly diverse options available to agriculturists, and the famine relief policies of Bombay Presidency combined to prevent crop failures from becoming major demographic and economic catastrophes"; see McAlpin (1983), p.189.

3.3 AGE AND SEX DIFFERENTIALS IN MORTALITY CHANGE DURING THESE LESSER-MORTALITY FAMINES

The age-sex pattern of mortality in the above famines is also of interest. Table 3.4 provides age-sex specific death rates both for the pre-famine baseline periods and prime famine years. As we have seen in the last chapter, infants, young children and elderly people appear to be the most vulnerable to death. It is notable that while these famines entailed minimal overall mortality, infants and children seem to have been the most vulnerable groups, especially compared to most adult ages. In both Bombay in 1906 and Punjab in 1897 it is only infants and young children who appear to have experienced adverse mortality, while for most other age groups mortality seems to have improved. Even when mortality of children above 5 years of age recorded a decline the infant mortality rate rose (e.g. Bombay in 1906; and Punjab in 1897). Figure 3.5 presents proportional changes in registered deaths by age and sex. These proportional changes in mortality have been calculated from the respective average levels during baseline periods (see Table 3.4). Figure 3.5 shows that young children were particularly vulnerable in most of these lesser mortality famines. This contrasts with the age pattern found during major famines of heavy excess mortality, in which <u>older</u> children and <u>adults</u> often appear to have experienced relatively great mortality increases. The implication may be that even when a major mortality crisis does not result from a famine the adverse mortality effects of nutritional stress may still show through for infants and young children (and to

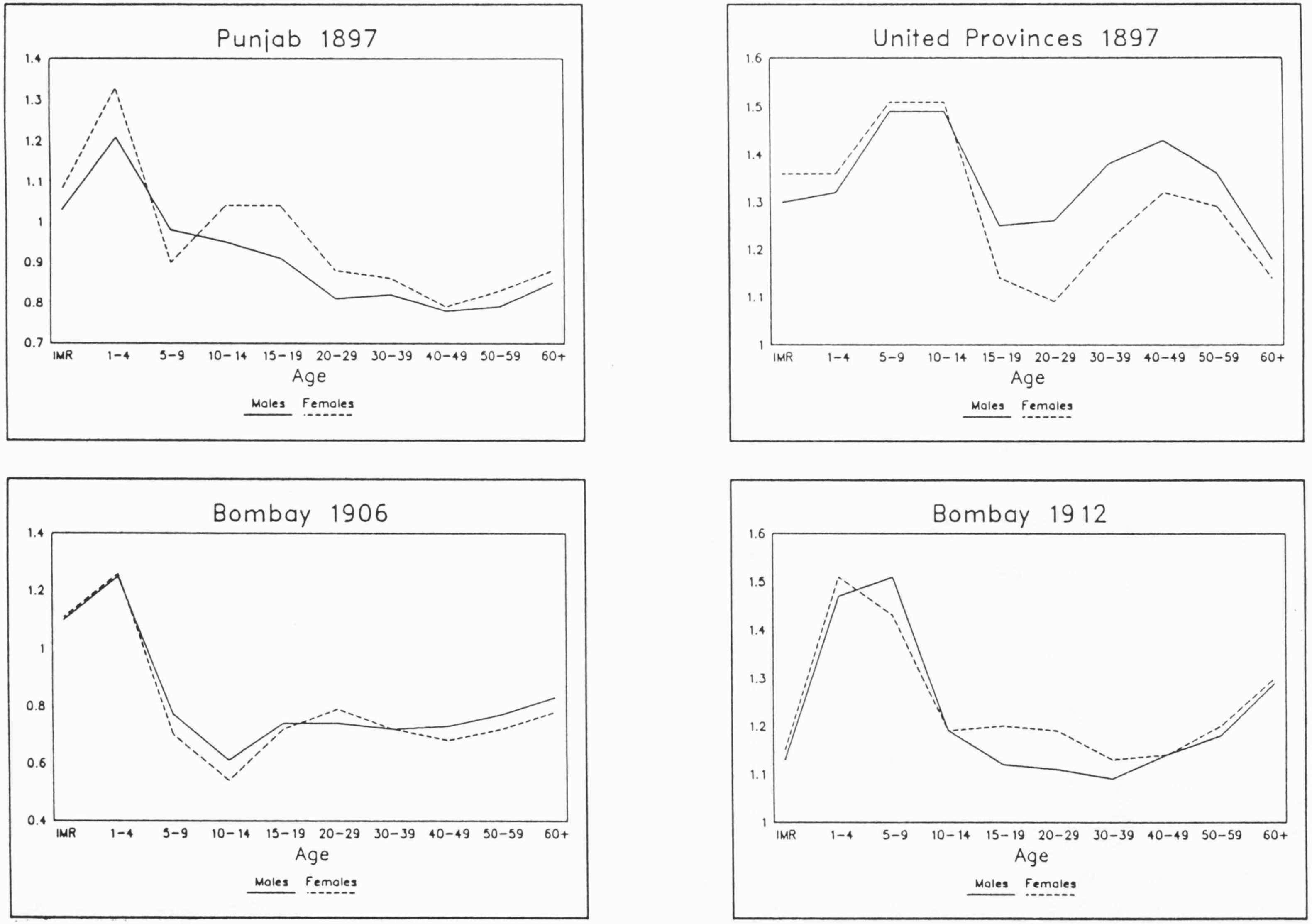
Table 3.4 Death rates by age and sex during the pre-famine baseline periods and the prime famine years, four lesser-mortality famine locations

	United Provinces				Punjab			
	1891-95		1897		1891-95		1897	
Age	M	F	M	F	M	F	M	F
IMR	221.2	217.4	286.9	296.6	215.7	224.7	221.4	242.7
1-4	55.7	53.5	73.6	72.8	48.3	49.7	58.4	66.7
5-9	13.6	11.7	20.2	17.7	10.2	10.9	10.0	10.8
10-14	8.2	7.6	12.2	11.5	7.2	8.3	6.9	8.6
15-19	11.8	16.3	14.7	18.6	8.2	9.3	7.5	9.3
20-29	15.9	17.0	20.0	18.5	11.5	12.5	9.4	11.0
30-39	20.1	17.5	27.7	21.4	15.1	16.3	12.4	14.0
40-49	30.6	25.6	43.7	33.7	23.5	21.3	18.4	16.9
50-59	50.0	39.1	68.0	50.6	37.0	32.0	29.4	26.4
60+	72.3	50.6	85.4	57.5	105.0	104.0	89.7	91.7
CDR	33.1	31.3	42.1	38.7	30.5	31.3	29.6	32.4
			(1.27)	(1.24)			(0.97)	(1.04)

	Bombay Presidency				Bombay Presidency			
	1901-04		1906		1907-10		1912	
Age	M	F	M	F	M	F	M	F
IMR	205.3	193.4	226.0	214.2	199.4	183.9	225.8	211.0
1-4	50.9	49.2	63.5	62.1	54.1	52.3	79.5	78.8
5-9	19.8	22.0	15.4	15.5	10.2	10.9	15.4	15.6
10-14	19.8	24.7	12.0	13.3	8.1	9.6	9.6	11.5
15-19	24.1	27.3	17.7	20.0	13.1	15.4	14.6	18.5
20-29	27.1	27.1	19.7	21.4	15.0	16.7	16.8	19.8
30-39	30.4	30.0	22.5	21.5	17.5	17.1	19.1	19.3
40-49	40.0	34.2	29.2	23.1	24.9	19.3	28.5	22.0
50-59	57.9	50.4	44.6	36.1	38.7	31.1	45.7	37.2
60+	113.4	110.8	94.5	86.0	88.9	79.9	114.7	103.9
CDR	40.2	40.6	35.3	34.9	29.7	29.2	36.9	37.3
			(0.88)	(0.86)			(1.24)	(1.28)

Notes: 1) All death rates have been calculated on the constant denominators being the respective populations according to the last census. Note, however, that death rates for 1912 have been calculated on the respective populations according to the 1901 census for the sake of comparability. 3) Figures in the parentheses are the respective ratios of the CDR (all ages combined) in prime famine year to that of the baseline period. 4) For Punjab the year 1892 has been excluded in the reference period, 1891-95.
Sources: See Table 3.2

Figure 3.5 Ratios of registered deaths in prime famine years to baseline years, by age and sex, four lesser mortality famine locations.



Sources: Based on Table 3.4.

a lesser extent the old). In other words, the comparative vulnerability to nutritional stress of infants, young children and elderly people remains overt during a subsistence crisis unless there are outbreaks of major epidemics and acute social disruptions which then dominate the age pattern of proportional mortality increase. It is also worth noting that in both the northern famines we have examined here (i.e. those in Punjab and United Provinces) there was a distinct female mortality disadvantage in both infancy and early childhood. This adds further support to our view that north Indian famines are harder on females - especially those in the childhood years.

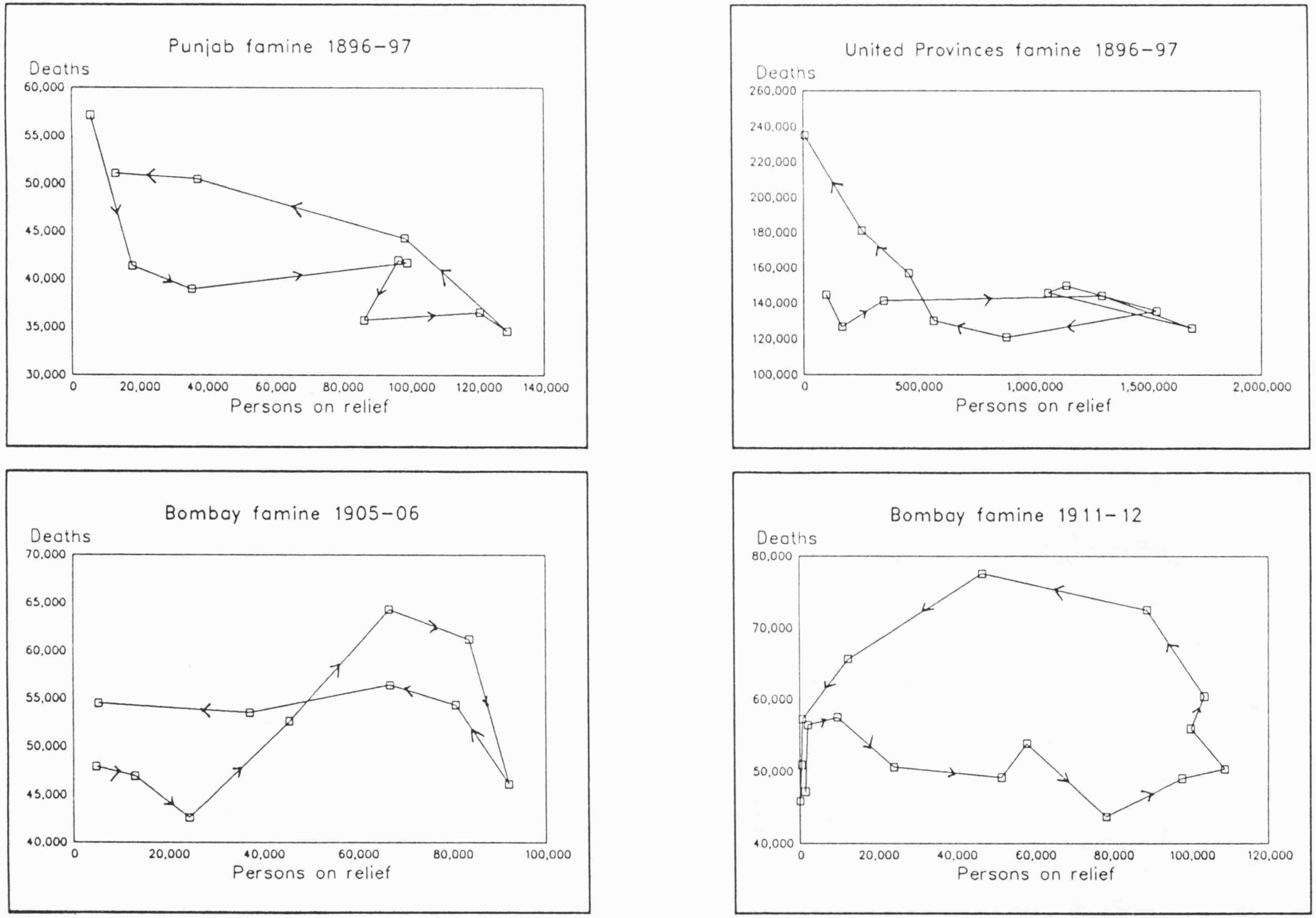
3.4 CONCLUDING DISCUSSION

The course of events during the famines with small (or even negligible) excess mortality appears to have been broadly similar to what we discovered for the famines involving large-scale mortality. All these famines - including those of the preceding chapter - were precipitated by drought (see Table 3.1). And food prices rose sharply, peaking in the year following the drought. Indeed, the extent of price rises during these lesser mortality famines does not seem to have been any less than in the famines involving huge excess mortality. Interestingly, the time-series data on the pattern of short-run movements of MI and CI also exhibit broad similarities with what we found in the last chapter. There was a reduction in conceptions during the period of maximum starvation (i.e. the later months of the drought year and the first part of the following year) - a period when monthly mortality levels hardly showed any sign of increase. Indeed, in some cases there were even improvements in registered mortality during these months. And in the lesser mortality famines the rises in deaths happened for a very short period of time.

The death peak occurred around the middle of the year in the Bombay famines, and during the post-monsoon months in the famines we have studied for Punjab and United Provinces. While the early MI peaks around the middle of the year in both the Bombay famines was largely due to cholera, the late MI peaks we found in Punjab and United Provinces were probably mainly due to epidemic malaria. All this is in conformity with our finding (based on the experiences of the major historical famines) that in the process of famine cholera epidemics tend to precede the occurrence of malaria epidemics. There was also a rough coincidence of the maximum MI and the minimum CI, confirming the additional fertility effects of excess mortality. Thus while all these features essentially appear to be shared with the famines which caused many excess deaths, the difference lies mainly in the scale of the demographic effects. Not only the peaks in the MI but also the troughs in the CI are much smaller for the lesser mortality famines. This almost certainly reflects, in large part, a lesser degree of overall distress and disruption.

Figure 3.6 presents scatter-plots of monthly deaths and relief provision in course of these lesser mortality famines. As can be seen, the relief provision in most cases (probably except Bombay during 1905-06) was increasing when the number

Figure 3.6 Scatter-plot of monthly average numbers of persons on relief and corresponding monthly numbers of registered deaths during the prime famine period, four lesser mortality famine locations.



Sources: See Table 3.2 and footnote 2.

of deaths was somewhat constant (e.g United Provinces and Punjab) or even declining (e.g. Bombay during 1911-12). And relief provision generally appears to have declined especially after the resumption of rains when there seems to have been an usual elevation of mortality.

The age-sex pattern of mortality provides an interesting aspect of the lesser severity of distress during these famines. That is, the greater proportional mortality increases for infants and young children (and probably the old) compared to other ages. This finding contrasts with the famines involving large-scale mortality, where older children and adults often experienced larger proportional increases. This may confirm the relatively great vulnerability of infants and young children to nutritional stress in circumstances in which a famine is prevented from developing into a mortality crisis. And the regional dichotomy of sex-differential in mortality increase too - particularly the female disadvantage in the northern parts - has been noticed in the lesser mortality famines.

Interestingly, the relatively mild overall demographic consequences of these famines does not seem to have been necessarily due to a lesser severity of drought and famine. The Punjab famine of 1896-7 was probably less severe and widespread than the famine of 1899-1900. But judged in terms of the failure in weather and crop output, the extent of food price rises, and the amount of relief expenditure, this famine certainly does not seem to have been a light one. Also, the famine in United Provinces in 1896-97 cannot be treated as being less severe than that of 1907-08.[37] Lastly, as McAlpin has demonstrated, the Bombay famines of 1905-06 and 1911-12 were no less "widespread and serious" than the famines of the preceding decades.[38] The extent of price rises in these later famines also seems to have been of quite comparable scale to those in the famines at the end of the nineteenth century.

While epidemic outbreaks occurred also in these famines (e.g. malaria epidemics in both United Provinces and Punjab in 1897, and cholera epidemics in Bombay in both 1906 and 1912), their severity was much less. Climatic and environmental factors sometimes play a part in the timing of peak mortality for epidemic diseases such as malaria. But the overall severity of epidemics often rests on the severity of distress (e.g. the extent of nutritional stress and starvation) and associated social disruptions. As Drèze and Sen remark, "in the case of famines the collapse of food entitlements is the initiating failure in which epidemics themselves originate".[39]

In the Punjab famine of 1896-97, for example, the absence of severe epidemics was partly due to a relatively minor degree of crop failure; but more adequate relief provision (particularly compared to the famine of 1899-1900) also played a role. Indeed, relief measures in some cases were started comparatively early (e.g. in both United Provinces in 1896 and Bombay in 1911). Large-scale migration from affected tracts

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[37] The percentage loss of autumn harvest compared to the normal level for all-United Provinces was 61 and 69 respectively in 1896 and 1907; and corresponding figure for spring harvest was 40 both in 1897 and 1908; see Resolution on the Administration of Famine Relief in the United Provinces of Agra and Oudh, Allahabad, 1908, pp.18, 32.

[38] See McAlpin (1983), p.170.

[39] See Drèze and Sen (1989), p.66.

to favoured areas (especially during the famine of 1905-06) was of considerable help, because "the people did not wander forth aimlessly in search of work, but knew exactly where they were going".[40] Attention was also placed on the provision of works in the villages; this probably helped to reduce population movements and large-scale congregations at relief camps - and thus helped contain the transmission of diseases such as cholera and dysentery/diarrhoea. Moreover, there are fairly strong indications that relatively liberal and rational relief policies - sometimes helped by general expansion and diversification in the economy - played a significant role in mitigating the scale of both distress and mortality.[41]

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[40] See Report on the Famine in the Bombay Presidency 1905-06, Bombay: Government Press, 1907, p.11.

[41] Reviewing the evolution of Indian relief policy during the nineteenth century, Klein remarks that "[w]hen more flexible and generous policies were invoked they were dramatically successful in reducing famine mortality"; see Klein (1984), p.201. It is probably worth noting what Drèze and Sen concluded on the basis of analysis of several famine experiences: "Many past experiences of famine prevention show the dramatic effectiveness that simple intervention measures can have on famine mortality. These measures have primarily taken the form of early protection of food entitlements, supplemented if possible with provision of drinking water and basic health care (especially vaccination)"; see Drèze and Sen (1989), footnote 5, p.66.

CHAPTER 4

REGIONAL VARIATION IN DEMOGRAPHIC CONSEQUENCES DURING THE MAJOR HISTORICAL FAMINES

4.1 INTRODUCTION

So far we have analyzed the demographic impact of famines at an aggregate provincial level. This provides an understanding of short-term aggregate demographic responses during the famine process. But examination of regional variation within a province may also provide insights into the factors which contribute to demographic consequences. This is because in major famines not all areas were similarly afflicted in terms of excess deaths. So inter-district analysis should help assess the relative importance of factors (e.g. drought severity, and relief provision) that shaped the demographic outcomes.

Of course, the question of regional variation is potentially far more complex than an aggregate province-level analysis. Indeed, a comprehensive study of spatial variation in demographic consequences might involve many complex forces (e.g. economic conditions, regional ecology, variation of infrastructure, and different patterns of relief). Thus a region with a relatively large proportion of irrigated land can be expected to cope better with a drought than a solely rainfall dependent region. However, given the existence of transport and communications network, trading and speculative activities may tend to spread dearth and high food prices across all regions - irrigated or unirrigated. Thus, in the context of an integrated market, a region with little loss of farm activities and employment may still experience a rise in food prices and associated distress, while a drought-affected region suffers both from employment (hence income) loss and price rise. From these considerations it may be hypothesized that regional variation in price rises actually may be a poor indicator of regional variation in famine distress (especially where a transport network is fairly developed). Furthermore, variation in the demographic impact of a famine may also involve factors such as migration, relief provision, and epidemics. Thus a significant flow of migration from one region to another, other things equal, will inflate the number of registered deaths in a receiving area and *vice versa*. Regional patterns of relief may also influence demographic consequences. A better provision of relief in one area may be hypothesized to mean less distress and less associated excess mortality. Here we will examine some of these issues using district-level data for selected major famine locations. These are the Bombay famines of 1876-78 and 1896-97, the Punjab famine of 1899-1900 and the United Provinces famine of 1907-08. Note that these famine locations have already been analyzed in detail at the aggregate province-level in Chapter 2 (except the Bombay famine of 1896-97).[1]

The primary source of district-level demographic data is

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[1] A somewhat detailed analysis of the Bombay famine of 1896-97 (at the province-level) has been made by Dyson; see Dyson (1991a). In our district-level analysis we have excluded the Berar famines because, compared to other provinces, Berar was extremely small.

the registration system. But principal sources of information on other variables (e.g. regional variation in drought, crop failure, price rises, and relief) include the annual provincial administration reports and separate official reports on famine adminstration. In the provincial reports on the famine administration districts have, almost always, been classified into "famine districts" and "non-famine districts". The former are those which were officially declared as "famine-affected" by the local-level administrations. Such official declaration of famine conditions at the district-level was admittedly based on the application of several tests and criteria which were prescribed in the Famine Codes.[2] It is important to note that relief provision was organized only in the officially declared famine-districts.

4.2 THE BOMBAY FAMINE OF 1876-78

Bombay presidency, or at least a large part of it, has traditionally been vulnerable to drought and famine. This is, of course, related to the scanty and uneven nature of monsoon rainfall in this vast and largely unirrigated land. The proportion of irrigated land to the total under cultivation has always been less than five per cent.[3] However, all regions were not equally vulnerable to drought. Table 4.1 provides some background on 23 districts, grouped into four divisions, under the British administration in the years immediately

[2] For discussions on those tests and criteria see the official reports on famine administration in several provinces.

[3] See McAlpin (1983), p.48.

Table 4.1 Background information on districts during the pre-famine period: Bombay Presidency

District/ Division	Population according to 1872 census	Average annual rainfall 1872-74	Yield of clean cotton per acre 1875-76 (lbs)	CBR 1874-75	CDR 1874-75
DECCAN DIVISION					
Khandesh	1,028,642	38.1	44.84	19.9	22.3
Nasik	734,386	29.9	57.08	26.3	21.1
Poona	907,235	63.8	43.16	22.7	20.0
Satara	1,061,002	88.0	41.02	28.8	20.2
Ahmednagar	773,938	45.7	12.87	30.8	24.3
Shalapur	718,034	42.9	23.87	20.8	19.4
Bijapur	816,037	34.2	10.02	21.3	18.1
Belgaum	938,037	60.6	29.92	29.4	26.5
Dharwar	988,037	47.9	46.24	28.4	26.5
Total	**7,966,061**	**50.1***	**34.33***	**25.4**	**22.2**
KONKAN DIVISION					
Kanara	398,406	159.1	-	30.4	27.8
Ratnagiri	1,019,136	179.9	-	15.4	13.4
Cobala	350,045	125.2	-	14.7	13.2
Thana	847,424	192.8	-	21.0	20.9
Total	**2,615,011**	**164.3***	-	**19.4**	**18.0**
GUJRAT DIVISION					
Surat	607,087	79.4	132.05	24.1	26.4
Broach	350,322	55.6	73.18	16.4	23.8
Kaira	782,733	46.5	143.25	20.5	23.4
Panch Mahals	240,743	46.2	n.a	17.6	15.6
Ahmedabad	829,637	34.7	50.17	18.9	24.5
Total	**2,810,522**	**52.5***	**99.66***	**20.0**	**23.7**
SIND DIVISION					
Hyderabad	721,947	9.5	425.01	5.8	8.2
Thar and Parkar	180,761	14.9	206.53	6.0	6.2
Sikarpur	776,227	8.3	49.64	6.0	9.6
Kurrachee	423,495	6.3	190.07	8.4	11.3
Upper Sind	89,985	6.4	117.14	8.6	9.1
Total	**2,192,415**	**9.1***	**197.78***	**6.5**	**9.2**
Bombay City	**644,405**	**-**	**-**	**20.1**	**25.9**
Bombay Presidency	**16,228,774**	**69.0***	**93.61***	**20.8**	**20.2**

Notes: 1) Figures marked (*) are the respective unweighted averages of the district-level figures. 2) There was almost no cotton cultivation in the Konkan division. **Sources:** Rainfall and demographic data: Annual Report of the Sanitary Commissioner for the Bombay Government, Bombay: Government Press, various years; data on yields of cotton: General Report on the Administration of the Bombay Presidency for the year 1875-76, Bombay: Government Press, 1877.

before the 1876-78 famine. Of the four divisions only Konkan normally received abundant rain. Both Deccan and Gujrat were usually the recipients of scanty rainfall and were thus relatively dry. However the districts of Sind division were the driest (see Table 4.1).[4] However, Sind was not as vulnerable to drought-related famine as the Deccan. This was partly due to the fact that Sind division - being extremely dry - used to rely on the cultivation of dry crops like cotton, sugar cane, and wheat. Also, agricultural production was largely based on the waters of the Indus river rather than on the monsoon rains.[5] Sind's relative prosperity and lesser vulnerability to drought was amply reflected in the fact of very high productivity of cotton cultivation, especially compared to the Deccan (see Table 4.1). Gujrat division, though dry, was not always affected by a general monsoon failure as severely as was Deccan. This was partly because "the southern districts of Gujrat lie open to the sea (rather than shielded behind the Ghats)".[6]

The vital rates for 1874-75 in Table 4.1 clearly indicate that the registration data were deficient; and the level of underregistration was almost certainly <u>not</u> uniform across districts. Very low registered vital rates for the districts of Sind reflect the division's own special difficulties in

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[4] The whole of Sind division is now included in Pakistan.

[5] See <u>Report on the Administration of the Bombay Presidency</u>, Bombay: Government Press, various years; see also Qureshi (1988), p.3.

[6] McAlpin (1983), p.26.

establishing the registration system.[7] However, while we cannot attach much confidence to the levels of these vital rates, proportionate changes in registered deaths and births may still be used for inter-district comparisons. Of course, we do this under the assumption that both registration coverage and its inter-district differentials did not change significantly within the very short space of time involved. Note that both the Deccan and Gujrat divisions registered comparatively high death rates in 1874-75. Relatively lower registered death and birth rates in Konkan division may be indicative that registration coverage in this region was slightly less. However, Konkon being a region of abundant rainfall, this may also be partly a reflection of the fact that this region was relatively secure from famine.[8]

We now analyze regional variation in the demographic consequences of the 1876-77 famine. Table 4.2 provides key indices of drought, crop losses, price rises, mortality and fertility effects and also relief provisions across the districts of Bombay Presidency. The officially declared famine districts (i.e. the Deccan division) - which were the only ones provided with government relief - have been distinguished from the rest; and districts in both groups have

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[7] The contemporary Sanitary Commissioner for Bombay Presidency in his annual reports commented upon some of the special difficulties faced by efforts to instigate registration in Sind.

[8] See also McAlpin (1983), p.54-55; indeed, McAlpin suggests that both low birth and death rates in Konkan may imply a different pattern of population growth - a pattern which implies "less wastage of human life". The underlying hypothesis is that "in Konkan, where the population was less subject to abrupt rises in the death rate due to famine, society had evolved norms for somewhat lower fertility resulting in lower birth rates"; see p.56.

Table 4.2 Indices of rainfall, land under cultivation, prices, relief provisions, mortality and fertility by district during the famine of 1876-78, Bombay Presidency

Districts	Index of rainfall in 1876 compared with average 1872-74	Index of land cultivated in 1876-77 compared with 1874-75	Index of price of jower in 1876-77 compared with 1874-75	Index of deaths in 1877 compared with 1874-75	Index of births in 1878 compared with 1874-75	Daily Average no. of persons on relief per 1000 population
Famine Districts						
Bijapur	13	27	176	561	16	80.7 (8.1)
Dharwar	28	51	186	320	35	38.3 (3.8)
Belgaum	35	62	169	282	42	33.7 (3.4)
Shalapur	14	34	365	252	45	84.9 (8.5)
Satara	44	62	248	243	61	31.4 (3.1)
Poona	40	48	215	170	57	56.5 (5.6)
Nasik	86	n.a	135	168	80	17.0 (1.7)
Ahmednagar	23	60	231	164	50	44.4 (4.4)
Khandesh	33	95	160	112	100	5.0 (2.3)
Average	**35***	**55***	**209***	**248**	**54**	**41.9 (4.2)**
Non-famine Districts						
Thar and Parkar	73	76	105	220	314	
Kanara	46	n.a	136	194	66	
Ratnagiri	36	100	n.a	156	87	
Hydrerabad	77	97	123	149	120	
Kurrachee	151	n.a	121	146	93	
Kobala	70	98	n.a	135	117	
Thana	43	54	123	133	92	
Sikarpur	58	105	105	98	109	
Surat	64	68	200	95	102	
Panch Mahal	90	n.a	n.a	94	105	
Broach	60	108	109	92	109	
Uppersind	120	n.a	100	89	86	
Kaira	68	76	157	86	98	
Ahmedabad	77	98	135	83	103	
Average	**73***	**88***	**128***	**118**	**98**	
Bombay city				198	105	
Bombay Presidency				191	92	

Notes: 1) Figures marked (*) are the respective unweighted averages. 2) Figures in parentheses are the respective percentages of gratuitously relieved persons to the total number relieved.
Sources: Data on prices and area cultivated: General Report on the Administration of the Bombay Presidency, Bombay, Government Press, various years; data on relief: Report of the Indian Famine Commission, 1898, Volume III, Appendix, London, 1899; on rainfall and demographic data: Annual Report of the Sanitary Commissioner for the Government of Bombay, Bombay: Government Press, various years.

been ranked separately (in descending order) with regard to the scale of mortality increase. It is clear from Table 4.2 that almost all of the Deccan region experienced a significant shortfall of rain in 1876, and hence much of the normally cultivated land had to remain uncultivated during 1876-77. Although shortfalls in both rain and land cultivation from pre-famine levels were not confined to the districts of the Deccan, it is apparent that such failures were relatively less in the other divisions. Indeed, some districts (e.g. Sikarpur and Broach) even recorded a slight increase in the area under cultivation in 1876-77.[9] This difference between the Deccan and other regions was also reflected in food prices. The districts of the Deccan (i.e. the "famine districts") generally experienced higher price increases than other regions. This probably partly reflects the fact that markets were not very well integrated. This should be judged in the light of the available transport and communication facilities which were, though developing, still relatively poor during the late 1870s. Thus the implication is that famine distress (particularly as evinced by rising prices) could not spread uniformly across districts. Conditions of severe famine distress were relatively confined to areas which were most severely affected by crop failures.

While the number of registered deaths more than doubled in the "famine districts", the "non-famine" areas on average recorded a modest (if not entirely negligible) increase in

[9] The district-level annual data on agricultural livestock also show large losses during the famine in the Deccan compared to other divisions; see e.g. Report on the Administration of the Bombay Presidency for the year 1877-78, Bombay: Government Press, 1878; p.181.

mortality (see Table 4.2). Similarly, the registered number of births in 1878 - which can be taken as approximately indicative of the number of conceptions in the peak famine year of 1877 - appears to have been reduced by about 50 per cent on average in the Deccan division; but all the other divisions, taken together, seem to have experienced no appreciable decline in births (see Table 4.2). Thus considering these two groups of districts - famine and non-famine - we find a clear correspondence between their presumed economic and demographic vulnerability.

Table 4.3 presents correlation matrix for the relevant measures. It shows that correlations of index of land

Table 4.3 Correlation Matrix involving Demographic and other measures presented in Table 4.2: the Bombay famine of 1876-78.

	Index of rain in 1876	Index of price in 1876-77	Index of deaths in 1877	Index of births in 1878
Index of cultivation in 1876-77	0.69*	-0.66*	-0.72*	0.86*
Index of rain in 1876		-0.64*	-0.70*	0.85*
Index of price in 1876-77			0.32	-0.58*
Index of deaths in 1877				-0.84*

* less than 1 per cent level of significance

Note: Data on changes in births and deaths for Thar and Parkar were excluded because of unduly extreme influences (see Table 4.2).

cultivation with indices of rainfall failure and price rises are respectively positive and negative - both being statistically significant and in expected directions. This implies that failures of the rains played a distinct part in determining failures of agriculture and hence price increases. As also can be seen from Table 4.3, the correlations of the index of births with the index of land cultivation and price are of the expected signs and also statistically significant. Note, however, that the relationship between the index of mortality and the index of land cultivation is much stronger (-0.72) than with the relationship with index of price (0.32). There may be a suggestion here that the extent of production failure is a better measure of distress than price rises *per se*. Note too that the reduction in births corresponds better with regional variation in the measures of distress. Moreover, the correlation coefficient between the indices of deaths and births is negative (as expected) and also statistically quite significant.

However, there are some notable irregularities to these generalizations at the district-level. For example, some non-famine districts (e.g. Thar and Parkar, and Kanara) experienced very large increases in mortality - even larger than some famine districts. As mentioned earlier, the division of districts into "famine" and "non-famine" was based on assessments made by district officials. However, such a sharp official distinction did not conform strictly to the real regional variation of distress. For example, Kanara which seems to have received less than half the normal rainfall in 1876, may well have suffered great food shortage and distress. Certainly it seems to have experienced both considerable mortality increase and fertility reduction (see Table 4.2). But Kanara was not officially recognised as a famine-affected district and was not provided with relief.

Thus the case of Kanara may be an example of administrative failure in the identification and classification of districts. However, the administration report for 1877-78 stated that: "The district of Kanara, without being affected by scarcity, became the resort of numerous immigrants from the famine country, who, being unaccustomed to the climate of the thickly-wooded coast and hill tracts, fell victims to fever and other diseases on their arrival".[10]

On the other hand, unlike Kanara, mortality increases in much of Sind division (e.g in Thar and Parkar, Kurrachee and Hyderabad) were not generally matched by signs of fertility reduction. Indeed, the fact that the registered number of deaths and births in Thar and Parkar both more than doubled is striking (see Table 4.2). As indicated earlier, the registration system, particularly in Sind, was extremely deficient. Apropos the enormous rise in registered births in Thar and Parkar in 1877 compared with the preceding year, the Administration Report writes that "no explanation of this increase has been given, but under the present system the registration of births and deaths cannot but be unsatisfactory."[11] In any case, an increase in the registered number of deaths (perhaps combined with an increased or constant number of registered births) in a less affected area may also be consistent with in-migration of famine victims.

This is probably best illustrated by the indices of registered deaths and births for Bombay in Table 4.2. The

[10] See Report on the Administration of the Bombay Presidency for the year 1877-78, Bombay, 1878, p.361.

[11] Ibid., p.360.

city recorded a considerable increase in mortality in 1877 with presumably no drop in the number of conceptions. In this context the Administration Report states that "The year [1877] has been an exceptionally unhealthy one, and there was a large influx of labourers from the coast and Deccan, amongst whom fever was both prevalent and fatal to an extraordinary degree. The total number of immigrants cannot be exactly stated, but during the six weeks that registration was carried on, it amounted to 36,258."[12] Note from Table 4.2 that in 1872 the population of Bombay city was only 644,405. So the volume of immigration was comparatively large. Note too from the foregoing quotation the perceptive linking of migration and mortality from "fever".

Relief operations may also exert an important influence on regional pattern of demographic consequences. Table 4.2 suggests that relief provision was relatively great in those famine districts which experienced comparatively large reductions in cultivated area (presumably reflecting greater crop losses). The estimated correlation coefficient between the index of land cultivated and the measure of relief is negative and very high (-0.95). In other words, relief operations appear to have been quite well targeted.

However, the impact that variation in the distribution of relief made on regional variation of mortality and fertility is not easy to judge simply by looking at the relevant district-level data in Table 4.2. Shalapur - experiencing severe drought and a large increase in mortality - received

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[12] Ibid, p.160.

the largest relief provision. Nearly equal relief provision in another most severely affected district, namely, Bijapur - which also recorded the largest mortality increase - may be suggestive that although relief was generally targeted in accordance with the severity of distress, it was not very successful in preventing demographic crisis. This, in fact, may imply several things (which are not necessarily mutually exclusive), such as the untimeliness, inadequacy, or excessive harshness of the relief measures which were provided. It is also possible that the allocation of large relief provisions to one area drew in victims from adjoining localities, and thus provoked epidemics and inflated the number of deaths in the receiving districts. But in turn this explanation implies inadequate relief provision in those areas from where people migrated. All this probably reflects both the inadequate and harsh nature of the relief provision. Proportion of gratuitous relief was indeed very small (see Table 4.2).[13]

While the question of what would have happened to mortality without relief remains open, the district-level data on relief and mortality effects indicate that relief policy was deficient in mitigating the great vulnerability in the most severely affected areas. Indeed, the scatter plot between the index of mortality and measure of relief (based on Table 4.2) suggests a positive relation, the estimated correlation coefficient being 0.61. Thus, while allocation of relief provision was broadly directed towards the severely affected districts, it does not appear to have been able to

[13] As Bhatia writes about this famine, "[t]he guiding principle in the management of this famine was to secure maximum economy in relief expenditure"; see Bhatia (1967), p.92.

break the positive association between the severity of famine and extent of mortality rise.

4.3 THE BOMBAY FAMINE OF 1896-97

The famine of 1896-97 in Bombay Presidency "resulted less from the total insufficiency of the rainfall than from its unreasonable distribution".[14] Table 4.4 presents district-level data on crop failure, relief, and mortality and fertility.[15] Famine was officially declared in nine districts of the Bombay Presidency. Note that as in the famine of 1876-78 the districts of the Deccan were only declared as famine affected. Relief provisions were also organised only for those nine districts. From Table 4.4 it appears that the famine-declared districts experienced considerable reductions in agricultural productivity in 1896-97. The remaining districts also seem to have experienced shortfalls in productivity, but generally to a lesser extent. Average prices in 1896-97 more than doubled in most of the affected districts. Although data on prices for the non-famine districts were not provided in the Famine Commission Report, the "tendency of equality of prices in famine and non-famine tracts" has been a very common feature of Indian famines especially in the late 19th century when transport reached a

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[14] See Report on the Famine in the Bombay Presidency 1899-1902, Bombay: Government Press, 1903, Volume I- Report, p.3.

[15] There was, indeed, considerable increase both in population and registered vital rates between the 1870s and 1890s in Bombay Presidency. But the basic normal patterns of regional variation that we have found prior to the famine of 1876-78 (see Table 4.1) seem to have remained largely valid before the famine 1896-97.

Table 4.4 District-level indices of crop failure, relief provision, mortality and fertility effects during the Bombay famine of 1896-97.

Districts (1)	Index of crop out-turn in 1896-97 compared with 1894-1895 (2)	Index of price of jower in 1896-97 compared with normal (3)	Average Daily no. of persons relieved per 1000 population during the famine (4)	Index of deaths in 1897 compared with average of 1892-95 (5)	Index of births in 1898 compared with average of 1892-95 (6)
<u>Famine Districts</u>					
Poona	27	211	24 (34)	177	80
Bijapur	4	225	95 (12)	176	68
Satara	63	206	13 (7)	167	74
Nasik	32	239	21 (3)	156	83
Shalapur	8	225	125 (8)	150	70
Belgaum	30	174	9 (6)	142	83
Khandesh	32	259	10 (1)	127	91
Ahmednagar	39	247	74 (11)	120	79
Dharwar	50	196	2 (37)	117	83
AVERAGE	**31***	**220***	**41 (11)**	**147**	**80**
<u>Non-famine Districts</u>					
Thana	39			152	96
Cobala	42			137	101
Ratnagiri	51			134	81
Kanara	47			125	77
Surat	50			115	99
Thar and Parkar	-			115	125
Broach	69			88	106
Hyderabad	-			83	83
Panch Mahal	53			82	113
Ahmedabad	61			78	106
Kaira	41			77	117
AVERAGE	**50***			**109**	**99**
Bombay City				188	70

Notes: 1) The figures marked (*) are the respective unweighted averages. 2) The figures in the parentheses are the respective percentages of persons on gratuitous form of relief to the total relieved.
Sources: Column (2): <u>Report on the Famine in the Bombay Presidency, 1899-1902</u>, Volume II, Bombay: Government Press, 1903, p.15; Columns (3) and (4): Government of India, <u>Appendix to the Report of the Indian Famine Commission, 1898</u>, Volume III, London: Government Press, 1899, p. 204 and 207; columns (5) and (6): <u>Annual Report of the Sanitary Commissioner for the Government of Bombay</u>, Bombay: Government Press, various years.

higher level of development.[16] Thus Khandesh, which appears to have recorded the highest price rise, does not seem to have suffered most either in terms of productivity or mortality.

Proportional rises in mortality during the famine of 1896-97 were distinctly less than in the famine of 1876-78. The range of variation in mortality increase too appears to have been less in the famine of 1896-97 (compare Tables 4.2 and 4.4).

Table 4.5 Correlation Matrix Involving Demographic and Other Measures presented in Table 4.4: the Bombay famine of 1896-97

	Index of deaths in 1897	Index of births in 1898
Index of crop outturn in 1896-97	-0.60*	0.53*
Index of deaths in 1897		-0.80*

* significant at 1 per cent level.
Note: For data used see Table 4.4.

As can be seen, some of the "non-famine" districts seem to have experienced significant mortality increases compared to some "famine" districts. In fact, the correlation coefficient between district-level indices of crop failure and mortality increase, though positive, is somewhat lower than in the famine of two decades before (compare Tables 4.3 and 4.5). Thus, the suggestion from the data that mortality increases were less confined to the famine-declared areas (compared to the events of 1876-78) probably also reflects greater market integration. This is consistent with the increased development of transport networks (especially railways) during the last few decades of the nineteenth century. Note too that

[16] See Bhatia (1967), p.241.

the association between the extent of crop failure and reduction in births during this famine seems to have also been lower than in the preceding crisis. The suggestion is that perhaps owing to both increasing transport networks and market integration over time, famine distress and its adverse demographic consequences became less restricted to drought-affected areas.

The apparent improvement in registered mortality in districts such as Broach, Ahmedabad, Panch Mahals and Kaira is notable. These four districts also appear to have experienced an increase in registered births. However, the correlation coefficient between the indices of births and deaths is negative - as expected - and also quite high (see Table 4.5). Note that the reduction in conceptions in most of the affected districts from their respective pre-famine levels appears to have been considerably less in the famine of 1896-97 (compared to the that of 1876-78).

As Table 4.4 shows the number of persons on relief in many of the affected districts in 1896-97 appears to have been lower than in 1876-78. This may partly reflect the reduced pressure on relief works because of a relatively liberal policy of giving loans and advances to landholders who created a considerable amount of employment.[17] In terms of crop failure Shalapur and Bijapur appear to have been the most severely affected districts; and they also received relatively large provision of relief. In fact, the regional distribution of relief provision in 1896-97 (as far as it can be assessed)

[17] See Bhatia (1967), p.244.

appears to have corresponded fairly closely to regional variation in severity of famine.[18]

It is notable that as a proportion of total relief the share of gratuitous relief in most districts seems to have been larger during 1896-97 than in 1876-78 (see Tables 4.2 and 4.4). As Bhatia states in connection with the Bombay famine of 1896-97, "In the treatment of the children and dependents of relief workers in kitchens, maintained at relief works, a high degree of success was obtained in Bombay. The administration of village gratuitous relief was "on the whole carried out with success"".[19] Measures were also taken to protect sanitary condition particularly at the relief camps.[20] Thus a comparative moderation in the scale of overall mortality and, perhaps, its reduced variation between districts during this famine can reasonably be attributed, in part, to better provision of relief. For example, the relatively moderate mortality increase in the severely affected district of Shalapur (compared with some less affected areas) may partly be due to the favourable effects of the largest provision of relief there (see Table 4.5). That relief provision during the famine was somewhat better (compared with the famine of 1870s) seems to find support too

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[18] The correlation coefficients of the numbers of persons on relief with the indices of crop failure and reduction in births are respectively 0.71 and 0.69.

[19] See Bhatia (1967), p.247.

[20] The Sanitary Commissioner of the Bombay Presidency reported the following to the Indian Famine Commission:"I consider the relief camps were kept in good sanitary condition and precautions taken, certainly at all large camps, to protect water supply"; "As far as I am aware there was no abnormal deficiency in the water-supply"; see Appendix to the Report of the Indian Famine Commission, 1898, vol.III-Bombay Presidency, London, 1899, p.239.

from the absence of a positive relationship between district-level relief provision and mortality increase, correlation coefficient being -0.06.

4.4 THE PUNJAB FAMINE OF 1899-1900

Under the British administration Punjab was a vast territory (110,463 square miles), consisting of 31 districts which were divided between six administrative divisions.[21] Table 4.6 presents demographic and other background information for all the districts and divisions of Punjab. Note that the spatial distribution of monsoon rain appears to be very uneven across the regions. For example, Kangra district normally receives rains as high as 139 inches, whereas for Dera Ghazi Khan the figure is only about 3 inches. Even immediately adjacent districts can receive very different amounts of rain (e.g. see Hazara and Peshwar). Yet despite inter-district differences, the divisional averages suggest a relative paucity of rainfall across most of Punjab.

However, Punjab is known to have had an advantage historically over most other provinces in terms of irrigation facilities. Several districts with low rainfall enjoyed relatively large proportions of irrigated land, and hence they were comparatively less dependent on the monsoon (e.g. the districts of Lahore division). But the districts of Delhi division appear to be particularly vulnerable, since they were

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[21] As mentioned before, areas from some of these 31 districts were taken out of Punjab to constitute a separate administrative province, namely the North-Western Frontier Province in 1901. Then Punjab consisted of 27 districts.

Table 4.6 Inter-district variation in demographic and other measures, Punjab 1891-95

District/ Division (1)	Population 1891 Census (2)	Rainfall during 1892-94 (inches) (3)	% of harvested crops grown by irrigation (10 year average) (4)	Average Registered CBR 1891-95 (5)	Average Registered CDR 1891-95 (6)
Delhi Division					
Hissar	775,808	17.29	6	42.1	25.7
Rohtak	590,446	30.86	10	44.4	27.4
Gurgaon	668,863	24.56	14	46.7	29.7
Delhi	635,224	25.66	19	43.8	37.3
Karnal	683,652	32.71	20	44.9	36.4
Umballa	982,291	29.83	4	37.4	38.3
Simla	35,246	53.56	n.a	18.7	25.0
Total	4,371,530	30.64*	12*	42.6	32.7
Jullunder Division					
Kangra	759,458	139.12	27	33.9	29.7
Hoshiarpur	1,011,644	39.00	5	36.8	34.0
Jullunder	891,347	35.02	43	40.8	35.6
Ludhiana	648,655	28.73	24	43.0	32.2
Ferozepur	861,499	22.07	31	42.3	26.9
Total	4,172,603	52.78*	26*	39.2	31.8
Lahore Division					
Mooltan	620,859	9.37	84	38.1	29.9
Jhang	436,821	8.24	75	39.3	26.1
Montegomery	499,449	8.07	75	38.9	25.6
Lahore	1,055,619	19.04	62	40.9	32.4
Amritsar	990,990	25.41	51	41.3	38.8
Gurdaspur	940,785	46.01	21	40.3	36.9
Total	4,544,523	19.36*	61*	40.1	33.0
Rawalpindi Division					
Sialkot	1,098,712	31.47	51	43.7	33.9
Gujrat	760,823	28.21	29	37.5	25.6
Gujranwala	690,061	23.66	65	43.2	31.8
Shahpur	493,535	11.70	48	38.5	23.5
Jhelum	605,774	28.48	5	38.7	27.7
Rawalpindi	845,259	27.09	5	38.9	30.5
Total	4,494,164	25.10*	33*	40.4	29.5
Peshwar Division					
Hazara	476,125	40.77	12	30.3	21.7
Peshwar	679,183	9.85	52	22.1	22.8
Kohat	182,487	14.84	23	35.3	31.6
Total	1,337,795	21.82*	29*	26.8	23.6
Derajat Division					
Bannu	369,972	10.29	26	35.8	24.4
Dera Ismail Khan	482,463	7.58	25	38.4	27.9
Dera Ghazi Khan	399,860	3.44	46	29.6	23.4
Muzaffargarh	381,072	4.53	76	32.7	26.9
Total	1,633,367	6.46*	43*	34.3	25.8
Punjab	20,553,982	-	30	39.2	32.9

Notes: The figures marked (*) are unweighted averages. 2) The year 1892 is not included in the average CBRs and CDRs for 1891-95 because this was an exceptional epidemic year.

Sources: 1) Columns (2), (5) and (6): Report on the Sanitary Administration of the Punjab, Lahore: Government Press, various years; columns (3), (4): Based on Government of Punjab, Report on the Administration of the Punjab and its Dependencies, Lahore: Government Press, various years.

neither recipients of good normal rainfall, nor were they provided with significant irrigation. Obviously, therefore, this region should be relatively susceptible to famine conditions. In this respect Hissar stands out as the most vulnerable district (see Table 4.6). However, many other districts, including some outside of Delhi division, were also susceptible. Yet because of the comparatively extensive irrigation facilities in the province, drought may be expected to have affected agricultural production less uniformly across the districts of Punjab, compared to other provinces (say Bombay) where irrigation was much more rare.

Registration data do not show any distinct regional pattern of pre-famine levels of mortality and fertility. For most districts the birth rate was considerably higher than the death rate. However, variation in death rates across districts seems to have been larger than for the birth rate; the coefficients of variation are respectively 0.22 and 0.16. Note from Table 4.6 that registered vital rates were both high and generally (perhaps with the exception of Peshwar division) very plausible; there is every reason to suppose that the registration system worked rather well in Punjab at this time.

With this as background, Table 4.7 gives key district-level data, with particular reference to the main famine period (i.e. 1899-1900). Again, we have distinguished those districts which were officially classified as famine-affected. The drought in 1899, however, appears to have been widespread; all districts experienced a shortfall of rains. And the intensity of drought does not seem to have been particularly

Table 4.7 District Level Indices of Rainfall, Prices, Crop Production, Livestock, Relief Provision, Fertility and Mortality during the famine of 1899-1900: Punjab

Districts	Index of number of cows in 1899-1900 compared with 1893-94	Rainfall in 1899 as a per cent of 1892-94 (kharif season)	Harvested area of crops in 1899(kharif) as per cent of normal	Price of jower in 1899-1900 as per cent of 1894-95	Average Daily no. relieved per 1000 population	Index of deaths in 1900 compared with with 1891-95	Index of births in 1900 compared with 1891-95	Index of land sale in 1899-1900 compared with 1893-94
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Famine Districts								
Hissar	61	41	10	321	108.0 (20)	374	58	202
Ferozepur	76	17	71	231	0.8 (0)	323	101	87
Rohtak	66	31	23	286	40.0 (14)	248	73	181
Karnal	93	24	55	197	10.0 (14)	255	111	234
Lahore	91	25	82	210	0.8 (31)	183	114	91
Gurgaon	72	48	39	533	14.0 (15)	167	81	162
Delhi	85	44	69	233	3.0 (12)	144	99	141
Gujrat	85	26	38	233	1.2 (0)	132	93	161
Amritsar	101	34	80	207	0.6 (0)	118	118	114
Shahpur	124	33	51	280	14.4 (1)	123	93	248
Jhelum	59	36	11	378	2.3 (0)	121	79	221
Umbala	68	51	39	181	0.3 (0)	132	81	121
Mooltan	108	29	73	254	1.6 (3)	95	124	108
Average	**83***	**34***	**49***	**266***	**13.8 (17)**	**183**	**95**	**159***
Non-famine Districts								
Jhang	168	31	261	254		226	197	147
Ludhiana	86	31	71	241		187	105	67
Montegomery	75	10	85	280		151	79	96
Gujranwal	115	46	83	132		140	129	165
Bannu	126	41	56	232		128	115	118
Sialkot	86	31	55	262		131	102	177
Hazara	120	49	95	n.a		135	118	151
Peshwar	102	17	87	276		120	140	116
Dera Ghazi Khan	124	6	78	260		116	114	220
Dera Ismail Khan	128	53	75	224		111	99	114
Gurdaspur	89	19	83	357		124	115	68
Kangra	116	58	83	n.a		118	100	97
Kohat	144	43	96	n.a		105	121	101
Muzaffargarh	119	28	103	158		101	133	100
Hoshiarpur	104	34	85	238		119	111	80
Rawalpindi	107	61	51	205		105	96	129
Jullunder	116	20	80	380		105	112	69
Simla	130	66	49	n.a		85	97	104
Average	**114***	**36***	**87***	**253***		**129**	**113**	**117***
Punjab						**155**	**104**	

Notes: 1) The figures marked (*) are the respective unweighted averages. 2) Years for columns (2) and (9) end on the 30th September. 2) The districts in each group are ranked according to mortality increase in 1900. 3) The figures in parentheses are the respective percentages of persons on the gratuitous form of relief to the total relieved.

Sources: Columns (2), (3), (5) and (9): Based on Report on the Administration of the Punjab and its Dependencies, Lahore: Government Press, relevant years; columns (4) and (6): The Punjab Famine of 1899-1900, Volume 1, Lahore: Government Press, 1901; columns (7) and (8): Based on Report on the Sanitary Administration of the Punjab, Lahore: Government Press, various years.

restricted to the declared famine districts. In several non-famine districts the deficiency of rainfall was also very appreciable (e.g. Montegomery, Gurdaspur and Dera Ghazi Khan). But, as already noted, the actual loss of agricultural production depends partly on the degree of monsoon dependence. And on this count the famine districts appear to have been particularly disadvantaged; while the average shortfall in rains in the famine districts was only slightly larger than in the non-famine districts, the loss of harvested area was very much greater (by 38 points, see Table 4.7).

The implications for famine distress are also clearly reflected in two other measures, namely, the indices of land sales and the number of cows in 1899-1900 (compared with 1893-94). Cattle mortality is generally believed to be an index of famine severity. And sale of property (particularly land) is often thought to be a means of last resort for those who have some property. It is clear from Table 4.7 that in famine districts there was overall a reduction in cattle of about 17 per cent, while most of the non-famine districts experienced an increase. The increase in the number of cows in the non-famine districts may partly be due to a net transfer by means of distress sales in the severely affected districts. Similarly, the frequency of land sales in the famine districts increased during the crisis by nearly 60 per cent (from the normal level) while in the non-famine districts this increase was only 17 per cent. This is again indicative of a higher degree of distress in the famine districts as a whole.

Turning to district-level price indices, Table 4.7 shows relatively small differences, on average, between the famine-affected and other districts. This was again partly due to the increased level of market integration, backed up by the advance of the transport network. Thus, the spatial integration of markets in the absence of state controls spread price hikes across the province, and thus made variation in food prices an inadequate indicator of regional variation in crop failure.

The proportionate increase in deaths in 1900 was generally much larger in the famine than in the non-famine districts. Among the officially declared famine districts, Hissar experienced both the highest increase in deaths and the greatest reduction in births. This probably reflects its acute famine vulnerability, which is amply reflected in many of the relevant measures. The apparent improvement in registered mortality in Mooltan, one of the officially declared famine districts, is noteworthy. In terms of measures such as agricultural failure and cattle mortality, both Mooltan and Amritsar seem to have suffered relatively less severe distress, especially compared with the other "famine" districts; and this may help to explain the rather negligible adverse mortality effects in these two districts. This said, some non-famine districts also experienced significant increases in registered deaths (e.g. see Jhang, Ludhiana and Montegomery in Table 4.7). In fact, there was a wide range of variation in proportionate increases in mortality between the districts of Punjab.

Table 4.8 provides a correlation matrix involving the measures presented in Table 4.7. It shows that the correlation coefficient between the district-level indices of

Table 4.8 Correlation Matrix of the Demographic and Other Measures presented in Table 4.7: the Punjab famine of 1899-1900.

	Index of land sales in 1899-1900	Index of rain fall in 1899	Index of harvested area in 1899	Index of price in 1899-1900	Index of deaths in 1900	Index of births in 1900
Index of cattle stock in 1899-1900	-0.14	0.17	0.74**	-0.30	-0.35*	0.80**
Index of land sales in 1899-1900		-0.02	-0.30#	0.13	0.21	-0.24
Index of rainfall in 1899			-0.16	-0.07	-0.09	-0.22
Index of harvested area in 1899				-0.21	-0.42**	0.80**
Index of price 1899-1900					0.06	-0.30
Index of deaths 1900						-0.21

** significant at 1 per cent level
* significant at 5 per cent level
# significant at less than 6 per cent level.

Notes: 1) Information on the change in the harvested area in Jhang has been excluded as it produced unduly large influences (see Table 4.7). 2) For data used see Table 4.7.

shortfalls in rainfall and the area under cultivation is negative but it's very low (-0.16). However, the correlation between the proportion of harvested area of crops compared to normal and the index of cattle stock is positive and fairly strong. But correlation coefficients between the district-level price indices and both the indices of land cultivation and cattle stock were low (but, as expected, negative). This probably confirms that extent of crop failure was a better indicator of regional intensity of famine distress than price rises. Mortality increases appear to have been somewhat large in those districts which were generally more affected by crop failure (see Table 4.8). However, note that this correlation is smaller than found for the preceding famines. Also, the correlations of mortality increase with various measures of distress across all districts in Table 4.8 are relatively weak.[22] This indicates that the distribution of mortality across districts was far from being solely determined by crop failure. Interestingly, however, the district-level reductions in births were strongly associated with most of the indices of distress (see Table 4.8).[23] So the regional variation in fertility reduction (especially in the early stage) was a better measure of the severity of distress than

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[22] The correlation coefficients between the index of deaths and the indices of cattle stock and land sales are respectively -0.35 and 0.21 (see Table 4.8). Note also that the positive association between the rises in human and cattle mortality is statistically significant.

[23] Note that unlike the previous famines the district-level indices of births in Punjab are given for the prime famine year (i.e. 1900), while a large part of the effect on conceptions in 1900 should be captured by the respective numbers of births in the following year. This was necessitated because of non-availability of comparable data for several districts after some areas were taken out of Punjab in 1901. However, for those districts for which comparison could be made the correlation coefficient between the index of harvested area in 1899 and index of births in 1901 is found to be 0.30.

was the pattern of mortality elevation.

As we have already stressed, regional pattern of famine mortality may significantly be influenced by the pattern of relief, the nature of epidemics and migration. Turning to the officially declared famine districts it can probably be suggested that relief was relatively large in those districts which were relatively severely affected. But the data for Jhelum provide an exception to this generalisation; while its intensity of distress as reflected by the relevant measures in Table 4.7 was quite similar to Hissar's, it received a negligible quantity of relief. On the other hand, Jhelum experienced a comparatively small rise in deaths. Emigration from Jhelum may be part of the explanation. Indeed, the Lieutenant-Governor in the Home Department of Punjab wrote that "[i]n Jhelum and Shahpur which show low birth-rates and low death-rates, the figures are principally due to emigration consequent on scarcity".[24] Test works in Jhelum (at Jalalpur Canal) were opened late in February of 1900; although the number of persons employed immediately rose fairly high, it then fluctuated, and it was thought that the "condition of those who attended was not such as to call for its [i.e. Canal work] conversion into relief work".[25] The reason for the smaller relief provision in Jhelum, thus, may partly be due to the relatively small mortality increase itself. The relatively small provision of relief may in turn have induced emigration from the district.

[24] Quoted in The Punjab Famine of 1899-1900, Volume I, Lahore: Government Press, 1901, (no page number).

[25] Ibid., p.9.

Indeed, it appears that the number of persons relieved was relatively high in those districts which experienced relatively high proportionate increases in mortality (see Table 4.7).[26] A part of this relation may stem from the fact that relief provision was relatively large in the severely affected districts. However, this also reflects the inadequacies of the relief policy. In a study of Hissar (which experienced the largest increase in deaths) a large part of excess mortality during this famine has been attributed to the very stringent and inadequate nature of relief.[27] Relief works applied harsh regulations and offered very low wages so that debilitated workers could not benefit much from the provision of such relief. Gratuitous relief was small, and it was extended mostly to those who were already on the brink of death. For example, the Deputy Commissioner of Hissar district himself wrote that "It may be argued that the fact of the high mortality occurring among recipients of relief would tend to show that either relief reached the necessitous too late or that something connected with the famine administration itself was a cause of the great mortality".[28]

However, there were of course exceptions to the positive relationship between relief provision and mortality increase.

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[26] Indeed, the correlation coefficient between the daily average number of persons on relief per 1000 population and the mortality indices across the 13 famine districts is positive and significant (0.70).It may also be noted that coefficient stays exactly the same (0.70) when average daily numbers of persons on relief (irrespective of population size) in the districts are used.

[27] See Guz (1989).

[28] See The Punjab Famine of 1899-1900, Lahore, 1901, Volume II, Appendix XVIIII, p.163-164. On this issue, see also Guz (1989), Drèze (1990), and Bhatia (1975).

For example, Ferozepur experienced the second highest mortality increase but received an insignificant amount of relief. In fact, the data on crop losses, reductions in births and land sales all indicate that Ferozepur was indeed relatively less severely affected compared to many of the other famine districts. The official report on the famine stated that "fortunately no portion of its [Ferozepur] area reached a state of acute distress".[29] Similarly, Lahore appears to have received scant relief probably because of the lesser severity of the famine in that district (reflected too in measures of crop loss, fertility reduction, land sales and livestock loss); but Lahore nevertheless registered a substantial increase in mortality (see Table 4.7).

As we saw in Chapter 2 above, the epidemic malaria was probably the most important killer in the Punjab famine of 1899-1900. And once such an epidemic breaks out the usual forms of relief (e.g. provision of works or dole) are unlikely to be of much help in mitigating excess deaths. Indeed, as we have indicated, the outbreak of malaria occurred late 1900 when relief had mostly been withdrawn. During this (malaria) epidemic stage part of the regional variation in mortality may well have been influenced by variation in malaria ecology (e.g. malaria endemicity). For example, it is probable that the more endemic was the malaria in a district during the pre-famine period, the less would be the severity of a subsequent epidemic in the wake of a famine, owing to greater levels of immunity.[30] Such factors may also have exerted some influences

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[29] See <u>The Punjab Famine of 1899-1900</u>, Lahore, 1901, Volume I, p.8.

[30] See Harrison (1978), especially pp.199-207.

in shaping the regional pattern of mortality during the famine.

In this connection the experience in the non-famine district of Jhang is particularly interesting. While the harvested area of crops more than doubled in 1899 from its "normal" level, the proportional increase in the number of registered deaths in 1900 was larger than in many of the severely affected famine districts (see Table 4.7). Note that the number of registered births in this district also rose substantially in 1900. All this can probably be taken as indicative of a significant amount of immigration during the famine. Indeed, there were a number of districts (even among the famine districts) in which the number of registered births increased from pre-famine levels. The cases of Karnal and Lahore (both famine districts) are particularly noteworthy on this count. They too both experienced rises in births while also experiencing considerable excess mortality. However, the index of births in 1900 largely reflects the outcome of conceptions in 1899. Since there were some territorial changes in Punjab in 1901, it is difficult to calculate comparable measures of changes in the number of births for all districts in that year. But in 1901 almost all districts for which comparisons could easily be made showed a reduction in births (except for Jhang and Mooltan). On the whole, the negative effects of famine on fertility seem to have been larger in the officially declared famine districts.

4.5 THE UNITED PROVINCES FAMINE OF 1907-08

Table 4.9 presents measures for 48 districts relating to the United Provinces famine of 1907-08. The districts were classified by the official famine Report into three categories, namely, "famine", "scarcity" and "non-famine" districts. This categorization (which we also use here) was usually the responsibility of the district administrations. It is clear from Table 4.9 that most districts experienced a considerable shortfall in monsoon rains in 1907. Consequently, crop failure was not restricted to the famine and scarcity districts. However, on the whole the extent of harvest failure in 1907 seems to have been larger in the famine districts. It is notable that there was hardly any difference in the overall shortfall of rain or harvested crops between the scarcity and non-famine districts.

But one important implication of this official classification was that non-famine districts were given almost no relief. As Table 4.9 shows, there was a remarkable difference in the amount of gratuitous relief provided between the famine and the scarcity districts. This discrepancy was not restricted to gratuitous relief. Indeed, a similar discrepancy in overall relief provision (in favour of the famine districts) is also indicated by the data contained in the Report on the administration of the famine.[31] Therefore the official diagnosis of famine severity between districts seems to have had important implications for the scale of relief provisions.

As can be seen, the overall reduction in births appears

[31] See Resolution on the Administration of famine relief in the United Provinces of Agra and Oudh during the years 1907 and 1908, Allahabad: Government Press, especially chapter VIII.

Table 4.9 District-level indices of rain fall deficiency, crop losses, gratuitous relief, mortality and fertility effects during the famine of 1907-08: United Provinces

Districts	% Deficit in Rainfall in 1907 compared to Normal	% of Autumn Harvest in 1907 compared to Normal	Gratuitous Relief Expenditure in famine period (per capita) (Rs)	Index of Deaths in 1908 compared with the average of 1901-04	Index of Births in 1909 compared with the average of 1901-04
(1)	(2)	(3)	(4)	(5)	(6)
FAMINE DISTRICTS					
Hardoi	63	41	107.0	195	59
Muttra	40	36	116.5	198	55
Agra	31	32	147.9	189	72
Sultanpur	56	14	102.5	169	64
Etawah	44	42	136.7	170	65
Bahraich	66	18	579.4	170	65
Kheri	70	20	409.1	165	69
Gonda	67	12	274.9	162	74
Sitapur	60	19	253.1	168	52
Mirzapur	-2	24	605.6	152	69
Banda	52	25	491.8	150	75
Jalaun	51	11	403.9	162	65
Bara Banki	58	12	168.8	155	62
Basti	53	43	81.1	142	86
Fyzabad	57	23	105.4	137	70
Jaunpur	36	62	70.1	113	84
Jhansi	33	20	214.2	125	84
Hamirpur	32	21	287.1	121	62
Allhabad	26	24	185.7	105	73
AVERAGE	47*	26	249.5	157	70
SCARCITY DISTRICTS					
Bareily	30	40	35.4	202	70
Moradabad	52	40	10.8	196	73
Baudaun	33	46	30.4	208	64
Bijnor	44	16	26.6	184	83
Pilibhit	47	43	9.7	185	75
Etah	47	54	6.4	196	63
Shahjahanpur	20	42	23.7	179	76
Farrukhabad	37	65	15.9	165	66
Mainpuri	51	47	18.7	160	73
Rae Bareli	47	32	80.8	159	62
Unao	53	25	46.5	154	58
Cawnpur	56	40	29.1	139	63
Fatepur	26	22	108.2	136	67
Almora	38		13.2	145	92
Garhwal	43		8.4	137	94
Lucknow	60	19	104.2	136	65
Derha Dun	54	46	19.3	123	88
Azamgarah	47	26	11.4	131	99
Benares	25	50	93.4	101	85
Ghazipur	32	39	26.7	98	72
Ballia	47	63	14.0	74	77
AVERAGE	42*	40	34.9	152	73
NON-FAMINE DISTRICTS					
Bulandshahr	60	45	0.0	182	67
Aligarh	41	49	0.0	187	58
Meerut	64	40	0.0	150	74
Muzzaffarnagar	56	23	0.0	143	69
Partabgarh	22	34	0.0	143	73
Saharanpur	58	42	0.0	121	76
Gorakhpur	46	71	0.7	122	121
Nanital	38	25	8.4	101	92
AVERAGE	48*	41	1.1	146	83
UNITED PROVINCES	45*	31	107.3	153	74

Notes: 1) Figures marked * are the respective unweighted averages. 2) Data on rainfall (in inches) refer to the period between 1st June and 31st October. 3) The baseline period does not include 1905 and 1906 because a partial famine occurred during that time.

Sources: Columns (2), (3) and (4): Resolution on the Administration of Famine Relief in the United Provinces of Agra and Oudh during the years 1907 and 1908, Allahabad: Government Press, 1908; columns (5) and (6): Report on the Sanitary Administration of the United Provinces of Agra and Oudh, Allahabad: Government Press, various years.

to have been somewhat larger in the famine districts, particularly compared to the non-famine districts. As Table 4.10 shows, the correlation coefficient between the indices of crop failure and reduction in births is positive and statistically significant. However, the relatively low degree of association compared to that we have found in the earlier famines may partly reflect the increased level of economic integration and partly the favourable influence of a relatively effective and liberal relief provision in the affected areas.

Relatedly, on the whole both the scarcity and non-famine districts appear to have experienced a roughly similar magnitude of mortality increase as in the famine districts.[32] Note too from Table 4.10 that there is hardly any correlation between the measure of crop failure and mortality rise. Apart from the possible effects of increased market integration and consequent diffusion of crisis, a part of the explanation for this may lie in favourable effects of relatively large relief provision in the famine districts.

Indeed, comparison with some of the earlier famines, say those in 1876-78 and 1899-1900 suggests that mortality increases in this famine were distinctly smaller (compare, for example, Tables 4.2 and 4.9). A relatively small excess mortality in this famine has sometimes been attributed to the

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[32] As the Report on the famine administration states, "One conclusion seems to follow from the experience of the present year [1908], namely that the distinction between scarcity and famine admits of better definition than is at present given in the Famine Code. General opinion seems in favour of defining famine districts to be those districts in which relief works with relief to dependents are needed, and scarcity districts as those in which gratuitous relief and aided works without relief works afford all the aid to distress that is necessary"; Ibid, p.86.

efficient management of the famine.[33] It is true that this

Table 4.10 Correlation Matrix of the Demographic and Other measures presented in Table 4.9: the United Provinces famine of 1907-08.

	Index of harvest in 1907	Index of deaths in 1908	Index of births in 1909	Gratuitous relief per capita
Rainfall deficit in 1907	-0.17	0.14	-0.13	0.02
Index of harvest in 1907		-0.07	0.37*	-0.56*
Index of deaths in 1908			-0.40*	-0.01
Index of births in 1909				-0.28**

* less than 1 per cent level of significance
** less than 5 per cent level of significance
Note: For data used see Table 4.9.

famine was not as widespread as former "countrywide" food crises (e.g. that of 1896-97). Therefore food could be imported from neighbouring provinces. Again, the labouring classes migrated out to other provinces where they were able to find remunerative employment. There are indications (e.g. an increased value of money orders sent back to the affected districts) that emigrants were even able to send remittances to support their dependents at home.[34] However, the number of such emigrants seems unlikely to have been sufficiently great

[33] As Bhatia writes, "As a result of the famine there was only a small excess of mortality over the normal rate and the local Government was congratulated by the Secretary of State on the efficient manner in which the famine had been managed"; see Bhatia (1967), p.269.

[34] See Bhatia (1967),p.267.

to influence the famine's demographic consequences.[35] This said, the relief policy adopted during this famine appears to have been both relatively liberal and rational. As the Report on the administration of the famine states, "the crop failure of the present year [1907-08] was serious enough to have caused widespread distress if the measures of relief adopted by Government had not been both prompt and liberal."[36] A liberal suspension of land revenue and as well as large grants of advances for farmers' subsistence and agricultural production, characterized the relative emphasis on indirect forms of relief during this famine. Interestingly, the large advances made to agriculturists, especially for irrigation and cultivation of the spring crops, helped maintain (and perhaps even increase) the demand for labour, and in turn this helped to keep market wage rates relatively high. Moreover, the fixing of wages on the relief works was modified so that, unlike the old policy, it was based not on what would be sufficient for the worker only, but on ordinary market wage rates instead.

Emphasis was also placed on village works so that people did not need to congregate around large relief works sites. "Aided" village works, which were undertaken by landholders using advances given by the Government, appeared as a prominent means of relief. They were so popular that on the

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[35] As the Report on the administration of the famine remarks, "there was no organised movement of the population from the distressed areas in search of work, no considerable emigration to or immigration from native states, and in fact no noticeable wandering at all"; see Resolution on the Administration of famine relief in the United Provinces of Agra and Oudh during the years 1907 and 1908, p.150.

[36] Ibid, p.150.

4th June 1908 about 1,77,185 persons were employed on such works. The wages paid in these aided village works "were as a rule higher than the rates paid on Government works and approximated to the ordinary wages of labour prevailing in the vicinity."[37] The implication of such policies lay partly in reducing deprivation and distress among farm labourers. But it also meant relatively less congregation at large work camps and this probably helped contain the spread and virulence of epidemic diseases such as cholera, dysentery and diarrhoea, which were all comparatively minor problems during this famine (as previously noted in Chapter 2, see especially Table 2.6). Finally, an increased emphasis on the provision of gratuitous relief to the dependents of relief workers was also a cornerstone of relief policy during this famine. Indeed, the ratio of workers' dependents relieved (gratuitously) to the total number of relief workers was 0.44 in 1907-08, compared to only 0.24 in 1896-97.[38] The proportion of persons receiving gratuitous relief to the total number on relief reached 54 per cent during this famine. The Famine Commission of 1901 had recommended that this figure should not exceed 42 per cent. Thus emphasis on relieving workers' dependents as well as the liberal nature of the relief policy - the policy being adopted in far greater measure in the famine districts than in the scarcity districts (see Table 4.9) - can probably be held as partly responsible for the somewhat lesser mortality rise. Again, the view that a relatively more gratuitous and liberal relief policy played a significant part in containing

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[37] Ibid, p.83.

[38] Ibid., p.74.

mortality during this famine gains support from the absence of a positive correlation between relief provision and mortality increase.[39]

4.6 DISCUSSION

It is useful to summarize and review major findings on the regional variation in demographic and other variables during four major famines (in the context of individual locations). Our foregoing district-level analysis for the Bombay famine of 1876-78 shows that the intensity of distress varied markedly between the affected and non-affected regions. In turn, this was also reflected in greater variation of adverse demographic consequences between the affected districts and those not affected. In fact, transport and communication system of earlier decades was very limited. Thus, during the 1870s the very restricted road and rail network inhibited both fast transport of grain and population movement.[40] So less affected famine areas seem to have been relatively insulated from both price rises and the spread of epidemics, while famine affected districts could not be supplied rapidly with grains.[41] As can be seen from Table

[39] In this connection, it may be noted that migration (especially from adjoining regions) during this famine was rather limited; see Resolution on the Administration of famine relief in the United Provinces of Agra and Oudh during the years 1907 and 1908, p.128.

[40] In the aftermath of the famine of 1876-78 the 1880 Indian Famine Commission recommended direct state efforts for extending railways and irrigation.

[41] Referring to the period before large-scale development of the railways, Drèze writes that "[e]ntitlememt failures were exacerbated by the sluggishness of trade and the large price disparities prevailing between adjacent regions"; see Drèze (1990), p.21. As Srivastava writes, "lack of satisfactory communications.... severely restricted the movements of food

4.11, both the scale and regional disparity in demographic impact during the famine of 1876-78 appears to have been larger than during the famines of 1896-97, 1899-1900, and 1907-08. Note too a weakening of strength of association over time between the district-level extent of crop failure and adverse demographic effects. In fact the regional variation in price rises has been a relatively poor indicator of the variation both in distress and associated demographic impact. On the other hand, compared with mortality variation, regional variation in the reduction in births seems to have been a better indicator of the variation in measures of famine distress (such as the extent of failures in rain and crop production).

Thus, while increasing transport and communications over time may have played a role in augmenting the diffusion of the intensity of crisis,[42] overall scale of mortality elevation seems to have depended partly on the nature of relief provision.[43] For example, much greater increase in mortality (and larger reduction in births) during the famine of 1876-78 compared to later famines does not seem to relate to the severity of drought and crop losses. Indeed, as we have shown earlier, on these criteria the later famines - particularly during 1899-1900 and 1907-08 - appear to have been no less

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grains so that while in one part of the country people died of lack of food, in another, only a few miles away, there was an abundance of cheap food"; see Srivastava (1968), p.7.

[42] Railway mileage in India increased from 9,891 in 1881 to 19,555 in 1895; see Currie (1991), p.55.

[43] It has sometimes been argued that the construction of roads and railways did not necessarily function as protective against famine mortality; see e.g. Currie (1991).

Table 4.11 Summary measures for comparison of the inter-district variation in demographic and other variables, four major historical famine locations

	Bombay 1876-78	Bombay 1896-97	Punjab 1899-1900	United Prov. 1907-08
Index of deaths in the peak mortality year[a]	248	146	183	157
Index of births during the year following peak mortality year[a]	54	80	87	70
Coefficient of variation in district-level indices of deaths	0.58	0.23	0.43	0.20
Coefficient of variation in district-level indices of births	0.41	0.17	0.23	0.17
Correlation coefficient between the measure of crop production and index of deaths	-0.72*	-0.60*	-0.42*	-0.07
Correlation coefficient between the measure of crop production and index of births	0.86*	0.53*	0.30[b]	0.30
Percentage share of gratuitously relieved persons to the total relieved[a]	4.2	11.0	17.0	54.0
Correlation coefficient between relief provision and index of mortality[a]	0.61#	-0.06	0.70*	-0.01

(a) refers to "famine districts" only;
(b) refers to those districts for which comparison could be made after some territorial changes in Punjab in 1901.
* less than 1 per cent level of significance
# less than 5 per cent level of significance.

severe than the famine of 1876-78.[44] Again, it was not that relief provisions in terms of the number of persons on paid works during the 1876-78 famine were particularly inadequate. In fact the average daily number of persons on relief during the 1876-78 famine compares favourably with that during later famines (see Tables 4.2, 4.4, 4.7). Furthermore, as has been shown above, the regional distribution of relief provision seems to have broadly corresponded to regional variation in severity of drought and crop losses. But the proportion of persons on gratuitous relief appears to have been much lower in the Bombay famine of 1876-78 compared to later famines (see Table 4.11). This probably partly reflects the more harsh relief policy during the 1870s (i.e. before the establishment of the Famine Codes). That the relief policy during the famine of 1876-78 was very severe and punitive in character (especially compared with later relief policy) has been documented by several authors.[45] Indeed, district-level data on relief and mortality do not support the idea that the greater the relief provided in a district, the smaller the adverse mortality effects during the famine (see Table 4.11). This probably partly stems from the fact that relief provision was generally larger in the most severely affected districts. This said, relief policy too must have been deficient in mitigating vulnerability of the population in the affected areas. This brings us to the issue of the <u>nature</u> of relief.

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[44] However, it should be mentioned that the Bombay famine of 1876-78 may be considered as being more severe than the later famines in one respect at least, namely that it involved the occurrence of <u>two</u> successive serious droughts.

[45] See Bhatia (1967), Srivastava (1968), and also Currie (1991).

Indeed, a declining trend in the quantum of excess famine mortality over the decades since the 1870s has been observed (see section 1.2 of Chapter 1 above), and this has often been attributed to a trend towards more "liberalism" and "flexibility" in relief policy (as formulated by the successive Indian Famine Commissions) - a trend which was sometimes helped by expansion of transport and communications network and creation of alternative employment opportunities.[46] But the formulation of Famine Codes and a more rational relief policy does not guarantee their implementation. Although relief policy became more liberal during the decades since the 1870s, it was sometimes very harsh and deficient in several respects (e.g. delayed response, non-adherence to Famine Codes). The relief policy has often been criticized as being influenced by "wait and see" attitude on government's part.[47] While stressing the extreme stinginess of relief policy Drèze remarks that "[i]n particular, the level of wages paid on relief works was extraordinarily low...As a result, during the most severe crises the availability of work did not always prevent a considerable enfeeblement of affected people, and their enhanced vulnerability to epidemics".[48]

This point is illustrated by the fact of a larger increase in mortality during the Punjab famine of 1899-1900

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[46] See e.g. Klein (1984), McAlpin (1983), Drèze (1990).

[47] See e.g. Alamgir (1980), p.83. Referring to the implementation of the Famine Code, Guz writes that "[i]t [government] stepped in once excess mortality and severe social disruption had occurred"; see Guz (1989), p.217.

[48] See Drèze (1990), p.34.

than both during the famines of 1896-97 and 1907-08 (see Table 4.11). As has been discussed before, the relief policy as adopted during the Punjab famine was particularly punitive and harsh. The Chief Engineer of the Public Works Department in the Punjab Government concluded that "some part" of the excess mortality in the famine of 1899-1900 was "due to the greater severity of our famine works as compared to the last [1896-97] famine".[49] That relief provision was relatively deficient in 1899-1900 is also reflected in the high positive correlation between district-level relief provision and mortality increase. In contrast, the relief policy as implemented in Bombay during 1896-97 seems to have been better organized and more rational in taking especial care for workers' children and dependents, and also in protecting sanitary condition at large relief camps. As has already been discussed, the relief measures during the famine of 1907-08 in United Provinces too were remarkably liberal and rational. Note from Table 4.11 that the proportion of gratuitous relief during this famine was far larger than in the preceding famines. Note too that in case of these two famines no positive relationship was found between district-level relief provision and mortality increase, confirming the greater effectiveness of relief provision than in the Punjab famine of 1899-1900. This is not to suggest that inter-district variation in mortality rises was solely related to the nature of relief. In fact, regional variation in ecology and inter-district migration also seem to have contributed to the variation in demographic impact.

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[49] See <u>The Punjab famine of 1899-1900</u>, Volume 2, Lahore, 1901, pp.90-92.

All these considerations, thus, suggest that although during the last decades of the nineteenth century India witnessed the establishment of a well-defined famine relief system, which partly contributed to the declining trend in overall excess famine mortality, the role of relief continued to conform to the popular notion "which conjures up the picture of a battle already half lost and focuses the attention on emergency operations narrowly aimed at containing large-scale mortality."[50] Indeed, as we will see in the following two chapters, this was proved again during the Bengal famine of 1943-44.

[50] See Drèze and Sen (1989), p.67.

CHAPTER 5

THE DEMOGRAPHY OF THE BENGAL FAMINE OF 1943-44

5.1 BACKGROUND

There is little dispute that the start of this century, or more specifically the famine of 1907-08, marked the end of the period of (drought-related) large-scale famines in India.[1] However, more than three decades later a severe famine occurred in 1943-44, particularly in the large eastern province of Bengal. Although some other provinces, notably Orissa and Madras, were also affected, the main brunt was borne by Bengal.

However, the Bengal famine is particularly significant in the history of Indian famines. For one thing, it broke a rather long period of absence of major famines which began early in the present century. Although there were several regional scarcities between 1908 and 1940, they involved little excess mortality. Indeed, in the inter-war years India experienced improving mortality and faster population growth. The question of the relative absence of major famines during the three decades preceding the Second World War is of some interest. What has made this question particularly intriguing is that per capita foodoutput in India over this period was not increasing. Indeed, there is rather persuasive evidence

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[1] As Bhatia writes, "The famine of 1907-08 ... proved to be a turning point in the long history of food and famine problem in India. Henceforth, drought ceased to be a problem of serious concern"; see Bhatia (1967), p.270.

of declining per capita foodoutput during this time.[2] Nor is there any convincing sign of improved public health and sanitation. Klein, for example, has sought to explain the improved mortality of the 1920s and 1930s as resulting from greater immunity to disease among population which had passed through a prolonged period characterized by several major crises.[3] Drawing on the experience of Bombay Presidency, McAlpin[4] has attempted to relate these two phenomena of mortality and famine. She argues that the absence of famine-induced mortality was largely responsible for the improved mortality and faster population growth after 1921. While crop failures did occur during this period, they were prevented from developing into major mortality crises. This was achieved by more effective and timely relief provision, greater diversification of the economy, better management of food supplies, and improved transport networks.

One factor which certainly distinguished the Bengal famine was that it was not attributable to drought. At one level, this famine has been viewed as the result of a long-term deterioration in the economic conditions of the poor in Bengal. For example, Alamgir writes that "[f]rom the beginning of the twentieth century, Bengal turned into a region characterised by a large proportion of the population

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[2] For the relevant evidence on this issue, see Bhatia (1967), especially pp. 311-314, Klein (1990), and Drèze (1990).

[3] See Klein (1990); and for a discussion on the difficulties of this hypothesis see Guilmoto (1991), pp. 23-24, and also Guha (1991). In fact Guha has argued that climatic change, enabling greater stability (though not the level) of agricultural production (and consumption) during this period (i.e. during the 1920s and 1930s) compared with the preceding decades, was the most important source of improvement of mortality; see Guha (1991).

[4] See McAlpin (1983, 1985).

leading a quasi-famine existence."[5] However, on an another level, the events immediately preceding the famine also played an important role. The Bengal famine occurred during World War II. The war caused a cessation of normal imports of rice from Burma which was captured by Japan in early 1942; consequently a deficiency in food supply resulting from the poor harvest of 1941 was largely un-met. Government controls brought dislocation of trade. Increased demand for food was created by both the army and the inflow of refugees from Burma. In 1942 there was "a heavy drain on [food] stocks, with increased exports and decreased imports".[6] Moreover, a cyclone accompanied by torrential rains and tidal waves in October 1942 caused major crop losses - especially in Midnapore district. All these factors pushed up the price of rice and other essentials, starting from 1941. In turn, rising prices fuelled "speculation, hoarding and profiteering" and helped create to artificial shortages. Because of this process food prices reached "astronomical heights" in 1943, which ironically was neither a year of drought nor, probably, of significant food-shortage.[7] In August of 1943, the quoted price of rice (Bengal's most important food) in the Calcutta market was more than eight times its corresponding monthly average for 1937-40. However, according to calculations made by the Famine Inquiry Commission, the shortage of rice in

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[5] See Alamgir (1980), p.79; and see also Chattopadhyay (1991), chapter 1.

[6] See Aykroyd (1974), p.73.

[7] For detailed treatment of this issue, see Greenough (1982), Chapter 3; see also Sen (1981), Chapter 6, Famine Inquiry Commission (1945a).

Bengal was only equivalent to three weeks requirements in 1943.[8] W.R. Aykroyd, who was a member of the Commission, wrote subsequently that "sheer lack of rice was a less important cause of starvation and death than its enormous price."[9] It is here that the failure of the Government to control prices and ensure a proper distribution of food really lies.[10]

The majority of the population, who were net purchasers of foodgrains, were near starvation from early in 1943.[11] Probably the most appropriate form of relief in these circumstances was direct provision of food to the distressed.[12] But such relief against the failure of food exchange entitlements did not come into operation on a significant scale until September of 1943; and by that time, as we shall see, mortality had already risen alarmingly.[13]

With a bumper aman harvest during the last months of 1943 the price of rice dropped - but it still remained very high throughout 1944 compared to its normal level. In late 1943 the army at last instigated an efficient distribution of imported foodgrains. However, before any plan for the rehabilitation of famine victims was put into operation,

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[8] See Famine Inquiry Commission (1945a), p.211.

[9] Aykroyd (1974), p.74.

[10] On this see Bhatia (1967), Chapter 11, Greenough (1982), Chapter 3, and also Sen (1981), Chapter 6. As Aykroyd wrote, "The Government of Bengal tried various expedients in a half-hearted way but failed to master the appalling difficulties"; see Aykroyd (1974), p.78.

[11] For a discussion on the development of distress during 1943, see Mukherji (1965), pp.41-60.

[12] See Aykroyd (1974), pp.76-77.

[13] For a discussion of the failure of relief measures, see Greenough (1982), especially pp.127-138; see also Famine Inquiry Commission (1945a).

multiple epidemics devastated the province.[14]

5.2 THE DEMOGRAPHIC DIMENSIONS OF THE BENGAL FAMINE: A REVIEW OF THE EXISTING LITERATURE

Demographic considerations have always been an important aspect of writings on the Bengal famine. The quantum of excess mortality has understandably constituted a hotly debated issue, not only during the famine, but even today.[15] Indeed this is worth addressing in somewhat detail (see below). But apart from the question of excess mortality, several other demographic aspects of the crisis have also received attention. For example, the Famine Inquiry Commission's own Report on Bengal gives an account of the nature of mortality, its timing and causes, including the role of epidemics and its geographical variation. According to the Report, the period of peak famine mortality was from the middle of 1943 to the middle of 1944. This conclusion was presumably based on unpublished registration data for the period up to June of 1944 which was only available to the Commission. On the basis of registration data for West Bengal, Amartya Sen argues that famine mortality lasted at least until 1946.[16] However, using newly found registration data for the whole of undivided Bengal, Dyson has shown that famine excess mortality began in June of 1943 and lasted until

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[14] This period of famine has sometimes been described as the "epidemic phase" as against the preceding "starvation phase"; see e.g. Sen (1981).

[15] For a brief summary of the debate over the scale of mortality during the famine period, see Sen (1981), especially pp. 195-196.

[16] See Sen (1980), and also Sen (1981), Appendix D, especially pp. 196-202.

the middle of 1945. This said, the bulk of mortality occurred during the period previously indicated by the Famine Inquiry Commission.[17] It has also often been suggested that East Bengal suffered a greater severity of famine - though not necessarily in mortality terms - as compared to the rest of the province.[18]

The Report on Bengal labelled as "normally deficit" in terms of food provision the districts of Chittagong, Dacca, Faridpur, Tippera and Noakhali which it also said "were unquestionably seriously short of supplies in the famine year".[19] The Report regarded the following districts as constituting "surplus" areas: Bakarganj, Burdwan, Birbhum, Bogra, Dinajpur, Jalpaiguri, Malda, and Rajshahi. Considering excess deaths in these two classes of districts, the Report concluded that "mortality during the first six months of the famine was related to the degree of local scarcity."[20] However, it also suggested that the districts which did not suffer severely in 1943 recorded a general rise in death rates during the first half of 1944.[21]

W.R. Aykroyd wrote that "in the early days of the famine most deaths were due to sheer starvation, but later hundreds of thousands of deaths were ascribed to smallpox, cholera and malaria, all rampant in a disorganised and unresistant

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[17] See Dyson (1991b).

[18] See e.g. Alamgir (1980), especially pp.86-87, Aykroyd (1974), p.72, and also Greenough (1982), p.163.

[19] Famine Inquiry Commission (1945a), p.114.

[20] Ibid., p.114.

[21] The subject of inter-district variation in demographic impact during the famine is dealt with in detail in the next chapter.

population."[22] A survey of five villages in Faridpur district found that more than 50 per cent of total deaths in 1943 were due to "starvation pure and simple".[23] The general picture in the emergency hospitals of Calcutta during the period August-November 1943 was also said to be one of "acute starvation and its effects"; it was only from about December of 1943 onwards that diseases took precedence over starvation.[24] Greenough notes that epidemic cholera, smallpox and malaria became prevalent between October 1943 and April 1944.[25] He adds that "[t]here is little reason to doubt that the major cause of epidemics was the nutritionally weakened state of the rural populace in combination with unusual concentrations of migrant destitutes".[26] Indeed, the monthly pattern of registered deaths during the height of the famine was remarkably similar to the pre-famine normal seasonal pattern.[27] In Amartya Sen's words: "The famine seems to have worked by magnifying the forces of mortality each month, heightening the peak mortality relatively more".[28]

The Report on Bengal explicitly deals with the question of the interaction of the famine and epidemics. It recognises the role of widespread famine-induced starvation in causing these epidemics. While cholera and diarrhoea were thought to

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[22] See Aykroyd (1974), p.77.

[23] See Mukherji (1965), p.51.

[24] See Famine Inquiry Commission (1945a), pp.116-118.

[25] Greenough (1982), p.141.

[26] Ibid, p.141.

[27] See Famine Inquiry Commission (1945a), p.113.

[28] See Sen (1981), p.213.

be largely related to food shortages and contamination of water and food, the cause of the epidemic of malaria, though more complicated, was largely taken to be the famine. The Report states that "in general mortality from malaria was exceptionally high in admittedly deficit districts". Bengal was normally among the most malarial provinces of British India. However, the Report on Bengal noted that "no epidemic approaching in severity that of 1943-44 has occurred within its recent history"; hence "a most formidable epidemic of malaria was associated with the famine".[29] The new data analyzed by Dyson confirm that malaria was almost certainly the most important element in the main death peak of 1943 and 1944. Together with other possible explanations such as the interaction of migration and epidemic malaria, he mentions the "refeeding hypothesis" as a tentative reason for "the temporal distribution of deaths during the famine".[30] Dyson cites Ramakrishnan's suggestion that the occurrence of extremely high malaria mortality during late 1943 and early 1944 followed the establishment of "feeding arrangements" in September of 1943, and may have been due to the fact that latent malarial infections amongst the undernourished population became manifest and fatal only after some improvement in the level of nutrition from extremely low levels.[31]

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[29] Famine Inquiry Commission (1945a), pp.119.

[30] See Dyson (1991b) and the references cited therein.

[31] See Ramakrishnan (1954), especially pp.94-95. More recently, evidence of increased malaria attack following the rehabilitation of famine crisis victims has also been found in the African context; see Murray et al. (1975, 1976 and 1990).

Information on the class composition of famine mortality is "limited and somewhat haphazard".[32] The Report on Bengal did not deal with occupational differentials in mortality. But sample surveys undertaken during and just after the crisis did pay particular attention to this aspect.[33] All available evidence indicates that agricultural labour was the most affected group in terms of both destitution and mortality.[34] Fishermen, artisans, and transport workers were also severely affected. Since distress was primarily due to very high prices, rather than non-availability of food or employment, we would expect that wage-workers were among the most vulnerable groups in terms of their ability to meet their basic subsistence requirements. On the whole, the survey evidence does indicate that the famine killed proportionately more of those sections of the population whose failure in food entitlements was relatively great.[35]

The fertility response to the famine has been relatively neglected. However, Dyson has recently used registration data to examine the time path of monthly movements of deaths and conceptions alongside movements in food prices. Monthly conceptions are taken to be equal to monthly numbers of births, displaced by nine months. Given considerable seasonality of conceptions in Bengal during the pre-famine

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[32] Sen (1981), p. 210.

[33] See e.g. Mahalanobis et al. (1946), Mukherji (1965), Chattapadhyaya and Mukherjea (1946), and Das (1949).

[34] See Sen (1981), especially pp.209-210. The Report on Bengal also noted that "only one section of the community suffered from starvation - the poorer classes in the rural areas"; see Famine Inquiry Commission (1945a), p.2.

[35] See Sen (1981), Chapter 6 and also pp.209-210.

baseline period of 1936-40, he constructs monthly "conception indices" during 1941-45. These are the absolute (rather than proportionate) deviations of conceptions during the crisis from those during 1936-40. His analysis shows that as early as 1941 food prices were higher than usual and the number of conceptions was lower than usual. The fall-off in conceptions continued and reached a minimum absolute level during September-November of 1943, which was broadly the period of highest death rates. The fertility of the population was therefore reduced long before the death rate started to rise.

Turning to the age and sex pattern of famine mortality, Sen used data from the Census of India 1951 publication for West Bengal.[36] He argued that age and sex differentials were very similar to those of normal times. However Dyson has shown that Sen's use of the data for West Bengal, which were themselves derived by applying a constant proportional age distribution (i.e pro-ration), makes this conclusion doubtful.[37] Using the newly found registration data for undivided Bengal Dyson shows that the largest proportional mortality rises were recorded for older children (i.e those aged 10-14) and adults. Infants, young children and elderly people experienced relatively small proportional increases in death rates. With the significant exception of infancy, male death rates in 1943 rose more in proportional terms than did those of females - and this was particularly true in the prime reproductive years. Also, the registered neo-natal mortality

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[36] Census of India 1951, vol. VI, part 1B, Vital Statistics, West Bengal 1941-50 (New Delhi, 1952).

[37] See Dyson (1991b), especially p.284, and footnote 38, p.280.

rate was little affected by the famine.[38]

With this as background, we now consider some of these issues in much greater depth using data contained in the Bengal Public Health Reports published for the years 1942, 1943, 1944 and 1945.[39] So far as we are aware, these Reports have never been used in any of the previous published work on the Bengal famine. Dyson's recent reanalysis used another publication and in any event pertains only to demographic responses in the whole of Bengal. But the Reports used here allow us to re-examine the demography of the famine at a much more detailed level.

5.3 EXCESS MORTALITY DURING THE BENGAL FAMINE: A RE-ASSESSMENT

Table 5.1 summarizes the main estimates of excess famine mortality which have hitherto been made. It shows that the estimates vary greatly, depending upon the use of divergent sources of data, methods and assumptions. While some of the estimates are based on sample survey data, others are based on registration material, and still others are based on a combination of both. The sheer number of estimates by different authors reflects both the importance with which this issue has been viewed and the potential for bias in this sort of estimation exercise. However, Sen's treatment and estimates are outstanding in that he is quite clear about his

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[38] Ibid, p.284.

[39] Government of Bengal, Health Directorate, Bengal Public Health Report, Alipore: Government Press (for the years as stated in the text). We discovered these reports in the Secretariat Library, Writers' Buildings, Calcutta.

Table 5.1 Summary of Previous Estimates of Excess Mortality During the Bengal famine of 1943-44.

Authors	Excess Deaths	Period to which pertain	Data Sources	Comment
1) Department of Public Health, Bengal.	792,854 to 1,017600	May 1943 - April 1944 (inclusive)	Vital Registration for all-Bengal	No allowance made for under-registration of deaths; also employs an over-estimated level of "normal" mortality, which thus reduces the estimated level of excess deaths.
2) Famine Inquiry Commission 1945	"about 1.5 million"	Jan. 1943 - June 1944 (inclusive)	Vital registration for all-Bengal	No allowance made for under-registration of deaths in 1944; baseline normal mortality fixed by deaths during 1938-42.
3) K.P. Chattopadhya	2.7 million (minimum)	1943 and first half of 1944	Vital registration and sample survey of ten famine affected districts	Probable unrepresentativeness of the sample for the whole of Bengal; also possible errors in calculations.
4) Bengal Public Health Report 1944	1.4 million	June 1943 - Dec.1944 (inclusive)	Vital registration for all-Bengal	Arbitrarily assumes under-registration of deaths as 40 per cent and this figure is also an underestimate.
5) Census of India 1951	1.413 million	1943 to 1945 (inclusive)	Vital registration for all-Bengal	Probable inadequate allowance for under-registration of deaths; use of a baseline "normal" CDR of 20 per 1000 which is probably too high.
6) Census of Pakistan 1951	1,714,000 (for East Bengal only)	1942 to 1944 (inclusive)	Probably vital registration for East Bengal	Level of baseline "normal" mortality probably underestimated (see text).
7) A.K. Sen	2.62 to 3.05 million	1943 to 1946	Vital registration for West Bengal and estimate no.6 for East Bengal	See text.
8) P.R. Greenough	3.5 to 3.8 million	1943 to 1946	ISI sample survey for 1943, plus both data sources given above for estimate no.7	See text.

Sources: 1) Memoranda no.14, "Note on mortality caused by the famine", submitted to the Woodhead (Famine Inquiry) Commission by the Department of Public Health and Local Self-Government (Medical) of the Government of Bengal, 1944, p.64, Document from the Pinnell Papers. 2) Famine Inquiry Commission, Report on Bengal, New Delhi, 1945, pp.108-110. 3) Quoted in Sen (1981), and also Greenough (1982). 4) Government of Bengal, Directorate of Public Health, Bengal Public Health Report for 1944, Alipore, Government Press, 1948, p.13. 5) Census of India 1951, Volume VI, West Bengal, Sikkim and Chandernagore, Part 1A, Report, Delhi,1953 6) Census of Pakistan 1951, Volume 3, East Bengal, Report and Tables, Karachi, (not dated), p.7. 7) Sen (1981), especially pp. 195-202. 8) Greenough (1982), especially pp. 299-309.

assumptions and procedures. In fact, Sen's estimates have been particularly influential in shaping the recent course of this debate about the scale of mortality and in casting doubt on previous estimates. Sen's own conclusion that "we may be inclined to pick a figure around 3 million as the death toll of the Bengal Famine" has been so widely cited that it can probably be safely described as representing the new "conventional wisdom" as to the scale of excess mortality during this famine.[40] From these various considerations it seems reasonable for us to here critically review the estimates provided by Sen.[41] In fact we will argue that his estimates too are not without some problems.

Sen arrived at the figure of 3 million excess deaths for the whole of Bengal by adding separate estimates of excess mortality for West and East Bengal. For West Bengal, he used annual data on deaths contained in a 1951 Census of India publication.[42] In fact Sen derived two separate sets of estimates for West Bengal corresponding to two assumptions as to what the "normal" number of deaths would have been in the absence of the famine. His A estimates are based on the assumption that the average of registered deaths in 1942 and 1941 can be taken as the normal expected number of deaths. Sen's B estimates take registered deaths in 1942 alone as the

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[40] For citations of Sen's estimate of 3 million excess deaths see, for example, Alamgir (1980), p.85 and p.92, Hugo (1984), p.15, Uppal (1984), pp.216-217, Arnold (1988), p.44, and also Kane (1988), p.20.

[41] Greenough's sometimes-cited estimate of between 3.5 and 3.8 million excess deaths is largely based on Sen's calculations; thus Greenough's estimate, in our view, does not deserve separate treatment here.

[42] Census of India 1951, Volume VI, Part 1B, Vital Statistics of West Bengal:1941-50, New Delhi: Manager of Publications, 1952.

normal expected number. Both the A and B estimates imply that there was prolonged elevated mortality, lasting well beyond 1946. Since the social and political turmoil in the wake of partition makes detection of famine deaths difficult beyond 1946, Sen counts only the resulting excess deaths in West Bengal for years 1943-46 inclusive as due to famine. This procedure gives total registered excess famine mortality of 601,000 and 673,000 deaths respectively under assumptions A and B. Next he makes some allowance for the level of death under-registration. Exploring several possible sources, Sen adopts Jain's estimate of the average level of death under-registration in West Bengal during 1941-50.[43] By employing two techniques (the differencing and reverse survival methods), Jain concluded that registered deaths constituted about 66 per cent of total deaths. Thus Sen, adopting the correction factors of 1.51 implied by this figure, arrives at total excess famine mortality estimates for West Bengal of 908,000 and 1,016,000 deaths respectively under his assumptions A and B.

Considering East Bengal, Sen used an estimate of 1.714 million excess deaths for the period up to and including 1944, which is contained in a 1951 Census of Pakistan report.[44] If this figure is added to the above two estimates for West Bengal for 1943-46, then total excess famine mortality estimates for undivided Bengal of 2.62 and 2.73 million are obtained. Alternatively, given that both the West Bengal

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[43] See Jain (1955).

[44] Census of Pakistan 1951, vol.3, East Bengal, Report and Tables, Karachi, (undated); see also Table 5.1.

population in the 1941 census and the numbers of registered deaths in West Bengal before 1943, were both almost exactly one third of the corresponding numbers for undivided Bengal, Sen multiplies his A and B estimates for West Bengal by a factor of 3. Thus he derives rough estimates of famine mortality for all-Bengal of 2.724 and 3.048 million respectively.

Sen notes some of the possible downward biases in the above estimate. First, use of a correction factor for death under-registration, derived for average conditions during 1941-50, probably makes inadequate allowance for the deterioration in the death registration system during the famine, particularly in 1943. Second, fixing "normal" mortality with reference to the pre-famine years, 1941 and 1942, neglects the fact that death rates in Bengal were generally <u>falling</u> in the 1930s and 1940s. Thus the relevant comparison to calculate excess mortality should <u>not</u> be with pre-famine mortality, but with the presumably <u>lower</u> level of mortality which would have occurred in the absence of the famine (this will be further addressed below). Third, the East Bengal estimate of excess deaths pertains only to those occurring up to the end of 1944, while the West Bengal data suggest, as we have already noted, a <u>continuation</u> of excess famine mortality until 1946 at least. In view of all these downward biases Sen tends to settle on the round figure of 3 million excess deaths as a reasonable summary estimate of the total scale of mortality.

Our chief criticism of Sen's estimates relates to the data he used and, relatedly, the treatment of West Bengal and

East Bengal separately. Registration data for the whole of undivided Bengal are available for the period up to 1945. Table 5.2 presents these annual registered deaths for undivided Bengal for 1941-46 and subjects them to precisely the same procedures and assumptions which Sen applied to his data for West Bengal. As can be seen the resulting total estimates are 1.8 and 1.9 excess million deaths respectively under his assumptions A and B. On this basis there appear to be two main reasons why Sen's estimate of excess mortality (i.e. around 3 million) are too high. First, the registration materials for undivided Bengal do <u>not</u> support the idea that elevated mortality lasted for years after the famine. As the all-India Public Health Report for 1945 states, "The deterioration in health conditions [in Bengal] that started with the famine in 1943 gradually disappeared by the middle of the year 1945".[45] Second, while the West Bengal data showed a sharp decline in deaths from 1941 to 1942,[46] the all-Bengal data instead show a slight increase, which viewed in historical perspective is perhaps not surprising (see Table 5.2). Obviously, the low number of deaths indicated for 1942 influences in an upward direction both the A and B series of excess deaths made by Sen.

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[45] See <u>Annual Report of the Public Health Commissioner with the Government of India for 1945</u>: New Delhi, 1948, p.39. In this context it is of some interest to compare deaths registered in undivided Bengal in the last half of 1945 (i.e. July to December inclusive) with the numbers registered during the same months in the previous years:

Year	Registered deaths	Year	Registered deaths
1940	605,619	1943	1,332,209
1941	585,708	1944	735,943
1942	680,658	1945	565,933

It is perhaps relevant to remark that the population in mid-1941 was of similar size to that in mid-1945 (see Table 5.4 below).

[46] See Dyson and Maharatna (1991a), Table 1.

Table 5.2 Registered Deaths in Undivided Bengal, 1941-46: A Re-estimation of Excess Famine Deaths Using Sen's Method

Year	Deaths	Excess Deaths	
		Estimate A	Estimate B
1941	1,184,850		
1942	1,222,164		
Average 1941-42	1,203,507		
1943	1,908,622	705,115	686,458
1944	1,726,870	523,363	504,706
1945	1,238,133	34,626	15,969
1946	1,068,996	-134,511	-153,168
Total Excess 1943-45		1,263,104	1,207,133
(Total Excess 1943-45) x 1.51		1,907,287	1,822,771

Notes: (1) For 1941, and preceding years, the registration area in Bengal covered 72,514 square miles. The data from 1942 onwards relate to an area of 72,435 square miles. Here and subsequently we have not adjusted for this very small difference.

(2) Registered vital events for 1946 were designated "provisional" and are thus likely to understate whatever were the true final numbers. In this context, it is noteworthy that some of the numbers of registered deaths given above are marginally higher than the numbers which appear in the Famine Inquiry Commission's Report on Bengal (Delhi: Government Press, 1945). For example, the Report cites 1,873,749 deaths registered in 1943. This figure may well have been the "provisional" number. If so, then the suggestion is that provisional numbers were not severe understatements of final numbers i.e. 1,873,749/1,908,622 = 0.9817.

Sources: Dyson and Maharatna (1991a). The original sources are the Annual Report of the Public Health Commissioner with the Government of India for 1943 and 1944, New Delhi, 1946; Statistical Appendices to Annual Reports of the Public Health Commissioner with the Government of India for the Period 1940-44, New Delhi,1947; and Statistical Appendices to Annual Report of the Public Health Commissioner with the Government of India for the Year 1945, New Delhi, 1948. The provisional numbers of registered vital events in undivided Bengal in 1946 are available in Annual Report of the Public Health Commissioner with the Government of India for 1946, New Delhi, 1948, pp. 4-5.

Our present use of the all-Bengal registration data in Table 5.2 is straightforward. But Sen's separate treatment of material for West Bengal and East Bengal (as necessitated by his use of census publications) is subject to difficulties. This is primarily because of errors introduced by the carving out of registered deaths for the districts which were split at the time of partition (namely, Nadia, Malda, Dinajpur and Jalpaiguri districts). In fact, in order to reconstitute data for the period before 1946 to accord with the new district jurisdictions of West Bengal, simple proportions of the vital events registered in the old districts of Bengal were taken by the 1951 Census of India publication. Indeed, there are clear indications that these census publication figures, though presumably originally derived in some way from the registration data, were also subjected to very heavy statistical manipulation (for more on this and a detailed evaluation of the data contained in the 1951 Census of India publication, see Appendix B). For example, comparison of the numbers of registered deaths in West Bengal (obtained from the 1951 Census of India publication) with the numbers of registered deaths in undivided Bengal shows rather striking variation in the fraction of deaths indicated to be occurring in West Bengal in different years. More importantly, for each of the years 1941-46 inclusive the numbers of deaths by age given in the 1951 Census of India publication share exactly the same proportional distribution - a fact which certainly means that they were prorated. Therefore there seems to be little reason to attach much confidence to the annual numbers of registered deaths in West Bengal given in the 1951 Census of India publication used by Sen.

On the other hand, the data on registered deaths in undivided Bengal also invalidate the figure of 1.714 million excess deaths for East Bengal which was used by Sen and is given in a 1951 Census of Pakistan Report.[47] In this context, the Report writes:

> The famine death roll as worked out from the official statements, which as explained are largely estimates in the absence of reliable reports, for East Bengal comes to about 17,14,000. The signs of famine became visible about July 1942, and its worst effects in the form of epidemics continued until December, 1944. The total number of deaths in these years has been estimated at 33, 35,000 deaths which, reduced by the quinquennial normal average of about 5,40,000 deaths annually, gives the foregoing official figure of deaths from the famine. According to popular belief, however, the deaths from famine in East Bengal were between two and two and a half millions..[48]

It is almost certain that the source of the above data on the actual number of deaths was the system of vital registration; in fact there was virtually no alternative source from which such numbers of deaths could be obtained. This conclusion seems to be confirmed by the fact that the total number of deaths given for East Bengal for 1942-44 inclusive (3,335,000)

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[47] Census of Pakistan 1951, Volume 3, East Bengal, Report and Tables, Karachi, (undated).

[48] Ibid., p.30.

is very close to the number (3,238,000) obtained by taking two thirds of registered deaths in undivided Bengal for these years (i.e. 3,238,437 = 2/3(1,222,164 + 1,908,622 + 1,726,870)). Recall that we have already noted that registered deaths in West Bengal were almost exactly one third of registered deaths in undivided Bengal during the years before the famine.

Now a serious problem arises with the statistics on deaths given in the 1951 Census of Pakistan report mentioned above; for there is no sound basis for setting the normal average annual number of deaths in East Bengal at only 540,000. During 1938-42, for example, the average annual number of registered deaths in undivided Bengal was 1,184,903. As about 2/3 of these deaths were registered in East Bengal the normal annual number of deaths on this basis alone should be about 790,000. The origins of the number of 540,000 normal deaths may never be known; but undoubtedly it represents a gross underestimate of normal mortality, overestimate of famine mortality in East Bengal.[49] It therefore seems clear that the estimate of excess mortality, based on the separate data for East and West Bengal (as contained in the respective census publications) is unsatisfactory. Moreover, given the possibility of migration and other demographic fluctuations, separate treatment of the statistics for East and West Bengal may well distort conclusions drawn for the whole of Bengal. For example, the existence of a prolonged elevated mortality

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[49] For example, if we use 790,000 as the average annual normal number of deaths then the excess deaths for 1942-44 in East Bengal amount to 965,000 which, of course, then has to be adjusted upwards for death under-registration.

at least up to 1946 in West Bengal (as shown by the statistics used by Sen) contrasts with our finding of an earlier recovery of mortality to normal level for undivided Bengal - a point to which we will return later. While this may well be related to population movements - among other things - determining the duration of famine mortality for Bengal on the basis of West Bengal's experience - as Sen did - is fraught with difficulties. Thus the foregoing discussion implies that for estimating excess deaths during the famine it is probably more appropriate to use the registration data for undivided Bengal.

Perhaps the most difficult issue involved in estimating famine mortality relates to the determination of an appropriate correction factor for under-registration of deaths. Moreover, there is the additional issue of differential registration coverage in the non-famine and famine periods. It is generally believed that registration coverage deteriorated in 1943 and improved in 1944. The Famine Inquiry Commission itself commented that: "[i]n spite of the conditions produced by the famine, there was no universal breakdown in 1943 in the system of recording deaths. We made careful inquiries on this point from local officials and other witnesses." Again it states that "[a]t the end of 1943 a considerable effort was made, by civil and military medical authorities, to improve the registration of deaths." Therefore, the average level of death registration during 1943-44 may not be much worse than in the immediately adjoining years of 1940-42 and 1945.

Table 5.3 presents a summary of several studies (including our own) which have assessed registration coverage

Table 5.3 Estimates of Vital Registration Completeness for Bengal

	Analyst(s)	Period	Territory Covered	Method(s) of Assessment	Births Level of Registration	Births Correction Factor	Deaths Level of Registration	Deaths Correction Factor
1	A.E. Porter	1921-30	Undivided Bengal	Differencing method	65.5	1.53	70.0	1.43
2	S.R. Chowdhury	1931-40 (births) 1930-32 (deaths)	Undivided Bengal	Reverse Survival (births) and growth balance (deaths)	61.7	1.62	76.0	1.32
3	Present author	1940-42	Undivided Bengal	Growth balance	n.a.	n.a.	74.7	1.34
4	S. Sengupta	1941-50	W. Bengal	Reverse survival	50.4	1.98	69.0	1.45
5	S.P. Jain	1941-50	W. Bengal	Differencing method and reverse survival	57.9	1.73	66.1	1.51
6	P.G. Chowdhury	1948	Six districts of W. Bengal	Comparison of district vital returns with survey figures	62.3	1.61	68.3	1.46

Notes: (i) The correction factor (CF) is the reciprocal of the estimate of the proportion of events registered. In this context see also footnote 50. (ii) The level of registration completeness figures given for the study by P.G. Chowdhury were obtained by comparing the number of events (i.e. births and deaths) recorded in the district vital returns with the number of events recorded by a special survey.

Sources:
1 Census of India 1931, Vol. 5, Bengal and Sikkim, Part I, Report, Calcutta, 1933, p. 127.
2 S.R. Chowdhury "The Unprecedented Growth of Population in Bengal in the 1930s: an Effort to Find Out the Real Mechanism", M.Sc. Demography Thesis, London School of Economics, September, 1989.
3 See Appendix C.
4 Census of India, 1951, Volume VI, West Bengal, Sikkim and Chandernagore, Part IA-Report, Delhi, pp. 329-331.
5 See Jain (1955).
6 Census of India, 1951, Volume VI Part IB, Vital Statistics, West Bengal 1941-1950, Delhi, 1955, Appendix B.

at different times, and for different jurisdictions, in Bengal. Unfortunately there are instances of errors that analysts have made in interpreting statistics on death registration completeness and in converting them into correction factors for death under-registration.[50] However, the following general comments can be made on the basis of these results in Table 5.3. First, we can probably safely conclude that the level of death registration was significantly higher than that of births. Second, there is an indication that registration completeness may have deteriorated to some extent at some time after around 1940-42. It is also noteworthy that Jain's estimates imply the largest correction factor for under-registration of deaths.

In view of the considerable difficulties confronted by any demographic analysis for Bengal during 1941-5, especially due to the limited publication of the 1941 census results, boundary changes and also migration flows, perhaps the strongest case can indeed be made for Jain's correction factors. His analysis, based partly on the 1951 census results and also migration data for West Bengal, appears to have been notably thorough. However, it should be observed that his correction factors for 1941-50 not only relate to

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[50] For example Sengupta, deriving an estimate of 31 per cent deficiency in death registration, ultimately used a correction factor of 1.31, whereas in fact the associated correction factor should be 1/(1-0.31)=1.45; see Census of India 1951, Volume VI, West Bengal. Sikkim and Chandernagore, Part1A-Report, Delhi, 1953, pp.329-331. Another example of such an error in understanding and using a correction factor for death under-registration can be found in the report of the Famine Inquiry Commission. While on the basis of registration data the excess deaths in 1943 over the quinquennial average was stated to be 688,846, the Commission's report then expressed the opinion that excess deaths in 1943 over the average were one million, thus implying a correction factor of 1.45. Now given the quinquennial average annual deaths of 1,184,903 and given the registered number of deaths in 1943 being 1,873,749, the Commission's stated belief of one million excess deaths in 1943 implies a correction factor of only 1.16; see Famine Inquiry Commission (1945a), pp.108-109.

West Bengal (rather than to undivided Bengal), but they may also have been unduly influenced by poorer registration in the latter part of the 1940s. Therefore, given the particular efforts made for improving death registration coverage in 1944 and also the possible deterioration of registration during the late 1940s, Jain's correction factor which relates to average conditions during the 1941-50 decade may conceivably overcorrect for death under-registration during the main famine period.

From the foregoing, it seems reasonable to follow Sen in using Jain's correction factors for under-registration and also provide estimates of excess mortality for a range of assumptions relating to the level of death registration completeness. Accordingly, we have adopted three sets of assumptions as follows:

Assumption 1: The correction factors of 1.62 (births) and 1.32 (deaths) as estimated by S.R. Chowdhury apply; note that this correction factor for deaths is very close to our own estimate for 1940-42 which is made in Appendix C (see especially Table 5.3).

Assumption 2: S.P.Jain's correction factors of 1.73 (births) and 1.51 (deaths) apply.

Assumption 3: Correction factors of 1.90 (births) and 1.70 (deaths) apply. These factors were chosen arbitrarily to represent an even greater degree of under-registration than is implied by Jain's work.

Given these assumptions, the basic calculations employed in order to estimate of excess mortality are presented in Table 5.4. Panel A addresses the question of what the death

Table 5.4 Estimation of Excess Famine Deaths in Undivided Bengal Under Assumptions 1-3

PANEL A

Year	Registered Deaths	Estimated mid-year population (000's)	Registered CDR	Registered CDR adjusted upwards by CF = 1.32	1.51	1.70	Registered Infant Mortality Rate (IMR)
1931	1,113,312	50,046	22.25	29.37	33.60	37.83	174.0
1932	1,022,219	50,996	20.05	26.47	30.28	34.09	178.9
1933	1,197,885	51,964	23.05	30.43	34.81	39.19	200.1
1934	1,176,887	52,950	22.23	29.34	33.57	37.79	189.2
1935	1,131,427	53,955	20.97	27.68	31.66	35.65	158.5
1936	1,222,724	54,979	22.24	29.36	33.58	37.81	170.9
1937	1,232,971	56,022	22.01	29.05	33.24	37.42	176.2
1938	1,315,886	57,086	23.05	30.43	34.81	39.19	184.1
1939	1,090,530	58,169	18.75	24.75	28.31	31.88	146.6
1940	1,111,082	59,273	18.75	24.75	28.31	31.88	159.3
1941	1,184,850	60,398	19.62	25.90	29.63	33.35	155.7
1942	1,222,164	61,544	19.86	26.22	29.99	33.76	154.3
			CDRs extrapolated on linear time-trend				
1943	1,908,622	-	19.44	25.66	29.35	33.05	195.4
1944	1,726,870	-	19.19	25.33	28.98	32.62	207.9
1945	1,238,133	-	18.94	25.00	28.60	32.20	143.2
1946	1,068,996	-	18.69	24.67	28.22	31.77	n.a.

PANEL B

Year	Assumption 1 Mid-Year Pop. (000's)	CDR	Excess Deaths	Assumption 2 Mid-Year Pop. (000's)	CDR	Excess Deaths	Assumption 3 Mid-Year Pop. (000's)	CDR	Excess Deaths
1943	62,107	40.57	926,015	62,019	46.47	1,061,765	62,013	52.32	1,194,991
1944	60,634	37.59	743,373	60,213	43.31	862,852	59,934	48.98	980,520
1945	60,580	26.98	119,948	60,014	31.15	153,036	59,656	35.28	183,740
1946	61,528	22.93	-	60,917	26.50	-	60,602	29.99	-
	Total: 1.8 million			Total: 2.1 million			Total: 2.4 million		

Notes: (i) The estimated mid-year populations for 1931 and 1941 (underlined) were based directly on census results pertaining to the areas under registration. In using them to derive estimates of mid-year populations for non-census years during 1931-42 (on the assumption of regular compound growth), account is explicitly being taken of probable net in-migration in the period. However, in the absence of data, allowance cannot be made for migration after 1941. Note that between 1931 and 1941 the population was growing at the fast rate of 1.88 per cent per annum. (ii) The registered CDRs given above are lower than the official rates published annually in the Bengal Public Health Report. This is because the official rates were unable to adequately take account of population growth during the intercensal years. (iii) The least squares regression line derived from the registered CDRs for 1931-42 was CDR = 506.098 - 0.25052 (YEAR). The trend line, and its extrapolation to years 1943-46 under assumption 2, are shown in Figure 5.1. As can be seen, it gives a reasonable representation of the downward trend in the death rate during the 1930s. (iv) The infant mortality rates (IMRs) are infant deaths per thousand live births registered in the same year. The IMRs given for 1943-45 inclusive, are those registered in those years (i.e. they are not extrapolated). See also footnote 52.

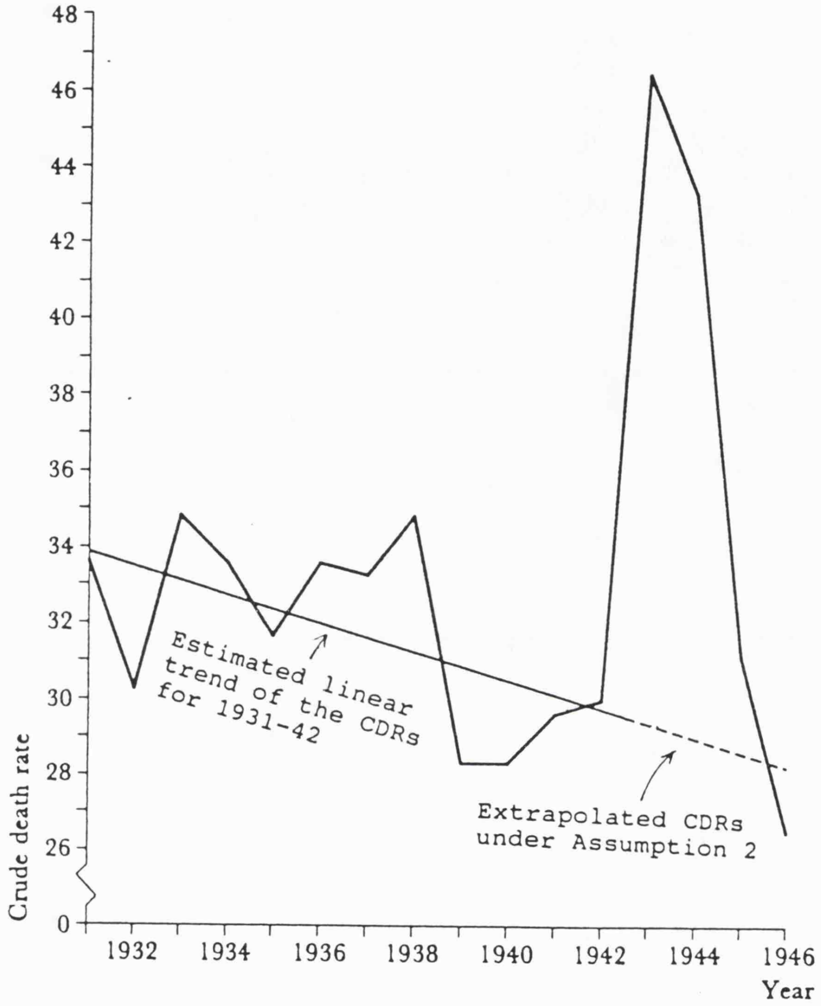
Sources: For years before 1946 data have been taken from Bengal Public Health Report, Alipore: Government Press, various years; the data for 1946 are from Annual Report of the Public Health Commissioner with the Government of India for 1946, New Delhi, 1948.

rate would have been in the absence of the famine. Assuming a constant rate of population growth (of 1.88 per cent per annum) between 1931 and 1941, we calculated the crude death rates (CDRs) for the years 1931-42 inclusive. Then we fitted a least-squares regression line to these CDRs for 1931-42 in order to determine the CDRs during 1943-46 that would have prevailed in the absence of famine (given the downward trend in the CDRs of 1931-42). Given this fitted line, the derived "extrapolated" CDRs for 1943-46 have all been adjusted upwards by the correction factors implied by assumptions 1-3 in order to allow for under-registration of deaths (see Panel A of Table 5.4).

Next the actual crude death rates for each of the years 1943-46 have been estimated by using the registered numbers of births and deaths adjusted upwards under assumptions 1-3 and also by calculating the corresponding mid-year populations on the basis of the adjusted births and deaths (see Panel B of Table 5.4). Now the differences between the actual CDRs and the "extrapolated" CDRs during this period represent the excess death rates which, when applied to the estimated mid-year populations, give the total numbers of excess deaths (see Panel B of Table 5.4). Figure 5.1 illustrates the basic process with reference to assumption 2. Essentially the volume of excess deaths is being evaluated as the area <u>under</u> the CDR curve, yet <u>above</u> the extrapolated CDR line.

Of course, the above estimates of famine mortality are not entirely beyond dispute. First, the estimated extrapolated normal level of mortality during the famine period, based on the trend of 1931-42, would be different if

Figure 5.1 Assessment of Excess Mortality According to Assumption 2



we used a different reference period to fix the pre-famine trend in the death rate. Second, the period of famine mortality itself is not entirely an objective matter. Thus the crude death rate in 1945, being below that for 1938, can arguably be considered as representing a non-famine year. On the other hand, the below trend death rate for 1946 might partly be a reflection of the changed age structure of the population after the famine and thus could well still represent some excess famine mortality. Third, we cannot be sure that the provisional number of registered deaths for 1946 used here represented only a modest underestimate of the true final number of deaths for that year.

However, while we are not in a position to evaluate these issues, we can probably safely conclude that they are relatively minor and that their effects are probably at least partly offsetting. Therefore, the implied range of famine mortality is between 1.8 and 2.4 million excess deaths. The upper estimate of 2.4 million is based upon an arbitrary assumption regarding the level of registration completeness (i.e. assumption 3). We know of no strong grounds for considering that the average level of death registration in 1943-44 was less than 60 per cent (as required by this assumption). Certainly, the limited survey data available for the period are insufficient to shed much light on the issue.[51] Thus it seems reasonable to conclude that the rough figure of 2.1 million excess deaths arising from assumption 2 (and embodying precisely the same correction factor for death under-registration as was used by Sen) is probably as good as any.

From Table 5.4 it also emerges that the main period of population reduction was from mid-1943 to mid-1944. Indeed, the period July 1943 to June 1944 was the most severe in terms of both increased deaths and reduced births. However,

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[51] For example, the survey data collected by the Indian Statistical Institute (ISI), Calcutta, and used by Greenough, pertain only to 1943. The number of deaths recorded by this survey for the period January to December 1943, and the number of people recorded as alive as of January 1943, may both have been influenced by their method of collection, which was called the "genealogical method"; see Greenough (1982), p.306. Whatever else were its merits, this survey does not provide a firm basis from which to evaluate registration completeness.

according to our calculations in the Table there was probably a further slight decline in population size between mid-1944 and mid-1945. Thus under assumption 2 the population of Bengal in mid-1945 was still some 2 million less than it was in mid-1943. Extrapolating from the figures in Panel B it cannot have been until around mid-1947 that the population regained its pre-famine (i.e. mid-1943) size. So while famine deaths were largely restricted to 1943 and 1944 the restoration of total numbers probably took at least four years.

Panel A of Table 5.4 also gives the registered infant mortality rates (IMRs) in undivided Bengal up to and including 1945. Interestingly, the peak IMR occurred in 1944 (rather than in 1943). This may have reflected the relatively small number of births in 1944 rather than a greater risk of dying. Perhaps the most significant feature of the IMRs is the suggestion that famine mortality was largely confined to 1943 and 1944. The registered IMR for 1945 is actually marginally below the linear trend based on 1931-42.[52]

However, to sum up this section, it seems that the volume of excess mortality during the 1943-44 Bengal famine was much closer to 2 million deaths (see especially Tables 5.2 and 5.4) than to 3 million.

5.4 THE TIME PATH OF FAMINE DISTRESS AND THE FERTILITY AND MORTALITY RESPONSES.

[52] The least-squares regression line derived from the registered IMRs for 1931-42 is IMR = 5871.8 - 2.9441 (YEAR). This gives a predicted IMR for 1945 of 145.6 infant deaths per thousand live births. In fact, IMR can be correct even if a proportion of infant deaths are not registered, provided that the same proportion of births are not registered.

As for the Indian famines considered in Chapters 2 and 3, it is of interest to examine the time path of short-run mortality and fertility effects in relation to the development of the famine in Bengal. There is a dearth of direct monthly data on food-availability or consumption which might help capture directly the time path of famine distress. However, time trends in food prices should largely reflect the development of distress because drought and consequent employment losses were singularly <u>not</u> very important sources of entitlement failure. Price rises indeed are widely believed to have directly caused much of the famine distress, especially among those sections of the population who were net-purchasers of food grains.[53] Most previous research on food price movements in the Bengal famine has used the weekly rice price for the Calcutta market, published in the <u>Indian Trade Journal</u>. But these Calcutta prices may not adequately reflect provincial food prices. Moreover, even the Calcutta prices are unavailable from October of 1943 onwards, since at that time the market in rice was suspended. However, fortunately, a monthly series of provincial average prices of coarse rice from July 1943 until October 1944 has been found in the personal papers of L.G. Pinnell which are lodged in the

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[53] As the <u>Report on Bengal</u> writes, "The remarkable feature of the Bengal famine was that the rise in the price of rice was one of the principal causes of the famine. This, as far as we are aware, makes it unique in the history of famine in India. The great majority of Indian famines have been caused by drought and widespread failure of crops over wide areas...In large famines produced by such [natural] calamities the shortage of grain was naturally reflected in a rise in price, but the latter was a secondary phenomenon, and not a primary cause of the famine"; see Famine Inquiry Commission (1945a), pp.96-97.

India Office Library in London.[54] Comparison of these with the monthly Calcutta prices suggests that they chime in well with - and significantly extend - previous price data (see Appendix D). The indicated rapid decline in rice prices in the last months of 1943 is especially noteworthy. However, prices still continued to remain remarkably high compared to their pre-famine normal level.[55]

Consequently we have used the Calcutta prices up to September of 1943, and we have then plotted Pinnell's provincial averages until October of 1944 (see Figure 5.2).[56] As in the preceding chapters, monthly conception and mortality indices (CI and MI) are here constructed as ratios of monthly conceptions and deaths respectively to the average monthly conceptions and deaths during the baseline period 1936-40 (these baseline average levels for 1936-40 being set at 100).[57] It is seen from Figure 5.2 that food prices were rising from early in 1941, and that conceptions were already below normal then. However, mortality did not rise until

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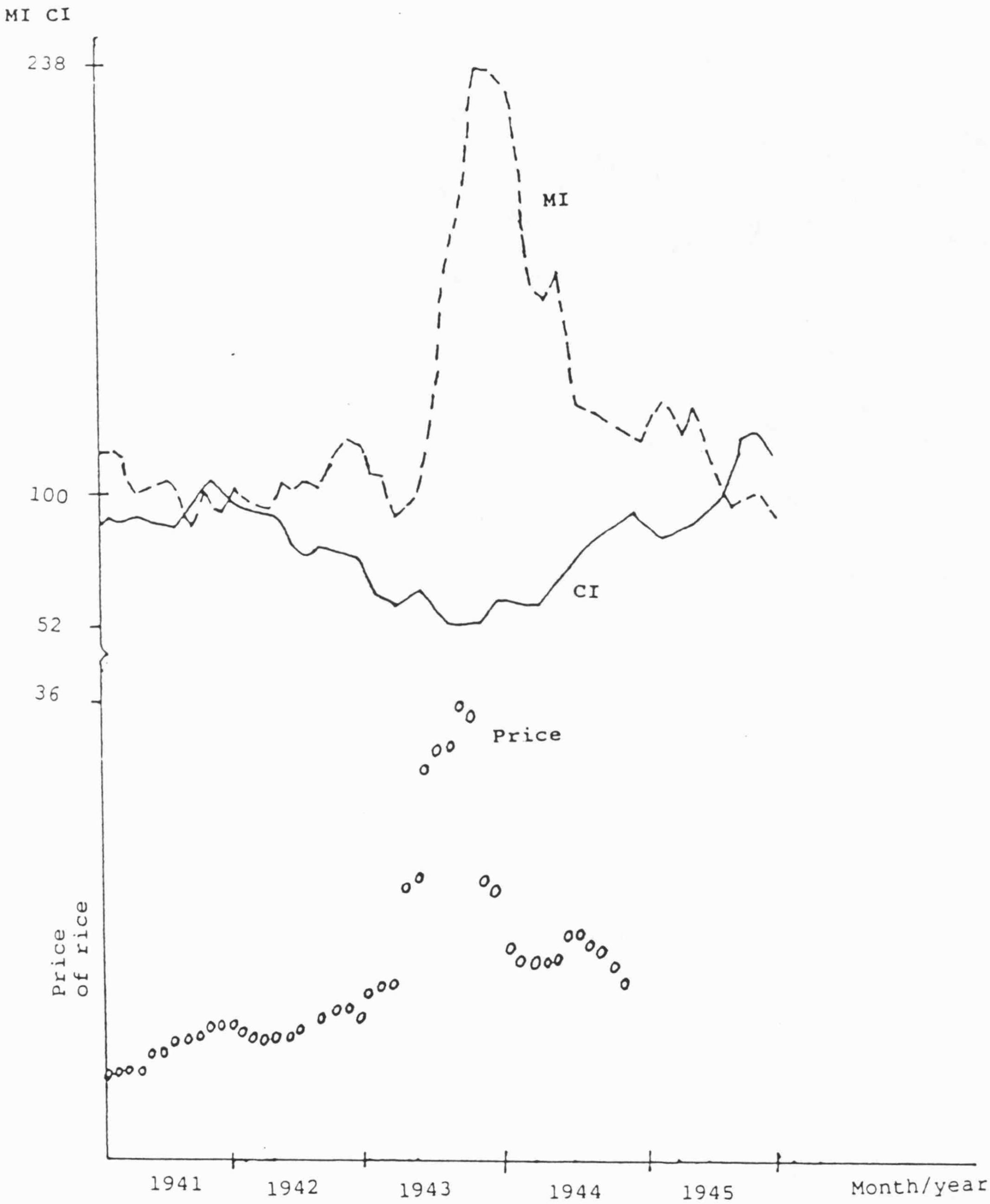
[54] Indeed, the Pinnell Papers also contain the weekly wholesale prices of rice as prevailing in the different markets throughout Bengal (i.e. about 70 markets including Calcutta) but only from January to August of 1943 (see Appendix D).

[55] Although official data on the price of rice in Calcutta show a sharp decline around August 1943, the black market prices seem to have continued to rise until October, after which they declined rather abruptly but to a level far above the "normal"; see Brennan (1988), Figure 1, p.544.

[56] For Calcutta market, we have used the price quotations for dates near the middle of the month. No quotation was available for July 1942. These are wholesale prices, and they are expressed in terms of rupees per maund. Until February 1943 the prices are for Ballam No.1 variety rice; thereafter they relate to Kalma No.1 variety, since the price of Ballam is not generally available. From October 1943 onwards prices refer to the province as a whole, and they relate to coarse rice (for details see Appendix D).

[57] As was assumed previously, monthly conceptions here are taken to be monthly births displaced backwards by nine months. For the monthly distributions of average annual births and deaths during the baseline period 1936-40, see Appendix E.

Figure 5.2 Food price, mortality index (MI) and conception index (CI), by month, Bengal, 1941-45.



Data Sources: See text.

1943. The implication is that conceptions may have responded to a rising trend in food prices from early in the famine process. This probably largely resulted from a deepening nutritional stress in "a substantial part of the population", caused by the persistently high food prices.[58] The MI started rising sharply from the middle of 1943; it reached a huge peak in October-November and then declined.[59] Mortality did not return to its baseline level until around the middle of 1945. The main excess mortality peak can indeed roughly be said to have lasted for twelve months, from mid-1943 to mid-1944. Although conceptions declined substantially before the start of the mortality rise, the additional negative effects of excess mortality (and presumably morbidity) on conceptions are perhaps also discernable from Figure 5.2. Although rice prices declined rather sharply during late 1943 they still remained quite high during 1944. Both conceptions and mortality returned to their pre-famine levels only in the middle of 1945 (see Figure 5.2).

Famine relief, which started at very modest levels in late 1942, took three main forms: agricultural loans, test works and gratuitous relief. Figure 5.3 shows monthly movements in money sanctioned by the Government of Bengal under these three heads. It shows considerable fluctuation in money allotted, especially during the early phase of the

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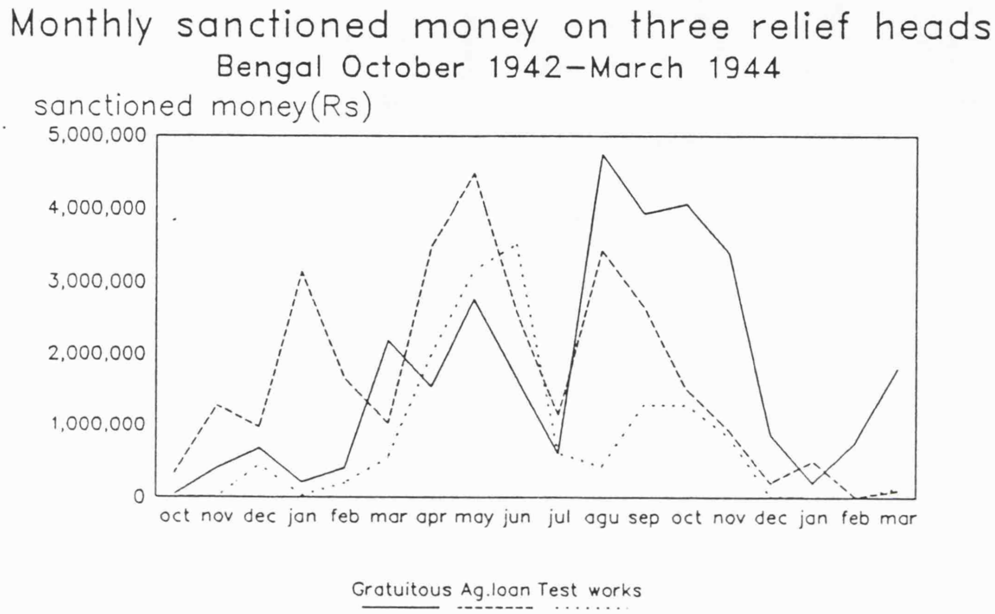
[58] War-induced disruptions may also have produced some fertility-reducing effects during this period.

[59] Note that baseline seasonal mortality during these closing months of the year is relatively high (see Appendix E), and therefore peak in the <u>proportional</u> rise in mortality during closing months of 1943 does not seem to have been due to low baseline figures. The correlation coefficient between monthly absolute rises and proportional rises in registered deaths during July 1943-June 1944 is positive and very high (0.95), being significant at 0 per cent level.

Figure 5.3



Sources: Pinnell Papers, (Confidential), Memorandum on the Ecocomic Condition of Bengal Prior to the famine of 1943, p.44.

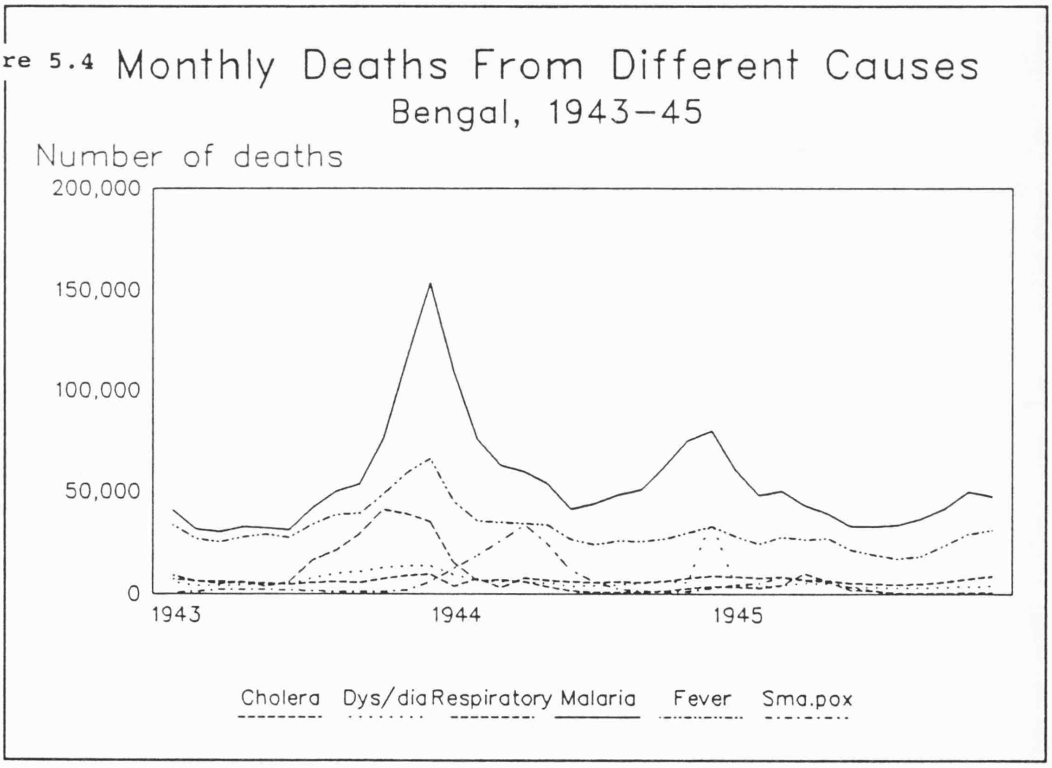
famine; and gratuitous relief was relatively small during that period too. Total money sanctioned under these three heads combined reached a maximum in May of 1943 - when there was no excess famine mortality at the all-Bengal level (see Figures 5.2 and 5.3).[60] In the following two months official relief expenditure declined; but it rose abruptly in August when the largest sum allotted was for gratuitous relief, and test

[60] The relief measures, especially the test works, during this period were inefficient, and entailed considerable wastage of money; see Famine Inquiry Commission (1945a), p.73.

relief was given only in small amounts (see Figure 5.3). Gratuitous relief continued to be high (and mostly spent on the provision of food) in the following three months, while excess mortality was mounting. However, relief expenditures by the Government declined drastically in December - the month in which the number of deaths reached its maximum.

Figure 5.4 plots monthly deaths from five major causes during 1943-45. In earlier famines we have examined, our

Figure 5.4



Sources: See Table 5.5

conclusions about malaria's role in famine mortality were bound to have been in the nature of inferences, as malarial deaths - presumably included in the "fever" category - were not recorded as a separate cause. But fortunately in the Bengal famine it is possible to examine the behaviour of malaria as a separate cause of death. From 1921 the Bengal Public Health Report started to provide a breakdown of fever deaths into several other causes including malaria. Malaria was certainly one of the dominant constituents of the fever group.[61] The quality of death reporting in Bengal, as elsewhere, was far from perfect. There is, for example, the possibility of misstatement of different causes in the fever group. Indeed, at the early stage (i.e. early 1920s) of recording separate causes under fever group the Bengal Public Health Reports contained comments on the possible misclassification of several fevers under malaria.[62] However, as late as early 1940s this problem was not paid any particular attention in the annual reports; and much confidence seems to have been attached to the registered malarial deaths. Moreover, our major concern here is not so much with the actual malarial death rate as with its change and its seasonal distribution during the famine.

Figure 5.4 shows that somewhat similar time path,

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[61] The constituents of fever group, and their respective percentage shares to total registered fever deaths in 1942 were: malaria (54.53), kala-zar (1.95), influenza (0.21), the enteric group of fever (1.10), measles (0.21), relapsing fever(0.0004), typhus (0.68), blackwater fever (0.04), cerebrospinal fever 0.08) and other fevers (41.20).

[62] It may also be noted that owing to its debilitating effect malaria can predispose to several other diseases. According to the estimate by an Indian malariologist malaria killed as many people directly as it did indirectly (i.e. through other diseases) during the 1930s; see Chand (1939), p.119.

especially in latter half of 1943, was shared by cholera, malaria and fever deaths. Mortality from these causes rose from the middle of the year. Smallpox deaths began to rise somewhat later - from around November - and peaked in April of 1944. October of 1943 was the month in which cholera deaths reached a maximum, and this was also the month of the highest proportional rise in mortality (shown in Figure 5.2). Deaths from dysentery/diarrhoea and respiratory diseases also peaked in the closing months of 1943. Therefore not only malaria, but also other major killers, simultaneously peaked during the closing months of 1943. And the climax in cholera deaths occurred two months <u>before</u> the peak in fever and malaria deaths. The number of deaths from malaria declined during the first five months of 1944, and then rose to a second peak in December. Interestingly, in December 1944 there was again a major and sharp peak in dysentery/diarrhoea deaths, which coincided with the malarial peak. Although malaria and fever deaths undoubtedly accounted for the largest fraction of mortality, there were no unusual climatic conditions which can be taken to have led to a particularly virulent malaria epidemic in Bengal during the famine.[63] Indeed, the basic time pattern of rising mortality during the prime period was broadly shared by several major specified causes. This, as in several earlier famines (see Chapter 2 above), indicates that a period of acute nutritional stress and social disruption led to a period of increasing mortality from several different diseases, while the exact timing of peak mortality from a

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[63] See Famine Inquiry Commission (1945a), p.122, Zurbrigg (undated), p.71, and also Dyson (1991b), p.294.

particular disease was partly shaped too by environmental and other factors. For example, the peak malaria mortality from August to December 1943 - which was also the normal seasonal pattern - may have been partly fuelled by favourable post-monsoon conditions for mosquito-breeding (e.g. through increased atmospheric humidity).

In this connection, the hypothesis of "malaria refeeding" may be considered apropos the huge malaria and fever mortality peak which occurred after September of 1943 (see Figure 5.4). The start of feeding arrangements (which presumably led to an improved nutritional state) in September is hypothesized to have dispelled the latent state of malaria infection among undernourished hosts, and thus contributed to the rise in malaria mortality in the following months. The number of relief kitchens (of which more than 90 per cent were Government-supported) peaked in late November. On the other hand the <u>proportion</u> of total victims covered by these kitchens was very low; probably never exceeding 5 per cent of Bengal's population.[64] While government-supported kitchens were the main source of rural food-relief, the gruel offered had "few nutritive benefits".[65] According to the <u>Report on Bengal</u>, it "did not at best supply more than 600-800 calories [per day] for adults and about half this number for children."[66]

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[64] See Greenough (1982), footnote 122, p.130. In a memorandum to the Famine Inquiry Commission the Communist Party reported that relief kitchens fed 1.7 to 1.9 million people, while the number in need of relief was about 20 million; see Bhatia (1967), p. 338.

[65] See Greenough (1982), pp.131-132.

[66] See Famine Inquiry Commission (1945a), p.128. Brennan in the context of Midnapore - one of the most affected districts - found that "[t]here was often not enough nutritional value in the gruel to do more than prolong starvation; at times, it brought death... Moreover,some of the worst hit people were too weak and ill after a year's deprivation to reach

Moreover, malaria infection and mortality does not seem to have been suppressed before the start of the supposed improvement in nutrition in September. For example, total mortality from fevers (including malaria) was 45 per cent higher during June-August 1943 compared with the corresponding average for 1937-41. The available clinical evidence on malaria during the Bengal famine suggests that although re-feeding may have caused parasites to be more numerous in famine victims, "its effect on actual mortality is at best unclear, and quite possibly negligible".[67] Indeed, as has been argued before, the available evidence on the malaria refeeding hypothesis suggests that even though the attack rate rises with refeeding the mortality rate probably depends considerably on the previous level of undernutrition. Although class-specific malaria mortality rates are not available for the Bengal famine, higher mortality among the most undernourished sections of the population has clearly been indicated in the surveys we have referred to above.[68]

Table 5.5 suggests that the percentage share of cholera deaths in total excess mortality was highest in 1943. Smallpox showed a similar contribution to total excess mortality in 1944. However, malaria remained far and away the single most important cause of death. And, notably, its

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the kitchens"; Brennan (1988), p.552.

[67] See Zurbrigg (undated), p. 54.

[68] Examining the whole issue of "refeeding malaria" in the context of the Bengal famine, Zurbrigg states that "[the] distinction between malnutrition and infection as cause of death therefore may be a technical extravagance when practically speaking it is the underlying hunger which makes the infection lethal on an epidemiological scale"; see ibid., p. 76. On this see also Maharatna (1991).

relative contribution in excess mortality was far higher in 1944 than in both 1943 and the baseline reference period. Thus elevated malaria mortality was relatively persistent over an extended period.

From Table 5.6 we can note that government expenditure on

Table 5.5 Cause-specific death rates and relative importance of different causes of death during pre-famine and famine periods: Bengal

	Cause-specific death rates		
Causes of death	**1937-41**	**1943**	**1944**
Cholera	0.73	3.60	0.82
	(3.72)	(23.88)	(0.99)
Smallpox	0.21	0.37	2.34
	(1.06)	(1.30)	(23.69)
Fever	6.14	7.56	6.22
	(31.08)	(11.83)	(0.91)
Malaria	6.29	11.46	12.71
	(31.82)	(43.06)	(71.41)
Dysent\Dia	0.88	1.58	1.08
	(4.47)	(5.83)	(2.27)
Respiratory	1.52	1.30	1.39
	(7.67)	(-1.82)	(-1.44)
Injury	0.37	0.33	0.27
	(1.86)	(-0.33)	(-1.05)
All other	3.32	5.57	3.91
	(18.32)	(16.26)	(3.23)
All causes	19.46	31.77	28.75
	(100.00)	(100.00)	(100.00)

Notes: 1) All cause-specific death rates are based on a constant denominator - being the enumerated population in the 1941 census. 2) For the period 1937-41, figures in the parentheses are the respective percentage shares to total average annual deaths, while for both 1943 and 1944 they are the percentage shares to total excess deaths. The excess deaths from each of the above diseases were calculated over the respective average deaths registered during 1937-41.
Sources: Government of Bengal, Health Directorate, Bengal Public Health Report, Alipore, Government Press, various years.

the "public health establishment" did not increase until 1944-45; in fact during 1942-44 it was lower than the 1941-42 level.[69] Expenses on epidemic diseases, however, increased during 1943-44; although they (together with other expenditures) reached a maximum in 1944-45 - a period in which mortality had returned close to its pre-famine level (see Figure 5.2). Like food relief, medical relief also seems to have been supplied rather late. It thus seems plausible to suggest that greater public health expenditures during the prime excess mortality period would probably have contributed towards a lowering of the famine death toll.[70]

Table 5.6 Expenditure on Public Health, Bengal 1941-42 to 1944-45

Year	Public Health Establishment (Rs)	Expenses in connection with epidemic diseases (Rs)	Total Expenditure (Rs)
1941-42	650,985	726,496	3,929,486
1942-43	614,585	942,122	3,595,021
1943-44	626,616	2,706,933	6,025,472
1944-45	735,977	7,146,172	10,929,958

Notes: 1) Expenditures on the "Public Health Establishment" include those on the established permanent health centres and hospitals. 2) The other major heads of health expenditures include grants, public health works (e.g. conservancy, water-supply and drainage).
Sources: Statistical Appendices to Annual Reports of the Public Health Commissioner with the Government of India for the period 1940-44, Delhi: Government Press, 1947. The corresponding figures for 1945-46 onwards are not available for undivided Bengal.

[69] Mukherjee provides evidence to show how inadequate were the government health measures adopted during the famine; reviewing the relevant statistics, he writes that "not even one bed per village, which ought to be the lowest desideratum of a health rehabilitation plan, was provided"; see Mukherjee (1947), p.146.

[70] As the Public Health Commissioner in his report for 1943 and 1944 noted, "Due to a variety of causes the civil medical organisation in Bengal was quite unable to deal with the health problems that arose in connection with the famine"; see Annual Report of the Health Commissioner with the Government of India for 1943 and 1944, Delhi: Government Press, 1946, p.3. The delay and inadequacy of health measures was also noted by the Report on Bengal which stated that "some of the mortality which occurred could have been prevented by more vigorous and timely [health] measures"; see Famine Inquiry Commission (1945a), p. 142.

Figure 5.5 shows monthly movements of the CI and MI in urban Bengal. Conceptions in urban areas were below baseline levels from as early as 1941 - as indeed was true for the whole province. However, conceptions seem to have returned to normal baseline level during the second half of 1944. The reduction in conceptions in urban Bengal was much less than occurred in the province as a whole. Also, the urban data do not suggest a correspondence between reductions in conceptions and increases in mortality (see Figure 5.5).

Interestingly, however, the time pattern of movements of the urban MI broadly coincides with that for the whole of Bengal (see Figures 5.2 and 5.5). Mortality began to exceed its normal level around the middle of 1943, and the MI peaked sharply in October. Although the urban MI dropped from its peak more dramatically than did that for the whole of Bengal, it remained quite high during the first half of 1944 and continued somewhat elevated until at least the middle of 1945. Note also from Figures 5.2 and 5.5 that the peak proportionate excess in urban mortality was <u>much</u> greater than for the whole of Bengal (and, by implication, for rural Bengal).[71] A lesser reduction in conceptions and a higher mortality increase in urban than in rural areas may both be indicative of <u>migration</u> to urban areas by rural destitutes. This is an idea to which we will return. Unfortunately monthly cause-specific data on urban deaths are not available. But, as we will see, there was a significant rural-urban contrast in causes of deaths both during the pre-famine and famine periods.

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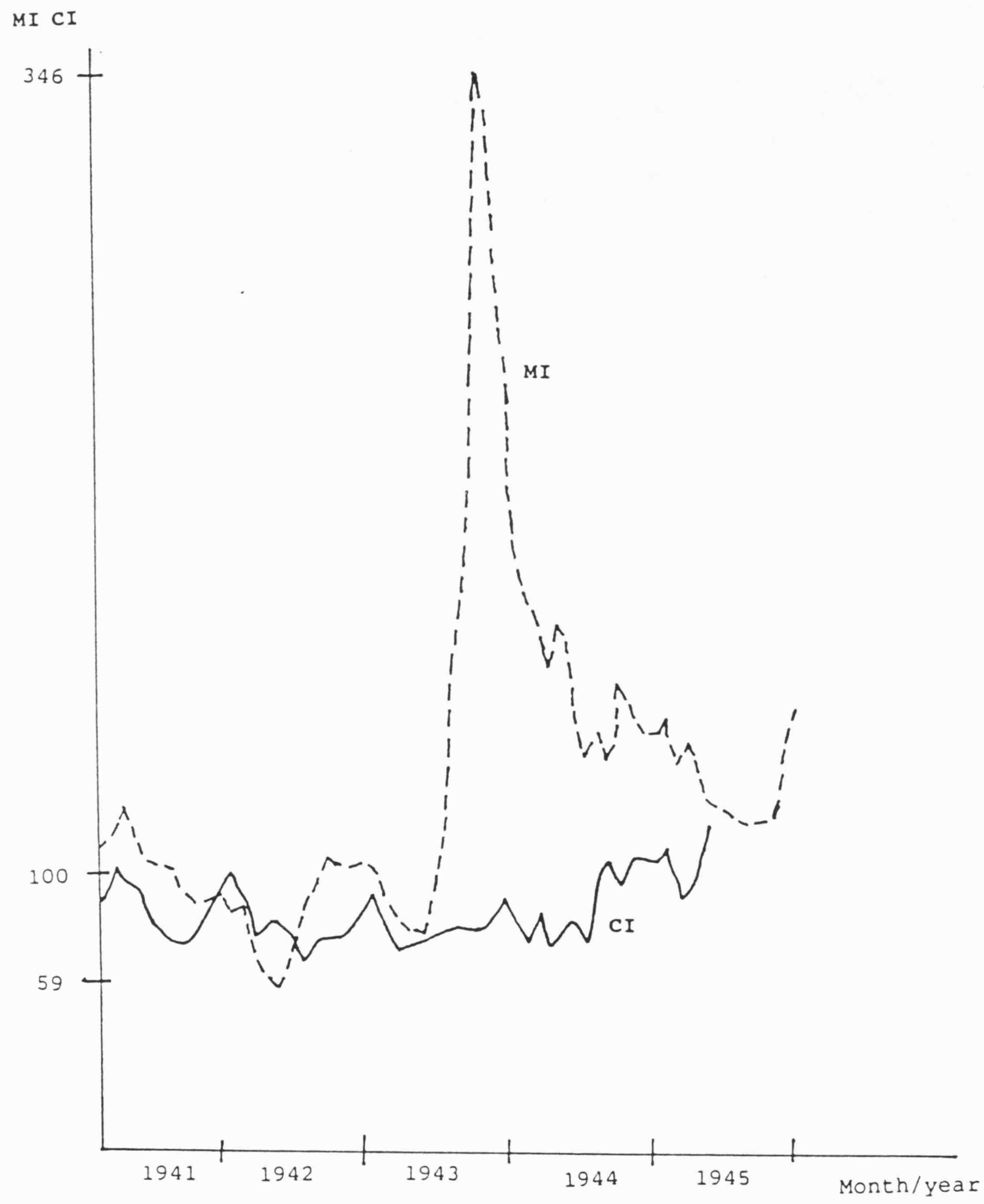
[71] Slightly more than 90 per cent of total registered deaths and births occurred in villages. This corresponds to that fact that about 90 per cent of the total population lived in rural areas.

Figure 5.5 Mortality index (MI) and conception index (CI), by month, Urban Bengal, 1941-45



Sources: See Table 5.5.

5.5 RURAL-URBAN DIFFERENTIALS IN THE FERTILITY AND MORTALITY RESPONSES

Table 5.7 shows clearly that during normal years registered birth and death rates were higher in rural areas. A significantly larger rural-urban differential in CBR than in CDR also implies a higher crude rate of natural increase (CRNI) in rural than in urban Bengal during the pre-famine period. Lower urban than rural death rates in normal times seem plausible because of better public health, sanitation and nutrition in urban areas.[72] But such a lower urban birth rate may at least partly reflect the fact that industrial towns (which accounted for most of the urban population) normally had a disproportionately large number of adult males, implying rarity of family life compared to rural areas. According to the 1941 Census, in the industrial towns of Bengal there were only 487 females per 1000 males. And this urban imbalance in the sex ratio was particularly acute in the reproductive age groups.[73]

We have already noted that while the percentage rise in famine mortality was higher in urban areas, the percentage decline in urban births was less pronounced. These facts seem to be consistent with the hypothesis that there was a

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[72] For example, the number of persons vaccinated per 1000 population during 1940-41 was 343 in urban Bengal, while the corresponding figure for rural areas was only 146.

[73] The 1951 Census results give the following age compositions (%) of male and female populations in Calcutta and other industrial towns:

	0-14		15-54		55+	
	M	F	M	F	M	F
Calcutta	22	36	73	57	5	7
Other towns	29	36	64	56	7	8

See Census of India 1951, Vol. VI, West Bengal, Sikkim and Chandernagore, Part IA-Report, Delhi, 1953, pp.420-424.

Table 5.7 Crude birth and death rates in rural and urban areas during pre-famine and famine periods: Bengal

Period	Rural	Urban	All-Bengal
Pre-famine: 1936-40			
CBR	28.51	14.94	27.24
CDR	20.51	13.76	19.89
CRNI (=CBR-CDR)	8.00	1.18	7.35
Famine:			
1943			
CBR	20.00	11.14	19.17
(% change in births)	(-29)	(-25)	(-29)
CDR	32.69	22.91	31.78
(% change in deaths)	(+59)	(+66)	(+59)
1944			
CBR	16.42	11.29	15.93
(% change in births)	(-42)	(-24)	(-41)
CDR	29.46	21.85	28.75
(% change in deaths)	(+43)	(+58)	(+44)
1945			
CBR	22.51	13.44	21.67
(% change in births)	(-21)	(-10)	(-20)
CDR	21.05	16.37	20.62
(% change in deaths)	(+2)	(+18)	(+3)

Notes: 1) All CBRs and CDRs are calculated on constant denominators - being the respective enumerated rural and urban populations in the 1941 census. 2) The CRNI - crude rate of natural increase - represents the change in population size, per 1000 persons, due to the balance of births and deaths, in a given year; it thus does not include the effect of migration on the change in population. 3) The percentage changes in registered deaths and births have been calculated over the respective average numbers during 1936-40.

Sources: See Table 5.5.

considerable inflow of destitute people to the towns where relief was believed to be more available.[74] In this connection rural-urban differentials in the provision of preventive health measures are perhaps worth noting. The number of vaccinations performed in 1943 compared with 1942 rose by 1 per cent in rural Bengal and 55 per cent in urban areas. However, in 1944 the increases were 532 and 287 per cent respectively. It is notable from Table 5.7 that rural-urban differences in the proportional decline in births and rise in deaths were far greater during 1944-45 than in 1943. This perhaps indicates that the greatest movement of people to the towns occurred during the later epidemic phase of the famine, especially 1944.

Table 5.8 presents rural-urban differentials in causes of death. The figures for the whole of Bengal are obviously very close to those for rural areas (because of the relatively small urban population). What is striking about urban Bengal during the pre-famine period is the relative unimportance of malaria and fever mortality, and conversely the pre-eminence of respiratory diseases. The notably lower urban incidence of malaria may reflect better availability of anti-malarial medicines (e.g. quinine) and less monsoon surface water build up which is conducive to mosquito-breeding. However, the much higher share of deaths in the "all other" category in the towns may be suggestive of rural-urban differentials in reporting biases. The much greater share of dysentery and diarrhoea deaths in the towns also merits notice.

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[74] See Greenough (1982), pp.143-144.

Table 5.8 Rural-urban differentials in the relative importance of different causes of death during the pre-famine and famine periods: Bengal

Causes of death	1937-41	1943	1944
	Cause-specific death rates		
RURAL			
Cholera	0.76	3.80	0.83
	(3.72)	(24.74)	(0.76)
Smallpox	0.17	0.36	2.32
	(0.85)	(1.52)	(23.66)
Fever	6.55	8.00	6.54
	(32.12)	(11.75)	(-0.16)
Malaria	6.89	12.51	13.84
	(33.80)	(45.67)	(76.63)
Dysent/Dia	0.87	1.45	0.95
	(4.29)	(4.69)	(0.82)
Respiratory	1.35	1.13	1.19
	(6.60)	(-1.74)	(-1.69)
Injuries	0.37	0.32	0.26
	(1.82)	(-0.42)	(-1.23)
All other	3.42	5.12	3.53
	(16.79)	(13.79)	(1.20)
All causes	20.38	32.69	29.46
	(100.00)	(100.00)	(100.00)
URBAN			
Cholera	0.51	1.69	0.79
	(3.73)	(12.73)	(3.65)
Smallpox	0.57	0.42	2.53
	(4.16)	(-1.54)	(25.62)
Fever	2.17	3.35	3.18
	(15.88)	(12.82)	(13.21)
Malaria	0.41	1.28	1.67
	(3.01)	(9.33)	(10.43)
Dysent/Dia	1.40	2.88	2.44
	(10.28)	(15.91)	(12.53)
Respiratory	3.15	2.89	3.25
	(23.10)	(-2.80)	(1.32)
Injuries	0.32	0.39	0.39
	(2.36)	(0.74)	(0.91)
All other	5.11	10.01	7.59
	(37.47)	(52.81)	(32.33)
All causes	13.75	22.91	21.84
	(100.00)	(100.00)	(100.00)

Notes: 1) All cause-specific death rates are expressed per 1000 population, using constant denominators - being the respective rural and urban populations according to the 1941 census. 2) The figures in parentheses for the period 1937-41 are the respective percentage shares to total average annual deaths, whereas they are the respective percentage shares to total excess deaths for both 1943 and 1944. The excess deaths for each cause have been calculated over the respective average numbers during 1937-41. 3) The fever deaths are exclusive of malaria.

Sources: See Table 5.5.

Most of the registered excess famine mortality in the towns was not due to malaria - although deaths from this disease did increase (see Table 5.8). Instead the "all other" category was prominent. The drastic fall in the relative importance of respiratory diseases in the towns during the famine is also rather striking.[75] Given that towns attracted destitutes during the famine, many starvation deaths may have been recorded in this unspecific category. The Public Health Commissioner for India in his report for 1943 and 1944 gave the recorded numbers of deaths of "destitutes" in Calcutta - "those persons who died and whose bodies were disposed of by public arrangement" - as follows: 3,000 deaths between June 1942 and May 1943; and 19,000 deaths between June 1943 and May 1944.[76]

It is interesting that while the time paths of the monthly MI in rural and urban areas were roughly similar, the composition of deaths responsible for such mortality differed quite markedly. Putting on one side the possibility of rural-urban differences in death reporting, this may imply that the seasonal pattern of famine mortality was less a matter of the seasonality of one or two specific epidemic diseases. In other words, such a common time pattern from several diseases is likely to be determined largely by the general course of economic distress and its lagged effects on human health, being only partly mediated by weather and environmental

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[75] Sen also commented upon the fall in the registered deaths from respiratory diseases during the famine; see Sen (1981), p.205.

[76] See Appendices to Annual Reports of the Public Health Commissioner with the Government of India for the period 1940-1944, Delhi: Government Press, 1947, p.2.

forces.

5.6 RATES OF STILLBIRTH AND MORTALITY RATES OF CHILDREN AGED 1-12 MONTHS, BY SEX

Table 5.9 presents stillbirth and infant mortality rates for both the pre-famine and famine years. It is striking that the rate of stillbirths seems to have declined slightly during the famine. This may partly be due to a deterioration in registration efficiency. But there is also evidence from a more recent famine in Bengal (specifically the 1974-75 crisis in Bangladesh) of no pronounced effect on rates of stillbirth.[77] Note that the registered rates of stillbirth in Table 5.9 are consistently higher for males during both the famine and non-famine periods. The neo-natal mortality rates for both sexes also declined slightly during the famine period. Again, the higher neo-natal mortality of males is quite clear. The drastic fall in neo-natal mortality recorded for both sexes in 1945 also seems worth noting (see Table 5.9). Again, this may be related to worsening registration.

In contrast to stillbirth and neo-natal mortality, there was a considerable rise in mortality for infants of both sexes aged over one month during the famine. Note that the highest death rates at ages over one month were recorded in 1944 (which was not the year of highest overall excess mortality). As indicated earlier, this is probably partly due to the fact that 1944 was the year of greatest reduction in births whereas a part of that year's infant deaths (i.e. deaths in 1944 of infants born in 1943) were not included in the denominator for

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[77] See Chen and Chowdhury (1977).

Table 5.9 Rates of stillbirths and mortality rates of children under one year of age by sex: Bengal 1936-45

		1936-40	1942	1943	1944	1945
				Bengal		
a) Stillbirths per 100 live births	M	4.6	3.9	3.6	3.6	3.3
	F	4.1	3.5	3.2	3.2	2.9
b) Deaths per 1000 live births:						
below 1 month	M	100	87	92	96	81
	F	87	77	84	87	71
1-6 months	M	49	48	67	71	47
	F	46	45	67	73	44
6-12 months	M	25	24	39	42	21
	F	26	25	40	46	22
below 1 year	M	175	160	198	210	148
	F	159	148	192	205	137

		1939-41	1943	1944	1945
			Rural Bengal		
a) Stillbirths per 100 live births:		3.94	3.19	3.20	1.80
b) Deaths per 1000 live births:					
below one month	M	92.5	90.6	95.8	79.5
	F	79.8	82.1	84.9	69.4
1-6 months	M	46.4	66.1	70.4	45.6
	F	42.5	66.1	71.1	42.7
6-12 months	M	22.2	37.9	40.5	19.8
	F	22.6	38.7	43.4	21.0
below one year	M	161.1	194.6	204.3	145.0
	F	144.9	187.7	199.3	133.2
			Urban Bengal		
a) Stillbirths per 100 live births:		5.07	5.31	5.5	5.3
b) Deaths per 1000 live births:					
below one month	M	88.0	127.1	127.8	102.9
	F	76.5	127.2	113.0	91.9
1-6 months	M	42.8	77.0	90.4	64.4
	F	42.9	87.1	97.5	68.9
6-12 months	M	39.6	54.5	70.5	38.6
	F	39.6	61.0	84.8	43.3
below one year	M	170.3	258.6	288.8	205.8
	F	163.2	275.5	295.3	204.1

Notes: 1) The mortality rates for female infants aged 1-6, 6-12 months and below one year for 1941 are excluded in the calculations of the respective rural and urban averages during 1939-41 because of some inconsistencies in the published figures. 2) The stillbirth rate for the towns was not available for 1939 or earlier years. They are only available from 1940. Also still-births for 1943-45 were expressed per 100 live + still births.

Sources: See Table 5.5.

calculating the rates. However, the possible partial effect of better registration operations in 1944 compared to 1943 should also be recognised. Interestingly, the female mortality advantage observed for infants aged 1-6 months during the normal period was weakened and even reversed during 1943 and 1944. Moreover broadly similar changes occurred for infants aged 6-12 months (see Table 5.9). There is thus some suggestion that the mortality of older infants was most affected by the famine. And this was particularly true for females.[78]

Table 5.9 also includes data on rural-urban differentials. The registered stillbirth rate during both pre-famine and famine periods was much higher in the towns. Moreover, note that the urban stillbirth rate during the famine rose somewhat from its pre-famine level. Since a fall in the stillbirth rate during a famine is difficult to explain, this possibly reflects better registration of stillbirths in the towns and is indicative that stillbirths do increase in times of famines. Although the neo-natal mortality rates for both sexes during the pre-famine period were somewhat higher in rural areas than in towns, the extent of the pre-famine female neo-natal mortality advantage seems be of similar magnitude. But during the famine while the rural neo-natal mortality rates showed a slight rise, the corresponding urban rates rose substantially. Again, this may be indicative that neo-natal mortality rates are indeed

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[78] Recent research has provided evidence to support the existence of discrimination against female children in different parts of Bengal during both normal and crisis periods; see Chen et al. (1981), Bairagi (1986a, 1986b) and Sen and Sengupta (1983).

adversely affected by famines. The registered mortality rates of infants were higher in the towns compared to rural areas during both the baseline and famine periods. During the baseline period this differential appears to be the result of significantly higher recorded urban mortality for infants aged 6-12 months. Such rural-urban differentials probably have something to do with differential registration efficiency. But during the famine period urban infants of all age groups exhibit higher registered death rates than those in the rural areas. A part of the explanation probably lies in the migration from rural to urban areas of a large number of people - many of whom were mothers with their newly-born children; deaths of such migrant infants may have contributed to our above rural-urban discrepancy.

We also examined the proportional rises in mortality rates of infants by age and sex in 1943 and 1944 for rural and urban areas. The proportionate rise in female, compared to male, neo-natal mortality seems to have been most pronounced in urban areas. But the proportional rise in neo-natal mortality for both males and females was relatively small in both towns and villages. This confirms our view that neo-nates are relatively protected from famine conditions. Infants aged 6-12 and 1-6 months seem to be more vulnerable; and female infants of these ages experienced higher proportional rises in mortality than males, the sex-differential being more pronounced in urban Bengal.

5.7 DIFFERENTIALS BY RELIGION

There are no vital registration data classified by different occupational or income groups. However, the distribution of vital events by religious community is provided in the Public Health Reports. Table 5.10 shows that the death rate in the pre-famine period was highest for Muslims, followed by Hindus, Buddhists, Christians and other classes in that order. A similar order holds for the pre-famine birth rates (save for a slightly higher CBR for Christians than for Buddhists). The registration data for "other classes" (which include different tribes) were relatively deficient. Hindus and Muslims are numerically the largest communities in Bengal; according to the 1931 census they respectively constituted 54 and 43.5 percent of the total population. The much higher infant mortality and the stillbirth rates recorded for Muslims in 1940-41 probably reflects their generally lower socio-economic status.[79] Conversely, the Christian community appears to have been the least vulnerable in the pre-famine period, with low levels of mortality. Similar community differentials in mortality were clearly observed during the famine. The highest mortality rate for all communities was recorded in 1943. However, in terms of proportional increases the Buddhist community seems to have been the most vulnerable in 1943, followed successively by Christians, Hindus and Muslims (see Table

[79] As one Indian historian writes, "..the vast majority of Bengali Muslims were peasants, in origin probably low-caste Hindus, Buddhists, or simply people who had never been assimilated into the structure of Arian society"; see Sarkar (1972), p.164.

Table 5.10 Vital rates by different religious communities: Bengal 1940-45

Period	CBR	Index	CDR	Index	Stillbirths per 1000 births	Index	IMR per 1000 live births	Index
					Hindus			
1940-41	31.5	100	21.5	100	33.1	100	148.8	100
1943	20.5	65	31.0	145	27.5	83	176.5	119
1944	17.4	55	28.4	132	28.6	86	192.0	129
1945	22.5	69	20.9	97	25.0	76	138.6	93
					Muslims			
1940-41	33.3	100	23.8	100	45.8	100	164.9	100
1943	18.0	54	32.6	137	38.0	83	212.6	129
1944	15.5	47	30.6	129	37.8	83	223.1	135
1945	22.3	67	21.6	91	33.0	72	146.7	89
					Christians			
1940-41	26.9	100	13.9	100	24.8	100	128.6	100
1943	21.4	80	22.9	165	32.9	133	161.7	126
1944	16.1	60	18.6	134	30.4	123	200.8	156
1945	21.3	79	15.6	112	30.0	121	180.7	141
					Buddhists			
1940-41	25.0	100	21.1	100	42.3	100		
1943	25.9	104	38.2	181	20.3	48		
1944	18.4	74	27.0	123	26.9	64		
1945	27.7	107	21.3	101	59.0	139		
					Other classes			
1942	16.6	100	10.9	100	27.9	100	150.4	100
1943	14.4	87	14.6	134	28.1	101	184.4	123
1944	10.5	63	13.0	119	27.8	100	168.8	112
1945	11.3	68	10.9	100	25.0	90	139.6	93

Notes: 1) All CDRs and CBRs (expressed per 1000 population) are calculated on the respective estimated mid-year populations. 2) For "other classes" the years of 1940 and 1941 could not be considered because of some inconsistencies in the published data. 3) The infant deaths in the Buddhist community were included in the Hindu community.

Sources: See Table 5.5.

5.10).[80] In 1944 the Hindu-Muslim differential in proportional mortality rise was relatively small. Thus, the Muslim community - having the most adverse mortality in normal times - appears to have experienced a smaller rise in famine mortality compared to Hindus.

As Table 5.10 suggests, while the Muslim community experienced a somewhat higher proportional rise in IMR during 1943-44 than did the Hindus, the highest proportional rises during 1944-45 were recorded for Christians. Moreover, except for Christians, recorded stillbirth rates for all communities appear to have declined during the famine. But the Christian stillbirth rate rose substantially. The reduced famine stillbirth ratios for most of the major communities probably reflects a deterioration in registration efficiency. Lower IMRs in 1945 than during 1940-41 for all communities (except Christians) could also reflect a decline in registration coverage. The greatest decline in births was recorded in 1944 for all religions - reflecting the reduction in conceptions in 1943, the year of maximum famine severity. It is notable that the Muslim community (having the highest birth rate during pre-famine period) experienced the greatest reduction in births, followed by the Hindus.

5.8 AGE AND SEX DIFFERENTIALS IN FAMINE MORTALITY: THE RURAL-URBAN CONTRAST

Table 5.11 presents age-sex specific death rates during

[80] In terms of proportional increases in the number of deaths in 1943 the Hindu community seems to have been the most vulnerable, followed successively by Muslims, Buddhists and Christians.

Table 5.11 Death rates by age and sex during the pre-famine and famine years, rural and urban Bengal, 1939-44

Rural Bengal

	1939-41		1943		1944	
Age	Male	Female	Male	Female	Male	Female
IMR	161.1	145.0	194.6	187.7	204.3	199.3
0-4	26.3	25.1	43.4	40.5	42.7	39.7
5-9	9.7	9.4	21.2	20.5	19.6	19.1
10-14	6.3	5.5	15.5	12.7	13.3	10.7
15-19	7.4	10.2	16.3	17.8	13.7	14.9
20-29	8.4	12.2	17.4	21.6	15.3	19.3
30-39	11.5	12.1	25.0	25.2	20.8	22.3
40-49	18.1	15.6	40.2	32.9	32.2	30.3
50-59	29.4	26.3	61.6	50.6	51.0	48.1
60+	77.9	66.2	125.6	108.2	116.2	107.5
CDR	**19.5**	**19.2**	**35.7**	**31.6**	**30.1**	**29.1**
Ratio*	**1.0**		**1.1**		**1.0**	

Urban Bengal

	1939-41		1943		1944	
Age	Male	Female	Male	Female	Male	Female
IMR	170.3	163.2	258.6	275.5	288.8	295.3
1-4	11.7	16.2	26.8	38.6	25.0	38.0
5-9	4.6	6.5	10.6	15.8	8.2	13.6
10-14	3.8	5.8	7.8	11.0	5.7	6.4
15-19	5.4	8.9	8.8	12.5	8.5	13.6
20-29	9.4	12.8	12.7	16.3	13.1	15.6
30-39	8.7	12.7	14.1	19.6	14.6	17.9
40-49	11.7	16.8	21.7	28.7	21.0	26.4
50-59	18.1	24.3	32.6	43.9	32.7	40.5
60+	36.9	60.4	80.6	127.7	75.5	130.3
CDR	**11.6**	**16.6**	**19.8**	**28.4**	**19.3**	**26.4**
Ratio*	**0.70**		**0.70**		**0.73**	

Notes: 1) All age-specific death rates have been calculated on constant denominators. As rural-urban breakdown of population by age and sex is not given in the 1941 census, the respective populations have been estimated on the basis of age distribution of the total sample population as per census of 1941. These estimated populations have been used as the constant denominators for calulating the above rates.

* Ratio of male CDR to female CDR.

Sources: See Table 5.5.

both pre-famine and famine years for rural and urban areas. The normal age-pattern of mortality in Bengal appears to have had the expected features, and they are shared by both rural and urban areas. However, a much adverse registered mortality for females, compared to males, in urban areas seems striking; note that for all age groups (except infants in the pre-famine period) in urban Bengal the registered female death rates were higher than the corresponding male death rates.

We have examined age and sex differentials in mortality in both 1943 and 1944 (compared with the average figures for 1939-41) separately for urban and rural areas (see Figure 5.6). The results for rural Bengal are broadly in conformity with Dyson's findings for the whole of Bengal.[81] But some additional points arise. Considering rural areas, while in all age groups except infants the male population experienced smaller proportional mortality increases compared to females in 1943, in 1944 the male population over age 30 experienced larger increases vis-a-vis females (see Figures 5.6 (A) and (B)). Thus in 1943 there was a slightly higher overall proportional mortality rise for males, while in 1944 the rise in overall mortality was the same for both sexes. It may also be noted that for children aged 1-9 years no significant sex differential in proportional mortality rise was recorded in either 1943 or 1944. Nor was there any sex differential in mortality rates for these age groups during normal times. Moreover, the smaller proportional female mortality increase especially in the ages between 15 and 30 in the famine years

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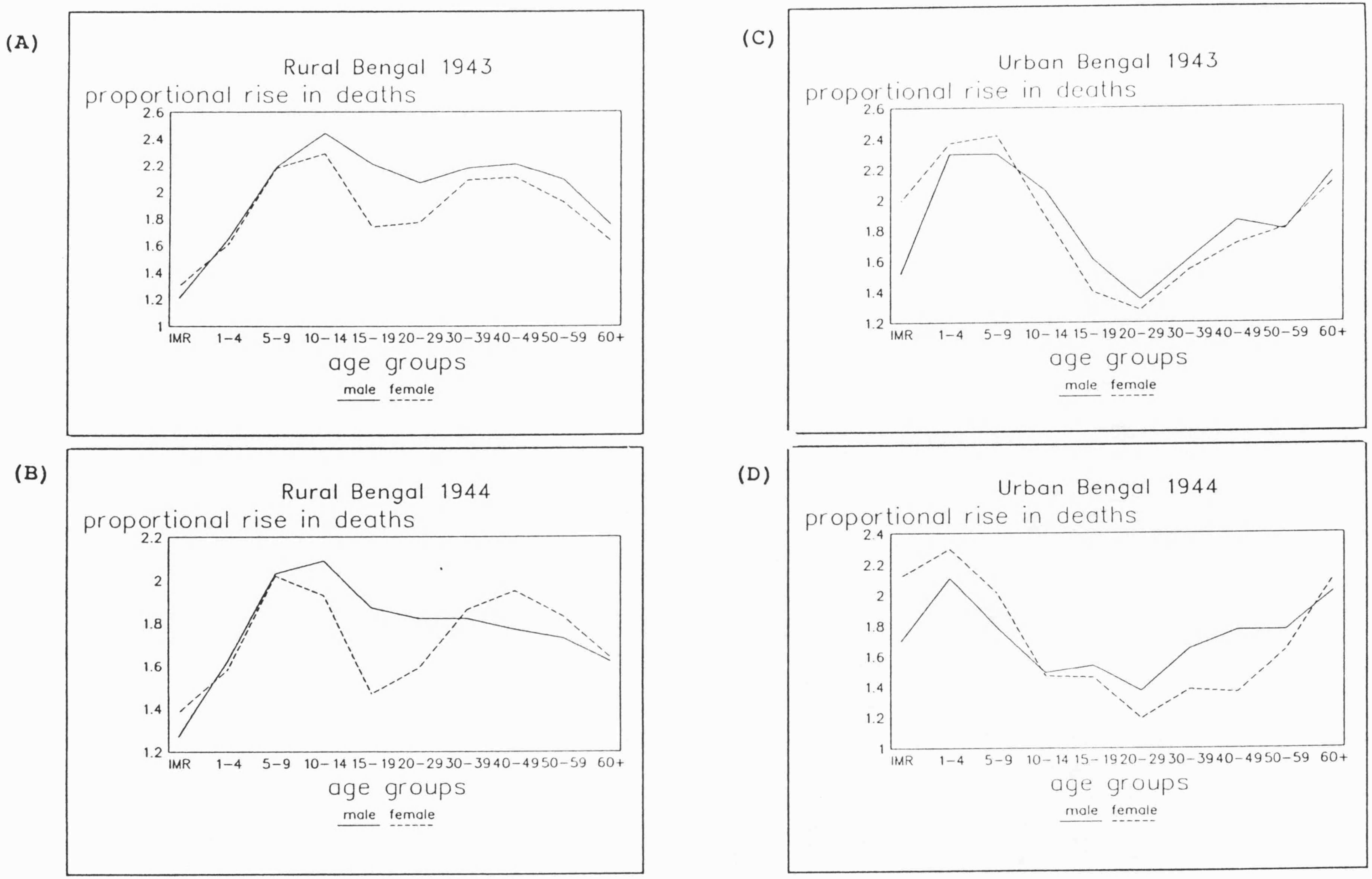
[81] See Dyson (1991b), p.284.

Figure 5.6 **Ratios of deaths in famine years to reference years, by age and sex: Rural and Urban Bengal.**



Sources: See Table 5.11.

was probably a reflection of the reduced fertility and consequent drop in maternal and related deaths during the crisis.[82] Thus the overall age-sex pattern of proportional mortality increases in the Bengal famine broadly coincides with what we have previously found for the south, west and central (*vis-a-vis* northern) Indian famines. Like the famines in large parts of southern, central and western India (and, particularly unlike north Indian famines), the Bengal famine does not appear to have been particularly harsh (in terms of proportional increase in mortality) towards young children and the female population.

Interestingly, however, the pattern in urban areas seems to have been very different. Figures 5.6 (C) and (D) show that female infant mortality in both famine years rose considerably compared to that of males. Female children too had a considerable mortality disadvantage compared to their male counterparts - especially in 1944. On the whole, however, infants, young children and the elderly in urban Bengal appear to have experienced relatively large proportional mortality rises compared to adults. Young people aged 20-29 of both sexes recorded the lowest rise in mortality in both years. The extent of the comparative female mortality advantage in the reproductive ages was much smaller compared to the rural population; this was partly a reflection of a

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[82] The number of registered maternal deaths in rural Bengal indeed declined from an average of 13,490 during 1941-42 to 10,129 in 1943, and further to 9,230 in 1944, although the maternal mortality rate per 1000 births rose from a pre-famine average of 8.75 during 1941-42 to 9.0 in 1943 and to 10.0 in 1944; see <u>Bengal Public Health Report</u>, relevant years.

much smaller reduction in urban maternal deaths.[83] And in urban areas there was no sex differential in the proportional rise in overall mortality in either of the main famine years.

The distinct urban pattern in Figure 5.6 could be real or due to data deficiencies. Although the Bengal Public Health Reports routinely comment upon differential registration between districts and between municipal towns, they do not provide any generalisations about relative registration completeness in rural and urban areas. If our interpretation of the IMR and stillbirth rates in Table 5.9 can be accepted then urban areas seem to have had better registration than rural circles. The possibility of better registration in Calcutta, which also experienced a relatively great proportional mortality disadvantage for young children and the elderly, was also noted by the Report on Bengal.[84] And this Calcutta pattern of age-sex differentials in famine mortality was thought by the Famine Inquiry Commission to reflect the fact that young children and the elderly were overrepresented among the migrants who came to the city.[85] Towns and cities were indeed the main poles of attraction for those in search of relief.[86]

Since young children and old people are among the most vulnerable to nutritional stress, these age groups are sometimes hypothesized to experience very high mortality

[83] The number of recorded maternal deaths in urban Bengal declined slightly from an average of 663 during 1941-42 to 603 in 1943, and then increased to 738 in 1944.

[84] See Famine Inquiry Commission (1945a), p.113.

[85] Ibid., p.113.

[86] See Greenough (1982), pp.143-144.

increases compared to adults during famines.[87] But, on the other hand, these age groups also have relatively high mortality rates in normal times. And there is a considerable amount of evidence of lower proportionate rises in famine mortality among young children.[88] However, apropos the Bengal famine, Greenough provided an elaborate cultural explanation for such a pattern of age-sex mortality increase. He argues that females, young children and the elderly, who were generally dependent for their survival on the support of adult males, were ultimately "abandoned" by the latter during the crisis. Greenough presents considerable evidence to show that women (mostly wives) were excluded from "domestic subsistence" and that this led to proportionately greater female migration for relief to the towns. In a survey of 2537 destitute persons living on the streets of Calcutta in September 1943, 47.3 percent were male and 52.7 percent were female. Among married destitutes (excluding those widowed and separated) 36.4 percent were male and 63.6 percent were female - a fact which conforms to a process of exclusion of women from domestic subsistence. The available evidence on "sale and abuse" of children is also indicative of what Greenough calls "the process of intentional dismemberment of families during the famine".[89] Greenough views this process as resulting largely from a moral impulse to maintain familial continuity through the preservation of the patrilineage. Critically,

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[87] See e.g. Greenough (1982) especially pp.239-245.

[88] See Chapter 2 above, Dyson (1991a and 1991b), and also Drèze and Sen (1989), especially p.80 and the references cited there.

[89] See Greenough (1982), p.221.

this depends upon the survival of the adult males, and this is the justification for "the intentional exclusion of the less valued members (women and children) from domestic subsistence". He adds that "the favoured famine position of women" in adulthood results from the requirement of their giving birth to "male descendants in the aftermath of the famine".[90] All this is forwarded as an explanation for the relatively favoured mortality position of adults *vis-a-vis* children and elderly people.[91] But as a corollary one can suggest that females, young children and old people - all normally dependent for their livelihoods ultimately on adult males - were probably overrepresented among destitutes who left home to seek relief in the towns. This probably accounts, at least, partly for the observed urban age-sex pattern of famine mortality shown in Figures 5.6 (C) and (D).[92]

5.9 CONCLUSIONS

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[90] See Greenough (1982), p.251.

[91] The "abandonment" of women and children has also been viewed as an "an effort to maximize the life chances of each and every member of the family in circumstances where co-residence was clearly not feasible"; see Appadurai (1984). As an another alternative explanation, Agarwal has recently argued that smaller mortality increase (in absolute terms) for the adult males - *vis-a-vis* women and children - seems to relate to men's larger resource-bundles and more numerous "fall-backs" at the beginning of the crisis, and moral-codes (favouring adult males on the ground of familial continuity) may have been an ideological cover; see Agarwal (1990), pp. 384-392; see also Greenough (1992).

[92] The following sentences quoted from the Report on Bengal succinctly describe the familial crisis during the famine:"Famine and migration led to much family disintegration. Husbands deserted wives and wives husbands; elderly dependents were left behind in the villages; babies and young children were sometimes abandoned. According to a survey carried out in Calcutta during the latter half of 1943, some breaking up of the family had occurred in about half the destitute population which reached the city"; see Famine Inquiry Commission (1945a), p.68.

The Bengal famine was undoubtedly a great catastrophe. Its special significance in the history of Indian famines lies in the fact that it broke a fairly long absence of major famines from early this century. Although the existing literature on the demographic consequences of the famine is substantial, our use of the hitherto unutilized detailed demographic data (e.g. the registration materials for undivided Bengal) have brought several important findings.

This famine certainly occurred under a unique set of circumstances largely related to War-induced inflation, and very inefficient management of prices and food distribution. Since this crisis, unlike some earlier famines, was not directly caused by a drought and food-shortage as such, it is a classic example of what is often termed a "class famine".[93] Prices were elevated as early as 1941; and still higher prices in 1942 led to a further deterioration in economic conditions. A reduction in conceptions was a distinct response during the early phase of the famine, perhaps indicating the fertility-reducing effects of nutritional stress (see Figure 5.2). Prices rose dramatically from the beginning of 1943, and reached a maximum in August (see also Appendix D). Mortality began to rise above its normal level from the middle of 1943;

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[93] See e.g. Alamgir (1980), p. 14. The Report on Bengal, attributing the famine primarily to an "enormous" rise in the rice price, states that "[l]arger landholders benefitted from the situation, since they could sell most of their rice at an enormous profit....The famine thus principally affected one section of the community - the poor classes in rural areas"; see Famine Inquiry Commission (1945a), pp.67-68. Emphasising the Government's non-priority in tackling the crisis, Arnold labels it as a "political famine"; see Arnold (1988) p.97. It is worth mentioning that some former famines in several Indian locations have also been described as "price famines" because extremely high level of food prices, rather than food shortage, was considered to be the root cause of the distress (e.g. the Berar famine of 1896-97); see Crawford (1901), Volume 1, p.2. But in such famines excess mortality was often relatively small compared to that in the Bengal famine.

proportional excess mortality peaked in October (see Figure 5.2). The main famine mortality peak was roughly of 12 months duration: July 1943 to June 1944. However, the mortality level did not return to "normal" until the middle of 1945 (see Figure 5.2).

While the quantum of excess deaths in the Bengal famine has been an issue of long-standing debate, Amartya Sen's recent estimate, based on the 1951 census publications for both West and East Bengal, appears to have been most influential. However, our newly found registration materials for undivided Bengal cast doubt on the these previous data. One major problem with these data relate to the derivation of registered deaths for those districts which were divided at partition, making separate treatment of East and West Bengal questionable. Applying Sen's procedures to the new data for undivided Bengal yields estimates of 1.8 to 1.9 million excess deaths. But taking account of the pre-famine declining trend in the death rate, a figure of about 2.1 million seems more correct.

As Figure 5.2 suggests, conceptions, which were considerably reduced during the "starvation phase", were reduced still further during the peak period of famine mortality, implying the operation of the additional fertility-reducing effects of excess mortality and morbidity. Thus, the nature of short-term fertility responses during the Bengal famine was broadly similar to that found in former Indian famines. However, in the case of the Bengal famine a considerable reduction in conceptions occurred remarkably early especially compared to the prime period of famine mortality. This probably matched the prolonged period of rising prices and other disruptions brought about by the war.

While malaria and fever together accounted for the largest part of total mortality in normal times, malaria increased its dominance still further during the famine (partly at an expense of fever's importance, see Table 5.5). However, epidemics of cholera and smallpox were also quite important in famine mortality. Deaths from cholera, dysentery/diarrhoea, malaria and fever all shared a rising trend from the middle of 1943. The cholera mortality peak (occurring in October) preceded the malaria (and fever and dysentery & diarrhoea) peak by two months (see Figure 5.4). A similar sequence of mortality peaks from cholera and fever has been found in most of the earlier Indian famines (see especially Chapters 2 and 3 above). Peak cholera mortality is often thought to occur in the phase of maximum social disruption from famine (e.g wandering, congregations in relief camps etc). In the Bengal famine relief works and camps were far from significant. And wandering in search of work was also very limited. However, movement of destitutes towards towns and cities was considerable - especially after September 1943 when relief policy began to shift towards food distribution. Thus it is notable that cholera deaths culminated during a period of maximum provision of food-relief (October-November), which at the same time marked the maximum (proportionate) rise in overall mortality. It should be stressed here that the most effective form of relief (food relief) came into operation very late (in the post-monsoon months) and also at the height of famine severity (particularly in terms of mortality increase).[94] In other words, food relief became significant only after famine mortality was already very high.

Mortality from malaria and fever, though declining from its peak in December 1943 continued to be elevated well into 1944. In fact the relative importance of malaria in excess deaths increased significantly in 1944 (see Table 5.5). While post-monsoon environmental factors (e.g. increased surface water), which contributed to the usual elevation of malaria (and fever) mortality in the later months of normal years, may have helped to aggravate excess malaria mortality in late 1943, the overall dimensions of malaria mortality during the prime famine period cannot be dissociated from the basic fact of acute nutritional deficiency on a mass scale.

The urban cause-composition of excess deaths differed from the rural pattern partly as a result of differences found even in normal times, and partly due to the fact that urban Bengal recorded the deaths of large numbers of migrant destitutes. Despite rural-urban differences in the cause-composition of deaths, the time pattern of excess mortality was similar between rural and urban area. This reinforces our view that the general course of mortality increase was largely determined by the effects (somewhat lagged) of large-scale nutritional stress and debilitation on human health, while the

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[94] As the Report on Bengal notes, "Distribution of food on a large scale was not begun, except in isolated areas as a result of local initiative, until September - several months after the need for it had arisen. With prices of rice soaring to unheard of levels, relief in the form of small payments of money, whether given gratuitously, as agricultural loans, or as test relief in return for work, could do little to relieve distress. Food was required"; see Famine Inquiry Commission (1945a), p.99.

exact timing of peak excess mortality was partly shaped by both usual seasonal influences and climax of various social disruptions (e.g. population movements).

The Muslim community - having normally the highest death rate - appears to have experienced a relative advantage in terms of proportional rise in mortality (especially compared with the Hindus). However the Muslim community - having the highest fertility in the normal times - experienced the greatest reduction in births.

While rural registration data exhibit no adverse effects on stillbirth rates during the famine, there has been a very marginal rise in the urban rate of stillbirth. The suggestion is that famine's effect on stillbirths is, though probably adverse, not pronounced. Neo-natal mortality appears to have been relatively protected compared with the mortality of infants beyond the neo-natal stage (see Table 5.9).[95] As has been noted earlier the rise in infant mortality may be related to both "pre-natal exposure" to famine (e.g. through maternal nutritional stress) and post-natal conditions (e.g. through nutritional deficiencies, poor care etc).[96] In this context a greater proportional rise in female infant mortality seems to indicate an anti-female discriminatory bias in both food and parental care during the Bengal famine.[97] However, compared

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[95] A similar conclusion has also been reached in the context of the Bangladesh famine of 1974-75; see Razzaque et al. (1990) and Chen and Chowdhury (1977). Remember that present-day Bangladesh was included in the undivided Bengal until the partition in 1947.

[96] See Stein et. al (1975), especially pp. 153-163.

[97] A similar pattern of sex-discrimination among infants during the Bangladesh famine of 1974-75 has also been indicated; see Razzaque et al. (1990). See also D'Souza and Chen (1980).

to other ages, infants of both sexes in rural areas seem to have constituted the least vulnerable group. We have also found a relative mortality advantage in the famine for young children of both sexes in rural Bengal, while older children and adults appear to have experienced comparatively large proportional increase in mortality. But, interestingly, this was not so in urban Bengal (see Figure 5.6). Urban infants appeared to be more vulnerable than adults, and female infants seemed to be most vulnerable. Young children and elderly people in urban Bengal experienced relatively large proportional rises in mortality, while adult mortality was least affected by famine. But this urban pattern probably also reflects the influence of rural-urban migration on the numbers of registered deaths by age.

CHAPTER 6

REGIONAL VARIATION IN THE DEMOGRAPHIC IMPACT OF THE BENGAL FAMINE AND FAMINE EFFECTS ELSEWHERE

6.1 INTRODUCTION

In the last chapter we analyzed the demography of the Bengal famine at an aggregate provincial level. But data contained in the Bengal Public Health Reports enable an examination of effects at much lower levels of disaggregation. Accordingly this chapter focuses on the regional demographic dimensions of the famine, with particular emphasis on the district-level. It also examines broad demographic experiences in two other affected provinces, namely, Orissa (an adjoining territory) and Madras.

An inter-district analysis is useful because it throws light on the relative importance of various factors which are commonly thought to shape the demographic consequences of the famines (e.g. the extent of crop failure, food availability, relief provision, ecology, migration and so on). The famine in Orissa was caused in much the same way as in Bengal (e.g. through war-induced inflation and sharp increase in food prices). Yet Orissa was affected "to a much less serious extent".[1] Moreover -being an adjacent province - Orissa felt some of the indirect effects of the famine in Bengal (e.g. through inter-provincial migration). The famine in Madras

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[1] See Famine Inquiry Commission (1945a), p.1.

during 1943-44 also occurred largely because of war-related circumstances (e.g. disruptions in food availability and inflation). But again the Madras crisis did not develop into a mortality crisis of a scale comparable to that in Bengal. Thus it is of some interest to compare the broad demographic experiences of Bengal, Orissa and Madras.

6.2 A PRE-FAMINE PROFILE OF REGIONAL DEMOGRAPHIC VARIATION IN BENGAL

An examination of pre-famine regional demographic variation and related conditions in Bengal is a useful background for an understanding of the spatial demographic consequences of the famine. For example, district-level changes in deaths and births, particularly if examined in proportional terms during the famine, may be partly dependent on the pre-famine baseline levels of the death and birth rates. For example, the higher the baseline level the lower may be the scope for a further proportional rise. More importantly, pre-existing regional differentials in ecology, environment and socio-economic conditions can be expected to have played some role in determining the spatial dimensions of the famine. This said, district-level detailed data on many relevant variables are lacking. Table 6.1 provides averages of several demographic measures in 1940-41 for 26 districts. It will be noticed that these districts were traditionally classified into four natural divisions of Bengal.[2] Since 1942

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[2] Throughout this chapter the district-level demographic data refer to rural areas; so, the city of Calcutta, which constituted another district, is not shown. As indicated earlier (in Chapter 5), since most of Bengal's population lived in rural areas, conclusions drawn for rural

Table 6.1 Some pre-famine demographic measures for the four natural zones of Bengal, 1940-41

District/ division	CDR	CBR	IMR	CDR from malaria	CDR from fever	Male Death Rate as % Female
			Western Bengal (Burdwan division)			
Burdwan	20.9	28.8	162.1	8.2(62)	13.2	101
Birbhum	22.9	35.7	162.8	8.2(51)	16.1	106
Bankura	20.9	30.7	151.7	4.7(38)	12.6	107
Midnapore	17.1	28.2	126.6	4.8(48)	10.1	103
Hooghly	16.7	28.8	142.0	5.1(66)	7.7	94
Howrah	11.5	22.0	125.2	0.7(22)	3.3	93
DIVISION	**18.2**	**28.9**	**145.1**	**5.3(48)**	**10.6**	**100**
			Central Bengal (Presidency division)			
24-Parganas	15.3	27.6	125.4	2.0(26)	7.6	93
Nadia	26.0	35.1	178.4	17.3(86)	20.1	100
Murshidabad	19.5	36.3	134.5	9.1(66)	13.9	99
Jessore	25.3	27.0	194.1	17.5(86)	20.5	101
Khulna	17.7	26.3	143.8	5.2(52)	9.7	100
DIVISION	**20.2**	**29.9**	**155.2**	**9.3(71)**	**13.6**	**98**
			Northern Bengal (Rajshahi division)			
Rajshahi	25.3	32.3	219.3	16.8(83)	20.3	98
Dinajpur	19.1	26.2	191.3	8.8(63)	14.0	100
Jalpaiguri	26.3	33.4	169.8	7.7(51)	15.1	87
Darjeeling	29.5	32.4	129.5	7.4(44)	16.7	95
Rangpur	22.9	32.2	169.3	10.9(60)	18.2	99
Bogra	19.6	26.2	198.9	10.4(72)	14.5	98
Pabna	25.4	25.8	217.7	14.5(72)	20.2	100
Malda	12.8	19.3	178.3	8.8(82)	10.8	111
DIVISION	**22.1**	**28.5**	**184.3**	**11.2(66)**	**16.6**	**98**
			Eastern Bengal (Dacca and Chittagong divisions)			
Dacca	16.5	29.2	142.5	2.5(26)	9.4	108
Mymensingh	19.4	27.0	168.1	7.7(54)	14.2	99
Faridpur	22.7	29.4	170.9	8.9(58)	15.5	104
Bakarganj	20.3	27.0	164.6	3.6(33)	10.9	104
Chittagong	22.6	26.8	130.2	4.3(24)	17.9	106
Noakhali	17.5	26.4	120.2	2.0(18)	11.0	98
Tippera	16.8	30.9	134.2	1.9(21)	8.3	102
DIVISION	**19.1**	**28.2**	**147.2**	**4.7(35)**	**12.2**	**103**

Notes: 1) All data relate to rural areas. 2) All death and birth rates, expressed per 1000 population, are based on the constant denominators - being the respective populations according to the 1941 census. 3) The fever deaths include malaria. 4) The figures in parentheses are the respective percentage shares of malarial deaths to total deaths from fever.

Sources: Government of Bengal, Health Directorate, Bengal Public Health Report, Alipore: Government Press, various years.

Bengal should remain unaltered if towns (majority of which were very small) are included.

was itself a year of partial calamity, and is often considered as marking the start of the famine, we have not included it in calculating these pre-famine average measures.

It is clear from Table 6.1 that there was considerable regional variation in the registered pre-famine vital rates. At the divisional level, western and eastern Bengal appear to have been relatively favoured regions in mortality terms. Death rates were significantly higher in northern Bengal. Divisional variation in the CBR, however, was much smaller than that for the CDR. The average registered IMRs for the four divisions quite distinctively show their classification in terms of relative mortality levels.

The divisional vital rates, of course, conceal much intra-divisional variation. While the district of Darjeeling registered the highest CDR (29.5), Howrah recorded the lowest (11.5); the coefficient of variation of the CDR across the 26 districts is 0.21. The degree of variation in the CBR is much smaller; the corresponding coefficient of variation being only 0.14. Notice that the IMR in Darjeeling is very low in view of the fact that it recorded the highest CDR. Conversely, the registered IMR in Malda is strikingly high given that it was the district with the second lowest CDR (see Table 6.1). Such non-correspondence between IMR and CDR variation may have resulted partly from differential biases in death registration. However we cannot exclude the possibility that such discrepancies may have been partly real, reflecting for example regional variations in the age structures of the populations.

Table 6.1 also provides data on death rates from both malaria and fevers (inclusive of malaria). Despite likely imperfections in death reporting, these data seem useful as a guide to regional variation in the malaria ecology of Bengal. There appears to have been a very significant degree of variation in death rates from malaria which probably broadly reflected regional variation in malaria endemicity. Given the possibility that in some districts malaria deaths may have been more likely to simply be classified as due to "fevers", the proportions of malaria to total fever deaths may serve as a better indicator of malaria endemicity. Table 6.1 suggests that the zones which experienced relatively adverse mortality were also heavily malarious. Both the malarial death rates and the shares of malaria in total fever mortality were significantly higher in the central and northern divisions.

It is useful to examine the degree of association between these different measures, taking all the districts together. In this context Table 6.2 presents the correlation matrix for all these district-level measures which are given in Table 6.1. It generally confirms our previous conclusions. First, there are very strong positive correlations between the levels of the CDR and the death rates from both malaria and fevers. Again, there are somewhat lower positive correlations between the share of malaria to total fever mortality, and the CDRs and IMRs. All this suggests that the differential pattern of malarial incidence was indeed an important determinant of the overall regional pattern of mortality during normal times. Moreover, a positive correlation is found between the CDR and the CBR. While malaria is known to produce fertility reducing effects, this positive relation may partly be the reflection

Table 6.2 Correlation coefficient matrix with some district-level demographic measures for 1940-41, Bengal (as presented in Table 6.1)

	CBR	CDR from malaria	CDR from fever	% of malaria to fever deaths	IMR	Male CDR as % of female CDR
CDR	0.59*	0.65**	0.87**	0.38#	0.44*	-0.16
CBR		0.27	0.41*	0.11	-0.02	-0.17
CDR from malaria			0.85**	0.89**	0.82**	0.00
CDR from fever				0.60*	0.66**	0.09
% of malaria to fever deaths					0.76**	0.02
IMR						0.08

** significant at 0.01 per cent level
* significant at 1 per cent level
# significant at 5 per cent level
Note: For data used see Table 6.1.

of inter-district differentials in registration coverage.

In view of a very prominent part played by malaria during the famine (as we have seen in the last chapter), inter-regional differences in malaria ecology are worth considering. As far back as the 1910s and 1920s the eastern part of Bengal - being "a land of open drainage and active rivers" - was identified as a less malarious zone. This contrasted with the relatively more malarious central and western divisions which were characterised by the poorly drained moribund delta of the Ganges, and large flood plains including that of the Damodar river. The Himalayan foothills in the north were generally considered to be "the most intensively malarious zone".[3] The favoured malaria ecology of eastern Bengal is clearly

[3] See Chowdhury (1989), p.28, and Dutta and Dutta (1978), p.77.

reflected in the very low registered malaria mortality during 1940-41 in the districts such as Chittagong, Tippera, Dacca and Bakarganj (see Table 6.1).

In 1925 in his celebrated work on the relationship between agriculture and malaria Bentley noted that "as a broad fact only between 58 and 60 per cent of the cultivable area in Central and West Bengal is under cultivation while in the less malarial eastern portion the percentage is 90".[4] However, an examination by Klein of malarial cycles in different districts of Bengal in different times suggests that "the prevalence of malaria was related to economic, geological, and ecological conditions, all of which interacted on each other".[5] Overall Bengal experienced a significant decline in mortality during the 1930s, and this has been shown to have been largely due to improving malaria mortality. Interestingly, however, during the 1930s the significant fall in recorded malaria mortality was restricted largely to the endemic malarious zones (i.e. western, central and northern Bengal). But there was no real decline in malaria in the eastern parts which were already less malarious and relatively favoured in terms of mortality.[6] Thus, while the decline in mortality at the all-Bengal level during the 1920s and 1930s seems to have conformed to the general downward trend in all-India mortality[7] there were differential rates of decline across the different divisions of Bengal. This fact produced a departure from the earlier

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[4] Quoted in Famine Inquiry Commission (1945b), p.170.

[5] See Klein (1972), p.143.

[6] See Chowdhury (1989), Table 11, p.30.

[7] See Davis (1951).

regional pattern of mortality. In particular, by 1940-41 the western division appears to be have been relatively favoured mortality zone compared to the eastern and the other divisions. A close comparison of Bentley's map of malaria endemicity for Bengal in 1916 with a similar map constructed for 1948 indicates a significant reduction in malaria endemicity in western Bengal.[8] Note also from Table 6.1 that in both the central and northern divisions (i.e. those with the highest death rates) there seem to have been a male mortality advantage which was not present in the two other zones. With all this as background, we now examine the regional variation in the demographic impact of the famine.

6.3 INTER-DISTRICT VARIATION IN MORTALITY EFFECTS

The Bengal famine was widespread. In fact no district entirely escaped distress. However, as we shall see, all regions were not affected uniformly in respect of both timing and severity. Some districts began to endurê famine distress earlier than others, while some experienced a lesser degree of famine severity. Regional diversity in the demographic impact results from a complex set of interactions between local-level economic, environmental, ecological and infrastructural factors, and also from the effects of migration. Thus, while interrelationships between measures of famine distress (e.g. undernutrition, starvation etc) and mortality can be, and indeed have been, relatively easily examined using household

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[8] For Bentley's original map for 1916 see Dutta and Dutta (1978), p.81; for the 1948 version, see Akhtar and Learmonth (1986), p.109.

or individual level data,[9] an attempt to establish such relations at the district level variation is fraught with difficulties.

Our prime concern here is to examine the regional pattern of mortality rise (rather than to estimate district-level excess deaths). In doing so, averages of 1940 and 1941 are taken to be the reference levels for calculating the increases in mortality. Table 6.3 presents district-wise percentage rises in deaths for the six half yearly sub-periods between January 1943 and December 1945. As can be seen, during the first half of 1943 most districts experienced little change in mortality, with improvements in some (see Table 6.3). But the predominantly coastal districts of Midnapore, Chittagong, Khulna and Noakhali - which were hit by the October cyclone in 1942 - did experience early rises in mortality during the first half of 1943, as too did Tippera (which is adjacent to Noakhali). On the whole east of Bengal appears to have experienced a comparatively early rise in mortality. However, it was only during the last half of 1943 that all Bengal's districts experienced mortality rises and in many the proportional increases were huge. In the first six months of 1944, the mortality elevation continued, but with some moderation. During the last six months of 1944 there was a further reduction in excess mortality - save in a few districts, particularly the two adjacent districts of Malda and Dinajpur. In the first half of 1945 some districts experienced rises in mortality while some showed a further

[9] See e.g. Mahalanobis et al. (1946), Mukherji (1965), and also Sen (1981).

Table 6.3 Inter-district variation in mortality rise in the period between January 1943 and December 1945: Bengal

Districts	Percentage rise in deaths over the average of 1940 and 1941						
	1943		1944		1945		
	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	July,1943-June,1944
Burdwan	-14.68	72.48	48.00	20.12	6.53	-7.73	60.35
Birbhum	-10.19	164.71	107.78	56.18	33.34	31.35	136.64
Bankura	-13.33	119.21	33.29	9.55	13.42	-12.04	77.74
Midnapore	37.14	229.44	73.99	28.91	16.15	2.92	155.70
Hooghly	-14.05	63.92	34.02	30.76	35.39	2.62	49.24
Howrah	14.84	203.76	137.49	92.77	58.36	57.56	168.76
Western Bengal	**4.30**	**150.70**	**67.60**	**32.40**	**21.61**	**6.00**	**110.11**
24-Parganas	-6.16	177.10	100.61	24.80	17.37	-5.67	138.13
Nadia	-2.43	140.77	70.49	14.68	35.91	-6.72	109.28
Murshidabad	-1.21	212.93	105.87	64.19	77.66	37.53	161.54
Jessore	-10.74	27.19	39.57	-12.34	5.58	-32.89	32.74
Khulna	21.38	34.34	41.00	1.18	13.58	-7.73	37.18
Central Bengal	**-1.19**	**111.32**	**71.46**	**15.01**	**27.71**	**-6.43**	**92.89**
Rajshahi	5.46	71.72	36.14	6.71	44.50	-0.38	55.18
Dinajpur	1.17	25.85	59.68	81.25	55.03	44.69	42.67
Jalpaiguri	5.69	61.62	25.93	47.69	29.51	15.57	44.66
Darjeeling	-4.18	20.21	7.47	12.81	8.45	5.40	13.83
Rangpur	20.53	121.26	145.99	47.86	16.41	7.57	132.76
Bogra	3.62	62.68	91.18	42.43	59.62	23.23	75.30
Pabna	-12.68	56.41	60.83	16.01	26.82	-42.72	58.37
Malda	-46.72	69.16	100.66	184.25	57.58	111.11	87.58
Northern Bengal	**1.44**	**71.52**	**77.51**	**39.73**	**35.76**	**9.92**	**74.36**
Dacca	0.39	216.35	139.57	18.85	19.38	-12.81	178.02
Mymensingh	12.75	92.91	114.13	35.02	39.16	-9.74	102.64
Faridpur	-11.48	110.87	63.13	-17.61	-11.29	-41.89	88.59
Bakarganj	1.27	77.70	52.77	-3.08	-4.12	-16.38	64.93
Chittagang	37.26	193.90	28.38	-3.03	-8.14	-29.65	110.76
Noakhali	31.25	138.73	83.28	1.16	7.96	-22.08	112.62
Tippera	29.02	231.39	118.02	15.23	10.33	-16.60	176.42
Eastern Bengal	**12.14**	**142.82**	**90.14**	**10.52**	**11.02**	**-19.64**	**117.40**
All-Bengal	**6.07**	**121.04**	**80.39**	**21.66**	**21.42**	**-6.25**	**101.62**

Sources: See Table 6.1.

decline. Consequently in percentage terms the overall rise in excess mortality in Bengal stayed much the same between the last half of 1944 and the first half of 1945 (see Table 6.3). However, in the last half of 1945 most districts experienced a considerable decline - with the notable exception of Malda. While in some districts (e.g. Howrah, Murshidabad, and Birbhum) elevated mortality, though declining, continued up to the end of 1945, only Malda and Dinajpur actually experienced a major mortality peak during the last half of 1944.

The eastern division on the whole appears to have experienced a relatively fast recovery (see Table 6.3). Indeed a quite sharp improvement in mortality in the eastern zone during the last half of 1945 is particularly noticeable. The main famine death peak in most of Bengal's districts seems to have lasted from about July 1943 to about June 1944 (see Table 6.3). At the divisional level, the highest proportional mortality increase during this prime period of mortality was actually recorded by eastern Bengal - followed by the western, central and northern divisions in that order.

The ranks of the districts in terms of percentage mortality rise during the six half-yearly sub-periods (i.e. Jan-Jun 1943 to Jul-Dec 1945) are quite similar. A matrix of Spearman's rank correlation coefficients for these sub-periods is presented in Table 6.4. The coefficients between adjacent sub-periods are respectively 0.36, 0.60, 0.51, 0.79 and 0.74. Note that correlations become even stronger during the later phase of famine. And there is some suggestion that the relationship extended beyond immediately adjacent periods; thus, for example, districts which experienced relatively high

Table 6.4 Rank correlation coefficients (Spearman) matrix for the districts in terms of proportional mortality increases in the six half-yearly sub-periods between January 1943 and December 1945.

	Jan-Jun'43	Jul-Dec'43	Jan-Jun'44	Jul-Dec'44	Jan-Jun'45
Jul - Dec'43	0.36#				
Jan - Jun'44	0.19	0.60*			
Jul - Dec'44	-0.07	0.10	0.51*		
Jan - Jun'45	-0.07	-0.02	0.37	0.79**	
Jul - Dec'45	-0.03	-0.05	0.22	0.84**	0.74**

** significant at 0.1 per cent level
* significant at less than 1 per cent level
# significant at less than 5 per cent level
Note: For data used see Table 6.3.

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mortality increases in July-Dec 1944 also tended to experience relatively great mortality increases during July-December 1945. However, the ranks are not significantly correlated beyond one year. This probably reflects the fact that with the passage of time the pattern of epidemics tended to re-order districts in terms of mortality.

Since there is evidently significant inter-district variation within each division in Table 6.3, it is useful to classify the districts into groups in terms of their proportionate increases in mortality during the prime famine period. Accordingly the districts have been classified as follows:

<u>Group A (very severely affected)</u>: those experiencing more than 150 per cent rise in mortality during the period July 1943 to June 1944: Midnapore, Howrah, Murshidabad, Dacca and Tippera;

<u>Group B (severely affected)</u>: districts experiencing 100-150

per cent rise in mortality : Birbhum, 24-Parganas, Nadia, Rangpur, Mymensingh, Chittagong, and Noakhali;

Group C (moderately affected): districts experiencing 50-100 per cent rise in mortality: Burdwan, Bankura, Rajshahi, Bogra, Pabna, Malda, Bakarganj, and Faridpur;

and Group D (slightly affected): districts experiencing less than 50 per cent rise in mortality: Hooghly, Jessore, Khulna, Dinajpur, Jalpaiguri, and Darjeeling.

Using this classification Figure 6.1 illustrates the regional distribution of deaths during the peak mortality period from July 1943 to June 1944. It may be noted that the same four-fold classification as used above in terms of percentage rise in mortality during July-December 1943 as compared to the corresponding period during 1938-42 was employed in an official memorandum submitted to the Famine Inquiry Commission by the Department of Public Health and local Self-Government (Medical) of the Government of Bengal.[10] Although these two classifications do not match with each other exactly, they are reasonably close and comparable.

It is of interest to compare our above classification with the subdivisional classifications that were provided separately at the time by two official departments of the Bengal Government, namely the Departments of Industries and Revenue.[11] The precise criteria used (or the exact time period referred to) for their four-fold classifications of

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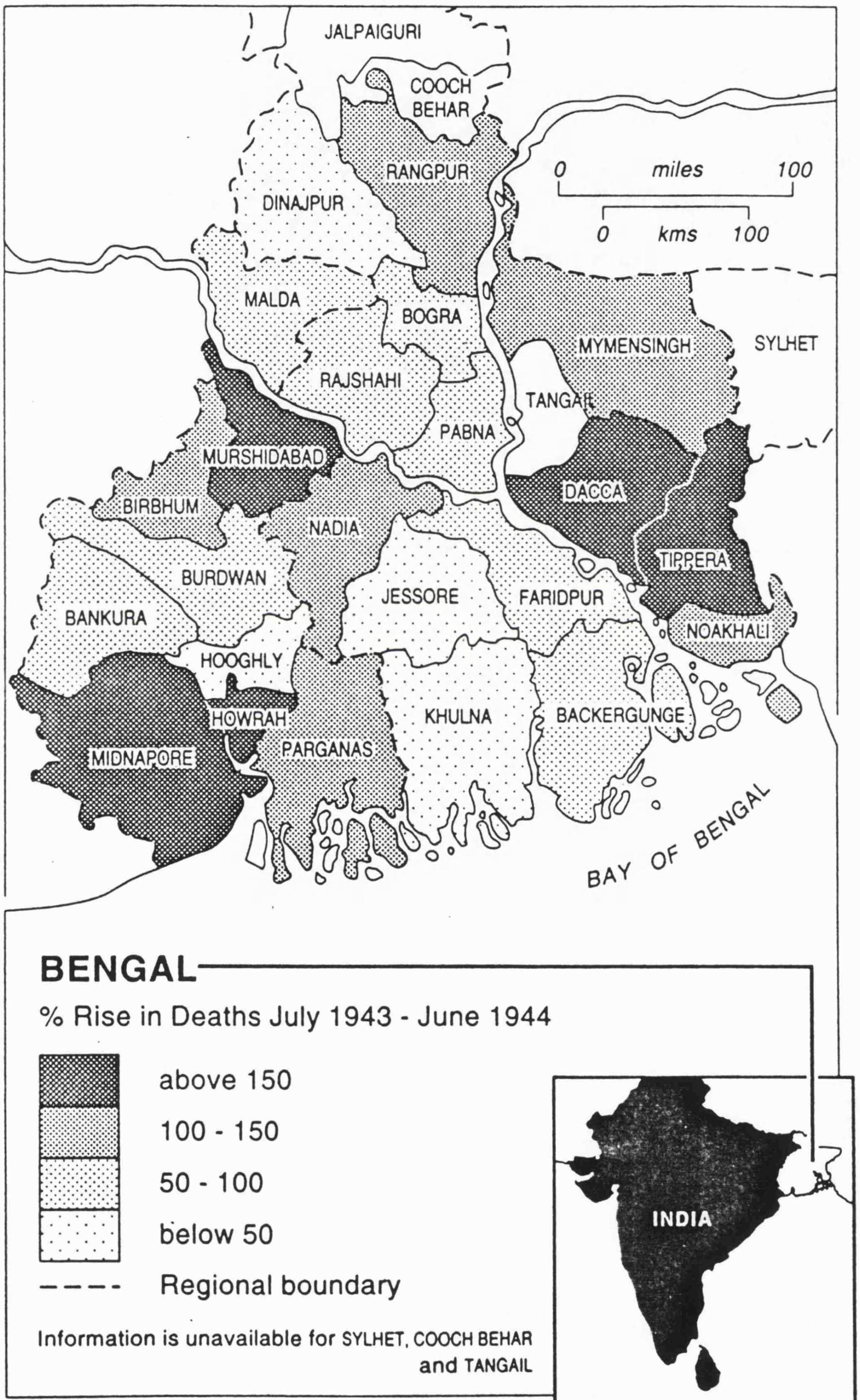
[10] See Pinnell's Papers, Memorandum No. 14, p.63.

[11] Government of Bengal, Revenue Department, A Scheme for Relief and Rehabilitation in Bengal, Calcutta, 1944; Government of Bengal, Department of Industries, A plea for the Rehabilitation of Bengal's Rural and Industrial Economy, Calcutta, 1944.

Figure 6.1 The Regional Pattern of Percentage Rises in Deaths During July 1943 to June 1944, Districts of Bengal.



Sources: See Table 6.3.

districts in terms of severity are not explicitly mentioned in either of these Departments' reports.[12] However in general the "most severely affected" category in both Departments' reports roughly corresponds to our classification (except for Murshidabad which emerges as very severely affected district only in our classification). However, those districts classed as "severely affected" do not correspond well between the various classifications. Mymensingh, for example, is considered as a "severely affected" district according to both the Industries Department report and our classification, but not according to the Revenue Department report. Again, Khulna and Jessore were classed as "severely affected" districts only by the Industries Department report whereas they were not so labelled according to both the Revenue Department report and our grouping. All this indicates that the criteria for identifying district-level severity were not solely based on excess mortality.[13] On the whole the impression one derives from the classification made by the Industries Department is that famine severity in eastern Bengal was more widespread and acute than in western Bengal. But neither our classification (based exclusively on excess mortality) nor that of the Revenue Department support such a conclusion.

In this connection it seems appropriate to examine the

[12] For example, as Greenough has remarked, "The criteria adopted by the Industries Department in determining the impact of famine on the sub-divisions were not stated clearly in the Plea for Rehabilitation (1944), but mortality was not the only or even the main criterion; apparently subdivisional officers and other district officers and other district officials were asked to form personal estimates of famine severity"; see Greenough (1982), p.142.

[13] Sen also found significant discrepancy between these official "diagnoses" of famine severity and excess mortality rankings of districts in West Bengal; see Sen (1981), p.208.

issue of whether there was a genuine difference in the post-famine time span of elevated mortality between West and East Bengal. We have already seen (from Figure 5.1 in the last chapter) that the registration data for the whole of the province do not indicate any excess mortality beyond 1945. However, the data from the 1951 West Bengal census report used by Sen did show elevated mortality for West Bengal up to at least 1946. Since the procedure by which deaths in divided districts (i.e. those which were partly allocated to West Bengal) were carved out by the 1951 West Bengal Census report was unsatisfactory (see section 5.3 of Chapter 5 above, and also Appendix B), we can simply ignore the division of these districts in deriving registered deaths for West and East Bengal. The numbers of annual registered deaths so-derived are given in Table 6.5 on the basis of excluding the four divided districts (Nadia, Dinajpur, Jalpaiguri and Malda) from the calculations. In view of Sen's use of data for 1941 and 1942 to represent the pre-famine situation, it is interesting that West Bengal indeed recorded a reduction in registered deaths from 1941 to 1942. Yet East Bengal (and the province as a whole) experienced an increase. Also Table 6.5 shows that in West Bengal registered deaths did not return to pre-famine levels even by 1946, whereas East Bengal experienced an improvement in 1945. So although the data for West Bengal used by Sen were defective, as we have already indicated, his finding of a prolonged post-famine mortality tail in West Bengal appears to be correct. So too may have been the suggestion from the data which he used that registered deaths

Table 6.5 Number of registered deaths in Bengal, East and West Bengal: 1941-46

Year	Bengal	West Bengal	Index	East Bengal	Index
1941	1,184,850	316,102 (381,934)		743,031	
1942	1,222,164	285,493 (343,568)		820,955	
Average 1941-42	1,203,507	300,797 (362,751)	100 (100)	781,993	100
1943	1,908,622	530,813 (622,235)	176 (172)	1,204,146	154
1944	1,726,870	471,324 (577,757)	156 (159)	1,056,859	135
1945	1,238,133	360,696 (447,130)	120 (123)	711,094	91
1946	1,068,996	- (414,687)	- (114)	-	-

Notes: 1) The numbers of deaths for West and East Bengal above have been calculated by ignoring four districts (namely Nadia, Dinajpur, Jalpaiguri and Malda) which were split in 1947.

2) The figures in parentheses are the respective numbers of deaths for West Bengal as given in the Appendix to the 1951 Census of India publication. These figures, however, do include deaths in the above four divided districts falling in West Bengal, but they differ from those given in the main text (which were used by Sen) (for details see Appendix B).

3) The numbers of deaths in West and East Bengal do not add up to those for undivided Bengal because the latter are inclusive of deaths in above four districts.

4) The registered deaths for undivided Bengal in 1946 were designated as "provisional"; and the number of registered deaths in the districts of undivided Bengal in 1946 are not available because the Bengal Public Health Report published for 1946 covered only West Bengal.

Sources: For total registered deaths in Bengal and in West and East Bengal (with above four districts being excluded) from 1941 to 1945, Government of Bengal, Health Directorate, Bengal Public Health Report, Alipore, various years; for registered deaths in Bengal in 1946, Annual Report of the Public Health Commissioner with the Government of India for 1946, New Delhi, 1948. For the figures in parentheses, see Appendix IV Census of India 1951,Vol. VI, Part 1B, Vital Statistics, West Bengal 1941-50, New Delhi, Manager of Publications, 1952, pp.67-68.

in West Bengal actually <u>fell</u> between 1941 and 1942.[14] On the other hand, these data in Table 6.5 also suggest that the proportional rise in registered deaths in West Bengal during the famine was higher than in East Bengal.[15] This poses an interesting problem.

Among Bengal's four natural divisions during the pre-famine decades eastern Bengal was a relatively favoured mortality zone (particularly compared to northern Bengal) (see Table 6.1). As we have seen this was at least partly due to a comparatively low incidence of malaria in eastern Bengal.[16] But these pre-partition natural divisions (into "easter Bengal" and "western Bengal" do not correspond geographically to the East-West political partition of Bengal in 1947 (which forms the basis of Table 6.5). Several districts (or more precisely large parts of districts) of post-partition East Bengal (or what became East Pakistan) came from the pre-partition "Northern" and "Central" divisions of Bengal.[17]

The post-partition East Bengal generally did not experience before the famine either favoured mortality or a lower malaria incidence compared to West Bengal. For example, excluding (as above) the four split districts from our calculations, the average death rate during 1940-41 was

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[14] See Dyson and Maharatna (1991a), Table 1, p.283.

[15] The lower mortality rise in East Bengal where Muslims were a majority (70.3% of the total population according to the 1941 census) appears to be consistent with our finding that the Muslim community experienced a relatively low proportional rise in mortality compared to Hindus (see Table 5.10).

[16] See Chowdhury (1989), and Klein (1972).

[17] Since 1947 (the year of independence and partition) the eastern wing of Pakistan was officially called East Bengal until the constitution of Pakistan, passed in March 1956, designated it as the Province of East Pakistan.

actually higher in East (23.3) than in West Bengal (18.2). Moreover, the average death rate from malaria during 1938-42 was in fact much higher in East (7.8 per 1000 population) than in West Bengal (4.9). Indeed, large parts of both moribund deltaic areas (which were very malarious) and the endemic malarious northern division (of undivided Bengal) became the part of East Pakistan (or East Bengal). So while historically a close relationship was found between river deterioration and the incidence of malaria, in fact a substantial area of decaying rivers was actually included in post-partition East Bengal.[18] Thus we suggest that East Bengal's lesser rise in famine mortality was at least partly related to its greater pre-famine malaria endemicity. In other words, highly endemic malaria in much of East Bengal (or what became East Pakistan since 1947) in the pre-famine period probably left relatively little scope for a large proportional increase in malaria mortality. Conversely, lower pre-famine malarial death rates in West Bengal probably made a relatively large proportional rise in death rates possible in the wake of the famine.[19] But this can hardly be an explanation for East Bengal's earlier post-famine recovery (see Table 6.5). Improved mortality in East Bengal in 1945 (and by implication 1946) might be viewed

[18] Areas of decaying rivers in East Bengal were designated as follows around the time of the famine: a) moribund delta: Kushtia, Jessore, North-West Faridpur and North-West Khulna; b) North Bengal: Dinajpur, Western Rangpur, Western Bogra and Western Pabna and all Rajshahi district; see Ahmad (1958), pp.38-39.

[19] Application of this principle was also noticed in the context of differential decline in malaria mortality from the 1920s to the 1930s in different divisions of Bengal. Eastern division, having very low malaria mortality, experienced little change while the western, central and northern divisions with higher malarial death rate experienced relatively large proportional falls; see Chowdhury (1989), p.30. In fact, role of malaria endemicity in regional variation of famine mortality would be discussed later in greater detail.

as consistent with the operation of some kind of demographic "Darwinian" selection.[20] The problem, then, is to explain the observed contrast between West and East Bengal.

Migration may have played a role in accounting for this East-West contrast. In particular, a net inflow of people into West Bengal during the post-famine period might have produced an artificial elevation of deaths for several years. At the time, war, famine, the freedom struggle and communal riots were all sources of population movement. But evidence about migration to settle the issue is scanty.[21] However, on the whole it appears reasonable that West Bengal probably experienced a net population inflow in the wake of both pre-partition Hindu-Muslim tensions and the partition of Bengal. For example, according to census information, the percentage of Hindu the population in West Bengal that was Hindu rose by 15 points between 1941 to 1951, while there was a corresponding 10 point decline in Muslim composition. In contrast, in East Bengal the rise in Muslim composition and fall in that of Hindus were both about 6 points.[22]

6.4 THE LATE MORTALITY PEAK DISTRICTS: MALDA AND DINAJPUR

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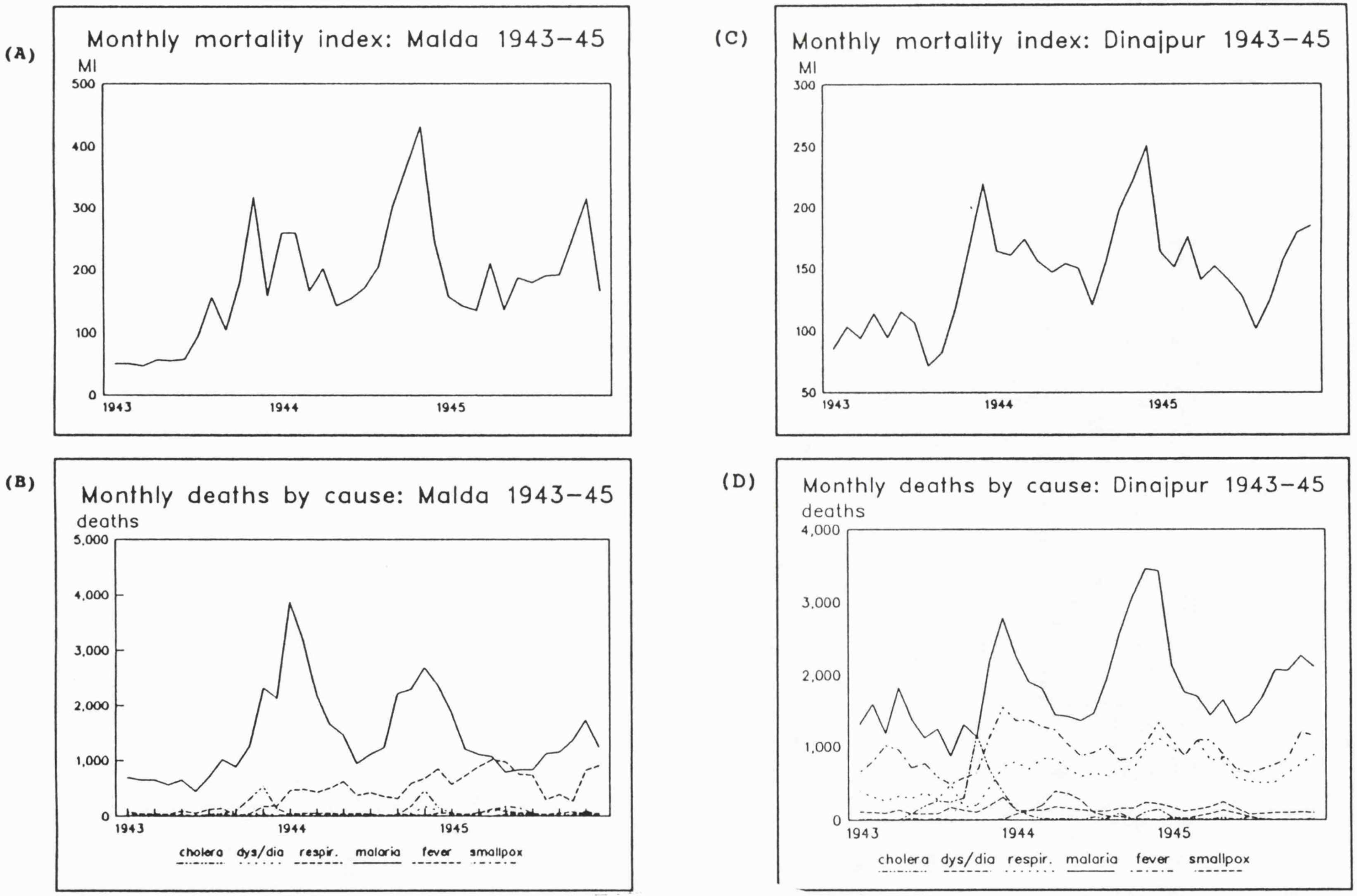
[20] See e.g. Bongaarts and Cain (1982).

[21] According to the 1951 Census, in 1946 alone 44,624 persons left East Pakistan (or East Bengal) and settled in West Bengal. However, non-availability of data on the number of persons migrating out of West Bengal and settling in East Bengal in 1946 prevents us from making an estimate of the net flow of people; see Census of India 1951, Volume Vl, Part II-Tables, Delhi: Manager of Publications, 1953, p.498.

[22] See Census of India 1951, Volume VI, Part 1C, Delhi: Manager of Publications, 1953, pp.4-5, Census of Pakistan 1951, Volume 1, Pakistan, Report and Tables, Karachi: Manager of Publications (undated), Chapter 2, p.27.

The very delayed nature of the mortality peaks in two adjacent districts of Malda and Dinajpur merits particular attention (see Table 6.3). Figure 6.2 presents monthly mortality indices and deaths by cause for Malda and Dinajpur. In both districts there was a mortality peak in conformity with that of the whole of Bengal during the final months of 1943. But the major mortality peak in both districts occurred in the closing months of 1944, when mortality in Bengal was only a little above normal. It seems that the major mortality peak around November of 1944 was due to fresh outbreaks of epidemic diseases. In Malda the maximum malaria deaths occurred in January of 1943 whereas the highest MI happened nearly one year later (see Figures 6.2 (A) and (B)). Moreover, two cholera mortality peaks (of almost the same magnitude) occurred in the month of November in both 1943 and 1944. In Dinajpur, on the other hand, the heavy mortality of late 1944 seems to have been associated with a huge peak from malaria mortality, (although deaths from respiratory diseases and fever also peaked). The elevation of registered mortality from respiratory diseases after 1943 in Dinajpur is interesting in view of the relative insignificance of such diseases in the overall famine mortality of Bengal as a whole (see Figure 6.2 (D)). Thus, although a simultaneous elevation of mortality from few diseases occurred in both Malda and Dinajpur, the operation of a similar cause in these two adjoining areas - probably the resurgence of a malaria epidemic during late 1944 - appears to have contributed to a delayed peak in excess mortality.

Figure 6.2 Mortality Index (MI) and Deaths from different causes, by month, 1943-45: Malda and Dinajpur.



Sources: See Table 6.1.

6.5 MALARIA ECOLOGY, RELIEF AND FAMINE MORTALITY: AN INTER-DISTRICT ANALYSIS

So far we have concentrated on identifying the regional patterns in both the course and magnitude of mortality increase. We have seen that most of the districts generally experienced a similar course of proportional mortality rise but there was substantial variation in its magnitude. We now attempt to explain these regional patterns. At the outset, it is important to note the potential difficulties associated with this task. First, as already mentioned, interactions of diverse forces - socio-economic, geographical, environmental, ecological, infrastructural so on - make the net outcome potentially a difficult area for applications of standard statistical tools. Noting significant variation in excess mortality across 84 subdivisions, Greenough rightly stated that "[n]ot all of this variation can be accounted for without detailed local studies".[23] Nevertheless one can still be interested in an assessment of the relative significance of some broad-based factors (e.g. food availability, relief provision, and food prices).[24] However, selecting appropriate empirical proxies for such broad factors is not easy. For example, one is not sure whether food prices or measures of food availability would be the best measures of famine distress. Finally, and perhaps most importantly, the problem

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[23] See Greenough (1982), p.142.

[24] According to Greenough, "some important factors were the price and availability of rice in local markets, the surplus or deficit status of the locality, the wage-rate offered to labour as well as the opportunities for employment, and the extent of public and private relief"; see Greenough (1982), p.142.

of lack of necessary data should be recognised. In fact, the available district-level data are quite limited. While there is no information on food availability or food production, data on the "harvest prices" of, and cultivated area under, autumn and winter rice for the districts of Bengal do exist for the years up to 1942-43. After 1942-43 these data are available only for the districts of West Bengal. In any case in the absence of any major drought as a precipitating factor we should not necessarily expect changes in area under cultivation to reflect scarcity or famine distress.

Table 6.6 provides district-wise data on CDRs during the main twelve month period of elevated mortality, CBRs during 1944, changes (proportional) in the harvest price of, and cultivated area under, (winter) rice in 1942-43, and also statistics on gratuitous relief during the period October 1942-March 1944. It appears that variation in divisional CDRs during the prime famine period was less than during the pre-famine period. However, there seems to have been some changes in the ranks of four divisions during the prime famine period (compared to the pre-famine years) (see Tables 6.1 and 6.6). For example, the eastern region, which was third in the rank of mortality in the years preceding the famine, appears to have recorded the highest death rate during the famine. Thus in terms of proportional rise in mortality, eastern and western divisions - relatively favoured mortality zones in pre-famine period - experienced a relative mortality disadvantage compared to the two other divisions. It is notable that the eastern division experienced both the highest proportional rise in mortality and the greatest proportional

Table 6.6 Inter-district differentials in demographic and other measures: Bengal

District	CDR 1943-44 (Jul-Jun)	CBR 1944	Despatches of food grains in 1943 (tonnes)	Ratio of price of rice in 1942-43 to the average for 1938-40	% change in area under rice in 1942-43 compared with 1938-40	Grant for Gratuitous Relief (Rs) Oct'42-Mar'44
Burdwan	33.4	19.9	14,978	3.38*	-15.82	1,899,010 (49)
Birbhum	54.2	21.9	1,729	5.14	-03.62	747,560 (40)
Bankura	37.1	19.7	4,710	3.07	+01.97	902,500 (48)
Midnapore	43.7	21.5	20,498	4.85	+09.90	12,844,004 (48)
Hooghly	25.0	21.7	9,752	2.00	+03.88	1,145,470 (48)
Howrah	30.9	20.8	17,174	5.47	+110.23	888,970 (47)
WESTERN BENGAL	**38.3**	**21.0**	**68,841**	**4.11**	**+17.76**	**18,427,514 (48)**
24-parganas	36.5	14.7	19,795	5.03	+06.86	1,840,500 (46)
Nadia	54.5	19.4	3,612	3.29	-01.00	217,710 (33)
Murshidabad	51.0	18.4	4,579	3.74	-00.18	243,660 (23)
Jessore	33.6	15.9	1,138	n.a.	+04.75	77,760 (35)
Khulna	24.3	18.8	13,278	2.18	+15.38	238,360 (82)
CENTRAL BENGAL	**39.0**	**17.3**	**42,402**	**3.56**	**+5.16**	**2,617,990 (42)**
Rajshahi	39.3	20.2	654	2.82	+21.58	113,480 (17)
Dinajpur	27.2	25.8	631	4.76	-02.72	185,920 (31)
Jalpaiguri	38.1	21.3	2,947	2.95	-09.88	104,300 (41)
Darjeeling	33.6	21.2	5,802	3.60	-00.32	13,060 (29)
Rangpur	53.2	17.0	3,919	2.00	+04.51	565,800 (52)
Bogra	34.3	18.8	425	2.68	00.00	181,020 (41)
Pabna	40.3	9.8	6,764	4.61	-00.39	331,000 (42)
Malda	24.0	19.2	202	3.73	+26.47	9,300 (39)
NORTHERN BENGAL	**38.4**	**18.8**	**21,344**	**3.39**	**+4.91**	**1,503,880 (39)**
Dacca	46.0	10.0	26,577	3.80	+13.66	1,535,760 (54)
Mymensingh	39.4	13.5	8,908	4.50	+08.79	640,320 (39)
Faridpur	42.7	12.4	16,493	n.a.	+08.05	1,539,970 (24)
Bakarganj	33.5	16.9	5,248	4.00	-02.56	1,171,820 (37)
Chittagang	47.5	13.7	23,366	1.00	-00.63	986,710 (63)
Noakhali	37.2	16.6	6,754	5.97	-09.46	1,172,095 (48)
Tippera	46.6	13.2	10,932	2.70	+22.31	700,835 (39)
EASTERN BENGAL	**41.6**	**13.5**	**98,278**	**3.66**	**+5.73**	**7,747,510 (39)**
ALL-BENGAL	**39.9**	**16.5**	**230,865**	**3.52**	**+05.30**	**30,296,894 (44)**

Notes: 1) The CDRs and CBRs are based on constant denominators - being the respective populations according to the 1941 census. 2) The figure marked * refers to 1943-44. 3) The year to which the data on price and area relate ends on 30th June. 5) The figures in parentheses are the respective percentage shares of gratuitous grant of money to the total grants. (6) The change in the price of, and area under, rice for 1942-43 is calculated with reference to the averages for the years 1938-39 and 1939-40.

Sources: For births and deaths: Bengal Public Health Report, Alipore, relevant years; for data on sanctioned money on different forms of relief: the Pinnell Papers, Confidential, Memorandum on the Economic Condition of Bengal Prior to the famine of Bengal 1943, p.44; for the data on food despatches in 1943, see Famine Inquiry Commission (1945a), Appendix V, p.223; for price and area data, see Government of India, Ministry of Agriculture, Indian Agricultural Statistics, Volume 1, relevant years.

reduction in births.[25] Again there does not seem to be a clear correspondence, particularly at the divisional level, between mortality increases and changes in price of, and area cultivated under, winter rice in 1942-43.

However, there are indeed some significant intra-divisional variations. Therefore, it may be useful to proceed by examining the correlations among the demographic and other measures. Table 6.7 provides the correlation matrix with district-level data on several such factors. Since estimates of simple correlations can be influenced by extreme values we have calculated both ordinary and rank (Spearman) correlation coefficients (the ordinary coefficients are not given in Table 6.7 but the results obtained with them are broadly consistent with those shown). It is of interest to examine the direction and strength of correlations of those variables which might be thought to have a causal relation with X_1 (the percentage rise in deaths during July 1943-June 1944). The positive correlation between X_1 and X_2 (the proportional rise in the price of rice in 1942-43) is consistent with the view that the degree of rise in food prices was a determinant of famine distress and associated mortality. But the association is extremely weak (see Table 6.7). This may well partly stem from the relative uniformity in price rises across districts, reflecting the integration of the market. However, the observed positive correlation between X_1 and X_3 (the percentage rise in the area under rice cultivation in 1942-43) is interesting; this seems contrary to our expectation in the

[25] There has been a rise in coefficient of variation in the district-level CBRs of 1944 (0.21) from its the pre-famine level (0.14).

Table 6.7 Correlation Matrix with district-level data on different demographic and other measures during the famine

	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}	X_{12}	X_{13}
X_1	0.16	0.17	0.47#	0.40#	0.43*	0.27	0.17	-0.40#	-0.55*	0.22	0.43*	0.23
X_2		0.13	0.24	0.15	0.07	-0.02	-0.32	-0.29	-0.12	-0.23	-0.05	-0.23
X_3			-0.10	-0.18	0.18	0.04	-0.12	-0.56*	0.05	-0.10	0.03	-0.23
X_4				0.87*	0.80*	0.69*	0.45*	-0.35#	-0.62*	0.29	0.12	0.00
X_5					0.63*	0.72*	0.51*	-0.21	-0.51#	0.04	-0.03	0.05
X_6						0.87*	0.59*	-0.36#	-0.64*	0.33#	0.26	-0.13
X_7							0.62*	-0.26	-0.51*	0.05	0.05	-0.08
X_8								-0.28	-0.51*	0.00	-0.09	-0.24
X_9									0.37#	0.18	0.33	0.47#
X_{10}										-0.35#	-0.12	0.09
X_{11}											0.50*	0.05
X_{12}												0.50*

* $P \leq .01$, # $P \leq .05$

X_1: percentage rise in deaths during July 1943-June 1944 over the average of 1940 and 1941; X_2: ratio of price of rice in 1942-43 to average 1938-40; X_3: percentage change in area under rice cultivation in 1942-43 compared with 1938-40; X_4: government grant on gratuitous relief during Oct.1942-Mar.1944; X_5: Government grant on gratuitous relief per capita during Oct.1942-Mar.1944; X_6: despatches of food grains in 1943; X_7: despatches of food grains per capita in 1943; X_8: percentage share of gratuitous grant to total relief grant of money; X_9: average CDR during 1940-41; X_{10}: share of malaria mortality to total fever mortality during 1940-41; X_{11}: number vaccinated per 1000 population in 1943; X_{12}: percentage decline in births in 1944 from average of 1940-41; X_{13}: average CBR during 1940-41.

Notes: 1) These are all rank (Spearman's) correlation coefficients. We also calculated ordinary correlation coefficients; they were found to be broadly consistent with these rank correlation coefficients. 2) It seemed appropriate to exclude few extreme figures (e.g. very large gratuitous relief for Midnapore which began to receive relief much earlier than other districts owing to the cyclone of 1942; also excluded was the extremely large proportional rise in area under rice cultivation in Howrah).

Sources: See Table 6.6

context of a drought-related Indian famine in which reduction in area under cultivation is a well-known route to distress for a large section of the population. But the Bengal famine was not associated with any significant drought. On the whole, variation in the area under rice cultivation does not appear to have had any significant role in determining the regional pattern of mortality increases across the districts of Bengal.[26]

The positive correlations of X_1 with X_4 (grant on gratuitous relief during Oct 1942-Mar 1944) and X_5 (the <u>per capita</u> grant on gratuitous relief) are of interest. This seems contrary to our general expectation that relief should reduce distress, and thus help minimise mortality. Although government grants on gratuitous relief are for a period which does not strictly coincide with that of the prime mortality increase, this should not cause much difficulty in interpreting our results. This is because gratuitous relief (of which the dominant form was food distribution) did not assume significance until September of 1943; very few districts actually received gratuitous relief before that time.[27] Similarly, most of the grain despatches in 1943 occurred during the last four months of the year.[28] Again, a significant positive correlation of X_1 is found with government despatches of food grains to the districts in 1943 (expressed

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[26] The finding of a positive relation - though rather weak - may partly be due to the influence of migration: i.e. people may have been drawn to areas where above-normal farming activity caused an increased demand for labour, and this may have inflated the number of deaths in such areas.

[27] See Brennan (1988).

[28] See Brennan (1988), Figure 5, p.559.

in both absolute and per capita terms, X_6 and X_7) (see Table 6.7).[29] This relation may, indeed, have an important implication both *vis-a-vis* the criteria by which the official allocation of food relief was made and also for the role that such relief played in shaping the regional pattern of mortality increase. Several possible mechanisms behind such positive a relation may be suggested: first, the allocation of gratuitous relief in the districts may have been determined partly by the proportional rises in death rates rather than *vice versa*. It is amply evident that gratuitous food relief (being the most appropriate form of relief in the famine) was provided very late (see Chapter 5 above). Therefore food relief distributed during the epidemic phase ultimately may not have helped reduce excess mortality. Instead its distribution over different districts followed the criterion of excess mortality itself. Thus, our hypothesis is that the distribution of gratuitous relief reflected mortality increases across districts and not vice versa.[30]

Now one implication of this hypothesis is that the administration was fairly efficient in collecting information about mortality rises, and in organising the distribution of

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[29] Much of the government grants on gratuitous relief was presumably for purchasing food grains and for running relief kitchens; strong correlations found between food grain despatches and gratuitous expenditures lends support for this view (see Table 6.7). We have also estimated the correlations of percentage rise in deaths during July-December 1943 with X_4, X_5, X_6 and X_7; they are respectively 0.42**, 0.41**, 0.54** and 0.16.

[30] It may be noted that the absolute (rather than proportional) rises in death rates during July 1943-June 1944 have also been found to have significant positive correlations with both X_4 (0.42**), X_5 (0.41**), and X_6 (0.54**). Interestingly, the finding of a much smaller correlation of mortality rise with X_7 may be suggestive that the allocation of food despatches was based more on an index of mortality increase than on the number of potential or actual victims in the various districts of Bengal.

food on the basis of that information. This may seem to be in conflict with Sen's finding (based on the data for West Bengal) that "the Bengal government's diagnoses of the relative severity of the famines in the different districts differed quite substantially from the excess mortality rankings for 1943-46 as well as for 1943 itself".[31] And considering all the districts of undivided Bengal, we have already indicated that the two official subdivisional classifications of famine severity - which were also referred to by Sen - do not seem to have been based on exclusive or even primary considerations of regional mortality increases.

However, Sen states that "relief operations were strongly influenced by these diagnoses".[32] In this context the timing of these "diagnoses" is important. In fact, both the official diagnoses of famine severity were made for the purpose of post-famine rehabilitation. Such official classifications, if made during the early part of a famine, can be supposed to have influenced the distribution of relief according to regional priorities. However, delayed distribution of relief food (as was the case during the early epidemic phase of the Bengal famine) - when famine-induced mortality has already assumed an alarming scale - is likely to be more influenced by information about the regional pattern of excess mortality. The balance of evidence suggests that the Bengal famine fitted the latter scenario. Although official awareness about relative mortality in different districts may have required a certain amount of administrative efficiency, this does not

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[31] Sen (1981), p.208.

[32] Sen (1981), p. 208.

seem implausible especially during the epidemic phase.[33] However, the significant negative correlation found between the malarial share in fever mortality during 1940-41 (X_{10}) and food despatches (represented by both X_6 and X_7) may raise question as to why despatches of food grains were relatively more in the districts which were relatively less malarious. Nor is it clear whether larger food was despatched to the normally deficit districts. In fact there are several difficulties - both conceptual and statistical - with the notions of a "normally deficit or surplus district". The Report on Bengal, however, characterised some districts as "normally deficit", and it also mentioned some districts as being "buying ares" according to the Bengal government early in 1943. However the Report on Bengal itself is quite doubtful whether these "buying" districts - as regarded by the Government of Bengal -"were genuinely surplus".[34] Moreover, relevant data to enquire about any inverse connection between food deficit and malaria endemicity are lacking.

Another possible explanation of a positive relationship between mortality rise and the extent of provision of food relief across districts centres around the "refeeding

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[33] Indeed there is evidence in the context of famines of the late 19th century that monthly (sometimes even fortnightly) mortality data (death rates) for individual districts were collected by respective district administrations during peak famine period. For example, a Memorandum submitted by the Sanitary Commissioner for the North-Western Provinces and Oudh (United Provinces) on the public health during the famine of 1896-97 states that "To ensure early recognition of distress in any locality, special arrangements were made. The health and condition of the general population was reported on fortnightly to this office by all Civil Surgeons, and from these reports a general statement was complied and submitted to Government. District officers also telegraphed the death-rates of their districts month by month"; see Resolution on the Administration of Famine Relief in the North-Western Provinces and Oudh during 1896 and 1897, Volume I, Allahabad: Government Press, 1897, p.132.

[34] Famine Inquiry Commission (1945a), p.114.

hypothesis". It might be suggested that refeeding a district through food relief actually produced relatively high malaria mortality. However, as we have already argued (see Chapter 2), even if refeeding enhances the chance of malarial attack, the actual risk of death depends on nutritional state prior to the nutritional improvement.[35] We have also seen in the preceding chapter that the food provision not only covered very small proportion of affected population, but it probably caused rather insignificant nutritional improvement. Moreover, this hypothesis is hardly consistent with the observed negative relationship between food relief provision and previous malaria endemicity shown in Table 6.7. In other words the question remains as to why food relief provision appears to have been smaller in districts which had a higher level of malaria endemicity in the pre-famine period - a question which does not seem answerable in terms of any direct causal connection between them.

Finally, inter-district migrations could also produce a positive relationship between mortality rise and the provision of relief. A district favoured with comparatively more food relief may have attracted destitutes from neighbouring areas, and this could inflate the number of deaths registered in the receiving district. But then question of what actually determined the allocation of relief provision remains open. Relatedly, this explanation should also take account of a negative relationship found between relief provision and

[35] Brennan has shown that official food policy during the famine appears to have depended on the private market. Even considerable parts of the government food despatches were sold through the market, resulting in a smaller amount of grain being available for running of free kitchens; see Brennan (1988).

malaria endemicity. Although information about famine-induced population movement between districts of Bengal is very scanty, some inferences may be drawn about the influence of migration on the regional variation of mortality - a point to which we will return.

We now turn to consider the influence of environmental and ecological variables. These can be partly represented by both the pre-famine CDRs for 1940-41 and the shares of malaria deaths in total fever mortality during 1940-41 (respectively variables X_9 and X_{10}). The proportional rise in deaths (X_1) during the prime mortality period appears to be negatively correlated with both X_9 and X_{10}. In case of X_9 this may be of no surprise in a statistical sense; since the lower the base the greater the scope for proportional increases. However, district-level proportional rises in deaths during July 1943-June 1944 are very strongly ($r= 0.90$) correlated with the corresponding <u>absolute</u> rises in death rates. We have already indicated that malaria ecology probably played a key role in determining pre-famine inter-district variation in mortality (see Table 6.1). Thus, our results in Table 6.7 also suggest that the lower the malaria endemicity in a district (X_{10}), the greater its mortality increase during the famine (X_1). Indeed, as we have already analyzed, a large part of the increased overall mortality during the famine was accounted for by malaria epidemics. Taken together, these considerations imply that the severity of malaria epidemics was probably less in those districts which were already heavily malarious - a point to which we will return.

In Table 6.7 district-level public health measures -

represented by the number of persons vaccinated in 1943 (X_{11}) - show a weak positive association with X_1. This suggests that public health measures played little role in reducing mortality increase, and supports the notion that public health measures were not only inadequate but also very late - a view which has already been argued at the all-Bengal level (see chapter 5 above).[36]

Thus we have considered roughly four groups of variables in relation to the explanation of inter-district variation in mortality increase during the famine: the economic variables (X_2 and X_3); relief variables (X_4 to X_8); environmental and ecological variables (X_9 and X_{10}); and public health variable (X_{11}). In order to better understand the causal mechanisms involved, estimation of a multiple regression equation may also be useful. However, formulating such an equation requires some consideration about the selection of dependent and independent variables. First, mortality increase in districts may be measured in both absolute and proportionate terms. So far we have concentrated on the percentage rise in deaths (X_1). However, as mentioned above it is very strongly and positively correlated with the absolute rise in the number of deaths per 1000 population during the prime famine period (a variable we can denote by X'). Accordingly we can use both X_1 and X' as separate dependent variables.

But correlations also exist between several of the above (supposedly) explanatory variables. For example, X_4 appears

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[36] Taking the number of vaccinated infants per 1000 births in 1943 as an index of public health provision in each district, we found a similar positive correlation with mortality increase, whether expressed in proportional (0.25) or absolute (0.32) terms.

to be positively and rather strongly correlated with both X_5 and X_6. And X_6 is also fairly strongly correlated with X_7. In fact, these correlations are all to be expected, since the different measures all relate to roughly the same variable, namely provision of gratuitous relief. Therefore, we include only one independent variable to represent gratuitous relief in the regression; X_6 seems to be the most appropriate. On similar grounds, we select X_{10} to represent the ecological (mainly malarial) dimension.

Thus we estimate the following two multiple regression equations:

$$(1)\quad X_1 = a + bX_2 + cX_3 + dX_6 + eX_{10} + fX_{11}$$

$$(2)\quad X' = a' + b'X_2 + c'X_3 + d'X_6 + e'X_{10} + f'X_{11}$$

The results are presented in Table 6.8. The signs of the regression coefficients for equation (1) are all consistent with the estimated correlations presented in Table 6.7. But none of the independent variables seems to be statistically significant, and together they explain only a small percentage of the inter-district variation in X_1. For equation (2), the explanatory power is even lower.[37] These poor results probably partly reflect the fact that the regional pattern of variation in mortality increase during the famine was far more complex than our explanatory variables can capture. In addition, our regression equation captures only linear relationship.

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[37] It may be noted that the different R^2 values obtained for X_1 and X' - which are highly correlated - may well be the result of the fact that these are being measured on two different scales, and hence are not strictly comparable; on this see Scott and Wild (1991), also Kavalseth (1985). We also tried a semi-logarithmic form of the regression, but it too provided a negligible overall explanatory power.

Table 6.8 Results of estimated multiple regression equations of mortality increases during the prime famine period.

Independent Variable	Coefficients	t-values
Equation (1)		
X_2	6.069	0.784(0.44)
X_3	0.526	1.195(0.24)
X_6	1.260×10^{-3}	0.850(0.41)
X_{10}	-0.441	-0.697(0.50)
X_{11}	0.107	0.400(0.69)
Constant	77.310	1.220(0.24)
$R^2 = 0.36$, Adjusted $R^2 = 0.18$		
Equation (2)		
X_2	0.228	0.142(0.89)
X_3	8.583×10^{-3}	0.094(0.93)
X_6	1.325×10^{-4}	0.431(0.67)
X_{10}	-0.028	-0.215(0.83)
X_{11}	0.040	0.718(0.48)
Constant	15.320	1.166(0.26)
$R^2 = 0.11$, Adjusted $R^2 = -0.14$		

Notes: 1) Figures in parentheses are the respective significance levels.

2) The statistic, "adjusted R^2", (denoted as R_n) corrects R^2 to more adequately reflect the goodness of fit of the model in the population. R_n is given by

$$R_n = R^2 - \frac{p(1 - R^2)}{N - p - 1}$$

where p is the number of independent variables in the equation being estimated, and N is the number of observations. However, it should be remembered that R^2 is a measure of linear relationship between the variables; so low value of R^2 indicates, strictly speaking, weak <u>linear</u> causal relationship rather than low association.

3) For data used see Table 6.7.

However, in order to identify the most significant factors in explaining variation in mortality increase, we also attempted a stepwise regression. This method first selects the variable with the highest correlation with the dependent variable. Then a criterion, namely, a minimum probability level (0.05) of the F statistic, is set to be fulfilled for entry of that variable. If the variable fails to meet this entry requirement, the procedure terminates with no independent variable in the equation. If it passes the criterion, a second variable is selected, based on the highest partial correlation. If the second variable passes the entry criterion, it also enters the equation, and so on. Applying this stepwise procedure we found that the share of malaria to total fever deaths (i.e. variable X_{10}) was the only significant independent variable.[38] The resulting estimation equation is as follows:

$$X_1 = \underset{(0.00)}{155.47} - \underset{(0.01)}{1.05}\, X_{10}\,, \quad R^2 = 0.23, \text{ Adjusted } R^2 = 0.20$$

Thus it appears that pre-famine malarial endemicity is the most important factor (among those considered) in explaining inter-district variation in increase, although it still leaves much of the total variation unexplained. This suggests that the regional pattern of famine mortality was shaped through a

[38] No independent variable satisfied the minimum significance criterion to be included in the model when stepwise regression was tried on the absolute change in the death rate (i.e. X') as the dependent variable. However, the estimated regression equation of X' on X_{10} is as follows:

$$X' = 24.19 - 0.11\, X_{10}\,, \quad R^2 = 0.08.$$

The fact that X_{10} explains less of the total variation of X' than of X_1, while both X_1 and X' are highly correlated, may seem surprising. But this is not implausible in view of the following considerations: first, while R^2 is a measure of strength of the linear relation, X' and X_1 are non-linear transformations of each other. Second, the fact that the correlation between X' and X_1 is, though high, not perfect may mean that sample variability partly accounts for this discrepancy.

complex interaction of diverse forces, and also that our formulation of different measures is largely unable to capture this.

However, the finding that the regional pattern of malaria ecology partly shaped the regional dimensions of famine mortality can be thought of as consistent with the positive relationship found between mortality rise and the provision of gratuitous food relief if we accept the view that the allocation of food relief was determined, to a certain degree, by the criterion of mortality rise. In other words, the pre-famine variation in malaria endemicity in the districts seems to have determined partly the variation in mortality increase, which in turn probably became an overriding consideration behind the allocation of food relief - a form of relief which, though appropriate under the circumstances, proved to be of little help in reducing the mortality cost of the famine.[39] Indeed, the realisation that the provision of food was to be the only effective form of relief, came rather late (in the middle of August 1943) when the revenue minister had no way but to admit that "there was no question now of saving the lives of all the destitutes in Bengal, but only of saving as many as could possibly be saved".[40] The decision then was taken in favour of "gruel" relief rather than "cash or

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[39] In this connection it is worth noting that grain supplies (or despatches) in most districts constituted rather small part of the effective gratuitous relief effort of the district administrations. This is mainly, as Brennan has convincingly argued, because of "the competitive structure built into the provision of grain and relief in the districts" - a fact that held the economically weakest (in terms of shortfall in purchasing power) at a relative disadvantage; see Brennan (1988), p. 559. Brennan provides strong indication that a large part of an apparently "massive" relief expenditures by the government failed to favour the most vulnerable sections of the population.

[40] Quoted in Greenough (1982), p.129.

uncooked grains". Even after this decision was adopted by the Revenue Department (which was responsible for relief) there was further delay associated with the policy of collecting rice locally - a policy proved to be a failure.[41] But meanwhile "mortality rose alarmingly in September. In response, the Revenue Department began to depend more and more on "gruel kitchens", which it opened in large numbers both in towns and villages and which it kept in operation until the end of the year."[42]

While evidence is, thus, fairly clear about government's delayed response in food provision, we do not have any direct evidence to say that the government distributed food across districts, following the criterion of respective mortality rises. Furthermore, the correlations between the mortality rises and measures of food relief are far from perfect. Indeed, the scatter plot of district-level ranks in terms of mortality increase and food despatches in Figure 6.3 (A) shows that a cluster of six districts received relatively large amounts of food grains - namely, Dacca, Howrah, Midnapore, Chittagong, 24-parganas and Tippera (in fact, these districts received more than 50 percent of the total food despatches in 1943). These districts also appear to have experienced relatively large mortality rises. Interestingly, exclusion of these six districts reduces the rank correlation coefficient close to zero. Now, Howrah, 24-parganas and (probably Midnapore) are all relatively close to Calcutta - the centre from where food was being despatched. Also, Chittagong is an

[41] See Greenough (1982), p.130.

[42] Ibid., p.130.

Figure 6.3 (A) Scatter-plot of district-level mortality increases (X_1) and food despatches (X_6)

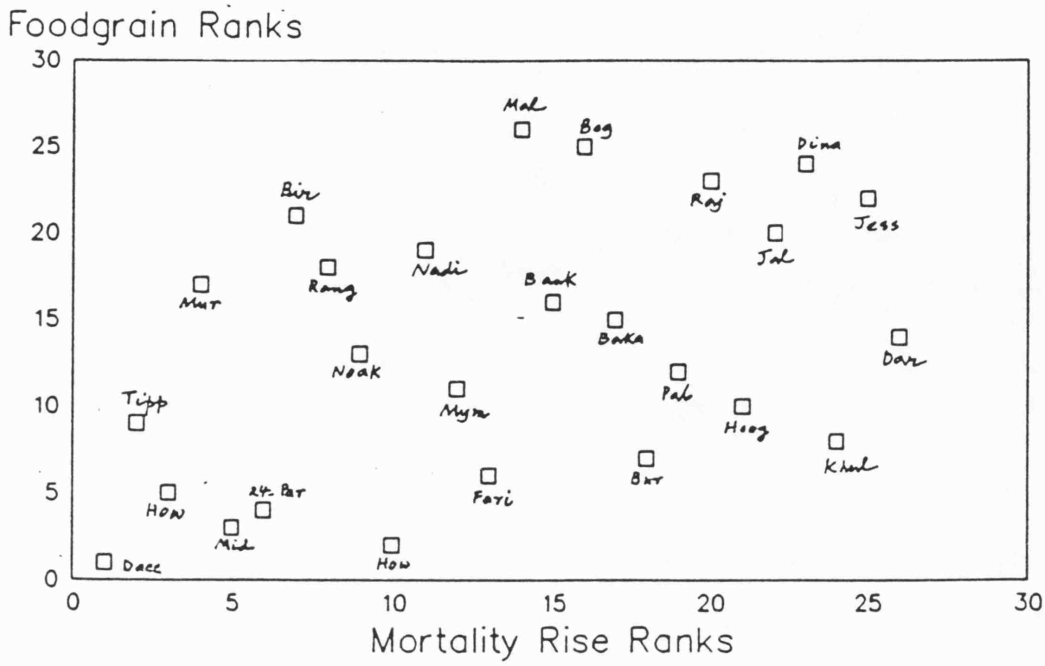
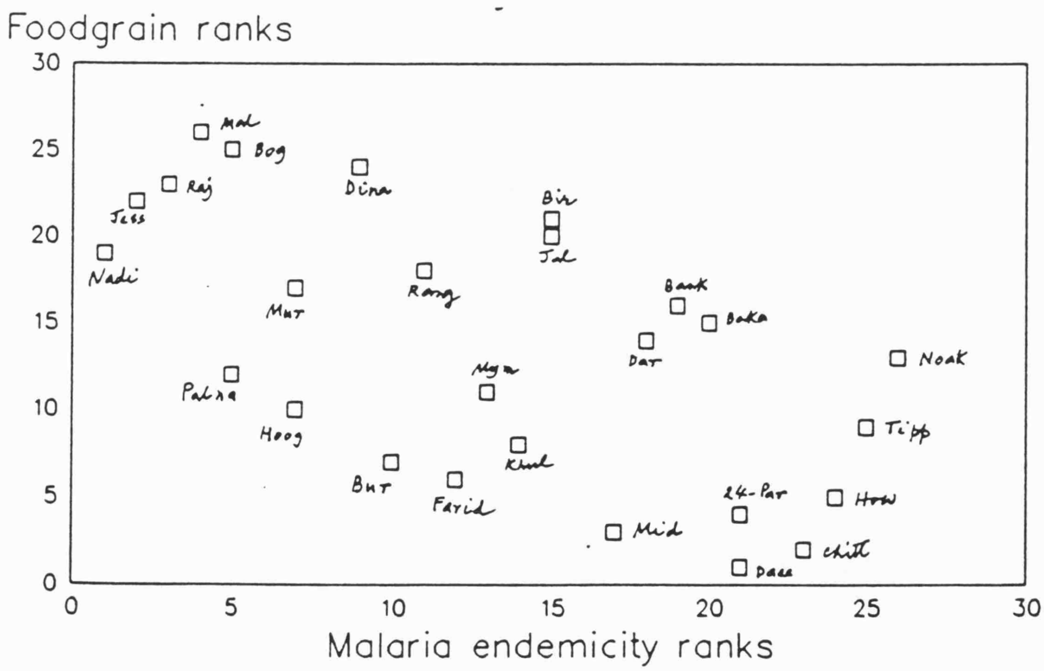


Figure 6.3 (B) Scatter-plot of district-level food despatches (X_6) and malaria endemicity (X_{10})



important port. Finally, Tippera is next to Dacca (which is also an important centre in the eastern Bengal) - and note too that Faridpur (which received the sixth amount of foodgrain despatches) is just across the river Padma from Dacca. It is plausible that the amount of food despatch received by a district was at least partly determined by its locational proximity with the main centres of communications. And the suggestion is that food tended to be despatched via the main foci of communications - namely, Calcutta, Dacca and Chittagang. Conversely, as Figure 6.3 (A) shows, a cluster of districts in the north-western Bengal (e.g. Malda, Bogra, Dinajpur) received relatively little food despatches probably due to poor communications. Relatively large food provision received by the relatively favourably located districts probably in turn caused large inflow of victims, many of whom died there.

There seems to have a geographical basis too for the negative relationship between food despatches and the previous malaria endemicity. The scatter plot in Figure 6.3 (B) suggests that districts which were proximate to main foci of communications (e.g. Calcutta, 24-parganas, Howrah, Tippear, Midnapore, Dacca and Chittagong) were generally less malarious. On the other hand, a cluster of districts in north-western Bengal (e.g. Malda, Bogra, Rajshahi, Nadia) received relatively little amount of food - probably partly due to poor communications, and these areas were normally quite malarious. Since it was the less malarious regions which experienced the largest proportional rises in deaths, this probably contributed to the positive relationship between food relief and mortality rises.

To better understand the role and nature of the famine-related epidemics, it is useful to contrast the mortality experiences of the heaviest and lowest mortality districts (i.e. Groups A and D respectively). We may begin by contrasting the cause-composition of deaths. In Table 6.9 we give cause-specific death rates and the percentage shares of different causes of death during both normal and famine periods for districts in Groups A (very severely affected) and D (slightly affected). It is worth noting that Group A as a whole had a substantially lower average registered death rate in the pre-famine period than did Group D. In Group A malaria does not seem to have been the most dominant killer during normal times, whereas it certainly was in Group D (see Table 6.9). Indeed, Group D districts had a considerably higher level of malarial incidence than did all-Bengal during the baseline years of 1940-41. What emerges is that in the districts which experienced the greatest excess famine mortality, malaria became much more important in the overall distribution of deaths. Conversely in the Group D districts there was a decline in the relative share of malaria deaths. This seems to have resulted from the fact that Group D districts were already very malarious before the famine. All these considerations indicate comparatively smaller proportional increases in famine deaths in districts where death rates were already high, and *vice versa*.

We tested whether inter-district variation in malaria mortality in 1943 and 1944 can be partly explained by differences in normal malaria endemicity; specifically,

Table 6.9 Cause-specific death rates and percentage shares of different causes of death during normal and famine periods in the heaviest and lowest famine mortality districts (Groups A and D)

Cause-specific death rates			
	Group A		
Cause of death	1940-41	1943	1944
Cholera	0.57 (3.52)	3.18 (13.19)	0.85 (0.72)
Smallpox	0.17 (1.01)	0.39 (1.76)	2.13 (18.76)
Malaria	3.89 (23.79)	11.90 (40.19)	12.76 (69.75)
Fever	5.37 (32.86)	8.34 (21.64)	6.68 (14.10)
Dysent/Dia	1.03 (6.27)	2.09 (5.40)	1.47 (1.74)
Respiratory	0.93 (5.69)	0.82 (-0.73)	0.87 (-1.77)
Injuries	0.34 (2.06)	0.40 (0.08)	0.32 (-0.78)
All other	4.06 (24.80)	7.00 (18.47)	4.00 (-2.52)
All causes	16.35 (100.00)	34.08 (100.00)	29.07 (100.00)
	Group D		
Cholera	0.54 (2.41)	2.11 (18.18)	0.66 (1.49)
Smallpox	0.08 (0.38)	0.03 (-0.26)	0.39 (5.77)
Malaria	9.64 (43.19)	12.30 (7.88)	12.78 (35.19)
Fever	4.82 (21.61)	10.28 (65.99)	12.00 (45.96)
Dysent/Dia	0.86 (3.87)	1.51 (3.94)	1.37 (1.65)
Respiratory	2.26 (10.15)	2.75 (1.41)	3.22 (5.29)
Injuries	0.34 (1.52)	0.34 (-0.34)	0.43 (0.27)
All other	3.76 (16.87)	4.39 (0.76)	4.63 (4.39)
All Causes	22.31 (100.00)	33.71 (100.00)	35.48 (100.00)

Notes: 1) All death rates above (expressed per 1000 population) are based on constant denominators being the respective populations according to the 1941 census. For the period 1940-41, figures in the parentheses are the respective percentage shares to total deaths, whereas for both 1943 and 1944 they are the percentage shares to total excess deaths. Excess deaths by cause in 1943 and 1944 were calculated over the respective averages for 1940 and 1941. 2) All data refer to rural areas.
Sources: See Table 6.1.

whether the proportional rise in the malarial death rate was higher in districts with comparatively low pre-famine malaria death rates. The correlation-coefficients between the average malaria death rate during 1938-42 and the percentage rise in malaria deaths in 1943 and 1944 were respectively -0.41 and -0.48 (both being statistically significant at the 5 per cent level). The implication is again that inter-district variation in malaria during the famine was partly determined by variation in the normal level of malaria endemicity. The most heavily hit districts - in terms of famine excess mortality - were those which were usually relatively malaria free.

This issue is probably better illustrated in Figure 6.4 which compares the seasonal patterns of fever and malaria deaths in groups A and D. District-level registration data on the monthly distribution of malaria mortality for the pre-famine period are not available. But Figure 6.4 makes fairly clear the contrast between these two extreme groups of districts in terms of both pre-famine malaria ecology and its implications for the nature of epidemics associated with the famine. It is notable that seasonal patterns of fever mortality in both groups of districts during the pre-famine years (1940-41) exhibited a peak in the later months of the year. But the group A districts appear to have experienced relatively evenly distributed malaria mortality compared with the heavily endemic districts in group D. During the famine years of 1943-44, the seasonal pattern of malaria mortality for group A contains a huge and sharp peak, reflecting the basic nature of an epidemic. Excess deaths from malaria began

Figure 6.4 (A) Monthly deaths from fever and malaria in the heaviest mortality districts (group A) in both pre-famine and famine periods.

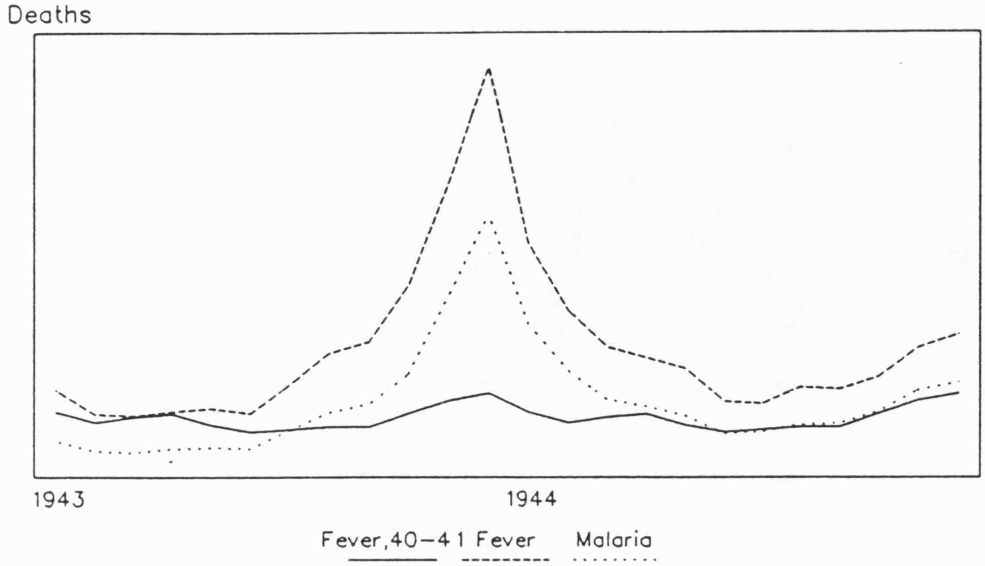
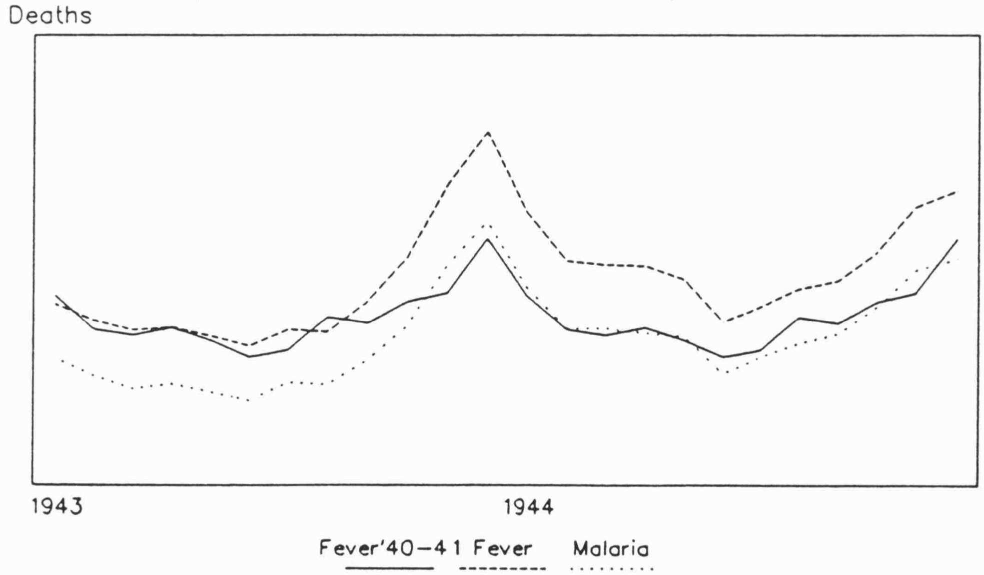


Figure 6.4 (B) Monthly deaths from fever and malaria in the lowest mortality districts (Group D) in both pre-famine and famine periods.



Sources: See Table 6.1.

mounting from around the middle of 1943, and reached a peak in December. In contrast, group D districts experienced a relatively small number of excess malarial deaths during the peak famine period, although the time patterns in the distribution of mortality from both malaria and fever roughly coincided with those for group A. For the districts in group D a comparison of the seasonal distributions of fever mortality in the pre-famine and famine periods also suggests relatively less peakedness, presumably reflecting less severe epidemics (see Figure 6.4 (B). The obvious suggestion is that the scope for a severe epidemic of malaria was far greater in areas where malaria was less endemic.

Indeed a similar regional pattern of mortality variation was also observed during the "most catastrophic malaria epidemic ever recorded" - that in Sri Lanka in 1934-35.[43] Basically the epidemic - which followed "an extraordinary drought" in 1934 - swept devastatingly through the southwestern area of the island which was normally least malarious, experiencing in most years a small post-monsoon surge in mortality. However, the zones which were normally characterised as "hyperendemic" and which usually experienced a big annual surge in malaria mortality, escaped the brunt of this havoc. Now in this context the "gross epidemic mechanism" may have related to the immunity level to malaria. As Harrison succinctly writes, "At the point of climatic convergence culicifacies exploded. If at that point the people

[43] See Harrison (1978), p.203; This epidemic received considerable scientific interest at that time, and was meticulously studied. For the relevant major works see the references cited in Harrison (1978), footnote 8 on p.203.

had been relatively free of malaria for long enough.. , then not only would the fever spread rapidly among non-immunes but it would also take a much higher percentage of lives than normal."[44] While climatic factors (e.g. alteration of drought and flooding patterns) are thought to have contributed to outbreak of the malaria epidemic in Sri Lanka, "a lowering of general physical resistance" among the population debilitated by hard times is also duly recognised.[45] We have seen that the origin of the malaria epidemic in Bengal in 1943-44 was apparently not explainable in terms of climatic vicissitudes. Rather, it seems to have been largely related to the prolonged debilitation and social disruptions in the wake of the famine.[46] But once the epidemic broke out, the regional variation in the outcome of the epidemic may well have been partly influenced by pre-famine immunity levels to malaria (measured rather crudely here in terms of proportion of malarial deaths to total fever deaths during 1940-41).

6.6 REGIONAL VARIATION IN THE FERTILITY EFFECTS

Unfortunately, owing to the non-availability of monthly data on numbers of births by districts, it is not possible to examine variations across districts in the detailed timing of the fertility effects. However, to throw some light on

[44] See Harrison (1978), 205.

[45] See Harrison (1978), p.205; Zurbrigg (1988) has also shown that economic distress played a part in causing malaria epidemics in Punjab.

[46] Zurbrigg has argued that acute nutritional deprivation was "an important, perhaps key, factor underlying the epidemic of malaria mortality during the Bengal famine"; see Zurbrigg (undated), p.73.

variation in the overall fertility effects during the prime famine period, we may examine the percentage declines in the number of registered births in 1944 compared to the annual average numbers for 1940 and 1941. We have already seen that in the province as a whole the greatest reduction in births occurred in 1944.

Looking at the Table 6.7 the correlation coefficient between the percentage rise in deaths during the period July 1943-June 1944, and the percentage decline in births in 1944 across the districts, is found to be 0.43. So, in general, districts which experienced major mortality rises tended to experience the greatest reductions in birth rate. A part of the lack of correspondence between mortality increase and fertility reduction may be due to the somewhat different time spans which have been taken when calculating these measures. Moreover, some degree of non-correspondence between mortality rise and fertility fall may result from inter-district distress migration and the independent effect upon mortality of epidemics. Out-migration of destitutes from a distressed district may have both lowered registered birth and death rates in sending districts and raised registered birth and death rates in receiving districts. Besides, while inter-district variation in excess mortality was explained by variation in the pattern of epidemics, a great part of the fertility reduction, caused presumably by nutritional stress and other social disruptions, occurred before the start of the epidemic phase.[47]

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[47] Interestingly, the correlation coefficient between district-level CBRs during 1940-41 and percentage declines in births in 1944 is positive and also statistically significant (see Table 6.7).

6.7 THE FAMINE OF 1943-44 OUTSIDE OF BENGAL: EVENTS IN ORISSA AND MADRAS

The famine of 1943-44 not only affected Bengal but also some neighbouring provinces (e.g. Orissa, and Bihar). Madras too was affected by a serious famine during 1943-44. Table 6.10 presents the average provincial prices of some staple foodcrops in Bengal, Orissa and Madras. It is clear that in

Table 6.10 Average Annual Harvest Prices of Staple Crops (Rs per maund): Orissa, Madras and Bengal

	Madras		Orissa		Bengal	
Year	Jower	Rice	Wheat	Rice	Rice	Wheat
1938-39	2.69	3.94	3.01	2.56	3.5	3.5
1939-40	2.88	4.31	4.00	3.01	4.4	3.8
1940-41	2.75	4.75	4.25	3.63	5.1	4.1
1941-42	3.25	5.38	5.88	4.13	5.3	5.0
1942-43	5.88	8.38	11.88	6.19	14.0	15.0
1943-44	7.81	9.81	15.00	9.69	15.0	12.6
1944-45	7.25	9.44	11.75	8.25	12.5	11.7
1945-46	7.25	10.01	11.98	8.44	12.6	12.5
1946-47	7.44	10.38	11.98	9.00	12.5	14.0

Notes: 1) The provincial annual harvest prices are the respective medians of district-level average prices. 2) In both Orissa and Bengal the harvest prices of rice are those for winter rice only. 3) Years to which the above data relate end on 30th June.
Sources: Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, Indian Agricultural Statistics, Volume 1, Calcutta: Government Press, various years.

all three provinces prices showed a somewhat rising trend from 1939-40 onwards. In both Orissa and Bengal, food prices in 1943-44 were about four times the 1938-39 levels, while they were about three times higher in Madras. Thus Madras seems to have experienced a somewhat smaller inflationary food price rise. In the post-famine years food prices continued very high in all these provinces (and this seems to have been particularly the case in Madras). Thus war-related inflation and consequent declines in purchasing power were a common influence in causing distress in these provinces.

In fact Orissa was considered to be "surplus" in rice during 1942-43 despite the damaging effects of the 1942 cyclone in its coastal districts. During the period between 1st December 1942 and 31st October 1943 Orissa exported about 10,000 tons of rice. But during the rule of the free trade policy in Bengal prices in Orissa rose steeply, "which had the effect of placing rice beyond the reach of the poor."[48] According to the Government of Orissa, the free trade experiment in Bengal - introduced in March 1943 - "was undoubtedly the greatest factor in causing high prices, hoarding, and unavailability of food grains to consumers in the latter part of 1943".[49] Serious distress, accompanied by some starvation deaths, was reported to have affected four coastal districts, namely Balassore, Cuttack, Puri and Ganjam. And these districts were immediately adjacent to Bengal's border. Considerable out-migration of destitutes from Bengal to these districts is known to have occurred.

The official interpretation of the Madras crisis of 1943-44, however, has tended to blame weather conditions as the precipitating factor.[50] But there is hardly any evidence of

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[48] See Famine Inquiry Commission (1945a), p.4.

[49] Quoted in Knight (1954), p.89.

[50] For example, the annual provincial Administration Report for 1943 stated that "there was a complete failure of the north-east monsoon in 1942 and rain was inadequate and ill-timed for the purpose of cultivation during the south-west monsoon. There was consequently a failure of crops in the Ceded districts resulting in distress which steadily became more acute and widespread"; see Madras in 1943 (Outline of the Administration), Madras:

significant crop failure in 1942-43; indeed data on the area sown under different crops (particularly foodgrains) in 1942-43 do not suggest any decline compared with the preceding years.[51] Thus as has been noted, "in 1942-44 no climatic irregularity occurred [in Madras province] that might be held responsible for a substantial production decline of food grains".[52] However, there does seem to have been a decline in net availability of food grains in 1942-43 - a decline which appears to have been partly related to a reduction in imports.

There has been little research conducted on the matter of food availability in Madras during 1942-44, particularly when compared to the corresponding literature for Bengal. However, there are indications that the experiences in Madras and Bengal during the first half of the 1940s provide us with two contrasting scenarios concerning the responses of government in terms of both handling war-related inflation and disruptions in food supplies and in mitigating the associated distress. In fact, Madras, like Bengal and other regions of India, experienced war-induced price rises from the early 1940s, which created distress among grain-purchasing population. A poor harvest in the non-Tamil parts of the province in the winter of 1942-3 caused localised food shortages. Faced with limited prospects for securing food

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Government Press, 1944, p.13. The Famine Inquiry Commission in its Final Report has stated that in four districts (Bellary, Anantapur, Kurnool Cudddapah) "both the north-east and south-west monsoons of 1942 failed and famine conditions prevailed in large areas of these districts during the greater part of 1942 and 1943"; see Famine Inquiry Commission (1945b), p. 6.

[51] See Government of India, Ministry of Agriculture, Directorate of Economics and Statistics, Indian Agricultural Statistics, Calcutta, Volume 1, various years.

[52] See Guilmoto (1991), p.17.

from outside the province, the Government of Madras started a scheme to move grain between surplus and deficit districts. It first offered contracts to private merchants to do this, and later, dispensing with the merchants, and invested its own necessary capital in transport services and storage go-downs.[53] In view of the exceedingly high prices of food in the open market, food rationing on a card system basis was introduced in Madras in September of 1943. To run this system the Government even introduced measures of "compulsory requisition" of grain from surplus cultivators and millers. All these measures of the Madras government - which essentially amounted to state intervention in the market - contrast sharply with the indifferent and non-interference policies of the government of Bengal. For example, the Famine Inquiry Commission's Report on Bengal stated that "[t]he failure to introduce rationing at any time during 1943 added to the difficulties".[54] In contrast that relatively high level of state intervention in Madras appears to have been somewhat effective in protecting the interests of province's the vulnerable population.

So in Madras the famine was dealt with relatively promptly and effectively. This was particularly true in relation to the state's handling of food distribution and relief operations. For example, 3 million rupees was spent in "financial assistance" in 1943 alone in the affected

[53] See Baker (1984), p.48; in 1943-44 alone the Madras Government put up the capital of Rs. 82.7 million for the purpose of grain distribution.

[54] See Famine Inquiry Commission (1945a), p.64. On the detailed evidence of Bengal's failure in the management and distribution of food, see Knight (1954), pp.92-95, and Greenough (1982), chapter 3.

districts; and total expenditure on relief operations amounted to 21.8 million rupees.[55] In 1944 "nearly 16 million workers [employed in 34 famine camps in Madras] were paid of their wages in grain".[56] Unlike Bengal (where the management of both food supplies and distribution was very inefficient) the Madras administration appears to have been relatively successful in both procuring rice from surplus areas in the northern and southern deltas, and in its distribution throughout the affected areas. Moreover, the existence of reserve stocks of millet in the hands of cultivators in dry areas ("as an insurance against poor harvests in years of deficit rainfall") also helped to ease the food supply situation. Higher prices especially in 1943 induced cultivators to sell part of their reserve stocks - a fact which was of some assistance in the famine-stricken areas.

With this as background, Table 6.11 provides birth and death rates in both Madras and Orissa for the pre-famine, famine and post-famine periods. It shows that the birth rate in 1942 was below normal in both Orissa and Madras. This probably signifies a reduction in conceptions from as early as 1941. Given the increased level of food prices from around 1940 (see Table 6.11) this indicates an early (negative) response of conceptions to economic distress. Birth rates declined markedly in 1944; the decline was slightly greater in Orissa than in Madras. The implication is that in Madras at least the maximum reduction in conceptions occurred in the

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[55] Famine Inquiry Commission (1945b), p.6.

[56] See Annual Report of the Health Commissioner with the Government of India for 1943 and 1944, Delhi: Government Press, 1946, p. 22.

Table 6.11 The crude birth rate (CBR), crude death rate (CDR) and infant mortality rate (IMR) during pre-famine, famine and post-famine periods: Orissa and Madras
(A)

	Madras		Orissa	
Pre-famine	**CBR**	**CDR**	**CBR**	**CDR**
1937-41	35.3	22.5	33.1	28.1
1942	33.8	22.5	31.9	25.7
Famine				
1943	31.2	25.2	31.4	31.0
1944	29.4	25.4	25.7	31.0
Post-famine				
1945	29.4	22.2	27.9	28.4
1946	31.7	18.9	28.0	24.2
1947	33.2	20.4	27.8	28.0
1948	30.8	17.8	27.2	23.3
1949	30.9	16.7	26.6	22.6
1950	29.7	18.9	27.4	20.9

(B) Infant mortality rate (IMR) per 1000 live births during 1937-46

	Average 1937-41	1942	1943	1944	1945	1946
<u>Madras</u>						
Rural	160.6	150.0	160.6	191.8	169.1	147.5
Urban	256.4	252.1	270.6	195.6	170.9	144.5
<u>Orissa</u>						
Rural	209.3	191.3	203.1	209.4	178.4	172.2
Urban	172.5	167.2	187.6	172.6	168.2	144.9

Notes: 1) All CBRs and CDRs are based on the respective official estimated mid-year populations.

Sources: For CDRs and CBRs see <u>Annual Report of the Director General of Health Services</u>, Delhi, various years; for IMRs see <u>Statistical Appendices to Annual Reports of the Public Health Commissioner with the Government of India for the period 1940-1944</u>, Delhi: Government Press, 1947.

prime famine year of 1943.

Mortality in both provinces rose significantly above normal in both 1943 and 1944 (see Table 6.11). Assuming that the main span of famine mortality in both provinces was from May 1943 to April 1944, the Director of Public Health with the Government of India calculated excess deaths over the respective annual averages during 1938-42; the resulting figures are 176,827 and 52,146 respectively for Madras and Orissa.[57] Although no account was taken of death under-registration in producing these estimates, it is clear that excess mortality, though by no means insignificant, was far from comparable to that in the Bengal famine.[58]

The Famine Inquiry Commission stated that "[although there was great distress among the poorer sections the people, the famine did not cause exceptional mortality [in Madras]."[59] In this connection we may note that the information collected in the parish registrars of three affected taluks in Travancore state indicates a 46 per cent rise in deaths during 1943-44 over the figure for 1941-2. Comparison of death rates based on parish figures with those from official registration data shows that the latter figures were about 50 per cent deficient.[60] It is notable in Table 6.11 that in both Orissa and Madras the CDRs, while generally back to their respective

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[57] See ibid., p.2.

[58] Reviewing the relevant literature, Guilmoto suggests that Madras as a whole registered a 20% increase in mortality in 1943-44; p.18; this certainly represents a very small volume of excess mortality compared to the Bengal famine; see Guilmoto (1991).

[59] Famine Inquiry Commission (1945a), p.6.

[60] See Sivaswamy et.al. (1945), pp.81-85 and 110.

baseline levels in 1945, dropped still further in 1946. This conforms with the hypothesis that immediate post-famine death rates tend to be lower than during pre-famine years (partly due to age structural selection effects).[61] On the other hand the data in Table 6.11 do not suggest any post-famine compensatory recovery in birth rates. This may partly have been due to the persistence of high food prices. It could also have partly been be a reflection of a possible deterioration in registration just prior to the independence.

Table 6.11 (B) shows that in Madras, as in Bengal, the urban IMR was considerably higher than that in rural areas, whereas the opposite held true in Orissa. In Madras the IMR rose slightly in 1943 in both rural and urban areas. But in 1944 the IMR rose markedly in rural areas while it declined in the urban sector. However, in Orissa infants seem to have experienced no mortality rise during throughout the famine.

Figure 6.5 portrays the monthly distribution of deaths from the four most important causes in 1943 and 1944. The time pattern of deaths from these causes in Orissa shows a remarkable similarity with that for Bengal. Deaths from different causes showed a rising trend from the middle of 1943; while cholera deaths peaked in October, the fever mortality-peak occurred just one month later (in December). Registered deaths from dysentery and diarrhoea, though peaking in late 1943, were rather persistently high until the middle of 1944; and mortality from smallpox reached a sharp climax in April of 1944. Interestingly, there was in a rising trend in

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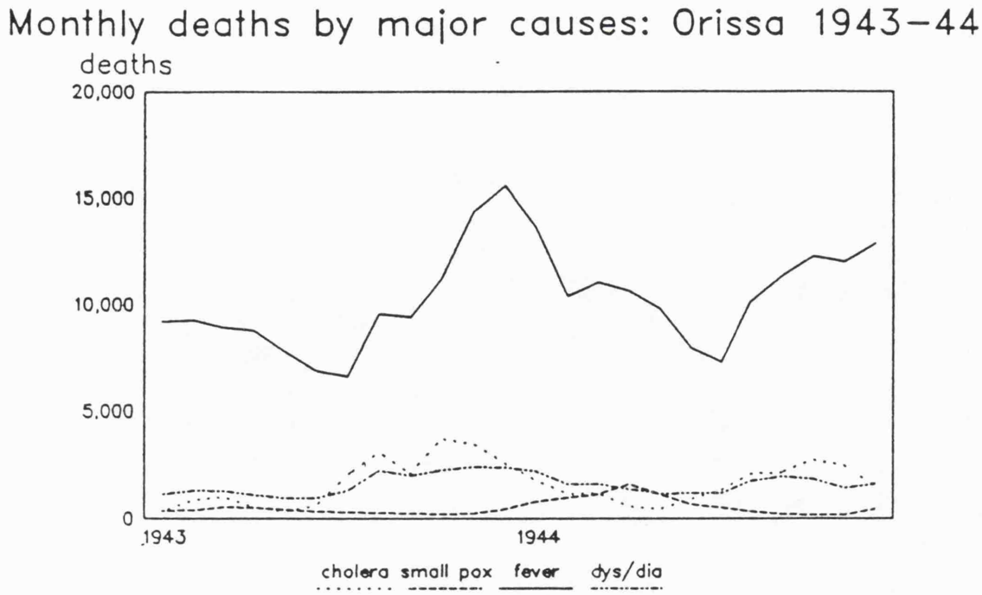
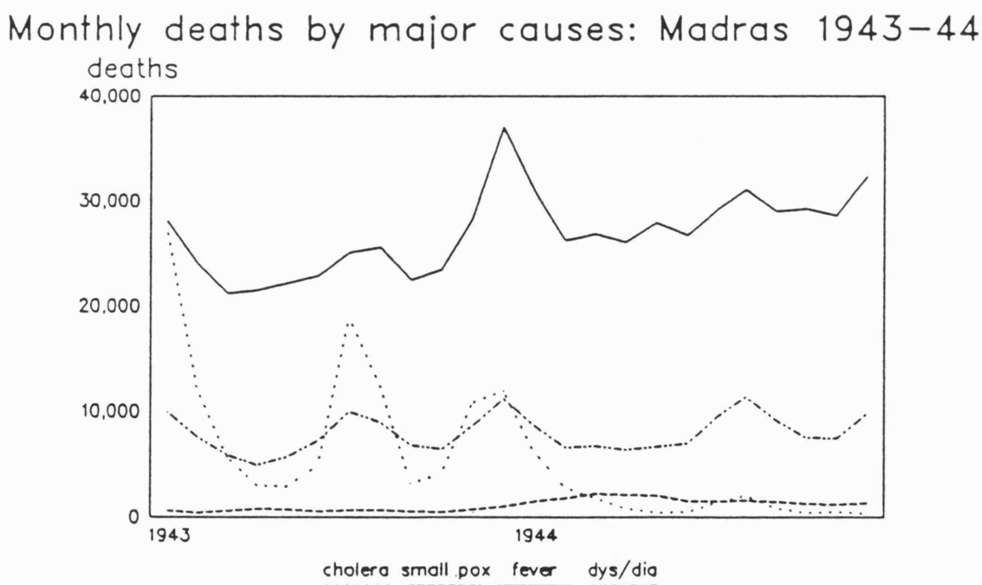
[61] See e.g. Bongaarts and Cain (1982).

Figure 6.5



Sources: See Table 6.11.

Figure 6.6



Sources: See Table 6.11.

mortality from these causes (except smallpox) from the middle of 1944; and peak mortality from cholera, dysentery and diarrhoea occurred about a month before the peak in fever-mortality (in December 1944). All these patterns in Orissa fairly closely resemble to those experienced in Bengal.

One should note that the prime cause of distress in Orissa, as in Bengal, was the enormous rise in food prices. Although Orissa was a surplus province in rice production, "purchases of rice by agents and merchants from Bengal during the free trade period pushed the price almost up to the Bengal level, so that in parts of Orissa, as in Bengal, the poor could not buy enough food".[62] The movement of famine-victims from Bengal towards adjacent parts of Orissa was also of significant magnitude. Thus whereas registered deaths in 1943 in Orissa as a whole increased by 17.9 percent over the quinquennial average, the rise in Balassore district, bordering Bengal, was 40.7 percent. In Balassore alone, 1,105 starvation deaths were recorded; many of these victims were believed to be migrant destitutes from Bengal.[63] The Director of Public Health in Orissa attributed the increased mortality in 1943 to "food shortage, migration within province, and the influx of destitutes from Bengal".[64]

In Madras, as in Orissa and Bengal fever mortality, peaked in December of 1943. However, the overall time patterns of mortality from different causes show quite wide fluctuations (i.e. sharper peaks) and a less steady trend (see

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[62] See Famine Inquiry Commission (1945a), p.144.

[63] Ibid. p. 144.

[64] Ibid, p.144.

Figure 6.6). The largest cholera peak within the famine period occurred about five months before the maximum fever mortality; indeed, "much of the excess mortality in 1943 can be ascribed to [this] severe cholera epidemic".[65]

On the cause-composition of famine mortality the parish records from three affected <u>taluks</u> (sub-divisions of a district) of the Travancore state are probably worth noting. The parish records can be thought to be relatively, if not "thoroughly", reliable "in so far as each priest has to perform religious rites in connection with every death".[66] Table 6.12 gives the breakdown of deaths by major causes as were recorded in the parish registers of the three <u>taluks</u> state for 1943-44. The cause-composition of deaths during the famine bears a rather distinct reflection of acute nutritional deprivation and its adverse health effects. Indeed, there was virtually no famine relief policy in the Travancore state. As Sivaswamy and his associates write, "Policies which were followed by Provincial Governments as Madras, and Bengal in later stages, for distributing relief were hardly followed here [Travancore]".[67]

In Figure 6.7 the proportional rises in deaths by age and sex in both 1943 and 1944 compared with the averages for 1941 and 1942 are plotted separately for rural and urban sectors of Madras and Orissa. Infant deaths by sex were not available. Several points emerge. First, unlike in Bengal, there does not seem to have been any striking difference in rural-urban

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[65] Ibid., p.145.

[66] See Sivaswamy et al. (1945), p.84.

[67] See Ibid., p. IV.

patterns in Orissa and Madras. This may indicate a lesser

Table 6.12 Breakdown of deaths by major causes during the famine: Parish records and survey results, Travancore, 1942-44

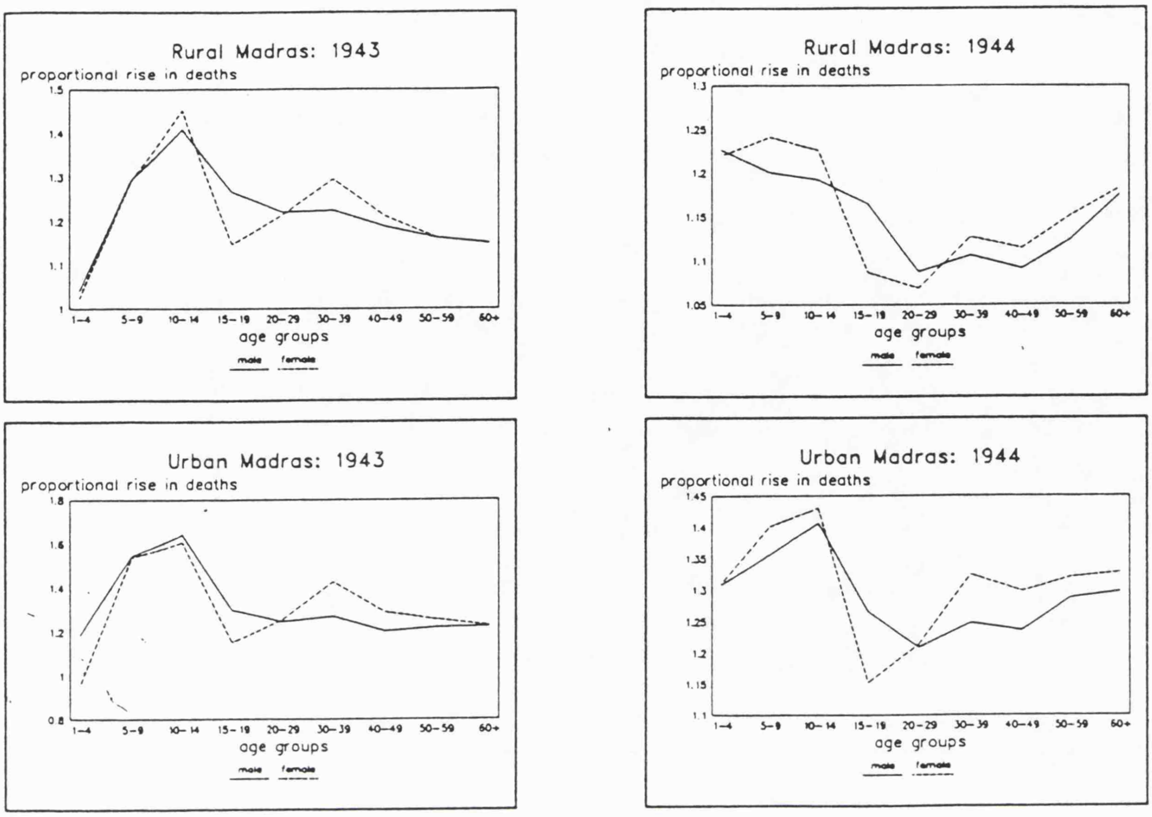
Cause of death	Number of deaths			
	Parish Registers 1943-44		Surveys 1942-44	
Starvation	46	(2.1)	0	
Oedema & Dropsy	597	(26.8)	242	(26.8)
Dysent\Dia	244	(10.9)	96	(10.6)
Other stomach dise.	115	(5.2)	59	(6.5)
Scabies	411	(18.4)	48	(5.3)
Fever	260	(11.7)	211	(23.3)
Consumption	42	(1.9)	56	(6.2)
Other diseases	514	(23.1)	192	(21.2)
Total	2229	(100)	904	(100)

Notes: 1) Surveys were conducted in three villages by the voluntary workers of the Servindia Kerala Relief Centre.
2) Figures in the parentheses are the respective percentage shares to total deaths.
Sources: Sivaswamy et al. (1945), pp.94, 116.

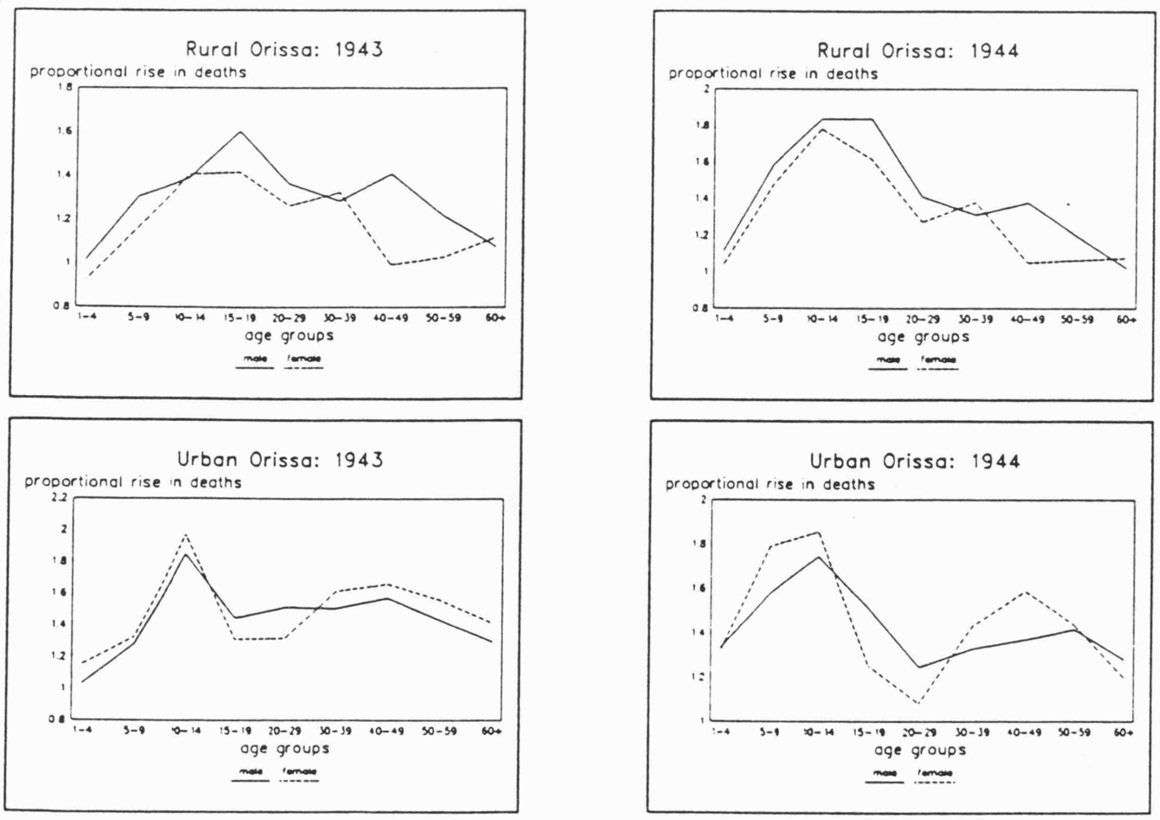
volume of rural-urban distress migration compared to Bengal. This may partly be due to relatively better distribution of relief provisions. In both provinces, older and teenaged children (i.e. those aged 5-9 and 10-14 years) generally appear to have been more vulnerable groups. In rural Orissa, late teenagers (15-19) appear to have been the most vulnerable. Young children (aged 1-4 years) seem to have been less vulnerable compared to most other age groups in 1943. However, in Madras in 1944, young children appear to have been quite vulnerable compared to adults and elderly people. In fact, young adults and middle aged people in Madras generally appear to have experienced a distinct mortality advantage (in terms of proportional rises in mortality); in Orissa the elderly people (60+) showed relatively small rise in

Figure 6.7 Ratios of deaths in famine years to reference years, by age and sex, in rural and urban areas: Madras and Orissa

(A)



(B)



Sources: See Table 6.11.

mortality. So what emerges from Figure 6.7 is that particularly older and early teenaged children generally appear to have experienced relatively adverse mortality, while adults and sometimes even elderly people seem to have experienced a relative mortality advantage. This is broadly consistent with our previous analysis based on the findings from former major Indian famines. The female population aged 15-19 years in Madras and those aged 15-29 years in Orissa appear to have had a distinct mortality advantage compared with males of the same age. Part of the explanation may be the reduction in births and the consequent fall in number of maternity deaths during the famine. Again, since female death rates in these age groups during normal times are higher than for males, the former may have experienced a relative mortality advantage (in terms of proportional rise in deaths during the famine). In urban Orissa, females appear to have experienced larger proportional increase in deaths than males in all age groups except 15-19 and 20-29 years, whereas in the rural sector the increase in male mortality was larger than for females in almost every age. In the Madras famine, males above age 30 generally experienced a relative mortality advantage compared to females.

6.8 CONCLUSIONS

As has been mentioned earlier, spatial variation in the demographic consequences of a famine is a complex issue. Unlike most of the previous Indian famines, drought-related crop failure and consequent loss of employment was not at the root of the distress in 1943-44. While astronomical levels of food prices in the wake of war-induced inflationary pressure and other disruptions (e.g. the cyclone) was the root cause of distress, a fairly high level of market integration was responsible for a relative uniformity in price rises across districts. Thus, in Bengal, no district can claim to have escaped from famine distress, and this seems to contrast with drought-initiated famines in which a part of regional variation in famine intensity often appears to have been related to the regional pattern of weather and crop failure (see Chapter 4 above). The distinction between "affected" and "non-affected" districts - a distinction which we have seen was traditionally made on the basis of several tests - seems to have ceased in the Bengal famine of 1943-44. But, interestingly, there nevertheless appears to have been significant spatial variation in demographic consequences.

The association of price rises and mortality increases in the districts of Bengal seems to have been very weak. But a considerable part of mortality variation can be thought to have been related to pre-existing environmental, ecological, infrastructural conditions, and relief measures and migration. For example the regional variation in malaria ecology appears to have partly shaped the regional pattern of mortality increase. Indeed, malaria endemicity (as measured by the proportionate share of malarial deaths in total fever mortality) has been found to be the most important variable in explaining regional variation in mortality increase - although its overall explanatory power is still rather small. Differences in the cause-composition of deaths between the "heaviest mortality" and lowest mortality" districts also suggests an intervening role for pre-existing conditions related malaria endemicity. The greatest increases in malaria deaths in 1943 and 1944 happened in districts which normally were relatively less affected by malaria. This is consistent with our finding that West Bengal -with a lower overall pre-famine malarial-incidence - registered a higher rise in famine mortality. The experiences of Malda and Dinajpur districts show that the epidemic phase of famine may extend well beyond the famine period itself. And the scale of these late epidemics may be even more severe.

The most appropriate form of relief in the crisis, namely gratuitous food distribution, was almost certainly inadequate, and more importantly, it was late. Indeed, the policy of food distribution only really assumed significance after the outbreak of the epidemic phase. Yet once they occur, epidemics almost by definition, seem irresistible and are likely to take their toll within a short time-span. This probably explains why regional distribution of relief does not seem to have influenced the mortality variation. On the contrary, it may be that the distribution of food relief was partly influenced by the regional pattern of mortality increases.

This said, communications network and locational factors also seem to have contributed to the positive relationship between food relief and mortality increase. In fact, districts in the neighbourhood of Calcutta and few other in the vicinity of naval connections (which mostly lie in the eastern Bengal) generally appear to have received large bulk of foodgrains; and these areas - being generally the least affected by malaria during normal times - appears to have been most affected malaria epidemic. On the other hand, foodgrains probably flowed relatively less in the far-flung districts (in the north-western part of Bengal) with poor communications; and these happen to have normally been heavily malarious, experiencing relatively small rise in malaria mortality. Thus, the suggestion remains that very late start of gratuitous food relief ultimately could not prove successful in mitigating excess mortality, a large part of which resulted within a relatively short span of time from the vigorous outbreaks of some epidemics.[68]

In this connection the experience in Madras presents a somewhat contrasting episode. There relatively prompt and more active state intervention, particularly in the spheres of food collection and distribution, combined with larger relief provision. This probably puts the failure of the Bengal government into greater focus. While a large part of grain imports into the districts of Bengal was ultimately channelled by private traders, the Madras government engaged in a serious competition with the private sector. The lower mortality cost of the Madras famine may partly be ascribed to the government's active interventions during the crisis. This view gains support from the experience of adjoining Travancore state where a much larger mortality increase coincided with a negligible provision of relief. These contrasting episodes

[68] As Bhatia writes, "It had been proved repeatedly in the past that, once a famine got out of hand, even a lavish expenditure on relief later would fail to save life and prevent distress. This was once again demonstrated during the famine of 1943"; see Bhatia (1967), p. 337.

testify to the role that a government's timely and effective intervention (especially in marketing and distribution of food) and provision of relief can play in moderating the scale of overall mortality.[69]

However, while the scale of excess mortality associated with the famine of 1943-44 was only colossal in Bengal, the broad patterns of demographic responses were somewhat similar in all these locations (i.e. Bengal, Orissa and Madras). Fertility reduction appears to have been a common demographic response. The monthly distribution of mortality during the famine shows a somewhat common pattern; epidemics of cholera, malaria and smallpox occurred in succession, although the exact timing of the peaks of mortality from these epidemics were partly mediated by the social disruptions (e.g. population movements) and environmental factors. Evidence about starvation deaths, though relatively small in number, has been reported in each of these locations. Deaths from acute undernutrition and debility also seem to have occurred. Indeed, evidence from these provinces suggests that the course of excess mortality was largely determined by the general course of distress - with its lagged effects on human health, being also partly mediated by environmental and other factors. Some similarity has also been found on the age and sex patterns of mortality increase in these provinces during the famine. The rural-urban contrast in Bengal, which can be seen

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[69] As the Report on Bengal states, "While other Governments in India were admittedly faced with a much less serious situation than the Government of Bengal, their generally successful handling of the food problem, and the spirit in which those problems were approached, and the extent to which public co-operation was secured stand in contrast to the failure in Bengal"; see Famine Inquiry Commission (1945a), p.105.

as an outcome of social crisis (e.g. abandonment of dependents from domestic subsistence and their movement towards towns with the hope of some relief) does not seem to have been prominent in Madras and Orissa. This may well reflect a lesser severity of distress in these two provinces and a relatively better distribution of relief provisions.

CHAPTER 7

THE DEMOGRAPHY OF DROUGHTS AND FOOD CRISES IN CONTEMPORARY INDIA: THE BIHAR FAMINE OF 1966-67 AND THE MAHARASHTRA SCARCITY OF 1972-73

7.1 BACKGROUND

As has already been discussed, occurrence of the famine of 1943-44, after about thirty-five years of absence of major famines, shattered the belief "that famine had became a thing of the past". Ironically, however, this disaster itself is marked as the start of an era in which famine has truly come to be considered as a phenomenon of India's past. Since Independence in 1947 India's vast population has never experienced a major famine comparable to those of the pre-independence period.[1] This development, of course, partly reflects expansion of India's economy in the post-independence period.

Interestingly, however, the absence of major famines in independent India does not appear to be due to improved availability of food. There is rather strong indication that since Independence India's net food availability has remained "remarkably stagnant".[2] Although food production has increased, this has not been translated into rising food availability per capita, because the production gains have been neutralized partly by reduced food imports and partly by increased population growth. Moreover, even the growth of

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[1] Note that Bangladesh has experienced at least one major famine in the recent period (i.e. that of 1974-75).

[2] See Drèze (1990), p.37.

food and agricultural output has been far from uniform across different parts of India. While increases in yields and output, resulting from the so-called "Green Revolution", have largely been confined to the irrigated regions, large unirrigated tracts - covering around two-thirds of the total cropped area - have witnessed "virtual stagnation".[3] Moreover, apart from fast population growth, these regions have also experienced considerable ecological problems (e.g. deforestation, soil erosion and falling water tables).[4] In fact, frequent visitations of drought and crop failures in one part or the other still constitute an important element of India's reality. As Drèze writes about the period since independence, "..localised crop failures (mainly due to drought) have occurred in different parts of the country almost every year".[5] Several of such weather failures and crop losses have shown even "the potential of turning into a major famine".[6] For example, Bihar and large parts of South India suffered from a serious drought in 1951, but this impending subsistence crisis was averted largely by "arranging imports, controlling prices and managing distribution of supplies by the State".[7] Crop failures of local character have usually created conditions for forthcoming food from neighbouring areas at reasonable prices, and hence the "Famine Codes

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[3] See Drèze (1990), p. 37.

[4] Drèze has argued that in all these respects India's unirrigated regions do not seem to have fared better than the African countries; see Drèze (1990), p.37.

[5] See Drèze (1990), p.45.

[6] See Bhatia (1991), p.340.

[7] See Bhatia (1991), p.344.

strategy" (of creating purchasing power and stimulating private trade) appears to have worked rather well. This, of course, does not mean that actual will and determination with which relief has been organised has always been commendable at every state or at every time. Indeed, some obvious failures have occurred such as in Assam in 1974-5.[8]

However, apart from such numerous local crises, India has also experienced the threat of major famine and widespread starvation (at least) on four occasions since independence: in 1966-67, 1972-73, 1979-80, and 1987-88. But none of these crises has developed into large-scale famine (in comparison with the past major Indian famines and contemporary African crises). Like most of the previous Indian famines, these recent crises also have been initiated by almost country-wide drought. Indeed, the crises of 1966-67 and 1972-73 both occurred in the wake of a considerable shortfall in monsoon rains for at least two consecutive years. Of course, all regions did not suffer uniformly from the drought, depending, among others, on the irrigation facilities (i.e. the degree of weather-dependence). Bihar and Maharashtra were the worst affected states respectively during the 1966-67 and 1972-73 crises. Indeed, these two food crises were probably the most important that have occurred in India since 1947. Although neither was a huge disaster on the scale of, say, the Bengal famine of 1943-44 both events have evoked considerable attention and controversy (see below).

Although the drought of 1979-80, unlike the former two,

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[8] See e.g. Prabhakar (1975) and Baishya (1975).

was short-lived, "its intensity and geographical coverage were exceptional".[9] However, large buffer stocks of food grains that India accumulated by that time were used both to prevent excessive rise in food prices and to finance public works programmes. The crisis was also well anticipated with remarkable foresight; and a massive employment programme of the "food-for-work" type was launched. As Drèze remarks, "The country seems to have taken the drought in its stride with remarkable ease".[10] According to some authors, this event has proved that the nexus between major drought and threat of widespread famine, that had dominated India's past, has indeed been broken.[11]

India's progress in famine prevention has also been affirmed by the experience during a severe drought in 1987. The rainfall deficiency during 1987 monsoon was quite substantial in large parts of India,[12] but "the decline in foodgrains production in 1987-88 from the previous year was only of the order of 3.5 per cent".[13] This of course partly reflects "the resilience that Indian agriculture has come to acquire over the years against ravages of drought".[14] Measures taken by government to minimise the drought damage to crops

[9] See Drèze (1990), p.46. There has indeed been a considerable reduction in foodgrain output (e.g. by 30 per cent in north India as a whole, and much more in individual states).

[10] See Drèze (1990), p.48.

[11] See e.g. Bhatia (1991).

[12] Indeed, the monsoon failure of 1987 followed two and, in some cases, even three consecutive low rainfall monsoon periods; see The Drought of 1987: Response and Management, Volume 1, Ministry of Agriculture, Government of India, New Delhi, 1990.

[13] See Bhatia (1991), p.366-367.

[14] See Bhatia (1991), p.367.

are also believed to have been partly responsible for this.[15]

Thus, although India after independence has experienced several serious droughts and food crises, none has caused any major tragedy. A part of the explanation of course lies in the key political, economic and demographic changes that had taken place by the 1960s. However, given India's persistent susceptibility to famine, the relatively effective relief provision also seems to have played a distinct role in the absence of major famines. In this context, the literature on the experiences during the Bihar famine of 1966-67 and Maharashtra drought of 1972-73 has put the issue of the role of relief into shaper focus. Indeed, two pivotal areas of debate have been the success, or otherwise, of famine relief measures and the demographic consequences - particularly for mortality. The Bihar famine (sometimes termed a "near famine") has often been considered as a success story of India's famine prevention efforts - as indeed has the Maharashtra crisis.[16] On the other hand a propos both events

[15] It is worth noting that although the drought of 1987 probably had little impact on the overall mortality level, there seems to have been a considerable reduction in the birth rate in several affected states:

State	CBR			CDR		
	1983-86	1988	1989	1983-86	1988	1989
Gujrat	31.2	28.1	26.5	8.6	9.2	8.8
Rajasthan	33.6	28.4	28.5	9.6	8.7	7.7
Maharashtra	28.0	25.8	24.4	6.8	6.7	6.1

Source: Registrar General, India, Ministry of Home Affairs, Sample Registration Bulletin, December 1987, vol. XXI, No.2, New Delhi, Table 3.

[16] On the Bihar famine Aykroyd (1974) writes that "[f]amine in Bihar was kept at bay.. No exceptional mortality was recorded (p.140)...The scale of relief was immense (p.141)...In a book about the conquest of famine the Bihar emergency of 1967 deserves a prominent and honourable place (p.142)". On the Maharashtra drought, Drèze (1990) writes that "[t]he sufferings occasioned by the Maharashtra drought were, indeed, very much smaller than one might have expected given the almost complete collapse of agricultural incomes... Mortality rose only marginally, if at all.. (pp.68-69)....The effectiveness of relief measures largely explains why this devastating

quite contrary views have also been expressed. For example, reviewing the Bihar episode Drèze has concluded that "[t]here is precious little evidence to support the self-congratulatory statements that have commonly been made about the Bihar famine".[17] Oughton, on the other hand, has criticised both the relief provision and management of food during the Maharashtra drought; she also provides some evidence of mortality increase in 1973.[18] It is true that some of these contrasts may reflect differences in perspective or purpose. But there can be no doubt that the basic gist of the suggested controversy - which clearly extends to mortality - is genuine.

Indeed, Drèze's careful comparative analysis of both the events has raised the issue of the distribution of hardship and, relatedly, the degree to which relief measures were successfully targeted. In case of the Bihar famine he concludes that relief was generally not well directed; the poor suffered most and "there appears to have been a pronounced maldistribution of hardship across areas more or less severely affected by crop failures".[19] Consequently in Bihar, "[s]hort of starvation deaths every possible kind of

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drought caused relatively little damage in terms of excess mortality..(p.99)."

[17] See Drèze (1990), p.59.

[18] The following sentences quoted from Oughton (1982) would make her assessment clear:"Between 1970 and 1973 Maharashtra ..suffered from a series of droughts...which caused considerable distress...The mortality rate in rural Maharashtra rose from 13.0 per thousand in 1970 to 15.6..in 1973 (p.169)..The data [on relief works] suggest that coverage was not very good...There are reports of many relief works being badly run (p.186)..[At the local level the famine was] a failure in the management..of the food system..the government was unable to procure grain, stocks were run down, and by the final drought year the supply coming through the public distribution system ... was reduced to a tickle in relation to the need (p.193)."

[19] Drèze (1990), p.60.

damage occurred to an alarming degree: hunger and severe nutritional deterioration, massive loss of livestock, depletion of assets, and possibly even substantial excess mortality".[20] In contrast to the Bihar famine the food deficit in Maharashtra was better distributed (e.g. between different socio-economic groups), and the famine relief "strategy was eminently successful ... in drawing food into deficit areas through the generation of purchasing power in the right hands at the right time and in the right places ..".[21] And this, as Drèze argues, is the explanation of why "mortality rose little if at all" during the Maharashtra scarcity. In this context our chief purpose is two-fold: to assess whether or not excess deaths actually occurred in Bihar and Maharashtra; and to examine the geographical distribution of mortality compared with various proxy measures of agricultural production failure. The seasonal distribution of deaths and age-sex pattern of mortality have also been examined for the Maharashtra crisis.

To assess the demographic effects of these crises we have adopted a "detrending" approach. That is, we have computed the ratio (times 100) of the registered death (or birth) rate in the main crisis year to that which would have prevailed if the linear (ordinary least squares (OLS)) trend of rates during the previous few years continued. This procedure - which has also been applied to some of the agricultural time series - seems appropriate, particularly in circumstances where there is evidence of a trend in the data during the

[20] Drèze (1990), p.46.

[21] See Drèze (1988), p.101.

period before the crisis. Moreover it has the important advantage that it does not reflect absolute levels of registered vital rates, which we shall see are often seriously flawed.

7.2 THE BIHAR FAMINE OF 1966-67

Bihar is generally considered to be one of the poorest and most backward regions of India. In the mid-1960s only a very small proportion of cultivated area in Bihar was irrigated, and it was prone to drought. Yields were pitifully stagnant, and there was significant State-level foodgrain deficit (about 1.3 million tonnes) in an ordinary year around 1966. "By any account Bihar in the mid-1960s was a highly vulnerable spot".[22] In the late 1960s the state was afflicted by extensive and successive droughts which culminated in the consecutive monsoon failures of 1966 and 1967. While cereal production per capita in Bihar was already on a downward trend, it collapsed drastically in 1966-67. According to one estimate, the cereal production in Bihar for 1966-67 "represents barely one-third of cereal consumption requirements".[23] South Bihar was worst affected; and 1967 was the year of greatest distress. While the food situation became extremely grave, massive imports of wheat from US (under the American PL-480 programme) - by some accounts equivalent to 20 per cent of the total US annual crop - played

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[22] See Drèze (1990), p.48, and also the literature cited.

[23] Ibid., p.49.

a significant part in limiting the disaster.[24]

In order to assess the famine's impact on vital rates we need time series data, both for the main crisis years and the preceding period. The sole source of demographic information for Bihar in the 1960s was the system of vital registration - which, as indicated earlier, was highly deficient. Table 7.1 summarizes the available registration data provided by the Office of the Registrar General of India and the slightly different vital rates used by Drèze. The true crude birth and death rates (CBRs and CDRs) in Bihar around this time were probably about 41 and 21 per thousand population respectively.[25] Thus it is obvious that most births and deaths were not being registered.[26] From Table 7.1 it is also clear that the single most important influence on the registered birth and death rates for the period was the particular choice of denominator which was used in their calculation (i.e. the population taken to be "under registration"). This is most apparent in 1965 when the denominators were suddenly reduced, thus producing a massive upward shift in the published registered vital rates.[27] But

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[24] On the scale of wheat imports see Aykroyd (1974), p.137. For a detailed account of the background situation on this crisis, see, for example, Drèze (1990), especially pp.48-65, and also Famine Relief in Bihar, A Study, Central Institute of Research and Training in Public Co-operation, Delhi, 1969.

[25] See Mari Bhat et al. (1984), pp.128-135.

[26] According to the Registrar General during 1961-71 roughly 79 per cent of births and 76 per cent of deaths in Bihar were not registered; see Office of the Registrar General, India, Evaluation of Birth and Death Registration in India 1961-71, Occasional Paper No.1 of 1980, Ministry of Home Affairs, New Delhi, p.2.

[27] A plausible explanation for this sudden reduction in the size of the denominator is that it was changed from the total population to an estimate of the population residing in registration units which were actually reporting vital events, i.e. defaulting units were abruptly excluded.

Table 7.1 Vital Registration Statistics for Bihar, 1962-69

Year	Registered Births	Population Under Birth Registration (000's)	Registered Deaths	Population Under Death Registration	Crude Birth Rate	Crude Death Rate	Crude Death Rate Cited by by Drèze	Infant Mortality Rate	Infant Mortality Rate Cited by Drèze
1962	429,885	47,577	184,572	47,577	9.0	3.9	-	78	-
1963	465,038	48,412	211,067	48,412	9.6	4.4	-	76	-
1964	495,982	48,599	240,485	48,599	10.2	4.9	-	79	-
1965	522,485	18,336	284,426	17,768	28.5	16.0	-	70	-
1966	497,046	19,457	246,662	19,002	25.5	13.0	11.4	74	74
1967	415,542	14,594	193,355	13,478	28.5	14.3	13.9	72	72
1968	435,002	n.a.	186,627	n.a.	25.0	11.7	10.4	53	51
1969	530,993	n.a.	179,250	n.a.	n.a.	n.a.	-	44	-

Notes:

(i) The crude birth rate (CBR) and crude death rate (CDR) are respectively calculated as registered births and deaths per thousand population under registration.

(ii) The infant mortality rate (IMR) is calculated as registered infant deaths per thousand registered live births.

Sources: Most of the figures are taken from Vital Statistics of India, Ministry of Home Affairs, New Delhi (various years). The figures used by Drèze are taken from Drèze (1990), Appendix 1.1. He gives their sources as: Annual Report on Vital Statistics of Bihar, 1968, Patna: Government of Bihar, and Condensed Annual Vital Statistics Report for the Years 1966 and 1967, Patna: Government of Bihar.

detailed inspection of district level CBRs and CDRs for subsequent years suggests that this problem of apparently arbitrary changes in denominators may have continued to distort annual vital rates (though to a lesser degree). Accordingly we will pursue them no further.[28]

However the infant mortality rates (IMRs) in Table 7.1 are potentially more promising. They too are deficient in level - the IMR in Bihar around 1970 was at least 130 infant deaths per thousand live births.[29] But, since the IMR is calculated as simply the ratio of registered infant deaths to registered live births, it is less likely to be biased by major and sudden numerator/denominator mismatches, such as are clearly evidenced by the CBRs and CDRs. Here our primary concern is with issues of trend rather than level. And in this context the comparative consistency of the registered IMRs in Table 7.1 is also encouraging. That hold out some prospect of being able to compare the registered infant mortality rates for the crisis years with the trend of the pre-famine period. Published annual IMRs are also readily available at the district level.

The frail data base for Bihar (that is Table 7.1) says little about excess deaths during this crisis. With appropriate caution Drèze views 1967 as the year of peak mortality, an inference which he supports by citing elevated

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[28] For example, the number of registered deaths in the district of Santhal Parganas fell from 11,310 in 1966 to 9,207 in 1967 while the registered death rate for the district rose from 14.3 in 1966 to 42.0 in 1967. Despite our reluctance to use such district level CDRs we should record that, nevertheless, taking the ratio of the registered death rate in 1967 to the average of the registered rates for 1965 and 1966 produces a broadly similar picture to that provided by the use of detrended IMRs in Figure 7.5 below.

[29] See Mari Bhat et al. (1984), pp. 40-69.

registered IMRs in that year for the three "severely affected" districts of Gaya, Hazaribagh and Palamau.[30] But as Table 7.1 shows the registered crude death rate in 1965 (for what its worth) was higher than the rate for 1967. And the registered IMR in 1966 was also slightly above that for 1967 - although, by definition, this reflects only the mortality experienced by infants.

Table 7.2 summarizes the data used in our district level analysis. As can be seen, in 1961 only 8 per cent of the state's 46 million people lived in urban areas. Undoubtedly, much of the IMR variation between districts shown for the pre-famine period, 1962-65, reflects differences in the registration coverage of infant deaths compared to live births. Column (iv) gives the main measure used by both the Government of Bihar and Drèze to gauge the collapse of food production at the district level. It shows that for the state as a whole, foodgrain output in the agricultural year 1966-67 (i.e. the period July 1966 to June 1967 inclusive) was only 48 per cent of that of the normal year 1963-64. Dhanbad, Gaya, Hazaribagh, Palamau, and Patna were especially hard hit. Figure 7.1 shows that these districts form a cluster in central Bihar to the south of the Ganga river. Column (v) of Table 7.2 gives a detrended measure of the area under foodcrops in 1966-67; almost certainly this is a less satisfactory measure of agricultural failure than the outturn of crop figures in column (iv). However, we include the area figures because they are based upon one of the few

[30] See Drèze (1990), p.58 and p.101.

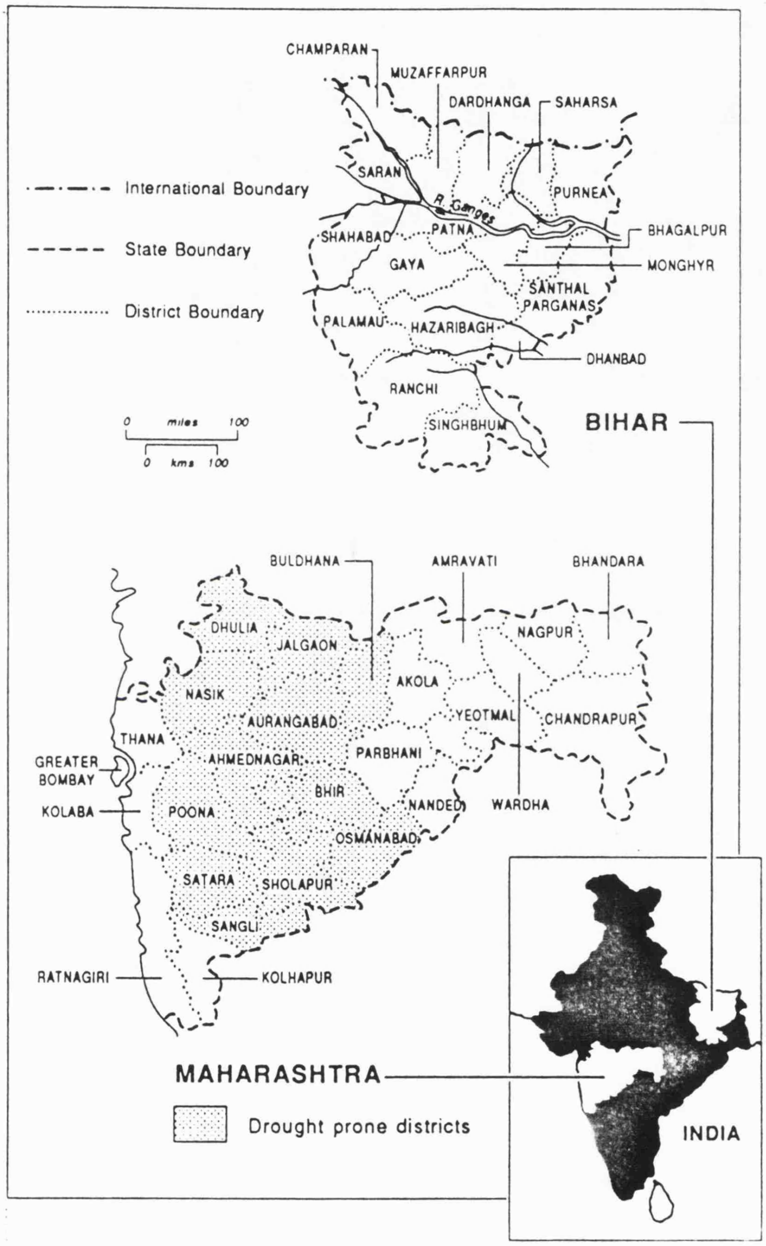
Table 7.2 Socio-economic and Demographic Data for the Districts of Bihar

District	Population 1961 (000's)	Per cent Urban 1961	Average Registered IMR 1962-65	Outturn of crops in 1966-67 as per cent of 'normal'	Area under foodcrops in 1966-67 detrended	Detrended IMRs compared to trend of previous four years	
						1966	1967
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Bhagalpur	1,711	11	67	51	91	75	83
Champaran	3,006	5	76	64	115	117	82
Darbhanga	4,413	4	60	48	95	88	75
Dhanbad	1,159	25	34	24	91	99	125
Gaya	3,648	7	104	20	70	115	128
Hazaribagh	2,396	8	54	27	79	133	114
Monghyr	3,287	11	82	59	83	105	94
Muzaffarpur	4,118	5	75	59	107	101	84
Palamau	1,188	5	85	27	69	115	131
Patna	2,950	20	101	22	69	121	100
Purnea	3,089	6	60	52	97	114	94
Ranchi	2,139	9	63	49	97	115	117
Saharsa	1,724	4	45	69	93	70	78
Santhal Parganas	2,675	5	50	62	95	79	92
Saran	3,585	4	60	75	85	128	105
Shahabad	3,218	7	113	47	97	97	69
Singhbum	2,050	22	39	41	94	71	129
Bihar	46,456	8	76	48	92	105	101

Notes: 1) The IMRs in column (iii) are infant deaths per thousand live births. 2) According to Drèze the figures in column (iv) almost certainly refer to outturn of foodgrains and the 'normal' outturn levels were taken to be those for 1963-64, see Drèze (1990), p.50. 3) The Index in column (v) is a detrended measure of the area under foodcrops in 1966-67 compared with the OLS trend of the data for 1961-62 to 1965-66. 4) The measures in columns (vi) and (vii) are also detrended. Thus the figure of 105 for Bihar in 1966 indicates that the registered IMR was 5 per cent above the OLS linear trend of the previous four years (i.e. 1962-65).

Sources: Columns (i) and (ii) are from Census of India, 1961, Volume IV, Bihar, Part I-A(i), General Report on the Census, p.26 and p.142. Columns (iii), (vi) and (vii) are based on statistics from various issues of Vital Statistics of India cited in Table 7.1. Column (iv) is taken from Drèze (1990), p.50; the original source is Government of Bihar, Bihar Famine Report, 1966-67, Secretariat Press, Patna, 1973. Column (v) is based on data from Indian Agricultural Statistics, Ministry of Agriculture, New Delhi, various years.

Figure 7.1 Famine Locations



agricultural statistical indices for Bihar which is available for a period of several years prior to the famine, hence can be detrended. Finally, columns (vi) and (vii) provide detrended measures of infant mortality in 1966 and 1967 compared with the trends of the immediately preceding years.

It is apparent from what we have already said that the statistical data available to study this famine do not justify detailed analysis. Nevertheless Table 7.3 presents the correlation coefficients between the various measures in Table 7.2. It is notable that especially in 1967 there is a strong

Table 7.3 Matrix of Zero-order Correlations, Bihar

	Outturn of crops 1966-67 as % of normal	Area under foodcrops 1966-67 detrended	Detrended IMR 1966	Detrended IMR 1967
IMR 1962-65	-0.25	-0.32	0.38	-0.17
Outturn of crops 1966-67 as % of normal		0.64*	-0.28	-0.62*
Area under foodcrops 1966-67 detrended			-0.33	-0.55
Detrended IMR 1966				0.32

* significant at one per cent level.
Note: For the data used see Table 7.2.

implication that mortality increased most in those districts which experienced the greatest reductions in crop outturn and acreage. The respective correlation coefficients are -0.62 and -0.55. The districts of Dhanbad, Gaya, Hazaribagh, Palamau and Singhbhum (the latter also in South Bihar) all experienced lower-than-average infant mortality compared to trend. In contrast the districts of northern Bihar escaped comparatively lightly in terms of agricultural failure and most of them experienced improved infant mortality relative to trend. Indeed, 38 per cent of the variance in detrended infant mortality in 1967 can be accounted for by variation in the outturn of foodcrops.

To sum up: Table 7.1 provides little evidence of major excess mortality during the Bihar famine - although it does not preclude it. On the other hand, Tables 7.2 and 7.3 provide support for Drèze's distributional thesis - namely that relief measures were not well targeted on those districts which were most affected by crop failures. Certainly those districts which experienced dramatic collapses in foodcrop outturn also tended to experience raised infant mortality in 1967.

7.3 THE MAHARASHTRA DROUGHT OF 1972-73

By many criteria - including the comparative maturity of its statistical base - Maharashtra (large part of which was included in the former Bombay Presidency under British administration) is a relatively developed state. But during the early 1970s it suffered three successive years of drought which culminated in the disastrous failure of the monsoon rains of 1972 and the associated calamitous agricultural year of 1972-73 - when cereal production fell to under half its 1967-68 level. At the time of the beginning of drought of 1970-73, Maharashtra was facing an agricultural decline as a result of stagnant area under cultivation, stagnant yields and increasing population pressure. As Drèze writes, "By any criterion, the severity of agricultural decline in Maharashtra before the early 1970s, and the extent of crop failures during the drought, dwarf the food crises which led to dramatic famines in the Sahel over the same period".[31] The crisis however was eventually broken by favourable monsoon rains during the second half of 1973.[32]

Two independent time series of vital rates are available for this crisis. First there are annual CBRs and CDRs from the ordinary system of vital registration (VR); second there are rates produced by the then newly instigated SRS. During the late 1960s and early 1970s the SRS was still in its formative stages and undoubtedly experienced some changes and disruptions. Figure 7.2 compares the VR and SRS birth and death rates for Maharashtra for the relevant period. Because SRS rates for the whole state (i.e. rural and urban areas combined) are unavailable for 1968 and 1969, those shown for these two years are simply the published rural rates adjusted downwards slightly to allow for the lack of urban rates. But the SRS rates shown for 1970 and subsequent years are the final official all-state figures produced by the Registrar General.[33]

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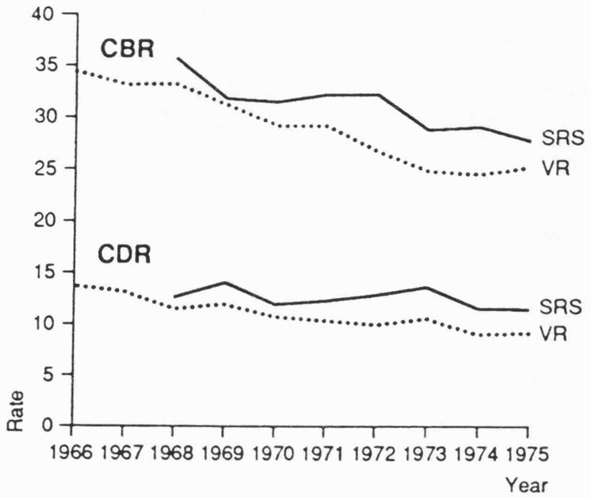
[31] Drèze (1990), p.68.

[32] For detailed background information on this crisis see, for example, Drèze (1990), especially pp. 65-97, Oughton (1982), and Subramanian (1975).

[33] The SRS rates for years 1970-75 inclusive in Figure 7.2 are taken from Mari Bhat et al. (1984), p.70 and p.82. The rates for earlier years are derived from Office of the Registrar General, Sample Registration Bulletin, Volume VIII, No.1, April 1974. During 1970-72 inclusive the average SRS death rate for the state as a whole 0.905 of the published rural rate; accordingly this figure was used to obtain "all state" CDRs for 1968 and 1969 from the published rural figures. The corresponding figure

Figure 7.2 Crude Birth and Death Rates for Maharashtra, VR (1966-75) and SRS (1968-85)



Several important points emerge from Figure 7.2. There is considerable agreement between the CBR and CDR trends indicated by both the SRS and the vital registration system. Evidently vital registration coverage in Maharashtra was quite good; for the years 1970-75 inclusive the average VR crude birth and death rates are respectively 87 and 81 per cent of the averages of the corresponding SRS rates. Indeed, in view of (i) the longer time span for which the VR figures are available (ii) the lack of SRS urban coverage in both 1968 and 1969, and (iii) the various other disruptions which the SRS undoubtedly suffered (especially in 1973 and 1974)[34] it may well be prudent to give greater weights to the trends implied by the vital registration statistics.

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used for births was 0.967. The VR rates in Figure 7.2 are taken from various issues of Vital Statistics of India cited in Table 7.1.

[34] See Mari Bhat et al. (1984), especially p.33.

Figure 7.2 suggests two key demographic responses to the Maharashtra scarcity. First, both data sources indicate that the birth rate dropped during the crisis. The SRS implies that the decline occurred in 1973, while the vital registration system - in our view more plausibly - suggests quite a drop also in 1972. Given the nine months of gestation, the implication is that some reduction in the level of conceptions took place in 1972 and perhaps even 1971. This conforms to our finding in the context of the past major Indian famines, namely, that the level of conceptions in a population experiencing famine tends to decline at the early stage (i.e. the starvation phase) when mortality is often hardly above its normal level.

Secondly, Figure 7.2 contains fairly clear evidence of excess mortality, particularly in 1973. A few simple calculations can illustrate its rough range of magnitude. A minimum estimate is obtained if we simply compare the SRS death rate of 13.6 in 1973 with the average CDR of 12.2 recorded for the adjacent years of 1972 and 1974; in a population of just over 50 million in 1971 this would imply about 70,000 excess deaths (i.e. 70,577 = (13.6 - 12.2)x 50,412). On the other hand a more sophisticated treatment is possible, using the VR data (with an adjustment for under-registration) and taking into account (i) the pre-crisis trend in the CDR, (ii) the growth of population since the census in 1971. On the basis of the OLS trend in the registered death rates for 1966-71 inclusive the death rates in 1972 and 1973 should have been 9.5 and 8.8 respectively; in fact the registered rates were 9.9 and 10.5. If the VR crude death rate was only 81 per cent of the SRS rate then a minimal correction factor for VR death under-reporting is 1.23 (i.e. 1/0.81). Assuming that Maharashtra's population grew at the average annual rate for the 1971-81 decade of 2.41 per cent, by early 1972 the state's population would have been 51,627,000. Thus a rough estimate is about 133,352 excess deaths (133,352 = (51,627 x ((9.9-9.5) + (10.5-8.8)) X 1.23). While the approximate nature of this figure must be emphasized, this figure may actually represent a significant achievement in "damage limitation" in such a large population experiencing a severe and prolonged crisis. But whatever the true figure, there can be little doubt that there was excess mortality associated with the Maharashtra drought.

Table 7.4 presents percentage shares of major causes of deaths in both pre-famine and famine years. As can be seen

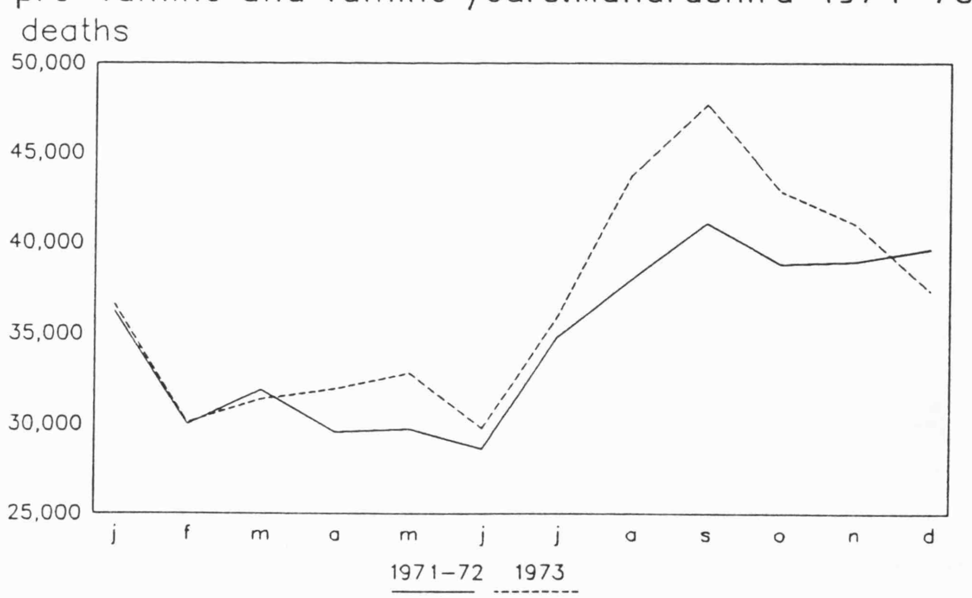
Table 7.4 Percentage shares of different causes of deaths, Maharashtra 1971-73

Cause of death	**% shares to total deaths 1971-72**	**% shares to total excess deaths, 1973**
Cholera	0.04	0.90
Smallpox	0.01	-0.04
Dysent/dia	4.20	13.60
Respiratory	15.10	9.80
Fever	17.46	20.60
Accident/Inj	3.70	-0.01
All Other	59.50	55.00
	100.00	100.00

Note: The excess deaths by cause in 1973 have been calculated over the respective average numbers of deaths in 1971-72.
Sources: See Table 7.1.

there has been an increased importance of cholera, dysentery/diarrhoea and fevers in accounting for the excess deaths in 1973. This is in broad conformity with our findings on India's earlier famines. While dysentery/diarrhoea has increased most, respiratory diseases recorded a decline in its share of excess deaths from pre-famine the level. Although there has been an increase in fever deaths, malaria probably played not a very significant role in the Maharashtra crisis. However, as Figure 7.3 shows, the monthly distribution of famine mortality appears very similar to what has often been found during the earlier Indian famines: relatively moderate excess deaths during the hottest months prior to monsoon, and the peak famine mortality after the resumption of monsoon (i.e. during August-October). And this timing of peak mortality (in September 1973) exactly coincides with the

Figure 7.3 Monthly distribution of registered deaths in pre-famine and famine years: Maharashtra 1971-73

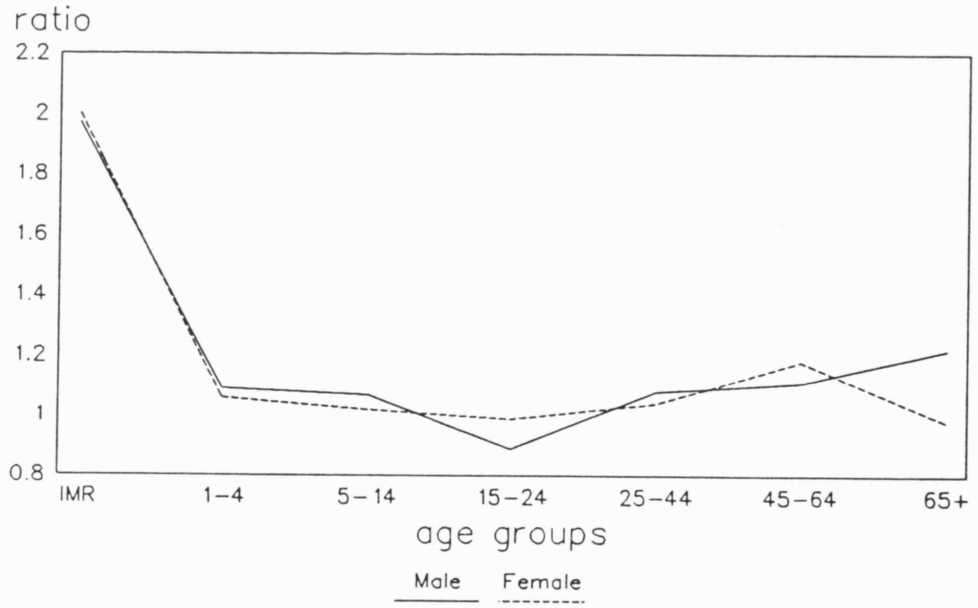


Sources: See Vital Statistics of India cited in Table 7.1.

normal annual peak mortality, reflecting the influence of usual seasonal and environmental factors. Unfortunately, the monthly data on cause-specific deaths for 1973 are not available. From the experiences of the earlier famines, it seems probable that much of the excess deaths in the pre-monsoon months was due to cholera while dysentery/diarrhoea deaths tended to peak after the resumption of monsoon.

Figure 7.4 presents the age-sex pattern of proportional mortality increase in 1973 (from the average in 1971-72). It shows that infants of both sexes experienced a significant increase in mortality. While young children and elderly people appear to have experienced a very small elevation of

Figure 7.4 Ratios of registered deaths in 1973 to those in 1971–72 by age and sex: Maharashtra



Sources: Based on Vital Statistics of India cited in Table 7.1.

mortality, the prime adult age groups recorded a mortality improvement. Interestingly, these results are consistent with those found for the historical famines of lesser mortality (in Chapter 3). This confirms our view that when overall excess mortality associated with a famine is very less or even negligible, the greatest vulnerability to nutritional stress of infants, young children and probably elderly (who are the most vulnerable groups even during normal times) becomes apparent. In other words, in the Indian context raised mortality of infants, young children and elderly people appears to be a good index of widespread nutritional stress, even when it is not followed by a major mortality crisis. Highest mortality increase for infants during the Maharashtra crisis reflects partly the adverse health effects on infants of malnutrition of pregnant mothers. This finding may also partly reflect the fact that relatively large number women were on relief works, and many must have been mothers of new-born children, who could not give adequate care to their infants. That the relief policy during the crisis provided substantial female employment, thus protecting food entitlement of female population in a direct manner, has often been commended.[35] In any case infants, young children and the elderly - who are the most vulnerable groups - do not seem to have received a special protection within the family during the crisis. Furthermore overall female population seems to have experienced a slightly higher proportional increase in

[35] See e.g. Drèze (1990) and Agarwal (1990). In a survey of a particular *taluka* during the 1972-73 drought, female labourers were found to be almost as numerous as male labourers on relief works; see Kulkarni (1974).

mortality than for the males.[36] This has also been noticed during the Bombay famine of 1911-12 which involved very less excess mortality. Thus, a relative female advantage in mortality increase (in proportional terms) that has been found in some major historical famines does not show up during lesser mortality crises.

To gain an understanding of the geographical distribution of crisis mortality requires some background information. In this context Table 7.5 gives basic data for Maharashtra's 26 districts. The state's relative advancement is reflected in the fact that in 1971 nearly one third of the entire population lived in urban areas; in addition to Greater Bombay - which is entirely urban - the districts of thana (which is adjacent to Bombay), and Poona and Nagpur (which both contain major cities with these names) were all fairly urbanised. Table 7.5 also gives the average vital registration CBRs and CDRs for the period immediately preceding the main crisis year of 1973 (as mentioned earlier, SRS does not provide district level vital rates). These birth and death rates are strongly and positively correlated; in other words, districts with high registered CBRs also tended to have high CDR.[37] While some of this association may have reflected variation in the level of registration coverage, it was also probably to a considerable extent real.

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[36] The ratio of total registered deaths (all ages) in 1973 to those in 1971-72 was respectively 1.07 and 1.08 for males and females.

[37] The correlation coefficient between columns (iii) and (iv) in Table 7.5 is 0.93. Note that in what follows we chiefly address the main year for excess mortality i.e. 1973. However, in passing it is worth noting that excess mortality in 1972 and 1973 (compared with the OLS trend for 1966-71) across districts is also strongly and positively correlated (r=0.77).

Table 7.5 Demographic Data for the Districts of Maharashtra

District	Population 1971 (000's) (i)	Per cent Urban 1971 (ii)	Average Reg.CBR 1967-72 (iii)	Average Reg.CDR 1967-72 (iv)
Ahmednagar	2,269	11	29.8	10.7
Akola	1,501	23	34.4	12.3
Amravati	1,541	28	38.4	13.2
Aurangabad	1,971	17	25.0	9.0
Bhandara	1,586	11	35.5	14.7
Bhir	1,286	12	22.9	8.0
Buldana	1,263	18	36.1	14.6
Chandrapur	1,640	10	37.8	14.8
Dhulia	1,662	17	34.8	14.5
Greater Bombay	5,970	100	29.4	10.2
Jalgaon	2,123	24	35.0	14.2
Kolaba	1,263	12	25.5	10.4
Kolhapur	2,048	22	29.4	9.7
Nagpur	1,943	54	34.1	12.3
Nanded	1,398	17	23.4	8.3
Nasik	2,369	29	32.1	12.4
Osmanabad	1,897	13	27.0	9.1
Parbhani	1,507	16	23.6	8.9
Poona	3,178	43	30.8	10.4
Ratnagiri	1,991	8	24.2	10.6
Sangli	1,540	19	26.7	9.2
Satara	1,727	14	30.4	11.0
Sholapur	2,254	28	31.3	11.0
Thana	2,282	36	25.3	7.9
Wardha	780	24	38.9	14.9
Yeotmal	1,424	14	41.0	15.6
Maharashtra	50,412	31	30.5	11.2

Sources: The 1971 census data in columns (i) and (ii) are taken from Census of India, 1971 *Maharashtra, General Population Tables, Part II-A*, Series 11, p. 37; the registration figures in columns (iii) and (iv) are from various issues of *Vital Statistics of India* cited in Table 7.1.

This brings us to a brief consideration of the state's agricultural ecology. Following the classification provided by Oughton,[38] Figure 7.1 shows that in broad terms Maharashtra's districts fall into three main rainfall zones. First there are the relatively developed western coastal districts in which precipitation tends to be both assured and high. In addition to Greater Bombay and Thana, perhaps commensurate with the relative development of this region, birth and death rates in these districts were lower than the figures for the state as a whole. The second broad zone - located mostly behind the coastal mountains (Western Ghats) which run north to south - is an area of marked rainshadow. Here precipitation tends to be both scant and unreliable. This drought prone zone comprises parts of Ahmednagar, Aurangabad. Bhir, Buldana, Dhulia, Jalgaon, Nasik, Osmanabad, Poona, Sangli, Satara and Sholapur districts. Finally, as one moves still further east, so normal levels of rainfall tend to increase and become much more reliable. Consequently the third broad agricultural zone comprises the eastern districts of Akola, Amravati, Bhandara, Chandrapur, Nagpur, Nanded, Parbhani, Wardha and Yeotmal; here precipitation is comparatively assured. Table 7.5 shows that with the exceptions of Nanded and Parbhani districts registered birth and death rates throughout this eastern zone were relatively high.[39]

In the early 1970s only about 9 per cent of Maharashtra's

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[38] See Oughton (1982).

[39] For more information on patterns of agricultural production in Maharashtra see Oughton (1982), especially pp.175-179.

total gross cropped area was irrigated. Consequently, these three broad rainfall zones played a key role in determining patterns of agriculture. In the high rainfall coastal zone patterns of cultivation were relatively diverse and included significant amounts of wet rice farming. But in the drought prone zone the predominant cultivation of coarse foodgrains such as jower (sorghum) and bajra (millet) depended almost entirely upon the lottery of the monsoon. Finally, in the eastern zone with relatively assured rainfall, cereal production was also comparatively high and, in addition, significant amounts of cotton are grown. Furthermore this eastern zone contained the two districts (Bhandara and Chandrapur) with the highest proportions of irrigated area in the state at the time.[40]

With this as background, Table 7.6 gives key data for the districts and state, with particular reference to the main period of crisis (i,e. 1972-73). Districts have been grouped by zone; and within zones we have separated out those districts with higher levels of urbanization, while the remainder have been ranked according to a rough index of famine provision in 1973. The measures shown in columns (i) and (ii) are those used by Drèze; they are respectively per capita cereal production in 1972-73 and cereal production in 1972-73 expressed as a percentage of output in 1967-68. Column (iii) gives a detrended measure of crop failure in 1972-73 derived directly from Drèze's data; it is cereal production in the agricultural year 1972-73 compared to

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[40] For more information on patterns of agricultural production in Maharashtra see Oughton (1982), pp.175-179.

Table 7.6 District Level Indices of Agriculture, Relief Provision, Fertility and Mortality, Maharashtra, 1972-73, by Zone

	Cereal production per capita 1972-73	Cereal production in 1972-73 as per cent of 1967-68	Cereal production in 1972-73 detrended	Per cent of population on relief Jan-Sept 1973	Detrended vital rates in 1973 compared to trend of 1967-72 CBR	CDR	IMR
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Coastal zone							
Greater Bombay	n.a.	31	69	n.a.	112	112	101
Thana	46	42	40	2.4	113	98	109
Kolhapur	53	65	54	3.5	94	92	101
Kolaba	131	67	82	0.5	93	92	104
Ratnagiri	85	86	77	0.2	95	100	95
Unweighted mean	79	58	64	1.7	101	99	102
Drought prone zone							
Poona*	38	43	74	6.4	100	109	108
Bhir*	27	17	32	19.8	78	105	95
Osmanabad*	61	45	129	18.1	79	112	98
Sholapur*	27	18	46	15.8	82	109	119
Ahmednagar*	47	33	67	14.7	84	94	118
Aurangabad*	31	20	57	14.5	81	112	117
Sangli*	20	18	22	12.7	92	97	111
Nasik*	32	26	44	9.3	94	110	118
Dhulia*	54	49	58	6.0	89	122	124
Satara*	45	41	44	5.9	91	98	104
Buldana	86	63	95	4.8	83	132	129
Jalgaon	72	70	152	2.8	88	121	112
Unweighted mean	45	37	68	10.9	87	110	116
Eastern assured zone							
Nagpur	49	67	108	1.9	116	131	114
Parbhani	66	41	216	7.4	90	139	165
Nanded	51	29	181	6.0	81	132	130
Yeotmal	86	85	98	3.3	85	122	144
Akola	64	61	91	2.6	89	134	156
Chandrapur	118	71	65	2.2	87	117	121
Amravati	62	79	161	1.9	89	134	149
Wardha	80	68	128	1.5	83	121	165
Bhandara	92	58	43	1.0	92	99	112
Unweighted mean	74	62	121	3.1	90	125	129
TOTAL MAHARASHTRA STATE:	51	47	71	6.1	96	115	116

Notes: (i) The districts marked with an asterisk were designated the ten "most acutely affected" districts by Subramanian, with the implication that this reflected the official assessment, see Subramanian (1975). (ii) The detrended cereal production measures in column (iii) have been calculated relative to the trend for years 1967-68 to 1971-72.

Sources: Columns (i), (ii) and (iii) are taken or derived from Drèze (1990), p.70. Column (iv) is based on district labour attendance statistics in Subramanian (1975), pp.576-580. Columns (v), (vi) and (vii) are based on statistics from various issues of Vital Statistics of India cited in Table 7.1.

expected production given the linear trend of the previous four years. Column (iv) gives average daily labour attendance on relief works during the main period of relief provision (January-September 1973) expressed as a per cent of the 1971 district census population totals. It is this index which we have used to rank districts according to the provision of famine relief.[41] Finally, columns (v), (vi) and (vii) present detrended registration based birth, death and infant mortality measures for 1973 relative to the linear trend of the period 1967-72.

The state level statistics in Table 7.6 underscore the gravity of the situation that was faced. Even in good agricultural years Maharashtra was a cereal deficit state. But in 1972-73 per capita cereal production declined to barely 51 kilograms per person - only 47 per cent of the level of 1967-68, and only 71 per cent of what might have been expected even on the basis of the declining trend of previous four years. An average of just over six per cent of the state's entire population were attending scarcity relief labour works during the period January- September 1973 (although the resumption of monsoon rains meant that this relief provision was sharply curtailed by October). The registered CBR in Maharashtra in 1973 was 4 per cent lower than might have been expected, while the death rate was 15 per cent above the trend of the previous years.

Table 7.6 shows that the coastal zone was comparatively protected from the crisis. Although cereal production in

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[41] The great bulk of relief provided in Maharashtra was through the programme of relief works.

1972-73 was much lower than might have been expected, per capita cereal production levels remained surprisingly high - particularly in view of the relatively low profile of agriculture in the economy of this zone. There was some limited provision of relief in Thana and Kolhapur districts. But only in Greater Bombay was the registered death rate above trend. The unweighted mean figures for the coastal zone as a whole imply that fertility and mortality were largely unaffected.

Turning to the districts which lie at least partly in the drought prone zone, a more complicated picture emerges. Cereal production per capita across these districts in 1972-73 was barely 435 kilograms - only 37 per cent of the level of 1967-68, and well below trend. Moreover, all of what were termed the "most acutely affected" districts were located in this zone. Lobour relief provision during January-September 1973 averaged aver ten per cent of the population. And in Bhir and Osmanabad districts vert nearly one person in five was recorded as receiving such relief. Perhaps not surprisingly, the drought prone zone also experienced the sharpest decline in CBR in 1973; again Bhir and Osmanabad experiencing the most marked reductions (see Table 7.6).

However, compared with trend, mortality in the drought prone zone seems to have been less severely affected than fertility. Thus the unweighted means in Table 6. indicate that the death rate was 10 per cent above trend while the birth rate was 13 per cent below trend. The infant death rate appears to have generally recorded larger proportionate rise above trend than did the overall death rate. This may partly reflect the faster rate of decline in infant mortality than overall death rate during pre-famine period. Table 7.6 also shows that in 1973 death rates were higher than expected in nine of the twelve districts in the zone. But in only three - a northern cluster consisting of Buldana, Dhulia and Jalgaon - was the increase on trend higher than the all-state figure of 15 per cent. It is also noteworthy that according to most of the agricultural indices shown, these three districts escaped relatively lightly during the drought; for example, they each experienced per capita cereal production levels above the state average (very much above in the cases of Jalgaon and Buldana).[42] Indeed, within the drought prone zone there is a strong indication in Table 7.6 that mortality rose in those districts where cereal production in 1972-73 was greatest relative to trend.

This last point is strengthened when we consider events in the eastern zone. Throughout this region cereal production was well below the levels of 1967-68. It is quite clear that 1972-73 was a bad agricultural year in the east. But per capita production figures were generally high - especially if the predominantly urban constitution of Nagpur district is taken into account. And, compared with trend, cereal production in 1972-73 in most of the districts of the eastern zone was higher than expected.[43] In general, relief provision

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[42] In our view the classification of Buldana with the other districts of the drought prone zone is particularly debatable, because for very many years it was closely associated Akola, Amravati and Yeotmal districts. Together these four districts constituted the former province of Berar.

[43] However, of districts in the eastern zone only Amravati actually experienced an increase in the absolute volume of cereal production between 1971-72 and 1972-73. (the only other district in Maharashtra to experience such an increase being Jalgaon). Thus, for example, the very high detrended measure for Parbhani in Table 7.6 should not obscure the fact that there

in this zone was low, except for the two adjacent southwestern districts of Parbhani and Nanded (which we have already had cause to distinguish). And there is clear evidence that birth rates were somewhat reduced throughout most of this zone in 1973. However, the most interesting feature of Table 7.6 is the strong indication that it was the districts of the eastern zone which registered the greatest death rate rises. Only Bhandara was spared a major increase in deaths compared to trend. And across the zone as a whole the CDR was 25 per cent higher than expected. So, somewhat paradoxically, it was in many ways the favoured eastern agricultural zone which experienced the greatest rise in death rates in 1973.

Table 7.7 presents the correlation coefficients between the various measures in Table 7.6. Not surprisingly the various cereal production indices are positively related with each other. There is also clear support for Drèze's contention that relief measures were comparatively well targeted. For example, greater proportions of the population received work relief in those districts where per capita cereal production levels were least and where the birth rate reduction (itself a powerful measure of agricultural stress) was greatest.

Finally, Table 7.7 provides support for the suggestion that, relative to their respective trends, death rates rose most in those districts where cereal production was highest. The full explanation for this relationship is almost certainly complex; it might involve for example, a district level

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was nevertheless a slight decline in the district's cereal outturn between 1971-72 and 1972-73. For the relevant statistics see Drèze (1990), p.70.

Table 7.7 Matrix of Zero-order Correlations, Maharashtra

	Cereal production in 1972-73 as % of 1967-68	Cereal production in 1972-73 detrended	Per cent of population on relief	Detrended CBR 1973	Detrended CDR 1973	Detrended IMR 1973
Cereal productio per capita 1972-73	0.75*	0.26	-0.64*	-0.04	0.09	0.16
Cereal production in 1972-73 as % of 1967-68		0.33	-0.80*	0.12	0.23	0.22
Cereal production in 1972-73 detrended			-0.24	-0.17	0.73*	0.57*
Per cent of population on relief				-0.50*	-0.19	-0.28
Detrended CBR 1973					-0.13	-0.26
Detrended CDR 1973						0.74*

* significant at one per cent level.

Note: For the data used see Table 7.6

examination of levels of nutrition, outbreaks of disease and patterns of rainfall. However, two tentative explanations can perhaps be proposed. First, relief provision together with other attendant government attention (e.g. to health measurers and water supplies) may have played some role in limiting death rate rises throughout much of the drought prone zone. For example, it is noticeable from Table 7.6 that of the ten districts which were designated the "most acutely affected", all of which received significant government attention and relief, only Dhulia registered a detrended CDR rise higher than the average for the state.[44] Indeed, the correlation between the relief provision and detrended mortality in 1973 is negative (see Table 7.7). This finding contrasts with the experiences revealed by the district-level data for India's previous major famines. Because, during the earlier famines although relief provision was generally relatively large in more severely affected districts, there was no clear indication that larger the provision of relief the lower the proportional increase in mortality. In fact, in some cases even a positive relationship was found while in some other cases almost no relation was discernable (see Table 4.11). This, as we have argued earlier, reflects deficiencies of relief policy (e.g. untimeliness, inadequacy, excessive harshness). Thus the finding of a negative relation of relief provision with mortality rise in the Maharashtra drought reflects its relative effectiveness.

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[44] It is worth noting that Dhulia is inhibited by relatively large number of tribal population; according to the 1971 census, the tribal population in this district constituted more than 37 per cent of the total population - which is indeed the highest proportion among all the districts of Maharashtra.

The second explanation for the relationship relates to interdistrict (and perhaps even interstate) patterns of migration.[45] The general tendency in the literature on the Maharashtra drought has been to play down, even deny, the existence of significant population movement. But the empirical base for the view that migration was negligible seems to consist of a few very small scale studies.[46] On the other hand there is considerable evidence from various parts of India that populations in drought prone zones have well established strategies of migration in the event of drought and production failure.[47] Thus in the present context it is noteworthy that the districts of Akola, Amravati, Buldana and Yeotmal - which together formerly comprised the province of Berar - each experienced comparatively large increases in death rates. There are reports for famines in the late nineteenth century of large numbers of people migrating into precisely these districts in search of work and food - who subsequently died there.[48] In 1972 there has been a considerable rise in the registered CDRs in several districts of Madhya Pradesh (Balghat, Bastar, Chindawara, Durg, and Seoni) which lie on the eastern border of Maharashtra; and this was not matched by reductions in CBRs in those

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[45] On this see also Dyson and Maharatna (1991b).

[46] See Drèze (1990), p.75 and also Subramanian (1975), pp.463-5. Subramanian (1975) alludes to interstate migration into Maharashtra and some movement towards Bombay.

[47] See Chapters 3 and 4 above, and also Dyson (1991a), p.7.

[48] See Dyson's own paper in Dyson (1989b), p. 164.

districts.[49] The suggestion may be that famine victims from Maharashtra migrated and thus raised number of registered deaths in these adjoining areas of Madhya Pradesh. That migration played a role in the geography of the demographic response to the Maharashtra drought is also suggested by the detrended CBR and CDR measures for the more urbanized districts - especially Bombay and Nagpur - in Table 7.6. More generally we posit that some of the more vulnerable sections of society may have moved towards areas of relative agricultural improvement in 1973, perhaps conditioned by longlasting routes for distress migration. There, some of them died.

One may argue that larger increase in death rate in the assured eastern zone may not necessarily be real if there was considerable in-migration from drought prone areas. Absence of appropriate adjustment in the denominator for migration in 1973 may produce upward and downward biases in the detrended death rates respectively for the receiving and sending zones. But there are some considerations here: first, if registration of an infant death implies registration of a live birth, calculation of infant mortality rate - being the ratio of infant deaths to total live births - does not require any adjustment for denominator when there is migration. And the

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District	CDR			CBR		
	1971	1972	1973	1971	1972	1973
Balghat	11.8	14.0	13.5	28.9	31.7	29.9
Bastar	9.6	12.0	11.6	21.7	21.2	22.5
Chindwara	12.9	15.8	14.8	35.1	34.8	31.8
Durg	11.5	12.6	7.3	31.4	32.1	19.1
Seoni	13.3	16.1	14.2	35.1	34.2	30.6

Source: Registrar General, Vital Statistics of India, New Delhi, various years.

pattern of regional variation in detrended death rate has largely been corroborated by detrended IMR data too. Second, in-migration into eastern zone may well have increased true death rate on the ground that migrants were selective having higher risk of death. Indeed, migrants are generally more exposed to disease. Finally, there was also some probable inter-state migration.

7.4 CONCLUDING DISCUSSION

The available vital registration data show little sign of excess deaths during the Bihar famine. But limitations of demographic data for Bihar mean that we certainly cannot exclude this possibility. Mortality appears to have risen in the districts of southern Bihar which were also the districts most severely affected by production failure. Conversely, mortality seems to have improved in most of northern Bihar where agriculture was less severely affected by the drought.

However, there is no doubt that there was considerable mortality during the Maharashtra drought - at least 70,000 excess deaths. Both VR and the SRS reveal a similar picture of demographic response at the state level. There was a pronounced reduction in births in 1973, and probably 1972. And deaths also increased in 1973, and probably 1972. The cause-composition of this excess mortality appears to have a broad similarity with what was generally observed during the earlier Indian famines: increased importance of cholera, dysentery/diarrhoea and fevers. The seasonal pattern mortality too appears to be similar to that of the previous famines, reflecting the influence of normal seasonal and environmental factors (e.g. post-monsoon unfavourable conditions) in shaping peak mortality during the crisis. As was found during the historical famines with very moderate excess deaths (Chapter 3 above), the greatest vulnerability of the infants, young children and the elderly has again been surfaced during the Maharashtra scarcity. In fact malnutrition among children is often seen as one of the signs of the onset of a subsistence crisis.[50]

On the question of regional variation in the crisis, Figure 7.5 shows the contrast between the relationship of mortality and production failure in Bihar and Maharashtra. The contrary slopes largely corroborate with the arguments proposed by Drèze i.e. "bad" targeting of relief in Bihar and "better" targeting of relief in Maharashtra. In fact the relief measures in Maharashtra were undoubtedly better organised and more effective than in Bihar. This said, the contrasting relationship of mortality and crop failure between Bihar and Maharashtra should not be interpreted solely in terms of differences in relief provision. Indeed, the relationship between mortality and famine is often very complex. In the present context, for example, explanations are required as to why mortality seemingly improved in some districts of Bihar despite quite sharp production declines. Conversely Maharashtra offers an instance where there was substantial excess mortality notwithstanding comparatively well targeted measures of relief. This brings us to the issue

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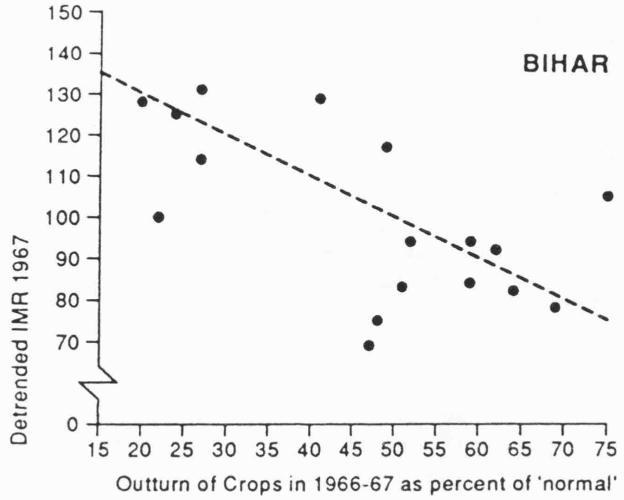
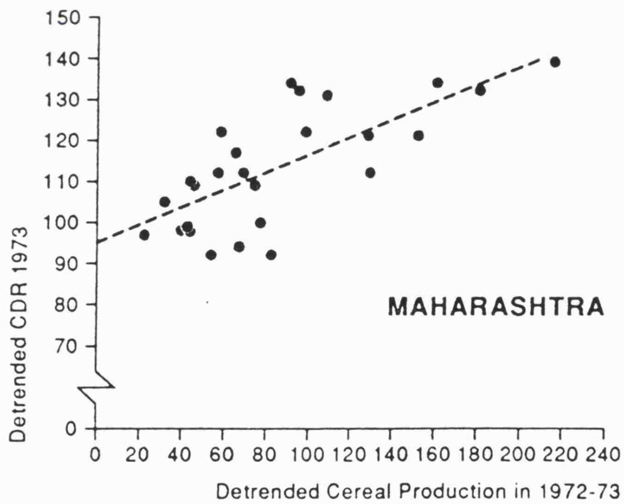
[50] See The Drought of 1987: Response and Management, vol.1, Ministry of Agriculture, Government of India, New Delhi, 1990, p.9.

Figure 7.5 **Detrended Mortality Against Measures of Agricultural Outturn for the Districts of Bihar and Maharashtra**





of migration - which itself has complex links with famine and mortality. Distress migration during famine can rightly be viewed as both an important survival strategy and a process which may actually increase the risks of death. Moreover, the ambiguity of the relationship between migration and mortality in circumstances of famine pertains not only to those who migrate, but to those who stay behind. Thus the stark distinction shown in Figure 7.5 may partly relate to differences in communication and integration.[51] The contrast may, therefore, be between Bihar - a state with a trivial urban sector, a poorly developed transport system, bisected north from south by a major river, where people basically died where they lived - and Maharashtra, where a more extensive communications system and much larger urban sector probably both redistributed, and helped limit, the volume of excess deaths.

[51] Road length and motor vehicles per 100,000 population in Maharashtra during the early 1970s were respectively 219km and 660, while the corresponding figures for Bihar were only 166 and 135. In 1966 Bihar had only 2 buses per 100,000 population while the corresponding figure for whole of India was 73; see Government of India, Central Statistical Organisation, Statistical Abstract, New Delhi, various years.

CHAPTER 8

CONCLUSION

The present study has set out to examine demographic responses during Indian famines since the 1870s. In fact, demographic information is only available for the period after the 1860s, since the establishment of censuses and vital registration. During the closing decades of the nineteenth and in the early twentieth centuries four major famines occurred, affecting large parts of the Indian subcontinent: those of 1876-78, 1896-97, 1899-1900 and 1907-08. Various estimates (including our own) suggest a declining trend in the overall number of excess deaths during these famines. Between the end of the first decade of the present century and the Second World War India was relatively free of famine. However, in 1943-44 a further severe famine occurred, affecting largely the eastern province of Bengal. Since this crisis, India has not experienced a major famine of comparable scale, although occasional food crises and droughts have occurred in several vulnerable regions since Independence in 1947. Thus, the evidence is of a long-term decline in both the frequency and severity of famines. Our chief purpose has been to exploit the fact India with a considerable wealth of historical materials presents a good opportunity for investigating famine demography from a historical perspective.

The study began with a detailed analysis of demographic responses during the above-mentioned four major famines of the late nineteenth and early twentieth century in several locations. Although there is controversy as to the major underlying factors that contributed to the occurrence of these famines, there is no doubt that drought was the proximate cause (see Table 2.5). The major drought which actually brought famine was sometimes the culmination of deficit rainfall in one or two preceding years. During the prime famine year i.e. the year following the drought there was a substantial rise in the death rate over the pre-famine level. The birth rate was very often somewhat below the baseline level during the prime famine year, indicating the onset of fertility-reducing factors before the major mortality increase. In the year following the famine, there was a substantial reduction in the birth rate, reflecting the further reduction in conceptions during the main crisis year. Thus, all these famines involved a considerable loss of population during the prime famine period.

However, as hypothesized there was a compensating rise in fertility above normal levels in the immediate post-famine period, and usually a continued elevation in the birth rate during the longer-term post-famine period. An alteration in age composition favouring the prime reproductive years, especially for females, seems to have contributed to this post-famine "excess birth rate", although the possibility of some deliberate behaviourial changes (e.g. a lowering of the female age at marriage) favouring elevated fertility should not be ruled out. In the post-famine period death rates appear to have been less stable than previously, and this seems to have been largely due to the occasional outbreak of epidemics. However in the longer-term post-famine period, the crude rate of natural increase appears generally to have exceeded the pre-famine levels, thus tending to promote recovery of the pre-famine population size. On balance, the post-famine demographic responses observed during these famines support the hypothesis of a fairly quick recovery to the pre-famine population size.

Our analysis of time-series data on food prices, conceptions and mortality shows that the failure of the monsoon rains immediately triggered sharp food price rises, which continued to eventually reach a peak by the arrival of the <u>next</u> monsoon. In step with the rising prices, the level of conceptions declined fairly quickly. There is relatively little information on fetal wastage due to the onset of famine distress. And although there is some evidence of an increase in stillbirths, the effect does not seem to have been pronounced. On the whole, it seems to us that the fetus was probably rather well protected from the dire circumstances of famine. In any event stillbirths constitute a very tiny fraction of all births. Although mortality sometimes began to rise somewhat later than the start of the fertility reduction, we nevertheless found a strong correspondence in the movements of our CI (conception index) and MI (mortality index), especially during the prime famine period. This certainly implies the existence of strong fertility-reducing effects produced by excess mortality (and presumably raised morbidity). Also, to the extent that the declining CI represents deepening nutritional stress and other disruptions (through, for example, the nutrition-fecundity link and spousal separation) the correspondingly rising MI presumably also reflects increasing distress. This view is reinforced by our finding that occasional elevations of mortality unrelated to famine conditions do not seem to have exerted a similar negative effect on conceptions. This probably also provides justification for treating the reduction in the level of conceptions as perhaps a more robust index of the existence of famine conditions than the elevation of mortality. However, information on conceptions only becomes available when the corresponding births occur nine months later. So the movement of our CI represents an *ex post facto* index of the development of famine, and it cannot really be used for predicting the crisis.[1]

Although we generally found signs of rising mortality from the early months of the year following the drought, the main MI peak usually occurred around the middle of the year - especially at the time of the resumption of monsoon rains. Again, the famine mortality peak, while dramatic, was comparatively short. In fact peak famine mortality occurred at a time when food-prices were either stabilized at a high level or were starting to decline. However, food-prices often continued to remain quite high even after the MI had returned to a normal level. These are probably the reasons why the correlation between the MI and food-price movements was found to be relatively weak.[2]

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[1] See also Menken and Campbell (1992) and Dyson (1992).

[2] A careful study of short run variations in food prices, mortality and fertility over several centuries in medieval England also suggested a much weaker connection between prices and mortality compared with prices and fertility: 64 per cent of annual fluctuations in fertility were associated with yearly variations in prices, compared with 16 percent in the case of mortality; see Lee (1981), and also Walter and Schofield (1989), especially pp.37-41.

Starvation was not the direct cause of most of the famine mortality, although there is evidence of some starvation deaths. Indeed, peak famine mortality was often the result of multiple epidemics associated with the famine. Increased mortality from cholera, dysentery/diarrhoea and fevers appears to have accounted for most of the excess deaths during these major famines. The mortality from all these causes generally tended to increase simultaneously from the early months of the prime mortality year. However, the epidemic of cholera generally occurred a little earlier in the year, particularly during the pre-monsoon months i.e. during the period of maximum undernutrition (as proxied by the level of food prices) and peak social disruptions (e.g. congregations at relief camps, wandering, scarcity of drinking water etc). Peak mortality from dysentery/diarrhoea generally occurred during the monsoon months.

However, epidemic malaria, which usually followed the resumption of rains (with the associated favourable conditions for mosquito-breeding) was the single most important factor in accounting for the relatively late occurrence of peak famine mortality. A surge in mortality from fevers during the post-monsoon months, again reflecting the rains-mosquitoes-malaria link, was also a normal feature. However, the huge scale of the epidemic malaria in the course of the famine seems to have been largely explained by the conditions of starvation and consequent debilitation. Thus while a period of acute undernutrition seems to have had somewhat lagged effects on human health and survival, the exact timing of peak mortality from specific epidemics was partly shaped by environmental factors (e.g. the monsoon-caused increase in mosquitoes in the case of malaria, and heat and lack of satisfactory drinking water in the case of cholera) and partly by other influences (e.g. population movements, crowding in the relief camps and breakdown of sanitary arrangements, encouraging epidemics of cholera and dysentery/diarrhoea).

Although information on socio-economic differentials in famine mortality is extremely limited, there are indications that mortality was higher for the poorer sections of the population. A higher mortality for the poor, it has sometimes been argued, may reflect poorer conditions of living and "public health factors" rather than food shortage or greater undernutrition *per se*.[3] In fact, a distinction between a "starvation model" on the one hand and a "health crisis model" on the other has been proposed to explain different patterns of famine mortality.[4] However, in our view such a sharp distinction is difficult to sustain, especially in the Indian historical context. This is because starvation and nutritional stress during these famines appear usually to have caused large-scale mortality through diseases (i.e. through increased susceptibility) the spread and severity of which were partly aggravated by famine-induced disruptions on both the social and public health fronts (i.e. through increased exposure). The health crises prompted by crowding, contamination and migration during these famines seems very

[3] See Walter and Schofield (1989) especially p.19, and also de Waal (1989b), p.116.

[4] See de Waal (1989c).

often to have been related to famine-induced destitution.[5]

Turning to the relief operations during these famines, we have seen that the start of relief provision was often rather late. One of the implications of this was that many people were already debilitated when they joined the relief works, and thus they failed to fulfil the set work-standards and often fell prey to diseases. On the other hand, we have seen that the timing of the decline of relief works sometimes occurred earlier than the resumption of the rains. This often resulted from the government's deliberate attempts (e.g. through raising the standards of work or the lowering of wages) to keep down the numbers of people on relief. In some cases, the provision of relief works does appear to have continued until the resumption of the rains. It seems that the time span of relief provision (especially of relief works) was influenced by the trend in overall mortality. When mortality failed to show a considerable rising trend, especially during the early part of the year, relief measures seem to have been run down much earlier than the resumption of the rains. Conversely, when mortality showed a steady increase over time, relief works were continued until the resumption of the monsoon.

On the question of the age composition of famine mortality we have seen that infants, young children and the elderly - age groups whose mortality rate is very high even in normal times - experienced very large absolute rises in the death rate during the famines. But in terms of proportional

[5] See also Drèze and Sen (1989), footnote 25, p.44.

rises in mortality age pattern of famine vulnerability does not always coincide with the one based on absolute increases in mortality. While a very high normal level of infant mortality reflects both widespread poverty and very poor public health provision in normal times, in terms of proportional increase in mortality infants appear to have been relatively protected compared to other ages. During normal times infant mortality was almost always higher for males than that for females; but female infant mortality usually rose by a larger proportion during famines. However apropos other age-groups, two broad patterns of proportional mortality increases seem to have corresponded with two regions of the subcontinent. First, in south, central and western India older children and adults experienced relatively large proportional increases in mortality, especially compared to young children. Second, in the north-Indian famines young and older children experienced relatively large proportional increases in mortality, especially when compared to adults. Likewise, in connection with the sex-differentials in famine mortality (all ages combined) two regional patterns emerged. In the first region (i.e. south, central and western India) famine mortality of males increased most in proportional terms; but in the north Indian famines the reverse was true. While the age-sex pattern of famine mortality is probably largely shaped by biological vulnerability and the pattern of afforded "social protection", the above regional differences seem to have corresponded to India's broad "north-south" dichotomy in basic cultural and social features. Relatively pronounced anti-female socio-cultural features (e.g. low status of women and related female neglect) in the northern parts (compared with southern, central and western regions) seem to have outweighed the potential biological and other female advantages in coping with famines.[6]

Our analysis of some historical famines which involved relatively minor mortality has shown that the time patterns of demographic responses were broadly similar to those for the major famines: i.e. relatively early declines in conceptions, comparatively late occurrence of the MI peak, and a generally close correspondence between the movements of the MI and CI. Also, the timing of the outbreak of cholera was generally somewhat earlier than the occurrence of the malaria epidemic, again reflecting seasonal influences. But the main difference with the major famines lay in the scale of the demographic effects, which were much smaller primarily reflecting, in our view, the lesser associated volume of distress and disruption. The relatively mild distress and disruption levels during these famines were not related to the severity of drought conditions and the scale of crop failure. Better provision of relief (e.g. a relatively timely start of relief, and a relatively liberal relief policy) - sometimes helped by the general expansion and diversification of the economy - appears to have played a crucial role in mitigating the scale of adverse demographic consequences in these famines. Also, the relatively high vulnerability of infants, young children

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[6] Note that females in the prime reproductive ages appear to have had a relative mortality advantage (compared with males in those ages) in almost all famine locations with notable exception of Punjab. The female mortality advantage (in proportionate terms) in reproductive years in most cases seems to have resulted (at least partly) from a considerable decline in the number of conceptions and associated decline in pregnancy and child-birth related deaths during the famine.

and probably elderly people to nutritional stress remains overt during these famines even though they were prevented from developing into major mortality crises. And the regional dichotomy of sex-differentials in famine mortality - particularly the female disadvantage in the childhood years in northern parts of the subcontinent - has again been observed in these "lesser mortality" famines.

Our inter-district analysis of variation in the demographic response during major famines has put the role of relief into even sharper focus. The "famine" districts as a whole generally experienced a somewhat larger measure of crop failure than did the "non-famine" districts. The correspondence of the regional variation in famine distress (proxied by crop failure) with the variation in the fertility-declines has been found to be somewhat stronger than that with the regional variation in the price rises. This reflects the fact that markets were inter-linked to some degree.

Regional variation (particularly between the "famine" and "non-famine" districts) in demographic consequences was found to be much greater during the famine of the 1870s than in the famines of later decades (i.e. those of 1896-97, 1899-1900 and 1907-08). In fact, our work indicates that there has been a declining trend over time in both the scale and regional disparity of the demographic impact of famines. There has also been a weakening of the strength of the association between the district-level indices of crop failure and the adverse demographic effects. Improved transport and communications (especially railways) over the years seems to have played a significant role in diffusing the famine intensity e.g through faster and greater movements of both food and population.

However, the change in the nature of government relief policy also seems to have played an important role. For example, the much larger increase in mortality and the larger reduction in births during the famine of 1876-78, compared to later famines, seems to relate to the very stringent and harsh relief policy which was adopted. True, district-level data on relief and mortality for the Bombay famine of 1876-78 do not support the idea that the greater the relief provided in a district, the smaller was the mortality increase. Instead, a positive relationship emerged (see Table 4.11). Our analysis shows that the most severely affected districts generally received relatively large amount of relief, and this may partly be the reason why a positive relationship between relief provision and mortality increase was found. However, this relationship reflects the deficient nature of the relief provision itself. The observed declining trend in overall excess famine mortality over the decades since the 1870s has often been attributed to a trend towards a more flexible and liberal relief policy (as formulated by the successive Indian Famine Commissions). For example, there has definitely been a rising trend over time in the provision of gratuitous relief (see Table 4.11).

However since the formulation of Famine Codes and relief policy does not guarantee their implementation (because the organisation of relief was the responsibility of the local administrations) the quality of relief provision was not uniform across different provinces. Thus although the relief policy became more liberal over the decades following the 1870s, it was nevertheless still sometimes very harsh and deficient (e.g. in its late response and non-adherence to the Famine Codes). As the experience in the Punjab famine of 1899-1900 has shown, the relatively harsh relief policy and consequent failure in tackling demographic crises has been reflected in the finding of a positive relationship between district-level relief provisions and mortality increases. And such positive relationship was found neither for the Bombay famine of 1896-97 nor for the United Provinces famine of 1907-08, where relief was comparatively liberal and rational (see Table 4.11).

The occurrence of the Bengal famine in 1943-44 again demonstrated the importance of the government's efforts in the prevention of a subsistence crisis and the occurrence of an associated demographic disaster. Unlike the previous drought-related major famines, the Bengal famine was triggered by the war-induced inflation and the disruption of supplies of food. Thus it was not the food shortage as such, but instead the government's failure in controlling the prices and distribution of food that was at the root of the large-scale distress in Bengal.

Although a substantial literature exists on the demographic impact of the famine, the original registration data for the whole of Bengal have hitherto been unutilized. While Amartya Sen's recent analysis of the famine's demographic impact has been influential, the data he used not only necessitated a separate treatment of post-partition West Bengal and East Bengal, but it appears to have been somewhat unreliable too. The detailed analysis of the demography of the Bengal famine, using the original (and hitherto neglected) registration data for undivided Bengal, has provided us with several new findings. The quantum of excess deaths in the famine has been hotly debated ever since its occurrence. While Sen's recent estimate of 3 million deaths has been widely quoted, applying Sen's own procedure to our new data for undivided Bengal gives figures of 1.8 to 1.9 million excess deaths. But allowing for the pre-famine declining trend in the death rate, an estimate of 2.1 million appears to be more appropriate.

A prolonged elevation in food prices after 1941 seems to have caused an early reduction in conceptions, reflecting in our view the fertility-reducing effects of deepening nutritional stress and war-related disruptions. Prices rose dramatically from the beginning of 1943, and the mortality level began to rise sharply above normal from the middle of 1943. The maximum MI occurred in October of 1943, while the main famine mortality peak was roughly of 12 months duration: July 1943 to June 1944. However, the mortality level did not return to "normal" until the middle of 1945. The CI, which was considerably reduced during the starvation phase (i.e. by the middle of 1943) declined further in that year and 1944 along with the rising MI. Thus the basic nature of the short-term fertility and mortality responses was broadly similar to that we have found for the earlier major famines. A remarkably early reduction in conceptions in Bengal probably matched the prolonged period of rising prices and other disruptions brought about by the war. In urban Bengal although conceptions began to decline as early as 1941, the scale of the overall reduction was much less than in the province as a whole. On the other hand, the time pattern of movements in the urban MI broadly coincides with that for the whole of Bengal. Also the urban areas experienced greater (proportional) excess mortality. All these features may well reflect the influence of rural-urban migration of destitutes.[7]

Deaths from cholera, dysentery/diarrhoea, malaria and fever shared a rising trend from the middle of 1943. The cholera mortality peak occurred in October of 1943, and it was followed by a peak from malaria, dysentery/diarrhoea and fever occurring about two months later. The smallpox epidemic peaked very much later (in April of 1944).

Epidemic malaria constituted the largest component of famine mortality in Bengal. However, in urban areas most of the registered excess deaths were not accounted for by malaria. In fact, the cause-composition of urban famine mortality differed from the rural pattern, perhaps partly as a result of differences found even in normal times. But the fact that large numbers of migrant destitutes died in the urban areas also partly accounted for the rural-urban differences in the cause-composition of mortality. However, the rural-urban similarity in the time pattern of the MI (despite differences in the cause-composition of deaths) reinforces our view that the general course of mortality was largely determined by the somewhat lagged effects of large-

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[7] It should also be noted that pre-famine registered death and birth rates were considerably lower in urban areas than those for rural Bengal. Putting registration biases aside, this probably implies both a larger scope for proportionate increase in mortality and a smaller scope for fertility reduction (in proportionate terms) in urban areas.

scale nutritional stress on human health and survival, while the exact timing of the excess mortality peak was also partly shaped by both usual seasonal influences (e.g. the post-monsoon outbreak of malaria) and the culmination of various social disruptions (e.g. the period of maximum population movement).

The newly discovered registration data for Bengal confirms the view that the impact of famine on the number of stillbirths is probably adverse, but is not pronounced. Neo-natal mortality appears to be relatively protected compared to that of infants beyond the neo-natal stage of life. The pattern of the mortality increase by age and sex found for rural Bengal seems to have been similar to that found during the major famines in the south, west and central regions of India: infants of both sexes experienced a relatively small proportional increase compared to other ages, and female infants suffered larger increases than did male infants. This greater rise in female infant mortality seems to have been due partly to anti-female discrimination in food and parental care. Young children of both sexes also appear to have experienced a relative mortality advantage (in proportionate terms) compared to older children and adults. Females in the prime reproductive ages appear to have experienced lower mortality increase than males in those ages - a relative female mortality advantage that seems to have resulted largely from a decline in pregnancy and child-birth related deaths, which in turn was due to a decline in fertility. And males (all ages combined) experienced a slightly larger proportional increase in mortality than did females.

But in urban Bengal the pattern was quite different. Infants in urban areas appear to have experienced larger mortality increase (proportional) than adults, and female infants seem to have been the most vulnerable group. Young children and elderly people in urban Bengal experienced relatively large increases in mortality, while adult mortality appears to have been least affected. But this urban pattern of age-sex increase in famine mortality probably reflects, in our view, the influence of rural-urban migration, especially by those groups who were largely dependent on adults.

Since a dramatic rise in food prices (in the wake of the war) was the root cause of the Bengal famine of 1943-44,[8] distress prevailed almost everywhere largely because of the existence of fairly integrated markets and speculative activities. Indeed, unlike the drought-related famines which we previously analyzed, the division between "famine" and "non-famine" districts was not made for the Bengal famine. But there was nevertheless considerable regional variation in the demographic impact. Regional variation in price rises showed a weak association with adverse demographic impact. But this probably reflects the relative uniformity of price rises during the Bengal famine.

The regional pattern of mortality increase appears to have been partly shaped by pre-existing environmental, ecological, infrastructural conditions, and the distribution of relief and migration. Malaria endemicity (as measured by the proportionate share of malarial deaths of total fever

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[8] For a detailed treatment of this issue see especially Sen (1981), chapter 6.

mortality) appears to have been the most important variable explaining the regional variation in mortality increase - although its overall explanatory power is still rather small. Differences in the cause-composition of deaths between the "heaviest mortality" districts and the "lowest mortality" districts also suggests the importance of pre-existing levels of malaria endemicity. The greatest increases in malaria deaths during the prime famine period happened in districts which normally were relatively less affected by malaria. This is consistent with our finding that West Bengal - with a lower overall pre-famine malarial-incidence - experienced a higher increase in famine mortality. The possible net inflow of people into West Bengal in the wake of pre-partition Hindu-Muslim tensions may have also contributed to West Bengal's relatively prolonged elevation in recorded mortality in the post-famine period. Interestingly, however, the experience of Malda and Dinajpur districts implies that the epidemic phase of famine may well extend beyond the famine period itself. And that the scale of such late outbreaks of epidemics may be extremely severe.

During the Bengal famine the most appropriate form of relief, namely, gratuitous food relief,[9] was not only inadequate, but was also very late in coming. In fact, it assumed significance only after the outbreak of the epidemic phase. Thus, the regional distribution of relief does not appear to have influenced the pattern of mortality variation. On the contrary, the finding of a positive relationship

[9] For a useful general discussion on the pros and cons of food and cash forms of relief see Sen (1990), pp.43-45.

between district-level relief and mortality increase suggests that the distribution of relief may have partly been influenced by the regional pattern of mortality increase. However, there is also a clear suggestion that food despatch was relatively greater in those districts which were relatively close to the main foci of communication. And lesser malaria endemicity in those favourably located districts (receiving relatively large food despatches) and also migration into those areas may well have contributed to their greater mortality increase (compared to the far-flung districts which received fewer food despatches, and were normally very malarious). On the whole relief provision, being very late, did not prove successful in moderating mortality increases - which were partly determined by the nature of epidemics (especially malaria) and probably to a lesser extent migration.

In this connection the experience in Madras during the famine of 1943-44 presents a contrasting episode, where the government's relatively prompt and active intervention in the management and distribution of food combined with a larger provision of relief. Indeed, the lower mortality toll of the Madras famine seems to have been partly a reflection of the government's relatively effective interventions. This again contrasts with the experience of adjoining Travancore state, where a much larger mortality increase coincided with a negligible provision of relief. On the other hand, part of the increase in mortality in Orissa - an adjoining province to Bengal - seems to have been caused by the deaths of many migrants from Bengal.

Although the scale of excess mortality was colossal only in Bengal, the broad patterns of demographic responses were somewhat similar in all these locations (i.e. Bengal, Madras and Orissa). Fertility reduction appears to have been a common feature. Most of the famine mortality can be attributed to the outbreak of epidemics, though some starvation deaths seem to have occurred in all these locations. Epidemics of cholera, malaria and smallpox happened in succession. The course of famine mortality seems to have been determined largely by the general course of distress and debility - with somewhat lagged effects on health and survival, again being also partly mediated by environmental (e.g post-monsoon malaria) and other factors (e.g. population movements). Some similarity has also been found in the age and sex patterns of mortality increase in these three locations, and these patterns are broadly consistent with our findings from earlier major famines. The rural-urban contrast in Bengal, which can be viewed as an outcome of famine-induced social crisis (e.g. the cutting-off of dependents from domestic subsistence and their movement towards towns in the hope of finding relief) does not seem to have been prominent in Madras and Orissa. This again probably reflects a lesser severity of distress in these two provinces and a relatively better distribution of relief provisions.

Since the famine of 1943-44 India has never experienced a major famine of a comparable scale (although Bangladesh has). This absence of major famines in the contemporary period partly reflects the key political, economic and demographic changes that had taken place since Independence.

However, the country still appears to be vulnerable to occasional droughts and food crises. The Bihar famine of 1966-67 and the Maharashtra drought of 1970-73 seem to have been the most important events since 1947. But major disaster has almost always been prevented by relatively timely and effective relief provision.[10] However, the basic patterns of demographic responses during contemporary crises appear to be similar to those found in the earlier famines. Thus in both the Bihar famine of 1966-67 and the Maharashtra drought of 1970-73, there seems to have been some excess mortality - though little compared to the earlier major famines. In the Maharashtra scarcity there were at least 70,000 excess deaths. There was also a pronounced reduction in births - especially in 1973. The cause-composition of excess mortality also appears to be similar to what we have found for the past famines: increased importance of cholera, dysentery/diarrhoea and fevers. The seasonal pattern of mortality too shows the influence of normal seasonal and environmental factors (e.g. post-monsoon unfavourable conditions) in shaping the crisis mortality peak. As was found during the past famines with moderate excess mortality, the greatest vulnerability of infants, young children and the elderly has again been

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[10] India's democratic system with a fairly strong opposition parties, adversarial politics, and independent press seems to have played an important role in instigating a relatively prompt and effective public action in the event of crisis. This contrasts with the experiences in several less democratic countries with less conducive conditions for generation of pressure on government in times of crisis. On this issue, see Sen (1983), Drèze and Sen (1989), Ram (1990), and also Article 19, The International Centre on Censorship, Starving in Silence, London, 1990. However, it should also be noted that India's democratic polity appears to have provided less protection against large-scale endemic poverty and hunger, which are less photogenic and harder to politicize. Indeed, an in-built ad hocism in India's relief policy and associated inefficiency in resource allocation - as opposed to a policy for a permanent elimination of weather-related crises - has often been criticised; on these issues, see Morris (1974, 1975) and Jodha (1975).

observed during the Maharashtra scarcity. This confirms the view that these are the most vulnerable age-groups even when a subsistence crisis does not develop into a major mortality crisis, (although during a major, famine-induced, mortality crisis they often appear to have experienced a relative mortality advantage (in terms of proportional increases) compared to older children and adults).[11]

Our comparative analysis of the Bihar and Maharashtra episodes has revealed that distribution of relief provision was comparatively well-targeted in Maharashtra, where a negative association between mortality and production failure was found. It is during this crisis that we have observed for the first time a clear negative correlation between relief provision and mortality increase. This implies that the relief policy was relatively effective in preventing distress and its associated excess mortality. The core principles of the famine relief strategy during the crisis were broadly the same as those which were laid down in the early 1880s by the first Indian Famine Commission (e.g. generating incomes through the provision of public works, supplemented by gratuitous relief for the weak). But India's present relief system cannot be viewed as a mere legacy of the British administration because significant changes have occurred since Independence. While some of these changes relate to practicalities of relief strategy, one fundamental change from the pre-independence system has been direct government

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[11] Note that most African famines in the recent period appear to have killed mainly young children (aged one to five years). In fact a distinction has sometimes been made between famines that kill mainly young children and those that kill both children and adults, the latter reflecting a higher degree of severity; see de Waal (1988), pp. 89-90.

participation in both food supply management and food distribution at controlled prices. Thus while the pre-Independence relief strategy concentrated only on the generation of incomes for vulnerable groups (e.g. through public works programmes supplemented by gratuitous relief), the relief strategy in the post-Independence period both generated incomes and ensured that food is available to the needy people at commandable prices.[12]

This said, distress migration from the most severely affected areas also seems to have influenced the regional pattern of mortality. Indeed, the contrasting relationship of mortality and crop failure between Bihar and Maharashtra appears to have been partly related to the differences in communications and integration. The contrast seems to be between Bihar - with relatively limited scope for population mobility, where people died where they lived - and Maharashtra, where a more extensive communications system and much larger urban sector seem to have helped redistribute and limit excess deaths. Thus while the long-term decline in the frequency and severity of famines since the 1870s appears to have corresponded to the evolution of relief policy towards greater effectiveness and liberality, the (coterminous) expansion in communications and increasing diversification of the economy also seem to have played a role in diffusing, redistributing and probably limiting the adverse demographic

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[12] Indeed, from the late 1970s onwards the holding of major national buffer stocks in staple grains - partly as result of Green Revolution in several parts - has also helped government tackle food crises and provide the relatively effective relief; see e.g. Article 19, The International Centre on Censorship, Starving in Silence, London, 1990, pp. 6-7, and also Drèze (1990).

impact of famine. However, characteristic features of demographic responses to famine have been much the same throughout.

APPENDIX A

Table A1 Average Monthly Crude Birth and Death Rates During Baseline Pre-Famine Periods, major famine locations

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Bombay, 1871-74												
CBR	17.2	15.8	17.7	18.0	18.9	19.8	21.1	20.5	19.9	20.2	19.9	18.6
CDR	18.6	16.2	18.1	17.2	17.0	17.3	18.8	20.6	19.0	19.5	20.3	19.0
Madras, 1871-75												
CBR	14.2	12.8	15.1	15.8	17.3	18.7	22.9	21.8	22.0	22.1	20.8	18.2
CDR	18.3	14.8	16.7	15.7	15.5	15.3	17.7	18.6	19.4	19.2	21.0	22.2
Central Provinces, 1891-94												
CBR	38.0	34.4	38.1	39.8	38.9	34.2	36.5	40.3	42.4	43.9	40.9	38.9
CDR	25.7	23.8	30.8	35.2	35.2	31.6	30.0	35.0	37.9	40.0	37.9	33.1
Bombay, 1891-94												
CBR	32.5	31.0	34.5	34.8	37.0	38.0	37.5	36.5	36.0	36.5	35.3	33.9
CDR	31.2	25.7	27.8	28.0	29.0	26.9	31.9	33.3	30.2	29.8	32.1	32.0
Berar, 1891-95												
CBR	34.7	34.6	39.6	34.5	33.1	32.7	37.3	43.6	43.3	44.5	37.2	34.7
CDR	28.1	25.4	36.3	37.8	34.8	26.0	33.1	53.7	58.9	53.2	42.8	36.2
Punjab, 1891-95												
CBR	40.4	35.6	36.7	30.3	30.4	28.9	33.4	40.7	47.4	50.0	47.3	46.5
CDR	34.1	27.0	24.5	23.1	29.7	27.2	27.2	26.7	31.2	39.9	39.5	39.2
United Provinces, 1901-04												
CBR	44.1	38.2	38.0	36.0	35.6	36.7	43.2	51.1	54.2	56.0	51.9	51.0
CDR	30.1	26.1	30.0	33.4	35.1	34.3	30.6	30.5	36.1	42.5	41.6	40.7

Notes: 1) The above vital rates are based on constant denominators - being the respective populations under registration according to the preceding famines. Thus these monthly schedules above effectively reflect the seasonal variation in the number of registered births and deaths. 2) To facilitate interpretation, all monthly vital rates are annualized by being multiplied by 12.

Sources: See Table 2.1.

APPENDIX B

Evaluation of the data given in the 1951 Census of India publication, Vital Statistics, West Bengal, 1941-50[1]

We here evaluate the demographic data contained in the above publication for West Bengal for the period around 1943-44 in the light of the available registration data for the whole of undivided Bengal.[2] Table B1 compares the numbers of registered deaths in West Bengal obtained from the 1951 census of India publication and the numbers of registered deaths in undivided Bengal. There is considerable variation in the fraction of deaths indicated to be occurring in West Bengal. In 1942 it is only 28.5 per cent, whereas by 1945 it is almost eight per cent higher at 36.2 per cent. And although the number of deaths shown for undivided Bengal in 1946 is a provisional figure, the suggestion nevertheless emerges that the fraction in 1946 may have been higher still. Real demographic fluctuations between West and East Bengal, as well as variation in registration coverage between these areas, may be influencing these comparisons of annual fractions. Nevertheless the instability in the annual fraction of deaths occurring in West Bengal shown in Table B1 seems somewhat worrying.

The basic question is obviously how did this 1951 Indian Census report carve out the registered deaths and births for those districts which were split at the time of partition in

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[1] Census of India, 1951, vol.VI, part 1B, Vital Statistics, West Bengal 1941-50, New Delhi, 1952.

[2] Government of Bengal, Health Directorate, Bengal Public Health Report: Alipore.

1947 ? In this connection it is important to note that for the following four districts of West Bengal, namely Nadia, West Dinajpur, Malda and Jalpaiguri (which were split, and were thus

Table B1 Recorded Vital Events for West Bengal Compared with Registered Vital Events in Undivided Bengal, 1941-46

DEATHS

Year	West Bengal	Undivided Bengal	Per cent in West Bengal
1941	384,220	1,184,850	32.4
1942	347,886	1,222,164	28.5
1943	624,266	1,908,622	32.7
1944	577,375	1,726,870	33.4
1945	448,600	1,238,133	36.2
1946	414,687	1,068,996	38.8

BIRTHS

Year	West Bengal	Undivided Bengal	Per cent in West Bengal
1941	541,280	1,594,291	34.0
1942	506,578	1,448,299	35.0
1943	440,014	1,151,556	38.2
1944	377,376	957,210	39.4
1945	457,356	1,301,314	35.1
1946	524,365	1,478,857	35.5

Notes: 1) See notes to Table 5.2.
Sources: See Table 5.2.

parts of former larger undivided districts) the ratios of both births and deaths as given in the 1951 Census publication[3] to the respective totals for the undivided districts as given in the Bengal Public Health Reports[4] for each year between 1941 and 1945 were respectively 0.5, 0.3, 0.7, and 0.7. This clearly

[3] Census of India 1951, Volume VI, part IB, Table 1.1-1.5, pp.20-23.

[4] Government of Bengal, Health Directorate, Bengal Public Health Report: Alipore, relevant years.

suggests that the data for these districts were derived by applying a fixed proportional norm for all the relevant years. This way of deriving the numbers of births and deaths for the split districts may well bias conclusions drawn about the demographic impact of the famine (see the relevant sections of the text in chapter 5).

It seems notable that also in an appendix to the 1951 Indian Census publication the number of births and deaths for all the districts in West Bengal are given for years since 1870.[5] Interestingly, these numbers of deaths and births for the above split districts do not match exactly with those we have just referred to above (as given in the text of the census volume). The number of deaths for these split districts as given in the text of the census volume are somewhat higher (except for Jalpaiguri) throughout the period 1941-1945 than are those given in its Appendix. For 1946 the Bengal Public Health Report produced data for only West Bengal. And for 1946 the numbers of births and deaths in these four split districts of West Bengal were all exactly the same in both the text and appendix of the Census publication as in the Bengal Public Health report[6]. For each of the four split districts we calculated the ratios of deaths and births as given in the appendix to the Census publication to the respective totals for the corresponding undivided former district as given in the Bengal Public Health Reports during the period 1938-1945 (see

[5] See Census of India 1951, Volume VI, part IB, Appendix IV, pp.67-68.

[6] Bengal Public Health Report for 1946 provides data only for West Bengal.

Table B2. It is interesting that these ratios for both deaths

Table B2 Ratios of births and deaths in the four split districts in West Bengal as given in the appendix to the Census publication to the respective totals in those undivided districts as given in the Bengal Public Health Reports.

	Nadia	West Dinajpur	Malda	Jalpaiguri
1938:				
Births	0.485	0.297	0.733	0.700
Deaths	0.486	0.311	0.727	0.700
1939:				
Births	0.465	0.247	0.729	0.700
Deaths	0.499	0.246	0.741	0.700
1940:				
Births	0.488	0.300	0.718	0.700
Deaths	0.436	0.276	0.751	0.700
1941:				
Births	0.489	0.273	0.753	0.700
Deaths	0.444	0.285	0.773	0.700
1942:				
Births	0.506	0.271	0.740	0.700
Deaths	0.437	0.263	0.749	0.700
1943:				
Births	0.483	0.285	0.792	0.700
Deaths	0.478	0.293	0.720	0.700
1944:				
Births	0.524	0.301	0.673	0.700
Deaths	0.458	0.321	0.740	0.700
1945:				
Births	0.582	0.297	0.651	0.700
Deaths	0.483	0.283	0.737	0.700

Sources: Census of India 1951, Volume VI, Part IB, Vital Statistics, West Bengal 1941-50, Appendix IV, pp.67-68; Government of Bengal, Health Directorate, Bengal Public Health Report: Alipore, relevant years.

and births show year-to-year fluctuations of considerable magnitude (except for Jalpaiguri for which all these ratios are 0.70). This implies that in case of Jalpaiguri the numbers of births and deaths as given in the appendix to the 1951 Census of India publication were derived by applying a constant fraction (i.e.0.70) to the total numbers of registered deaths and births as given for the undivided district in the Bengal Public Health Reports.

But now the question arises as to why did these ratios for the other three districts vary so markedly from one year to another ? One possibility is that real demographic fluctuations between the boundaries of East and West Bengal as well as variations in the registration coverage between these areas produced such variations in the ratios found in Table B2. This in turn implies that for these three districts which were split in 1947, both deaths and births for the whole period as reported in the appendix to the 1951 Census publication were meticulously derived from the registration data at the necessary disaggregated level, strictly in accordance with the divided geographical boundaries. If this is the case then the question remains: Why was it necessary to apply a fixed proportions-formula to derive the numbers of deaths and births as given in the text of the Census publication (which in fact were the data used by Sen and others) ? Actually we cannot be sure whether these data in the appendix are real or not. If they are real (i.e. not calculated on a fixed-proportions-formula) the question of why it was also necessary to apply a fixed age distribution formula to the total number of deaths for West Bengal remains unanswered.

APPENDIX C

Growth Balance Estimation of Death Registration Completeness in Undivided Bengal, 1940-42

A useful, though sometimes limited, technique for assessing the death registration coverage is the "Growth Balance" method advanced by Brass.[1] We briefly describe its application to the data for Bengal around the 1941 census. The method involves the following assumptions: 1) that the population is both stable and closed; 2) that the completeness of death registration is the same at every age; 3) that age-reporting is accurate. Table C1 presents the age distribution of average registered deaths in 1940-42 and also of the 1941 census population. Cumulating these data gives respectively the values of d_x and p_x i.e. the numbers of deaths and population above age x. Approximate estimates of n_x (the numbers of people aged exactly x) can be obtained from adjacent census population age groups; thus the numbers aged 10 can be estimated as 1/10 the numbers aged 5-14 (i.e. 31,179 = 1/10 (175,163 + 136,624)). Then we compute the partial birth rates (n_x/p_x) and death rates (d_x/p_x) by age. Under the above assumptions the relationship between these partial rates should be linear, and the slope of this line should provide a correction factor for the level of death registration coverage. The relationship for Bengal is shown in Figure C1. The slope of the regression line based upon all eight age points is 1.34, implying a 75 per cent coverage level of registered deaths in 1940-42.

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[1] Brass (1975); also United Nations (1983),pp.139-145.

Table C1 Growth Balance Method Applied to Death Registration Data for Bengal, Both Sexes, 1940-42

Age Group	Average registered deaths 1940-42	Mid-1941 Population	Age x	Registered deaths above age x d_x	Population above age x p_x	Population at exact age x n_x	Partial birth rate n_x/p_x	Partial death rate d_x/p_x
<1	246,540	29,868						
1-4	180,266	138,880	5	745,893	1,048,055	34,391	.0328	.0143
5-9	86,799	175,163	10	659,094	872,892	31,179	.0357	.0152
10-14	42,625	136,624	15	616,469	736,268	24,874	.0338	.0169
15-19	51,243	112,118	20	565,226	624,150	23,858	.0382	.0182
20-29	121,146	228,422	30	444,080	395,728	20,264	.0512	.0226
30-39	105,643	176,864	40	338,437	218,864	14,385	.0657	.0312
40-49	95,912	110,837	50	242,525	108,027	8,724	.0808	.0452
50-59	89,265	63,644	60	153,260	44,383	4,647	.1047	.0696
60+	153,260	44,383						
Total	1,172,699	1,216,803						

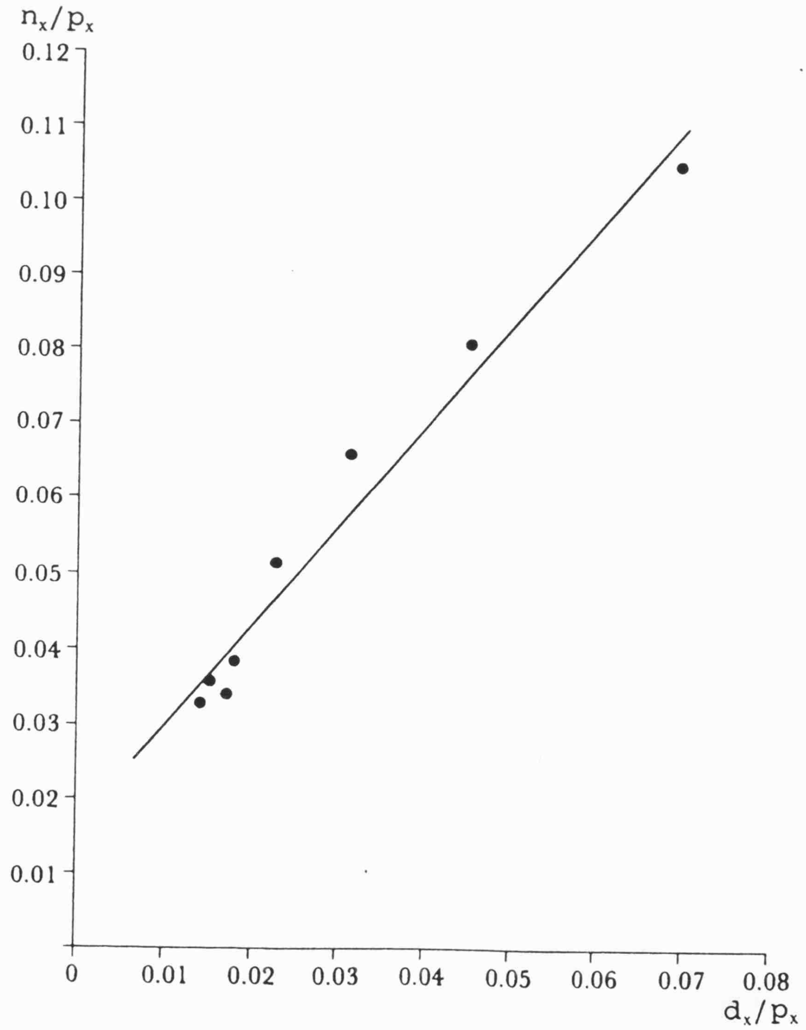
Notes: (i) In calculating the partial death rates, the values of p_x were scaled-up by a factor of 49.6367 in order to allow for the fact that the 1941 Bengal census age data are only available on a sample basis. This factor gives a corresponding Bengal population in mid-1941 of 60,398,085.

(ii) The least squares regression line to all eight age points is $y = 0.0164 + 1.3381x$. Hence the implied CF for death registration completeness is 1.34 and the estimated level of death registration is 75 per cent.

Sources: For the 1941 census age data, see, Census of India, 1941. Volume IV, Bengal, Tables, Delhi, 1942, p.110. For the death data, see the sources listed in Table 5.4.

However, by themselves, we cannot treat these estimates as particularly robust because conditions in Bengal probably departed from some of the method's requisite assumptions. For example, recording of age (in both the census and at the time of death registration) was certainly subject to systematic biases (e.g. exaggeration at older ages). In addition, we know that Bengal experienced significant net in-migration in the 1920s and 1930s. It is difficult to evaluate how such considerations might affect the estimates. Figure C1 also shows that quite different values of correction factor might result if we were to omit certain age points when calculating the slope of the line. Nevertheless, the estimates may be broadly consistent with some of the other assessments of death registration coverage given in Table 5.3.

Figure C1 Growth Balance Plot for Bengal, 1940-42



APPENDIX D

Table D1 Comparison of monthly average prices of rice in the Calcutta market with the Provincial average rice prices given in the Pinnell Papers.

Month/year	The whole sale price of rice (Rs per maund) Bengal	Calcutta	"Provincial price of coarse rice" (Rs per maund)	Wholesale price of rice in Calcutta (Kalma mill cleaned No.1) (Rs per maund)
	(1)	(2)	(3)	(4)
1943 January	9.00	11.25		n.a
February	11.46	13.75		n.a
March	13.75	19.30		23.00 - 24.00
April	20.73	19.30		23.00 - 24.00
May	26.85	30.60		31.00 - 32.00
June	27.19	31.65		31.00 - 32.00
July	29.56	30.69	29.56	33.00
August	31.39	32.34	30.25	35.00
September			23.50	32.00
October			22.31	20.00*
November			19.63	20.00*
December			15.13	17.00*
1944 January			14.69	
February			14.50	
March			14.50	
April			14.81	
May			15.75	
June			15.56	
July			15.19	
August			14.13	
September			12.94	
October			11.81	

Notes: 1) The prices marked * are the maximum controlled rates. 2) The prices in column (4) are those quoted at the end of each month. 3) The figures for Bengal in column 1 are averages for about 70 markets. 4) L.G. Pinnell, ICS, Bengal's first civil supplies director (a former district officer and secretary to two Governors), was largely responsible for the Government's food policies in the crucial period from August 1942 through April 1943; he then resigned. L.G. Pinnell was indeed closely linked to the course of events especially in 1943. He took charge of the Bengal Development Department in late 1945.

Sources: Columns (1) and (2): the Pinnell Papers, Confidential, Department of Civil Supplies, Bengal, "Further information desired by the Commission", Appendix E(2), p.30; column (3): the Pinnell Papers, Confidential, "Reference - The last sentence of paragraph 2 of annexure 1 to Famine Inquiry Commission's letter No. FC(E)/10, dated 8th September 1944"; column (4): Government of India, Department of Commercial Intelligence and Statistics, <u>Monthly Statement of Wholesale Prices of Certain selected Articles at various centres in India, December 1943</u>, Delhi:Government of India Press, 1945.

APPENDIX E

Table E1 Average monthly crude birth and death rates during pre-famine baseline period 1936-40, All-Bengal and Urban Bengal

	All-Bengal		Urban Bengal	
Month	**CBR**	**CDR**	**CBR**	**CDR**
Jan	30.92	21.73	18.35	15.48
Feb	29.17	17.71	16.40	13.63
Mar	32.21	20.13	16.37	14.98
Apr	26.77	21.01	14.65	14.78
May	22.35	17.47	13.65	13.21
Jun	19.43	15.21	12.15	11.36
Jul	18.58	17.78	13.15	12.52
Aug	19.57	16.92	14.33	12.99
Sep	23.85	17.86	14.51	12.52
Oct	30.79	20.35	17.28	12.76
Nov	36.03	24.88	19.41	15.14
Dec	35.43	28.31	16.95	15.75

Notes: 1) All rates above are calculated by using a constant denominator - being the respective populations according to the 1941 census. So, all these rates effectively reflect monthly variations in the numbers of registered births and deaths. And these average monthly births and deaths schedules are used in the calculation of the conception and mortality indices. 2) Due to non-availability of data on urban births by month prior to 1940 the urban CBRs are the averages of 1940 and 1941. All monthly rates are annualized by being multiplied by 12.

Sources: Bengal Public Health Report cited in Table 5.5.

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