DEMOGRAPHIC RESPONSES TO FAMINES IN SOUTH ASIA

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1 INTRODUCTION

Definitions and discussions of famine often refer to its demographic consequences.[1] Most frequently, famine is seen as a process leading to widespread excess deaths by starvation. Since young children and old people are usually regarded as being the most vulnerable age groups, it has often been assumed that they probably experience the largest proportional increases in death rates. A reduction in the birth rate is also commonly seen as part of the famine process; in particular - and very much as a secondary response -a decline in births is assumed to occur about nine months after the increase in deaths. Finally, migration is manifestly a major feature of most famines.

Yet despite the widespread acceptance of these and other statements about the demographic consequences of famine, it is also generally agreed that there is a chronic shortage of data with which to study famine demography. Indeed, this lack of data is sometimes attributed partly to the social and administrative disruption which occurs at times of famine.

Two analyses of famines in the Indian subcontinent have been particularly influential in shaping modern views about demographic responses. The first is Amartya Sen's treatment of mortality during the 1943-44 famine in Bengal (see Sen 1981). His analysis is frequently cited not only for its estimate of mortality (according to Sen, some three million excess deaths) but also because of its conclusion that there was an extended 'tail' of deaths. To quote him: 'The size of mortality did not return to the pre-famine situation for many years after the famine ...' (1981: 215). The second influential work is Lincoln Chen and Alauddin Chowdhury's analysis of the 1974-75 famine in Bangladesh (Chen and Chowdhury 1977). This is cited, for example, to substantiate the view that children and the elderly experience the greatest proportional increases in death rates.[2]

The present article addresses some of the issues raised in the previous paragraphs. In the next section, by way of a case study of Central Provinces, we illustrate some of the key demographic regularities which characterized major Indian famines of the late nineteenth century (such as those of 1876-78, 1896-97 and 1899-1900). The subsequent section is devoted to the Bengal famine of 1943-44 and the Bangladesh famine of 1974-75; we examine in what ways these two crises conformed to the regularities of the earlier nineteenth century famines, and in what respects they were distinct. The final substantive section of the article is a brief comparison of some of the demographic aspects of the food crises which occurred in Bihar in 1966-67 and Maharashtra in 1970-73.

In the light of our examination of the demographic responses during these various famines, we contend that some of the preceding views about the demography of famine are either wrong, or at least require significant qualification. This is particularly true apropos the mortality effects of famine.

2 LATE NINETEENTH CENTURY FAMINES: A CASE STUDY OF CENTRAL PROVINCES

Despite frequent pronouncements that there is a dearth of data with which to assess the demographic consequences of famines, there is in fact a huge quantity of very detailed demographic material for India which was collected on famines during British colonial rule. The single most important source is vital registration (i.e. registration of births and deaths). Those few scholars who have taken the time to study this information include Roland Lardinois (1985), Michelle McAlpin (1983) and Elizabeth Whitcombe (1993 in press). However, in general, it is fair to say that this rich data source has largely been ignored. This failure to properly address the historical record is unfortunate because, with due caution, it can undoubtedly shed valuable light on the demographic

1 This paper draws on several recently published articles on the demography of South Asian famines. For further details on many of the points made here see Dyson (1991a, 1991b, 1992) and Dyson and Maharatna (1991 and 1992).

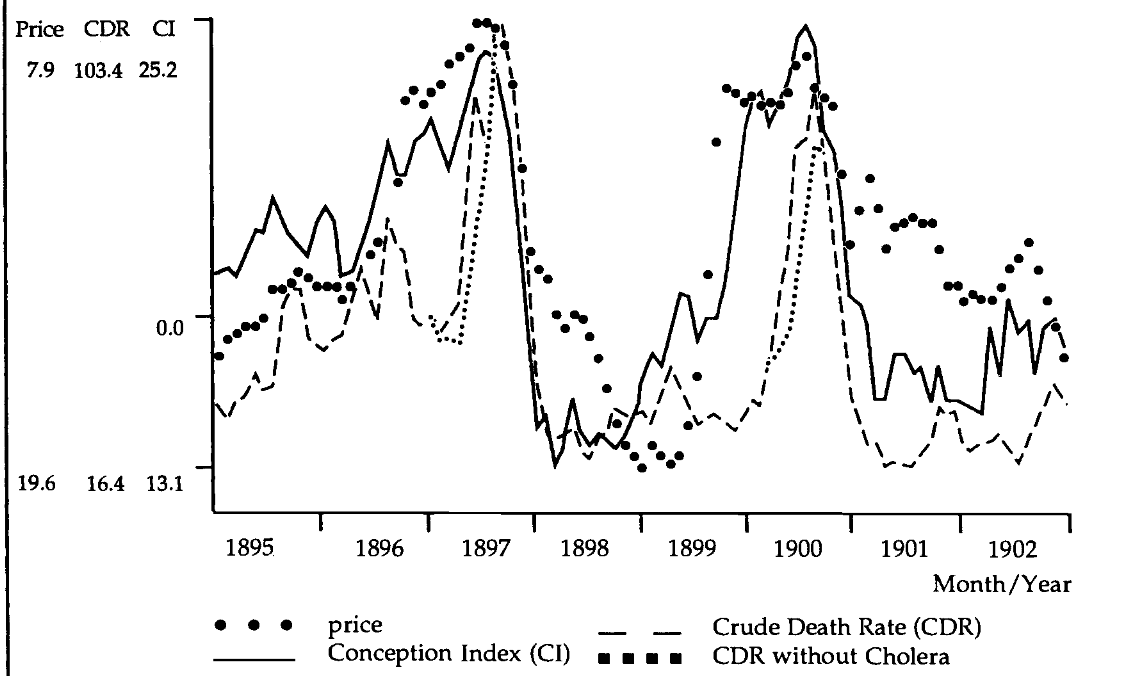
2 Valuable general articles on the demography of famine which sometimes exemplify points made in the first three paragraphs of the present article are: Bongaarts and Cain (1982), Hugo (1984) and Watkins and Menken (1985).

dynamics of famines in the contemporary world. In many respects the registration data and other demographic material available for historical Indian famines is better than that available for more recent crises which have occurred in Asia or Africa. And while it is certainly true that these historical famines did sometimes adversely affect the level of birth and death registration, on other occasions it was probably the case that registration coverage actually improved - not least because extra personnel were brought in specifically to register famine deaths and births.

We now demonstrate the value of this historical record. For the population (of about nine million) of Central Provinces in British India, Figure 1 shows monthly time series of staple food prices, death rates and an index of conceptions for the period 1895-1902. The conception index shown is essentially based on deviations of the registered monthly birth rate from its normal average level during the prefamine period 1891-94. These deviations were displaced by nine months in order to correspond to the presumed time of conception. It is important to bear in mind that, because of the way in which it has been calculated, an increase in the conception index in Figure 1 indicates a decline in the level of conceptions.[3]

Figure 1 shows obvious demographic reactions during the two major famines of 1896-97 and 1899-1900. The trigger for the first famine was the failure of the crucial southwest monsoon rains during the period June to October in late 1896; the second famine was precipitated by the corresponding monsoon failure in the second half of 1899. With this as background, Figure 1 illustrates several key features of major Indian famines which were triggered by the failure of monsoon rains.

Figure 1: Food Price, Conception Index and Crude Death Rate by Month, Central Provinces, 1895-1902



Source: Dyson (1991a)

3 The price series in Figure 1 is an average for wheat, rice and large millet. For further details of this and the conception index in Figure 1, see Dyson (1991a: 12). For discussion of the validity of estimating conceptions by shifting births by nine months, see also Dyson (1992: 107-9), and Menken and Campbell (1992: 91-2).

First, the initial reaction to the failure of the monsoon rains was a steep rise in food prices and, at about the same time, a sharp reduction in the level of conceptions. Both these responses were virtually instantaneous - they occurred in the second half of 1896 and 1899 which were the two years of monsoon failure (see Figure 1).

Second, there was no corresponding immediate increase in the death rate. On the contrary, in both famines death rates during the initial months of the crisis were relatively low. Thus as late as April of 1897 the death rate was smaller than it had been in the same month of 1896, even though the prevailing high food prices and reduced level of conceptions leave little doubt that the population had already been in a state of severe privation for several months. Likewise, the official famine report on the 1899-1900 famine in Central Provinces specifically remarked on '...the extreme healthiness of the first four months of the famine ...'[4]

Third, the major peak in the death rate occurred approximately twelve months after the initial rise in food prices and decline in conceptions. Thus in the first famine the death rate peaked in September of 1897. And in the second famine the death rate climaxed in August of 1900. Figure 1 shows that in both famines cholera broke out relatively early in the famine process. But nevertheless, the bulk of the increase in deaths in both crises occurred about one full year after the start of the famine.

Fourth, the major rise in the death rate was essentially a massive exaggeration of the normal seasonal peak in mortality - which usually occurred during and just after the southwest monsoon rains, in the latter half of the year (see Figure 1).

Finally, Figure 1 strongly suggests that the already depressed levels of conceptions in the population were depressed still further by the major peaks in famine deaths which occurred during the second halves of 1897 and 1900. So in both famines, the initial declines in conceptions which occurred at the time of the rises in food prices were further compounded by the later rises in deaths.

All of the above five features seem to have been common regularities in major historical South Asian famines that were precipitated by a failure of the monsoon rains. And several factors - especially patterns of migration and epidemic malaria - are important in accounting for these interrelated demographic regularities. Accordingly, we now offer a stylized explanation.

Not surprisingly, when it became apparent that the monsoon rains were likely to be insufficient the price of basic foodstuffs rose. The broadly simultaneous reduction in conceptions may have had a biological component. But the most likely explanation involves a mix of social factors, including reduced coital frequency and the separation of couples by the onset of sex-selective migration in search of employment or food. The death rate initially did not increase very much, because the drought which triggered famine also greatly reduced the incidence of malaria (and perhaps some other monsoon-related diseases as well). The initial rise in famine deaths - its 'cutting edge' so to speak - was caused by cholera, which was no doubt partly stimulated by famine-induced migration and congregations of people. But the main famine peak in deaths occurred broadly simultaneously with the return of the rains. In all probability the monsoon rains which 'broke' the famine also helped to stimulate major outbreaks of malaria and other coincident diseases. In accounting for these huge peaks in famine mortality which occurred towards the end of the crises, we need to bear several possibilities in mind. These include: the weakened physiological state of the population, which had been through an extended period of great stress; the lower-than-usual levels of acquired immunity to malaria, which ironically probably partly reflected the original failure of the monsoon rains which triggered the crisis about a year before; the introduction of new strains of malaria into communities as migrants returned home at the end of the famine; and, perhaps, the start of the recovery of the population's nutritional status from very low levels - since it may be that malaria and some other diseases are actually reactivated in human populations by refeeding (see, for example, Murray, Murray, Murray and Murray 1976, 1990). But whatever was the precise mix of causes for these huge peaks in deaths, it is clear from Figure 1 that the associated burdens of increased sickness in the population also acted to further depress the already reduced levels of conceptions.

4 Emphasis added. For the full source of this quotation see Dyson (1991a: 16).

In all of the major nineteenth century famines studied as part of the present work, the percentage increase in male deaths was greater than that for females. Several factors are probably relevant in explaining this differential; they include higher levels of female body fat and the likely greater propensity of males to migrate - thus exposing them differentially to the weakening effects of physical movement and infectious diseases.

However, an additional explanation is suggested by Figure 1. It shows that the original reduction in conceptions pre-dates the main rise in deaths by approximately a year. Thus the reproductive status of the female population at the time of the main famine death peak was radically different compared to normal times. In particular, a much smaller proportion of women were either pregnant or in the early stages of lactation. Clearly, this is a fact which could only 'benefit' the position of women (rather than men) when the major death peak occurred.[5]

Turning to the age distribution of famine deaths, the largest absolute increases in death rates indeed occurred to young children and old people. Nevertheless, the largest proportional increases in death rates tended to occur to older children and adults; perhaps this is not surprising, since these age groups (i.e. older children and adults) tended to experience relatively low death rates during normal times.[6]

One final important feature which emerges from our study of major historical Indian famines is the element of contingency between the occurrence of a famine and the occurrence of an increase in deaths. Most famines did involve increased mortality. But enough has been said already to emphasize that epidemics - especially of malaria - were essential elements if there were to be major peaks in deaths at the aggregate level. Indeed, until these epidemics broke out, death rates during famines were often lower than normal. Paradoxically, it may even be that a certain level of human undernutrition has a protective effect by inactivating malaria, and perhaps some viruses and bacteria (see Murray and Murray 1977). Certainly, there is little evidence to suggest that starvation by itself elevated death rates above their normal level. Furthermore, provided that the monsoon rains returned in a way that was unconducive to malaria transmission it was possible for a famine to occur with only a modest increase in deaths. For example, this may have happened in Bombay Presidency during the same famine of 1899-1900.[7]

However, the argument can be taken further still. In some historical famines it seems undeniable that the overall level of mortality actually improved. Arup Maharatna has made a particular study of such crises (see Maharatna 1992). A good example is the famine which afflicted parts of Bombay Presidency in 1905-06. Due to poor monsoon and winter rains, crops in 1905-06 failed in over half the sown area and agricultural output was only about a quarter of the normal level. Nevertheless, the crude death rate, which had averaged over 40 deaths per thousand during 1901-04, fell to about 32 in 1905, 35 in 1906 and 33 in 1907. One possible explanation is that the hot, dry conditions which brought famine also caused a reduction in plague, insofar as they were inhospitable for the plague-carrying rat flea ***X. cheopis*** (see Gottfried 1983: 9). In addition, Maharatna argues that the provision of relatively timely and liberal relief was also crucial in averting large scale mortality (Maharatna 1992: 148). The idea that measures of famine relief may sometimes actually reduce death rates below normal will also be suggested in our discussion of the Maharashtra famine of 1972-73 below (see Section 4).

3 MAJOR FAMINES IN EASTERN SOUTH ASIA: BENGAL, 1943-44; BANGLADESH, 1974-75

There are two main reasons why it is appropriate to devote a little space here to a reconsideration of the Bengal and Bangladesh famines. First, they occurred in a somewhat different ecological and agricultural setting to the type of famine examined in the previous section. Thus malaria in eastern South Asia in 1943-44 had a somewhat different epidemiology to that which prevailed, for example, in Central Provinces. More importantly, neither the Bengal or Bangladesh famines were triggered by monsoon

5 According to Rosenberg (1973: 40) on the basis of data for Bangladesh, about 75 per cent of women aged 20-39 might normally be pregnant or lactating at any one time. The material on major nineteenth century famines suggests that this proportion could be reduced by a half or even more.

6 Conversely, we would not expect large proportional increases at ages where absolute death rates were very high. Menken and Campbell (1992: 95-7) rightly state that absolute increases may be more important than proportional increases. Probably both perspectives are required when considering famine mortality.

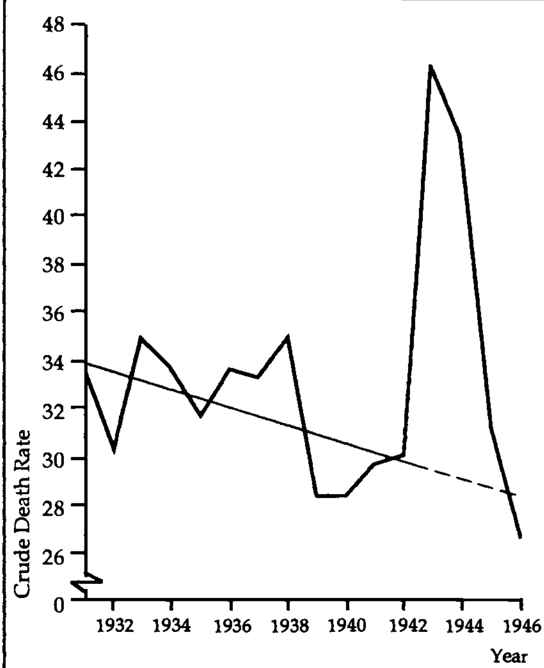
7 For more information, see Dyson (1991a: 17-18).

failure and drought. Instead, they had a more complicated aetiology involving, among other things, both inflation and war. Consequently, it is of interest to ask in what ways these major famines conformed to the basic pattern of demographic responses which we have already described, and in what ways they were distinct.

The second reason for addressing these famines is that the aforementioned influential analyses of these crises by Sen (1981) and Chen and Chowdhury (1977) both used data which were flawed. As a result, they have led to some questionable conclusions.

In the case of Sen's analysis of the 1943-44 Bengal famine, he largely relied upon data from a 1951 Indian census report for West Bengal - parts of which (e.g. the age distribution of famine deaths) were entirely concocted.[8] Perhaps more important, Sen - and indeed virtually all other scholars who have studied this famine - have evidently been unaware that very detailed monthly demographic data for undivided Bengal (i.e. for the whole Province subject to this disaster) are available for virtually all of the famine period.[9] Sen's use of the West Bengal data led to several doubtful conclusions. For example, that the time pattern of famine mortality lasted for many years after the famine (1981: 215).

Figure 2: Reassessment of Excess Mortality During the Bengal Famine of 1943-44



Source: see footnote 10.

In fact, as Figure 2 shows, the newly unearthed registration data for undivided Bengal does not show this pattern.[10] On the contrary, by 1945 the registered death rate, though slightly above the linear trend of 1931-42, was still well within the usual bounds of annual fluctuation. Indeed, the registered infant mortality rate in 1945 was slightly below its linear trend of 1931-42. The all-India Public Health Report for 1945 stated that 'The deterioration in health conditions [in Bengal] that started with the famine in 1943 gradually disappeared by the middle of the year 1945'.[11] The same seems to have been true for excess mortality. There was no extended tail.

Sen's conclusion that the 1943-44 Bengal famine caused roughly 3 million excess deaths has been widely cited. But because of the newly unearthed data for undivided Bengal, it too needs amending. Table 1 applies exactly the same method and assumptions that Sen used for West Bengal to the data for the whole of undivided Bengal. As can be seen, it produces an estimate of 1.8 to 1.9 million excess deaths. A slightly more sophisticated approach, which *inter alia* takes the pre-famine downward trend in the death rate into account (essentially estimating the area under the curve in Figure 2) produces an estimate of 2.1 million. Even allowing for underregistration and other biases, it seems unlikely that there could have been 3 million excess deaths in the Bengal famine (see Dyson and Maharatna 1991).

Turning to the more detailed demographic dynamics of the 1943-44 famine, in several respects they do

8 The census report is Census of India, 1951, Vol. VI, part 1B, Vital Statistics, West Bengal 1941-50, Manager of Publications, New Delhi.

9 The sources of these rediscovered data are given in Dyson (1991b: 280). For a detailed district-level analysis of the famine using these and other previously neglected data, see Maharatna (1992).

10 Figure 2 graphs the 'Assumption 2' scenario detailed in Dyson and Maharatna (1991). This essentially involves accepting Sen's assumptions as to the degree of death underregistration.

11 See Statistical Appendices to Annual Report of the Public Health Commissioner with the Government of India for the Year 1945, New Delhi, 1948, p 39.

Table 1: Registered Deaths in Undivided Bengal, 1941-46: A Re-Estimation of Excess Famine Deaths Using Sen's Method and Assumptions

	Year	Deaths	Excess Deaths	
			('Normal' mortality = average deaths in 1941-42)	('Normal' mortality = deaths in 1942 alone)
	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

Note: The correction factor assumed for death underregistration is 1.51.

Source: Dyson and Maharatna (1991)

conform to our earlier generalizations. Thus the decline in conceptions occurred long before the rise in the death rate; the major increase in deaths was essentially a huge exaggeration of the normal seasonal peak in mortality, which in Bengal occurred around November-January and was heavily influenced by malaria; males were slightly harder hit than females; and again in proportional terms, young children and the elderly experienced comparatively small increases in death rates.

Perhaps the most distinct feature of the demographic response to the Bengal famine relates to conceptions/births. Possibly because of the particularly complex antecedents of this famine, the decline in conceptions began as early as 1941, and lasted until 1945. This said, the minimum number of conceptions occurred in late 1943 - broadly coincident with the main peak in deaths. Lastly, in accounting for the huge peak in famine deaths, it seems unlikely that reduced levels of acquired immunity to malaria are germane to the explanation; this is because the usual partly-malaria induced peak in deaths did occur in late 1942.

Finally in this section, we briefly consider the Bangladesh famine of 1974-75. By the 1970s Bangladesh was relatively free of malaria, and the overall level of mortality had greatly improved compared with colonial days. Unfortunately, the demographic effects of this famine can only really be assessed using longitudinal data from the Matlab demographic surveillance system, which at the time covered only a relatively small population of about a quarter of a million people. Thus even in the year of maximum mortality in Matlab (1975) only about 5,400 deaths were recorded - which is a small number with which to evaluate changes in the age and sex distribution of famine mortality. Nevertheless, it is largely on the basis of Chen and Chowdhury's (1977) analysis of Matlab data that the impression has arisen that young children and the elderly experienced the largest proportional increases in death rates.[12] And their analysis has also somehow come to be interpreted as indicating that female mortality rose by more than male mortality.[13]

We take this opportunity to put the record straight on these two counts. Chen and Chowdhury's annual data on the age distribution of famine deaths were in fact all displaced by one year. Thus, for example, when they examined rates for 1973-74 the rates actually related to 1972-73. And the rates presented for 1974-75 actually related to 1973-74. This and several other considerations mean that no really reliable indications can be gleaned from their data as to the age distribution of famine deaths. In fact, examination of available adjusted data for a larger population within Matlab suggests that the age pattern of famine mortality in Bangladesh in

12 See, for example, Watkins and Menken (1985: 654-6).

13 See, for example, Alamgir (1980: 145).

1974-75 may indeed have been broadly similar to that of the earlier crises examined above (Dyson 1991b: 290-92).

Turning to the sex differential in famine mortality, the Matlab data clearly show that male mortality increased most. Thus in 1975 - the main year of famine mortality - 51.6 per cent of all deaths were to males, whereas the average figure for neighbouring years for which comparable data are available (1974, 1976 and 1977) was only 49.5 per cent.

As in the 1943-44 Bengal famine, the decline in conceptions occurred long before the rise in the death rate. Indeed, the time path of conceptions in the period before, during and after the 1974-75 famine is very reminiscent of that for the 1943-44 crisis. Again, deaths in Matlab during the famine rose most steeply at the time of their normal seasonal increase i.e. in the second half of 1974. However, in this case there may have been a 'tail' of mortality, since the number of registered deaths remained above average throughout most of 1975 (indeed, as has already been mentioned, according to the Matlab data 1975 was the main famine year). This said, it is possible that some of the registered mortality in 1975 actually reflects delayed registration of deaths which occurred earlier, but were only reported as migrant relatives return home to the Matlab surveillance area. So the degree to which there actually was a 'tail' of deaths in the Bangladesh famine could well have been exaggerated by the Matlab data. It is certainly conceivable that in this crisis too, famine mortality was essentially a huge magnification of the usual seasonal pattern of deaths.

For reasons which should now be fairly clear, the demographic surveillance data for the Matlab area of Bangladesh do not always constitute a firm basis with which to draw conclusions about demographic responses during the 1974-75 crisis. The contrast with the Bengal famine of 1943-44, when a system of vital registration was in operation, is very considerable. History does not repeat itself in a simple way. And, to reiterate, by the 1970s the epidemiological and demographic situation had change significantly, not least through the great gains which had been made against malaria. Nevertheless, there can be little doubt that the demographic time series available for the 1943-44 famine provides a valuable basis with which to assess the events in Bangladesh in 1974-75.[14]

4 POST-INDEPENDENCE CRISES: BIHAR 1966-67; MAHARASHTRA 1972-73

Of course, since Independence in 1947 India as it is presently constituted has managed to avoid famines on the disastrous scale of, say, Bengal in 1943-44. While we cannot go into the reasons for this here, the explanation clearly lies in a combination of political, economic, demographic and epidemiological changes.

Nevertheless, smaller famines have occurred - although, as in Bangladesh, the regrettable deterioration in vital registration has made it much harder to assess them. This said, a brief consideration of the events in Bihar in 1966-67 and Maharashtra in 1972-73 is worthwhile, partly because these two food crises have recently featured prominently in the writings of Jean Drèze (see Drèze 1990 and Drèze and Sen 1989) and partly because they illustrate both the utility and complexity of using demographic data to make inferences about the dynamics of contemporary famines.

Essentially the view propounded by Drèze (1990) is that famine relief efforts in Bihar were poorly directed, and that as a result there may have been substantial excess mortality. In contrast, he arrives at a much more favourable conclusion about the distribution of relief measures in Maharashtra, where in his view any resulting mortality increase was probably only marginal. Drèze's writings therefore raise two distinct but related issues regarding famine mortality - namely its level and distribution.

In fact it is very difficult to be sure whether there was any excess mortality in Bihar in 1966-67. The annual crude death rates (CDRs) produced by the state's vital registration system are virtually useless, because they are heavily biased by abrupt changes in the numerators and denominators which have been used. The annual registered infant mortality rates (IMRs) for Bihar do not suffer from this problem, although they are clearly very deficient in level. This said, the fact is that the IMRs do not show any real sign of elevated mortality in either 1966 or 1967. So to sum up: there is actually little evidence of major

14 For a more detailed justification of this statement see Dyson (1991b).

excess mortality during the Bihar famine, although given the weaknesses of the data we cannot entirely rule it out (Dyson and Maharatna 1992).

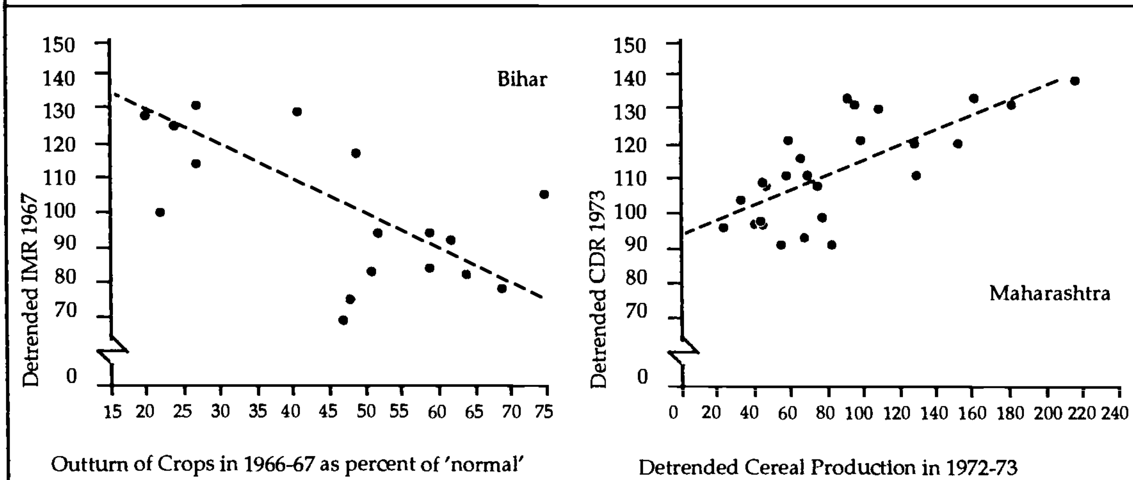
For Maharashtra there is a much better data base with which to work. It clearly shows that there was excess mortality associated with the 1972-73 drought. Using a similar analytic approach to that illustrated for Bengal in Figure 2 leads to a rough estimate of around 130,000 excess deaths in Maharashtra (Dyson and Maharatna 1992: 1328). Given our previous arguments in Section 2 above, it is noteworthy that the bulk of this excess mortality occurred just after the resumption of the monsoon rains in July-November of 1973 (Maharatna 1992: 358).

For the districts of Bihar in 1967 and Maharashtra in 1973 Figure 3 plots detrended measures of mortality (respectively IMRs and CDRs) against measures of agricultural outturn. We use detrending chiefly because the absolute levels of the mortality measures used are certainly deficient, especially for Bihar. And given these and other data considerations, we should interpret Figure 3 with some caution. Nevertheless, the Figure suggests a remarkable contrast between the distribution of mortality during these two crises. In the Bihar famine of 1966-67 the indications are that mortality rose most in those district which suffered the worst outturn of crops. Perhaps this is what many people would expect. But note too the indication that mortality was actually below trend in some other districts despite quite sharp (but lesser) agricultural production declines.

In contrast, in Maharashtra death rates rose most in precisely those districts which had relatively good cereal outturns (both measures, remember, being relative to trend). Conversely, the only districts in Maharashtra where mortality seems to have improved were those with relatively large declines in cereal production. Perhaps this is also what might be expected in a famine where provision of relief is relatively well-targeted. On the other hand, one has to account for the relative rises in death rates in the districts with better cereal outturns. While we cannot address all of the possible explanations here, one would certainly wish to consider variation in patterns of rainfall resumption. And even more important, migration into those districts which had relatively good cereal outturns (perhaps in part from those districts with large production declines) could also help explain much of the observed pattern.

To conclude, the differential slopes in Figure 3 might be considered as consistent with Drèze's view (which we do not contest) that relief was better targeted in Maharashtra than in Bihar. But it is probably only part of the explanation. And the evidence, such as it is, indicates no rise in Bihar's mortality, but a significant volume of excess deaths in Maharashtra. Such

Figure 3: Detrended Mortality Against Measures of Agricultural Outturn for the Districts of Bihar and Maharashtra



Source: Dyson and Maharatna (1992).

considerations further imply that mortality data cannot be interpreted either alone or in a simplistic way when assessing famine outcomes. All sorts of factors - such as patterns of disease, migration, relief, rainfall and perhaps even mere chance - can all enter into the picture.

5 SUMMARY AND DISCUSSION

Despite the fact that most people agree that demographic considerations are central to an understanding of famine, there has been a remarkable lack of interest in actually studying the available data. As a result, much of the demographic and social science literature on famine essentially continues to express commonplaces - most of which are oversimple, and some of which are plainly wrong. This is particularly true about interpretations of famine mortality. We now summarize and comment upon our main conclusions, stressing the complexity of the issues raised for an understanding of modern food crises.

While the avoidance of excess deaths from famine must surely always be the prime concern, it is clear that excess mortality is not an inevitable component of famine. One certainly cannot discuss famine mortality without a full consideration of relevant diseases - and often prominent among these is malaria. Young children and old people, particularly the former, probably usually constitute the bulk of famine-related deaths. This reflects both the young age structures of populations and large absolute increases in already high death rates at young and old ages. However, the South Asian evidence indicates that in major famines the precentage rises in death rates are relatively small for young children and old people (though we stress that this may rightly be considered less important than the fact of large absolute increases).

The data strongly suggest that populations reduce their conception rates long before there is any increase in mortality. A reduction in the level of conceptions is thus very much a primary and integral response to famine situations. A decline in coital frequency, for various reasons, seems the most important cause of the reduction in conceptions - but in some situations there may also be a biological component. In any event, a reduction in conceptions seems 'always' to characterize famines, whereas the same cannot be said of an increase in deaths.

In each of the five major famines examined as part of the present work, male deaths increased proportionately more than female deaths. Several factors need to be borne in mind when interpreting this finding. They include the sometimes higher level of 'normal' female death rates, greater female body fat reserves, and a probable greater propensity of males to migrate (migration being potentially hazardous). But an equally important part of the explanatory jigsaw is that the reproductive status of the female population is radically changed in famines (because of the much earlier response of conceptions to deteriorating circumstances).[15] Given these various complex and interacting considerations, we believe that attempts to deduce inferences about a society's 'preferences' in the allocation of food between family members during famines from an interpretation of the pattern of mortality increases by sex (or age) are usually naive.[16]

There is considerable evidence that the bulk of excess famine mortality normally constitutes an exaggeration of the usual seasonal distribution of deaths in a population. Furthermore, the occurrence of long post-famine periods of elevated death rates - tails of mortality - gains little support from the present work. Certainly such a 'tail' did not occur in undivided Bengal after the 1943-44 famine (and relatedly, Sen's estimate of 3 million excess deaths requires significant revision).

For anyone concerned with limiting the scale of excess famine mortality a vital piece of information is therefore likely to be knowledge as to the usual seasonal distribution of deaths in the population under threat. And a relevant observation in this connection is that death rates in many developing countries typically peak during, or just after, the rains (Crook and Dyson 1981: 141). Certainly, in the major late nineteenth century famines studied as part of the present work, the death peaks broadly coincided with the return of the monsoon.

One should always be careful about generalizing, perhaps especially apropos famine which is a phenomenon with an almost intrinsic element of unpredictability. Nevertheless, the sometime role of

15 The importance of this factor in explaining greater male mortality rises is also supported by the age and sex pattern of proportional mortality increases around the reproductive age groups (see Dyson, 1991a: 25).

16 For more on this see Dyson (1992: 111).

drought in triggering famine but actually improving mortality, and conversely rainfall in breaking famine but actually raising death rates, deserves particular emphasis in view of the special prominence of malaria throughout much of Africa today.

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