THE DYNAMICS OF CONTEMPORARY FAMINE

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Summary

This paper presents data on the demographic impact of two contemporary Bangladesh famines, due to war (1971) and crop failure (1974). Fluctuations of births, deaths, and migrations are analyzed and disaggregated. From such empirical data, an analytical framework delineating the multiple, interacting causes and consequences of famine is constructed. The framework postulates that several mutually-reinforcing viscious cycles, between infection and malnutrition and between the three demographic variables, contribute to the impact of acute nutritional crises. The implications of these findings for preventive and remedial interventions are discussed in the conclusion.

Famine has been defined as "widespread food shortage leading to a significant rise of the regional death rate."[1] The demographic component of this definition is clear; famine is a disaster characterised by large numbers of excess deaths. The strength of this definition however is also its weakness for simplicity often obscures more than it reveals. Famine in fact is a complex syndrome of multiple interacting causes, diverse manifestations, and involving all three demographic variables - mortality, fertility, and migration. A sound understanding of the complex mechanism by which disaster overwhelms the social, economic, and demographic stability of a society is essential not only for effective remedial action but also for long-term prevention.

Since 1970 Bangladesh unfortunately has experienced two tragic famines. The first in 1971 was precipitated by the Bangladesh War of Independence with Pakistan. Military hostilities caused widespread food shortage by disrupting agricultural production (dislocation of agricultural services, supplies, laborers) and impeding the

1. G. Blix, Y. Hofvander, and B. Vahlquist (eds.), Famine: A Symposium Dealing with Nutrition and Relief Operations in Times of Disasters. Almquist and Wikselle, Uppsala, Sweden, 1971.

delivery, transport, and distribution of imported foodgrain, which accounted for 15 percent of total foodgrain availability.[2] Per capita cereal consumption fell from the subsistence baseline level of 15 ounces to the near starvation level of 12 ounces (1,200 calories) daily. Malnutrition and the death rate increased markedly. The second disaster in 1974 was caused by severe monsoon flooding which destroyed the minor aus and major aman rice crops in selected areas. These crops constitute about 25 and 60 percent, respectively, of total foodgrain production. Crop failure led to unemployment, hoarding, and escalating rice prices, which eroded the purchasing power of the poor.[3] Foodgrain consumption was compromised; malnutrition and the death rate again increased sharply.

These disasters provided a unique opportunity for the study of famine because both crises affected Matlab thana, a riverine rural area 40 miles from the capital city of Dacca. Since 1966 the Cholera Research Laboratory

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2. L.C. Chen and J.E. Rohde, "Civil War in Bangladesh: Famine Averted?" in L. C. Chen (ed.), Disaster in Bangladesh: Health Crises in a Developing Nation. Oxford, New York, 1973, pp.190-205.

3. A. Akbar, "The 1974 Famine in Bangladesh," Institute of Bangladesh Studies, University of Rajshahi, Rajshahi, Bangladesh, unpublished mimeograph, 1975.

(CRL) has maintained a longtitudinal vital registration system among a population of 120,000 in Matlab thana. The prospective nature of these data and their high quality provided a unique micro-level record of the demographic impact of two contemporary nutritional crises. Details of the CRL demographic data collection system and of its reliability have been reported earlier.[4]

Demographic Fluctuations

Table 1 presents a summary of demographic rates in Matlab thana for ten complete years, 1 May 1966 to 30 April 1976.[5] As the data indicate, the two contemporary disasters exerted profound influences on all three demographic variables - births, deaths, and migrations. One year after the war (1972-73) the birth rate declined modestly but in the following year (1973-74) the rate climbed to the highest level recorded in the decade of observation. The rate fell again in 1974-75, the year of

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4. W.H. Mosley, A.K.M.A. Chowdhury, and K.M.A. Aziz, "Demographic Characteristics of a Population Laboratory in Rural East Pakistan," Population Research, Nat. Inst. Child Hlth. and Human Development, Bethesda, 1970.

5. The CRL data reported here were processed in Bangladesh by counter-sorter. The data are currently being edited, cleaned, and checked for internal consistency. Findings from other analyses of these data, therefore, may differ in minor respects from this report. The differences, if any, are likely to be minor and would not affect the basic conclusions of this study.

flooding, and declined dramatically one year after the 1974 famine. From reasonable stable levels in the 1960s, the death rate climbed markedly during the 1971 war. In 1972-73 some recovery was noted but full recovery was not attained until 1973-74. The 1974 famine marked the onset of another sharp increase of the death rate and recovery, although detectable, remained incomplete in 1975-76. The out-migration rate changed in a consistent pattern in response to the crises, increasing during both disruptions. In-migration, however, fluctuated paradoxically, rising in 1971-72 and declining in 1974-75. The overall effect of these fluctuations was a decline of the rate of natural increase during and immediately following the disasters. These declines reflected marked increases of deaths during the crisis and a combination of reduced births and incomplete recovery of deaths one year following the disasters. When net migration is combined with these fluctuating vital rates, the population growth rates during and immediately following the crises were greatly reduced. The growth rates even became negative in 1974-75.

Figure 1 was constructed to show the temporal response of births and deaths to the disasters. In the figure

the range of the highest and lowest quarterly birth and death rates for five baseline years (1966-67 to 1970-71) was plotted. Superimposed upon these were quarterly vital rates and the wholesale national price of coarse rice for the period 1971-72 to 1975-76.[6] Although there was a marked seasonal swing of baseline values, fluctuations of the quarterly birth rate followed the same pattern as the annual rate. One year (or nine months) after the 1971 conflict the birth rate declined modestly. This was followed in 1973 by an increase and beginning in 1974, the rate began a dramatic decline which intensified and extended to the end of the observation period. Fluctuations of the death rate coincided with both crises and gradual recovery was noted after the termination of the disasters.

The fluctuations of vital rates suggested that the impact of the 1974 famine was of longer duration than the effects of the 1971 disaster. Recovery in

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6. Rice price data were obtained from, Bangladesh Agriculture in Statistics, Agro-economic Research Section, Ministry of Agriculture, Government of the People's Republic of Bangladesh, Dacca, 1973, p.113.

1972-73 was far more prompt than in 1975-76. This is consistent with the chronology of the crises. The 1971 war did not affect rural areas until July when the Pakistan army carried military hostilities into the countryside.[7] The conflict ended abruptly in December and, although the damage to physical infrastructure was extensive, relief and rehabilitation activities were in full swing by early 1972. The 1974 flooding, however, destroyed the minor aus and major aman rice crops in selected areas.[8] For many farmers, particularly the landless, the winter boro rice crop would have provided insufficient food and work opportunities, and normal foodgrain consumption would not have been possible before the next aman harvest at the end of 1975.

Regarding the intensity of the disasters, the quarterly birth and death rates appeared to be paradoxical indicators. The 1974 famine exerted a more

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7. L.C. Chen and J.E. Rohde, op. cit. in footnote 2.

8. B. Curry, "The Famine Syndrome: Its Definition for Relief and Rehabilitation in Bangladesh," Johns Hopkins University Center for Medical Research, Dacca, 1976.

profound depressant effect on the birth rate but the death rate climbed to a higher level during the 1971 conflict. Objectively, the 1974 crisis was more severe than the 1971 disaster. Nutritional surveys in Matlab thana in 1972 and 1975 showed that the percentage of malnourished children after the 1974 crisis was significantly higher than the level observed after the 1971 conflict.[9] The crude death rate was a misleading and imprecise indicator because the rate in 1974-76 was artificially reduced by two biases. The first was the provision of health services for diarrheal disease by CRL. Such services were more adequate in 1974-76 than during 1971 when the conflict hampered field operations. In Table 1 crude death rates were adjusted controlling for the estimated lives saved by the CRL treatment unit.[10] The adjusted death rates clearly showed a disaster of greater intensity in 1974-75 than in 1971-72. The second factor that depressed the crude death rate

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9. R. Ryder and S. Ryder, Center for Disease Control, Atlanta, personal communication to the authors.

10. The adjusted death rates were estimated by assuming that 25 percent of the diarrheal disease inpatients residing within the study area would have died in the absence of treatment by the CRL field hospital.

in 1974-76 was the marked reduction of births. Fewer births resulted in a lower proportion of infant deaths among all deaths. In 1975-76, for example, the proportion of infant deaths to all deaths was 23 percent in comparison to 35 percent in the three preceding years. Had the crude birth rate in 1975-76 been 45, the crude death rate in 1975-76 would have been 20.8 instead of 18.2 per 1,000.

Fluctuations of the rice prices confirm that the two crises were of a different character. Rice prices surprisingly began their steep rise in 1974 even before the monsoon flooding in July. So too did the onset of the decline of the birth rate which was first noted in the last quarter of 1974. This suggested the conceptions nine months earlier were reduced at a time prior to the monsoon catastrophe. A likely explanation for this temporal inconsistency was the marked downturn in the Bangladesh economy which preceded the flooding. Food scarcity, inflation, and shortages of basic commodities were all noted in early 1974 and crop failure may have accelerated the downward trend of the economy.[11] The

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11. A. Akbar, op. cit. in footnote 3.

national rice price in 1971, in contrast, failed to exhibit any substantial elevation suggesting that the 1971 famine differed in several major respects. It is possible that the famine was marked more by socioeconomic dislocation due to hostilities than by overall food shortage. Such shortages probably existed in localized areas but may not have affected the nation overall. Moreover, socioeconomic disruption, particularly migration in response to the conflict, could have reduced employment, wages, and purchasing power (demand) more than food availability (supply). Under such circumstances the price of food may not necessarily be a reliable indicator of famine.

Impact of Famine Disaggregated

In Table 2 are presented age-specific death rates in Matlab thana for the ten year period. The mortality burden of the disasters weighed heaviest among the young and the elderly. Infant mortality and the mortality rates among children 1-4 and 5-9 years rose dramatically, as did the death rates of adults over age 45. Noteworthy were the stillbirth ratio and the neonatal (0-29 days) mortality rate which remained unaffected by either crisis. These rates were probably influenced more by long-term

biological and maternity care variables than by malnutrition and infection precipitated by an acute crisis.[12] The significant increases of the infant mortality rate were due entirely to postneonatal deaths (30 days - 11 months). Interestingly, the infant mortality rate, commonly assumed to be the most reliable indicator of the health status of a community, was only a fair indicator of the crisis. This was due to the preponderant and unchanging contribution of neonatal deaths to infant deaths. The more sensitive age-specific rates were among children ages 1-4 and 5-9 years. These rates climbed during the crises and the elevations tended to persist or even increase after the disasters. As discussed later, the persistent elevation of these rates probably reflected an increased incidence of infectious diseases which were exacerbated by the disasters.

Also significant, but not shown in Table 2, were sex differentials. During baseline years, female

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12. Others have reported increases of stillbirths and neonatal deaths during famine. C. Smith, "Effects of Maternal Undernutrition upon New-Born Infants in Holland, 1944-45," J. Pediat., 30, 1947; and A. Antonov, "Children Born during the Seige of Leningrad in 1942," J. Pediat., 30, 1947. In Bangladesh, no such increases were observed, possibly because many neonatal deaths are due to chronic maternal malnutrition, tetanus, and inadequate perinatal care-variables not influenced by acute events.

mortality consistently exceeded male mortality in all age groups except infant deaths.[13] The age-specific sex differentials were more pronounced in children 1-4 and 5-9 years and in the childbearing years. Disaster tended to accentuate even further these sex differentials, particularly among children. In 1971-72 female mortality of children 1-4 years was 57 percent higher than male mortality in comparison to a differential of 40 percent in the preceding five baseline years. Adult women however fared as well as adult men during the crises.

Disaggregating the impact of disasters by demographic characteristics however precise in incomplete because the effects of famine may vary widely between differing socioeconomic groups. It is the poor and the disadvantaged who bear the major blunt of disasters. In one rural area near Matlab thana, for example, the 1975 crude death rate among landless families was threefold that of families with three or more acres of land.[14] The differential increased to fivefold when

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13. G.T. Curlin, L.C. Chen, and B. Hussain, "Demographic Crisis: The Impact of the Bangladesh Civil War (1971) on Births and Deaths in a Rural Area of Bangladesh," Population Studies, 30:87-105, 1976.

14. C. McCord, "What's the Use of a Demonstration Project," a paper presented at the Annual Conference of the American Public Health Association, Miami, 1976.

considering deaths among children. The age-specific death rate for children ages 1-4 years, for example, was 86.5 per 1,000 among landless families in comparison to 17.5 per 1,000 among families with three or more acres of land.[15] Another example was the differing impact of the 1971 conflict on religious groups. The 1971 war probably exerted a disproportionate impact upon the minority Hindu community because the Pakistan army specifically singled out Hindus as a target subgroup.[16] Although unsubstantiated, the Hindu minority during the 1971 conflict probably experienced higher mortality and lower fertility than their Muslim counterparts. It was well documented that the majority of the ten million temporary migrants from Bangladesh to India in 1971 consisted of Hindus. This religious minority normally constitutes 15 percent of the Bangladesh population.

The Famine Syndrome

The two contemporary disasters in Bangladesh provided essential empirical information for the development of an analytic framework delineating the multiple

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15. During the 1974-75 famine, 83 percent of migrants crowded into camps in transport and urban centers consisted of landless families. A. Akbar, op. cit. in footnote 3.

16. J.E. Rohde, L.C. Chen, and P. Cardner, "Refugees in India: Health Priorities," in L.C. Chen (ed.) op. cit. in footnote 2, pp.145-166.

interacting causes and consequences of famine. This is depicted in Figure 2. A triggering event, such as war or crop failure, may precipitate widespread food shortage by disrupting agricultural production, food distribution and/or marketing. Shortages may cause an escalation of food prices which stimulates hoarding, thereby generating a viscious cycle of higher prices and more hoarding. Unemployment may increase from loss of productive employment opportunities (e.g. flooding damage to physical infrastructure) or from dislocation of workers (e.g. large-scale migration due to war). Unemployment in combination with inflation erode purchasing power, especially among the poor. Food consumption becomes compromised. Families trapped in this dilemma may compensate through the sale of assets - such as land, household goods, and farm animals and implements - and may shift to cheaper but nutritionally inferior food sources not customarily consumed.[17] In search of food or work, out-migration from distressed regions be urban

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17. Consumption of jute leaves, roots and other foods not customarily part of a diet may increase. Interestingly, in 1974-75, the price of beef fell below that of rice, since on a weight basis beef contains far fewer calories than cereal grain.

and transport centers may increase, and separation between family members may not be uncommon. Local government may become paralyzed and traditional social and economic relationships may break down. Although an increase of crime and violence has been reported in other disasters, very few of such disorders were observed in Bangladesh.

Malnutrition and Infection

The most direct effects of compromised food supply are malnutrition and death. This sequence, shown in Figure 2, was well documented in Matlab thana during the 1971 conflict. A predisaster nutrition survey found that the prevalence of moderate and severe malnutrition among children under age 10 years was 41 and 9 percent, respectively.[18] One year later a post-crisis survey employing the same nutritional standards documented that the prevalence of moderate and severe malnutrition had increased to 54 and 17 percent, respectively. The mortality risk of children during the crisis, moreover, corresponded strongly with nutrition status prior to the conflict. This is presented in Figure 3 which shows the number of survivors

18. W.B. Greenough and R.A. Cash, "Post-Civil War in Bangladesh: Health Problems and Programs," in L.C. Chen (ed.) op. cit. in footnote 2, p.248.

followed prospectively over 18 months among children ages 1-4 years according to their nutrition status prior to the crisis.[19] Of 1,000 children classified as severely malnourished in December 1970, only 860 survived to July 1972 in comparison to 970 survivors among normally nourished children.

The cause of death was rarely starvation per se; rather infectious diseases usually precipitated the terminal event. In Matlab thana, large epidemics of diarrheal diseases were noted in 1971-73 and 1974-76.[20] Cholera and shigella dysentery increased markedly but in many cases specific pathogonic organisms could not be identified. In 1971-73 there was evidence of increased mortality due to measles among children ages 1-4 and smallpox took a heavy toll, particularly among children under age 10.[21] There was also a large increase of deaths due to

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19. A. Sommer and M.S. Loewenstein, "Nutritional Status and Mortality: A Prospective Validation of the QUAC Stick," Am. J. Clin. Nutr., 28:287-292, 1975.

20. M.M. Rahman, I. Huq, C.R. Dey, A.K.M.G. Kibria, and G.T. Curlin, "Ampicillin Resistant Shiga Bacillus in Bangladesh," Lancet, 1:406-407, 1974; and D.M. MacKay, "The Effects of Civil War on the Health of a Rural Community in Bangladesh," J. Trop. Med.Hygiene, 77:119-127, 1974.

21. J.E. Rohde, L.C. Chen, and P. Gardner, op. cit. in footnote 16, p.163.

unknown causes, but unlike earlier famines, increased deaths due to tuberculosis, typhus, plague, and influenza were not documentated.[22] Interestingly, deaths due to respiratory infections did not exhibit and appreciable elevation.

Infectious disease and malnutrition acted in unison to greatly affect the death rate. As postulated in Figure 2, these two disease processes, along with socio-economic disruption and demographic change, generated several mutually reinforcing viscious cycles. Socio-economic dislocation may have enhanced the transmission of infectious diseases through such mechanisms as the breakdown of traditional water sources and waste disposal. Transmission may have been further enhanced by movement of people, particularly large-scale migration of the mal-nourished, increasing the spread of infectious organisms. Migrants, moreover, tended to congregate at transport centers or in camps leading to over-crowding. This sequence was well illustrated during the 1971 war, when Bangladeshi refugees streamed into India and were settled into temporary camps. Conditions were such that smallpox

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22. J. Mayer, "Coping with Famine," Foreign Affairs, 1974 pp.98-120.

took hold, festered in the overcrowded camps, and was reintroduced into Bangladesh with the return of the migrants in early 1972.[23] By 1972-73, Bangladesh was in the midst of another major smallpox epidemic. In addition to increased transmission, reduced host resistance due to malnutrition may also enhance the incidence and clinical consequences of infectious diseases. Infectious disease, furthermore, may exacerbate malnutrition by reducing appetite, increasing the malabsorption of nutrients in the gastrointestinal tract, enhancing energy demands, and possibly reducing the efficiency of nutrient utilization.[24] An increase of infectious diseases, moreover, may itself further transmission by increasing the number of disease carriers.

Interaction of Demographic Variables

The definition of famine confines itself to mortality, but as shown in Figures 1 and 2, fertility and migration were also profoundly affected by disaster. Moreover, these

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23. A. Sommer, N. Arnt, and S.O. Foster, "Post-Civil War in Bangladesh: The Smallpox Epidemic," in L.C. Chen (ed.) op. cit. in footnote 2, pp.225-240.

24. N.S. Scrimshaw, C.E. Taylor, and J.E. Gordon, Interaction of Nutrition and Infection, WHO Monograph Series No. 57, Geneva, 1968.

demographic variables were not mutually independent; rather the effect of disaster on any one demographic variable represented the net outcome of the crisis on all three parameters. The death rate, for example, has been shown to be a very sensitive indicator of both the intensity and duration of a crisis. Mortality however was regulated in part by fertility, since the reduction of births in 1974-76 reduced the proportion of deaths that occurred to infants, thereby deflating the crude death rate. Migration, furthermore, has been postulated to operate as a contributing factor to mortality through the transmission of infectious diseases.

The birth rate, similarly, was affected by deaths and migrations. One year after the 1971 conflict, the birth rate declined. The decline was followed by a rise in 1973 and beginning in 1974 another more dramatic decline was observed. Reduced births one year after crisis presumably reflected reduced conceptions during the disaster.[25] Famine would be expected to reduce conceptions through behavioral and biological mechanisms.

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25. Reduced births could also be the consequence of higher rates of fetal wastage. Fetal wastage rates in Matlab thana however were not affected by the crises.

Behaviorally, coital frequency may be reduced because of fear, anxiety, or the desire to postpone pregnancy. Induced abortions may increase and the number of couples entering reproductive life may diminish from postponment of marriage.[26] An intensification of malnutrition and disease could reduce conceptions by prolonging the period of postpartum amenorrhea, increasing the frequency of anovulatory cycles, or increasing fetal wastage.[27] Migration could contribute to reduced conceptions by either voluntary or involuntary separation of spouses.

The post-crisis "compensatory" rise of the birth rate in 1973 was not totally unexpected.[28] Such a rise could be due to either an increase of the proportion of women vulnerable to conception or an increase of the conception rate among these women or both. A post-crisis

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26. K.M.A. Aziz, private communication to the authors.

27. The role of maternal nutrition in postpartum amenorrhea, anovulatory cycles, and fetal wastage has been postulated by several authors. For a review, see: R.E. Frisch, "Demographic Implications of the Biologic Determinants of Female Fecundity," Social Biology, 22:17,1975.

28. Compensatory rises of the birth rate were observed in several historical famines, see: E.A. Wrigley, Population and History, Weidenfeld and Nicolson, London, 1969, pp.62-76.

rise in the proportion of women vulnerable to conception was expected because of: the continued vulnerability of women who normally would have conceived during the crisis but had failed to do so; the premature return of ovulation due to the termination of lactation among women who experienced death of young children; and the clustering of new marriages that were deferred by the crisis. The conception rate among these women could be higher after disaster because of improved health status or changes in fertility behavior due to attitudinal factors such as the desire to replace lost children.[29]

Migration not only may influence fertility and mortality, through the mechanisms postulated earlier, but also may affect the measurement of vital rates. As shown in Table 1, outmigration increased during both crises but in-migration fluctuated paradoxically, increasing in 1971-72 and decreasing in 1974-75. Movement during crisis presumably reflects the net effect of various "push" and "pull" forces.[30] Out-migration during

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29. S.H. Preston, "Health Programs and Population Growth," Population and Development Review, 1:189-200, 1975.

30. J. Stoeckel, A.K.M.A. Chowdhury, and K.M.A. Aziz, "Outmigration from a Rural Area of Bangladesh," Rural Sociology, 37:236, 1972.

the crises probably increased for different reasons. In 1971 many people temporarily migrated into India to escape the hostilities. The 1974 flooding and crop failure however affected low-lying riverine areas such as Matlab thana more so than high land or urban centers. Rural People, in this case, moved in search of food and work. In-migration in Matlab thana increased in 1971-72 probably because hostilities associated with the conflict were more severe in urban centers. Rural area, such as Matlab thana, would have constituted a relative haven from danger. Such "push" forces were absent in 1974. In fact the major impact of the crop failure was experienced in rural areas, since urban centers were provided with imported foodgrain through ration shops. Not surprisingly therefore in-migration into Matlab thana during 1974-75 decreased.

Migration, it should be emphasized, is invariably selective. Out-migrants from a distressed area would be expected to consist of population subgroups most affected by a crisis. In-migrants would be expected to represent those population subgroups most affected in adjacent rural areas or nearby urban centers. Measurement of births and

deaths that confine themselves to permanent residents of a single area, therefore, are subject to bias. Omitted are those subgroups who moved away and who would have been expected to experience the most extreme fluctuations of vital rates.

Discussion

That famine is a complex syndrome involving multiple interacting variables appears to be well substantiated by this empirical study. Of the three demographic variables, mortality is the most sensitive and consistent indicator of the severity and duration of a crisis. But mortality is influenced by fertility and migration, and mutual interactions between the three are possible. Mortality was the most discriminating index in identifying subgroups of the population at highest risk to the adverse impact of disaster. The young and the elderly were especially vulnerable and, in Bangladesh, young girls were at very high risk. Adult men and women fared better than those at the extremes of life. Disaster also affected disproportionately the poor and the disadvantaged and, depending on the nature of the crisis, other subgroups may also bear a disproportionate share of the burden.

An understanding of these differentials and the complex mechanism of famine have important implications for disaster intervention programs. Food needs to be channeled to those subgroups in greatest need. Food programs, moreover, should be accompanied by preventive and curative health services to interrupt the viscious cycle of malnutrition, infection, and death. Services delivered directly to distressed areas are likely to be more effective not only in reducing hunger among the most needy but in steamming the tide of migration. Feeding programs at transport or urban centers would provide relief to the destitute but at the cost of encouraging migration and overcrowding. Government policies and programs to stabilize or reduce food prices, minimize hoarding, generate employment, and rehabitate physical infrastructure would all contribute to recovery.

One major limitation of demographic indicators is that they are responsive to a crisis only after it has already occurred. Earlier warning signals are needed to strengthen disaster preparedness. Ongoing monitoring of climatic change, statistics on agricultural production, survey of food prices, and surveillance of nutrition status

are among the signals that deserve exploration in the development of an effective early warning system. Even more important, of course, is long-term prevention of disasters. Development of infrastructure - such as reforestation, irrigation, drainage, introduction of new crops, and better food storage - would reduce the adverse impact of flooding and crop failure. In the long-run, protection against disaster would be strengthened by rural development involving the adoption of new technologies and fundamental socioeconomic change. Such advances, however, would not eliminate manmade disasters such as the 1971 conflict.

One aspect of disaster that deserves emphasis is the fact that crisis exposes and highlights conditions that prevail during normal times. Malnutrition and premature death are all too common in disaster-prone countries like Bangladesh during non-crisis periods. Disaster simply exacerbates the chronic situation but it attracts more public attention. Another dimension of disaster not customarily considered is the irreversibility of the impact among some victims. Those who die during a catastrophs are obvious examples. Another subgroup is the

population of Bangladesh would be 170 million by the year 2000. Should disasters strike Bangladesh twice every decade (in the first and fifth year) and should the growth rate be reduced to 2 percent in the year of and in the year following the crises, the Bangladesh population by 2000 would be 151 million. Under these assumptions, a net reduction of 19 million or 11 percent from a population of 170 million would be achieved at the cost of six major catastrophes. Surely the focus of population scientists on socioeconomic development and fertility control as the most effective and humane means of reducing rapid population growth is not unfounded.

Table 1

Crude rates (per 1,000) in Matlab thana, Bangladesh, 1966-67 to 1975-76

Rates	Year 1966-67	1967-68	1968-69	1969-70	1970-71	WAR 1971-72	1972-73	1973-74	FLOODING 1974-75	1975-76
crude birth	46.8	45.2	46.4	45.2	43.6	44.5	41.8	47.8	40.1	27.6
crude death	16.0	17.2	15.7	15.1	14.6	21.3	16.4	14.6	20.0	18.2
crude in-migration	-[a]	-	28.1	26.0	31.2	34.1	23.8	13.4	14.1	23.8
crude out-migration	-	-	29.7	30.7	22.4	35.0	35.1	15.7	41.6	34.2
crude natural increase	30.8	28.0	30.7	30.1	29.0	23.2	25.4	33.2	20.1	9.4
population growth	-	-	29.1	25.4	37.8	22.1	14.1	30.9	- 7.4	- 1.0
adjusted crude death	16.9	18.0	17.4	18.3	16.6	23.0	17.3	15.6	24.6	20.8

a. Migration rates for 1966-67 and 1967-68 are omitted because the definition of migration was changed beginning 1968-69.

Table 2

Stillbirth ratio, infant mortality rate, and age-specific death rates in Matlab thana, Bangladesh, 1966-67 to 1975-76

	Year									
						WAR			FLOODING	
Rates	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76
Stillbirth ratio[a]	33.0	42.6	39.6	35.4	33.2	37.8	39.3	36.1	37.1	40.0
Infant mortality rate[a]	110.7	125.4	123.8	127.5	131.3	146.6	129.2	128.8	167.2	150.4
neonatal	59.5	67.8	82.9	87.5	89.9	86.9	71.9	81.1	74.8	71.0
postneonatal	51.2	57.6	40.9	40.0	41.4	59.7	57.3	47.7	92.4	79.4
Death rates[b]										
ages 1- 4	24.9	29.4	23.8	23.1	27.9	25.8	36.9	22.7	29.7	32.7
5- 9	4.1	5.0	3.9	3.3	2.3	3.7	11.4	14.1	6.5	12.3
10-14	1.7	2.1	1.7	1.0	1.3	1.6	2.2	2.0	1.6	1.2
15-44	4.1	4.4	3.7	3.8	2.7	3.7	5.1	2.9	4.4	3.8
45-64	15.3	17.9	17.4	17.9	14.4	16.6	20.0	14.7	23.8	25.1
65 over	67.9	79.3	74.4	71.1	72.9	73.1	119.1	96.5	109.3	100.1

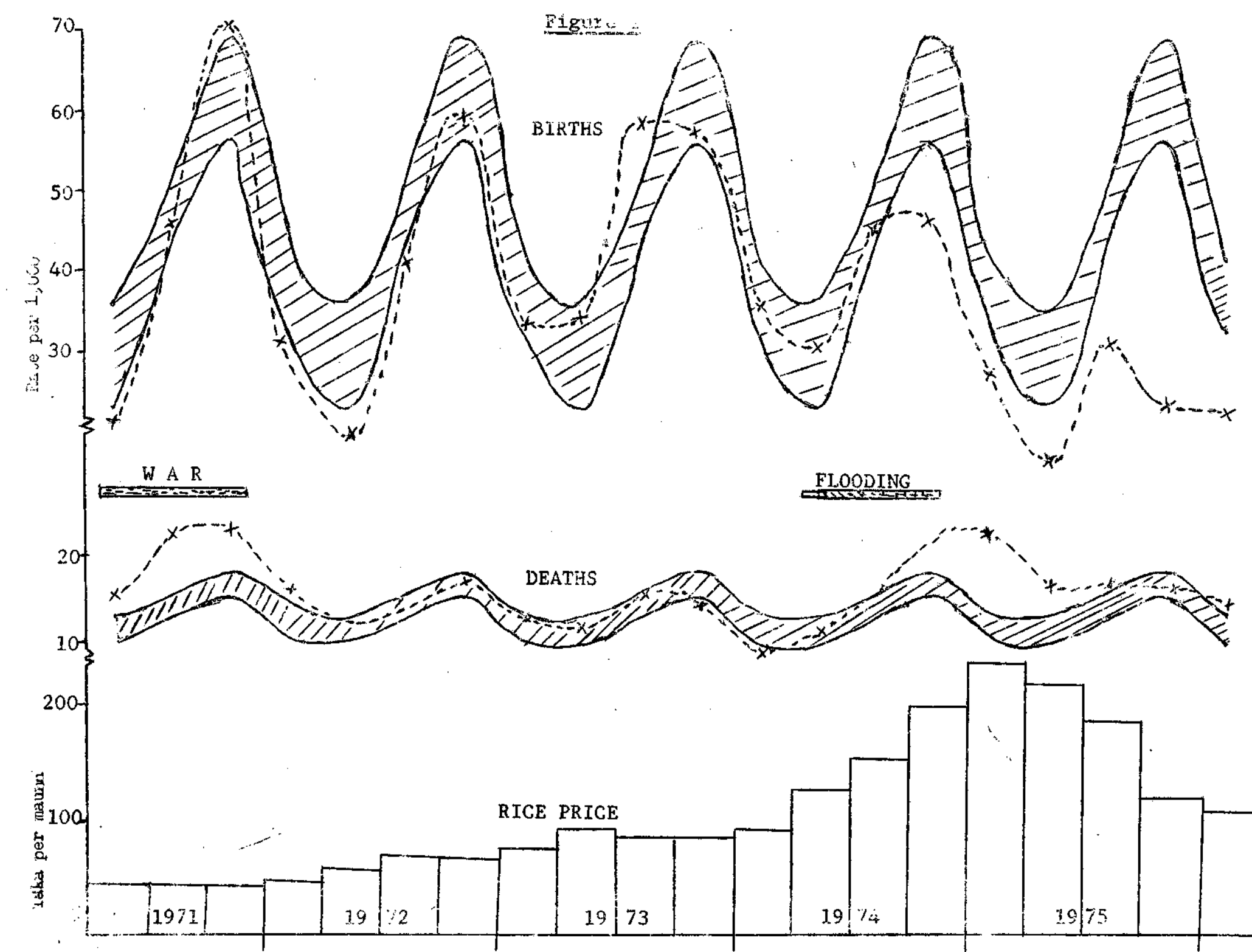
a. per 1,000 livebirths
b. per 1,000 population

Legend for figures

Figure 1. Lowest and highest quarterly crude birth and death rates (per 1,000) in Matlab thana during five baseline years (1966-67 to 1970-71) and average quarterly birth and death rates and quarterly wholesale prices (taka per maund) of coarse rice in Bangladesh from 1971-72 to 1975-76.

Figure 2. Postulated interaction of food shortage, socioeconomic dislocation, and demographic variables during famine.

Figure 3. Number of survivors among children ages 1-4 years followed prospectively over 18 months according to nutrition status.



Figure
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RICE PRICE
1971
19 72
19 73
19 74
19 75

Figure 2

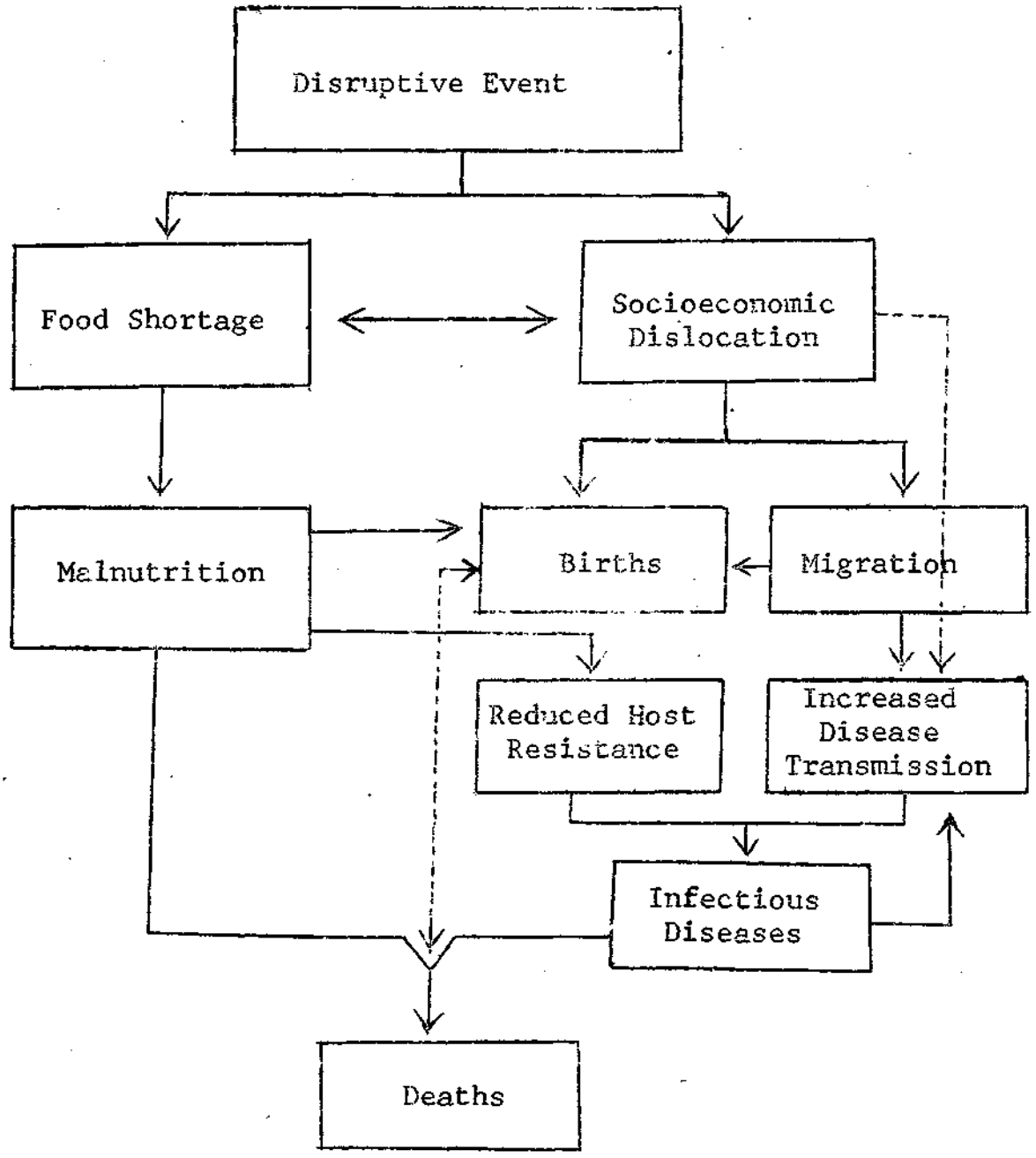
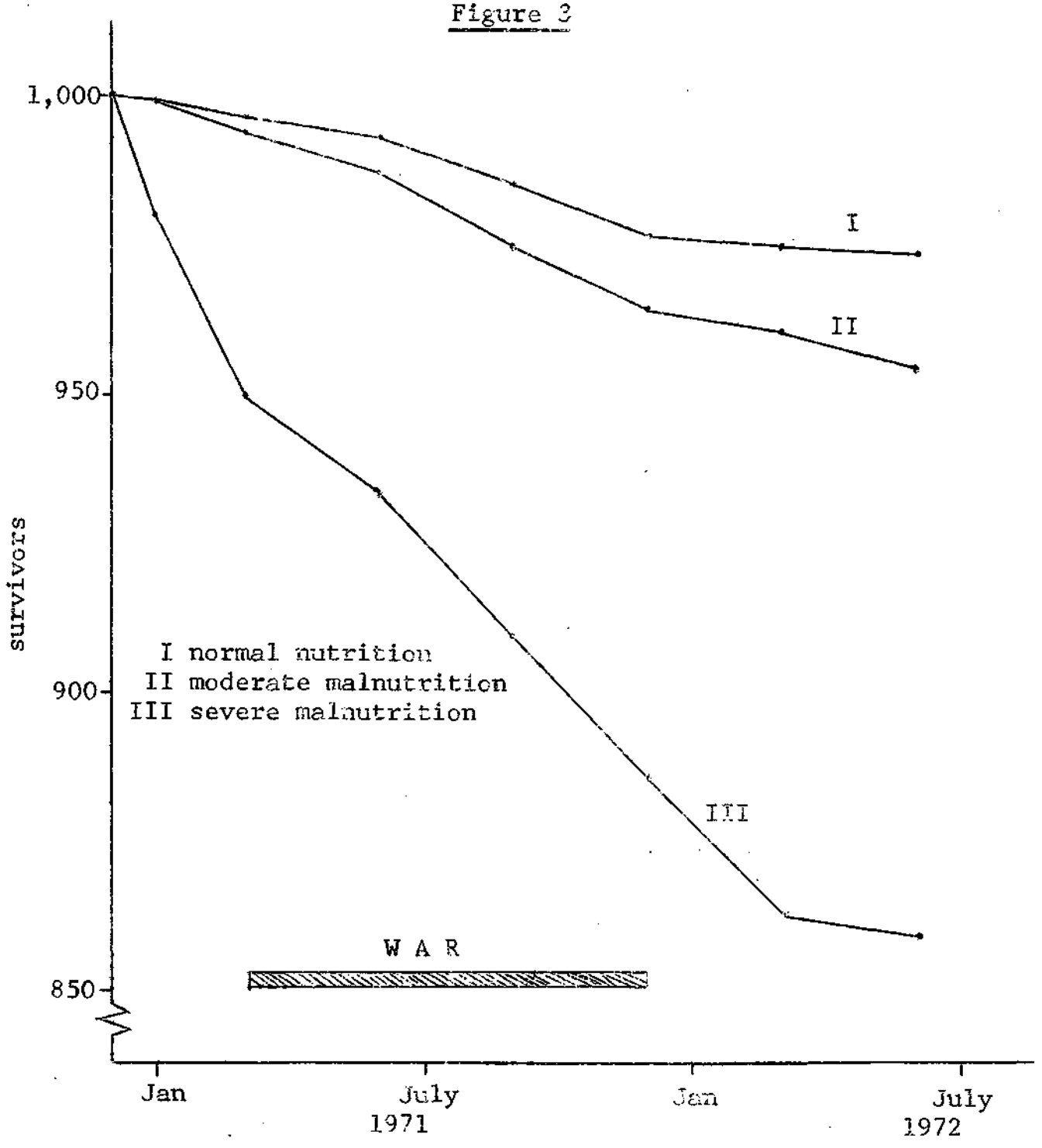

Disruptive Event
Food Shortage
Socioeconomic Dislocation
Malnutrition
Births
Migration
Reduced Host Resistance
Increased Disease Transmission
Infectious Diseases
Deaths

Figure 3


1,000
950
900
850
survivors
I
II
III
I normal nutrition
II moderate malnutrition
III severe malnutrition
W A R
Jan
July
1971
Jan
July
1972