(9) THE CYCLONE: MEDICAL ASSESSMENT AND DETERMINATION OF RELIEF AND REHABILITATION NEEDS

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INTRODUCTION

Within the past several years, Bangladesh has been the victim of two disasters of unprecedented proportions. In November 1970, a cyclone and tidal bore swept across the southern coast of Bangladesh leaving countless deaths and hundreds of thousands of destitute survivors in its wake. In 1971 Bangladesh achieved independence after a tragic civil war. With each disaster, precipitated by man or nature, emergency relief requirements were enormous. Concerned governments, international organizations, and voluntary agencies contributed large quantities of relief materials, personnel, and supportive equipment to aid the victims. Yet, those anxious to assist often lacked even minimal information on the nature of the disaster and the character of relief requirements This chapter discribes an assessment and survey technique employed after the cyclone of November 1970, which was effectively utilized to assist and direct relief efforts Such an assessment can be performed rapidly, efficiently, and at low cost. Similar approaches should be implemented for more effective relief and rehabilitation activities after future disasters

BACKGROUND

Bangladesh is one of the most densely populated nations of the developing world. Trapped between a rapidly growing population and a limited amount of land. the average Bengali has been forced to feed his family from progressively smaller plots of paddy. This has greatly increased his vulnerability. to the point that even minor fluctuations in climatic conditions can seriously affect his family's already marginal existence (1).

While adequacy of the food supply is an annual uncertainty. the loss of thousands of lives and hundreds of villages to the monsoon rains is not. The same press of humanity that forced villagers to build their homes in areas subject to recurring flooding also sowed the seeds of one of the worst and certainly swiftest natural disasters of all times. For the past 60 years land hunger has forced villagers southward. to clear and settle the Sunderban Forest Once the home of the Bengal tiger, it was transformed in two generations into a relatively prosperous rice surplus area. but one constantly exposed to the vagaries of the Bay of Bengal.

Like most of Bangladesh, the cyclone-affected area is a flat deltaic plain eminently suited for the cultivation of rice. the main dietary staple. Eighty per cent of the workers are farmers, 10 per cent are fishermen, and the rest are traders, clerks. day laborers, and professionals. Over 85 per cent are Moslem. the remainder primarily Hindu More than 90 per cent of the population live in rural villages where sanitation is primitive at best. and where defecation is usually along the banks of the rivers and ponds. which serve as the primary sources of water for drinking. cooking. laundering. and bathing. It is therefore not surprising that there are a host of endemic diarrheal diseases. including cholera. whose historical home has been the Ganges Delta.

Houses are generally one-room structures of woven bamboo and jute stick. with either thatch or, rarely. corrugated iron roofs. They sit on elevated dirt mounds. which raise them above the lower-lying paddy and offer some protection from the summer monsoon floods. Most homes are grouped into family-related compounds or *baris* opening on a common courtyard. Most of the

trees (banana, date and coconut palm, bamboo. etc.) are found in close proximity to these *baris*

The cyclone area is divided administratively into villages. unions (2–20 villages). and *thanas* (2–20 unions).
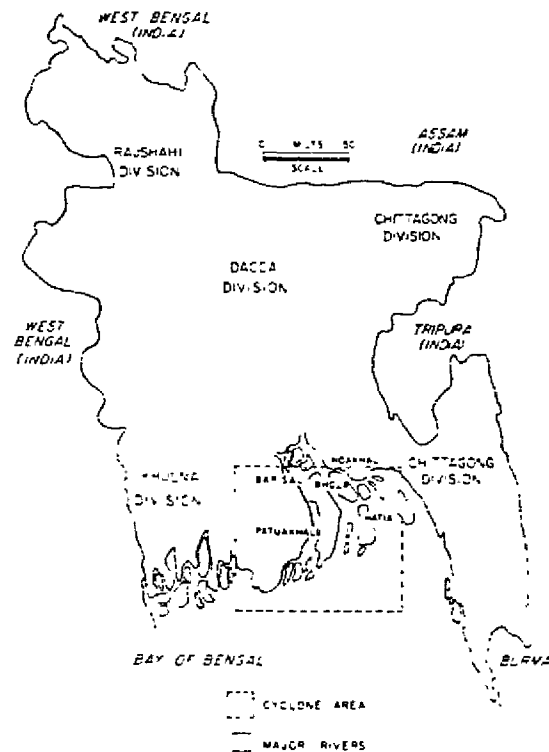

FIGURE 9.1. Cyclone Area. Bangladesh

THE CYCLONE

On the night of November 12–13, 1970. tragedy—in the form of a cyclone and massive tidal bore—struck this southern coastal region of Bangladesh (Figure 9.1). With the resulting disruption in communication. the devastation was for days not even suspected outside the disaster area. But within weeks the major airport in

Dacca and the docks of Chittagong and Narayanganj were awash
with food, medicine, and international relief teams. To document
the extent of the tragedy and to help define emergency relief needs
and future requirements for rehabilitation, the Epidemiology Divi-
sion of the Cholera Research Laboratory in Dacca conducted two
medical assessments of the 2,000-square-mile affected area. In the
first, carried out between November 24 and 28, 1970, four two-
man teams visited 18 sites by helicopter, addressing themselves to
the urgent questions of post-cyclone morbidity and incidence of
epidemic diseases. The second more detailed survey, aimed at es-
tablishing baseline information for planning further relief and re-
habilitation efforts, was carried out by ten two-man teams between
February 10 and March 4, 1971; these teams studied 72 sites in
the nine most affected *thanas* (Table 1), and 8 sites in a nonaf-
fected control *thana* for comparison. A total of 3,500 families,
representing 22,000 people or 1.4 per cent of the area's pre-
cyclone population (1.4 million in 1970) were studied.

FINDINGS

Cyclone Mortality

Villagers described the flooding in one of two ways, depending on
their location: either as a gradual process increasing over hours
until it reached a height of 8 to 20 feet, or as a sudden thunderous
roar followed by a massive wall of water. Whichever the onset, the
results were the same: huge numbers of deaths, all within the brief
period of a single night. Where the water rose gradually, people
scrambled on to roofs of their houses or scaled trees. But the
houses frequently gave way, and only the strongest could maintain
their grip on the wet and slippery tree trunks in the face of the
90-mile-per-hour winds. In areas where the tidal bore struck sud-
denly, there was even less hope of withstanding the force of the
waves. After the water receded, those not washed out to sea were
often found miles inland, caught in the branches of some distant
tree.

The mortality was appalling. Almost 17 per cent of the popula-
tion of the surveyed area, at least 225,000 people in all, were lost
in the storm. This is far from the total. We had no accurate way

TABLE 1

Surveyed Unions
Map References Numbers

Ramgati Thana

1. Char Kalkini
2. Char Lawrence
3. Char Falcon
4. Char Jangalia
5. Char Kadira
6 Char Alexander
7. Char Abdulla
8. Char Algi
9. Char Ramiz
10. Barakheri
11. Char Gazi
12. Char Badama

Sudharam Thana

13. Char Jabbar
14. Char Bata

Tazumuddin Thana

15. Sonapur
16. Chandpur
17 Chanchra
18. Manpura

Lalmohan Thana

19. Bodarpur
20. Okalma
21. Dhali Gaurnagar
22. Char Lalmohan
23. Char Lord Hardinge

24. Char Bhuta
25. Char Umed

Char Fasson Thana

26. Osmanganj
27. Aslampur
28. Jinnagar
29. Char Madras
30. Hazarganj
31. Aminabad
32. Char Nilkamal
33. Char
34. Char Kalmi
35. Char Manika

Galachipa Thana

36. Rangobali
37. Bora Baisdia
38. Choto Baisdia
39. Char Kajal
40. Panpatti
41. Galachipa
42. Dakua
43. Ratandi Taltali
44. Rango Paldi
45. Chiknikandi
46. Bakulbaria
47. Alipur
48. Dasmina

49. Betagi Sankipura
50. Golekhali
51. Amkhola
52. Auliapur

Amtali Thana

53. Dankhali
54. Karaibaria
55. Bara Bagi

Kalapara Thana

56. Lata Chapli
57. Khaprabanga
58. Mithaganj
59. Nilganj
60. Tiakhali
61. Lalua
62. Chakamala

Hatiya Thana

63. Harni
64. Chanandi
65. Suk Char
66. Nalchira
67. Char King
68. Char Iswar
69. Char Tamoruddin
70 Sonadu
71. Burir Char
72 Jahajmara

Source: From Sommer and Mosley. 1972.

of estimating the losses among migrant workers. between 100.000 and 500.000 of whom had come south to help with the harvest. and all of whom slept in the low-lying fields without benefit of houses or trees.

Mortality varied considerably with geography. On such off-

shore islands as Char Hare and Sonar Char it reached 100 per
cent, and all that remained of large pre-cyclone settlements were
some trees and an occasional dirt mound. Among the *thanas*, mor-
tality ranged from a low of 4.7 per cent in Amtali to a high of
46.3 per cent in Tazumuddin. Mortality is mapped by union in
Figure 9.2. The areas of highest mortality, lying along the coast of

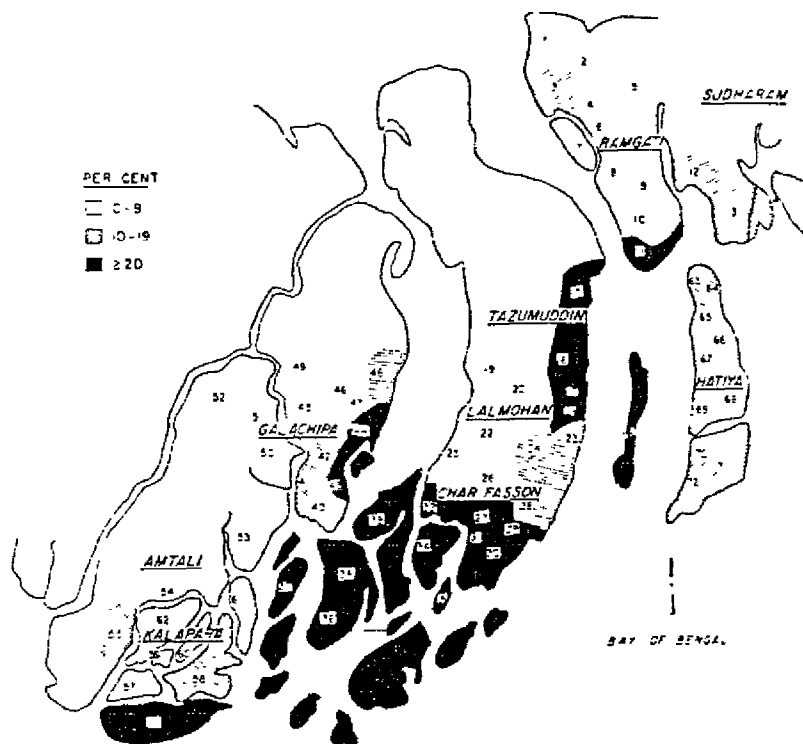FIGURE 9 2. Cyclone Mortality by Unions

the Bay of Bengal and skirting Hatiya Island, probably indicate
the path of the tidal bore itself.

Age-specific mortality ranged from a high of 29.2 per cent for
those 0–4 years of age, and 20.7 per cent for those 70 years and
over, to a low of 6.1 per cent for those 35–39 years old Females
fared worse than males in all but the youngest age groups. Adult

males between the ages of 15 and 49 had the highest rates of survival.

These findings confirmed our impression that it was those too young, too old. and too weak to hold on to the trees who were lost in the storm.

Post-cyclone Population Patterns

Post-cyclone morbidity was limited to lacerations, contusions, and occasional fractures. A common clinical finding, which we dubbed "cyclone syndrome," consisted of severe abrasions of the chest and medial aspects of the arms and thighs: grim evidence of the tenacity with which the survivors had clung to the trees to withstand the buffeting of the waves.

Post-cyclone mortality remained low for at least the three months immediately following the storm and compared favorably with that of the control area (0.5 per cent). The same was not true for migration patterns. Within the cyclone-affected region, we found large numbers of females in all age groups migrating into existing families. This probably represents remnants of family units that had lost their male heads seeking the security of kindred families—an example of the "extended families" function as the subcontinent's equivalent of Social Security.

Housing Losses

Fully 85 per cent of all families studied claimed that their homes had been severely damaged or destroyed by the cyclone. representing a loss of 176.121 houses (Figure 9.3). Objective measurements at the time of the second survey indicated that 53 per cent of all families in the cyclone region still lived in shelters deemed inadequate. even by Bengali standards. to withstand the summer monsoon rains. While the minimal amounts of bamboo distributed by the government were adequate for repairing the roof or sides of a house in the more northerly areas. they were wholly inadequate for rebuilding the entire structure. which was necessary in the more devastated coastal regions The results were pathetic: tiny grass and straw huts, three or four feet wide and high and perhaps six feet long. each housing a family of two to eight persons.

FIGURE 9.3. A *Bari* Devastated by the Cyclone. The rice stalks hanging in the tree (upper right) indicate the height of the tidal wave.

Food Sources *

The villagers' private stores of rice were negligible. The cyclone had struck at the worst possible time, at the end of the traditional famine period when reserves were depleted and the new crop was ready for harvesting. The storm destroyed what little supplies still existed as well as most of the standing paddy. In the hardest hit areas, the tidal wave inundated the fields, destroying everything in its path. But even the more northerly regions were not spared: there we found the rice stalks standing tall and green when they should have been bending over under the weight of the grain. The latter, unfortunately, had been blown away by the 90-mile-per-hour winds that accompanied the storm.

* The results of the nutritional assessment conducted during these surveys are presented in the next chapter.

As a result of inadequate local food supplies, relief food was mandatory to avert starvation. By the time of the second survey, fully 75 per cent of the population were receiving free food on a regular basis, and 13.9 per cent (157,871 persons) were dependent on relief for more than half of their total food intake.

Agricultural Potential

While the land available for cultivation was three times larger on a per capita basis in the cyclone-affected region than in the control area, statistics on the land with newly planted rice at the time of the second survey were very different. Ranging from a low of 0 decimal (100 decimals equal 1 acre) in three *thanas*, Amtali, Hatiya, and Char Fasson, to a high of 2.12 in Lalmohan, the average for the cyclone-affected region as a whole was 0.48 decimal per survivor. This contrasts sharply with the 1.9 decimals per person planted with rice in the control area, a ratio of 1:4.

While many explanations were advanced by the villagers for this lack of cultivation, the most common was the lack of seeds, plows, and more important, bullocks and buffaloes. By comparing the total number of draft animals owned with the amount of land worked by each farmer, we derived area-wide ratios of bullocks and buffaloes available per 100 acres. This ranged from a low of 5.4 in Char Fasson to a high of 20.2 in Hatiya, with a mean of 12.8 for the cyclone area as a whole. This is approximately half the density of bullocks and buffaloes found in the control area, which stood at 25.1 per 100 acres.

Similar calculations indicated a mean density of 7.4 plows per 100 acres in the cyclone region, compared with 20.0 in the control area.

Relief and Rehabilitation

While it was impossible to assess the degree of rehabilitation achieved, since we lacked detailed data on the actual levels of destruction and dislocation at the time of the cyclone, it was clear that villagers in the less affected regions were busy reconstituting the fabric of their society. The same was not true in the more devastated coastal regions. There the men were usually found squatting despondently in the center of the village. They lacked all the

implements basic to achieving self-sufficiency, and they had no money with which to buy them.

We attempted to gauge the amount and kind of relief received to date, but the effort was not overly successful. Except for money, amounts were either unquantifiable (bamboo, seed, etc.) or negligible (no one reported having received plows or draft animals). The major relief distributed, besides food, was in the form of *rupee* payments. Although these were dispensed for specific purposes (purchase of seed, building materials, etc.) they were in fact spent by the villagers for food. Among the 76 per cent of families who received some monetary relief, the average grant per family was 148 *rupees*.

RELIEF REQUIREMENTS

From the surveys, an estimation of relief and rehabilitation requirements for the entire cyclone-devastated region was made. These data, summarized in Table 2, represented an absolute minimum estimate of the area's needs.

1. Housing: 110,000 houses were needed to provide "adequate" shelter for over 500,000 people.
2. Food almost 1,000,000 people were dependent on outside food relief for survival, although only 160,000 depended on relief for more than half their food at the time of the second survey.
3 Agriculture: to return the area to agricultural self-sufficiency, a minimum of 125,000 draft animals and 127,000 plows were needed.

These represented bare minimums—we did not survey the entire cyclone-affected region, only the hardest hit While other areas may have been less affected, their total losses, because of their higher population base, may have been just as great Yet with all this destruction and suffering, the impression that remained with us is of a determined and resilient people. Even as we prepared to return to Dacca after the survey, we encountered men setting out to establish themselves and their families on the

TABLE 2

Relief and Rehabilitation Requirements

	Houses Required	Persons Homeless	Persons On Food Relief	Persons Getting More Than ½ Their Food From Relief	Animals Required	Plows Required
Amtali (part)	5,210	26,050	29,918	5,507	25,093	25,730
Hatiya	16,710	85,221	102,030	5,051	6,576	12,750
Kalapara	9,789	52,861	78,535	11,162	12,660	13,375
Rangati	9,798	60,748	97,548	5,366	4,020	7,112
Lalmohan	13,076	79,764	141,065	30,877	9,254	8,387
Galachipa	32,019	179,306	242,645	43,868	22,485	24,647
Sudharam (part)	2,497	13,734	26,856	12,556	8,445	6,678
Char Fasson	12,985	62,328	79,249	19,869	19,757	16,128
Tazumuddin	6,354	33,041	56,093	23,615	14,801	12,599
Total	108,438	593,053	853,939	157,871	123,091	127,406

Source: From Sommer and Mosley, 1972.

off-shore islands, the very same islands that only two months earlier had been swept, in one tragic night, of all signs of human habitation.

DISASTER SURVEYS AND SURVEILLANCE

While the international community has become increasingly involved in worldwide relief activities, too little attention has been given to the need for rapid, accurate assessment in support of such operations. Each new disaster is approached on an *ad hoc* theoretical basis, rather than a solid evaluation of actual conditions. As a result, huge amounts of money and effort are wasted on unnecessary activities. The Bangladesh cyclone and tidal bore is a recent example: a large number of countries and private relief organizations sent fully equipped field hospitals, including surgical teams, although there was little post-cyclone morbidity and almost no need of surgical care; emergency food supplies were often culturally unacceptable; medicines included large numbers of weight-reducing pills, birth control pills, and aspirin, the least appropriate items for a starving and homeless population; thousands of Bengalis were vaccinated against cholera when there was no indication of increased levels of cholera; and water-processing and storage facilities were erected to replace "saline-contaminated" sources which proved not to be contaminated after all. By documenting the absence of significant post-cyclone morbidity, the initial survey allowed the U.S. Government alone to save over $2 million earmarked for unnecessary field hospitals and to use that money for urgently needed clothing and shelter.

The cost of such surveys is insignificant (our detailed second survey cost under $10,000), nor do they delay relief operations appreciably (it took over two weeks for significant amounts of relief to arrive in Dacca; our initial survey took only four days).

When a disaster produces consequences necessitating relief activities that will last over months or years, as when there is an interruption in agricultural activities at planting or harvest time (Bangladesh cyclone disaster) or continuing civil strife (Biafra and Bangladesh), longitudinal surveillance is as important as the initial assessment. Only by closely monitoring indices of nutri-

tional status, health, food availability, etc., can relief officials be certain that their efforts are being effective. All too often the various donor countries and their voluntary agencies are concerned with their small area of responsibility, to the neglect of the country at large (2). All too often, generalizations about the huge quantities of food donated obscure the fact that isolated communities or even whole regions with inadequate transportation facilities are not receiving their proportionate share, that selling cheap rice at ration shops does not benefit the penniless, that work relief projects do not aid the fatherless, and that feeding centers do not aid those too weak or sick to leave their huts (3). And the overemphasis on establishing sophisticated medical treatment centers at huge expense often benefits no one. The Nigerian experience showed that the people directly involved in providing relief are *least* capable of making such objective assessments

With these considerations in mind, a three-phase survey and surveillance system can be used with great effectiveness for future disaster relief. The first phase would involve a rapid initial survey of randomly selected sites covering the entire disaster area. Such surveys can define the priority of relief materials (food, shelter, clothing, blankets, etc.) and identify outbreaks of communicable diseases and the physical extent of destruction. Information generated from the initial assessment can serve as guidelines for the first stage of relief activities. The logistical support for the survey should facilitate rapid evaluation. We used two helicopters and completed such a survey within four days. While a rapid survey may seem crude, we found that the first survey produced virtually the same results as the second more detailed assessment (4).

The second survey should be more detailed and more stringently structured. It should include an intensive study of sampling sites and should form the basis of a longitudinal surveillance system, which is the third phase. During the third phase selected families should be studied at regular intervals (one to two months) Data to be monitored should include births, deaths, illnesses, and status of housing, food stocks, and agricultural activities. Such an objective data-gathering system can provide a framework for future rehabilitation efforts and evaluate the adequacy of existing relief measures.

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