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INTRODUCTION

Recent events in Kigoma Region of Western Tanzania have pointed out practical weaknesses in the international mechanisms for the protection of refugee rights. In April 1987, the Tanzanian government conducted an operation to repatriate Burundian illegal immigrants from border areas back to Burundi. The stated purpose of this operation was to control smuggling and other illegal activities in the border areas. Inadvertently included in the round-up, however, were large numbers of refugees who were internationally recognized, though undocumented, and who had received international refugee assistance while in the villages concerned.

During this crisis, 10,000–15,000 legitimate refugees were forced to leave their homes from two days to up to four months. A reported 2,800 people (most of them refugees) were actually accepted by the Burundi authorities and resettled there, before most returned extra-legally to Tanzania. 3,000–5,000 more were delivered to the border but later returned to their homes after being rejected by the Burundi authorities. Thousands more abandoned their homes and fled into the bush to avoid being rounded up. Upon return, either from Burundi, the border, or the bush, many of the Burundians found their homes looted and crops stolen. In one case, the village government ordered the burning of over 150 of the vacant Burundian homes.

The inadvertent victimization of the Burundi refugees was a mistake later regretted by both the Tanzanian government and the United Nations High Commissioner for Refugees (UNHCR), who has an office in Kigoma. There was an expressed government policy that no refugees were to be collected in the operation. The fact that refugees were collected is largely because of the poor documentation provided for the masses of rural refugees while they were in Tanzania during the previous fifteen years.

While I was working in a refugee assistance program in many of the affected villages, both before and after the crisis, I made the following observations about the practical protection problems encountered by the refugees.

- the importance of registration in protecting refugees and managing refugee crises;
- the difficulties in quickly ascertaining material needs and priorities of dis-
placed persons in remote border areas;
- the inadequacy of existing mechanisms with which to trace, reunite, or identify displaced persons;
- the lack of an authoritative body to represent or counsel refugees and communicate reliable information to them about changes in their status;
- failure to insist upon, and provide the means for, the removal of refugees from inherently sensitive border areas during past years, in compliance with recognized international practice;
- confusion and lack of definition about what practical actions are justified in field conditions by the UNHCR's protection mandate.

BACKGROUND, 1972–87

Western Tanzania has traditionally received migrating Burundians in search of land, business and refuge from war. Since the independence of Tanzania in 1961, there have been two major movements of refugees fleeing into Kigoma Region from Burundi, the first in 1966 and the second in 1972–3. The latter crisis was especially significant; well over 100,000 refugees of the majority Hutu tribe fled into Kigoma Region.

Most of these refugees were collected from both Kigoma township and rural villages, for resettlement in three large refugee settlements established away from the border. With the assistance of the UNHCR, and the Tanganyika Christian Refugee Service (TCRS), the refugees were able to establish prosperous communities between 1973, when the first settlement was established, and 1985, when the final settlement was handed over to the Tanzanian government.

However, thousands more remained in Kigoma Region where they spontaneously settled. Exactly how many is not actually known, though the total was estimated in 1981 to be about 23,000.

Large numbers melted into substantial Burundi communities in Kigoma and Ujiji townships, while thousands more resettled in rural areas near the border where the Tanzanian government permitted them to farm. From 1981 to 1987, the UNHCR has funded a project to improve the local infrastructure so that these refugees can be integrated into the local community. Projects funded by the UNHCR, and implemented by TCRS, include construction of schools and dispensaries, agricultural extension, tree planting, road maintenance, and tsetse control. Protection has remained the responsibility of the UNHCR, which has a sub-office in Kigoma to serve both fleeing Burundians, and Zaireans fleeing from across Lake Tanganyika. Indeed, it is the Zairean refugees who are generally perceived as having the greatest protection need, because they are fleeing on-going conflicts in Zaire.

Tanzanian policy towards refugees has been among the most generous in the world. Refugees from many countries have been accepted without question, and generously allocated land in established settlements, or in the areas where they have spontaneously settled. The biggest influx of refugees permanently settled in Tanzania has been from Burundi.

Perhaps because of this traditionally generous Tanzanian policy towards refugees, protection issues, which can dominate refugee assistance programs in other countries, have apparently been given a low priority. As a result, the UNHCR trusts the Tanzanian government with the responsibility of registering refugees. Insistence on an independent census or registration has not been a condition of any of the multi-million dollar programs for assistance, either in the settlements, or for the spontaneously settled refugees during the last 15 years. Significantly for this paper, the result was that a mixed population of both refugees
and illegal immigrants lived in border areas, the refugees indistinguishable from illegal immigrants.

THE OPERATION, 1987

The actual round-up of Burundians began simultaneously in all three administrative districts of Kigoma Region on 3 April 1987. Round-ups continued for four days until 7 April when the operation was suspended, apparently due to the refusal of the Burundi authorities to accept more people.

That the operation was the result of an agreement between the two governments was apparent from the first day; lorries were waiting on the Burundi side of the border to accept the deportees. That the spirit of the agreement broke down became obvious from after the second or third day, when Burundi authorities began accepting only those deportees who spoke the Kirundi language with a Burundian accent. Later, Radio Burundi was to charge that the agreement was for only 500 specifically named Burundians who were in Tanzania, though 2,800 non-specified Burundians had actually been accepted.

The operation was implemented in Tanzania by village militia under the supervision of District authorities. Round-ups were conducted in areas of known Burundian concentrations, both refugee and non-refugee. Official policy was that no refugees were to be rounded up, and old but incomplete lists of refugee names were provided to the officers implementing the operation. They were also instructed to exempt any refugee who had a refugee identification card, which perhaps only 1% of the refugee population had received (these cards had been distributed in Kigoma town by the government in cooperation with the UNHCR sporadically and without publicity from 1982 to 1986). In practice, though, the surprise nature of the operation, and the inherent violence involved, meant that it was difficult to separate refugees from non-refugees, even assuming that the lists provided were complete and accurate.

From the perspective of refugee protection, the consequences of the operation were manifold. Because of the sudden nature of the operation, families were inevitably separated. Undisciplined militia in some cases, and opportunist civilians in others, stole refugees' belongings and the recently harvested maize crop. One refugee village of about 1,000 people was burned. Such activity was more pronounced in some villages than others, and was greatly dependent on the policies of village and district authorities. Finally, and most significantly for long-term planning, the refugees in the area lost the sense of security established under the benevolent policies of the Tanzanian government during the last fifteen years. What had been perceived as a lasting solution of spontaneous settlement, turned out to be only a new protection crisis.

RESPONSE OF THE INTERNATIONAL COMMUNITY

As would be expected, the international community was surprised when it became apparent that the refugees were included in the round-up of illegal immigrants in Kigoma Region. In the Kigoma area, it meant that the UNHCR and TCRS made protests to the government. Protests were also filed by concerned embassies in Dar Es Salaam. Because of Tanzania's past good record with refugee rights, it had somehow become assumed by all that the Burundi refugees were not a protection problem, and were somehow immune from the excesses found in other countries. The low priority given protection services for the Burundi refugees was apparent from the willingness of the UNHCR to fund multi-million dollar pro-
jests, without registration, or even more than a general census of the population served.

UNHCR

Diplomatic efforts on behalf of the deported refugees by the UNHCR continued throughout the crisis period. Channels to the local government officials concerned were kept open, even when relations grew tense because the Tanzanians resented what they perceived to be interference in their internal affairs. However, information about the conditions of the refugees continued to be collected and brought to the UNHCR by TCRS and other sources.

The UNHCR office also communicated concerns to their offices in Dar Es Salaam, Bujumbura, and Geneva.

Despite the tensions, the UNHCR was able to deal successfully with a court case brought against 50 refugees for illegal entry, and received permission for the distribution of relief items to the more seriously affected villages. A UNHCR request for an emergency registration of the refugees was also considered, but not followed up.

No serious attempts were made to contact the affected refugees themselves, either in the affected villages, at the border, or in Burundi. Normally, most refugees lived at least one day's travel (by local means) from the UNHCR office in Kigoma, though, of course, during the operation, even this limited accessibility was restricted for fear of being rounded-up. Even had it been feasible to reach the Kigoma UNHCR office, it is doubtful that many of the semi-literate rural refugees would have understood the practical legal significance of refugee rights and responsibilities. Further communication difficulties would have been caused because the UNHCR officers do not speak Swahili, the national language of Tanzania, or Kirundi, the local language that the refugees use at home.

Following the granting of permission by the government to distribute relief items to the UNHCR, TCRS was asked to distribute some 50 tons, including blankets, cooking utensils, rice, fish, and household items. These items were donated by TCRS.

TCRS

TCRS is the implementing partner for the UNHCR-funded refugee project being undertaken in Kigoma Region. Much of its work is involved with construction and agriculture and as such, it is not involved in protection issues. I worked for this agency from 1984 to November 1987, assigned to the Kasulu sub-base about 100 kilometers north of Kigoma town.

However, because TCRS was working in the villages affected by the operation, it assumed many of the protection responsibilities at that level, in the absence of the UNHCR. Details of the villages affected, conditions and practices of the operation, and information about the refugees were regularly relayed to the UNHCR office in Kigoma. Likewise, information about a planned (but aborted) emergency registration was relayed to the refugees through TCRS. TCRS also donated emergency commodities for distribution to the affected villages, and conducted the distribution. This was done at the request of the UNHCR, which obtained the necessary approvals.

Shortly after the operation began, TCRS unilaterally suspended work on the refugee integration project in the villages most severely affected by the operation. The government opposed this decision, while the UNHCR did not take a position. Work resumed seven weeks later.

TCRS continues to have the primary presence in the affected villages as of October 1987. As a result, despite their
lack of authority, they continue to be approached by refugees about questions regarding registration and the future of refugees in the Region.

THE REFUGEES

The reaction of the refugees was one of panic, because the Tanzanians had apparently ended their general policy of asylum, abruptly, and with violence. This was not, of course, true, but it seemed so to the refugees in the remote villages concerned, who had no reliable source of news except what they saw in their own villages and heard on government radio reports. The general belief held by all concerned, that those sent back to Burundi would be shot on arrival, did not help to calm fears. This belief, though later proved untrue, did not contribute to the sense of well-being in the villages.

Contributing to the panic was the lack of independent information about changes in their status as refugees. Because the few refugees with identification cards were exempted from the round-up, inevitably, there were questions about the availability of such cards. Other questions arose concerning the status of family-members, protection of stationary property, legal rights, collection of "customs duties", and the reunification of families separated by the operation.

As a consequence of the confusion, large numbers of refugees began to seek refuge away from their home villages. Often this involved a great deal of wandering in search of missing family members. In some areas, the neighboring villages were able to absorb and assist friends and relatives who had been displaced. In the worst case, though, involving about 1,000 refugees, the local community could not absorb the large numbers, and many spent some weeks wandering in the forest with or without their families.

Most villagers had reestablished themselves within six weeks of the operation. Deliveries of material aid to the approximately 3,000 villagers affected most severely by looting, fire and theft, helped both their mental and material state.

At the inland settlements, groups of refugees from Kigoma began to approach the Tanzanian authorities for permission to stay. They were refused, however, because authorization from the capital in Dar Es Salaam had not been received.

Relations between the local Tanzanian villagers and their Burundian neighbors have deteriorated since the operation. As can be expected, this is particularly true in the villages most affected by looting and deportations, and less so in places where the local village governments were able to protect the property of the absent refugees.

In October 1987, most refugees were still asking questions about their legal status, and when the promised emergency registration would occur. Most had resumed farming, and planting continued normally in most of the villages affected. Only in the village that was burned were plantings considerably below those of previous years.

SUMMARY AND ANALYSIS

As a result of this operation, the following practical issues of refugee protection were raised:

- The importance of registration and refugee identity cards as a tool for dealing with any refugee population;
- The importance of keeping refugee populations away from border areas which are inherently sensitive for such persons;
- The separation and reunification of families;
- The deprivation of property and livelihood;
- The value of an accurate information flow to refugees so that adequate personal decisions can be made by them, and the difficulties in transmitting such information to rural semi-literate refugees in remote areas;
- The importance of cultural sensitivity in dealing with masses of semi-literate rural refugees.

Using the undeniable advantages of hindsight, it is apparent that there were failures in refugee protection on two levels. First, in the past, adequate precautions were not taken in the years immediately following the 1972-3 refugee crisis to register and account for who was a refugee, and who was not. Also, the basic precaution of moving the refugees away from sensitive border areas was not taken in early years, despite established international practice to the contrary.

The second failure occurred in 1987 after the operation began, and mechanisms to deal with the emergency proved inadequate. This is in large part due to the fact that the agencies concerned were not equipped to deal with a refugee crisis involving large numbers of inarticulate but suspicious rural refugees. Despite the fact that most refugees in the world are of such a class, mechanisms and principles for dealing with them are not well-developed. Little attempt was made to assess food stocks, ascertain refugee goals, reunify families, or communicate information to refugees so that they could make adequate personal decisions. To do this, Protection Officers would have had to familiarize themselves better with the population concerned beforehand. Especially, this means that Protection Officers need to speak the same language as the refugees do. Such services go beyond the dry requirements of international law, but are critical if this law is to be applied to the populations most in need of such services. Mechanisms are needed to find such persons, or retrain existing personnel.

Finally, the importance of registration as a practical administrative tool cannot be overestimated. It gives refugee agencies a clear idea of the population they serve with both material and protection services. For the refugee, it provides an agency to identify with in case of emergency. Finally, for the government, it provides a tool with which to separate legitimate refugees from illegal immigrants.

Of course, there are also dangers to any registration system. This operation pointed out one of them: inadequate or incomplete coverage can victimize the refugees who do not have a refugee card. If requirements for registration are too complicated (including availability only in a distant town, inadequate publicity, a requirement for fees, too many signatures required, etc.), the purpose of the registration is lost, and the victimization of refugees can be the result.

Registration is a basic need for any refugee program. Knowing who agencies are working with, how many are involved, where they live, and what they want to do are critical in any kind of assistance program. To a certain extent, this need can be satisfied by an inexact census of affected populations. However, in the case of refugees, with their inevitably tenuous legal status, shifting goals, and itinerant nature, the precision that results from a formal registration is more appropriate.

For the refugee himself, the formality of refugee registration returns to him a sense of belonging which is lost by the very fact of becoming a refugee. Legally and practically, it can give legitimacy to his status, and identify him to others and himself as being a refugee with rights under international law. Even given the
fact that most refugees do not know their rights, such papers give them the UNHCR as an authoritative agency with which to identify in case of emergency, such as has been described.

Of course, no system of registration, whether official or unofficial, conducted by the government, or unilaterally by the UNHCR, is an absolute guarantee of legal protection under international law. Nations loathe giving up sovereign rights, including the right to expel aliens. Registration, nevertheless, is a critical tool if protection services are ever to be seriously extended; in most refugee crises, at least one of the two countries involved has enough goodwill to make such a tool useful. Thorough issuance of identity cards by the UNHCR in the past in Kigoma may or may not have prevented such an operation as happened in 1987, but it would certainly have made the case for refugee rights stronger, and follow-up programs (i.e. aid distribution, and family reunification) more effective. In a case such as this, where there never was any particular malevolence towards the refugees by either Tanzania or Burundi, identity cards, even those unilaterally issued by the UNHCR would, I think, have effectively excluded large numbers from deportation.

Much of the confusion in this crisis results, I think, from a lack of understanding in how to meet the practical needs of refugees in difficult situations. The United Nations definition of a refugee as being “Any person who, owing to well-founded fear of being persecuted for reasons of race, religion or nationality, membership of a particular social group or public political opinion, is outside the country of his residence . . .” is well-known and oft quoted. Equally well-known is the promise of signatory states not to forcibly repatriate persons meeting this definition. But judging from the consequences of the operation described above, the practical, administrative and logistical procedures for implementing a protection program for such people is not so carefully defined. In some ways, this is strange, since many of the procedures for dealing with such situations are well-established: i.e. prompt and complete registration, removing refugees from border areas quickly, establishment of tracing services for missing persons, and the dissemination of accurate information by radio, village visits and leaflets. The difficulty, then, is in ensuring that the people who meet the definition meet the practice applicable to their circumstances.

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INTRODUCTION

This paper reports on some aspects of OXFAM's experience in famine relief amongst pastoral communities in Sudan, during 1985-1986. At the time the author was Deputy Country Representative for Oxfam, based in Khartoum, and responsible for motivating donor interest in OXFAM's work in Red Sea Province.

Under normal conditions, pastoralism is often the only sustainable survival strategy in marginal environments. In the Sudan, pastoralists dominate the arid lands in the north and the wet lands in the south. They have survived, not as isolated economies, but in a commensurate relationship with the agrarian sector. Previously, livestock were bred for exchange, and now for sale, to obtain grain. Today, most pastoralists are not purists. The Mundari cattle transhumants in Equatoria (southern Sudan) will attempt to grow as much as 90% of their grain needs. The Beja, in Red Sea Province, base their economy on the herding of goats and sheep, but exhibit lifestyles that range from the near true nomad to settled farmers.

Through their exchange relationship with farmers, pastoralists are often better able to survive small changes in the economy or environment. However, under extreme stress conditions, they are far more prone to long term destitution than their agrarian counterparts.

This is exemplified by the incidence of malnutrition amongst children in Northern Kordofan during the 1984-1986 famine. At the peak of the famine, those pastoralists who had maintained some animals showed 17% of their children malnourished (i.e. less than 80% standard weight/height). The settled farmers of the area showed 25%. However, it was the pastoralists who had lost all their animals who suffered most. Amongst this group, up to 40% of the children were malnourished (McLean, 1986). It is this juxtaposition of sustainability and vulnerability which marks out the pastoral society as one deserving of particular support from aid agencies during famine.

THE DEMISE OF PASTORALISM IN SUDAN

Pastoralism is under threat across the Sudan. In Red Sea Province the accumulated effect of six years of drought and the loss of range-lands under agricultural schemes, caused herd sizes in 1985 to be reduced to an estimated 10% of their predrought level (Hale, 1986). In common
with many other pastoral societies in Africa, the Beja are politically marginalised (Horowitz and Little, 1987), and were thus unable to command relief support from government sources until the very last minute, by which time their economy had been destroyed and famine was endemic.

In Kordofan, the camel nomads in the north witnessed the failure of their traditional grazing lands as a result of the drought. This was allied to a collapse of purchasing power as grain prices rose and animal prices dropped. Pre-drought, one sack of sorghum could be purchased with 0.6 of a sheep. By May 1985, at the height of the famine, the same sack would have cost 8.8 sheep, a 1,466% inflation in the price (McLean, 1986).

The Dinka cattle-rearing transhumants in the extreme south of Kordofan have seen their herds decimated by the civil war with a corresponding effect on their way of life. The rustling of cattle as well as the wholesale destruction of crops, has been deliberately used as a weapon to destroy their economy.

In Equatoria, the Mundari agropastoralists have similarly been affected by the war, but from the other side. Old tribal conflicts have been exploited by both sides and exacerbated by food deficits. The rustling and slaughter of cattle has combined with the general insecurity in the area, to cause a profound dislocation of the economy. On top of this, the South, like northern Sudan, has suffered a period of low rainfall. Unable to survive in their traditional lands many thousands of Mundari fled south to the regional capital, Juba. By April 1987 there were over 38,000 Mundari receiving food aid there (Stockton, 1987).

APPROACHES TO RELIEF WORK WITH PASTORALISTS

The crisis in pastoralism, and the need for outside help, occurs long before stress exhibits itself through increased malnutrition. Malnutrition rates measure what has happened; they say nothing about how a people arrived at that state or when and how they will recover. A development worker in southern Sudan expressed it thus: “For a pastoral society, the proper subject of relief appraisal is the socio-economic system as a whole, and the aim of the appraisal is to identify those points in the system where timely intervention will safeguard the basis of the economy. Namely, the livestock herds.” (Stockton, 1987).

Hay (1986), has identified this approach as a relief/development strategy. His thesis is that relief aid, which usually means food aid, represents a missed opportunity, as it seeks to mask the effects of famine rather than halt the causes.

The classic relief process disenfranchises the victims of crisis, reducing them to passive recipients. However, relief aimed at sustaining the collective economy rather than the individual’s health, maximizes economic recovery and ensures that the aid recipients maintain an active role in determining their futures. It may seem ironic but for pastoralists, keeping animals alive may be the best way to keep people alive, and ensure that they maintain control over their futures.

In summary: The need for relief assistance to pastoralists must be identified long before the people collapse from malnutrition. Such assistance should take the form of interventions which sustain the basis of the pastoral economy; namely the pastoralist’s position as a trader of animals. Interventions should be multifaceted, exploiting the linkages within complex food production systems, to provide the pastoral sector with a respite from abnormal levels of stress.
OXFAM'S PROGRAMMES IN RED SEA PROVINCE AND EQUATORIA

In Red Sea Province (RSP), the economy had already collapsed before relief aid arrived in early 1985 (Walker, 1988). There was no question of averting the final crisis of famine. However, when seeking both to mitigate its worst effects and rehabilitate the economy, the above interventionist philosophy was applied (Foster, 1987).

In early 1985 a major food-aid programme was initiated. An estimated 400,000 people were destitute, having lost 90% of their livestock (Hale, 1986). Food-aid was deliberately targeted away from the growing road-side relief camps and towns: it was delivered direct to the destitute villages in the rural hinterland. The amount of food aid needed in a village was calculated according to an assessment of the over-all economic well being or "self-sufficiency" of the village, rather than the prevalent rate of malnutrition. Its purpose was to create the economic space within which the Beja could rebuild their herds. It filled the gap between what they could earn and what they needed to survive, aiming at directly decreasing their material vulnerability.

The process of targeting and monitoring the food, and the nature of recipient participation in its allocation, is continually evolving. Throughout the programme the emphasis has been on getting food aid directly to the communities who need it, by utilizing the existing strong tribal structures within the villages to control and distribute the food. Famines often cause the demise of supportive community structures leaving the post-famine community in an increased state of vulnerability. Using such structures to disseminate food aid has the important effect of decreasing post famine organizational vulnerability (Anderson, 1985).

As the rural economy has gradually revived (see Fig. 1), so the amount of

\[
\begin{array}{c|c|c|c|c}
\text{Month} & \text{Dec 85} & \text{May 86} & \text{Sept 86} & \text{Jan 87} \\
\hline
\% \text{self sufficiency} & 30 & 60 & 70 & 80 \\
\end{array}
\]

FIGURE 1 Self-sufficiency changes
Food-aid needed has decreased. By mid 1987 food-aid was being delivered at half of its early 1986 level. It is calculated that it will take another three to four years for the Beja to regain a position of food security (Foster, 1987).

Food-aid is seen as a continuing although diminishing need in this process (Fig. 2). What started off as a classic food aid/famine relief intervention has shifted, by evolution rather than planning, to a much more integrated and re-active programme geared to decreasing the vulnerability of the Beja pastoral community to famine.

In parallel with the food-aid programme, a number of rehabilitation initiatives have been started. Assistance is being given to the local Pest Control Department, to provide relief from locust damage to the Beja agro-pastoralists normally beyond the reach of the Department. Villages are being supplied with tools to help construct new wells and deepen old ones. Further interventions may be considered which aim to alleviate the high losses of young animals from preventable disease, (often 30% of goat kids are lost to disease, see Swift, 1986).

It should be emphasized that the scale of interventions involved in the food-aid and non food-aid programmes are hugely different. The food-aid programme in RSP reaches over 400,000 recipients. The other interventions affect only a few thousand people.

These interventions do not aim at returning the Beja to their pre-famine state. To do so would be to place them in the same vulnerable position they were in prior to the famine.

The political, economic and environmental systems within which the Beja survive are continuously evolving, often to their detriment. Over the past 100 years a number of Beja sub-groups have
reacted to increased economic stress by moving from a nomadic to a more settled existence. Whilst still maintaining the pastoral basis of their lifestyles, they have turned increasingly to cereal production to provide an alternative source of income. The next few years may well see an acceleration in this trend. Equally the trend towards involvement in waged labour in the Port (Port Sudan), and trading in the towns and along the main roads may increase.

The famine caused many families to diversify greatly their sources of income. Figure 3 shows the make up of a typical family income for the district of Derudeb in early 1987. It is probable that this move towards income diversification will be sustained.

Ultimately, the OXFAM rationale is not to provide pre-planned alternatives. Interventions aim to give the pastoralists (and the development agencies) the breathing space needed to seek out sustainable survival strategies.

In Equatoria, the successful application of the intervention philosophy has substantially delayed the onset of famine, and curtailed its harshness. The agro-pastoralist Mundari have seen their cattle herds and economy devastated by civil war and drought. Relief interventions have aimed at safe-guarding the cattle herds rather than directly affecting human malnutrition rates.

A Para-vet programme supported by OXFAM and run by a local Mundari self-help group, has trained local cattle owners to diagnose and treat the common diseases of that area (Stockton, 1987). Because they are part of the community and do not see themselves as outsiders, they are able to travel into the militarily unsafe areas of Equatoria to administer vaccines where they are needed. They were instrumental in diagnosing and con-
taining an outbreak of East Coast Fever in 1986 (the first case of the fever ever reported in southern Sudan). Perhaps the most remarkable aspect of the programme has been the way its coverage has spread, apparently unlimited by tribal and military boundaries. Large numbers of cattle from both sides of the civil war have been vaccinated.

By reducing take-off from the herds by disease, the para-vets are directly contributing to the recovery of the Mundari economy. Healthy cattle are more valuable and more able to cope with the stresses caused by drought. Equally of course, healthy herds multiply more quickly.

A livestock/grain exchange scheme had to end in 1986, primarily due to a lack of food-aid at that time. The scheme aimed to provide grain to those who had livestock, at a fair price, and pass on the livestock obtained to those who had lost their animals. Once again the primary target of the relief effort was the cattle economy, not human malnutrition.

With the increased dislocation of the economy and displacement of people due to the civil war, the above scheme has been superseded by free food hand outs. The food-aid is used as a resource to offset the stress sales of livestock. If these sales were allowed to continue at pre-intervention rates, herd sizes would soon be decimated causing a loss of long-term food security. Food distribution is helping avert almost certain famine in the future. Recognition of this wider role for food-aid predictates a wider role for the organizations involved in monitoring food-aid. They must be sensitive to the effects of food distribution upon livestock sales, milk production and livestock/grain prices, as well as human malnutrition rates.

VICTIM-LED INTERVENTION

All the above programmes have found that success only came where relief was implemented through those who were the victims of the crisis. The policy of "enlightenment", prevalent in rural development thinking in Sudan, has totally failed. This policy held that rural areas were undeveloped because their population was "unenlightened", uneducated and unable to gain access to the sophisticated thinking of the urban based and educated experts.

Attempts to use "experts" as links between the expatriate agency and the people it wished to help, did not work. In Red Sea Province, University graduates were employed to act as project officers on rehabilitation and development projects. They found it difficult to relate to, and share, the aspirations of those they were supposed to be in partnership with. In Equatoria the local Mundari "self-help" group was initially dominated by Mundari who no longer lived in the rural environment. These urban "enlightened" men saw development as a process of rejecting their traditional values and way of life in favour of an urban, educated existence.

LESSONS LEARNED

Intervention is needed when the basis of the economy, livestock, comes under abnormal pressure. To wait until the economy has collapsed and people are dying of malnutrition is analogous to delaying servicing an aircraft until it crashes and kills people. (Such a dereliction of duty on the part of an airline would lead to public outrage and criminal prosecution.)

It is only by working directly with those at the sharp end of the crisis, and by empowering them to become responsible for implementing the response to that crisis, that relief efforts will meet with any lasting success.

Interventions can take place at any point in the socio-economic web which
leads to a positive effect on the pastoralists' ability to maintain their herd sizes.

If food-aid is used, it should be seen not only as a method of containing malnutrition but as a direct support to the animal herds. The monitoring and targeting of the food-aid should take this philosophy on board.

References


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Shelter for the Homeless after a Flood Disaster: Practical Experience in Southwest Afghanistan

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In spring 1965 a flood disaster occurred in the province of Nimruz (Sistan) in the southwest corner of Afghanistan. This was due to a winter with heavy falls of snow, a quick change of air temperature in spring and the newly-built Kohak Dam on the Iranian border, a measure to protect the province of Zabul from floods of the Helmand river (see Figure 1).

The capital town of Kang and many small villages around the Sistan basin (Hamun-i Helmand) were flooded within a few days and the inhabitants of the affected areas were evacuated.

At that time I was in charge of the newly-established City Planning Authority and thus had to accompany the Minister of Public Works to Sistan in order to investigate and to take necessary measures against the damage to buildings. We reached Sistan after two days of driving. The disaster was much more serious than I had expected. The entire town of Kang with all its mud houses had been evacuated. Most of the houses had collapsed. The families with all their belongings lived in temporary tents provided by the Afghan Red Crescent. A mobile health centre and a central station for drinking water, food, clothes and medicine gave the necessary help to the families that had been evacuated.

Din Mohammad Delawar, the governor of the province, on receiving us mentioned that emergency steps were necessary to start building the new capital town. He mentioned that after two months the temperature in July would rise to above 45°C in the shade and living under tents would be unbearable then.

He said the families would be able to build shelters and even houses within two months for their accommodation. We should just help them by making available free land and water.

I tried to explain that starting to build a new town would not be a simple matter, especially since I was seeing this part of my country for the first time, and that I would not even be able to select a site for the new capital. Only a young engineer, a surveyor, was accompanying me and without proper investigation I could not take the responsibility for selecting the site.

We received orders from the prime minister’s office in Kabul not to disappoint the people and to try to give as much help as possible. The governor suggested that for the selection of a site the oldest and most experienced inhabitants of the province and the surrounding villages should be asked to give advice. They know the conditions and possibilities of the area the best.
The following day about 20 people, mainly inhabitants from the surrounding villages and representatives from the Baluch tribes, were gathered to discuss the new town. The governor explained the problem and asked the representatives to help in selecting the most suitable site for the new town. The new site should have the following qualities:

- It should be out of the flood danger-zone but at the same time within the reach of water from one of the irrigation canals.
- It should be only a short distance to the Hamun and the agricultural fields.
- It should be situated on the motor route from Farah to Chahar Burjak and also on the caravan route to Iran.
- Distribution of plots should be free of charge, which implied that there would be no private ownership of land.
- Suitable soil should be present for construction of houses.
Throughout the day, different suggestions and possibilities were discussed and argued. Finally all the representatives agreed that Dasht-i Amiran (Plain of the Kings) about 12 km southeast of the destroyed town of Kang would be the most appropriate location where all the requirements could be fulfilled. We visited the new site on the same afternoon. The area was flat and covered with good soil. A quick survey with our jeep assured us that the 4 km² site presented no problems. Ruins of forts and old palaces shaped the horizon.

The governor promised that within two days a labour force supplied by the army would dig a waterditch from the nearest watercanal, which was about two kilometres away.

For the first stage of the new town I produced the following programme.

- At the moment 600 homeless families are living under temporary tents, 300 families are living in surrounding villages.

- For the first stage 1,000 plots should be distributed:
  - 50 plots for extended families each 2000 square metres (m²)
  - 100 plots for extended families each 1000 m²
  - 350 plots for middle income families each 600 m²
  - 500 plots for low income families each 300 m²

Provision should also be made for:

- two segregated schools for boys and girls
- health centre with future extension to regional hospital
- offices for different government departments
- a shopping area, bazaars and market place
- a central place with a Friday mosque, with local mosques in surrounding neighbourhoods.
- a housing area for government officials.

The first concept of the new town was drawn up on the same evening and the next day, and was shown to the minister and the governor (see Figures 2 to 5). We all visited the site again and the place for the Friday mosque was fixed. Two days
later during a great ceremony the foundation-stone of the mosque was laid. Affected families, people from the surrounding villages and government officials took part in the ceremony. The new ditch was full of water. With the agreement of the government in Kabul the new town was named Zaranj, the capital of the province Nimruz.

After one month I visited Zaranj again. The empty desert was full of life. Hundreds of people were busy with building shelters, surrounding walls and collecting building materials. I handed over the approved plan of the town. The town received the necessary budget for building two schools, one health centre and some office buildings.

In 1970 I had the opportunity to visit Zaranj again. The empty area had changed to a crowded and busy town. They already had safe water from a deep well and a generator provided electricity. Every family had either a sound house or a shelter. There was no difference between the houses of the new town and houses in the surrounding villages. Earth was the main building material and the traditional dome-and-vault construction with mud-bricks was common (see Figures 6 and 7). Only government buildings had concrete roofs and burned bricks walls.

Now, after many years of dealing again with the problem of "Shelter for the Homeless", I remember our efforts to provide immediate help for the homeless.
case of Zaranj showed that people are able to participate in finding solutions to complicated problems like the selection of a new site. I am not sure whether a group of experts could select a new site in such a short time any better or even with the same measure of success. All kinds of regulations and building laws which do not correspond with the traditional building methods in such areas should be avoided, because they will not help in immediate and short-term reconstruction programmes.

Action planning, even in a very simple way, is necessary. Only with the help of action plans could cooperation between government and people be coordinated and demonstrated, and financial help from the governmental authorities be obtained more easily.

Involving groups of foreign experts is not always helpful and usually very costly. Local experts with international experience but acquainted with the local situation are generally more effective.

FIGURE 4  Simple and easy way of plotting families in Sistan.

We succeeded because the people were involved in finding solutions. Cooperation with the people concerned is always helpful, sometimes essential. The
Notes

1. The author of this report was President of the Afghan Central Authority for Housing, Building and Townplanning before his flight from Afghanistan in 1980. He is now a Lecturer at Karlsruhe and Stuttgart Universities. Those interested in the history of Sistan might refer to G. P. Tate, *Seistan: a memoir on the history, topography, ruins and people of the country*, 2 vols, Calcutta 1910-1912, repr. Quetta 1977. Some attention to

the history of flooding in the area is given in a recent article in *Iran*, vol. XXII (1984), 113-150 (ed.).

2. Zaranj was the ancient name of the capital of Sistan.

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A two-day Workshop, on 16–17 May 1988, was held at the Institute of Advanced Architectural Studies in York. It was sponsored by the University of York and convened by James Lewis, an independent consultant in disaster mitigation. Its aims were to explore aspects of post-war reconstruction in the context of "continuing and/or recurrent destruction and/or peace-building"; to examine the similarities and differences between post-war reconstruction and reconstruction following natural disasters; to bring together the experience of different disciplines; and to recognize the gaps in our knowledge about the subject.

Although this Workshop was the first to be held on this subject in the United Kingdom, a previous one, the "International Conference on Reconstruction of the War-Damaged Areas of Iran, Tehran University, 6–16 March 1986", should be mentioned.

The inspiration for the Workshop was developed by the organisers because of two postgraduate research architects currently involved at York University, namely the author, who is researching into damage in the rural areas of Iran, and Souheil El-Mesri who is working on Beirut, Lebanon, at CARDO, The University, Newcastle Upon Tyne.

More than 20 delegates from different universities and organisations attended the meetings. Altogether thirteen papers were presented. Despite the initial idea of the Workshop to designate the greater part of the time to discussions, it did eventually become a mini-conference. However, enough time after each presentation was spent for exchanging ideas.

The majority of speakers were architects, although participants from other disciplines including politicians, psychologists and engineers, promoted a broader scope for discussion than merely focusing on housing and settlement matters.

In view of the fact that "There have been about three hundred wars since 1945. There has been no single day free of war and few islands of tranquillity." (Michael Kidron & Dan Smith The War Atlas, 1983, London, Pan Books), the importance of the subject becomes apparent. Looking through the existing literature, most documents dealing with post-war reconstruction date back to the World War II. If damaged areas of those 300 wars are restored and reconstructed in one way or another, there remains the question to ask, why is there this gap in our present knowledge on reconstruction after war?

The opening session was addressed by Sir Peter Marshal KGMC. He was followed by Hawthorne William talking on "The Helsinki Accord and opportunities for confidence building", which reviewed
some political aspects of war. James Lewis focused on survivors’ resources and aspects of their vulnerability in pre- and post-war conditions. Comparing reconstruction after the second World War with wars since then he claimed; “In reconstruction after World War II it was inconceivable that war should occur again. In reconstruction since, it seems just as inconceivable that it will not.”

The author’s own contribution to the workshop was a discussion on “War as a disaster”. He highlighted the urgent need to study the subject and proposed a framework that would take account of the many different issues and disciplines involved. The first day programme ended with a somewhat dated, but nevertheless impressive film show on the reconstruction of Warsaw, entitled Warsaw: The city that refused to die.

The second day started with Ian Davis. While he was expected to talk to his earlier paper entitled “Some comparison of reconstruction after war and natural disasters” which had been circulated, he preferred to shift to a valuable presentation on “Five dilemmas in reconstruction policies” and explored them in discussion.

The case of housing reconstruction in Beirut was illustrated by Souheil El-Mesri, an architect from that city. He mentioned the very special and sophisticated problems concerned with supporting and reconstructing damaged concrete housing blocks, where the civil war appears to have no end. He spoke about the astonishing figures of homeless people, and the methods they use to shelter themselves. He said there was a lack of confidence on the part of the people and the government for any long term measure to control the situation sufficiently to embark on a proper programme of reconstruction. His final point was a proposal for dealing with vast numbers of the homeless.

Two additional Iranian speakers introduced some cases of post-war reconstruction in Iran. Ali Parsa illustrated the case of reconstruction in the city of Hoveizeh in Khuzestan and, after showing some examples from post-earthquake reconstruction in Khurasan Province, moved on to examine the role of appropriate technology in post-war reconstruction.

Ali Madani Pour, on the other hand, raised the question of appropriate design in villages reconstructed due to war damage. He compared two examples, one from a self-designed village and the other where a professional design had been prepared. He discussed the advantages and disadvantages of these two approaches. It became clear that the non-professional solution was better in many respects.

The contribution of Robert MacAdam, an engineer, was a review of his experience in the refugee camps of Lebanon. He has published his conclusions in the Journal of the Institute of Civil Engineers. On this occasion he summarised the special circumstances that an engineer might have to face working in the context of a war and which he is unlikely to face in any other post-disaster work.

A case from World War II was reviewed by Ross Gilhome. He gave an historical summary of “The systematic and planned destruction of Warsaw 1939–45 and its symbolic reconstruction”. He detailed the 1939 invasion of Warsaw by the Germans, and the violent measures they took to destroy the city and to loot all valuable items. He compared the first attempt by German architects to make a design for the city “to become the administrative and military centre for the governorship of the Reich”, and what was actually designed and built. As a case history this contribution well illustrated just how far the violence and destruction of wartime can go.

The next paper was presented by
Stephen Ledbetter, another engineer. He took as his theme the concept of reducing vulnerability by planned reconstruction, based on the assumption that the damage of war has many similarities with that of earthquakes. Some traditional dilemmas of risk reduction in the reconstruction phase were also elaborated. His main emphasis was on dispersion and concern for the resistance of public buildings as a necessary measure in post-disaster reconstruction.

The contributions by the two psychologists were enthusiastic. Dr Roderick Ørner talked about the human tragedy of experiencing a disaster, how the syndrome of “post traumatic stress disorder” can be found among survivors of all kinds of disasters, be it a civil war, an earthquake or “transport disasters such as occurred in Zeebrugge and the Kings Cross underground station”.

Michael Stewart, the second psychologist, talked about the other side of the same coin; our life is full of vulnerability to different hazards and Man by his very nature has the ability to react to these events and make an “opportunity” out of having to survive. The main message received, perhaps, was that the psychological effects of disasters, unlike the physical effects, are invisible and during the reconstruction period are constantly ignored.

The Workshop finally concluded that although many countries all over the world (most developing countries), are currently or have been involved in wars of different kinds, it seems that our existing knowledge about post-war reconstruction is still in its infancy. It was agreed that this situation should be changed.

The Workshop also recognized that in the case of war, there should be the involvement of different disciplines in the study of reconstruction. It was also much hoped that besides the old experience from post World War II reconstruction, the knowledge of reconstruction after natural disasters could be used as a major source of more up-to-date information. And finally the need for further meetings of this kind was recognized, with aspirations for an international conference to provide the opportunity of exchanging ideas and experiences from all over the world. Ideally it could take place in one of those countries which are currently involved in post-war reconstruction.

At the moment, the Institute (I.A.A.S.) is thinking about an interim event of the same scale as the May Workshop. However it is in its early planning stage, and would welcome suggestions for speakers and topics. The report of the Workshop, including a summary of all the papers, can be obtained from the Institute of Advanced Architectural Studies, University of York, Kings Manor, York, YO1 2EP, England.

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This report describes the progress of the landslide and flood emergency that occurred in Valtellina, in the northern Italian Alps, during July and August 1987. For the authorities, the critical problem was one of controlling the rise of a large lake impounded on the River Adda by landslide debris that threatened to breach catastrophically, releasing a major floodwave. Several lessons can be learned from the way in which the emergency was managed. First, helicopters played a critical role in evacuating survivors and moving supplies around the disaster area, but there was scope for better co-ordination of operations. Secondly, high levels of private car ownership allowed greater flexibility in designing mass evacuation plans for threatened communities, but such high personal mobility proved difficult to control in order to ensure public safety. In future, education programmes could be used to help people appreciate the dangers of driving during periods of great natural hazard risk. Thirdly, the Valtellina disaster coincided with a change of national government, including substitution of the Minister of Civil Protection. This led to a policy vacuum, sub-optimal decision making and erosion of public confidence in political leaders. Landslide-dammed lakes represent a widespread but rather unpredictable hazard: they therefore require flexible emergency response, but not without decisive leadership.

INTRODUCTION

Valtellina, in the Province of Sondrio among the Rhaetian Alps of Northern Italy (Figure 1), was the scene of a landslide and flood emergency that lasted from 18 July until the beginning of September 1987. Fifty three people were killed or remained unaccounted for, at least 110 were injured and 25,000 were evacuated from 40 municipalities that have a combined population of 48,500. Damage and destruction, which were widespread throughout the Alps, have been valued at £450 million in Valtellina alone, and it took five months merely to re-open the valley to through traffic. Essentially, flooding of the River Adda (which flows into Lake Como) provoked landslides and led to casualties, destruction and disruption from 18 July until, on 28 July, major debris avalanches blocked the Adda and began the impoundment of a large lake. During the following month, the authorities had to design a strategy that would reduce the risk of overtopping or breaching of the debris dam as the water level rose. This necessitated evacuating settlements for 50 km downstream of the lake and then releasing water impounded behind a hydro-electric dam.
upstream, in order to scour a relief channel through the debris barrier.

In this report I will describe the evolution of the emergency and make some general conclusions. From the point of view of disaster studies, the event is particularly interesting for what it tells us about two problems: the use and misuse of helicopters and private cars; and the impact of government indecisiveness on the supervision of relief work, the enforcement of evacuation measures and the degree of public confidence in elected leaders.

THE SETTING

Since 1945 landslides and floods in Italy have killed more than 10,000 people and caused damage valued at £40,000 million (Alexander, 1987a). A 1987 survey of 26 provinces identified 1,670 landslides at an average density of one per 53.8 km² (Ministry of Civil Protection, 1987). About 25 percent of these are periodic or continuous, 20 percent have damaged buildings and 47 percent have damaged roads. The study emphasized the special vulnerability of the Bergamo-Como-Sondrio triangle in the Alps, in which 255 damaging landslides were identified, 70 percent of them in close proximity to settlements. In Valtellina since 1800 landslides and floods have provoked damage and sometimes destruction with an average recurrence interval of no more than 15 years.

At Tresenda, near Sondrio (Figure 1) in May 1983, 17 people were killed in a major debris slide associated with heavy rainfall (Azzola and Tuia, 1983).

Undoubtedly, the primary cause of such instability lies in the tectonic and post-glacial conditions of the valley. Orogeny in the Alps has involved collisional tectogenesis among continental rocks from several crustal plates and microplates situated above a crystalline basement. Folding mainly occurred in the first half of the Tertiary (65–25 m.y. B.P.), with phases of quiescence during which
erosion succeeded in keeping pace with
the bursts of uplift (Embleton et al., 1984). More recently, the Alpine Orogeny ended
in the Pliocene and early Quaternary, after which neotectonics continued the
process of active crustal adjustment to pre-existing stresses. The section of
Valtellina from Lake Como to Tresenda follows the Insubric Line (known to
Italians as la linea tonale), a suture that divides the Southern Alps from the
northern, Austro-Alpine nappes. This discontinuity may be a form of overthrust, or
possibly a strike-slip fault with up to 300 km of dextral movement (Ollier,
1981). In any event, it has guided the orientation of the lower valley. North of
it, south- and east-facing overthrusts are present, and the upper valley is cut in
metamorphic rocks, such as gneiss and micaschist, with exposed plutonic rocks
that include granite, porphyrite and acid diorites. These Archeozoic to Mesozoic
rock formations are complemented by small outcrops of slate, limestone and
dolomite.

Among five or six Quaternary glacia-
tions, the penultimate or Riss (200,000
yrs. B.P.) and the last or Wurm (80–60,000
yrs. B.P.) appear to have extended the
furthest and removed many traces of
earlier cold periods (Embleton et al.,
1984). Hence, the valley is undergoing
morphological adjustment to both neo-
tectonics and the post-glacial conditions
of the last 11–14,000 years. The River
Adda has not yet removed all fluvioglac-
ial deposits from its valley, and the
most unstable slopes include those cut in
moraines, tills and debris cones at the foot
of hanging valleys.

A secondary but by no means insignifi-
cant cause of slope instability is poor
environmental management, mainly
involving deforestation, mismanagement
of water resources and overdevelopment
of settlements and routeways. About 8.7
million hectares (28.8 percent) of Italy is
forested, an area that compares well with
European Community averages. Most
trees occur on 20–25 percent slopes and
about 0.9 percent of the woody biomass
of 1000 million m³ is cut each year. But 40
percent of forests suffer damage to a
greater or lesser extent as a result of soil
erosion, fires or acid deposition (Docter,
1987). Valtellina has suffered additionally
since 1918 from progressive deforestation.
Demand for wood as a building material
and fuel has recently been replaced by
demand for steeper land. Although much
of the area is theoretically protected under
conservation laws of 1923 (for drainage
basin management) and 1939 (regarding
preservation of scenic beauty), as well as
a Ministerial Decree of 1963, the laws are
seldom respected at any level of authority
(Cederna, 1975, regarded the nearby
Stelvio National Park as merely a “geo-
ographical expression,” utterly unprotected
against incursion by developers). In
1984–85 3200 trees were cut down to open
up new runs for the World Ski Cham-
pionships, and this signalled a renewal of
demands for planning permission to
develop chair lifts, hotels, restaurants and
access roads in many parts of the valley.
State participation was not lacking: £450
million was invested in a 20-year project
to upgrade State Road S.S. 36 north of
Lecco, including the construction of 28 km
of tunnels. No environmental impact
statement was prepared.

In short, development to some extent
followed the model identified by Kariel
and Kariel (1982) for an Austrian valley
that had changed from a traditional agri-
cultural economy to one based largely on
commercial tourism. Environmental and
natural hazard safeguards were minimal,
although in the months preceding the
1987 disaster £18 million were spent on
slope consolidation in Valtellina, a sum
that commentators regarded as “too little,
too late” (La Stampa, Turin, 21 July 1987). Lombardy Region at the time spent only
0.4 percent of its budget on environmental protection, according to the weekly *L’Europeo* (8 August 1987). To some extent, any reduction in the hazardousness of slopes was counteracted by increase in that of flood-plains. For example, ENEL, the state electricity generating authority, raised the bed of the River Adda at Ardenno, in order to accommodate a hydro-electric plant.

Apart from the electricity demands of Po Valley settlements such as Milan, tourism has been the major impetus to environmental modification in Valtellina. Twenty-five percent of the local economy is based on recreation, which is worth £680 million a year. Bormio, which is at the head of the valley 20 km from the Swiss border, is one of the richest municipalities in the country and normally earns about £90 million a year from tourism. The 1987 floods and landslides occurred during the high season, causing tourist presence in the valley to fall by 60 percent, and confirmed reservations to drop 90 percent.

THE DISASTER

On Friday, 17 July 1987, the Italian Meteorological Service predicted heavy rain over the north of the country. The Ministry of Civil Protection in Rome was alerted during the early hours of Saturday 18th. By 11 hrs. on that day a landslide and flood warning had been transmitted to the Prefectures of seven northern regions, who had warned local municipal mayors. In Valtellina and Val Brembana campsites were evacuated and motorists were warned via television news and three radio channels. By the afternoon of Monday 20th, 11 bodies had been recovered, 23 people were missing, 120 were injured, 2730 had been evacuated and damage was provisionally estimated at £450 million. Army, airforce, fire brigade, ambulance and bulldozer crews and personnel in the field amounted to 3620, using 332 vehicles and 42 helicopters and aircraft. Bormio was accessible only from Switzerland and 21 settlements were isolated in Val Brembana. Sixty municipalities had been affected, 2000 buildings flooded and six bridges washed away. Local administrators requested that a State of Emergency be declared for an 80 km stretch of Valtellina from Talamona to Bormio.

Mudflows had buried 20 vehicles at Sant’Antonio Morignone and swept away a hotel at Tartano, in which seven people died. Most victims were hit by fast-moving rockfalls, mudslides or debris avalanches, although incidences of drowning in the floodwaters were reported from various places in the Italian Alps, as well as in concurrent events in Austria, Switzerland, France and Belgium. Lake Como rose gradually to 283 cm above its datum, flooding the centre of Como city; by 18 hrs. on Sunday 19 July the lake was receiving a discharge of 1600 cumecs and disgorging only 760. About 290 mm of rainfall was received over the period 18–20 July.

During the subsequent week the floodwaters ebbed, but mass movements continued to damage roads and railways, posing a hazard to transport. For example, 200,000 m³ of sediment created a temporary barrier to the River Adda near Sondalo. Fractures were observed in the east side of the valley at 2000 m above sea level (800 m above the valley floor) about 8 km south of Bormio. Air photographs taken on 21 July showed them to be 1 km long, at which point the coordinator of a geological office that had been set up at Bormio warned the Minister of Civil Protection, the Hon. Giuseppe Zamberletti, that a major slope failure was probable. The location, Val Pola, had been identified as a landslide risk zone in a report dated 1972 (Pozzi and Sfondrini, 1972), although a more superficial survey
of 1984 had been reassuring (L'Europeo, 8 August 1987). On 26 July the Minister signed an ordinance allowing only relief workers access to the evacuated area south of Bormio. A day later he suspended it, but seven construction workers had nevertheless acquired authorization to retrieve a bulldozer from Sant'Antonio Morignone. Their bodies were never recovered.

At 7.18 hrs. on Tuesday, 28 July, the Val Pola landslide began to mobilize. At 7.27 it slid as an avalanche of at least 10 million m³ of debris, accelerating to 70 m/sec (250 kmh). The movement lasted 31 seconds and caused tremors at magnitude 3.9 on the Richter scale. The settlements of Morignone and Sant'Antonio Morignone were obliterated and, as the debris climbed the opposing sideslope, damage was extensive in the valley-side village of Aquilone, which had not been evacuated. The lower part of this settlement was crushed by moving rock debris and the upper part impacted by a faster-moving air pressure wave. One body and nine injured people were recovered, while 27 remained missing. The River Adda had its course blocked by a barrier of saturated debris 9 km² in size, 2800 m long and 40-70 m deep (similar landslides in the Alps have been described in extenso by Heim, 1932, and Erismann, 1979). The debris drained in a continuous anastomosing flow towards the southerly floodplain of upper Valtellina. At a time when Lake Como was gradually subsiding towards its normal level, the flow of the River Adda (albeit much reduced by abstraction via a network of hydro-electric dams and aqueducts) was discharging 20-22 cumecs of water into a new lake basin 1,500,000 m³ in volume in the municipality of Valdisotto, south of Bormio.

The rate of discharge into the lake fell to 2-3 cumecs as the weather improved for a while. But a brief interlude of heavy rain on 30 July provoked fears that a further 2 million m³ of rock would cascade into the lake, causing a floodwave that might overtop or breach the debris barrier, leading to damage downstream akin to that which in 1963 killed 2100 people in the Piave Valley near the Vajont Reservoir (Kiersch, 1965; Quarantelli, 1979). Fears were reinforced by the occurrence of a 1.5 million m³ landslide at Fusine that together with floods damaged 110 houses and killed one person.

In early August it was predicted that the lake would swell to 21 million m³ of water within six weeks, or sooner if there was heavy rain – provided, that is, that the debris barrier did not fail. As there was little evidence that this was about to happen, plans were laid to install in the debris a drainage tunnel 1.6 m in diameter capable of discharging 5-6 cumecs, plus an open spillway over which water would be pumped. Later a tunnel would be built that would carry up to 400 cumecs through a tube 6 m in diameter. Pumping would not begin until 19 September, although preliminary installation work was carried out over the period 3-18 August. Unfortunately, rockfalls and slides continued to occur on the sideslopes (providing dramatic television footage). Throughout this time evacuation downstream was minimal, as a 5-12 hour lead time (later raised to 12-15 hours) was expected in the event of a serious flood. But on 24 August work on the debris barrier was suspended amid conditions of great uncertainty. At 22.32 hrs. the Prefect of Sondrio signed evacuation orders for 19,500 downstream residents, at a time when the lake waters were only 7 m below the top of the debris. At this point, the Hon. Remo Gaspari, who had replaced Sig. Zamberletti as Minister of Civil Protection, took the difficult decision to flush the debris barrier by augmenting the discharge of the River Adda, in the expectation that this would erode a spillway deep enough to reduce the lake level...
and thus the risk of destruction of the barrier.

The operation was without doubt extremely risky, as there was no guarantee that flushing would occur evenly, rather than as a major floodwave. Upstream, the Premiado Reservoir of the Milanese Electrical Company (AEM) held 244 million m³ of water behind a 140 m-high dam. Normally, it released 13–26 cumecs in order to generate 150 MW of electricity. The sluice-gates were to be opened at 4 hrs. on 30 August. The River Adda, whose discharge had fallen to 4 cumecs from a flood peak of 120, would reach more than 20 cumecs. Although 24 hours would be needed to achieve tangible results, it was conceivable that massive scour damage could occur as far south as Villa di Tirano, 30 km downstream, and that the floodwave would still be 4 m high at Sondrio, a further 25 km down the valley. The alternative, to reduce the discharge and cut a new spillway, was deemed too slow, given the continued hazard of rockfalls into the lake.

Seven thousand people at Sondrio were put on evacuation alert and the discharge of the Adda was increased gradually to 35 cumecs. State television ran a seven-hour live broadcast that captured 77 per cent of viewers nationally, some 3.8 million people. In the event, the operation succeeded and more normal engineering works were then employed to drain the lake, at its lower level. A 10 km tunnel was constructed on State Road S.S. 38 and opened in January 1988, thus restoring direct communications between Sondrio and Bormio. The government allotted £680,000 to the families of victims and £51 million for repair of basic infrastructure. Reconstruction of the worst-damaged settlements would take decades.

PROBLEMS OF TRANSPORTATION

Distinctive problems were experienced during the emergency with two of the most useful modes of transportation: helicopters and private cars.

Throughout the emergency about 40 helicopters were used. These included many light, single-rotor machines and a small force of double-rotor Chinooks, capable of carrying more than 30 people, but less manoeuvrable and less easy to land than the smaller craft. The helicopters belonged to the Italian Airforce, Army Light Air Transport Command, Revenue Police, Carabinieri, Forestry Corps and private aviation firms. They were especially useful during the period of floods, when occupied homes in the valleys were submerged, and afterwards when roads were interrupted by landslides. An illustration of how heavily they were used is furnished by information supplied from the Ministry of Civil Protection command post at Bormio after the first three days of the emergency: the Airforce made 300 helicopter flights, moving 2600 evacuees, and 30 Army helicopters carried 1600 people during 171 flight-hours of operations. At Talamona during the initial floods 35 people had been winched to safety aboard helicopters in three hours. Bergamo city airport had been the main base for flights, and in Valtellina local sports pitches had been used as landing pads.

Although the helicopter operation was an undoubted success, it was not without drawbacks. Hours of continuous manoeuvring during heavy rain, amid cloud cover and in deep Alpine valleys, exerted a serious strain upon the pilots. At Oimo al Brembo, in Val Brembo, a light helicopter crashed onto a filling station after its rotor became entangled in overhead power lines; fortunately, there were no casualties. While Valmalenco was submerged by floodwaters, pilots working for private companies are alleged to have offered stranded residents a trip to safety at prices of up to £4,500. Unless
payment was made immediately in cash, the victims allegedly were not winched up. Other unscrupulous people assumed the role of intermediaries who would, for a price, find survivors space in the free flights made by Army helicopters. The Prefect of Sondrio promptly issued an order banning such practices, but they proved difficult to stamp out.

Some of these problems, one supposes, might have been resolved by improving co-ordination among helicopter corps. Ideally, it would seem appropriate to plan to have all helicopters at work in a disaster area under the command of one traffic controller and to ensure that pilots have training – and licenses – adequate to the special conditions associated with civil emergencies, such as floods, in which visibility is poor and many helicopters are at work in a restricted airspace.

The problems associated with the use of private cars were rather different. There is no doubt that rapid mass evacuation of groups of people as large as the 19,500 evacuated downstream of the Val Pola dam could not have been achieved efficiently without private transportation – at least, not without careful preparation of public transport. Hence the private car lent a degree of flexibility, and perhaps even spontaneity, to evacuation plans. However, the other side of the story is that mandatory evacuation became very difficult to enforce. After the formation of the Val Pola debris dam, for example, downstream communities were evacuated by order of the Prefect of Sondrio and Minister of Civil Protection. Although police surveillance of State Road S.S. 38 was continuous, some 300 official waivers of restrictions on access were issued in the first 36 hours after evacuation. There were many more illegal entries into the cordoned areas, such that supposedly evacuated villages near Sondrio developed traffic jams and crowds. Such a combination of free-will and personal mobility proved extremely hard for the authorities to control.

There is also mounting evidence that people have an inflated idea of the degree of safety offered by an automobile during flood and landslide emergencies. Travelers were warned of the hazard by broadcasts on national radio and television at 13 hrs. on Saturday, 18 July 1987. The Ministry of Civil Protection held the warnings to be adequate, but not the public response. The storms of July 1987 killed about a dozen people in transportation accidents that occurred in various parts of Europe. In Italy at least six died in cars while driving in valleys with high flood, rockfall or mudflow risks; others had narrow escapes. One might question the necessity or wisdom of such journeys and the awareness of danger shown by car users. Similar conclusions were reached by Gruntfest (1977) and Gruntfest et al. (1987), who investigated the reliance on cars to escape flash floods in the Colorado canyons and found that driving tended to increase people’s vulnerability in comparison to more carefully considered evasive action. The key to the problem may lie in improving public awareness of these risks.

THE IMPACT OF POLITICAL DECISIONS

The frequent changes of government in post-War Italy tend to leave one with the suspicion that a cabinet of ministers is only semi-relevant to the conduct of national affairs (Allum, 1973). As it happened, such a change coincided with the Valtellina disaster, upon which it had a profound influence.

In the 1976 Friuli and 1980 Irpinian earthquake disasters, the Italian government appointed the Christian Democrat politician Hon. Giuseppe Zamberletti as Special Commissioner for Relief Work. The 1980 disaster involved Zamberletti so
profoundly, and with such high government expenditure (estimated at 3 percent of GDP per annum for five years), that a full scale Ministry of Civil Protection was established in Rome under his direction on 1 August 1982 (Alexander, 1986a, 1987b). National legislation enacted to set up the Ministry has been described in detail by Pastorelli (1986). For a brief period during the 1983 Pozzuoli (Naples) volcano-seismic emergency Hon. Vincenzo Scotti became Minister, but the next cabinet reshuffle restored Zamberletti to the post, as he was the man with the greatest experience of government involvement in disaster relief and had earned a fair measure of public trust by his way of administering it. This achievement is all the more remarkable, as the reserve of national funds allotted to the relief and prevention of natural catastrophe (il serbatoio) falls far short of the sums actually needed by a government that sets itself up as the chief indemnifier of the public against disaster losses (Alexander, 1987a).

Following the precedent he had set himself in previous disasters, Zamberletti set up a Ministerial command post at Bormio in Valtellina, from which he directed relief operations with the help of Dr. Elveno Pastorelli, the Head of the National Civil Protection Council. His working relationship with the Valtellinesi was, however, jeopardized by the question of who had signed the papers authorizing the seven workers who died in the Val Pola landslide to enter the risk zone on the morning of 28 July. Although the matter was rapidly placed sub judice, it appeared that a misinterpretation of orders had occurred at a lower level of command, and so the Minister was not formally implicated.

On 29 July 1987 the first government to be headed by Giovanni Goria was announced. Zamberletti immediately lost his ministerial post to Remo Gasperi, also a Christian Democrat, who had been a parliamentarian since 1953 and a minister frequently since 1970. Dr. Pastorelli resigned with the passing of Zamberletti. Essentially, the latter had been sacrificed to the so-called "Cencelli Code," in which the coalition government is maintained by appointing ministers from each participating party in strict proportion to their level of support from colleagues in the Italian Lower House. At the same time a Socialist was appointed Minister of the Environment and a Social Democrat to the Ministry of Public Works.

It is certain that the act of substituting a competent minister at the height of the crisis did little to reinforce public confidence in the government's ability to manage the Valtellina disaster. It was widely held to have been at best insensitive and at worst a cynical act (La Repubblica, Rome, 26 August 1987). Gasperi's inexperience showed. During the emergency he failed to convene the government's Commission on Great Risks (Commissione sui Grandi Rischi), which is the steering committee for government intervention during disasters and has a hydrogeological section chaired by a geologist, Professor Lucio Ubertini. The eminent European parliamentarian Professor Felice Ippolito promptly resigned his Vice-Presidency of the Commission in protest. Commentators also noted that the government's Environmental Commission was not due to meet until 28 August at the Chamber of Deputies and 8 September at the Senate. The result was a policy vacuum that manifested itself as indecision, or wrong decisions, and gradually filtered down the chain of command in Valtellina until it eroded public confidence.

During August 1987 Gasperi changed his approach to managing the Val Pola lake from a strategy based on pumping to one based on flushing the debris barrier by opening the flow of water from hydro-
electric reservoirs. Controversy among geologists and hydrologists as to the possible effects of this highlighted the seriousness of the dilemma. In the Autumn of 1807 a landslide dammed the River Adda near Tirano and attempts to manage the debris barrier led to catastrophic breaching and heavy scour damage downstream. In 1987 the day on which the discharge of the Adda was increased, 29 August, was dubbed by the press, not "D-Day," but “Gasperi-Day,” as the Minister's reputation hung on the outcome (La Repubblica, Rome, 30 August 1987). The success of the operation saw demands for Gasperi's resignation subside with the waters of the Val Pola lake.

Despite his eventual success, Gasperi's management of the emergency was clearly improvised, even to the extent that he found himself on holiday at Vasto, 750 km away, during the critical phase (to the fury of local politicians in Valtellina). The change in the strategy for managing the lake led to ad hoc policies for evacuation downstream, and hence was a factor in the mass violation of evacuation orders. At Le Prese, near Sondalo, poor identification of risks led to residents being evacuated five times in 11 days; on 28 August they joined with residents of nearby Mondalizza in a demonstration against the Minister. There had been a precedent in that on 5 August at Cepina 1000 people resisted an evacuation order that they did not consider necessary.

Questions of governmental lassitude and ministerial incompetence apart, the administrators faced a serious dilemma concerning the external image of Valtellina. Politicians were caught between the need to demonstrate that they were facing up to a very threatening natural catastrophe and the desire to minimise the risks in the hope that tourists would return to the area and revive its economy. The press and television oscillated between reassurance and nicknaming Valtellina "Death Valley." Much of the equivocation, however, reflected the day-to-day unpredictability of the crisis and government response to it.

CONCLUSION

Cases of the impoundment of rivers behind landslide debris dams are not difficult to find in the geomorphological literature (Schuster and Costa, 1986). Many of the examples have seismic causes: for example, the Hebgen Lake earthquake of 1959 in Montana (Wittkind et al., 1962), the Huascaran debris avalanche in 1970 in Peru (Plafker et al., 1971), and the Bairaman River landslide of May 1985 in Papua New Guinea (King et al., 1987). The last of these, triggered by a magnitude 7.1 earthquake, breached suddenly, losing 40 million m$^3$ of water and about 80 million m$^3$ of rock debris downstream in less than 3 hours. In contrast, the Torrente Lago landslide-dammed lake created in Calabria by the 1783 earthquakes there, which was 15 million m$^3$ in size, was only drained laboriously by human intervention 40 years after it formed (Cotecchia et al., 1969). Thus it is clear that there is no set procedure for handling landslide-dammed river emergencies. The literature indicates that they can be just as volatile as glacier meltwater impoundments, which have been a persistent problem in the Alps (Tufnell, 1984) and Andes (Lliboutry et al., 1977).

In general terms, the Italian Alps undoubtedly deserve to be regarded as a high-risk zone for natural hazards. Govi et al. (1979) summarized events and the damage they caused during three years of repeated intense rainstorms, 1972-74, while Tropeano (1978) described examples of flood and mudflow damage near Turin that look depressingly similar to those of Valtellina. According to Benedini and Gisotti (1985), the floods of 20-24 May 1983 in Valtellina caused 240 landslides
and damage valued at £109 million. One person died at a campsite and 17 in the Tresenda di Teglio debris avalanche; 5200 people had to be evacuated. Thus the 1987 disaster must be seen in the light of repeated and widespread Alpine hazards, for which too little preparation has been made and which occur in a context of steadily rising vulnerability. Indeed, many of the criticisms made in the press about the government’s environmental management policies merely repeated those made after the 1985 Stava mudflow disaster in the Dolomites, in which 267 people were killed (Alexander, 1986b).

The case of Valtellina 1987 was one in which the emergency phase, waxing or waning, lasted for nearly seven weeks. During that period it was necessary to reconcile two conflicting needs, the maintenance of evacuation orders and of access to the risk zone. The former was needed in order to ensure public safety and the latter to move plant and equipment to where it could help reduce the risk. The case of the seven workmen who lost their lives in the Val Pola landslide highlighted the perils of laxity in controlling movements around the disaster zone. On the other hand, personal mobility in Italy is such that many residents evaded the cordons in order to return home. The less mobile members of society, especially old people, would instead hide indoors when called upon to evacuate: the Italian concept of domus, that the home is a sacrosanct shelter, evidently prevailed (Haycraft, 1987).

Firm and decisive leadership might have persuaded more Valtellinesi to put their faith in alternative arrangements at the evacuation centres, rather than in the invulnerability of home or car. However, it is always possible that draconian measures would have side-effects that outweigh their benefits, and so the best future strategy would probably involve the sort of education programme that teaches Alpine valley residents to recognize the risks, including those associated with staying at home or travelling on hazardous roads during the emergency.

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References


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The Scandinavian Earthquakes of 22 December 1759 and 31 August 1819

ROBERT MUIR WOOD

The two largest known pre-1850 Scandinavian earthquakes are the 22 December 1759 Kattegat event (located at 57.7°N–11.1°E) and the 31 August 1819 Nordland event (located at 66.4°N–14.4°E), the latter being the largest north European near-shore earthquake of the past few centuries. The 22 December 1759 event caused minor damage to buildings (MMI VII) on either side of the Kattegat in Northern Jutland and in the Swedish province of Bohuslän, and was felt up to 600 km away. The 31 August 1819 earthquake caused widespread damage (MMI VIII) to stone components of wooden buildings in the sparsely populated region of Nordland Norway, as well as very extensive rockfalls, liquefaction phenomena and a remarkable variety of disturbances in fjords and in the sea. The earthquake was felt throughout northern Scandinavia over distances of up to 800 km.

INTRODUCTION

The western margin of Scandinavia (northern Europe) (see Figure 1) has a low to moderate seismicity, comparable with other intraplate regions, such as eastern North America. Earthquakes are recorded from 1073 in Denmark and 1570 in Norway (see Muir Wood and Woo, 1987). Yet for much of the post-Medieval period Norway was an underdeveloped northern colony of Denmark, and those regions with the highest seismicity (western coastal Norway) had few centres where such natural phenomena would be recorded. Communications were always very difficult along the rugged fjord coast and many of the details that have survived from the period 1570–1750 are fragmentary, and do not allow earthquake effects to be usefully mapped. Even for an earthquake in the southwest Norwegian cathedral city of Stavanger on 16 March 1752, that “caused locked doors to burst open, glasses and crockery to fall, and stones from many houses to be thrown down” (Seyfart, 1756) no local sources have been found that might indicate the full geographical range of the shaking. However, at least in southern Sweden and Denmark, the start of newspapers and the greater spread of literacy make this mid 18th-century period the watershed after which major earthquakes can be adequately reconstructed.

Thus it proves possible to research, map and reconsider the significance of two of the most important events known from the region: the North Kattegat earthquake of 22 December 1759 and the Nordland, north Norway, earthquake of 31 August 1819.
FIGURE 1 Location of places mentioned in the text

Key: Brekken – locality/town; STOCKHOLM– major town/city; BOHUSLÄN = province/region/county
22 DECEMBER 1759 NORTH KATTEGAT EARTHQUAKE

The earthquake occurred soon after midnight on the morning of 22 December 1759 and was widely felt throughout Denmark, Holstein, southern and central Sweden and southern Norway (see Figure 2). The most important contemporary accounts appeared in the new biweekly newspaper published in Copenhagen: the Kjobenhavnske Danske Post Tidende (KDPT). The only other local periodical was published in Gothenburg: the weekly Göteborska Magasinet (GM), which contained far less news. Other primary accounts appeared in Hamburg and Stockholm. There were no newspapers published in Norway at this period, although accounts from Norway passed into the Copenhagen newspaper. Within secondary catalogues the earthquake has often become conflated with earthquakes around the Holland-German border in January 1760.

The first Scandinavian earthquake survey was set up by the Bishop of Sjaelland (Christian Horrebow) who asked the priests of his island diocese (on which Copenhagen is located) to send in accounts of the shock, generating more than 70 replies which he analysed and discussed in a lengthy paper (Horrebow, 1765). A number of letters recording the earthquake have been uncovered, and the event is reported in local topographical works.

The earthquake followed on only four years after the great Lisbon Earthquake that had an extraordinary impact on cultural and religious life throughout Europe. A heightened earthquake-consciousness is revealed by the several poems that the earthquake triggered – the longest of which, by Christian Biering (1760), was published in a thirty-two page pamphlet, liberally spiced with anecdotal footnotes.
Central Effects

In both western Sweden and Sjælland the earthquake was claimed to have lasted between one and three minutes (KDPT, 24/12, 7/1/60). At Hamburg it lasted “about a minute”. The time was somewhere between 12.30 and 12.45: one report from Sjælland records the clock striking the quarter as the tremor ceased.

The region of strongest vibration and consequent damage extends across northeastern Jutland, the northern fringe of Bohuslän, Sweden. Around Gothenburg – “there are notes in various parish records that church walls had collapsed (cracked) in several places on the west coast” – Holmberg (1843). Several chimneys were knocked down in Ålingsä and Gothenburg (Gazette de France, 12 and 19 January 1760), where unsupported furniture moved around and porcelain and wood-burning stoves fell over or broke (KDPT, 7/1/60). At Walda (Vallda), to the south of Gothenburg, a letter describes how glass and porcelain fell down, and tiles fell off the roof of the writer’s house (GM, 5/1/60). On the road from Marstrand to Varberg (south of Gothenburg) slight cracks had formed between the bridges and the adjoining river banks (GM, 5/1/60). Holmberg describes a large earthfall into the Göta River (which passes through Gothenburg). At both Marstrand and Walda there were disturbances in the sea – at Walda “waves washed strongly at the foot of the cliff”, and at Marstrand a party going home from a fishing trip on a flat sea, suddenly felt waves rocking the boat quite hard; water flew up on both sides into the boat, and the oars jumped out of their rollocks”.

To the west of the Kattegat in Ålborg an upper storey of St. Bochs or Budolphi church fell down (KDPT, 31/12). This caused great damage to an extension of the building and the collapse of the two ends of the church (Trap, 1961) which were only restored in 1764. Elsewhere in the town arches were cracked and several buildings moved on their “ground wall” foundations. At Ålborg the ice on the Limfjorden broke, as also at Vejle, where the following morning the ice was found to have been broken and lifted up. The same is told about many lakes and rivers in Sweden (KDPT, 28/12). At Walda ice on the lakes was broken, even where the lakes were frozen to the lake floor (GM, 5/1/60).

Further south in Jutland, at “Chatoul-ler” (location unknown) some new buildings were cracked and ripped and doors were forced open, a phenomenon also observed at Odense “and other places”. In Vejle objects fell and “people who were up could not stand still on the ground”. A woman said that as she was walking along the street it was just as if she had become lifted off the ground and she became so confused in the head that she hardly knew where she was. The watchman says the same. A man who wanted to get out of bed fell back into it.

In Helsingør, on the north coast of Sjælland, the hammer in the bell in Olai Church tower rang by itself, in the same way as when it chimes slowly (KDPT, 28/12). In the same place plaster came off the roofs and at Sørø roof tiles fell.

These observations suggest that Modified Mercalli intensity (MMI) VI effects were very widely distributed with MMI VII experienced locally around the coast of Bohuslän, Sweden and in Ålborg, northern Jutland. The spread of the region suffering minor building damage, from Ålborg to Ålingsä, is 150 km. No intensity VI effects are reported from Norway (although in Christiana (Oslo) panes of windows fell) and while isolated observations, such as the ringing of church bells, and fall of plaster at Helsingør, the fall of tiles at Sørø, and the bursting open of locked doors at Vejle, are all commensurate with intensity VI affects, these all appear...
to be isolated observations within a prevailing intensity V region.

In Jutland the earthquake is mentioned as being generally felt in all the principal towns although stronger in north Jutland (KDPT, 31/12). Across Sjaelland, from where Horrebow collected his observations, the earthquake was “was not so strong as to cause building damage but it knocked over some objects, and knocked down some pictures in a church. The earth felt as if it were in a cradle. Houses were rattling – there was a loud noise of windows and doors, and doors sprang open, even those that were locked. Beds were moving as if in big waves – but quicker. Everything was creaking, plates and spoons rattling, furniture moving.” Along the north and east coasts of Sjaelland it was strongest, while in the extreme southwest of the island it was only perceived by sensitive observers. A report from England that at Elsinor (Helsingør) “the sea was so agitated that several ships were driven from their anchors” (Gentleman’s Magazine, January 1760) must be poetic license as it cannot be corroborated from local sources.

Within a few days information had arrived at Copenhagen from the whole of Jutland and within a week from southern Sweden, where the shaking had been felt in Värmland, Bohuslän, Halland, Västergötland and Småland, and more weakly in Stockholm, where it “could have been mistaken for a gust of wind” (KDPT, 7/1/1760). The shock was stronger in Arboga, Örebro and Kristinehamn than in Stockholm, and even stronger in towns over in the west: Karlstad, Lindköping, Uddevalla, Gothenburg, Älingsäss, Laholm and Jonköping.

The shaking was also strong around the southeast coast of Norway, at Tønsberg (KDPT, 4/1/60) and at Christianslund (Kristiansand?) near Birch (Birkeland?) where people thought the houses would collapse (Morgenbladet, 15 April 1894). Further to the northeast the quake was felt around Scheen (Skien) and Kongsberg. A letter from Pastor Stokfleth, dated 29 January 1760, describes a fairly strong earthquake in the south of Gudbrandsdalen, at Fåberg, Fron and Odalen. The shock was also felt on the west coast of Norway – “news from Bergen that they have also felt the earthquake – which was preceded by a whistling and thundering noise and made the houses shake” (KDPT, 22/2/1760).

To the south of the affected region beyond the towns of southern Jutland the earthquake was felt widely across Holstein, in Sleswic (Schleswig), Flensburg, Kiel and other places. “It was felt very sharply and clearly by many reliable witnesses in Hamburg and in the neighbourhood, the shock lasting about a minute” (Staats und Gelehrte ... Hamburg ..., 28/12).

Earthquake lights were seen at a number of places: at Tønsberg, Norway there was a whistling in the air – and a ray of fire showed itself in all quadrants and drifted from south to north. In upper Fyn, Denmark after the movement and the thundering sound, those who ran out under an open sky said that there was not one but several powerful flashes of lightning.

An aftershock at 5.30 am was reported from Marstrand on the shores of the Kattegat. The epicentre was probably located offshore between Sweden and Jutland. The thick sedimentary deposits found beneath the towns to the west of the Kattegat (such as Ålborg) may reflect an asymmetric disposition of the highest intensities around the epicentral position.

Both Bergen and Hamburg are around 450 km from this epicentre in the Kattegat. In both towns the shock was widely felt, and was reported independent of news from Copenhagen. For numerous reports to have emerged from the middle of a (severely cold) night suggests that the intensities at Bergen and at Hamburg were predominately IV rather than III. However
the news from Stockholm suggests intensity III in that city. The most outlying observations are from Ångermanland almost 300 km to the north of Stockholm and more than 600 km from the epicentre (Kjellen, 1903). Subsequently the event was reported as having been felt in Holland, and while this has been dismissed as a confusion with the earthquakes around the lower Rhine a month later, it is not inconceivable that it was weakly felt around Groningen, at epicentral distances as low as 500 km, closer to the epicentre than Ångermanland. However no first hand accounts have been located to confirm this.

At the hour of the quake it is unlikely that intensity II would have been perceived. No single observations of people feeling the quake while at rest in upper storeys have survived. As in other moderately large earthquakes, pockets of high intensity exist at the outer bound. Therefore the outer intensities are generally III, and the averaged radius for this isoseismal is about 500 km.

THE 31 AUGUST 1819 EARTHQUAKE

The earthquake of 31 August 1819 had widespread felt effects, but an obscure epicentral location being subsequently claimed as Swedish (Ehrenheim, 1824; Kjellen 1903), Finnish (Renqvist, 1930), Russian (Musketoff and Orloff, 1893), and most recently allocated an epicentre on the border between Norway and Sweden (Ambraseys, 1985a). New primary and secondary descriptions of the earthquake have been uncovered in the course of this study, not used by any of the earlier cataloguers.

The most important eye-witness accounts were provided by two parson-naturalists who lived in Helgeland. The priest at Hemnes on Ranafjord from 1814 to 1842 was Iver Ancher Heltzen, who wrote seventeen books on the natural history and economy of the region; while about 120 km to the northeast Søren Christian Sommerfeldt, the priest at Saltdal from 1818 until 1824, wrote works on the flora of northern Scandinavia and on the natural history of Saltalen. Sommerfeldt sent two accounts of the earthquake to the Norske Rigstiden newspaper in Christiana (Oslo); the first written on the day of the mainshock, his writing interrupted by an aftershock. This letter is fairly similar to an account he later published in a local natural history (Sommerfeldt, 1827). A description of the effects of the earthquake around Hemnes and Mo i Rana, that also appeared in Rigstiden, was probably from Heltzen, although there are a number of discrepancies in detail between this account and that published by him later (Heltzen, 1834).

Reports from a storekeeper and merchant on the island of Luroy (Mr Dass) were collated by the local priest (Pastor Debes) and passed on to Norway’s first earthquake cataloguer, Keilhau in 1827 (Keilhau, 1835, 1836). The powerful earthquake had such an impact on the lives of the people living around the Ranafjord and Lurey that stories have passed down the generations, finding their way into local history books. Some of the detailed oral histories that had survived more than 160 years were collected together by Aasvik (1985).

Newspapers in Trondheim, Stockholm and Oslo reported local and some regional effects, and subsequently descriptions contained in letters from northern Sweden appeared in a Stockholm newspaper. Newspapers were not published north of Trondheim in Norway or Uppsala in Sweden in 1819. Local recollections of the earthquake were, however, reported in a newspaper at Tromsø more than 20 years later, and reports claiming to have emerged from Russian Kola passed into French and Swedish newspapers. In Swedish Finland there was only one newspaper published in
1819, from Åbo, now Finnish Turku.

Two travellers through northern Scandinavia reported earthquake effects. While the serialized memoirs of Lars Johan Prytz’s summer journey from his hometown of Åbo to the North Cape (Prytz, 1821) were truncated by his death, a detailed account of the earthquake as perceived in Lapland and northern Bothnia (published in the Åbo Tidningar) is almost certainly his. In early summer 1820, a wealthy Englishman, A. de Capell Brooke MA, was rowed along the Norwegian coast en route to the North Cape (Brooke, 1823), and while more interested in stories of sea-serpents, gained some insight into the effects of the earthquake.

Effects of the earthquake

The earthquake occurred at about 2.30 pm local time and was strongest in the region on the borders between Nordland and Helgeland south of Bodø, close to the Norwegian coast (see Figure 1). The earthquake was variously estimated to last for c. 6 minutes at Saltdalen (Rigstidenden, 15/8/1819), 4 minutes shaking, 10 minutes noise at Hemnes (Rigstidenden, 10/12/1819), 5 minutes at Hemnes (Heltzen, 1834), 1.5 minutes at Hundholm (Bodø) (Brooke, 1823).

All the buildings in this region were constructed from wood, with stone chimneys and roof-weights and it was these latter features that were most susceptible to damage. Heltzen mentions that “in many places the walls on the roofs fell down”, while “in some places chimneys were damaged” (Rigstidenden, 10/12/1819); and “chimneys fell down on Selsøen (Selsøya)” (Tromsø Tidende, 1/5/1842). However, shaking was strong enough to cause damage to some wooden frame structures: “some farms ... were thrown down” (Brooke, 1823) and “further up the (Saltdalen) valley ... some old walls fell down” (Sommerfeldt, 1827; Rigstidenden, 22/10/1819). No casualties are recorded although this must reflect not just the resilience of the buildings but also the time of day and the weather, for this was the first fine day in three weeks and all the people were harvesting vegetation to feed the animals.

As the local buildings do not provide a susceptible measure of ground shaking, other indicators can be employed. A man working with the hay in Konsvik (Lurøy parish) “noticed the start of the earthquake (and) was going to hurry home, ... but the ground heaved so fiercely that he fell down several times, and found that it was impossible to run’ (Aasvik, 1985). At Hemnes “people out in the fields couldn’t stand up because their knees wouldn’t bear up” (Heltzen, 1834). At Nabostad in Nesna parish “the shaking was so powerful that two horses which were ploughing a pasture fell over in their furrows” (Aasvik, 1985).

Further evidence for strong shaking comes from the evidence of superficial disturbances. Heltzen writing from Hemnes on Ranafjord, described how during the shaking “the mountains shook so very strongly that the stones from off the tops and sides, fell down with great noise and threw up a rain of dust that obscured the sun” (Heltzen, 1834). On the island of Lurøy “large-rocks became separated from the mountains and tumbled down providing such quantities of powdered rock that the island’s heights became enveloped in fog” (Dass, in Keilhau, 1836). “In Traena ... stones fell down from the tops of the mountains” (Heltzen, 1834). In the Tonnes-Konsvik district (Lurøy parish) large boulders in Strupen half way between the two villages fell down from the mountainside during this earthquake (Aasvik, 1985). On the slopes around Liafjorden (next to the community of Lia) the damage caused by rockfalls was very extensive. “All the hillsides below Lia-
jellet, from Haugen to the Upper Liamyrene, became covered by rocks which fell from the mountain . . . all cultivated land on this stretch became ruined” (Aasvik, 1985). Rockfalls were distributed even to the north of Bodø where at the foot of the mountains to the north of Löb (Löp), Brooke (1823) observed the crest of one rock greatly shattered in the earthquake. The rock dust contributed to the clouding of streams that was noticed over a wide region. Heltzen (1834) reported that the streams became filled with soil and clay; Dass, as reported by Keilhau (1836), noted that at the foot of the mountains on Lurøy, “many streams were disturbed as though they had been mixed with milk, such that the water, smelling strongly of sulphur, remained undrinkable, even for the animals, for three days”. At Saltdal the water emerging from two small springs at the foot of a mountain close to the parsonage, “became whitened with clay although there was no such material along the stream-banks” (Sommerfeldt, 1827; Rigstidenden, 15/10/1819).

Some of the most spectacular effects noted in the region of strongest shaking were the disturbances seen in large bodies of water. In the Ranafjord next to Hemnaes, where the water had been completely calm before the earthquake, the water “came up in jets, as high as the mast of a small sailing vessel, as if in a fierce storm. As the sea died down the water rose above its highest flood-level” (Heltzen, 1834). At the Storelven (mouth of the Rana river at Mo i Rana) the water “was disturbed as if in a storm” (Rigstidenden, 10/12/1819). In the sound between Traena and the mainland “columns of water were seen by many who were at sea, who thought their boats were going to capsize” (Heltzen, 1834). In the Aldersundet fjord below Lia “the waves on the sea were so big that it was impossible to get onto the water” (Aasvik, 1985).

These disturbances could reflect a variety of submarine processes induced by strong vibration. They appear to be too widespread to be explained simply through submarine flow-slides, although such phenomena may provide a partial explanation. They are not simply restricted to delta-fronts as proposed by Ambraseys (1985a).

Heltzen offers a poignant description of liquefaction phenomena in an age before such features had gained any scientific description: “In some places thin sand came up from the earth. It seemed as if it came from the inside of the earth. In searching for the source of this sand afterwards it could not be found.” These were evidently sand-blows.

With such liquefaction in evidence it is unsurprising that there were larger-scale land-disturbances. Across the Ranafjord opposite Hemnes, on the eastern coast of the bay of Udskarpen, close to the Storstrand farm, there was a major landslide. “The dwelling houses were on a big hill and beneath that hill there was a large raised field cultivated with potatoes. When the earthquake happened this field fell down and the western part of the clay-hill on which the houses were built, fell down as well. A massive 30–40 fathom clay fall was created in this hill and the field below became submerged. The fjord bank, that was even deep enough to take the largest ships, was filled up with gravel so that it became difficult to get into the shore. One neighbour, with other people’s help, had to move his farm. But what happened within one of the following earthquakes was that the above mentioned field that went underwater came up again to the place it was before, even though it was no longer level or smooth, due to the clayfall. It was strange that a bucket in which there was a dungfork came back with the field again. It belonged to an old woman who had been digging potatoes, but fortunately she had left the place before the accident” (Heltzen, 1834).
In the account in the Rigstidenden (10/12/1819) the landslide was solely attributed to an aftershock in the night following the earthquake, but this is corrected by Heltzen. At the time of the major earthquake, the slide moved the field underwater, presumably beneath the fjord, while at the time of a night-time aftershock, additional material was piled behind a rotational slump, elevating the field to a new subaerial location.

Another large landslide is suggested from accounts that have been passed down from Kvina farm (at the head of Kvinafjord, on the mainland in Lurøy parish) where it was claimed that the "water flooded the land around the same time, causing permanent damage so that the value of the farm was reduced" (Aasvik, 1985). A submarine landslide is suggested by reports of disturbance in the deltafront of the Glommåga river where it passes into the western end of the Langvatnet lake (a few km to the north of Mo i Rana), although at the time this was blamed on an appearance of the monster of the lake – the "Langvasstrollet" (Coldevin, 1964).

**Maximum intensity**

There are a number of difficulties involved in attempting to estimate the highest intensity effects in this region of very low population (less than one person per square kilometre) and wooden houses. However the evidence of people and animals being thrown to the ground; the widespread and severe rockfalls, landslides, sand-blows, submarine flow-slides with probable seiching, and the evidence for the destruction of certain wooden buildings must reflect intensities of at least MMI VIII (see Figure 3). A regional intensity greater than VII extended from the island of Traena to the west, through Lurøy, Nesna and Hemnes parishes to Upper Salttdalen. The extent of this high

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**FIGURE 3** Effects of the 31 August 1819 earthquake in the epicentral region, around the parishes of Hemnes, Lurøy and Nesna
intensity region to both north and south is unknown as these regions are mountainous and unpopulated. High intensities (>VI) did not however extend to Lower Salttdalen where Sommerfeldt was based.

Confirmation that the region of highest intensities around the coast at the boundary of Luroy and Nesna parishes, was the epicentre of the earthquake is provided by the distribution of the aftershocks. Following the mainshock an aftershock was felt at Luroy “every hour until daybreak” (Dass, in Keilhau, 1836), of which only about half (7) were felt at Hemnes (Heltzen, 1834), and only two at Saltdalen. This allows the epicentre to be located with a probable precision better than 20 km, at 66.4°N-14.4°E.

Aftershocks of the 1819/8/31 earthquake continued as a sound heard “daily for 4–5 weeks, though always accompanied by a weaker quake than the first” (Rigstidenden, 10/12/1819). This then passed into a period of swarm activity with an average of around ten shocks a year felt in Lurøy for the next decade.

Ambraseys (1985a) has proposed that there was a widely felt foreshock with the same epicentre, on 29 August at 10.45 am, but primary accounts indicate that this was only felt (“as a hard shake that rattled windows, made the pulpit seem to sway, and sent the chandelier into motion” – Inrikes Tidningar, 24/11/1819) at Åsele in Sweden, some 300 km to the southeast. The shock was not noticed by Heltzen, Dass or Sommerfeldt and hence had no connection with the earthquake of 31 August. (Ambraseys uses the evidence of this “foreshock” to justify the location for his epicentre of the Norway–Sweden border, some 100 km to the east of the maximum earthquake effects and concentration of aftershocks.)

Rockfalls are reported at least 100 km to the north of the epicentre (Brooke, 1823), and to the south the furthest extent of damage is from Overhalla near Namsos, 200 km from the epicentre where “an old chimney collapsed and people ran out of their houses for fear that they might fall down” (Trondheims Adr.-Cont. Eft. 21/9/1819). To the east the reports of old walls falling down in Upper Salttdalen are within about 100 km from the epicentre. At greater distances to the north there was strong shaking, in Senjen and the Vesterålen (300–350 km), causing chimney cowls to dance and furniture to move in the rooms (Tromsø Tidende, 1/5/1842).

The earthquake was widely felt offshore to the north and west: Heltzen (1834) notes “many of those who were on the sea thought that their boats were going to capsize”. In the isolated Traenarchipelago, situated 30 km to the west of Lurøy, the shaking was, if not worse, just as strong as at Hemnes. Brooke (1823) reported that “the captain of a small Russian vessel off Hundholm received so great a shock that he instantly let fall both his anchors, and prepared to warp off, thinking the ship had run aground, when at the time, as he found afterwards, he was in 300 fathoms of water”.

To the east reports from Åsele and Lycksele, in Västerbotten County, Sweden (300 km from the epicentre) suggest strong shaking: at Åsele, “the teacups and glasses on the table were moved from their places”; at Lycksele, “the houses shook, the roofs creaked, kitchen chairs in the rooms swung, the churchtower and the chimneys seemed to be swaying”. Along the coast of the Gulf of Bothnia at Umeå parish (400 km) the shaking caused a “strong noise in the upper floors and the lofts of the houses and thereafter a shake which made lots of smaller objects start to fall down from the walls” (Post-Tidende, 22/12/1819). However the shaking was not universally felt: those farms on the eastern side of the river, close to Umeå, perceived nothing.

Prytz reported strong shaking in many towns at the head of the Gulf of
Bothnia around the modern border of Sweden and Finland and the event was generally considered to be a local earthquake. At Torneå, it was recounted “that the buildings shook for half a minute and the air smelt of smoke as if from a nearby woodfire” (Åbo Tidningar, No. 4, January 1820). The shaking was considered to have been stronger at Arpela and Könlä than in Torneå or Haparanda. The shock was also felt in the towns of Brahestad and Uleaborg on the eastern coast of the Gulf of Bothnia.

A number of accounts from Trondheim (Trondheims Adr. Cont. Eft. 14/9/1819, 21/9/1819) described the effects in towns in the immediate neighbourhood. From Statsbygden, on the north side of the fjord opposite Trondheim, it was reported that “we were eating in a large room on the second floor, when the table began to move. My daughter seemed to be dancing on the floor, which was not in keeping with her upbringing, yet I saw that it was a wavelike motion, which convinced me that it must be an earthquake.”

To the south of Trondheim the earthquake is reported from Brekken, a community within Østerdalen, close to the Swedish border, and the earthquake was “said” to have been felt in Oslo (Keilhau, 1836). At the limits of the felt-area, reports from “Vrola” (Kola) in Russian Lapland that somehow passed to a Paris newspaper state that the shock was “sufficiently strong to overturn furniture and chairs” (Moniteur Universal, No. 324, November 1819). It is inconceivable that the earthquake could achieve such effects at a distance of 1000 km from the epicentre, and it is likely that news became scrambled, compounding the port of origin of some vessel with details picked up along its journey.

Following an account from the Rigstidenden, the translator for Allmanna Journalen (11/10/1819) inserted his own impressions in Stockholm: while seated he had felt the room sway from north to south and heard the house timbers creak. However it was not noticed by others in the house. Subsequently (three months after the event, and following the arrival of all the Norwegian news) Inrikes Tidningar (24/11/1819) gave more details about the effects in the city where “many observed this phenomenon”. “Two persons who sat in easy chairs with their backs towards the south felt . . . a shake or rocking from east to west, when their heads were thrown from one side to another. This went on for less than a minute, even so one of them noticed a break in between the shakes. Cracking was heard in walls and doorframes, chandeliers which hung from the ceiling were thrown from east to west; a woman who poured her coffee, had to hold onto the table and saw the coffee spill over the edges of the cup.”

The earthquake was particularly felt in upper storeys – in Norrmalm (at the centre of Stockholm) two persons described “a push or shake of enormous nature. A low sound was followed by a shaking of the house so strong that a tea-tray on the wall started to swing and a book in one hand almost fell to the floor. The earthquake lasted 30 to 40 seconds and its direction seemed to be northwest to southeast. It started with a perpendicular push and finished with a horizontal swinging which later became so noticeable that the tray finally flew 50 cm from the wall. The earthquake was felt on the third floor but in the lower parts of the house was hardly noticed.”

Stockholm is about 800 km from the epicentre, and these reports are convincing evidence of long-period affects at the margins of the intensity III felt area, indicating a major earthquake. However the anecdotal intensity at Oslo, 750 km from the epicentre, cannot have been above intensity II. While the surviving information is too thinly spread to map accurate isoseismals (see Figure 4) it is
FIGURE 4 Modified Mercalli intensities and approximate isoseismals for the 31 August 1819 Nordland, Norway, earthquake

easier to estimate felt area radii, which are around 800 km for intensity III, 350 km for intensity V and 150 km for intensity VI.

MAGNITUDES

The magnitude of these two earthquakes can only be estimated through comparison with 20th-century events from this same area for which both instrumental and macroseismic data are available. The 22 December 1759 earthquake has a comparable macroseismic field to the 23 October 1904 Oslofjord (59.2°N–10.5°E) earthquake (R_{III} = 450 km, Muir Wood and Woo, 1987) located 150 km further to the north and to the 7 June 1931 Dogger Bank (54.1°N–01.5°E), southern North Sea earthquake (M_s 5.5, R_{III} = 500 km, Woo and Muir Wood, 1986). While the Oslofjord earthquake generated numerous scientific articles, detailing the macroseismic effects not just in Norway, Sweden and Denmark but also in the lands around the eastern edge of the Baltic, some details of the two suggest that the 1759 shock may have been the larger. While the 1904 earthquake was scarcely felt in coastal western Norway, at greater epicentral distances, the 1759 earthquake caused houses to shake in Bergen. Low intensity shaking around the eastern Baltic from the 1759 earthquake was relatively unlikely to have been felt in the middle of the night and has not been reported. The 1759 earthquake has a macroseismic field suggesting a magnitude M_s 5.4–5.6.

The 1819 earthquake has a larger felt area than any near-shore event in northern Europe over the past few centuries. Earthquakes of comparable felt areas in this region have all had offshore epicentres. The pre-instrumental 9 March 1866 event caused damage around Kristiansund, was felt across much of Norway and Sweden, and even very weakly at Banffshire, Scotland at an epicentral distance of 1000 km (R_{III} = 600 km). The estimated location is
at 65.2°N–6.0°E, around 100 km offshore Møre. The largest 20th-century event in this region is that of 10 June 1929 located at 70.9°N–9.2°E in the Norwegian Sea, with an instrumental magnitude $M_s$ of 6.1 (Ambraseys, 1985b). From the available small sector of its eastern onland macro-seismic field, this had an $R_{III}$ of around 700 km. Uncertainties in the complete macro-seismic field for both this event, and the 1819/8/31 earthquake, suggest that the 1819 event had a magnitude in the range $M_s$ 5.8–6.2

CONCLUSIONS

The western coast of Scandinavia, formerly a region of poor isolated farming and fishing communities, has in the past two decades become economically transformed, principally through the discovery and exploitation of large offshore reserves of oil and gas. The construction of important engineered structures both onland and offshore and the expansion of coastal towns, has considerably increased the vulnerability of this area to the impact of future earthquakes.

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Evaluative Research in a Refugee Camp: The Effectiveness of Community Health Workers in Khao I Dang Holding Center, Thailand

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An evaluation of Khmer refugee public health services found a strong cultural preference for older females as Community Health Workers (CHWs), in contrast to the young males employed. Class conflicts were identified between educated, upper-class CHWs and the uneducated camp majority. Poor community acceptance of the CHWs impaired their effectiveness, and was attributed to age, sex and socioeconomic barriers. Based on these evaluation findings, the refugee health program was restructured to include a preponderance of female workers. A repeat survey demonstrated enhanced program effectiveness following this change.

Selection of refugee health workers should be based on intrinsic community roles, taking age, sex, socioeconomic and other group distinctions into account. Additional research is needed on the adaptation of community health principles to the refugee context.

INTRODUCTION

Although program evaluations are an essential tool for decision-making and program development (Renthal, 1978) it is the authors' experience that refugee health programs are rarely evaluated. This impression is supported by the virtual absence of literature specific to evaluations in a refugee context. "The biggest problem with the international aid community is that of not learning the lessons from previous experience" (Cuny, 1979: 340).

In the summer of 1986 an evaluation was conducted of the public health services provided by the International Rescue Committee (IRC) in Khao I Dang Holding Center, a camp for Cambodian (Khmer) refugees in Thailand. Particular attention was given to the impact of refugee Community Health Workers (CHWs) in the camp. Simmonds, Cutts and Dick (1985) have remarked on the scanty literature available on the subject of refugee health worker selection and training, and the importance of further researching this essential part of refugee relief.

The evaluation produced a number of useful findings which were successfully incorporated into the program. Chief among these was the importance of incorporating cultural roles and community preferences in the selection of CHWs. A description of the program, the problems it encountered, the evaluation methodology, and evaluation results follows.
BACKGROUND

The people
The Khmer people are Theravadan Buddhists of predominantly agrarian background, with a smaller number of urban elite. Their culture emphasizes family ties, social obligations, and avoidance of direct confrontation. Expressions of anger and overt disagreement are taboo, and feelings of resentment are usually covered by a smiling exterior. As in most Asian cultures, physical modesty is the norm and social relations are largely confined to members of the same sex. Women are expected to defer to men in public but may be quite assertive within the privacy of the family. There is a distinct ordering of social position based on age, sex, occupation, wealth and family status. Deference to superiors requires outward agreement with anything they may say or do (Vickery, 1984; Chandler, 1972; Steinberg, 1959).

Deference, outward acquiescence, and a reluctance to contradict or question instructions typifies the relationship between Khmer refugee workers and Western relief personnel. Westerners are automatically accorded a high status in this post-colonial society. The colonial pattern is reinforced in refugee camps where the Westerners in question are a source of vital aid and many factors conspire to promote dependency.

Rural people (the majority of Khmer) are largely uneducated and unaccustomed to modern health care. “City people” tend to be educated and more Western in their thinking. Long-standing resentments between urban/rich and rural/poor are strong although not always expressed in a manner readily apparent to Westerners (Vickery, 1984).

The camp
Khao I Dang Holding Center (KID), located in Prachinburi Province about 12 kilometers from Cambodia, was opened in November 1979 by the United Nations High Commission for Refugees (UNHCR) and the Royal Thai Government to provide humanitarian aid to displaced Khmer (Cambodians). Referred to at its peak as “the largest Cambodian city in the world” (Carney, 1981: 84), its population of about 180,000 gradually dwindled over the next seven years as refugees resettled abroad. Resettlement moves out of KID occurred in a sporadic and unpredictable fashion, creating an atmosphere of transience and uncertainty.

By 1986 the camp was in its seventh year and its anticipated closure prompted an evaluation of its public health services, with the hope of identifying lessons learned for future application in refugee programs.

Although the population of KID initially included many of the surviving Khmer middle and upper classes, these were soon resettled. Most of the remaining long-time residents of the camp were peasants of little or no formal education who had been rejected by third countries for resettlement. These long-time residents, of rural background, comprised the majority of the camp’s population (30,000) by the summer of 1986. More recent arrivals were few in number and tended to be middle-class urban dwellers, some of whom had received higher education under the present Vietnamese regime. Although a minority of the population, these newer urban arrivals predominated among the refugees trained and employed by the PVOs in KID. In speech and in gestures these workers were often openly derogatory towards the camp’s long-time residents (peasants) whom they characterized as “dirty”, “lazy”, and “uneducated”.
The program

IRC was active in public health programs in KID from the camp's origin. Early priorities were sanitation, immunization and communicable disease surveillance and control. These programs were highly successful, with a virtual eradication of immunization-preventable diseases and the achievement of an infant mortality rate of only 33.67 per 1,000 by 1984 (Murphy, 1984).

In 1982, the IRC Public Health staff constructed a basic health curriculum for the preparation of primary health care workers. A group of Community Health Workers (CHWs) were selected, trained and assigned to areas of approximately 100 homes per worker. Although the program evaluation covered all facets of the public health program, this paper is confined to a discussion of the evaluation of the Community Health Workers (CHWs).

The selection of the CHWs was handled in the same manner as the selection of any other workers, with no specifications regarding age or sex and no effort to involve the community in the selection process. Among the reasons for this was a lack of leadership among the refugees (reflective of the camp's transient atmosphere) and the language barrier between the refugees and non-Khmer speaking expatriate personnel.

The role envisioned for these workers was modeled after the Primary Health Care concept widely applied in developing countries: to serve as grass-roots level health care personnel, providing case-finding, simple curative treatments, referrals to higher levels of care, immunizations, ante/post-natal care, family planning and community health education. Unfortunately, the realities of KID's health care system, which was fragmented among many different and highly independent private voluntary agencies (PVOs), necessitated a modification of this role.

Serving as a linkage between households and the multiple services (Maternal-Child Health clinics, outpatient departments, family planning clinics, etc.) took the place of actual service delivery. This proved effective in bolstering the utilization of these services but inevitably weakened the status and credibility of the CHWs in the community since they were then viewed as not actual "providers", a sentiment which was expressed to the evaluator by both clients and workers. Plans for the inclusion of very basic curative treatments (simple wound cleansing, dispensing oral rehydration salts, treating minor aches and pains) were proposed in the early stages of the CHW program but dissolved due to opposition from medical staff in the curative programs.

Problems encountered

The CHW program was hampered, over the years, by two major problems: the fragmentation of services among different PVOs, and a frequent turnover in both refugee and expatriate staff.

KID had evolved into an unplanned, complicated network of separate services, each run by a different agency. The referral system operated through the CHW program was heavily used by all the agencies in the camp and appeared effective in linking together otherwise isolated services. Workers could be seen each morning sorting through a new batch of referral forms. Expatriate staff received verbal reports on referrals that ran into difficulty ("they refuse to go to the clinic"; "I can't find the house"), and the CHWs met twice daily to receive referrals and discuss problems. A great deal of CHW time was spent simply escorting people from place to place and following up on those who failed to show up at one of the various services. Because each PVO had its own separate funding sources, the overall cost-ineffectiveness of health care in KID
received little attention. Furthermore, each PVO tended to be protective of its "turf"; and while acknowledging the need to combine and integrate services most were reluctant to give up programs. Coordinating positions met with limited success due to a lack of accompanying authority.

Refugee staff turnover resulted from unpredictable resettlement moves. The methods of recruiting and selecting refugee staff exacerbated this. Despite the sociodemographic make-up of the camp, as well as cultural norms which might dictate otherwise, the program's refugee staff were predominantly young (i.e., 18-25 years) middle-to-upper class males. Particular preference was given to those who could speak English, and English-speaking was considered to be a logical prerequisite for refugee staff positions. This failing was reinforced by an eagerness on the part of the Khmer - particularly the social segment most apt to have been employed - to learn English. Indeed, learning English and hopefully improving one's resettlement odds were the reasons most often cited by refugees for wanting to work with a PVO. The actual mechanisms for obtaining workers were limited to word-of-mouth (guaranteed to produce only the friends and relatives of the existing workers) and campwide loudspeaker announcements. These generally brought forth the more assertive, upper class and English-speaking of the refugees but rarely any women and/or any of the less educated majority. No attempt was made to recruit people actively on the basis of their existing role within the community nor to include indigenous leaders of the (admittedly shaky) refugee political infrastructure in the selection process.

This approach to refugee personnel was fairly universal among PVOs in KID. One reason for it was the perceived limited timeframe available for recruitment and training: entire workforces were sometimes abruptly resettled. This would throw the programs into complete chaos, and the emphasis tended to be on finding and training new workers as rapidly as possible in order to maintain service delivery. Another key factor was the inability of expatriate personnel to speak the Khmer language. Little effort to learn Khmer was apparent among the KID expatriate staff, and there was heavy reliance upon translators. Translators were frequently - in fact, usually - heard to alter content as they translated. (The evaluator speaks Khmer). As a result of the reliance on translators the refugee worker hierarchy was structured around the ability to speak English and thus to have direct access to the expatriate supervisor. This did not always result in optimal leadership. Refugees who could not speak English were disadvantaged in contributing to the program.

The shortness of many expatriate contracts produced a tendency to think in terms of a short timeframe. A person on a six-month contract is understandably more apt to set goals and seek approaches which can produce immediate results rather than plan for the long-term. Expatriate contracts in KID varied among the PVOs, ranging anywhere from three weeks to two years; the average was about six months, inclusive of the initial adjustment period and days off or holiday time. Frequent staff "burn-out" limited the number of contract extensions. Although staff living conditions were comfortable, most people found the work itself highly stressful. One major and recurrent stress was the disruption of programs due to unexpected resettlement moves. As the IRC Program Director observed: "When you face training your fifth new [refugee] program supervisor in the same number of months, the will to continue is greatly diminished" (Mark Gorman, personal communication, 1987). Another constant strain was the refugees' anxiety about resettlement and repeated requests from refugee workers to intercede on their behalf with the embassies; most found it stressful...
to work with a population whose expressed wish or need (resettlement) was totally outside their control. Inevitably came the realization that the work at hand, while it provided a vital service, did not consist of "saving" the refugees from their true (political) plight.

Separation from the usual routes of external control (friends, family, familiar social norms) also increased expatriate stress. Some overworked in response to the absence of clear expectations; overwork in turn led to exhaustion.

The health education component of CHW activities suffered the most from staff turnover. A number of effective innovations — including the use of a traveling puppet show — were begun only to collapse later due to lack of follow-through. None of these undertakings were abandoned as a deliberate choice; the usual occurrence was the unexpected departure of key refugee staff with a resulting suspension of the program, soon to be followed by an overturn of the expatriate staff who had initially designed it. "Reinventions of the wheel" were frequent and the files were full of memos from public health staff newly describing "a need for community health education in KID" — usually having perceived this towards the completion of their short term contracts.

The refugee staff employed by the public health program were predominantly male, young (i.e. early 20s) and overwhelmingly urban, upper-class. They seemed weak in interpersonal skills, particularly when dealing with clients of a different social class. The evaluator witnessed many cases in which home visitors went out in improper attire: young men with their shirts unbuttoned and longish hair; women wearing fancy clothes and jewelry. Complaints were heard from refugees in the community about "impolite men with long hair" and "conceited city people" coming to visit their homes. Obvious resentment and distrust were noted on the part of poorer families when visited by workers in (comparatively) expensive dress. There was a tendency on the part of expatriates to assume that Khmers knew how to approach other Khmers. In fact, upper class urban Khmer often had less understanding of their rural countrymen than did outsiders and needed considerable assistance in learning to overcome social distance. Due to the cultural pattern of deference to superiors, workers often failed to inform the expatriates of such conflicts and barriers, which were difficult for non-Khmer speaking expatriates to discern.

General observations of the community health workers were that there was great variation in their abilities. A few had real rapport with their assigned families and served as health resources. A few appeared to do nothing at all. Most performed specific tasks ("find this patient and bring them back to the clinic") but had difficulty performing as educators and independently identifying problems.

Survey research was undertaken to determine the extent to which the CHW program actually penetrated daily camp life, and the response of the refugee community to these workers.

SURVEY RESEARCH: METHODS

In June 1986, 305 households in Khao I Dang were interviewed. Households were selected by a random drawing of house numbers, stratified by camp section. The sampling frame used was the current public health census listing of addresses. Where more than one family resided in the same house, all families were interviewed separately and the (geographically) next closest house(s) omitted to maintain a manageable sample size. For this purpose a distinct family unit was defined as people who lived and ate together, sharing rations. In stratifying the sample by sections, official figures were used as a base with the addition of a generally
accepted estimate of 500 unregistered persons in the newest section.

The respondent for each household was selected on the basis of the question: "Who is the person responsible for this family's health?". Whoever the family identified as filling this role was the person to be interviewed.

Five refugee women were used as interviewers. All were married, over the age of 30, and literate in Khmer. Four of the five had children. Selection of the interviewers was based on these socio-demographic characteristics (thought to render them more acceptable to the likely respondents), good interpersonal skills as demonstrated during the employment interview, appropriate appearance ("polite" and "modest" for this cultural context), and successful completion of a literacy examination. The interviewers received two weeks of training which covered the nature and purpose of the survey, the concept of random sampling, interviewing techniques, recognizing and overcoming social distance, use of the questionnaire and problem solving. A short interviewer training pamphlet was developed in Khmer for this purpose, and supplemented by discussion, role-playing and supervised practice. Before starting the survey all interviewers were required to pass a written examination and conduct five acceptable interviews.

To compose the questionnaires, the information desired was explained to the interviewers (in Khmer) and group discussion followed on means of phrasing the question. Thus the questions were developed by Khmers and in the Khmer language, rather than being translated from English. Questions were pre-tested, discussed, and revised as necessary. Upon completion of the questionnaires two separate English translation checks were made and the final form pre-tested on thirty households.

The interviewers gave out balloons or small toys to distract young children during the interview; no other incentives were provided. Measures were taken to ensure anonymity of responses, with only the section of residence and a coded serial number appearing on the completed questionnaires. Respondents were assured of confidentiality. The survey had a 100% response rate.

**SURVEY RESEARCH: RESULTS**

**Representativeness of the sample**

In relation to the general KID population, the sample was statistically representative in terms of section of residence and length of stay in the camp. Length of stay in the camp was significantly associated with socioeconomic status, and the sample therefore may be inferred to be representative in that aspect as well.

The respondents – identified as “the person responsible for this family’s health” – were predominantly female (91.8% ± 3.1% for 95% confidence interval), with a mean age of 33 years (range: 16-75; median: 30). 67% had one or more children under the age of five, and 59% had one or more schoolchildren, in the family.

**Community preferences and attitudes regarding CHWs**

The respondents were asked their opinion of the preferable age and sex for a CHW. An explanation of the CHW role supplemented this question. Age choices were phrased as "older, younger or the same age as yourself".

Results showed a clear preference for female CHWs which was consistent across socioeconomic groups. Women, who comprised the majority of persons “responsible for the family’s health”, were the most apt to have a strong preference (Table 1).
TABLE 1
Sex preference for CHW: by sex of respondent

<table>
<thead>
<tr>
<th>Sex</th>
<th>Prefer Female CHW</th>
<th>Prefer Male CHW</th>
<th>No Preference*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>28.0%</td>
<td>16.0%</td>
<td>56.0% (N=25)</td>
</tr>
<tr>
<td>Female</td>
<td>57.5%</td>
<td>5.0%</td>
<td>37.5% (N=280)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>55.1%</td>
<td>5.9%</td>
<td>39.0%</td>
</tr>
</tbody>
</table>

*(± 95% C.I.) (± 5.6%) (± 2.6%) (± 5.5%)*

\[ X^2 = 6.9243 \text{ df=1} \] significance = p < .01*

*"Prefer male" and "no preference" combined for Chi Square test.

TABLE 2
Age preference for CHWs: by age of respondent

<table>
<thead>
<tr>
<th>Respondent</th>
<th>Prefer Younger*</th>
<th>Prefer Same*</th>
<th>Prefer Older</th>
<th>No Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;25 yrs</td>
<td>0</td>
<td>13.3%</td>
<td>68.3%</td>
<td>18.3% (N = 60)</td>
</tr>
<tr>
<td>25-34 yrs</td>
<td>4.3%</td>
<td>23.7%</td>
<td>45.3%</td>
<td>26.6% (N = 139)</td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>11.7%</td>
<td>21.7%</td>
<td>35.0%</td>
<td>31.7% (N = 60)</td>
</tr>
<tr>
<td>45-55 yrs</td>
<td>24.1%</td>
<td>17.2%</td>
<td>20.7%</td>
<td>37.9% (N = 29)</td>
</tr>
<tr>
<td>&gt;55 yrs</td>
<td>52.9%</td>
<td>11.8%</td>
<td>11.8%</td>
<td>23.5% (N = 17)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>9.5%</td>
<td>20.0%</td>
<td>43.6%</td>
<td>26.9% (N = 305)</td>
</tr>
</tbody>
</table>

*(± 3.1%) (± 4.5%) (± 5.6%) (± 5.0%)*

\[ X^2 = 30.6684 \text{ df = 8} \] Significance = p < .01

*"Younger" and "same" age categories combined for Chi Square.

Although the overall age preference was for a CHW "older than myself" this ceased to be true as the respondent's age exceeded 45 years. The majority of respondents would consider the appropriate age for a CHW to be between 30-50 years (Table 2).

Projections of the overall acceptability of CHWs by age and sex are shown in Table 3, based on the age and sex composition of the survey respondents and their stated preferences.

The CHWs employed at the time of this survey, and throughout the program's seven year history, were predominantly young males (Table 4). No attempt was made to measure the socioeconomic status of the CHWs but by observation they were
TABLE 3
Projected Acceptability of CHWs

<table>
<thead>
<tr>
<th>Community Health Worker</th>
<th>% of Respondents to Whom Acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>44.9%</td>
</tr>
<tr>
<td>Female</td>
<td>94.1%</td>
</tr>
<tr>
<td>&lt;25 yrs</td>
<td>36.4%</td>
</tr>
<tr>
<td>25-34 yrs</td>
<td>58.7%</td>
</tr>
<tr>
<td>35-44 yrs</td>
<td>70.5%</td>
</tr>
<tr>
<td>45-54 yrs</td>
<td>72.5%</td>
</tr>
<tr>
<td>&gt;55 yrs</td>
<td>70.5%</td>
</tr>
</tbody>
</table>

TABLE 4
Sociodemographics of CHWs (N=49)

<table>
<thead>
<tr>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>63.3%</td>
<td>36.7%</td>
</tr>
</tbody>
</table>

Mean Age = 24.8 years
Median Age = 22 years
Age Range = 16-43 years

TABLE 5
Recognition of CHWs (N = 305)

<table>
<thead>
<tr>
<th>Recognition</th>
<th>% of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondent knows their CHW by name and face</td>
<td>4.9%</td>
</tr>
<tr>
<td>Respondent knows their CHW by face only</td>
<td>35.7%</td>
</tr>
<tr>
<td>Respondent knows their CHW vaguely (has met, but cannot recall face)</td>
<td>14.1%</td>
</tr>
<tr>
<td>Respondent denies having ever met the CHW</td>
<td>45.2%</td>
</tr>
</tbody>
</table>

TOTAL recognition = 54.8% (± 5.6% for 95% C.I.)
TOTAL non-recognition = 45.2% (± 5.6% for 95% C.I.)

predominantly mid to upper class urban-dwellers.
Familiarity with the CHW was assessed through the question: “Have you ever seen (met) your CHW?” followed by a description: “the worker who goes house to house asking if anyone is sick, checking the children’s road-to-health cards, teaching about health and hygiene.” Approximately half the respondents indicated some degree of acquaintance with the CHW (Table 5).

Respondents who reported having met their CHW were asked to rate the worker in terms of behavior ("politeness", a term with broad implications in this culture) and knowledge of health (Table 6).
A correlation matrix for the three variables relating to CHW performance (CHW recognition, perceived politeness and knowledge) showed very weak correlations (r <0.4) among these variables. Consequently they were treated as three
**TABLE 6**
Perceived personal qualities of the CHWs

<table>
<thead>
<tr>
<th>Manner/Behavior</th>
<th>Percent</th>
<th>(95% C. I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHW is &quot;polite&quot; =</td>
<td>54.5%</td>
<td>(± 7.6%)</td>
</tr>
<tr>
<td>CHW is &quot;okay, so-so&quot; =</td>
<td>43.1%</td>
<td>(± 7.5%)</td>
</tr>
<tr>
<td>CHW is &quot;impolite&quot; =</td>
<td>2.4%</td>
<td>(± 2.3%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knowledge of Health</th>
<th>Percent</th>
<th>(95% C. I.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHW knows &quot;very much&quot; =</td>
<td>16.2%</td>
<td>± 5.6%</td>
</tr>
<tr>
<td>CHW's knowledge is average =</td>
<td>59.9%</td>
<td>± 7.4%</td>
</tr>
<tr>
<td>CHW knows little or nothing =</td>
<td>11.4%</td>
<td>± 4.8%</td>
</tr>
<tr>
<td>Unsure/no opinion =</td>
<td>12.6%</td>
<td>± 5.0%</td>
</tr>
</tbody>
</table>

**TABLE 7**
Recognition of CHW by sex

<table>
<thead>
<tr>
<th>CHW Assigned to Household</th>
<th>% Recognition</th>
<th>% Non-Recognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>49.7%</td>
<td>50.3% (N = 171)</td>
</tr>
<tr>
<td>Female</td>
<td>61.2%</td>
<td>38.8% (N = 134)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54.8%</td>
<td>45.2% (N = 305)</td>
</tr>
</tbody>
</table>

(± 95% C.I.)  (± 5.6%)  (± 5.6%)

X² = 3.5508  df = 1  Significance = p < .05

**TABLE 8**
Perceived politeness of the CHW by socioeconomic status of the respondent

<table>
<thead>
<tr>
<th>Respondent</th>
<th>% CHW &quot;polite&quot;</th>
<th>% CHW &quot;so-so&quot; or &quot;impolite&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Socioec.</td>
<td>37.5%</td>
<td>62.5% (N = 56)</td>
</tr>
<tr>
<td>Mid and High Socioec.</td>
<td>63.1%</td>
<td>36.9% (N = 111)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>54.5%</td>
<td>45.5% (N = 167)</td>
</tr>
</tbody>
</table>

(± 95% C.I.)  (± 7.6%)  (± 7.6%)

X² = 8.8046  df = 1  Significance = p < .01
separate entities and factor analysis was not attempted.

Breakdowns by age, sex, literacy and socioeconomic status of respondents failed to show any correlation to respondents' recognition of the CHW. Univariate analysis showed a significant correlation to the sex of the CHW, with female CHWs more often recognized than males (Table 7). An association with the age of the CHW, present on univariate analysis, was not statistically significant when the effects of the CHW's sex were taken into account through multiple regression. Approximately half the CHWs received the culturally important designation of "polite". The perceived politeness of the CHW showed no significant correlation to the worker's sex. A strong correlation to the socioeconomic status of the respondent was found on univariate analysis: persons of low socioeconomic status were much less likely to consider the CHW "polite" than were those of higher status (Table 8). A correlation between perceived politeness and the CHW's age (with older CHW's considered more polite) was statistically significant when the simultaneous effects of socioeconomic status were taken into account through multiple regression analysis (Table 9).

The perceived knowledge of the CHW, by contrast, showed no correlation to the age of the worker nor to the socioeconomic status of the respondent but did show a strong correlation to the

### TABLE 9

Effect of CHW's age on perceived politeness of the CHW

<table>
<thead>
<tr>
<th>Worker's Age</th>
<th>%CHW &quot;polite&quot;</th>
<th>%CHW &quot;so-so&quot; or &quot;impolite&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;4 yrs older than respondent</td>
<td>77.8%</td>
<td>22.2%</td>
</tr>
<tr>
<td>Same age ±4yrs</td>
<td>56.9%</td>
<td>43.1%</td>
</tr>
<tr>
<td>&gt;4 yrs younger than respondent</td>
<td>48.4%</td>
<td>51.7%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>54.5%</td>
<td>45.5%</td>
</tr>
<tr>
<td><strong>(± 95% C.I.)</strong></td>
<td>(± 7.6%)</td>
<td>(± 7.6%)</td>
</tr>
</tbody>
</table>

\[ X^2 = 5.4546 \quad df = 1 \quad \text{Significance} = p < .05 \]

<table>
<thead>
<tr>
<th>Multiple regression analysis: Socioeconomic status and CHW age as predictors of perceived politeness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regression Coefficient</strong></td>
</tr>
<tr>
<td>Socioec Status</td>
</tr>
<tr>
<td>CHW age</td>
</tr>
</tbody>
</table>
CHW's sex, with women receiving a higher rating (Table 10).

Respondents were asked to identify any recent sources of information regarding medications taken during pregnancy. This was the subject of a current, multifaceted public health education campaign, and CHWs had been instructed to teach on this subject in the homes. Approximately half of the survey respondents reported having heard such information, but only a minimal number (1%) reported their CHW as the source (Table 11).

### TABLE 10

<table>
<thead>
<tr>
<th>CHW</th>
<th>Above Average</th>
<th>Average</th>
<th>Below Average</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>9.4%</td>
<td>70.6%</td>
<td>14.1%</td>
<td>5.9%</td>
</tr>
<tr>
<td>Female</td>
<td>23.2%</td>
<td>48.8%</td>
<td>8.5%</td>
<td>19.5%</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16.2%</td>
<td>59.9%</td>
<td>11.4%</td>
<td>12.6%</td>
</tr>
</tbody>
</table>

(± 95% C.I.) (± 5.6%) (± 7.4%) (± 4.8%) (± 5.0%) (N = 167)

\[ X^2 = 15.5104 \quad df = 3 \quad \text{Significance} = p < .01 \]

### DISCUSSION

The "person responsible for the family's health" among these Khmer refugees was usually a woman, as tends to be the case worldwide (WHO, 1985:9). The survey results clearly demonstrate a preference among them for older females in the role of a home-visiting CHW, which is consistent with Khmer cultural norms. This preference sharply contrasted with the actual demographics of the CHWs then employed by the program, who tended to

**TABLE 11**

<table>
<thead>
<tr>
<th>Source</th>
<th>Percent</th>
<th>95% C.I.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loudspeaker</td>
<td>15.2%</td>
<td>± 4.0</td>
</tr>
<tr>
<td>CHW</td>
<td>1.0%</td>
<td>± 1.1</td>
</tr>
<tr>
<td>MCH</td>
<td>17.5%</td>
<td>± 4.3</td>
</tr>
<tr>
<td>Clinic</td>
<td>6.3%</td>
<td>± 2.7</td>
</tr>
<tr>
<td>Grapevine **</td>
<td>13.9%</td>
<td>± 3.9</td>
</tr>
<tr>
<td>Other</td>
<td>2.6%</td>
<td>± 1.8</td>
</tr>
<tr>
<td>None</td>
<td>48.5%</td>
<td>± 5.6</td>
</tr>
</tbody>
</table>

*Because of multiple answers, the total exceeds 100%.

**"my neighbor told me," "I heard it at the market" etc."
be young men.

The overall recognition rate for CHWs, while high enough to support the existence of grass-roots health workers, was lower than expected given the scope of the program (there was an assigned CHW for every 60 families in the camp, and records of visits to each household). Non-recognition may have resulted from the CHW not visiting houses as assigned or visiting in a cursory manner; and/or such responses may have reflected non-acceptance of the CHW in their role. In the latter regard it is interesting to note the higher recognition for female CHWs — the sex Khmer consider appropriate for this job — than for males.

Although extremely few CHWs were actually labelled “impolite” (four responses only), informal discussions with refugees frequently elicited this complaint. It may be that some respondents who disliked their CHW denied knowing them, either to avoid the issue or as an indirect means of “getting back” at the worker. Another possibility is that CHWs refrained from visiting households in which they received, or anticipated receiving, a negative reaction. Both of these possibilities are consistent with the Khmer culture, which emphasizes conflict avoidance and non-confrontation. The higher ratings on “knowledge of health” given female vs. male CHWs indicates that, in addition to being more culturally acceptable, women have more credibility in this role. (In fact, the male and female CHWs had received identical training with no objectively apparent differences in their knowledge or skills).

Part of the CHW’s job is to teach and instruct the community in health matters. Such activities in the Khmer culture are acceptable when coming from an older person but considered rude from a younger one; hence, the higher “politeness” ratings for older vs. younger workers. The CHWs themselves frequently cited the age factor as a problem: “How can we tell the people what to do if some are older than we are?” The strong association between socio-economic status and politeness ratings for the CHW reflects underlying class conflicts, which are marked throughout Khmer society (Vickery, 1984). Complaints that educated workers “look down” on less educated/lower class clients plagued relief programs in both KID and other Khmer camps. The workers, for their part, often complained of hostility and abuse from their clients. Both allegations were probably true. Class conflict may have been exacerbated through employment and association with expatriates.

The number of respondents who reported receiving health information from their CHW was so small as to make it extremely unlikely that many CHWs followed instructions to teach this in the homes. This reinforced field observations that the teaching component of the CHW role was either ineffective or absent.

PROGRAM REVISIONS BASED ON EVALUATION FINDINGS

The evaluation was conducted as an interactive process between the evaluator and the program staff. The incorporation of evaluation findings into the actual program design was greatly facilitated by having longer-term expatriate staff. Reorganizations in the agency’s field administration provided increased support for field personnel.

As soon as hard data indicating the ineffectiveness of young male CHWs was obtained it was shared with the staff, who responded by actively recruiting older women. Within a relatively short time the Community Health Workers were converted to an older, predominantly female workforce. Observations of the class conflict/social distance problem were shared with the staff, as were training materials in interpersonal techniques.
TABLE 12
Recognition of CHWs pre- and post-program changes

<table>
<thead>
<tr>
<th>CHW Known by Name</th>
<th>June 1986 (N=305)</th>
<th>Jan. 1987 (N=328)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>CHW Known by Sight</td>
<td>36%</td>
<td>65%</td>
</tr>
<tr>
<td>CHW Known Vaguely</td>
<td>14%</td>
<td>26%</td>
</tr>
<tr>
<td>Respondent Never Met CHW</td>
<td>45%</td>
<td>1%</td>
</tr>
</tbody>
</table>

\[ X^2 = 179.73 \quad df = 3 \quad \text{Significance} = p < .01 \]

TABLE 13
Reported frequency of CHW visits, pre- and post-program changes

<table>
<thead>
<tr>
<th></th>
<th>June 1986 (N=305)</th>
<th>Jan. 1987 (N=328)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a Month or Less</td>
<td>76%</td>
<td>36%</td>
</tr>
<tr>
<td>Twice A Month</td>
<td>8%</td>
<td>32%</td>
</tr>
<tr>
<td>Three Times Per Month</td>
<td>3%</td>
<td>15%</td>
</tr>
<tr>
<td>Four or More Times</td>
<td>13%</td>
<td>17%</td>
</tr>
</tbody>
</table>

\[ X^2 = 110.86 \quad df = 3 \quad \text{Significance} = p < .01 \]

Several of the interviewers used for the evaluation were subsequently retained by the public health program as resources for training CHWs in interpersonal skills and awareness of social distance.

The necessity to articulate problems, goals and objectives for the purposes of the evaluation served to strengthen the program. Objectives were written in measurable terms and the survey research conducted provided baseline information against which future progress could be measured. The expatriate public health staff requested and received basic instruction in survey techniques. With this assistance they were able to plan and implement a system of ongoing program monitoring.

A repeat survey done in January of 1987 (approximately six months after shifting to an older, female workforce and providing CHWs with interpersonal skills training) showed a substantial increase in community recognition of the CHWs, and in the reported frequency of CHW visits (Tables 12-13). There was no increase in the number of visits workers were officially required to make, and no other apparent reason for an increase in CHW visits. Morbidity and mortality patterns were essentially unchanged in the camp between time 1 and time 2, and the camp population was relatively stable. It is the impression of both the evaluator and the program staff (expatriate and refugee) that the improved
visibility of the CHWs at time 2 resulted from a changeover to workers of more culturally acceptable age and sex. Whether this occurred through the mechanism of an actual increase in CHW visits or through an increase in the quality and acceptability of the visits – or both – is unclear.

CONCLUSION

Many successful elements were identified in the evaluation of IRC’s public health services in Khao I Dang, particularly in the areas of epidemiology, immunization and communicable disease control. This paper has focused on the least successful element – the Community Health Workers. Through the evaluation process, weaknesses in this program were documented, likely causes were identified, and remedial action was taken with subsequent improvement in program performance.

The chief impediments to program success were identified as:

1. Selection of refugee staff based on expatriate needs rather than on existing cultural roles and norms, and lack of community involvement in the selection process. This resulted in the selection of CHWs of culturally unacceptable sex and age, and class conflict between the refugee staff and the general population. Expatriate awareness of these dynamics was restricted by the factors mentioned below.

2. Problems relating to expatriate personnel: short-term contracts and “burn-out”, with consequent frequent staff turnover; lack of language skills and understanding of the refugee culture; unfamiliarity with community health principles and/or an inability to apply these in the refugee setting. These problems interrelate: longer contracts and the ability to speak Khmer would probably have resulted in a closer understanding of Khmer culture and sensitivity to class divisions.

3. Frequent turnover of refugee staff due to sudden departures for resettlement. This in itself was a major contributing factor in expatriate turn-over and provided a partial rationale for the tendency to select the most “trainable” (i.e., well-educated and English-speaking) refugees to fill the vacancies which suddenly arose. At the same time, such selection practices actually increased the turn-over problem, since those selected were those most apt to be later resettled. Certain segments of the camp were more transient than others; at least half of the population present in the summer of 1986 had been there since the camp’s early years.

4. Fragmentation of services among multiple agencies, and poor inter-agency coordination. Among other things, this prevented the CHWs from participating in even simple curative treatments, which might have increased the community’s perception of their value and rendered their home visits more welcome. (This problem was, however, beyond the agency’s control).

None of these problems were unique to KID. Poor coordination between agencies, frequent refugee and expatriate staff turnover, and problems with the community acceptance of refugee health workers have been reported in refugee camps worldwide (Simmonds et al., 1985; Dick and Simmonds, 1985).

As Simmonds et al. (1983) have pointed out, refugee populations are not homogeneous. Although the camp environment may present a fairly uniform appearance, refugees bring with them all the complex stratifications of their country/culture of origin. There are marked age, sex, socioeconomic and other group distinctions which may not be immediately apparent to outsiders. These must be carefully dis-
cerned and taken into account in the planning and implementation of health programs.

Community Health Workers should be selected on the basis of their intrinsic role in the community, and with regard for cultural norms applicable to home-visiting, teaching and other CHW activities. No aspect of the CHW job should require fluency in a foreign language; rather, emphasis should be given to the ability to influence and command respect among other refugees on a grassroots level. Identifying such people will be challenging, especially in camps such as KID where the indigenous leadership is absent or weak. One possible solution is the method ultimately used in KID: a random survey to solicit community preferences and attitudes, and inclusion of these in selection criteria.

In camps where a significant number of the refugees are uneducated, the work should be structured so as to require as little prior education/literacy among as few of the workers as possible. Aimed at reducing the social distance between CHWs and clients, this recommendation might have the added benefit of decreasing the loss of workers to resettlement, which tends to select the highly educated. The training of uneducated workers will be harder and more time-consuming, but it is an investment well made if it results in an effective program. The sense of urgency which often accompanies refugee work needs to be critically examined; it often persists long after the actual emergency has subsided, and spills over into services which by definition are of a long-term, non-emergent nature.

Relief workers in KID often explained the absence of community involvement in the selection of refugee workers and planning of health services on the basis that “KID is not really a community”; “there isn’t any community to involve”. It is true, as Simmonds et al. (1983), Holt (1981) and others have remarked, that refugee camps are systems suffering from severe social disruption. Yet these same authors have identified many elements of community in the refugee camp: a shared language and culture, a common relationship to external powers, and a common dwelling within a foreign environment.

Walks through the KID revealed women gossiping outside their homes, men gambling in make-shift cafes and groups of children playing in the streets. People generally knew their neighbors’ business — where they were, why, and when they might return. Cooperative efforts, such as house-building and market enterprises, were evident. Gossip and rumors were rampant. The camp had the personality of a community — a highly stressed one, under abnormal conditions, but a community nonetheless.

The KID research findings support the need for community involvement in the selection of refugee health workers — or at least for the identification and inclusion of community preferences in the selection process. “The community participation of refugees is always likely to be as difficult as it is essential. What is needed is commitment to their involvement. It will require imaginative approaches….“ (Dick and Simmonds, 1985: 5).

Language instruction is essential for relief personnel, particularly in the public health field, and warrants the allocation of agency resources. Language and culture are closely intertwined. Planning and supervising culturally appropriate programs requires some facility with the indigenous language. Furthermore, the refugees most effective as home-visitors and health educators may not be those with higher education and foreign language skills.

More research is needed on the unique features of a refugee community, and on the adaptation of community health/community development principles to this
highly challenging context. Research is also needed in the area of relief personnel adjustment and “burn-out”, especially in public health endeavors, which require continuity and are adversely affected by frequent staff turnover. Efforts should be made to recruit and retain longer-term personnel in order to better support such investments as language training and to reduce the other problems associated with frequent staff turn over: lack of program continuity, “reinventions of the wheel”, and repetition of past mistakes.

Above all, the KID public health experience demonstrates the feasibility and value of program evaluations in refugee health care. With the exception of nutrition programs, where periodic anthropometric surveys serve an evaluative function, little has been done and even less written about program evaluation in the refugee setting. “It is generally assumed that because a program has good intentions then it will necessarily have good effects.” (Taylor, 1979). Unfortunately, a great deal more than good intentions are required to achieve relief objectives. Without evaluation, it is impossible to know what is really being done, much less how to do it better.

Acknowledgements

This research was possible through support from the International Rescue Committee and a grant from the East West Center. The opinions expressed are those of the authors and do not necessarily reflect the views of the International Rescue Committee nor of the East West Center.

The authors wish to thank the following for their assistance with this project: Dr. D. W. Wood of the University of Hawaii, Mark Gorman and Helen Daly Bhamornsatit of the International Rescue Committee, and Dean Sumi Makey, Glen Yamashita and Rose Nakamura of the East West Center.

References

Limitations of Anthropometry During Acute Food Shortages: High Mortality Can Mask Refugees’ Deteriorating Nutritional Status

PHILLIP NIEBURG, ANGELA BERRY, RICHARD STEKETEE, NANCY BINKIN, TIMOTHY DONDERO and NABIL AZIZ

Longitudinal comparison of anthropometric data from cross-sectional surveys is commonly used to assess nutritional status in relief operations. In a refugee camp in Sudan, assessment indicated a high level of childhood malnutrition, but nutritional status appeared relatively unchanged between cluster sample surveys in January (26.3% below 80% of median weight-for-height) and March 1985 (28.4% below 80% of median weight-for-height). However, in this interval, which was marked by irregular food supplies and relatively low energy (calorie) intake as well as by a high incidence of diarrhoeal disease and measles, nearly 13% of all children in the camp died. This deceptive appearance of stability in nutritional status in the face of high mortality may be explained by ongoing nutritional deterioration (“replacement malnutrition”) among surviving children. These findings demonstrate that collection and analysis of mortality data are essential for the correct interpretation of anthropometric results during periods of uncertain food supply.

Evaluating children’s nutritional status by anthropometric measurements is an accepted method of assessing nutritional well-being in developing countries (WHO, 1986). Comparison over time of such anthropometric data, collected in surveillance systems or by repeated cross-sectional surveys, is commonly used to assess improvement or worsening of community nutritional status in relief situations (Simmonds et al., 1983). However, de Ville de Goyet et al. (1978) and others (PAG, 1977) have warned about the theoretical possibility of misinterpreting data because of failure to account for mortality when comparing results from repeated cross-sectional community anthropometric surveys. In this paper, we describe a situation in a refugee camp in Sudan where the children’s nutritional status appeared serious but relatively stable between two sample surveys performed over a two-month interval. During this time, direct data indicated high childhood mortality in the camp. In the absence of mortality data, trends in nutritional status based on sample surveys of malnourished populations should be interpreted with caution.
BACKGROUND AND METHODS

The Fau I camp in eastern Sudan received approximately 7700 refugees who had left Tigre Province in Ethiopia between October and December 1984. The refugees’ departure from Tigre had been due at least in part to drought-related food shortage. Food assistance was begun shortly after the camp was opened in December. The general food ration available to refugees in this camp varied from approximately 1500 to 1800 kcal (6.3-7.5 MJ) per person per day, and it was often less than the recommended maintenance ration of at least 1800 kcal per person per day (Simmonds et al., 1983; de Ville de Goyet et al., 1978; UNHCR, 1982). In addition, food deliveries were irregular in the first several months of operation. Oil, which provides rations with the digestibility and high energy density required by children (WHO, 1985) was sometimes unavailable for distribution. Furthermore, unmilled sorghum received in some of the food shipments could not be properly ground locally because the necessary equipment was lacking. This sorghum was thus probably poorly digested, further reducing available dietary energy.

The total population had been determined by registration on arrival at the camp, and the number of children <5 years old was estimated by later sample surveys of households, using height <110 cm as a surrogate for age <5 years. As part of the provision of ongoing health services, a team from the Office of the United Nations High Commissioner for Refugees (UNHCR) collected anthropometric data on children from a random sample of clusters of households in this camp in January and again in March 1985. During this period, the camp had no new arrivals. The UNHCR team obtained the length or stature of children <110 cm using a standard height-measuring board with footboard and headboard and obtained weight using calibrated spring balances. Using the NCHS/WHO reference population (WHO, 1986), percent of median weight-for-height (Wt/Ht) was calculated for each child. Crude mortality data were collected by daily surveillance of burial sites; age-specific mortality was calculated from data on age at death obtained by visits of community health workers to affected refugee households.

RESULTS

Registration and an initial survey had estimated the <5 year old population at 1386 children. The January 1985 nutrition sample survey revealed that 26.3% of 240 measured children had Wt/Ht <80% of the reference median (Table 1). Two months later, the corresponding figure was 28.4% of a sample of 363 children. This difference is not statistically significant. The prevalence of children in the highest risk nutritional group, those <70% of median Wt/Ht, had also changed negligibly from 7.1% to 6.9% during this interval. Thus, based on nutritional anthropometry alone, the status of the childhood population appeared poor but stable. However, direct mortality data, collected by a different agency during the two month inter-survey interval, indicated that at least 179 (12.9%) of the 1386 children <5 years old in the camp had died. The major causes of death in the age group during this period were measles and severe diarrhoea with dehydration (International Rescue Committee, unpublished). Mortality data on the individual children included in the initial nutritional survey were unavailable.

DISCUSSION

This severely malnourished population was receiving a general ration of 1500 to 1800 kcal per person per day, an amount...
TABLE 1
Distribution of nutritional status of refugee children
<5 years old (<110 cm) at Fau I Camp, Sudan
January to March, 1985

<table>
<thead>
<tr>
<th>Weight-for-Height Category</th>
<th>% of Reference Median</th>
<th>Calculated population</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥80% of median</td>
<td>73.7%</td>
<td>(1021)</td>
</tr>
<tr>
<td>(95% Confidence intervals)</td>
<td>(63.3–85.0%)</td>
<td>(863)</td>
</tr>
<tr>
<td>70–79% of median</td>
<td>19.2%</td>
<td>(266)</td>
</tr>
<tr>
<td>(95% Confidence intervals)</td>
<td>(14.0–25.1%)</td>
<td>(258)</td>
</tr>
<tr>
<td>&lt;70% of median</td>
<td>7.1%</td>
<td>(98)</td>
</tr>
<tr>
<td>(95% Confidence intervals)</td>
<td>(4.1–10.9%)</td>
<td>(84)</td>
</tr>
</tbody>
</table>

which corresponds to recent ration recommendations for emergency “survival” targets in refugee populations (de Ville de Goyet et al., 1978; UNHCR, 1982). The continuing high mortality despite this level of rations underscores the point that such recommendations are not intended – or adequate – for populations that already contain large numbers of malnourished children or adults. To accomplish catch-up growth, for example, a severely malnourished 30-month-old child weighing 8 kg would require 150–200 kcal/kg/day, or 1200–1600 kcal/day (Ashworth, 1985), up to twice the intake recommended for maintenance and normal growth (WHO, 1985). Corresponding calculations for adults have resulted in recommendations of 3300 kcal/day for rehabilitation of the severely malnourished (Bengoa and Beaton, 1976). Therefore, malnourished populations initially need a “rehabilitation ration” (Taylor, 1983), i.e., a level of food distribution greater than maintenance, to stabilize their nutritional status if high nutrition-related mortality rates are to be prevented or reduced. Actually, it is likely that actual energy intake at this camp fell far below calculated levels during those periods when oil was unavailable and when unmilled sorghum was the dietary staple. Foods that require further mechanical processing before consumption are inappropriate rations in emergencies unless suitable processing equipment is locally available.

In view of available information about camp rations, the seemingly stable nu-
tional status of the Fau I camp's <5 year old population was paradoxical. The explanation, however, may rest with the high mortality rate observed.

We suspect that what occurred in the Fau I setting was "replacement malnutrition," i.e., that the more malnourished children died at higher rates and were replaced in the moderately and severely malnourished categories by surviving children who initially had been better nourished but whose nutritional status deteriorated during the inter-survey interval. We cannot be certain that the 179 children who died included the most malnourished in this population nor are data yet available on anthropometric correlates of mortality in other famines. However, several groups of investigators have demonstrated in longitudinal studies among chronically malnourished children, that malnutrition as identified by abnormal anthropometry is associated with excess mortality risk (Chen et al., 1980; Sommer and Lowenstein, 1975; Heywood, 1982). It is not unreasonable to assume that a similar pattern of excess mortality risk exists among malnourished children exposed to a more acute food deficit such as occurred just prior to and during the first months at Fau I.

It is theoretically possible that the younger children in this population, i.e., those <110 cm, were preferentially fed and were thus less exposed to the effects of the inadequate ration than were the adults. If this occurred, the "replacement malnutrition" scenario may be a less likely explanation for the observed events. However, based on the pre-existing poor nutritional status of the entire Fau I population, the ration irregularities which occurred and the recent data from Somalia (Brown and Berry, 1987) and Sudan (Steketee, R., personal communication) indicating poor attendance at even those feeding centers targeting malnourished refugee children, we feel that a significant amount of preferential feeding of young children is unlikely to have occurred.

The occurrence of measles and severe diarrhoea as major causes of illness and death in children under 5 years in this camp is in accord with the "replacement malnutrition" concept. Measles and diarrhoea are diseases for which severity and adverse outcome (including mortality) are thought to be related to pre-existing malnutrition (Black et al., 1984; Morley, 1973). In addition, both diseases can have clinically important negative effects on children's subsequent nutritional status (Morley, 1973; Rowland and Rowland, 1986).

One accepted definition of famine is a lack of food production or distribution associated with an increased mortality rate (Cox, 1981). This definition highlights the close association between severe food shortage and death; it also implies that an assessment of food deficit severity and of adequacy of relief efforts requires information on mortality rates in the affected population(s). In this refugee camp, mortality data were available for correlation with cross-sectional nutritional status data, resulting in a correct assessment of the gravity of the nutritional situation. Had concurrent mortality data been unavailable, as is often the case, relief staff might have incorrectly concluded on the basis of nutritional anthropometry that conditions in this population were poor but stable and thus of a lower priority for additional resources than other populations where conditions were perceived to be deteriorating. Although mortality data may be difficult to collect, especially in situations when food aid is tied to family size and when other disincentives for reporting deaths may exist (Harrell-Bond, 1986), collection and analysis of such data are critical to appropriate decision-making. Failure to seek out and evaluate these data can result in false reassurances that emergency feeding
and other relief programs are functioning optimally to save lives.

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In November 1985, tuberculosis was highly prevalent among the 6,250 Tigrayan refugees of Fau I camp in Eastern Sudan. It was therefore decided to launch an active case-finding campaign aimed at decreasing transmission, to be carried out by primary health care workers. The entire population of the camp was screened for symptoms of pulmonary tuberculosis and the sputum of people with productive cough was examined by direct microscopy. However, it was considered that this examination was insufficiently sensitive in the camp situation. For this reason, people with non-productive cough or sputum-negative were enrolled in a follow-up program whose length was determined by the severity of their symptoms.

The campaign was interrupted by circumstances that are typical of refugee situations. On the basis of results obtained a few conclusions can nonetheless be made on the appropriateness of introducing an active screening program in situations where a stable refugee population has good access to basic health care of good quality.

**INTRODUCTION**

Tuberculosis is still responsible for high morbidity and mortality rates throughout the Third World. Many studies and handbooks are devoted to measures of control of this disease in developing countries. However, their suggestions generally presuppose a stable population and reliable paraclinical testing, especially of sputum samples.

This paper addresses the special case of a campaign against tuberculosis in a camp of refugees from Tigre established in the Sudan during the 1984–85 famine. An active home-screening program was organized according to primary health care concepts. The detection methods used thus depended above all on health workers trained in the camp and relied little on paraclinical means or skilled personnel.

The main differences between the situation described at this camp and the one prevailing in “a typical Third World country”, as referred to generally by handbooks, include the following:

- The epidemic nature of the illness in a population that had been subject to extreme malnutrition and was living in overcrowded conditions.
- The speed with which the population’s health status and general situation changed.
- The population’s instability: Return to the country of origin was to take place as soon as the quality of rains and harvests was judged sufficient by
refugee leaders and the concerned international organizations.

- The poor diagnostic methods available: Since the camp was just one year old, relatively small and was considered temporary, the infrastructure could not be costly and the refugee staff trained in the camp had only limited experience.
- The confined nature of the population: Refugees could not leave the camp's limited area without a pass.
- The special importance of non-medical factors intervening in decisions concerning health care for the refugees: For example, tuberculosis treatment could favour the stabilization of refugees in a region where resources and infrastructures available to the native population were already severely insufficient.

THE REFUGEE CAMP

Its Background

As early as 1967, refugees fleeing the civil war in northern Ethiopia poured into Eastern Sudan and set up new villages (described by Steketee and Mulholland, 1982). This stream turned into a mass exodus in 1984 when the drought and famine struck large regions of Africa. Huge refugee camps formed along the border between the two countries. Some of the refugees were subsequently transferred to smaller camps deeper in Sudan.

Such was the case for the refugees in the camp described here (Fau I) located five hours drive from the border, 20 minutes from the nearest paved road, and over 2 hours from the two closest towns, El Gedaref and Wad Medani (see Fig. 1; for a more detailed map of the area see Gibb, 1986). The campaign under discussion took place in November 1985. At that time approximately 6,250 refugees from Tigre, for the most part farmers, were living there.

Its Organization

Administrative and assistance functions

FIGURE 1 Map of the southern part of the Province of East Sudan.
within the camp were divided among several organizations.

Multilateral assistance organizations and host government representatives jointly assured the distribution of food rations and tents and maintained law and order. The authors worked for a non-governmental organization that was in charge of all health activities in the camp, with the exception of a nutritional supplements program. This was administered by a second NGO. Leadership among the refugees was provided by members of the liberation movement which had organized the refugees' transfer. The movement was in charge of educational and social activities.

THE HEALTH SYSTEM IN THE CAMP

Local Staff
In 1985 a number of refugees were selected – as much as possible from among the camp's few literates – to be trained as nurses' aids, sanitarians, home visitors, traditional midwives and cleaners. Moreover, a number of political refugees were recruited in the surrounding cities for jobs requiring secondary school education and knowledge of English. They were then trained to work as nurses, physicians and laboratory assistants.

Curative Care Facilities
The facilities consisted of a small 20-bed hospital, a dispensary and a tuberculosis clinic, all housed in straw buildings. A small laboratory equipped with a microscope and a few reagents carried out routine analyses and some specialized tests, including staining of smears for Mycobacterium tuberculosis. All medical care to refugees was given within the camp, under the responsibility of expatriate staff. Referral to health institutions of the host country was possible only in rare instances, since the distances involved were large, (almost three hours drive to the nearest referral hospital at Wad Medani) and the health resources of the region were already insufficient for the native population. Despite this fact, the medical staff of the Sudanese health services willingly accepted refugees and helped them through difficulties arising from linguistic and cultural differences. However, in the context of an emergency intervention expected to be of short duration, little attention had been given to possibilities of providing care to refugees by strengthening the health services of the region, whose population was also severely affected by the drought.

Preventive Activities
Sanitation, home visiting and mother and child care were carried out by locally-trained refugee staff, under the supervision of expatriates.

The home visitors – most of them literate in Tigrignia – were each responsible for approximately 450 people within a particular section of the camp. They visited their population’s tents on a daily basis to find new cases and to follow up on chronic or convalescent patients. The home visitors had a good knowledge of the people in their respective areas of the camp and for this reason they represented the mainstay of the program described here.

THE TARGET POPULATION

Demographic Characteristics of the Camp Population
The camp population could be considered as "closed", since the movement of refugees was small. However, many young men returned to Tigre in the spring of 1985 to plant their plots before the rainy season. Because of this, women
TABLE 1

Age distribution in the camp population
(in per cent)
(UNHCR-unpublished figures)

<table>
<thead>
<tr>
<th>age group (years)</th>
<th>% of refugees in the camp (April 1985)</th>
<th>&quot;typical&quot; % for an African country</th>
<th>Ethiopia</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-5</td>
<td>14</td>
<td>19</td>
<td>21</td>
</tr>
<tr>
<td>6-14</td>
<td>11</td>
<td>20</td>
<td>24.5</td>
</tr>
<tr>
<td>15-64</td>
<td>73.5</td>
<td>57</td>
<td>51</td>
</tr>
<tr>
<td>over 64</td>
<td>1.5</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

and children constituted the majority of the camp's population during this campaign. Nonetheless the proportion of young children was low in comparison with typical African rural populations (Table 1) since malnutrition had taken its toll, causing high mortality in that age group and at the same time bringing about a major drop in fertility (Table 2).

Nutrition

Although the population's nutritional status had been critical only nine months before (Shears et al., 1987 for a description of the epidemiologic situation in the camps in February 1985), it was satisfactory at the time of the campaign. It was in fact comparable to what one can expect to find in a typical rural African population (Table 3).

In the first stage of the emergency operation, however, the increase in food intake resulted in a growing number of cases of vitamin deficiency. In April 1985, for example, 20% of the camp's refugees but only 7% of new arrivals had scurvy. In February 1985, 7% of the camp's refugees suffered from xerophthalmia (UNHCR, unpublished figures). This occurred because the increase in protein-energy intake was not accompanied by a commensurate increase in vitamin intake. Daily rations distributed to refugees included 500 grams of white flour, 60 grams of beans or lentils, 30 grams of oil and 10 grams of sugar per person, supplying an energy intake of 2,200

TABLE 2

Number of pregnant and nursing women

<table>
<thead>
<tr>
<th>In the Camp (December 1985)</th>
<th>Average for a &quot;typical&quot; population of 6,250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pregnant</td>
<td>68</td>
</tr>
<tr>
<td>Nursing</td>
<td>250</td>
</tr>
</tbody>
</table>
Table 3
Protein-calorie malnutrition:
Percentage of children under 110 cm tall
with weight/height ratio below standard

<table>
<thead>
<tr>
<th>month</th>
<th>70%–80% of standard (moderate malnutrition)</th>
<th>under 70% of standard (severe malnutrition)</th>
</tr>
</thead>
<tbody>
<tr>
<td>February 1985</td>
<td>42</td>
<td>7</td>
</tr>
<tr>
<td>October 1985</td>
<td>6.9</td>
<td>0.7</td>
</tr>
</tbody>
</table>

(Note: In a developed country around 2% of the children have weight/height ratios under 80% of what is considered standard. The typical percentage in developing countries is 6%)

calories but little vitamin. To correct this problem a program of general distribution of vitamins A and C was implemented, beginning in the spring of 1985.

Mortality
After initially being very high, mortality dropped sharply to a level much lower than is normally found in developing countries (Table 4). Most probably, this is above all attributable to the relatively good health of those refugees who survived the famine, with the high-risk groups being under-represented. It can also partially be explained by the refugees’ access to basic health care of a good quality. For example, measles — a major cause of death in the camps at the beginning of the emergency (Shears et al., 1987) — had virtually disappeared as a result of vaccinations.

Morbidity
The range of cases motivating consultation at the dispensary — skin infections, ear nose and throat problems, parasites, gastroenteritis, fevers, etc. (Steketee and Mulholland, 1982 report on the relative frequency of these causes of consultation for the population of the nearby settlement of Tawawa) — was “typical” for a population from an African country, if we do not count the high incidence of psychosomatic diseases in the camp. The refugees were indeed living through a difficult period with much mourning and an uncertain future. Furthermore, their forced inactivity and the availability of free and

Table 4
Mortality in the camp’s population

<table>
<thead>
<tr>
<th>period</th>
<th>Mortality Rate (deaths per 10,000 per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>December 1984–February 1985</td>
<td>10</td>
</tr>
<tr>
<td>November 1985–April 1986</td>
<td>0.07</td>
</tr>
<tr>
<td>Average for a Third World country</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Diagnosis

- Tb adenitis
- Pulmonary
- Peritoneal
- Renal
- Pott’s Disease

Total (October 1985) of which:
- Positive sputum at direct microscopy
- Children under 12 years old
- Under 5 years old

Table 5
Known Tuberculosis cases (Patients of the Tuberculosis Clinic)

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tb adenitis</td>
<td>74</td>
</tr>
<tr>
<td>Pulmonary</td>
<td>72</td>
</tr>
<tr>
<td>Peritoneal</td>
<td>3</td>
</tr>
<tr>
<td>Renal</td>
<td>1</td>
</tr>
<tr>
<td>Pott’s Disease</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>151</strong> (2.4% of the population)</td>
</tr>
</tbody>
</table>

Easily accessible medical care encouraged them to use the dispensary excessively, to the point where the total number of consultations per month was equivalent to half the camp’s population.

The main causes for hospitalization included malnutrition, pneumonia, complicated malaria, typhoid fever, tuberculosis, gastroenteritis and, more rarely, meningitis and septicemia.

The Epidemiology of Tuberculosis in the Camp

Malnutrition and living conditions in the camp facilitated the spread of tuberculosis to the point that 2.4% of the refugees were registered in the tuberculosis clinic (Table 5), a prevalence at least 10 times higher than those usually found in rural African populations. Of course, the number of patients in the clinic is not exactly equivalent to the number of cases in the camp, since not all with tuberculosis would be attending the clinic, and an important fraction of registered cases were not confirmed through bacteriology.

The number of "early reactions" to BCG reflects the magnitude of the transmission of this disease. In January 1986, during the first tuberculosis-vaccination campaign, 9% of children under five years of age had such reactions, quite possibly indicating that they had already been infected by Mycobacterium tuberculosis (Table 6).

THE "COUGH SURVEY": A CAMPAIGN AGAINST TUBERCULOSIS

The Tuberculosis Program in the Camp Before the Survey

Faced with a great number of tuberculosis cases, the expatriate medical staff in the camp set up a treatment program as soon as the first emergency period was over, in June 1985. Patients admitted in the "tuberculosis program" had been screened passively from among the patients that...
Total number of children vaccinated: 970
Early reactions 75 (9%)

Evocative symptoms. Positive sputum had been found for a third of pulmonary cases (this proportion is inferior to that found in other refugee contexts: for example 46% were found by Rieder, 1985 and 40% by Steketee and Mulholland, 1982), but all had responded well to tuberculosis drugs, which were administered only after a period of observation on non-specific treatment. Contacts had not always been traced and examined. The treatment chosen was the one used by the host country, with a cost of only $6 per patient (according to 1983 prices). This therapeutic scheme included, for an adult, 150mg of Thiacetazone and 300mg of Isoniazid (TB 450) administered over 12 months, with 1g of Streptomycin added during the first two months. Cases were generally followed as outpatients but ate a warm meal in the tuberculosis clinic when they came to receive treatment. Before being accepted into the program, the patients made the commitment not to leave the camp before having completed at least nine months of supervised treatment and were warned that every effort would be made to ensure that they kept this promise. Treatment compliance was followed up very closely by the staff of the tuberculosis clinic, in collaboration with the home visitors. There were no defaulters among patients who remained in the camp.

The appropriateness of starting such a treatment program within the framework of an emergency operation was strongly challenged by the host country authorities and by many expatriates in charge of refugee assistance (Miles and Maat, 1984 report on similar arguments being brought forward within a quite different refugee context on the Thai-Cambodian border). In November 1985, given the prospect of an imminent return of the refugees to their homeland, the Sudanese authorities ordered that no more new patients be admitted for tuberculosis treatment after 31 December, with the exception of cases whose life was immediately threatened.

The Survey’s Objectives
The “Cough Survey”, which began in November 1985, consisted in an active home screening program. Its goal was twofold: to halt – or at least reduce – the spread of tuberculosis and to insure access to treatment to as many patients as possible before (or shortly after) the tuberculosis program’s deadline for new cases.

Method
It is well known that tuberculosis is transmitted almost exclusively by smear-positive pulmonary cases and that approximately half of cases of pulmonary tuberculosis can be expected to be smear-positive at the moment of diagnosis (PAHO, 1986). A few studies (reviewed by Toman, 1980) have shown that practically all (95%) such cases are symptomatic and that cough is the first complaint for two-thirds of them while another quarter puts forward fever and “flu-like” symptoms.

<table>
<thead>
<tr>
<th>Table 6: Importance of transmission: early reactions to BCG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of children vaccinated: 970</td>
</tr>
<tr>
<td>Early reactions</td>
</tr>
<tr>
<td>75 (9%)</td>
</tr>
</tbody>
</table>
discomfort as the major symptoms. Pulmonary cases which are only culture positive contribute little to transmission and only half are symptomatic (Toman, 1980); their prognosis in the absence of treatment is also more favourable than that of smear positive cases. Clearly then, symptoms and sputum tests are the key elements for the detection of cases of public health importance.

The campaign described here involved asking every refugee in the camp about the presence of chronic cough. These potential cases were then questioned on the presence of other symptoms evocative of tuberculosis and were investigated by direct sputum examinations or close monitoring of key symptoms.

The method was devised to take into consideration the suspected low reliability of sputum testing within the conditions of the camp: Staining of Mycobacteria requires several delicate steps that were performed by a locally-trained refugee, also responsible for all routine examinations of the hospital and dispensary. Furthermore the extreme heat and bright sunlight, in the absence of electricity and refrigeration, offered conditions far from optimal for the conservation of samples and reagents. On the other hand, the "closed" nature of the camp's population facilitated a very systematic monitoring of symptoms.

**Stages of the Program**

The home visitors visited every tent in the camp at dawn and noted the name and tent number of anyone who answered yes to the question, "Have you coughed every day or nearly every day for the last four weeks?" – to the exclusion of known tuberculosis patients.

A questionnaire on symptoms was submitted to "chronic coughers" (see Appendix); these latter were then separated into two categories – those with "little" and those with "medium to strong" probability of being ill – on the basis of the sum of points attributed to each answer.

Any chronic coughers who answered in the positive to the question, "Do you expectorate?" were subsequently instructed on how to produce sputum samples suitable for microscopic testing. Two samples from each person were then to be collected by home visitors early in the morning on different days and tested in the laboratory after specific staining for Mycobacterium tuberculosis. Any coughers who said they did not expectorate, or for whom the sputum tests were negative, were registered in a monitoring program designed to further investigate the possibility that they were infected (Figure 2). This monitoring was to be carried out by relatively unskilled health workers that would refer only a few cases to more qualified refugee and expatriate staff. For this reason it consisted of a series of simple steps requiring few diagnostic skills. At each step answers to questions and weight changes were recorded on the card of the potential case and these cards were filed in labelled boxes.

**Results**

As shown in Figure 3, 301 chronic coughers could be identified and submitted to the questionnaire (Tables 7 and 8). Sputum samples were collected from forty of them. However, just at that moment, it was announced that the long awaited return to Tigre would take place the following month. In spite of the best efforts at keeping discreet of all workers involved in the survey, the refugees understood that this was an effort to screen tuberculosis cases; they consequently refused to take any more tests, fearing that the disease's diagnosis would block their return home. Indeed, while
tuberculosis patients in the camp were perceived as “privileged” with daily meals, clothes and sometimes jobs, this was hardly the case given the prospect of an impending departure. Nonetheless, 40 sputum samples were examined (Table 9) and one was positive: the patient agreed to begin treatment. Two adolescent sisters with negative sputum tests, but “high probability of having tuberculosis” on the basis of the questionnaire were referred to the hospital where the staff noted that they suffered from emaciation, pulmonary effusions and night fevers that did not respond to antibiotherapy. They refused to remain in the camp for treatment and returned to Tigre.

The departure took place in fact three months later than planned and only included half of the camp’s refugees due to insufficient precipitation in many parts of Tigre. A small number of “tuberculosis-patients” who had not completed nine months of treatment left the camp, despite the efforts of health workers to stop them. Some of the camp’s refugees were still in Sudan a year after this campaign.
Weighing and questioning 3 times (every 2 weeks)

0 to 10 points on questionnaire
- No loss of weight and symptoms less or better
- Loss of weight* and/or symptoms definitely worse

11 to 21 points on questionnaire
- No loss of weight and symptoms less or better
- Loss of weight* and/or symptoms definitely worse

Repeat weighing and questioning (after 1 month)

Complete clinical workup in hospital

Decision
- ELIMINATE FROM FOLLOW UP
- REEVALUATE
- TREATMENT

* loss > or = to 2 Kg for an adult, any loss for a child or an adolescent.

FIGURE 3 The follow-up

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TABLE 7
The "Cough Survey" – results

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Population</td>
<td>6,250</td>
</tr>
<tr>
<td>Chronic Coughers</td>
<td>301</td>
</tr>
<tr>
<td>Persons with Sputum</td>
<td>74</td>
</tr>
<tr>
<td>Hemoptysis</td>
<td>5</td>
</tr>
</tbody>
</table>
DISCUSSION AND CONCLUSIONS

The Cough Survey

Although the campaign could not be completed, because of circumstances typical of a refugee situation, these events described allow a certain number of comments and conclusions.

A few studies (for example Larbaoui et al., 1970 or Nagpaul et al., 1968) show that case finding among a symptomatic population in a developing country can be expected to yield approximately 18% of confirmed cases when direct smear examinations, cultures and a chest radiograph are performed. This yield is of approximately 13% if the chest radiograph is omitted, 8% if cultures are also omitted and 6% if only a single sputum test is performed (Nagpaul et al., 1970).

Thus two or three positive smears are to be expected if 40 sputum samples are examined once by direct microscopy. A number of factors – beyond sample size and the quality of the exam itself – related to the particular epidemiologic situation in the camp, could account for a lower yield. These factors may be discussed in terms of the sensitivity/specificity of the screening test (the questionnaire) and of the confirmatory test (the sputum examination) with respect to the “true positives (cases) and true negatives” that may have been diagnosed through a complete and reliable paraclinical assessment:

1. Low bacterial counts in the sputum of cases resulting in a decreased sensitivity of the confirmatory test. The probability of detecting Mycobacteria in the sputum depends on the density of bacteria in the sample; for example,

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**TABLE 8**

Breakdown of questionnaire results into probability groups (among 301 chronic coughers)

<table>
<thead>
<tr>
<th>Total Points on Questionnaire</th>
<th>Probability of Infection</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–10</td>
<td>little</td>
<td>213</td>
</tr>
<tr>
<td>11–21</td>
<td>medium or strong</td>
<td>88</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>301</td>
</tr>
</tbody>
</table>

**TABLE 9**

Results of sputum examinations

<table>
<thead>
<tr>
<th>Total Number Performed</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Positive</td>
<td>1</td>
</tr>
</tbody>
</table>

(One young woman with “strong probability” of being infected tested positive.)
this probability falls to less than 10%, for an examination performed under optimal conditions, when there are less than 1000 Mycobacteria in a milliliter of sputum. Individuals whose sputum has low bacterial counts will often show mild symptoms and a favourable prognosis, the reverse being also true (Toman, 1980). None of the potential cases detected by the survey had a severe clinical picture or they would already have been brought in for consultation by the home visitors. Hence, a remaining "pool" of less symptomatic cases would be expected to show low bacterial counts and negative smears.

2. Over-reporting of symptoms resulting in a decreased specificity of the screening test. Patients may have confused frequent occasional coughing with continuous and chronic coughing. Cigarette smoking was virtually unknown among refugees, and could not account for the frequency of this latter symptom. In the crowded conditions of the camp, however, infections of the upper respiratory tract were common. Moreover, refugees had come from cool highlands and suffered from occasional bouts of cough due to the dry, hot and dusty climate of Eastern Sudan.

3. The effectiveness of previous passive screening resulting in a small number of remaining cases and a decreased predictive value of a positive screening test (the ratio of true positives to screened positives). Access to medical care was not limited by either distance or cost and, according to some studies, symptoms of pulmonary tuberculosis are severe enough to motivate consultation in 75% of cases (Banerdji and Andersen, 1963). In fact, in regions of the developing world where access to care is good, studies show that large campaigns yield few additional cases which go undiagnosed through the normal activities of the health services: For example in Kuala-Lumpur only 9% of cases were found in this way (Sodhy, 1972).

On the basis of the results of the survey and values obtained from studies cited above, the number of additional cases of pulmonary tuberculosis in the camp can be estimated to be, most probably, between 16 and 54 (18% of symptomatic people), of which 7 to 24 (8% of symptomatic people) had positive smears. The lower estimate, calculated taking into account only the 88 refugees that complained of several symptoms and therefore scored more than 10 points on the questionnaire, is certainly closer to the truth than the higher estimate based on all 301 "chronic coughers". Taking into consideration this estimated number of pulmonary cases in addition to the 150 known patients, the distribution between lymphatic and pulmonary cases in the camp comes closer to that normally found, with cases of adenitis accounting for a third of the total number. The real prevalence of tuberculosis in the camp then approximates 3%. A selection bias partly accounts for such a high prevalence, since among those who left the camp toward Tigre during the spring few were either unwell or were taking care of someone ill.

From what precedes one may conclude that an active screening program for tuberculosis will generally not detect a large number of new cases in the context of a small refugee camp where a stable population has good access to health care. The number of cases that may have been confirmed through the follow-up of the 301 "coughers" is much smaller than the 151 cases already identified through the normal activities of the health system. Of course, the impact of such a campaign would have been greater had it been
carried out at the moment the program for tuberculosis treatment was started. In each particular circumstance therefore, the appropriateness of launching an active screening program must be evaluated by weighing the expected yield of cases (especially smear positive) against the necessary investment of resources.

Beyond the three cases actually detected, the "cough survey" had some useful outcomes. It was the first "preventive campaign" carried out by health-workers whose training had been largely clinical during the first emergency phase (a situation often found in a refugee context: Simmons et al., 1985). The survey thus constituted an excellent means to introduce health workers to the concept that a disease has a "cycle" that can be interrupted, resulting in a decrease of cases. The next logical step, had the campaign continued, would have been to involve these workers in educational activities aimed at transmitting this same message to all the refugees in the camp.

The Approach to Health in the Camp

The situation described for this camp seems rather "typical" of refugee situations which have gone beyond the immediate emergency stage. This inspires us to "transgress" beyond the cough survey and make a number of more general observations.

When dealing with refugees, the population's "mobility" is often overestimated. There are numerous recent examples, including the one mentioned above, that bear witness to this.

There appears to be a "dynamic" assistance approach which evolves along with what is perceived as the refugee camp's "transitory" nature. During the crisis responsible for the displacement, assistance organizations and the host country respond generously. In medical care this is reflected both in the availability of both highly qualified personnel and in the abundance of supplies. Urgent needs demand an immediate response, mainly curative in nature. However, once the crisis is overcome and the refugees remain, it becomes more and more difficult to find funding for assistance and to set up prevention programs. At the same time, the authorities in the host country begin to realize that such assistance unfairly favors the refugees over the local nationals and in fact serves to stabilize the former. It is then that expatriate staff, drugs and other resources attributed to refugee health care are cut back, with understandable reactions of insecurity and discontent on the part of refugees.

Hence it is a difficult moment when this transition between an "emergency" approach and a "developmental" approach – emphasizing self sufficiency and preventive strategies – is begun: the cough survey took place at such a time. Since this transition is practically inevitable it should be possible to prepare for it as soon as the emergency operation is under way and while there are still few material and political constraints. Among other things, this would reduce the risk of such programs being perceived by the refugees themselves as a "fall back" instead of a logical development of the emergency intervention.

To take the case of tuberculosis described above as an example, active tuberculosis screening could have begun and even could have been institutionalized in the camp when the treatment program was launched. This would have made it possible:

1. First of all, to train local staff from the start to the concept that prevention of the spread of a disease is every bit as "urgent" and important as its treatment;
2. Secondly, to transmit an analogous message to all refugees in the camp.
This is especially true in the case described here, since most refugees had never had access to care previously, the system encountered upon arrival in the camp thus becoming a “model” for them.

3. Finally, to avoid many “secondary” cases that were infected in the camp (for example a proportion of the small children that gave early reactions to BCG) and to gain access to treatment for a greater number of patients before the treatment itself was challenged.

Appendix: The Questionnaire

(Its questions and answers, and the amount of points attributed to each answer.)

1. Do you spit? Describe your spittle.
   a) No, I do not spit. (0)
   b) Yes. My spit is clear. (1)
   c) Yes. My spit is white and thick. (2)
   d) Yes. My spit has red spots in it. (3)

2. Have you lost weight? How can you tell?
   a) No, I have not lost weight. (0)
   b) Yes, I think I have lost weight. (1)
   c) Yes, my friends and family tell me I have lost weight. (2)
   d) Yes, I was weighed at the dispensary and they told me I lost weight. (3)

3. Do you have chest pains? When?
   a) No, I never have any pain in my chest. (0)
   b) Yes, but only when I move. (1)
   c) Yes, often. (2)
   d) Yes, especially when I take deep breaths. (3)

4. Do you have fever? When?
   a) No, I never have a fever. (0)
   b) Yes, especially in the morning. (1)
   c) Yes, sporadically. (2)
   d) Yes, especially in the evening or at night. (3)

5. Do you sweat more now than you used to?
   a) No, I sweat as much as before. (0)
   b) Yes, when it’s hot and I do physical work. (0)
   c) Yes, sometimes I sweat a lot, with no apparent cause. (1)
   d) Yes, especially at night. (3)

6. Has anyone from the group of people who was close to you in Tigre been treated for tuberculosis or has anyone died from a long illness involving coughing?
   a) No, nobody. (0)
   b) Yes, a friend or neighbor. (1)
   c) Yes, a member of my family (except parents) or someone living in the same house as me. (2)
   d) Yes, my mother or father or I myself was treated for this disease. (Please specify for how long the treatment continued, dates of treatment and who decided to halt the treatment.) (3)

7. Has anyone among the group of people with whom you live here in the camp been sent to the nutrition program because he or she was underweight? Has anyone been treated for tuberculosis?
   a) No, nobody. (0)
   b) Yes, a friend or neighbor. (1)
   c) Yes, a member of my family or a person living in my tent is in the program because he or she was underweight. (2)
   d) Yes, a member of my family or a person living in my tent has been treated for tuberculosis. (3)

Acknowledgements

We would like to thank the International Rescue Committee (IRC) which hired us to work in Fau I as physician and nurse. In addition we wish to express our gratitude to Sudanese authorities for
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References


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Practical Experience with the Management of a Cholera Outbreak in a Refugee Camp in Eastern Sudan, 1985

EIGIL SØRENSEN and KLAUS DISSLER

From May to November 1985 most refugee camps in Eastern Sudan were affected by cholera. This article summarizes the experience from the refugee camp Wad Sherife with the emphasis on the practical aspects of management of cholera in a refugee context. Paramedical personnel from the refugee community were used to a great extent both in curative and preventive measures. The home visitors played an important role in the early detection of the cases and in trying to prevent the spread of cholera in the camp. A total of 1793 cases were admitted during a three month period. The results show a case fatality rate of 1.8%. A significantly higher number of women were affected in the age group 15–44. As seen in other refugee camps in Eastern Sudan, there was a relatively high intravenous fluid consumption with an average of about 6 litres in adults.

INTRODUCTION

During the first months of 1985, there was an outbreak of cholera in Somalia and Ethiopia. From May until November of the same year most refugee camps in Eastern Sudan had confirmed outbreaks of cholera and a total of 5,385 cases were reported.

Wad Sherife (pop. 100–130,000), the largest refugee camp in Eastern Sudan, was located 12 km to the east of the town of Kassala and 20 km from the Ethiopian border. All the refugees were from the Eritrea province in Ethiopia, with a major influx in late 1984 and early 1985 due to drought and famine. The majority of the refugees were from the lowlands of Eritrea, mostly farmers, semi-nomads and nomads with a high illiteracy rate. A nutritional survey from April 1985 showed a malnutrition rate of 41% (<80 w/h using NCHS/CDC/WHO 1982 standards) in children less than five years of age. However, the general condition of the population had improved somewhat at the time of the cholera outbreak. A health care system was established by Swiss Red Cross and the American Refugee committee; it comprised out-patient departments and two temporary hospitals in addition to a public health program with home visitors. There were several feeding centres with intensive and supplementary feeding programs. The sanitation of the camp was under the responsibility of the Sudanese Government Commissioner of Refugees office (COR).

The camp covered an area of about 10 km² (approximately 5 × 2.5 km) on flat country without any vegetation. The
refugees were living in small huts made of straw mats but, as of July 1985, tents were distributed. The water supply came from drilled wells and was distributed to watertanks in the camp by lorries. There were no latrines and defecation occurred in the open spaces in the camp. The climate is hot and dry with a rainy season from July to September.

The cholera outbreak lasted from 30 May until 20 November 1985, with the majority of the cases occurring during the months of June and July (Figure 1). The maximum number of daily admissions was 58 patients. The first patients were in one of the camp hospitals, but after seven days an isolation unit was established.

ORGANISATION OF THE ISOLATION UNIT
The isolation unit was located just outside the camp in an open space area with relatively easy access from all parts of the camp. The unit was planned for 150–200 patients, and the square dimension of the unit was $60 \times 58$ metres. The ground consisted of sand mixed with soil. Around the unit there was a fence of bast mats with one entrance. The planning and construction of the isolation unit took six days. The materials used were bast mats and wooden poles, all locally available. The construction was done by workers from the refugee community.

Registration and Observation Area
Close to the entrance was the admission and observation area where all new patients were registered. On admission, all patients were screened, and patients with typical signs and symptoms of cholera were brought to the intensive care unit.

Cases which were not obvious cases of cholera were kept for observation.
They were given oral rehydration salt (ORS) and intravenous fluids if necessary. In cases which were under observation, inspection of the stool was carried out.

The patients were registered and given a plastic bracelet with name, date of admission and a registration number. Each patient was accompanied by one family member. The family attendant also received a bracelet, but with a different colour so they could easily be identified. This helped prevent other family members from entering the isolation unit. A daily report was written compiling the number of admissions, discharged patients and deaths.

**Intensive Care Unit**

The intensive care unit had a total capacity of 50 to 60 patients located in a "rakuba", a large ward with walls and roof constructed of bast mats. In addition, there were also two large tents with a capacity of about 40 beds. Due to the hot climate, with temperatures up to 45 degrees C, the tents were only used during rain. About 60 beds were the maximum in use and were sufficient to meet the demand even at the peak of the epidemic.

Two types of beds were used: wood frame hemp rope beds and steel frame beds stringed with plastic ropes, both locally available. The hemp rope beds were cheap, and a hole was made in the middle and covered with a plastic sheet. These beds were difficult to clean and to disinfect. The plastic string beds had the advantage that the patient could lie quite comfortably directly on the bed, and the watery diarrhoea passed easily through the plastic strings. These beds were easy to wash and to disinfect, but were more costly than the hemp rope beds. Under each bed, there was a plastic bucket for the stool and another bucket beside the bed for vomitus.

Other equipment in the unit consisted of locked cupboards for medicines, water-barrels (2 × 100 l) with a tap for drinking water and two similar barrels (2 × 100 l) with a tap for ORS. For washing our hands we had half a barrel of chlorinated water on a table (150 l) and another barrel underneath for spill water. From this barrel, a hose was directly connected to the waste water disposal. A generator and neon lights were installed after an initial period during which we used kerosene lamps and torch lights, and this greatly improved the working conditions at night.

**Unit for Oral Rehydration**

When the patients had completed intravenous therapy and their condition seemed stable, they were moved to the unit for oral rehydration, which had a capacity of 120 people. In this area, there were only a few beds and stretchers for old and weak persons, but otherwise straw mats on the ground to lie on. In addition to administering chemotherapy and observing the patients, the health workers gave some health education to the patients about prevention of diarrhoeal diseases.

**Staff**

The medical staff were refugees themselves, with some medical training but without any formal medical qualifications. For the work in the isolation unit, the staff were trained especially in rehydration therapy and in observing signs and symptoms of the possible complications of cholera. These paramedical trained personnel did the major work in the isolation unit under the supervision of one nurse with one or two daily rounds by the physician. During the major peak of the outbreak, a doctor was available in the camp for 24 hours most of the time.
The work was organized in three shifts with each shift lasting eight hours.

Sanitation in the Isolation Unit

In the unit, there was a water tank with a capacity of 15,000 litres which had to be filled every second day. The water was chlorinated and could be used as safe drinking water. For disinfection of the hands, we used chlorinated water (10 mg/l) and soap. The staff were instructed to wash their hands for at least 30 seconds after handling a patient. Our experience is that proper hand-washing facilities are essential in preventing contamination in the ward. During the six months outbreak, none of the staff showed clinical signs of cholera. In the initial period of the outbreak, the staff members received chemoprophylaxis, but this was discontinued after about three weeks.

After each use, the buckets for stool and vomiting were washed and rinsed in chlorinated water. When the patients were moved from the intensive care unit, the buckets were disinfected with Dettol 5%, rinsed and dried in the sun. Beds and blankets were also washed after each patient, disinfected with Dettol 5% and dried in the sun. The floor of the wards was swept every day after it had first been sprinkled with chlorinated water. Below and beside the patients’ beds, we used lime powder when it was considered necessary due to contamination. Once a day, the floor and bast mat walls were sprayed with insecticide (Baygon). There were virtually no flies in the isolation unit.

Waste water trenches were made close to the unit. The ground hardly absorbed any water, so some of the trenches had to be emptied by use of empty barrels and dispersing the waste water in the desert.

Separate latrines were constructed for patients and the staff. The patients’ stools were disposed of into the latrines. Once a day, the latrines were disinfected and sprayed with insecticide. Limestone was inserted into the hole once a day. Hand washing facilities were installed outside the latrines.

CLINICAL MANAGEMENT

Rehydration Therapy

The majority of cases admitted to the isolation unit were given intravenous infusions. Even though we were aware of the need to limit the use of intravenous fluids, only about 15–20% were managed on ORS alone. When available, Ringer lactate was used as it allows all cases to be managed with a single type of intravenous fluid. For adults with severe dehydration without peripheral pulses, we gave the first two litres as fast as possible. The speed of the further rehydration depended on the clinical condition and the amount of fluid lost in diarrhoea and vomiting. From our experience the radial pulse was the single best indicator for evaluating the patient’s condition and for monitoring the rehydration therapy. The number of litres of intravenous fluid received by the patient was written on the bottle using a marker pen. The intravenous rehydration of children on a large scale needed special attention. For children with severe dehydration we used 30 ml/kg for the first hour and 20 ml/kg for the second and third hour. For giving infusions to children, the staff were trained to calculate the number of drops per minute and this was written on the bottle before the infusion was started. The staff also received special training to look out for signs of overhydration in children.
Antimicrobial Therapy

Antimicrobial therapy given consisted of tetracycline capsules 750 mg × 3 for three days; children less than 12 years old were given 50 mg/kg/3 doses for three days. The tetracycline treatment was started as soon as the patient could take anything by mouth. The patients were kept in the isolation unit until 72 hrs of tetracycline were completed.

Record Keeping

A special medical card was kept with each patient. Once or twice in every 8-hour-shift or more often in critical cases, the following parameters were monitored:

- diarrhoea −/+/+ /++/++++
- vomiting −/+ /++/++++
- drinking −/+ 
- urine output −/+ 
- pulse: no pulse/weak/good/rapid/irregular
- fever −/+ 

According to our experience, it is important that not too much time should be spent on written evaluation, but more on practical observation and management of the patients. For critical cases, we used a red sign above the bed to show that this patient needed special attention.

Special Medical Problems

It is important to identify patients with special medical problems. Patients with severe anemia need attention in the rehydration therapy to avoid overload and the development of cardiac failure. Miscarriage in pregnant patients with cholera is common. It is important that pregnancy should be recognized on admission and that female patients of childbearing age should be asked specifically about pregnancy. For pregnant patients we used a special regimen with frequently monitoring of pulse and blood pressure during the acute phase of their illness. Normal pulse and blood pressure were to be obtained as soon as possible. Old people have a higher risk of complications and a higher mortality rate in cholera. From our experience one should be especially aware of the urine output in old people.

PREVENTIVE MEASURES

Water Supply

It is well known that water is a major source for the spreading of cholera. Well water was distributed by lorries to water tanks around in the camp. At an early stage of the outbreak, chlorination of the water was performed to levels of 2.5–3.0 mg/l of free chlorine. The staff responsible for the distribution of water were given special instructions about handling of equipment, hoses etc. to prevent contamination at this point. Remaining water around the tanks was removed at some points by cementing the place around the watertap. This was done so that the spilled water was led into a cemented channel, into a water trench or – even better – into a small garden beside the water tank.

Sanitation

Marked areas and trenches for defecation were supposed to be constructed, but turned out not to be very successful. The trenches filled up with water during the rain and probably represented a greater risk than leaving the stool to dry in the sun on the ground. About 150 sanitarians were employed to remove waste material, dried faeces and disinfection of contaminated households. In principle, all patients should have their home disinfected and sprayed with insecticide.
Soap was distributed to improve personal hygiene.

**Home Visitor Program**

The home visitor program played an important role in the surveillance of the situation in the camp and for the health education of the refugees. There was approximately one home visitor for 150 families. Through megaphones and by home visits the refugees were informed about the symptoms of cholera and told to seek early medical help if any severe diarrhoea and vomiting occurred. Early detection of the cases was stressed and a 24-hour emergency service was established in the camp feeding centres, where the patients were given ORS. An ambulance service was arranged, with the ambulance passing the feeding centres at regular intervals on a 24-hour basis, bringing the patients to the isolation unit. The household contacts of the patients were given tetracycline prophylaxis (Adults: 500 mg × 2, Children: 0–3 years: 50 mg × 2, 4–13 years: 125 mg × 2 for 3 days) and the home visitor distributed the prophylactic doses while visiting the home of the patient. A graveyard watch was also established with registration of all deaths and the medical history of the deceased.

**RESULTS**

With a total number of 1793 cases (Table 1) admitted to the isolation units, this gives an attack rate of approximately 1.8%. The majority of the cases came during the first three months of the epidemic. A total of 32 patients died (1.8%). Four of these patients had a clinical diagnosis other than cholera.

A limited number of bacteriological samples (rectal swabs in peptone water) were taken and analysed at National Laboratory in Khartoum. In the beginning of the outbreak the serotype El Tor Ogawa was seen, but later on also the serotype Inaba was found, which was the dominating serotype in the other refugee camps in Eastern Sudan.

Two pregnant women in the last trimester delivered stillbirth in the isolation ward, and another delivered a stillbirth 6 weeks after she had recovered from cholera. Four patients showed signs

<table>
<thead>
<tr>
<th>Age</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1</td>
<td>8 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>1-4</td>
<td>144 (3)</td>
<td>116 (2)</td>
</tr>
<tr>
<td>5-14</td>
<td>265 (4)</td>
<td>228 (4)</td>
</tr>
<tr>
<td>15-24</td>
<td>58 (2)</td>
<td>120 (3)</td>
</tr>
<tr>
<td>25-44</td>
<td>152 (3)</td>
<td>338 (3)</td>
</tr>
<tr>
<td>45-</td>
<td>172 (4)</td>
<td>145 (3)</td>
</tr>
<tr>
<td>Unknown</td>
<td>26 (0)</td>
<td>21 (1)</td>
</tr>
<tr>
<td>Total</td>
<td>825 (16)</td>
<td>968 (16)</td>
</tr>
</tbody>
</table>

**TABLE 1**

Age, sex and mortality figures of cholera patients (Deaths)
of peritonitis, out of which one died. It is possible that some of the patients with peritonitis could have a diagnosis other than cholera. One or two cases of renal failure were seen. Several children showed signs of pneumonia, possibly due to aspiration. A few cases with convulsions in small children were seen which might be caused by hypoglycemia or hyponatremia.

For patients more than 15 years of age, we used an average of about 6 litres intravenous infusion with a range from 2–30 litres. In these figures there are not included patients who were managed on ORS alone.

DISCUSSION

During an epidemic, the diagnosis is generally obvious. If there is a low number of patients in the initial stage of an outbreak, the diagnosis can be more difficult. During this period, it is important to take regular stool specimens for confirmation of the diagnosis and having a selective medium like thiosulphate citrate bile salt (TCBS) might be useful. Severe watery diarrhoea and vomiting in an adult causing circulatory collapse is very suggestive of cholera. Other signs and symptoms that support the diagnosis, are a short history, often only a few hours from the onset of symptoms, and a watery non-faeculent stool. A feculent stool is not likely to be caused by cholera.

With an attack rate of 1.8% it is likely that the majority of the refugees in the camp were infected during the epidemic. This is based on the assumption of a high number of asymptomatic cases normally seen in El Tor cholera (WHO, 1970). From this point of view the preventive measures that were implemented were not very effective. However, the preventive measures probably did limit the speed with which the disease spread. Thus the daily number of cases did not extend beyond the capacity of the medical facilities and personnel, and the epidemic could be handled in a controlled manner.

The source of the infection was not clearly established, but it is likely that it had been brought to the camp with new arrivals from across the Ethiopian border. The introduction of a second serotype later on in the epidemic shows that there must have been at least two sources of infection. The mode of transmission in the camp was not identified but it seemed not to be a common source of infection. The good quality well water, with sufficient chlorination, probably prevented a major spread through water. Standing water around some of the water tanks might have been a source for contamination and transmission of infection. It is likely that person-to-person transmission played an important role in the continuous spread of the disease in the camp (Feachem, 1982).

There was a significantly higher number of females in the age group 15–44 who developed cholera. This cannot be explained by the population structure of the camp and is contrary to what is found in most epidemics (Feachem, 1981 and Lasch et al., 1984). In the 19th century there was a higher incidence among males, explained by their greater mobility. With high number of asymptomatic carriers seen in El Tor cholera, the mothers might be more exposed to infection because of their closer contact with their children. There was a low incidence in infants, who were mostly breastfed. It has previously been shown that breastfeeding protects against cholera (Gunn et al., 1979).

The relatively high intravenous fluid consumption of about 6 litres in adults (Sack et al., 1970 and Mahalanabis et al., 1968) was also seen in other refugee camps in Eastern Sudan. Kim Mulholland (1985) reported an average of 8 litres from
the Shagrab East camps. A high degree of vomiting seems to have been a typical feature of this epidemic and was also reported from other camps in Eastern Sudan. The use of inexperienced staff could be another explanation for the high fluid consumption.

Management of cholera in a refugee camp is basically an organisational problem. It is important to emphasise the training of the staff. It has been shown that treatment of cholera with the use of paramedical personnel gives acceptable results (Baqui et al., 1984). The home visitors play an important role in the education of the refugees and the early detection of cases. In a refugee camp where one can suspect a cholera outbreak on the basis of experience of previous years and recent outbreaks in nearby areas, we would suggest the following:

- establish cooperation between the different agencies, refugee community and local authorities
- appoint a cholera coordinator
- identify an area for the construction of an isolation unit or select established buildings, such as a school or feeding centre, as a possible isolation unit
- prepare a buffer stock of intravenous fluid, infusion sets, cannula, ORS, disinfectants etc.
- brief home visitors/public health workers on the signs and symptoms of cholera and the prevention of diarrhoeal diseases
- implement a graveyard watch with registration of all deaths and be aware of deaths in adults with a short history of diarrhoea.

References


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It is gradually becoming accepted in informed circles that public perception is an essential ingredient in preparedness against disaster. Waiting for Disaster is one rare example of a comprehensive sociological analysis of public appreciation of, and reaction to, the risk of impending earthquake. The authors launched their study in southern California in 1976, upon the announcement of the so-called "Palmdale bulge," an uplift of the ground that many scientists and administrators felt would soon lead to a major earthquake whose tremors would cause devastation and casualties throughout the Los Angeles metropolitan area. For the next three years Turner, Nigg and Heller Paz closely monitored the news media, while making a careful investigation of seismic awareness, preparedness and opinion among residents of the wide area encompassed by the uplift.

The year 1976 was one of special importance to the debate on earthquake hazards in southern California. In April, Dr Robert Whitcombe of California Institute of Technology, issued a "hypothesis test," or "near-prediction," that the area had entered a period, expected to last up to one year, of high risk of a moderate magnitude earthquake. Later in the year, the self-styled geophysicist Henry Minturn issued a more immediate prediction of impending disaster. Media interest in these prognostications waxed and waned, as did the level of commitment to seismic preparedness on the part of government. However, these events became the material of a rich case study concerning how the public reacted to them.

The authors used questionnaire surveys to sound out a wide variety of responses concerning, for example, public confidence in scientists, administrators and maverick self-styled "experts." They investigated the role of television, radio, newspapers and personal contacts in relaying information, and in either generating or quashing rumour. They examined the relationship between ethnic group, or social status, and factors such as risk perception and disaster preparedness. They tested the degree to which contemporary scientific information on the level of risk was understood by the public and the extent to which simple advice on readiness had been absorbed and acted upon.

This is a long, detailed and thorough case study, whose results are too numerous to encapsulate adequately in a brief review. In summary, however, the perception by urban southern Californians of day-to-day earthquake hazard is rather less than the gravity of that risk would
merit, but is not as poor as one might suppose, given their image to the outside world as a people with its collective head in the sand. Turner and his associates have unearthed wide discrepancies in the level of appreciation of the problem, with particularly low levels recorded among blacks and residents of poor neighbourhoods, who apparently regard crime and deprivation as much more pressing calls upon their attention. Overall, the level of public preparedness rose during the period studied, but not dramatically: few property owners, for instance, admitted even asking their insurers about earthquake coverage, let alone purchasing it.

If the low level of preparedness suggested that the risks were being taken for granted, then at least it could be said that scientists were held in fairly high regard by the public. In fact, the researchers observed a certain measure of overconfidence in the ability of scientists to predict future earth tremors (yet a widespread and general ignorance of what this would actually involve). But, for a population that is commonly assumed to be dependent on its army of psychiatrists and therapists, the southern Californians gave relatively little credence to occult, religious and mystical explanations of seismic phenomena. Interestingly, the written word gained ascendancy over the televised image, despite the immediacy of the latter: newspapers, magazines and books came to be perceived as reliable sources of information, while television, which picked up and dropped the subject at will, came over as fickle (for a while it did indeed give as much space to pseudo-scientists as to reputable seismologists). Finally, although public confidence in government was rather patchy, local politicians and administrators were expected to tackle the problem of preparedness. This expectation, however, was not backed up by substantial grass-roots or even personal initiative to put pressure on the authorities.

In many respects, Turner, Nigg and Heller Paz have set the standard for sociological analysis of risk perception. Their book is a mine of information that has been carefully collected, rigorously analysed and laced with intelligent comment and insight. The project is particularly admirable because it extracts a myriad worthwhile conclusions from a situation in which the disaster itself does not actually occur. Hence, although we are used to reading about the public perception of risks and hazards that turn rapidly into tangible and destructive events, it is something new to be able to delve deeply into the perception of an event that, however real the risk, remains purely symbolic throughout the period studied. It is also very useful to be able to chart alterations in public awareness and response to the earthquake threat as the manifestations of that threat altered over time (the authors repeated their population surveys five times, including after the destructive earthquake that occurred on New Year’s Day 1979).

My only reservation about this book is that it provides little context in which to place the attitudes of southern Californians. To what extent might we expect its conclusions to be replicable elsewhere in the U.S.A. and abroad? The reader is left to decide for himself, while the authors concentrate hard on their field research. But, on the other hand, until this study is emulated in other societies, there may be little to compare it with.

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