biological risk factors in the lowest third of childhood socioeconomic conditions, examination of these factors in adulthood alone may obscure the earlier effects of such risk factors. For example, earlier development of adverse concentrations of low density lipoprotein cholesterol in subjects in the lowest third of childhood socioeconomic conditions than in subjects in the highest third might put those in the lowest third at higher risk as adults. Thus to understand the mechanisms that underlie the association seen in this study it will be necessary to have information on differences in the course of risk factors, from childhood to adulthood, in subjects in different socioeconomic strata.

The impact of prevalent disease on this association also requires some comment. Although it is true that adjustment for a previous diagnosis of ischaemic heart disease substantially weakens the association between socioeconomic conditions in childhood and the risk of ischaemia on exercise, this should not be interpreted as an indication that prevalent disease is responsible for the association. Because the report of socioeconomic conditions in childhood is an account of events that happened before ischaemic heart disease developed, socioeconomic conditions in childhood may be a causal variable, one of the consequences of which is the development of ischaemic heart disease. One hypothesis is that ischaemic heart disease develops earlier in those with low socioeconomic state during childhood.

Thus possible explanations of the observed results are that, in the cohorts of men studied, risk factors for ischaemic heart disease developed earlier in those with low socioeconomic state in childhood or that clinical and subclinical disease presented earlier, or both. Barker *et al* found that systolic blood pressure in 10 year olds was inversely related to birth weight, suggesting that hypertension and its complication may have developed earlier in subjects from the lower socioeconomic strata, which have higher rates of low birth weight.[21] The Kuopio ischaemic heart disease study is examining the prevalence and progression of carotid atherosclerosis as a function of, among other things, socioeconomic conditions in childhood, and it will consider earlier development and faster progression of disease in subjects with low socioeconomic state during childhood.

This work was supported by the Finnish Academy and the Sigrid Juselius Foundation.

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(Accepted 24 August 1990)

Famine in southern Ethiopia 1985-6: population structure, nutritional state, and incidence of death among children

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Abstract

***Objective*—To assess the effects of drought on mortality in children.**

***Design*—Prospective epidemiological study forming part of nutritional monitoring during famine relief work.**

***Setting*—24 Food distribution sites in Arero and Borana provinces in southern Ethiopia.**

***Patients*—A monthly average of 14 173 and 5334 children under 5 were examined in 1985 and 1986, respectively. Altogether 148 966 child months (105 872 for 1985 and 43 094 for 1986) were available for analysis.**

***Intervention*—The families of all children were supplied with food each month. Basic medical care was also provided.**

***Main outcome measure*—Mortality in children under 5.**

***Results*—A 40% increase in crude mortality was observed among children living in traditional and stable societies. The severe consequences were observed mainly among children living in relief shelters, where a threefold to fourfold increase in crude mortality was recorded among children. Increased childhood mortality was also associated with high prevalence of malnutrition, living in the most arid areas, and the dry season. A long period of food aid was needed to normalise the nutritional state, especially for children living in relief shelters.**

***Conclusions*—The most severe consequences of the widespread famine that occurred in the Arero and Borana provinces of southern Ethiopia during 1985-6 were seen among children living in relief shelters. Early food intervention may decrease the scale of migration and thus also reduce the severe consequences of a famine.**

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Br Med J 1990;**301**:1123-7

Introduction

Several studies have assessed human mortality in relation to drought and famine in Africa. In the 1970s a threefold increase in crude mortality among nomads affected by drought was reported from Mauritania,[1] and similar figures have been published from northern Ethiopia.[2] During the Ogaden famine of 1973-4 pastoralist Somalis experienced higher mortality than agriculturalist ethnic groups.[3] Very high death rates have been reported from famine relief shelters in Somalia, Ethiopia, and the Sudan.[4-6] Because the population in relief shelters represents people who moved from their homes they may form a biased selection of the community affected by drought.[7]

Infectious diseases represent the main cause of sickness and death at the time of famines,[5 6 8] but during more normal years confounding variables seem to influence the association between malnutrition and infection.[9 10] These variables include season,[11] family structure,[12] population movement,[13] and living conditions.[14] The conflicting results of studies in children with regard to the relation between anthropometric measurements and risk of infection and death[15-18] may reflect the influence of such environmental variables.[5]

During 1984-6 southern Ethiopia was affected by severe drought and famine. The present study was part of the nutritional monitoring established during relief work in the drought affected Arero and Borana provinces. Its main objective was to assess the effects of drought on crude childhood mortality, and it also sought information on the relation between death rate and social structure, nutritional state, and some environmental characteristics.

Patients and methods

STUDY AREA AND POPULATIONS

The seminomadic Boran pastoralists depend on cattle herding and live in the Arero and Borana provinces in southern Ethiopia (fig 1), areas that receive little and unevenly distributed rain. Pasture and water are related to the local rainfall pattern.[19] The main rainy season lasts from mid-March to May and the small rains are in October. Least rain falls in the east and the lowlands. The Boran have suffered numerous droughts and expect intermittent disasters and livestock loss; a complicated generation system regulates their daily life.[20 21] In the past decades traditional modes of managing during periods of drought may have been weakened, so that people more often move to urban centres at times of food shortages.[22] Out of an estimated population of 250 000,[21 23] about 25 000 of the Boran (10%) moved to relief shelters during the 1984-5 drought (unpublished data).

The study population consisted of children aged 1-5 years. Most of the children in this study belonged to the Boran ethnic group, but a few were of the Arsi, Somali, Gebra, or Gerri ethnic groups. On average 14 173 children a month were examined in 1985 and 5334 in 1986. Altogether 148 966 child months (105 872 for 1985 and 43 094 for 1986) were available for analysis from the 24 food distribution sites.

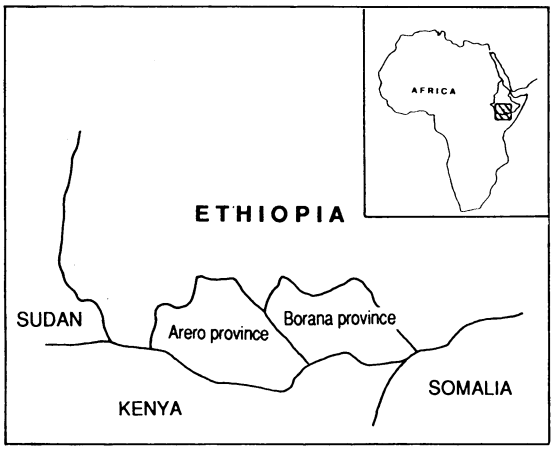

FIG 1—*Map of southern Ethiopia showing Arero and Borana provinces*

NUTRITIONAL RELIEF WORKS

The choice of locations for food distribution was based on initial nutritional surveys of the communities affected by drought.[24] Families with malnourished children or families who were defined as poor by the local community were included in the food distribution programme, and all families in the relief shelters were registered as beneficiaries. Each family was given a monthly ration of grain, dried skimmed milk, and vegetable oil to provide an estimated 6688 kJ (1600 kcal) per person per day. Additional rations were given to the malnourished children. Basic medical care as well as vaccinations against measles were provided at each distribution site. In addition, each child was given a capsule of vitamin A (200 000 IU) every three months.

Standardised procedures were used to measure weight and height. Weight was recorded monthly from March 1985 to December 1986, and height was measured every second month. Anthropometric standards issued by the National Center for Health Statistics, Washington, DC, were used to calculate the weight for height ratio.[25] Wasting was defined as weight for height less than 80% of the reference median.[26]

TABLE I—*Incidence of death and prevalence of wasting among children aged 1-5 years in Arero and Borana provinces, Ethiopia*

	Arero province		Borana province	
	1985	1986	1985	1986
Deaths/100 child months:				
Pastoralists	0·55	0·42	0·81	1·16
Shelter population	2·38	0·52	2·17	No data
Agropastoralists	0·39	0·24	No data	No data
Mean monthly prevalence of malnutrition:				
Pastoralists	4·1	3·3	13·0	3·1
Shelter population	13·7	5·7	20·4	No data
Agropastoralists	3·7	5·3		

STAFF

Ten teams, each with five members, distributed the food and collected the data. The team members had completed 10-12 years of formal education and were familiar with the culture and language of the famine victims. In preparation for the work the team members received three weeks of training with emphasis on basic nutrition, food distribution practices, and data collection procedures. Nurses supervised the teams, regularly checking the recording procedures and measuring tools.

DATA COLLECTION AND ANALYSIS

Data collection was standardised and included information on weight, height, and number of deaths of registered children during the preceding 30 days. The social environment of the children was recorded either as traditional pastoralist, shelter population (mainly Boran pastoralists who moved to urban centres), or agropastoralist (practising both subsistence farming and cattle husbandry). Mortality was recorded as number of deaths per 100 child months; wasting was recorded as the monthly prevalence (in percentages). The monthly statistics from each distribution site formed the basis of this paper.

The influence of drought on the population was estimated by comparing the 1985 and 1986 malnutrition and death rates; 1986 represented the post-

drought period with normalisation of nutritional state (table II, fig 2). Measurements of nutritional state and recordings of deaths were made regularly, following the same children during the whole period of observation, but the duration of the study varied from place to place (table II).

Data analysis and statistical evaluation were by the SPSS PC+ package.[27] The data were weighted for mean number of children at the distribution site, and means were compared with the *t* test and proportions by the χ^2 test or Fisher's exact test. The relative risk with 95% confidence intervals and differences in regression line characteristics were analysed as recommended by Armitage.[28] p Values <0·05 were considered significant. The data set was complete for all variables except the variable mortality; the monthly mortality is missing in 21% of the children under surveillance, but these children did not differ from the average in regard to any of the other variables.

Results

MAGNITUDE OF FAMINE

Table I shows the average mortality and prevalence of wasting for the different population groups in 1985 and 1986. For the whole study population the death rate among children was twice as high in 1985 as 1986 (1·08% *v* 0·48%). The relative risk of death in 1985 was significantly increased both for the pastoralist and the shelter population in the Arero province, but no such increase was seen among the pastoralists in Borana province (table III). The relative risk for death was significantly higher among the children living in shelters than among children of the traditional pastoralist and agropastoralist groups (table III).

Figure 2 shows the mean monthly prevalence of malnutrition and mortality among the traditional pastoralist, shelter, and agropastoralist groups. The nutritional recovery rate in the traditional pastoralist group was faster than in the shelter population. Children in shelters showed by far the highest prevalence of wasting, especially during 1985. Similarly, the monthly mortality among those in the shelters remained higher than for the traditional pastoralist and agropastoralist groups, particularly during the first six months of nutritional intervention.

RELATION OF MORTALITY TO MALNUTRITION

Communities where children showed high prevalence of wasting also had high mortality, but the regression lines of mortality on wasting differed for the shelter population and traditional pastoralist and agropastoralist communities (fig 3). This difference was significant both about the slope (t=5·28; p<0·001) and at the intercept on the y axis (t=96·33; p<0·001).

TABLE II—*Monthly incidence of death and prevalence of wasting at 24 food distribution sites in southern Ethiopia*

	Population structure	Mean monthly No of children	No of months of consecutive observations	Mean death rate (per 100 child months)	Mean prevalence of wasting (%)
Arero province:					
Jijiddu	Shelter	565	22	1·70	15·73
Dillo	Shelter	588	19	0·97	5·45
Hidi Ale	Agropastoralists	895	20	0·30	4·72
Ade galchat	Pastoralists	803	20	0·70	3·14
Birnadar	Pastoralists	506	7	0·18	3·56
Dara	Pastoralists	1098	10	0·50	3·41
Bube	Pastoralists	501	3	0·00	2·46
Matagafarsa	Pastoralists	1212	13	0·58	4·74
Web	Pastoralists	585	7	0·30	5·35
Borbor	Pastoralists	498	1	Not registered	1·81
Dololo Makal	Shelter	1491	9	2·84	12·34
Erder	Pastoralists	419	7	0·42	3·51
Dubluk	Pastoralists	557	8	0·52	3·47
Dikitcha	Pastoralists	662	8	0·35	4·76
Tuka	Agropastoralists	570	8	0·22	3·50
Argenne	Agropastoralists	463	7	0·51	3·80
Mudi Ambo	Pastoralists	212	7	0·42	4·57
Dambi	Pastoralists	470	6	0·55	4·04
Mado	Pastoralists	414	6	0·64	4·02
Borana province:					
Hidedo	Shelter	778	9	2·18	20·40
Hudet	Pastoralists	346	8	0·70	15·71
Wachille	Pastoralists	266	17	1·18	6·70
Melka Guba	Pastoralists	248	19	1·02	7·00
Hadessa	Pastoralists	146	19	0·84	5·35

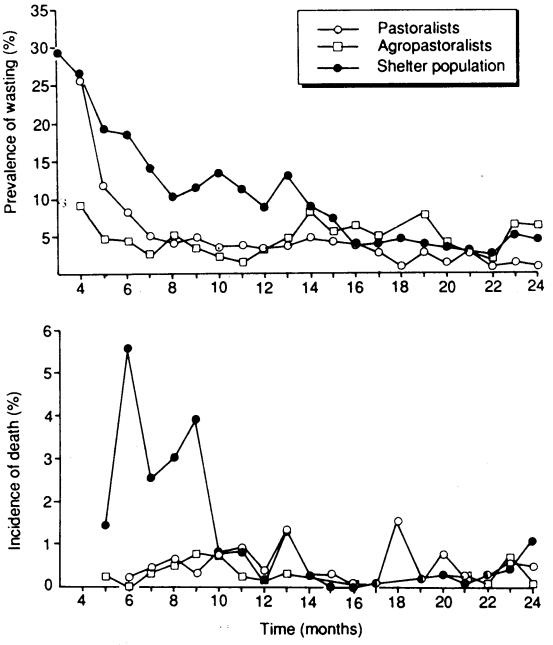

FIG 2—*Mean monthly wasting rate (top) and death rate (bottom) for pastoralists, agropastoralists, and shelter population in southern Ethiopia*

RELATION OF MORTALITY, ALTITUDE AND SEASON

In general, in 1985 and 1986 the risk of death among children was higher in the eastern and more arid Borana province than in the Arero province (tables II, III). Children living in highland shelters had a greater risk of death during 1985. Table IV shows that the risk of death was increased during dry seasons except for the traditional pastoralist and agropastoralist societies in 1985, when it was increased during the rainy season.

TABLE III—*Factors associated with risk for death among children aged 1-5 years*

	Relative risk	95% Confidence interval	p Value
Year (1985 *v* 1986)	2·26	1·89 to 2·70	<0·0001
Population structure (Shelter *v* traditional groups)	3·84	3·42 to 4·32	<0·0001
1985	4·37	3·85 to 4·96	<0·0001
1986	1·14	0·76 to 1·70	>0·05
Geographical location (region):			
1985, Borana *v* Arero	1·44	1·21 to 1·71	<0·0001
1986, Borana *v* Arero	2·91	1·99 to 4·25	<0·0001
Borana, 1985 *v* 1986	1·26	0·86 to 1·84	>0·05
Arero, 1985 *v* 1986	2·55	2·08 to 3·12	<0·0001

Discussion

This study confirms earlier reports of widespread famine in the Arero and Borana provinces of southern Ethiopia during 1985-6.[24,29] Although children living in traditional and stable societies were affected by the drought, the severe consequences were noticed primarily among those living in relief shelters, where we observed a threefold to fourfold increase in mortality in children compared with that in traditional pastoralist and agropastoralist groups. Even the pastoralist population of Arero had a 40% increase of deaths in children during 1985 compared with 1986.

The mortality in 1985 in the shelter populations in Arero and Borana was comparable to that reported from relief shelters in the Sudan.[5] The present study may thus be representative of the recent severe famines

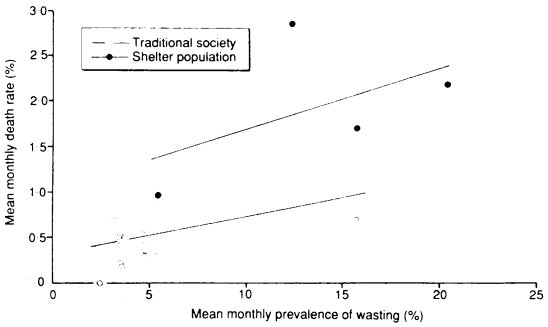

FIG 3—*Relation between mortality and prevalence of wasting in shelter population (+) and traditional societies (□) in southern Ethiopia*

TABLE IV—*Influence of year, season, and altitude in Arero province on risk of death among children aged 1-5 years*

Population structure and variables	Relative risk	95% Confidence interval	p Value
Pastoralist and agropastoralist populations			
1985 *v* 1986	1·40	1·07 to 1·82	<0·05
Season:			
1985, Wet *v* dry season	1·86	1·46 to 2·37	<0·0001
1986, Wet *v* dry season	0·26	0·13 to 0·54	<0·0001
Altitude:			
1985, Lowland *v* highland	0·92	0·72 to 1·18	>0·05
1986, Lowland *v* highland	0·77	0·41 to 1·43	>0·05
Shelter population			
1985 *v* 1986	4·53	3·26 to 6·28	<0·0001
Season:			
1985, Wet *v* dry season	0·25	0·19 to 0·33	<0·0001
1986, Wet *v* dry season	0·30	0·10 to 0·93	<0·05
Altitude:			
1985, Lowland *v* highland	0·52	0·40 to 0·70	<0·0001
1986, Lowland *v* highland	1·13	0·54 to 2·36	>0·05

that have occurred in Africa. The figures for mortality and nutritional state obtained in 1986 compare with those for African countries without acute food shortages.[17 30-32] Thus 1986 may be considered representative of a normal year in southern Ethiopia.

Rates of malnutrition and death remained high for several months in the shelter population. Experience from refugee shelters in Somalia and the Sudan shows that long periods of food aid were needed to normalise nutritional state.[4 5] Some studies from the Sudan showed that shelter conditions temporarily worsened the nutritional situation.[5] Likely explanations for the comparatively high incidence of death in this study include crowding, limited supply of drinking water, and poor sanitation facilities. These factors promote the spread of infectious diseases such as respiratory tract infections, measles, and diarrhoeal diseases. Diarrhoea and measles may in turn cause the nutritional state to deteriorate,[33 34] and malnourished children often experience infections.[9]

The association between malnutrition and mortality may, as my study indicates, be influenced by the social structure of the population. Furthermore, environmental factors such as geographical area and season seem to affect the incidence of death. Hence the association between malnutrition and risk of death is likely to be influenced by confounding variables, even during periods of famine. This may partially explain previous contradictory reports on the relation of anthropometric results to the risk of dying.[15-18]

My study indicates that children of families who move to emergency shelters from their homes during periods of drought are at an increased risk of death. This may be due to factors prevailing before, during, or after migration. Migration may occur mainly among families with sick children. The reasons why people migrate during famines are complex, but food shortage in itself is the main reason. In the Sudan, as de Waal reported, the threat of destitution rather than the risk of death influences people's response during a food emergency.[35] Migration increases the risk of disease,[36] and the nutritional state of children in famine relief shelters often deteriorates early in their stay.[5] Thus, adequate food supplied early in a famine may reduce the scale of migration. If large scale migrations could be prevented the problem of rehabilitation of relief shelter populations may also be eased. These observations may have practical implications for future famine relief operations.

A study such as this has several limitations. Some deaths may have been missed, so that our figures may have been estimates of minimum death rates. In such a culturally homogenous population this bias is probably the same in all samples examined. It may be argued that the samples representing pastoralists are not totally representative of pastoralist communities because the sampling methods were not random. The pastoralist communities were, however, initially screened for moderately and severely malnourished children to select those most affected. These samples thus represent a possible bias towards overrepresentation of malnourished children among the pastoralists, and this would amplify the differences observed between stable pastoralist and agropastoralist societies and the shelter population, in which coverage was complete.

Our knowledge of drought prone populations in Africa is limited. We need more baseline information on food supply, nutritional state, and disease patterns. Specifically, more studies are needed of health and nutrition in relation to the changes now occurring in social and production systems of populations affected by drought.

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(Accepted 7 September 1990)

Long term survival after intensive care

S Ridley, R Jackson, J Findlay, P Wallace

Abstract

***Objective*—To examine the long term survival of critically ill patients admitted to an intensive therapy unit and to ascertain the effects of age, severity of illness, and diagnostic category at admission on survival.**

***Design*—Retrospective observational study with prospectively gathered data on all patients admitted to the unit between June 1985 and July 1987 and followed up until 1 January 1989.**

***Setting*—Regional intensive therapy unit.**

***Patients*—513 Critically ill adult patients, 16 of whom were excluded because measurements on severity of illness scoring were not available.**

***Main outcome measures*—Age, severity of illness (determined with the acute physiology and chronic health evaluation (APACHE) II score), and diagnostic category on admission; deaths in the unit; and long term survival after discharge. Details of the survivors were sent to the Registrar General for Scotland, who issued copies of death certificates for the patients who had died between discharge and 1 January 1989.**

***Results*—Of 497 patients, 119 (24%) died in the intensive therapy unit and 120 (24%) after discharge, leaving 258 (52%) who were still alive at two years. The median (APACHE II) score was 13 and about half of the patients were aged 55 years or more. A wide range of critical illnesses, except neurosurgical emergencies, were treated. Survival analysis showed that only 41 (34%) of 122 patients with an APACHE II score of ≥ 20 were alive at one year (95% confidence interval 25 to 42) compared with 124 (80%) of 155 patients with a score of <10 (73 to 87). Of the 144 patients aged 65 or more, only 68 (47%) survived to one year (39 to 55) but 90 (83%) of the 109 patients aged between 18 and 34 survived a similar period (76 to 71). Mortality was also related to diagnostic category; 71% of trauma victims survived to one year compared with only 41% of those admitted with gastrointestinal pathology. Univariate analysis of the results showed that age, severity of illness, and diagnosis were all predictors of long term survival. Multivariate analysis, however, showed that only age and severity of illness were independent prognostic factors.**

***Conclusions*—Long term survival of patients treated in an intensive therapy unit is related to severity of illness and to age. The outcome from critical illness in the elderly population is poor.**

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Br Med J 1990;**301**:1127-30

Introduction

Nunn *et al*[1] and Searle[2] described studies of the long term survival of patients who had been ventilated after intensive therapy. There has, however, been no recent study examining the long term survival of all patients discharged from a typical British intensive therapy unit. If guidelines for admission to such units are to be developed as recently proposed by the King's Fund Institute[3] then accurate data about the long term survival and the factors influencing such survival are needed. The aims of this study were, firstly, to study the survival of a large cohort of patients admitted to an intensive therapy unit and, secondly, to test the effects of age, diagnostic category, and severity of illness on survival.

Patients and methods

All patients admitted to our intensive therapy unit between June 1985 and July 1987 were included in the study. The severity of illness of each patient on admission was assessed with the acute physiology and chronic health evaluation II (APACHE II) scoring system (appendix).[4] The patient's age, the diagnosis necessitating admission, and the outcome of intensive treatment were recorded.

Details of patients discharged from the intensive therapy unit, including date of birth and national health number, were reported to the central register for the NHS (office of the Registrar General for Scotland). The registrar issued copies of the death certificates of those patients who had died between the date of their discharge and 1 January 1989. Thus, depending on the date of admission, patients were followed up for between 18 and 42 months after discharge.

Statistical analysis—The effects of age, severity of illness, and diagnostic group at admission on long term outcome were initially examined in a univariate analysis to give Kaplan-Meier survival curves and by log rank tests. This was followed by a multivariate analysis based on the Cox proportional hazards model. A stepwise backwards elimination method was used, and the models were fitted using the biomedical data program statistical package.[5]

Results

During the two year study period 513 adult patients were admitted to the intensive therapy unit. Sixteen patients were excluded from the study because the required measurements for APACHE II scoring were unavailable. The registrar could not trace 12 of the patients because they had either left Scotland or were living elsewhere in the United Kingdom at the time of their critical illness; these patients were assumed to be still alive.

Of the remaining 497 patients, 119 (24%) died in the unit and 120 (24%) died after discharge, leaving 258 (52%) alive at 1 January 1989. Table I shows the age distribution of the patients, severity of illness, and diagnostic categories. About half of the patients admitted were aged 55 years or more. The median APACHE II score for the whole group was 13 and the