

**THE SOCIOECONOMIC IMPACT OF HIV/AIDS
IN MONZE DISTRICT, ZAMBIA**

Susan Dwight Foster

Department of Public Health and Policy
London School of Hygiene and Tropical Medicine

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ABSTRACT

Zambia has one of the highest HIV seroprevalence rates in the world, estimated in 1995 at 17%. Rural Monze district in the Southern province, the site of the study, has high rates of HIV, estimated at 10-12% in 1991. During the study, the district was affected not only by AIDS but also by the 1991-92 drought and by a bovine epidemic of East Coast Fever. This study documents the impact of HIV and AIDS on the health services and on the district economy, and draws some long term implications for the national economy.

At the district hospital, approximately 44% of inpatients and 30% of outpatients were HIV seropositive as were 18% of rural health centre patients. Tuberculosis, other respiratory infections, and diarrhoea accounted for the majority of days in hospital. The HIV epidemic was found to be affecting the hospital staff as well, with mortality at Monze and neighbouring Choma hospitals rising from 2 per 1,000 nurse years in 1980 to 27 in 1991 – a 13-fold increase. Measures to increase supply, reduce losses, and make better use of existing staff are proposed.

The household survey found that while patients were better off overall than the district population, there was no appreciable difference in wealth between patients with HIV infection and those without. HIV-positive patients were younger than HIV-negative patients, and had fewer children. The loss of a member with HIV would cause a rise in the average household's dependency ratio of 16-17%. Production was affected by HIV disease, with an average of 94 days' loss of labour (patients plus carers) in the final year of life.

Implications for policy include the need to decentralize care of patients with HIV disease to health centres, and to protect and make better use of the health human resources. The impact of HIV/AIDS on rural production, with approximately 1 in 3 district households having a member with AIDS, combined with external factors such as removal of subsidies, changes in marketing processes under structural adjustment, and long term drought, makes it increasingly difficult to eke out a living from farming. Combined with the lure of apparent employment opportunities in urban areas created by deaths due to AIDS, these factors may contribute to increased urbanization, making it difficult for Zambia to replace declining copper revenues with increased yields from agricultural production.

PREFACE

From the dark harbour soared the first rocket of the firework display organized by the municipality, and the town acclaimed it with a long-drawn sigh of delight....While cataracts of coloured fire fell thicker through the darkness, Dr Rieux resolved to compile this chronicle, so that he should not be one of those who hold their peace but should bear witness in favour of those plague-stricken people; so that some memorial of the injustice and outrage done them might endure; and to state quite simply what we learn in time of pestilence: that there are more things to admire in men than to despise.

--Albert Camus, *The Plague*
(tr. Stuart Gilbert)

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LIST OF ABBREVIATIONS

ADZAM	Study of Adult Disease in Zambia (the local name for the study)
AIDS	Acquired Immune Deficiency Syndrome
ARC	AIDS-related Complex
CHW	Community health worker
CO	Clinical officer
CPI	Consumer Price index
CSA	Census Supervisory Area
CSO	Central Statistical Office
DMO	District Medical Officer
ECF	East Coast Fever (theileriosis)
ECHO	Equipment for Hospitals Overseas
ELISA	Enzyme linked immunoassay
GACPAT	Immunoglobulin G antibody capture particle adherence test
HBC	Home based care
HH	Household
HIV	Human immunodeficiency virus
IDA	International Dispensary Association
K	Kwacha (Zambian currency)
MCH	Maternal and child health
MDH	Monze District Hospital
MMD	Movement for Multiparty Democracy
MOH	Ministry of Health
OPD	Outpatient department
PID	Pelvic inflammatory disease
PTB	Pulmonary tuberculosis
RHC	Rural health centre
RN	Registered Nurse
RTI	Respiratory tract infection
SDA	Seventh Day Adventist
SDAdj	Social Dimensions of Adjustment Survey
SDR	Special Drawing Rights (IMF)
SEA	Supervisory enumeration area
SES	Socioeconomic status
TB	Tuberculosis
UNICEF	United Nations Children's Fund
UNIP	United National Independence Party
WHO	World Health Organization
ZCCM	Zambia Consolidated Copper Mines
ZEM	Zambia Enrolled Midwife
ZEN	Zambia Enrolled Nurse

1. The economic impact of AIDS and HIV disease: a review of the literature

1.1 Introduction

The HIV epidemic and deaths from AIDS are changing many aspects of life in Zambia and elsewhere in heavily affected countries. This raises a number of questions: what is the economic impact on a rural community which is suddenly affected by a devastating epidemic? Who is affected and in what ways? What are the mechanisms through which these changes occur, and what practical measures can be taken to mitigate the negative effects of the epidemic? A study of the impact of AIDS in a rural African community requires an understanding of many different factors which are operating. This chapter will review a number of subjects, each of which has a contribution to make to the overall understanding of the problem. This will include a review of previous work on economic impact of AIDS in a number of countries; the traditional mechanisms for coping with serious illness and death; and some lessons from previous great epidemics in history. The chapter then describes some applications of welfare economics, a discussion of some characteristics of AIDS which make it a less than wholly suitable subject for study using welfare economics, and finally some cautions regarding the applicability of Western economic thought in studying a transitional society.

1.2 The economic impact of HIV/AIDS

There exists a growing literature on the economic and socioeconomic impact of AIDS. Prior to beginning the fieldwork for the study which is the basis for this thesis, a review of the existing literature was carried out (Foster and Lucas, 1991) which illustrates three phases of economists' response to the epidemic. These are first, to project the cost; secondly, once the epidemic becomes apparent, to give guidance for coping with the epidemic, especially with the care of people with HIV; and third, to look forward and try to determine what an economy and society affected by AIDS will look like in the future. The first phase is the attempt to predict the likely impact of the epidemic on the health services and on the economy as a whole through the estimation of direct and indirect costs. Over et al (1989) have made such estimates for Tanzania and Zaire, Mechai Viravaidya et al (1993) for Thailand, Yang (1993) for Korea, and others; and Hellinger (1988, 1990) and Scitovsky and Rice (1987a, 1987b) among others for the United States. In general both the direct health care and the indirect cost estimates are highly speculative; the health care costs are based on early treatment costs which tended to be higher in view of the fact that the first cases were treated in teaching hospitals and much of the expenditures on care, diagnostics in particular, were wasted due to the lack of experience with the

disease and the natural curiosity of medical personnel whose first few encounters with a new disease can result in over-investigation and over-treatment.

Indirect cost estimates are even less reliable since little information is available on what Over has termed the "economic epidemiology" of HIV disease, i.e. the extent to which it will spread from the index cases, what groups in the society will eventually be affected and in what numbers. But in addition to their speculative nature, such estimates may have a negative impact on efforts to mobilize action against HIV; the estimates thus generated are so overwhelming to policy makers that they risk becoming frozen with inertia.¹ Few health ministers expect to last long enough in their positions to have to live with the consequences of inaction today. Peter West (1988) cautions that emphasizing costs may prove counterproductive, and comments that "if we continue to emphasize the cost of AIDS we may put it more strongly under scrutiny from the many people who see themselves at no risk of acquiring the infection."

Once the epidemic has taken off and there is no longer any doubt about its potential for harm, economists begin to look at different questions; they begin to provide useful input to the process of coping with the epidemic. Examples of this are sector-specific studies such as that of Gillespie (1989) which looked at the impact of AIDS on the agriculture sector of Rwanda, and that of Barnett and Blaikie (1990, 1992) in Uganda, and of Barnett et al in Zambia (1993), both of which highlighted the impact of HIV disease on labour-intensive agricultural systems and the likely decrease in cultivation of labour intensive crops and a shift to less demanding crops, even if less remunerative or nutritionally valuable. Barnett and Blaikie (1992) assessed more than half of the 50 farming systems used in Uganda as "vulnerable" or "very vulnerable" to labour loss from AIDS; and they particularly highlighted the problems of dry area farming systems in which there is only one rainy season, seasonal peaks of labour demand, and a limited choice of alternative crops. Pastoral and maize-based systems, such as that of southern Zambia, exhibit all of these characteristics. Gillespie also noted that nuclear families are more vulnerable than extended families, since a single adult death may force a change in family structure; and that due to gender specialization of labour, some farming systems will be affected more by female deaths.(Gillespie, 1989)

¹ The medical adviser to the South African Chamber of Mines, Dr Izak Fourie, pleaded with researchers presenting data on the epidemiology and impact of HIV/AIDS to "catalyse, not paralyse" the response to the epidemic in South Africa.

Other work has focused on specific sectors; Giraud (1993) focused on the transportation sector in Thailand, showing that not only were truck drivers exposed to HIV with already high rates of seropositivity, but also that their loss and consequent difficulties in finding replacements could result in losses to the industry and a general slowdown in the economy through the inability to keep trucks on the road. Many of the costs associated with these losses would be passed on to the customers in the form of higher prices. His conclusion was that workplace-based prevention activities implemented now by the trucking industry could reduce or mitigate this impact. Whiteside (1988, 1990, 1993) has estimated the impact on various industrial and agricultural sectors, particularly in southern Africa, and has developed a manual for planning to take account of the impact of AIDS for Kwa-Zulu Natal in South Africa. (Whiteside et al, 1995)

1.3 Previous work on the economic impact of HIV/AIDS in Zambia

Until recently most of the economic work from Zambia had focused on the copper mining industry, the source of 90% of Zambia's foreign exchange earnings; Nkowane (1988) forecast lower productivity and an increasing burden on the mine health services as well as difficulty for the industry to replace skilled and managerial staff. Buchanan et al (1986) in an early study found that 21% of staff in Zambia Consolidated Copper Mines (ZCCM) offices in Kitwe and 14% of samples from Konkola mine hospital were seropositive; 11% of artisan students were also positive, whereas none of a group of prisoners who were blood donors was seropositive at that point. Green (1988) focuses on the impact on the mines' skilled manpower, reporting that a study in the Zambian Copperbelt found that 68% of the (early) cases of HIV infection were in skilled professionals in the mining industry; this may be due to the fact that most of the employees in that area with entitlement to health care, and indeed most of the health services, were also attached to the mines. Green also notes that only Kenya among the ten East African countries most affected by HIV disease has a relatively abundant skilled labour pool as well as the capacity to train skilled workers quickly. In Malawi, the 'modern' sector represents only 6% of the population, but 19% of new AIDS cases -- and 28% of the nation's income. (Forsythe et al, 1993)

Paying for the care of people with AIDS and HIV disease will have a serious economic impact on both the 'modern' urban and rural sectors, and will further erode the economic base, both by increasing the financial burden and by weakening the economy's ability to produce. In Swaziland, AIDS will have a major impact on a large sugar estate, by

affecting the production process, employee benefits, the medical services, and the overall well-being of the estate.(Gilbertson and Whiteside, 1993) Increasingly multinational companies operating in developing countries have become aware of the need to be aware of and plan for the impact of AIDS on their benefit plans and health services.(Heinzen, 1993) The medical aid societies in Zimbabwe are facing major increases in liability due to AIDS.(Hore, 1993). In Tanzania there is concern that expenditures on care for AIDS may divert resources from preventive programmes, but a study suggests that treatment costs can be minimized by adhering to treatment protocols, and caring for patients at peripheral levels and at home. (World Bank, 1992)

Kambou and colleagues (1992) have used an economic model to predict the impact of AIDS on the economy of Cameroon. Using a variety of assumptions, their model of 11 sectors of the economy shows that certain sectors will be particularly affected by the loss of labour; in particular, the cement/base metals and capital goods sectors decline from the base case are 3.6% and 3.4% respectively; the construction and private services sectors lose 2.9% and 2.3% respectively. Food crops and cash crops, by contrast, are projected to decline much less, by 0.11% and 0.7%. They simulated the impact of labour loss of three categories of worker: rural, urban-unskilled, and urban-skilled, and by far the most damaging to the economy was the projected loss of urban-skilled workers. Their assumption is that the supply of skilled workers will decline annually by 10,000, or 6% of the urban-skilled workforce; the 1% annual growth in skilled workers is insufficient to counter the losses. This assumption may, however, be unduly pessimistic.¹ Labour shortages will cause a projected rise in wages of 0.46% for rural, 23% for urban-unskilled, and 8.7% for urban-skilled workers. As a consequence the growth rate of savings and investment fall sharply leading to a decline in GDP growth rate from a base case of 4.3% to 2.4%. The competitiveness of the economy in world markets declines as the rate of exports declines and current accounts problems are exacerbated. Kambou et al. point out that this is taking place in a context of governments attempting to implement structural adjustment programmes, which require cutting public sector deficits, raising domestic savings, and

¹ This rate of 6% seems implausibly high; even at a projected rate of 10% of all HIV seropositives progressing to AIDS each year, this would mean that 60% of the workforce is seropositive, which is quite a high figure in groups other than commercial sex workers, and compares with rates of seroprevalence among patients at sexually transmitted disease treatment centres of around 50%.

improving the efficiency of public sector enterprises. But if the country must devote a large percentage of its budget to prevention and treatment of AIDS, if personal incomes fall due to mortality among working adults, and if the loss of skilled workers is great, these reforms will be very difficult if not impossible to achieve. (Kambou et al, 1992) Cuddington (1993) modeled the impact of HIV/AIDS on Tanzania. He projects that the GDP might decline by as much as 15-25% by 2010, and that per capita income might drop by as much as 10% by 2010.

Trotter (1993) draws out the significance of the distribution of AIDS cases for the potential loss of investment in human capital. Using South African data he produces calculations which take account of both investment in education and of industry's cost of replacing, recruiting and training new workers to replace people who die of AIDS. If the epidemic is skewed towards the unskilled and uneducated workers, the estimated overall cost would be R5 billion. If on the other hand, it is skewed towards skilled and educated managers, the cost would be on the order of R110 billion -- 20 times greater. If it is evenly spread amongst the economically active population, the cost would be R43 billion.

1.4 The impact of HIV/AIDS on the health services

In 1992 developing countries spent an estimated \$340 million on care of AIDS patients, which was nearly twice as much as was spent on prevention in developing countries. (World Bank, 1993) At present the biggest burden of care is being felt in Africa, where health services are having great trouble coping with the case load, but the future burden of AIDS, and of AIDS care in the future, is likely to be even greater in Asia, India and Thailand in particular. Public expenditure on health was always very low in many African countries, and expenditures on drugs rarely top \$5 per capita per year. Many African countries are highly dependent on donors for drugs and other health care supplies, and are thus subject to externally determined priorities.

The growing number of cases, especially in Africa, has meant that in some hospitals as much as 40-50% of adult hospital bed-days are being used for the care of patients with HIV disease; in countries which spend 60-70% of their budget on tertiary and hospital care, this can easily translate into a third of the health expenditure being spent on the care of patients with HIV disease and AIDS. (Foster, 1990; Hassig et al, 1990) The inevitable corollary of the high rates of HIV seroprevalence among hospital patients is "crowding out" of other patients. (N'Galy et al, 1990) A study in Nairobi comparing admissions in 1988-9

with those in 1992 found that HIV seroprevalence had doubled in 3 years to 39%, with 20% fewer seronegative patients being admitted in 1992. More seronegative patients died, with mortality rising from 15% to 23%.(Gilks et al, 1993) The annual direct medical cost of care per case around the world ranged from about 60-80% of per capita gross national product (GNP) in several countries to as much as nine times the per capita GNP; in four African countries for which data were available the range of costs for public care was about 1-2 times per capita GNP.(Cameron, 1992) In Asia, given the concentration of HIV infections among lower income groups, most of the burden will fall on the patients and their families, and will increase the inequality and contribute to further impoverishment of the poor.(Bloom and Glied, 1993)

Discussions of patient care often tend to focus on the needs of terminally ill patients, but as DeCock and colleagues have pointed out, there are in fact at least three categories of patients with HIV disease with very different needs, namely asymptomatic patients whose HIV status has been learned early and who can benefit from prophylaxis; patients with early HIV disease, whose needs are for treatment of opportunistic infections, especially tuberculosis, and who might benefit from prophylaxis; and patients with end-stage disease for whom outcome may be poor despite treatment.(DeCock et al, 1993) For every terminally ill AIDS patient in hospital, there are probably 10 or 20 HIV-infected people living in the community, struggling to stay well enough to continue working and possibly to conceal their illness from friends, colleagues, and even family. Focusing the majority of care of patients with advanced HIV infection means that many opportunities for useful and cost-effective interventions especially at early stages will be missed.(Gilks et al, 1990; Gilks 1993)

There has been great enthusiasm for home-based care for AIDS patients but there are a number of problems remaining to be solved. One is the very limited coverage of home-based care; in many developing countries only patients living in catchment areas of mission hospitals have the chance to be included in such programmes. Another is that priority is not always given to the patients most in need of help, whether because they do not have an appropriate carer, the family is very poor, there is no water, the health centre is very distant, or the patient is very sick. In some cases, not enough thought has gone into what the patients actually need; most of the significant expenditure is going to vehicles, allowances, and staff salaries, but little on drugs, food, nursing aids, and related items that are of direct benefit to the patients. These aspects need to be given more attention if home-

based care is to be considered a serious alternative to other forms of care, and not just 'home neglect.' The impact of providing care on the family can be devastating, as discussed below.

The impact of HIV/AIDS on health staff who are looking after patients with HIV disease may manifest itself in two ways. First, there is a problem of "burnout" among health workers. The stress of caring for terminally ill young patients, the social stigma (which sometimes affects staff as well as patients), the risk of accidental exposure, and the lack of resources for treatment, all make caring for people with HIV more difficult than is the case for many other conditions. (Cameron, 1992) The other problem is that growing numbers of health staff are contracting HIV disease and AIDS. While a major study of occupational exposure carried out in Zaire showed no evidence of association of HIV seropositivity with patient contact (Mann et al, 1986; Ngaly et al, 1988) nurses in some parts of Africa are observing high levels of HIV-related morbidity and mortality among their colleagues and understandably concluding that the problem is occupationally related. Data from two hospitals in Zambia's Southern Province indicate that mortality among female nurses has increased from 2 per 1,000 nurse years in 1980-85 to 26.7 per 1,000 nurse years in 1989-91. (Buvé et al, 1994) The issue of whether these nurses were infected at work or through personal exposure is of interest, but cannot be settled with the existing data. What is important, however, is to note that the health services' ability to cope with the growing caseload is seriously impaired by the loss of so many nurses and other health staff. Baggaley et al (1994, 1995) found a similar trend among employees of 33 enterprises, where mortality had increased from 0.25 per 100 person-years in 1987 to 1.8 in 1993 – a sevenfold increase. Clearly a priority area for research is to determine to what extent the high rates observed in nursing and other health staff are attributable to personal as opposed to occupational exposure, but attempts to carry out such research have met with methodological and practical difficulties.

1.5 Coping with serious illness

The literature on household strategies for coping with illness is not very extensive, and draws from that on coping with famine and drought, since many of the same strategies may be employed. In a classic work on famine and poverty by Amartya Sen (1981) entitled *Poverty and famines: an essay on entitlement and deprivation*, Sen identifies the reason for most famines as the loss of value of people's labour or assets (cattle, cash, crops etc.) which thereby prevents them from being able to purchase the food which may be available on the

market. They have lost their *entitlement* to purchase food. When the prices of food rise due to a shortage or a famine, typically many people are trying to sell their assets or their labour so the prices fall, and they cannot buy enough food to prevent starvation. This is essentially what has happened with the drought and epidemic of a tick-borne cattle disease which caused the death of many cattle in Monze district in 1992 (described below in chapter 3). Fortunately, the incoming government took steps to organize a relatively effective drought relief effort, and starvation was avoided in the district in 1992.

Sen's concept of the loss of entitlement would seem to fit well with the loss of entitlement through the loss of the ability to work due to illness. Robert Chambers, in an introduction to a series of papers on coping strategies notes:

"the main asset of most poor people is their bodies...at a sudden blow, the body, the poor person's greatest and uninsured asset, is devalued or ruined. From being an asset, at one stroke it becomes a liability that has to be fed, clothed, housed, and treated. A livelihood is destroyed, and a household made permanently poorer." (Chambers, 1989)

A different concept of assets is developed by Jeremy Swift (1989), who has expanded on Sen's work by producing a useful classification of those "tangible and intangible stores of value or claims to assistance which can be mobilised in a crisis." He divides these assets into three types, as follows:

i) Investments:

- human investments including investments in education and health;
- individual productive assets (including animals, farming equipment, houses and domestic equipment, land, trees, wells;
- collective assets, soil conservation or irrigation works, access to common property resources.

ii) Stores:

- food stores, granaries, etc.;
- stores of value such as gold, jewellery, etc.;
- money or bank accounts.

iii) Claims:

- claims on other households within the community, for production resources, food, labour, or animals;
- claims on patrons, big men, chiefs or other communities for help in need;
- claims on the government;
- claims on the international community.(Swift, 1989)

These assets can be called upon in times of need and the sequence in which they are used can be significant in determining how severe the crisis is, and what point has been reached. While Swift was referring mainly to coping with famine, this schema is useful in examining the coping strategies used by households in coping with AIDS. Swift has categorized animals as "investments" but they might as well be categorized as "stores" since many cattle owners do not use their cattle productively but rather as a sort of inflation-proof bank account. Unlike Chambers, Swift refers to the human body as something in which investment in health and education has been made, but not as an asset in itself.

The literature on impact of illness and coping strategy includes a paper by Timothy Evans (1989) on the impact of onchocerciasis in West Africa, in which he describes the gradual decline of affected households, in particular the change in dependency ratios. He characterizes the household as made up of consumption units and active units; as people lose their sight and become progressively more blind, they move from being a productive unit to being a consumption unit, thus changing the balance of the household; the end result is the destitution of the household. The process is as follows:

- increasing dependency ratios
- decreasing health and nutritional status
- decreasing labour input and decreasing ability to participate in traditional labour exchange systems;
- decreasing area under cultivation and decreasing ability of household food production to feed household members;
- increasing duration and severity of food shortage;
- decreasing ability to undertake food shortage coping strategies;
- increasing expenditure of scarce household resources on health problems;
- decreasing household viability;

- increasing stress and disunity, and reliance on village welfare system and extended family.

Although the paper is somewhat hypothetical, as it is not based on data collected in the field but rather on a model incorporating epidemiological data to generate a "typical" household, it describes a typology and a process which is useful in analyzing the impact of AIDS on a household.

Pryer (1989) has described the process of families adjusting to illness of the main income earner through seven case studies in Bangladesh. Unlike Evans, she found that dependency ratios in chronically incapacitated households actually became lower as women and children entered the labour force. Only one of the seven breadwinners was in the formal sector and he was injured at work so received 50% of his normal wage plus medical care costs. The others had to rely on other coping strategies; these included taking out loans, receiving support from the neighbours, decreasing their consumption of food, collecting wild food, begging and scavenging; and sending women and children out to work. Nutritional status deteriorated in all the households, with three (of seven) households having all members malnourished. These households had disposed of most or all of their assets, thus making it more likely that the impoverishment would be transmitted to the next generation.

Chambers (1983) describes the "poverty ratchets" model whereby sickness drives already poor households into abject poverty from which they cannot recover; this occurs through the sale or other disposal of assets, which makes people poor and vulnerable to becoming still poorer. Corbett (1989) reviews the evidence for the "poverty ratchet" model and finds that one common strategy is to not seek treatment where this would impoverish the household, whether the barrier to seeking care is the time costs or the user fees which may be in effect. There is some evidence that as communities gain more experience with the incurable nature of AIDS, this strategy is increasingly used, as discussed below.

1.6 Coping with HIV disease and AIDS at household level

The literature on AIDS-specific coping problems in the developing country setting is growing rapidly. Initially much of it consisted of case studies or personal accounts, which were useful in indicating areas for further research or documentation. Certain characteristics of AIDS and HIV disease which make the coping process more difficult than for other

diseases; these include the long period of decline, with periods of relatively good health interspersed with bouts of serious illness. Secondly many of the symptoms are particularly difficult or distressing for families to cope with, such as frequent diarrhoea and dementia. Third, the disease still carries a degree of stigma even where it is common; patients and family members find it difficult to talk about their problems and sometimes feel reluctant to ask for help when needed. Finally, due to the fact that most HIV is sexually transmitted it is common to find both spouses ill at the same time, with the burden of care falling on the children or on another relative. Many cases of HIV are detected in a couple when a newborn baby fails to thrive or dies of an AIDS related illness. Concern over the future of their children is often the worst problem such the couple has to face.

There are three phases in the cycle of illness and death from AIDS, which include the illness itself, the period immediately following the death, and the longer term aftermath. Coping with the illness itself imposes a number of constraints on the carers; a Kenyan researcher, Elizabeth Ngugi, describes how a family took leave from their work to look after a young man with AIDS; the mother took 90 days off work and other relatives spent an average of 10 hours a day with him. Special food and drink and other supplies had to be bought for him. In addition, the family had invested in his schooling which was never completed.(Ngugi,1990) Noerine Kaleeba, who founded TASO (The AIDS Support Organisation) in Uganda following the death of her husband from AIDS, described the contrast between the compassionate care he received in England (he was a student in Hull when AIDS was first diagnosed) with the stigma and uncaring attitude of the health staff in Uganda, where one nurse commented, "imagine such a fuss being made about someone who is already nearly dead, a skeleton with AIDS".(Kaleeba, 1991) Her children were traumatized by seeing him in a great deal of pain during the last week of his life. The main longer term issue was that the house her husband had built for the family was inherited by his brother according to the traditional inheritance laws, and although they were not forced to leave the house, this left the family with an uncertain future.

A study of 50 AIDS patients and their family members' ability to cope with AIDS was carried out in Lusaka by Annette Nkowane, who found that there were many social and psychological pressures on relatives to provide care even when the economic means were not available; "the apparent willingness to take care of the relative does not suggest the capacity to cope."(Nkowane, 1990) Diarrhoea was particularly difficult for relatives as most

of the patients lived in houses with no running water or toilets; so relatives with a patient with persistent diarrhoea were reluctant to have the patient discharged. Nkowane observed that nurses provide only limited care, with relatives providing most of the nursing care even while patients are in the hospital. Overall, 70% of the relatives preferred the patient to remain in the hospital.(Nkowane, 1990) She cautions that many factors must be considered when strategies to promote home care for AIDS are promoted.

The burden of care, especially terminal care, is increasingly falling on families and households, and the trend is likely to intensify as hospitals are less able to cope with the numbers of new cases. But while families are in general *willing* to care, their *ability* to provide an acceptable level of care is under great strain, and the longer term socioeconomic impact may be quite devastating. In Abidjan, the degree of stigma surrounding AIDS patients and the resulting willingness to care for them was found to be linked to socioeconomic status, with 26% of patients from the lowest socioeconomic group reporting having been rejected, blamed, or isolated by their families, versus none of the highest socioeconomic group; support decreased with the passing of time. (Ingegno et al, 1993) Even in high prevalence areas, AIDS patients must contend with a high degree of discrimination and stigma, both from strangers and from within their own families. Much of the blame for this can be laid at health education messages which target risk groups and risky behaviours, leading the population as a whole to assume that all AIDS patients are either members of risk groups or practicing risky behaviours.

While focus group discussions in rural Rakai district of Uganda seemed to indicate that there was a low degree of stigma associated with AIDS and discussants exhibited a high degree of compassion (Konde Lule et al, 1993) unfortunately this is at odds with the experiences described by AIDS patients in Kampala, who feared stigma and ostracism to the point that eight of 20 patients in one study had told no one in their household of their diagnosis, fearing that the family would send them away and in the words of one patient, stop 'paying out money for a patient without any hope of permanent recovery'.(McGrath et al, 1993) The stigma was linked to physical appearance and as symptoms develop patients begin to withdraw from social contacts. A worrying finding from Uganda is that patients perceive that the health services are actually trying to kill them.(Seeley et al, 1993) Some felt that patients are given 'some tablets in the health units which just shorten their lives or which kill them off prematurely...'(Ingegno et al, 1993)

In rural Uganda, a study of the extended family's ability to care found it was a 'safety net with holes'; for 27 of the 30 patients in the study there was evidence of limited care. Reasons given included lack of food in the home, lack of money for medications, competing demands on carers' time, belief that the illness was caused by witchcraft and that Western medicine was therefore harmful, and stigma and blaming. Neglect was cited as a contributing cause to the death of three of the eight patients for whom medical reports were available; but in virtually all cases the extended families did provide assistance for the funeral, as is the custom. (Seeley et al, 1993)

Davachi and colleagues (1998) described the economic impact of providing care and of the funerals for 33 children who died of AIDS in Kinshasa. The average cost of treatment was \$90, three times the average monthly income; the funeral costs were \$320, or the equivalent of 11 months salary.

The longer term consequences of the burden of care on households should not be underestimated. In many cases the pattern of employment will change; the AIDS patients themselves often have to stop working, and someone has to take on their care. In Abidjan, of those patients who declared a change in their pattern of work, 3% were dismissed, 22% had to stop working, and 22% had to switch to lighter duties.(Ingegno et al, 1993) The carers often have to change their pattern of work; Ankrah (1993) notes that "pressure will be applied for the woman as the prime care giver in the family to withdrawn from paid employment, if the job conflicts with that role...older children are taken out of school, not only to reduce pressure on the family budget, but also to help with care of the sick member of the household." School performance of children who have to care for an ill parent usually suffers.(Ankrah, 1993) In the longer term, the ability of the household to withstand external shocks is undermined by loss of labour, especially in rural areas; the recent drought in Southern Africa hit AIDS-affected households especially hard and their ability to recover is much less than that of unaffected households.(Foster, 1993b)

1.7 Coping processes at community level

Several studies of the coping process within an African community have been completed or are underway. The first was carried out with ODA funding in Uganda by Tony Barnett and Piers Blaikie; their report to ODA was entitled "Community coping mechanisms in the face of exceptional demographic change."(Barnett and Blaikie, 1990) The second is an ongoing study funded by the World Bank in Tanzania.(World Bank, 1989) The

study involves multiple rounds of visits to households.(Ainsworth and Over, 1992) A third set of studies has been carried out in Chiawa, Kafue District, in Zambia. (Bond et al, 1993)

Barnett and Blaikie (1992) have made an extensive catalogue of the coping mechanisms they encountered in the Rakai district of Uganda, one of the most heavily affected areas in the world. Among the mechanisms used during the illness phase are the diversion of productive labour time of still healthy family members to caring for the sick, and the diversion of cash to medical expenses, palliative care and in a search for cure. Immediately following the death there is diversion of food reserves to funeral feasts and cash for a coffin and other funeral expenses; and in the longer term children are taken out of school to reduce cash expenditure and increase available labour time. In households which take on additional orphan children, there may be a change in patterns of consumption and production by households receiving orphans; and in the longer term there may be amalgamation, or splitting of the household. This may involve the joining of additional dependent members (young orphans), or of additional productive members (older orphans). Work distribution is often altered within the household, particularly affecting women; and there is often a change in level of life/welfare of household members. This may be reflected in a poorer diet (restricted range of food, less preparation time) or poorer housing (less time for repairs; loss of housing tied to the employment of the deceased, etc.). Access to education, particularly of girls, may be reduced as a consequence of the labour reallocation.

As regards the impact of AIDS on the farm, the strategies commonly employed include less time being spent on farming, hiring of labour, cultivating a smaller area, switching to less labour-intensive crops with either more or less of a cash crop being grown, and adopting intercropping. Barnett and Blaikie studied the 50 farming systems in use in Uganda, and assessed their vulnerability to AIDS. Farming systems which were most vulnerable were those in an energy or protein deficiency situation; farm systems which had a labour deficit in any month in an *average* household (not only an AIDS-affected household); and/or those in which the maximum labour available in the average household is within 20% of peak seasonal labour demand. Farming systems where there are crops which can be substituted which require a lower level of maximum labour input, and which provide sufficient energy and protein within existing labour demands provide some protection against the impact of AIDS; whereas systems which due to rainfall or soil characteristics do not have this possibility are much more vulnerable. Barnett and Blaikie assess the farming

systems of drier parts of Africa to the south, including Zambia, as particularly vulnerable to AIDS.

1.8 Lessons from earlier epidemics

The HIV epidemic will soon be the best documented of the great epidemics of history, but the experiences of earlier epidemics can provide useful insights into the social and socioeconomic impact of very great levels of morbidity and mortality. AIDS is different from plague or typhus in important respects, notably the very long incubation period and long illness phase. It is much less contagious than either plague or typhus and, unlike many of the epidemics of earlier times, its methods of spread are well known to even illiterate rural people (although possession of this knowledge has not done a great deal to slow the spread of the disease). However it is useful to draw from history with regard to two themes in particular: the breakdown of law and order, and in particular of the rules governing the exchange relationships following a large number of deaths, and the impact on labour availability, wage levels and agriculture.

Thucydides wrote the first description of a major epidemic in Athens in the fifth century BC, which he describes as "plague" although Zinsser (1963) suspects the disease was actually typhus. He describes the lawlessness which prevailed, when men "saw how sudden was the change of fortune in the case both of those who were prosperous and suddenly died, and of those who before had nothing but, in a moment were in possession of the property of others." (quoted in Zinsser, 1963) Saint Cyprian wrote of the changes in agricultural practice and trend towards urbanization following the Plague in Rome in 256 AD:

"Men crowded into the larger cities; only the nearest fields were cultivated; the more distant ones became overgrown, and were used as hunting preserves; farm land had no value, because the population had so diminished that enough grain to feed them could be grown on the limited cultivated areas." (Haeser, cited in Zinsser, 1963)

Perhaps best researched historical epidemic and the one whose economic and demographic aftermath is of most interest is the Black Death which ravaged Europe in the fourteenth century. Approximately one-third of the population died within a few years, producing profound changes in the economic and social life. But Philip Ziegler, a respected historian of the Black Death makes the point that the economic impact was somewhat mitigated by the fact that prior to the epidemic England was "grossly over-populated... not...that the population was greater than the land could support...but merely that the

working population had expanded far beyond the work available. In the economic conditions of the fourteenth century this led to chronic under-employment rather than unemployment." (Ziegler, 1969) The deaths caused by the Black Death led to a rise in wages, which more or less doubled, and this rise was particularly problematic for landlords who depended on paid labour for farming. Prices of agricultural products and animals fell due to lack of demand caused by the death of so many consumers, while manufactured products rose in price due to the scarcity of artisans; unlike the agricultural workers there was no pool of skilled labour to replace them. (Ziegler, 1969) These effects were not long-lasting, however, and agricultural prices had regained their former levels about two years later, while prices of manufactured goods dropped back a bit but remained well above the pre-plague levels. Perhaps the most lasting impact was the greatly increased mobility of labour. Labourers could command not only higher wages but better working conditions, and Ziegler cites the example of a Lincolnshire ploughman who refused to work unless he was given fresh meat rather than salted meat. (Ziegler, 1969) This trend was checked, however, by the legislation which was designed to fix wages and prices at pre-plague levels, and to restrict movement of labour; Ziegler contends that "as prices and incomes policies go, the fourteenth-century freeze was remarkably successful." Prices and wages fell back, not to pre-plague levels but to levels well below the maximum levels which prevailed just following the Black Death. The impact on agriculture was to produce larger holdings, when the lands of the deceased were distributed among the survivors, and there was a decrease in the land under cultivation and a retreat from the more marginal lands. Contrary to the common belief that there was a shift from labour-intensive crops to sheep farming, Ziegler points out that there was no increase in the production of wool, and in fact there was a decline in the demand for wool; "the great swing to sheep...was checked rather than advanced by the Black Death." (Ziegler, 1969)

The impact of a later plague epidemic in a small town in Italy in 1630 was described by an economic historian, Carlo Cipolla. (1973) He describes the situation in the small town of Prato, where the plague hit the poorer groups disproportionately; he also notes that "the gravediggers and attendants at the pest-house died like flies." The gravediggers were the first to go on strike, and their wage was then raised by 42%; when three of the gravediggers died, the remaining one refused to continue his work at the existing salary level and the authorities were forced to raise the salary by 87%. They were thus able to recruit three new

gravediggers. The plague caused a financial crisis for the town of Prato, which experienced a 10% reduction in revenues from duties and tithes; and in addition to the ordinary expenses there had been large expenditures for public health, primarily for extra security, for subsidies to people confined in their homes, and wages for public health workers including "*recognitiones*", extra payments for services rendered under the difficult and dangerous conditions prevailing during the epidemic. Overall, the economy was severely affected by the halt in trade and the failure to sow or reap crops; this fall in productivity occurred at the same time as the many extra expenditures on public health and on care; the city's financial situation in the years following the epidemic was "dominated by one leitmotiv--paying off the debts which it incurred during the epidemics." (Cipolla, 1973)

1.9 Welfare economics and HIV/AIDS in Africa

The theoretical economic framework which underpins this study is that of welfare economics. (A more detailed discussion of welfare economics is presented in Annex 1; this section will highlight points of particular relevance to the design of the study). Winch has defined welfare economics as "the study of the well-being of the members of a society as a group, in so far as it is affected by the decisions and actions of its members and agencies concerning economic variables." (Winch, 1971) This describes an essentially orderly process, a controlled change resulting from *decisions* and from *actions*, and in fact the body of welfare economics is mostly concerned with optimality and with marginal changes. Its focus has been the incidence of a new tax, the implications of a price change, the results of a policy or a project--all of which have a limited and/or measurable impact. It has been concerned for the most part with events that are controllable or predictable. Furthermore, the assumed direction of change is towards the improvement of society, and the methodologies have been developed to measure the degree and the incidence of that improvement. There appear to be few applications of economics to an uncontrolled phenomenon like an epidemic, where there is no decision per se to make, and where actions (mainly as regards sexual behaviour) may or may not have consequences years in the future. Few epidemics have presented the opportunity which AIDS presents to the economist to study and measure the phenomenon as it unfolds.

Although welfare economics (and its applications) provides a useful economic framework for the study of the study of the AIDS epidemic, it is not a perfect fit. A kind of "reverse" welfare economics is needed, where the principles are applied to the study of

disutility and the social "dis-welfare" function in order to measure the impact of a catastrophe rather than an improvement. Several characteristics of the AIDS epidemic which differ from most problems to which welfare economics has been applied include:

- 1) The non-marginal nature of the impact of HIV/AIDS: AIDS is expected to cause non-marginal changes in society, i.e. large numbers of deaths, orphans, major changes in land use, societal organization, urbanization, and labour relations. In high seroprevalence areas it affects as many as 1 in 3 households.
- 2) The time scale is long, and intergenerational effects are more important than in many projects. HIV/AIDS produces winners as well as losers in the short term, but the overall economy is likely to contract over the longer term so in the longer term all may lose.
- 3) HIV/AIDS is unpredictable to a large degree and there are many unknowns, possibly more than would be the case in a planned project.
- 4) The effects of HIV disease are neither controllable nor reversible (as would be an unpopular tax, for example); economic decisions are generally not possible, and it is not possible to move back from the present to a point before the epidemic began, however much one would wish to do so. Furthermore, the winners cannot compensate the losers, although many would willingly do so if they could.

Yet not all change associated with the AIDS epidemic will result in loss to all members of society; some clear winners are already emerging. Coffin-makers are becoming wealthy. A person who remains seronegative will have a much better chance at a good job since competition for existing places will diminish; but he may be less well prepared for the job, or otherwise he would have risen to the top even in the absence of AIDS. So while an individual's welfare may increase as a result of the epidemic, society may be less well off since less competent people may be taking on more responsible positions. Similarly, the brother of a man who dies of AIDS may suddenly find himself in possession of a luxurious house, or a car. The objectives of the society as a whole are not fulfilled, yet the private objectives of some of its members are fulfilled beyond their wildest dreams.

1.10 The application of welfare economics

Pure welfare economics provides a framework for thought and debate, and the basis for applications, of which two of the most common are the analysis of wealth and income distribution, and of the benefits and costs of a programme or project. The problem comes in bridging the gap between the theoretical construct and the real-world problem, and in

particular, how to make use of economic or survey data. Much of the work in this area has been under the auspices of the World Bank, where in the 1970s under the presidency of Robert MacNamara poverty became a central concern of the Bank. The research arm of the Bank became concerned that project appraisal methods tended to emphasize growth "often to the detriment, if not the virtual exclusion, of the equity objective....the equity objective could then be served by a program of taxes or subsidies that would bring about the desired redistribution of that maximum increment in national income." Squire and van der Tak, 1975) The focus on poverty in the 1970s brought the realization within the Bank that growth could, and often did increase inequality, and that some carefully prepared Bank projects even had the unintended effect of *increasing* poverty.

As a result, a number of economists both inside and outside the Bank were working to improve the appraisal of investment projects and in particular to ensure that World Bank projects were contributing to poverty alleviation.

1.10.1 *The measurement of welfare*

At about the same time, in the early 1980s the World Bank became involved in the Living Standards Measurement Survey (LSMS), some further analytical work was carried out under the auspices of the World Bank by Angus Deaton (1980) to try to bridge the gap between theoretical welfare economics and the needs of the LSMS, which were ultimately to make interpersonal comparisons of welfare. Welfare economics provides a theoretical framework but the traditional reticence of welfare economists to measure and compare welfare between individuals leaves the problem of making the link between the concepts of welfare and utility, to wealth and income, using data which can be gathered in a field survey, through observation, or through a case study approach. Deaton, faced with the need to use data to compare welfare of individuals, attempted to bridge the gap between the theory and the practice:

"The economic approach to welfare works with such concepts as preferences, utility and social welfare functions, and many economists take the view that, in these terms, even individual welfare measurement is arbitrary while welfare comparisons across individuals or combinations of welfare measures are completely unjustified. Not only does this view deprive economics of a major field of research, but it also deprives the statistical approach of both precision and methodological coherence." (Deaton, 1980, p.1)

In this model, the consumption of goods is the basis for economic welfare. Deaton therefore proposes that a solution to the measurement problem may be to take "a standard

or reference bundle of commodities" to measure welfare. He points out that if the bundle varies strongly with income or taste, this may not be applicable, but "some such methodology is frequently relevant in measuring welfare for individuals close to poverty." (Deaton, 1980, p.2) He then traces the concept of preference ordering which can yield a utility function, which can then be plotted on a graph; "the problem of choosing a welfare index can be seen as one of attaching meaningful numbers to indifference surfaces." (Deaton, 1980, p. 4) He raises the difficulty of preferences, which are "typically revealed by behaviour subject to constraints"; and which are thus revealed by the operation of the market. It is therefore "often preferable to start from a market-based measure of welfare and to modify it as necessary for consumption which is not bought..." (Deaton, 1980, p. 11) Consumers behave by maximizing their welfare, and the sum of these functions yields the indirect utility function, which is the maximal attainable utility subject to the price constraint. In order to make this indirect utility function useful, the concept of the cost function is introduced, which is the minimum cost of reaching that level of utility at prevailing prices.

The notion of intertemporal welfare, which is often neglected by welfare economics is considered by Deaton. He observes that consumers may not plan their intertemporal choice as expected where there are constraints on borrowing. He is perceptive about the problems of poor people:

"Poor consumers ...often cannot borrow so that if, for example, higher incomes are anticipated later, the optimal consumption plan may require borrowing and thus cannot be realized...borrowing constraints reduce welfare... They also enforce a connection between current income and current consumption (in the extreme case, consumption equals current income)...For such consumers (and the young and poor are likely to be particularly affected), current income, appropriately deflated, is a good measure of current welfare, as, of course, is current consumption. In this case, however, current consumption does not reflect the wider life-cycle welfare as it does when there are no liquidity constraints....many poor consumers are not constrained in this way since their future expectations are no different from their current experience. For such consumers, current income, current consumption, and life-time consumption are all too closely related." (Deaton, 1980, p. 29-30)

He thus concludes that the best measure is "deflated current consumption". He goes on to make suggestions for the treatment of specific groups of goods, such as durables, labour, and leisure; and offers a detailed treatment of the consumer as producer. Comparison of welfare across households can be done using money metric utility, by labeling their standard of living

by the money needed to reach it at some reference price. Once these basic assumptions have been made, and accepted, it is possible to construct a social welfare function, which is an aggregate or index of the utilities of each household.

1.11 Dissenting views: applying Western economic thought to a transitional economy

Economics, as every basic text explains, is the study of scarcity of resources and of the choices made by society regarding the use of those resources. Early Western economists began with the observation that the early industrial society in which they lived was characterized by scarcity of resources, and that economic life had mainly to do with choices regarding the use of land, labour, and capital made either explicitly by governments or other agents, or implicitly by markets which reflect people's behaviour and preferences. These economists cannot have known much of the conditions of life and the economic behaviour in rural Africa (or other non-Western societies); their sources of information would have been explorers or slave traders who were recounting fantastic tales of primitive peoples who subsisted on insects and roots, and who did not spend much time examining the economic life of these "primitive" people. Indeed it is only recently that much light has been shed on the subject of the economic life of primitive societies; and some of that work appears to call into question the basic premises both of scarcity and of choice.

A rural African community exhibits patterns of economic life which do not find ready explanations in Western economic thinking. Many economic possibilities seem to be left unexploited; people could be richer, yet some choose not to make the effort required while others are clearly on the verge of starvation. They do not behave according to the model of "economic man." This leads to the possibility that Western economic thinking may be as much the product of Western society as the inevitable result of human nature *per se*. Tawney (1973) points out that "economic laws...indicate the manner in which, given certain historical conditions, and a certain form of social organization, and certain juristic institutions, production tends to be conducted and wealth to be distributed." (Tawney, 1973) It could be argued that a traditional society like that of southern Zambia shares very little in terms of its history, social organization, or legal system with Western Europe. Marshall Sahlins, writing about the economics of "primitive" societies from the anthropological viewpoint, makes the point more forcefully; "economics flourishes as ideology at home and ethnocentrism abroad....it draws great strength from its profound compatibility with bourgeois society." (Sahlins, 1972, p. xiv) He takes this line of thought further:

"The market-industrial system institutes scarcity...insufficiency of material means becomes the explicit, calculable starting point of all economic activity...Worse, in this consumer game of free choice, every acquisition is simultaneously a deprivation, for every purchase of something is a foregoing of something else, in general only marginally less desirable....That sentence of 'life at hard labour' was passed uniquely upon us. Scarcity is the judgement decreed by our economy--so also the axiom of our Economics: the application of scarce means against alternative ends to derive the most satisfaction possible under the circumstances. And it is precisely from this anxious vantage that we look back upon hunters....Having equipped the hunter with bourgeois impulses and Paleolithic tools, we judge his situation hopeless in advance." (Sahlins, 1972, p.4)

He claims that the hunter "is 'uneconomic man'....he is the reverse of that standard caricature immortalized in any *General Principles of Economics*, page one. His wants are scarce and his means (in relation) plentiful."(Sahlins, 1972, p. 13) Sahlins points out the need for caution when assuming the applicability of even the basic premises of economics, namely those of scarcity and choice, to a non-Western economy.

The reality of modern Africa, Zambia in particular, is more complex than the "primitive" society described by Sahlins; it is rapidly evolving from the traditional society to a modern economic society. Zambia is the most urbanized of sub-Saharan African countries, and more than half of Zambia's population live in urban areas yet most maintain some ties to the rural areas from which they originate. African societies have been undergoing a period of very rapid change with the old customs and traditions breaking down while new "Western" ones have not yet taken root. It is important to realize how recent this change is; the plough was introduced to the most accessible African farmers living in Southern province along the line of rail in the 1920s.(Chipungu, 1988) The use of cash became widespread relatively recently in Gwembe, one of the remote parts of the province. In 1951-52 when a shop was opened selling cloth and other goods, women wanted cash to buy these new goods and realized the economic opportunity offered by commercial beer brewing. The men resisted paying for beer which had previously been given free, but the women persisted and poured it on the ground rather than give it away, and eventually won the right to sell their beer.(Colson and Scudder, 1988) Urbanization has been rapid as well; there was no town larger than 500 in Monze district in 1945 (Colson, 1951) but Monze town's population at the 1990 census was about 30,000. The factor which has driven this change appears to be access to improved agricultural implements, especially the ox-drawn plough; the process of economic differentiation which this unleashed in the district is described in Chapter 3.

Economic life in Southern Province does not appear to be driven by the need to produce ever greater quantities of produce, including food. Sahlins has gathered evidence from other similar societies to show that this is not an isolated phenomenon, and various explanations can be found. In a culture based on reciprocity and exchange, excess production means additional obligations and can be a force of instability. Among the Bemba of northern Zambia, for instance, there are obligations to various relatives and it is not considered possible to refuse to share whatever one has -- food or beer in particular. It is permissible, under certain circumstances to "hide" food at a neighbour's house when a distant relative or a well-known cadger comes to visit.(Richards, 1939 cited in Sahlins, 1972, p. 246) A chief has particularly great responsibilities to share his food, and there is a Bemba proverb that "We will shake the tree until it gives up its fruit", meaning that "we will nag the big man until he divides his supplies...his followers would sit and stare at [the food] and talk about it until he was forced to give them some..."(Richards 1939, cited in Sahlins, 1972, p. 262) The economic tradition is that of "reciprocal sharing of foodstuffs, rather than their accumulation....Plainly, therefore it does not pay a Bemba woman to have very much more grain than her fellows. She would merely have to distribute it..."(Richards, 1939, cited in Sahlins, 1972, p. 274)

A similar tradition of reciprocity and exchange exists among the Tonga of Southern Province. The penalty for infringing these reciprocity arrangements and other social norms can be severe; in many ways it is "a culture of blackmail."(A. O'Connell, personal communication) The penalties can range from exclusion from the community to poisoning in extreme cases. This may be the partial explanation for otherwise unexplained behaviours which can be observed in Monze district today, in particular the failure in a few cases to provide care to seriously ill and dying people. Perhaps the concept of "entitlement" as developed by Sen is relevant; have these sick people somehow lost their entitlement to assistance through earlier infringements of the social code? Many patients tend to move frequently from one household to another, and to make contact with a wide variety of health services. This has been interpreted as "shopping" for a better diagnosis or care, but it could also be that they have "worn out their welcome" in successive relations' households and have been pressured, openly or subtly, to move on. Allen (1993) describes the blaming of women and others as witches, some of whom were tortured to death by their neighbours, which

took place in northern Uganda in part as a response to the AIDS epidemic; his explanation is that they had infringed the social norms and the society punished them for that.

There is another factor contributing to the lack of excess production. During colonial times, a surplus had no outlet since no market for the produce of Africans existed; the colonial administration would only buy maize from white farmers. The administration wanted Africans to sell their labour for mining, not their produce.(Simons, 1979) Furthermore, grain could not be stored indefinitely; when in 1962 there was an abundance of grain (not maize) much of it was converted into beer.(Colson and Scudder, 1988) In general, when the harvest is good everyone has an excess, but when conditions are bad, everyone suffers hunger.

2. Study design and conceptual framework

2.1 Introduction

AIDS has a profound economic impact in areas where HIV prevalence is high. Few studies at the time this study was initiated had documented the mechanisms by which the epidemic will affect the economy, from household level on to national level, and as a result little was known about which interventions might mitigate this impact. The present study was designed to investigate the impact of HIV disease on the households, on the health services, and on the economy of a rural African district with high HIV seroprevalence. This chapter describes the conceptual framework used, the study design, the selection of the site, the sample size, and the methodology and development of the questionnaires used for the study, and the procedures used in collecting the data.

2.2 Conceptual framework

The AIDS epidemic in Africa is having an impact not only on the present production system and economy, primarily through the loss of labour, but also through a diversion of expenditures to medical care. It is causing a loss of investments which have been made in the past, thus affecting the ability of the economy to recover and regenerate itself in the future. Attention is understandably focused on the present problems of coping with the illness and immediate aftermath of death, but the wider implications although more difficult to discern, are probably more damaging to the economy of the country. This thesis will attempt to identify and where possible quantify the economic impact of AIDS in a rural district of Africa. The study aims to answer two principal questions, namely,

- 1) what is the impact of HIV and AIDS on the health services? and
- 2) what is the impact of HIV and AIDS on the household and family, and on the community and the economy of the district?

From the findings it should then be possible to outline policy implications as well as measures to mitigate the impact of AIDS and HIV disease on both the health services and on the affected households.

Under the first question regarding the impact on the health services, several subsidiary issues arise, as follows:

1. The burden of HIV in the district and at its health services, the resulting costs of treating HIV and AIDS, in comparison with the costs of treating other illnesses, the percentage of

resources (including hospitals and health centres) being devoted to HIV disease and AIDS, the cost and resource implications for the hospital and for the health services as a whole.

2. The impact of HIV on the health labour force, and the implications for the ability of the health services to meet the increasing demand for care.

3. Measures to take and alternatives to existing patterns of provision of care (i.e. home-based care, hospice care, specialized wards, etc.), and their potential impact on both the health services and on the affected households.

Under the second question regarding the impact on the household and community economy, several subsidiary issues arise, as follows:

4. The economic position of the patients with HIV disease, in comparison with HIV-negative patients, and with the community as a whole, with regard to demographics, income and wealth, occupation, educational level, etc. and their place within the pattern of distribution of wealth and income in the district.

5. The future impact of loss of a household member, and of the expenditures on funerals, etc., and the number of orphan children which will need to be looked after.

6. The impact of providing care for HIV and AIDS on the family and household, and the mechanisms families are using to cope with the provision of care; the normal occupations and opportunity cost of time of carers, including those involved in food production; and the difficulties experienced by survivors in terms of dispersal and loss of assets and entitlements.

7. The loss of investment in human capital due to illness and death from HIV disease as evidenced by the educational levels patients had attained, the occupations or professions they exercise, and the amount of work experience they had gained.

In order to answer these questions, the study collected data through a number of component studies. These are described below.

Brief description of study components

The study was composed of five main components which are described below.

1. of hospital and rural health centre patients:

Patients and outpatients from Monze Hospital, Choma Hospital, and 3 health centres in the Monze district were recruited to the study. This involved explaining the purpose of the study to them, asking them to consent to be interviewed and to give a sample of blood

for an HIV test. They were then interviewed as to their previous use of health services and socioeconomic and demographic situation; and examined for clinical signs and symptoms of HIV disease.

Data were collected from *hospital inpatients* on

- socioeconomic and demographic characteristics of patients
- prior health services utilization for that episode of illness
- HIV seroprevalence and stage of HIV disease
- reasons for admission, and diagnosis at discharge
- details of treatment received
- follow-up after discharge of a subset of HIV-positive patients and matched HIV-negative controls.

Data were collected from *hospital and health centre outpatients* on

- socioeconomic and demographic characteristics
- health services utilization for that episode of illness
- HIV seroprevalence and stage of HIV disease
- reasons for seeking care, diagnosis, and treatment received

2.3.2 Study of hospital inpatients' helpers:

Many inpatients are accompanied to the hospital by a "helper" who looks after them and often are expected to perform basic nursing tasks. Where possible, these people were identified and interviewed about their socioeconomic and demographic situation and about the costs of accompanying someone to the hospital. A subsample of helpers was interviewed several times on their expenditures throughout the stay in hospital.

Data were collected from inpatients' relatives or friends ("helpers") on

- socioeconomic and demographic characteristics of patients' helpers
- costs incurred related to the illness episode

2.3.3 Study of hospital and health centre costs and impact:

In order to enable costs of patients' care to be calculated, the services of the two hospitals and health centres were costed and unit costs determined. Costs were apportioned to different cost centres of the hospital and unit costs were determined on the basis of actual number of service units performed, where this could be determined. Donated drugs and

supplies were valued at their international market prices. On discharge, details of the care received by study patients were abstracted from their notes onto a form for entry into the computer; the cost per treatment episode was thus calculated. Costing methodology is described in detail in appendixes 4.1 (hospital inpatient and outpatient department), 4.2 (rural health centres), and 4.3 (home-based care).

Data were collected at the hospital and health centres on

- overall capital and recurrent cost, and unit costs of services provided
- cost of treatment episodes
- bed utilization
- HIV-related absenteeism and mortality among female nurses
- HIV seroprevalence among "replacement" blood donors (relatives of patients)
- costs of home-based care.

2.3.4 Follow-up of hospital inpatients at home:

A total of 52 HIV seropositive inpatients and HIV seronegative controls, matched for age, sex, and occupation were visited at their homes approximately 9-12 months following discharge from the hospital. They were interviewed about any changes which had occurred in the household in the intervening months. Families of patients who had died were interviewed about the present situation of the household and about the details of the funeral, etc. and about the present whereabouts of household members.

2.3.5 Community survey:

In order to ascertain whether the patient sample was representative of the district as a whole, and to gather basic background information on the demographic and socioeconomic characteristics of the district's population and on the health-care seeking behaviour of the population (as distinct from patients interviewed at hospital), a community survey of 1740 individuals living in 246 urban and 256 rural households was carried out using two linked questionnaires, one on the demographic and socioeconomic characteristics and health care seeking behaviour of every adult of 15 or over, and the other on the characteristics of the household, including ownership of assets, production, housing, etc. which was addressed to the head of household.

Data were collected from adults (15+) in urban and rural households on

- socioeconomic and demographic characteristics of urban and rural households

- health services utilization of individuals

2.4 Logistics of the study

2.4.1 *The site*

Monze District in Southern Province, Zambia was chosen for the main part of the study following discussions with Ministry of Health, the Churches Medical Association of Zambia (CMAZ) and with the WHO AIDS Coordinator in post at the time. One other site in Eastern Province was visited but rejected due to distance from Lusaka, security difficulties (cross-border raids by RENAMO in Mozambique), and lack of long-term staff interested in participating in the project. Monze District Hospital was visited and after discussions with the medical officer in charge and the district medical officer, it was agreed to carry out the study in Monze District, based at the hospital, and in the rural health centres of the district. The Government had wanted to include a government hospital in the study as well, so the neighbouring Choma General Hospital was subsequently visited and included in the study; the data from Choma Hospital are being analyzed separately.

Monze District is approximately 2 1/2 hours south of the capital Lusaka (Annex 2.1), and the hospital is located along the main road from Lusaka to Zimbabwe and South Africa. The hospital is supported by the Catholic Church, and the Diocesan seat is located in Monze. The hospital is staffed by a combination of expatriate doctors, some of whom are members of religious orders, and by Zambian doctors. The district medical officer is based at the hospital and in addition to clinical duties supervises the other health activities in the district including the operation of the 15 health centres.

The study protocol was reviewed and approved by the Research and Ethics Committee of the Ministry of Health of Zambia.

More information on Monze district is provided in Chapter 3.

2.4.2 *The study staff*

A total of eleven secondary school graduates and two drivers were recruited in March 1991 for the purposes of data collection and computer data entry. On average they were about 20 years old, with approximately equal numbers of men and women. Prior to recruitment they were interviewed and a test was administered to assess their quantitative and cognitive skills. They were all local residents and most were fluent in Tonga. A codebook of study procedures was prepared and a two week training course was provided on how to

administer a questionnaire, on the use of computers for data entry, and on the importance of maintaining confidentiality. A brief introduction to statistics and to data analysis on the computer, such as frequencies and means (using Epi-Info) was also provided. At the end of the training period, the staff carried out a bed census of the hospital (Buvé and Foster, 1995) and entered the data into the computers.

Expatriate staff who have been involved in the study include an epidemiologist (Dr A Buvé), and two computer programmers, M Myatt and I Kleinschmidt.

2.4.3 Data management

One of the staff who showed ability in computer work during the training period was designated "data manager" and given additional training in DOS and in managing (e.g. backing up) the project's data; he received a slightly higher salary. The software used for initial data entry and analysis is Epi-Info version 5.01; additional data analysis was done using SPSS. Costing and graphics were done using Quattro Pro version 4 and Excel and word processing using WordPerfect version 5.1 and Microsoft Word for Windows.

All data (except the bed census) were double entered and then checked by a third person using the validation programme provided within Epi-Info. Discrepancies were then resolved and the data merged into a master file and downloaded onto diskette for safekeeping.

2.4.4 The timetable of study activities

The chronology of the main events in the study was as follows.

Table 2.1. Timetable of study activities

August 1990:	Funds released to LSHTM by ODA
September 1990:	Reconnaissance visit to Zambia and first visit to Monze
February 1991:	Arrival of study team in Monze, setting up (vehicles, office, housing, etc.)
March 1991:	Drafting of questionnaires Preparation of codebook Recruitment and training of study staff Pilot testing of questionnaires Bed census
April 1991:	Recruitment of inpatients at Monze Hospital begins (ongoing until September 1991)
June 1991:	Recruitment of outpatients at Monze Hospital begins
August 1991:	Planning and pilot of community survey; survey begins in rural Monze

November 1991:	<i>Movement for Multiparty Democracy (MMD) wins national elections, President Kaunda steps down in peaceful transition to democracy</i>
December 1991:	Community survey begins in urban Monze
January 1992:	<i>Drought: rains fail and food shortages become serious</i>
March 1992:	Community survey data collection completed
March 1992:	Follow-up of patients in Monze district begins
March 1992:	Recruitment of patients at Choma Hospital begins
May 1992:	Recruitment of patients at Monze District rural health centres begins
September 1992:	Data collection completed, analysis begins

2.4.5 Ethical clearance and permission

Ethical clearance and permission to carry out the study was granted by the Research and Ethics Committee of the Ministry of Health of Zambia, and by the management board of Monze District Hospital. Informed consent and permission to test blood for HIV was sought from all patients participating in the study; they were given an explanation regarding the purpose of the study and confidentiality of medical information and HIV results. Permission to carry out the community survey was also sought from and granted by the six traditional chiefs in Monze District, each of whom was given a bottle of cooking oil as a token of appreciation. Patients and their carers who participated in the study received a bar of toilet soap, and followup patients and their families were given a small bag of dried fish or beans.

2.5 Details of study components

2.5.1 Experience of other large-scale surveys

The study benefited from experience gained in three other large-scale surveys in Zambia. The first was the national census held in 1989 (CSO 1990a, CSO 1994); the Central Statistical Office kindly made available detailed census maps and helped to train the interviewers, and provided copies of the Census Enumerator's Handbook. (CSO 1898b) Two of the staff had been enumerators in the census and thus had direct experience of fieldwork. During the development and piloting of the study in early 1991, two other large surveys were being planned in different parts of Zambia; the first of these was a UNICEF-funded survey of household expenditures in Western Province, which had been carried out in November 1990 (Forsberg, 1992). This study was primarily interested in use of health services and user fees, and involved visits to 630 households, which were questioned on their use of health services as well as general household characteristics, demographics, and cash

income and expenditures. This survey used health staff (primarily clinical officers) as interviewers, and the difficulties of motivating and supervising these staff indicated that the preferable option would be to hire, train, and motivate younger staff. Insufficient time devoted to pretesting and piloting of the Western Province questionnaire also led to a number of the questions which were inapplicable or yielded data of doubtful value; and the time allowed for entering and analyzing the data was felt to be insufficient.

At about the same time, the national Social Dimensions of Adjustment (SDAdj) survey, funded by the World Bank, was in the planning phases; the Central Statistical Office was the main coordinating body. This was a major multi-country initiative, and the Zambian versions of some of the questions were under discussion at the CSO. In order to gain experience of this type of survey, the CSO became involved in the planning and piloting of the Monze survey, and made available two experienced supervisors to help with the fieldwork. A detailed questionnaire was later made available (Grootaert and Marchant, 1991) but it was not ready in time to be used in planning the Monze survey. The SDAdj survey relies primarily on data on expenditures, and although in Monze the intention had been to ask about expenditures on key items (such as school fees), during the pilot phase it became clear that respondents had great difficulty in remembering how much had been spent on such items. In Monze, therefore questions regarding expenditures were limited to very recent and focused expenditures on use of health services, i.e. transport to the hospital, food, hospital fees, etc.

2.5.2 Questionnaire design

The core demographic, education, employment, and socioeconomic parts of the questionnaires used in the patient and helper interviews and in the community survey are the same. In addition, the patient questionnaire contains questions regarding use of health services for the present illness; the helper questionnaire contains questions on the expenditures incurred and opportunity cost of time spent at the hospital. The community survey has additional questions on income (amount received in the past month, source of income, who receives the income, and how long the source of income has been operating); on knowledge and practice regarding self-treatment of malaria; and on knowledge and experience of HIV disease and AIDS. The patient questionnaire was piloted in the hospital on approximately 20 patients, and no major problems were encountered with the questionnaires. The community survey questionnaire contains two parts, the first

("household") is administered to the head of the household and the second ("individual") to each adult 15 or over in the household, including the head of household. It was piloted in one census Supervisory Enumeration Area (SEA) near Monze town, and minor changes were made to the questionnaire following the pilot; those data were excluded from the analysis.

All questionnaires were in English and were translated by the staff. Initially efforts were made to have a Tonga version of the patient and helper questionnaires; the study staff produced a translation and a translator was found to review their work. His main experience, however, was in translation of the Bible, and he found the version produced by the staff to be very "poor"; he preferred a more formal Tonga while the staff preferred a colloquial and conversational type of Tonga, and felt the population would not understand the biblical version or would find it odd. During the pilot phase however, it became clear that although the majority of the district's population is Tonga, about 40% of the interviews were in other languages including English which was preferred by educated people as well as a number of other major Zambian languages.

2.5.3 The patient sample

Patients were recruited at five sites: Monze District Hospital (inpatient wards and outpatient department), Choma General Hospital (inpatient wards and outpatient department), and at Rusangu, Keemba, and Nampeyo Rural Health Centres in Monze District (annex 2.2). At all sites the procedure was essentially the same. For inpatients, every third admission to male, female, and tuberculosis wards was selected using the ward register, which was consulted every morning by the study staff to determine who had been admitted within the previous 24 hours. In the hospital outpatient departments, every tenth adult patient was asked to participate by study staff who were present in the OPD. At health centres every adult patient was asked to participate. The patients were then approached by study staff who explained the purpose of the study, asked whether they would agreed to be interviewed, whether they would agree to give blood for an HIV test, and whether they wished to know the result of their HIV test. Refusal to agree to an HIV test did not constitute a reason for exclusion from the study. The staff returned later to approach patients who were too ill or confused to give consent, in discomfort, or asleep. The patients were then examined by a physician or clinical officer for signs and symptoms of HIV disease to enable them to be staged according to the WHO staging criteria (Annex 2.3; WHO, 1990).

Blood was drawn by hospital staff into a blood tube labeled with a coded number (to preserve confidentiality) which was then delivered to the lab for testing. Sera were first tested in the hospital laboratory using HIVChek 1+2 (DuPont de Nemours, Geneva, Switzerland) followed by Wellcozyme HIV 1+2 (Wellcome Diagnostics, Dartford, UK); they were retested with Wellcozyme at the laboratory of the University Teaching Hospital in Lusaka. Discrepant results were further tested using a Western Blot.

Patients were interviewed by a member of the study staff (interviews lasted approximately 20 minutes) and if a helper could be identified, that person was traced and interviewed by the staff. Both patients and helpers were offered a bar of soap on completion of the interview. On discharge, the patient's notes were placed in a special basket and the details of their care were abstracted onto a computer form by one of the researchers.

During the inpatient recruitment period of 1 April - 9 September 1991, 1349 adults were admitted to male, female, and TB wards. Out of this a sample of 414 subjects was recruited; of whom 315 were randomly recruited. 34 (8%) refused to participate; data were incomplete on another 81 patients (20%). Of the 299 who remain, 273 (66%) could be classified as having HIV disease or not having HIV disease. The remaining 26 (6.2%) could not be classified with regard to HIV disease as either an HIV test result was not available, and/or the clinical examination could not be performed or was incomplete. The same procedure was followed in the outpatient department, with the exception that every tenth patient was recruited due to the high volume of patients; half were asked to take an HIV test. 309 patients were thus recruited. The study team spent at week at each of three rural health centres, and recruited all patients; 241 rural health centre patients were recruited.

2.5.4 The helper sample

As noted above, if a patient reported having a "helper" efforts were made to contact that person, and in all but a few cases the staff managed to interview the helper. A "common house" is provided in town near the market for helpers to stay in and a number of them were found there. A total of 168 helpers were interviewed. In addition, a subsample of helpers whose patients were in hospital for a longer period were interviewed a second and in a few cases a third time regarding their expenditures.

2.5.5 The patient follow-up sample

Many households experience difficulties after the patient is diagnosed as having AIDS and discharged from the hospital. In order to assess the impact of providing care for HIV disease, a follow-up study of 25 cases of HIV disease matched by age, sex, and occupation with HIV-negative comparison patients were visited at their homes approximately 9 months after discharge from hospital. However, this component was largely unsuccessful for several reasons. First, matching the patients proved difficult as some age groups and occupations had virtually no HIV-seronegative patients to provide close matches for the seropositive patients; this was the case with market women and with skilled manual men in particular. In order to make the match, a compromise had to be made on the age, with ages up to 10 years apart. Secondly, many of the patients could not be found 9-12 months later; addresses in the rural area are very approximate and Zambians in general are highly mobile and move frequently. Third, although a questionnaire had been prepared for use, some parts of it proved to be unworkable in many cases, especially where the patient had died; semi-structured interviews proved to be more appropriate and were adopted. This however led to other difficulties as the interviews were carried out by expatriates dependent on interpretation from Tonga and often a long explanation would be given a two or three word translation. The fourth difficulty encountered in the follow-up interviews was that the drought sometimes made it difficult to distinguish which of the problems faced by families were drought-related and which were AIDS-related. The drought and the bovine epidemic of East Coast Fever are discussed more fully below in Chapter 3.

2.5.6 The community survey

The main objectives of the community survey were to determine whether and in what ways the district population differs from the patient population in terms of socioeconomic characteristics and health care seeking behaviour. A stratified sample was taken from both the rural population of Monze district and from Monze town (the only urban area). The sample size was determined on the basis of expected differences between patients and population in terms of ownership of assets (radio, bicycle, etc.), and socioeconomic status (a combination of occupation and education). The sample size required to find the expected differences for the rural population ranged between 205 and 279 depending on which variable was chosen, and for the urban population, the range was between 218 and 292. A two-stage sampling technique was chosen for the rural population.

Census areas (supervisory enumeration areas, or SEAs) as defined by the Central Statistical Office in Lusaka were the primary units; these were the units which an individual census enumerator was expected to cover in one week and contained on average 73 households. 20 rural SEAs were chosen through proportionate-to-size sampling (see map in Annex 2.4). Staff were provided with census maps of each SEA; all households within each SEA were listed and a list of 12 to be interviewed was selected using random numbers. In Monze town all 3,000 households were listed and a random sample of 250 households was chosen. All adults in each household (15+) were interviewed.

In order to motivate the staff and make sure that the listing was done completely and properly, a disability survey was carried out at the request of a local rehabilitation centre. When the household was listed, the staff asked whether anyone in the household had a disability of any kind; if the answer was affirmative a questionnaire was completed. The disability survey found approximately 225 disabled people; those data are being analyzed separately.

The staff was divided into two teams of 4-5, each of which had a vehicle, a driver, and initially a supervisor from the CSO. Staff worked in groups of 2 or 3. During the rural survey, they camped in schools and churches in the rural areas and stayed out for the week, returning to Monze town at the weekend. Monze town was covered on foot.

As noted above, there were two questionnaires in the community survey, one of which concerned the characteristics of the household (size and composition, housing, socioeconomic characteristics) which was asked of the household head, and an individual questionnaire which was completed by each adult in the household. Migration for work is a widespread phenomenon in rural Zambia. Up to three attempts were made to interview each adult. For persons who were not at home after repeated attempts to interview them, demographic and socioeconomic data were collected from a proxy (another household member); no data on illness and health-seeking behaviour were collected from absent individuals. In rural Monze, 31% of adults listed were absent on more than one visit; in the town the percentage was 15%. This was because staff could return to interview them at night; some respondents voluntarily came to the study office to be interviewed. In the rural survey there were significant differences between those who were present and those who were absent; the differences were much less in the urban areas. The importance of this bias is described in Chapter 6.

2.5.7 Steps taken to reduce errors and bias

A number of steps were taken to minimize errors and bias in the collection and manipulation of the data. First, with regard to the design of the questionnaires, a short recall period of one month was used for most variables other than highly significant events such as the death of a household member. The questionnaires were pre-tested and piloted and revised in line with the results of those efforts. The translation posed problems (described above) both due to the level of Tonga to be used and later due to the finding that many respondents preferred to be interviewed in one of several other languages; an English version was chosen and staff translated on the spot. This may have led to differences in interpretation of certain questions, although almost all questions were pre-coded to minimize this effect. Attention was paid to training, briefing, and supervising the young and inexperienced staff. A study codebook was prepared giving details of study procedures, appropriate answers to all questions, etc. A two-week training period was provided, which involved review of study procedures as contained in the study's codebook, training and practice in interviewing, use and care of the computers, data entry, and the importance of confidentiality. During field work both at the hospital and in the field, questionnaires were checked each day by either a CSO supervisor or one of the researchers for discrepancies or missing data and where possible staff were sent back to reinterview the respondent to correct any errors or omissions which were found. Data were entered using a double entry system, whereby by two different staff entered the data and any discrepancies had to be resolved. The entry programme provided validity checks to ensure that data entered were within reasonable ranges; the question on sex of the respondent, for example, would only accept "M" or "F" as answers.

Despite these precautions, two problems remained. One was the largely unsuccessful attempt to follow up patients 9-12 months following discharge, as described above. As a result the data collected were minimal, and those data are used in only a few parts of this thesis to complement or corroborate other sources of data (in particular the discussion of funeral costs in Chapter 8).

The other major source of bias in the study is the absence from rural areas of about 31% of the adults listed as belonging to the household, mostly younger and healthier people who have migrated for studies or for work. The extent of this phenomenon has been analysed and the degree of bias it represents is discussed in Chapter 6.

2.6 Problems encountered in carrying out the study

Two problems encountered by the study are likely to have had an effect on the outcome. The first was the severe drought, which began in the 1990-91 season but became more severe in the 1991-92 season, and in some areas of the district the population was facing starvation. The impact of the drought was exacerbated by an epidemic among the district's cattle of East Coast Fever (ECF) or theileriosis, which reduced the herds of some of the traditional farmers by half or even more. (Foster, 1992a and 1993b) These two events occurred after the main data collection phase had been completed but before the follow-up interviews, and as a result the population as a whole was experiencing upheaval and extreme economic distress; it was difficult in some cases of households affected by AIDS to determine which problems were caused by AIDS and which should be attributed to the drought or to loss of animals. The drought and the epidemic of ECF are described in more detail below in Chapter 3.

The second problem which affected the study was HIV disease itself among the staff of the hospital and the study. An estimated 10-12% of the district's adults, adjusted by age and sex are HIV-positive, and among younger age groups the level is 25% or even higher. During the study on average one hospital staff member died every month, and ADZAM study staff felt obliged to attend funerals, including those of several valued colleagues and friends whose input was crucial to the study; several others have since died. Loss of staff time and low morale due to illness, to the need to look after sick relatives, or to grieving was a problem for the study as for virtually all other employers in the district.

3. Zambia and Monze District

3.1 Introduction

This chapter describes the economy of Zambia with emphasis on agriculture and maize production, the main economic activities in Monze District. It presents relevant physical, demographic, and economic characteristics of Monze district, with an emphasis on recent events affecting agriculture including the 1991-92 drought and the bovine epidemic of East Coast Fever. It will describe the health services of the district. Finally it will present recent epidemiological information on the burden of HIV infection and disease in the country as a whole and in Monze district.

3.2 Zambia's economy

3.2.1 The importance of copper mines

At Independence in 1964, Zambia was one of the richest countries in sub-Saharan Africa, with a per capita income of nearly \$700. The great majority of this income came from the sales of copper, which accounted for up to 95% of foreign exchange earnings; mining accounted for 36% of GDP in 1970.(Jansen, 1988) As a result of the high level of economic activity around the copper mines, Zambia became sub-Saharan Africa's most highly urbanized country, with nearly half of the population living in a 25-mile wide zone along the "line of rail", running from Livingstone in the south through Lusaka to Ndola in the Copperbelt. A map of Zambia showing population density is found in Annex 2.1. The economic boom was brought to an end by the 40% fall in the price for copper which occurred as the global economy adjusted to the oil price shocks in the mid-1970s; real GDP had been growing at a rate of 5.6% from 1965 until 1974, but since then growth has been nil. The fall in the price of copper also meant that Zambia was caught by its past neglect of agriculture; the government had been content to use the copper revenues to import the nation's food. Yet despite prices which were below border prices, marketed production of crops grew at an average of 8% annually between 1965 and 1974.(Jansen, 1988) The nation began to import maize in 1979. But while the economy could no longer afford the subsidized prices to which urban consumers had become accustomed, it was politically impossible for the ruling United National Independence Party (UNIP) led by Kenneth Kaunda to risk the wrath of the urban population by completely removing the subsidies.

Attempts by the government to borrow to make up the shortfall in revenue led to increasing indebtedness, but much of the money borrowed was used unproductively to support an inefficient parastatal sector and to maintain price subsidies. Friction with major lenders, especially the IMF and the World Bank, intensified. The major issues were the level of subsidies to urban consumers and the low producer prices paid to farmers. The government made several attempts to reduce the subsidies; in 1978 the price of sugar was increased by 14% and of wheat products, including bread, by 85%. A final attempt to raise the price of the national staple food, maize meal, met with riots and chaos in 1986, with 15 deaths, and by May 1987 relations with the IMF and the World Bank had broken down, with the two organizations declining to make further loans to Zambia. (Turok, 1989) Following the election of the MMD government headed by Frederick Chiluba in November 1991, the IMF and World Bank have now resumed relations and lending operations with Zambia.

3.2.2 Inflation and devaluation

The Central Statistical Office (CSO) in Lusaka has been keeping and publishing statistics on prices. Two indices are published, for low and high income groups in urban areas, for a basket of 500 goods and services determined on the basis of results of the 1974-5 Household Budget Survey. No statistics are kept for prices in rural areas. The statistics show that largely because of the price controls in operation and subsidies, consumer prices in Zambia remained under relative control, with the 10% annual price rise threshold being breached for the first time in 1976. From 1975 until 1984 the consumer price index (CPI) for urban low income groups rose from 100 (base) in 1975 to 373 in 1984, an annual rate of increase of between 10% and 20%. In 1985, however a period of steep increases began, with prices rising by 37% in 1985 and by 52% in 1986; by 1989 inflation had reached 125%, and 142% in 1990. Largely led by the fuel price increases brought on by the Gulf War, by 1991 inflation had reached 226%, and the CPI for low income groups had hit 11,980. (CSO, 1991) High income groups were better off in terms of maintaining their purchasing power, with a CPI which had reached 10,192. This level of inflation requires people to adopt creative strategies to stay even, and for holding wealth.

One of the major forces driving the rises in the consumer price index was the exchange rate, and the Zambian economy was particularly vulnerable given the high percentage of consumer items which were imported, including food. From 1964 to 1972 the Zambian kwacha was pegged to the US dollar at a fixed rate of K1=\$0.714. A series of changes then ensued, with the kwacha first pegged to the SDR at a rate which implied a 20% devaluation; further

devaluations occurred in 1978 and 1983. In 1983 it was delinked from the SDR and pegged to a new basket of currencies based on the pattern of trade. In 1985 foreign exchange auctions were introduced, which produced further immediate and dramatic declines, from 2.2 to 5.6 to the US dollar, and by the end of 1986 the kwacha had fallen to 10.9.(Jansen, 1988) But the slide continued; by 1991 the rate was K75 to the US dollar; the new MMD government liberalized exchange controls in early 1992 resulting in the virtual disappearance of the parallel market, and by mid-1993 the rate was K500 to the US dollar. As of November 1995 the rate was approximately K1000 to the US dollar, and by April 1996 it had moved to K1235 to the dollar.

3.3 National maize pricing policy

The policy of keeping maize prices low in order to subsidize urban consumers is often ascribed to newly independent African governments, but in fact in the case of Zambia it dates back to the colonial administration. This policy was accentuated in the 1940s when the copper was needed for the war effort and increasing numbers of miners were recruited; the colonial administration was willing to subsidize the production of maize to keep the mines working at full speed and spent £7m from 1943-54 to keep labour costs low.(Fry, 1979) The corollary of paying farmers too little to produce the maize came about later when the Zambian government found itself unable to continue to subsidize the low price to consumers and began to shift the burden to the farmers (both peasant and commercial), who naturally were unwilling to produce maize for a price which did not provide a fair remuneration. In 1978, a maize producer could expect a net return per bag of average quality maize of about 2 kwacha compared with production costs of 2.5 kwacha and a selling price of 4.8 kwacha, or a 41% return.(Marter, 1978) By the mid to late 1980s, however, the net return per bag had dwindled to the point where African farmers were not interested in marketing their production and sold only enough to meet their cash needs for school fees, etc. When in mid-1991 the producer price was increased from K500 to K800 per bag, farmers still complained that their profit was only K17 per bag--a 2% return. Maize meal ("mealie meal") in Malawi is 8 times more expensive than in Zambia, leading to smuggling of Zambian maize to Malawi and other neighbouring countries.(Sanderson, 1991) The policy of "panterritorial pricing" whereby the same price was offered for maize all over the country regardless of the costs of production in that locality was a further disincentive to producers in many parts of the country.(Jansen, 1988) By 1991 the maize subsidy was costing an estimated K9 billion which the government could not pay out of revenues but only by printing more money.(Sanderson, 1991) Furthermore, maize was being imported from elsewhere in the region,

including Zimbabwe at the equivalent of K2000 per bag, paid in foreign exchange, while Zambian farmers were paid only K800.(Mwanza, 1991) In Zaire, a 90 kg bag could earn K1300 on the black market in July 1991 (Anonymous, 1991) compared to the official price of K800.

Several times, in response to pressure from the IMF and World Bank, the UNIP government had tried to remove or reduce the maize subsidy but each attempt was met by riots and chaos. Zambia's high degree of urbanization (about 50%) made this a particularly risky thing to attempt but the funds to pay the farmers a better price could not be mobilized. A stated policy of the MMD government which came to power in November 1991 was to remove the maize subsidy and pay a reasonable producer price. In December 1991 the government announced that subsidies on the more refined "breakfast" meal would be removed by the end of 1992, while a 20% subsidy on roller meal would be retained. In a bid to win farmers' votes, in October the UNIP government raised the producer price from K800 to K1200 per 90 kg bag and in May the MMD government announced a further rise to K3000 but rescinded the increase a week later because of the precipitous price rises instituted by millers who had bought maize at the old price.

In some respects the drought was fortuitous for the new government as there was already such a shortage of maize meal, both real and artificial in both urban and rural areas, with corresponding price rises, that people were happy to find supplies of white maize meal¹ at almost any price. The disruption to the maize production and marketing system and consequent shortages are likely to last beyond 1992 and 1993.

3.4 Epidemiology of HIV and AIDS in Zambia

Zambia is one of the worst affected countries in Africa, with the most recent estimate of 17.1% of adults being HIV seropositive at the end of 1994, according to data from WHO.(WHO, 1996) Other neighbouring countries are similarly affected; WHO data estimate seroprevalence in Botswana at 18%, Zimbabwe 17%, and Malawi 13.6%. Other neighbouring countries with lower seroprevalence include Mozambique (5.7%) and Angola (1%), and Namibia (6.5%). Seroprevalence in South Africa, with which Zambia has increasingly important economic and social ties, was estimated at 12% in 1994 -- approximately 2.5 million people (Epidemiology Unit, South Africa, 1995) and is doubling approximately every 13 months. In Zambia, WHO estimates that in 1994 there were 700,000 seropositive persons. A total of 32,491

¹ Most of the relief maize was yellow meal from the US and South America, and some of it was dirty or mouldy. Zambians' clear preference is for white maize meal.

cases of AIDS had been reported to WHO by June 1995 but this is believed to be an underestimate.

Several studies have tried to estimate the epidemiological impact of HIV in Zambia. Data from the sentinel surveillance sites for 1990 and 1991 were used by a group of World Bank consultants to generate two scenarios using WHO's EPIMODEL programme, one of which was based on an overall estimate of seroprevalence in Zambian adults of 17%, and the other based on a 13% prevalence rate. Projections were made from 1990-95.

Table 3.1. EPI-Model projections of HIV infections and AIDS cases, Zambia, 1990-95.

Year	New HIV Inf (17%)	New AIDS (17%)	Deaths (17%)	New HIV Inf (13%)	New AIDS (13%)	Deaths (13%)
1990	156,180	24,167	20,399	119,432	18,481	15,600
1991	165,733	33,037	28,602	126,737	25,264	21,872
1992	171,545	42,815	37,926	131,182	32,741	29,003
1993	173,888	53,094	47,955	132,973	40,602	36,671
1994	173,152	63,456	58,275	132,410	48,525	44,563
1995	169,793	73,547	68,501	129,842	56,242	52,383

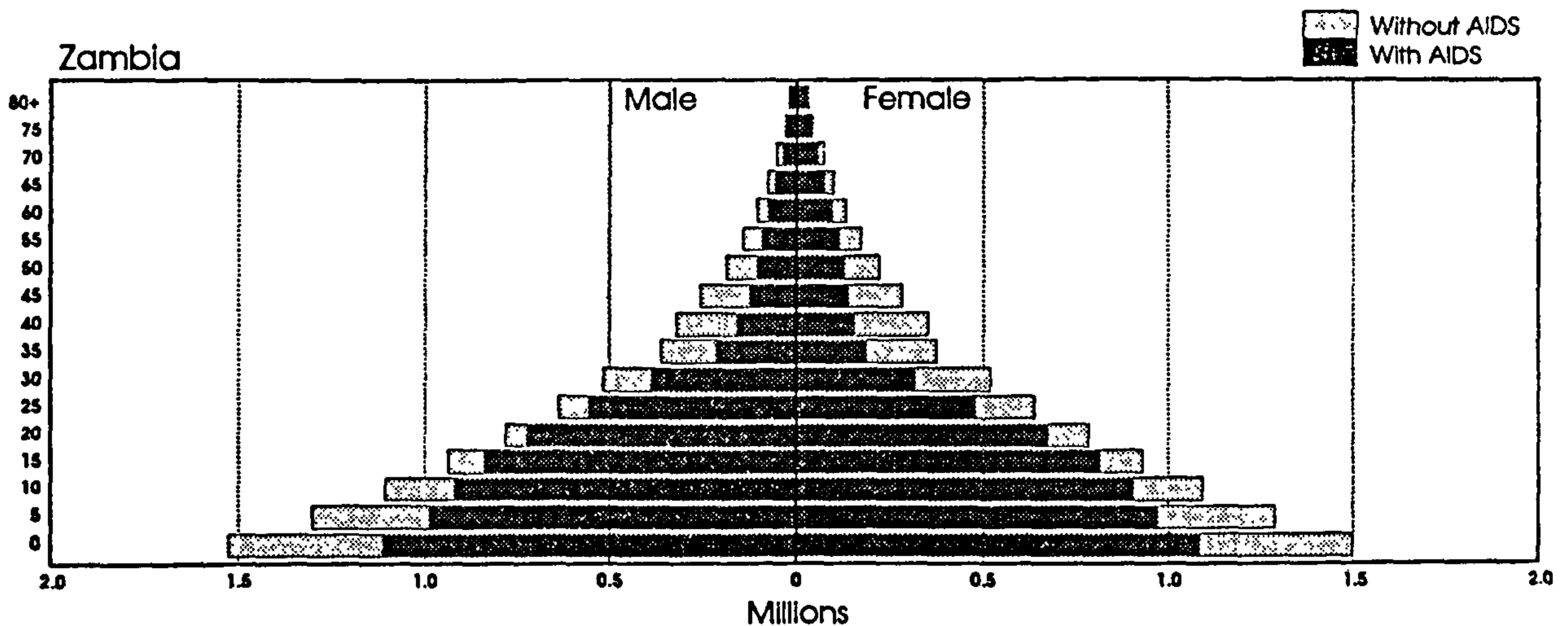
Source: EPIMODEL computer programme, reported in World /Euro Health Group (1993).

These figures indicate that depending on which scenario is chosen, between 56,242 and 73,547 new cases of AIDS would have occurred in Zambia in 1995. Given that the 1994 seroprevalence has subsequently been estimated at 17% it seems that the higher figure is closer to the real situation, and that therefore the 32,491 declared cases represent approximately half of the total.

Regarding the geographical distribution of these cases, data from the sentinel surveillance system in 1991-2 showed that seroprevalence among antenatal attenders in urban areas was high, in 1990 reaching 25% in Lusaka and 30% in Solwezi periurban; in rural Mukinge it was 13%. By 1991 seroprevalence had declined slightly to 28% in Solwezi periurban, and to 7.5% in Mukinge rural; 1991 data from Lusaka were not presented. Projections on the basis of population in each province suggest that the majority of cases would be found in the Copperbelt with 27%-30% of the total, and Lusaka with 21%-23% of the total. Urban areas would appear to have about 48-53% of the cases, so whereas approximately 42% of the population lives in urban areas, the

urban areas will have more than their share of the cases, due to the higher levels of seroprevalence which have been reported there.(Foster, 1993a) (Findings of the study regarding the epidemiology of HIV in Monze District are presented below in Chapter 4.) Figure 3.1 shows the effect HIV/AIDS is expected to have on the population composition.

Figure 3.1. Population pyramid for Zambia taking account of HIV/AIDS, 2010.



Source: US Bureau of the Census, 1994, reported in SAFAIDS News, 1994.

This pyramid, based on projections made by the US Bureau of the Census using the iwgAIDS model, shows that the effect on the population size and composition in Zambia will be particularly severe, with half the potential number of adults aged 35-50 by the year 2010. The narrowing of the base of the pyramid is due to high rates of child mortality. The Bureau of the Census projects that population growth rate is projected to slow from 3.4% per year to 1.4% by 2010, the child mortality rate (aged 0-4) to rise from about 55 to 150 per 1,000 live births, and the crude death rate to more than triple from approximately 6 per 1000 population to over 25. Life expectancy at birth will fall from 66 to about 35. (US Bureau of the Census, 1994).

3.5 Monze District

Monze district is approximately 6,600 km² in size, and its population was estimated in the 1990 census as 157,000, with a male to female ratio of 0.956.¹ A map of the district is found in Annex 2.4. The only town of any importance is Monze, with a population of about 30,000; a second "urban" area is Chisekesi, which contains a few stores, a bank, a petrol station, and numerous bars, and has a population of about 2,000. In 1945 there was no town bigger than 500 (Colson, 1951); and the 1969 census records the population of Monze township as 2,983. (CSO, 1975) The district was formed in 1972 when the large Mazabuka district was split into three smaller districts -- Mazabuka to the north, Monze, and Choma to the south. It was at this time that the existing Monze Hospital was designated the district hospital and the other administrative functions were established in Monze town, and the town began to grow rapidly.

The district's population is largely composed of Tonga people, organized into six traditional chiefdoms. The district is bisected by a major road leading from Lusaka and the north to Zimbabwe and South Africa and is a major truck route. The railway also runs parallel to the road and Monze is an important cattle loading point. The civil administration was established in 1903, and two missions, the Roman Catholic and Seventh Day Adventist (SDA), were founded within days of each other in 1905. (Colson, 1951) The railway was built in 1910 and by 1913 the administration had established areas for European development along the road and line of rail, extending about 5 miles on either side of the railway; Tonga who lived within this area were ordered to move to "reserve" areas (Colson, 1951), and although some of the large commercial farms have been sold back to Tonga farmers, by and large the line of rail farms remain in the hands of settler farmers. The land available to Tonga farmers and herders is further reduced by swamps and a wildlife sanctuary to the north (Kafue flats and Lochinvar National Park) and by the rugged hilly terrain of the Zambezi escarpment to the east, towards Lake Kariba, which in any case had tsetse flies and was thus unsuitable for cattle-raising. Overall the density in the rural areas is approximately 24 per km² although when these large excluded areas are taken into account the actual population density in most of the district is likely to be closer to 30 per km² or possibly higher.

¹ The fieldwork done by the study indicated that the population might be significantly less than this, around 130,000, and that the population of Monze town might be only 20,000. However, as the purpose of the fieldwork was not to estimate the population, and not all areas were enumerated, the official census figures, published in a preliminary report by the CSO, will be used throughout this thesis.

The Tonga have been studied intensively by an anthropologist, Elizabeth Colson, who first arrived there in the 1940s. Initially she studied the "plateau Tonga" who live in the Monze-Mazabuka area (Colson 1951, Colson 1962) but when plans were made to dam the Zambezi River at Kariba, a investment was made in documenting the process of change and adaptation which the Gwembe or "valley Tonga" had to undergo, and based on her work with the Plateau Tonga, Prof. Colson was commissioned to undertake this study.(Colson, 1960)

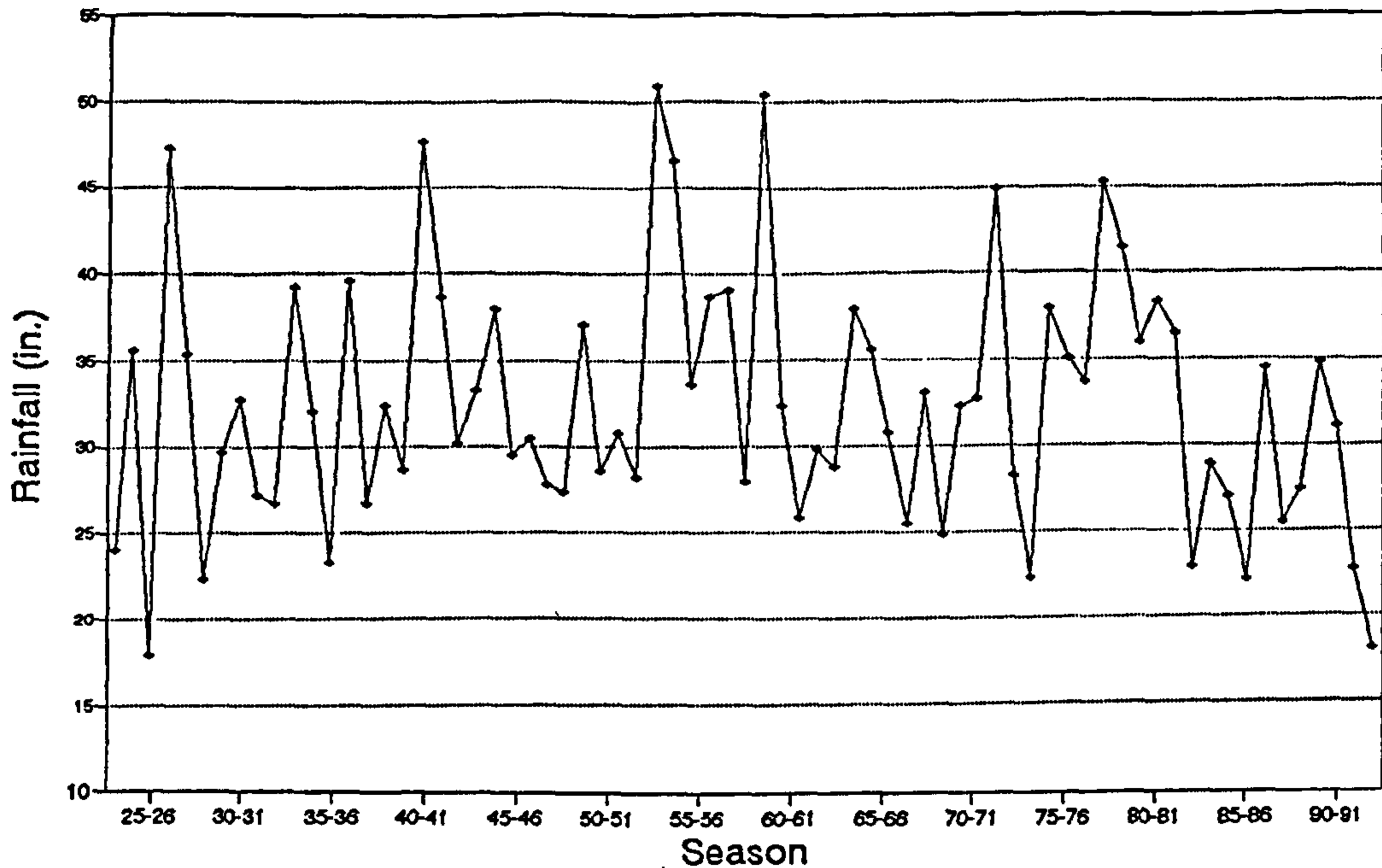
3.5.1 Agriculture in Monze District

Monze district's agriculture is dominated by two main products, maize and cattle. Other crops, tobacco, cotton and sunflower in particular, are grown but are less important. Maize is Zambia's staple food, consumed two or three times a day by virtually the entire population in various forms; and cattle have provided meat and milk, and recently the value of their manure has been appreciated. But they play an even more important role as the preferred method for accumulating, exchanging, and displaying wealth and forming social bonds in rural areas, and to a lesser extent in urban areas as well.

The district receives on average about 700-800 mm a year of rainfall, just adequate for the production of maize. The part of the district west of the road and line of rail is in the isohyet of 32 inches or 800 mm, as is most of Mazabuka district; the eastern half is significantly dryer, with 28 inches or 700 mm average.¹ Figure 3.2 shows the annual rainfall from a farm along the line of rail 10 km from Monze from 1921-1992.

¹ Meteorological Department, 30 year average, 1950-1980.

Figure 3.2 Annual rainfall, Monze District, 1921-1992 (inches)



Source: Tom Savory, "The Moorings", Monze district.

Some local people assert that the decline in rainfall is as a result of the construction of the Kariba Dam which was built in the 1960s and was completely filled by 1962. The mechanism by which this would happen is that the reflective glare of the water prevents the formation of rain clouds, similar to the effect produced by a desert. The general trend seems to suggest that the timing of the decline coincides with the filling of the Kariba dam and the rainfall map shows that the isohyets follow the contours of the Kariba dam, with declining rainfall nearer the dam. Most of the rest of Southern Province, especially the southwestern part is also in the drier zone.

3.5.2 History of maize production in Monze District

As with virtually every other aspect of Zambia's economy, even the production of maize is closely linked with the development of the copper mining industry. As noted above, the line of rail runs through the district (and through the whole of Southern Province), and as recently as

the 1950s Lusaka could be reached by rail in two and a half hours.¹ This ease of transport made the district (which was then part of Mazabuka district to the north), a logical choice for the production of maize for shipment to the Copperbelt. Until the 1930's maize was not grown by the African farmers in Monze district in any quantity, who continued to raise the traditional crops of sorghum and finger millet.(Chipungu, 1988) Maize production was introduced to the African farmers by the colonial administration who needed a source of rations for the growing body of workers at the mines in the Copperbelt. The settler farmers could not meet the demand and imports had begun. There was a tension between the those who wanted to encourage the peasants to produce maize and the proponents of the commercial sectors; some contended that "a villager would be 10-15 times more valuable in terms of manpower as a farm employee rather than self-employed."(Chipungu, 1988, p. 26)

The choice of Southern province, and Monze district in particular, for maize production, however, had more to do with geographic suitability than with climate or the agricultural characteristics. Maize will grow in a range of 300-1800 mm of rainfall, but is susceptible to variations in the distribution of rainfall.(Marter, 1978) In areas of low rainfall, such as Monze District, there is a risk of inadequate rainfall at planting time. The amount of rainfall which the district receives, on average about 700-800 mm a year is just adequate for the production of maize – if the distribution of the rainfall is relatively even. Furthermore, data collected in Monze district show that while the average rainfall may be adequate, as figure 3.1 above shows there are significant fluctuations from year to year, and ten of the 71 growing seasons since 1921 have had rainfall less than 25" or 625mm, insufficient for maize.

The introduction of maize as a main crop in the district had a major impact on the economic life of the peasant farmers. The key was the adaptation of the ox-drawn plough for growing maize. In the 1920s there were demonstrations of the ox-drawn plough but the plough was still rare in 1930, mostly due to the high capital requirement a plough represented. However a few peasants did acquire ploughs, mostly through associations with the missionaries especially at Chikuni mission in the south of the district; and this gave rise to the beginning of peasant differentiation in the district.(Chipungu, 1988) Peasants who acquired a plough were able to not only plough and plant a larger area for themselves, but to hire out the plough. They then also required ox carts to carry their increased production of maize to market, and these too could be

¹ The same journey now takes at least 11 hours because of the poor condition of the signalling equipment.

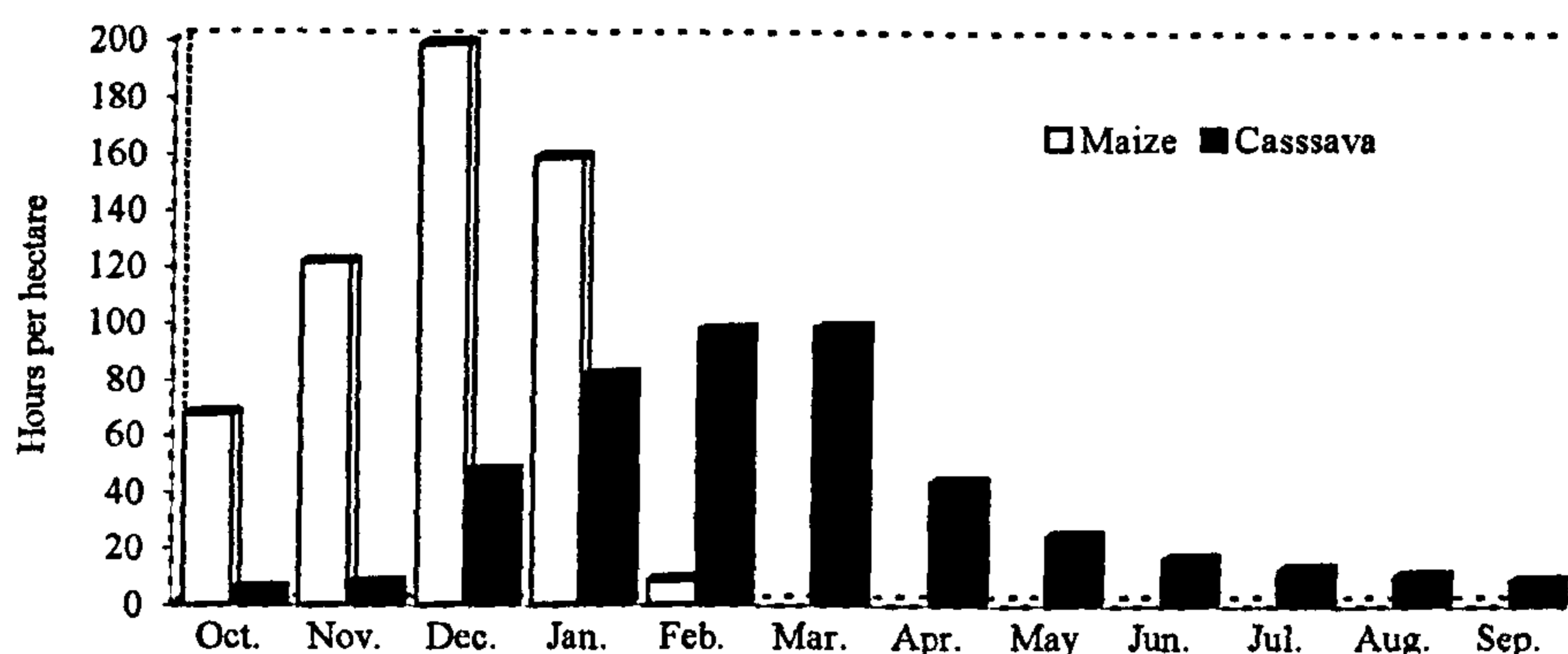
rented out for numerous purposes. This gave added impetus to and coincided with the push towards maize monoculture in the 1930s; there was little point in acquiring all this capital equipment to produce the traditional crops which were not marketed.(Chipungu, 1988) These "accumulating peasants" were often paid in calves and were thus able to concentrate their wealth in the form of cattle, which further increased their assets since cattle can be used to plough, to carry produce to market, and as a source of dung manure as well as being a (relatively) safe way to hold wealth.

Meanwhile the majority of the population had largely abandoned the traditional drought resistant crops, sorghum and finger millet in particular, and had become vulnerable to drought and famine. In 1985-86, sorghum production by volume amounted to only 4% of that of maize, and millet only 3.5%. Only small fractions (7.35% and 5.2% respectively) of this production was marketed.(CSO, 1989a) This trend away from sorghum and millet unfortunately has coincided with a downward trend in rainfall, particularly since the 1970s, and there is some discussion of trying to reintroduce crop rotation with some of the former traditional crops as well as maize.

Another drawback to the reliance on maize is the concentration of its labour requirement in a few months of the year. Traditional varieties are more tolerant of a lower labour input than are the new higher yielding hybrid varieties, which also require more fertilizer and pesticides. A comparison of the labour requirement for maize and for cassava was prepared by Marter (1978) and is reproduced graphically in figure 3.3 below. This demonstrates the vulnerability of households to labour shortages especially during those months of the year. This is of importance in estimating the impact of HIV on agricultural production in the district.

Figure 3.3. Hours required per hectare per month for maize and cassava (excluding harvesting)

Source: Marter, 1978.



3.5.3 Production and marketed sales of maize in Monze District

As noted above, maize is Zambia's staple food and annual requirements are now estimated at 11 million 90 kg bags, or 990,000 tons. (CSO, 1989a) Until 1978 the country was largely self-sufficient in maize. In 1979, however, marketed production of maize fell to half of the estimated requirements and in 1980 imports reached 81,000 tons, at an expenditure of K11 million or £6.5m equivalent. (CSO, 1990b) By 1991 imports had reached 270,000 tons, more than a quarter of the requirements.

In 1985-86, the last year for which data are available, Southern Province produced 26% of the national sales of maize, and Monze District was responsible for producing about 4.5% of the marketed national total (compared with its share of 2% of the population). Only about 35% of the district's estimated production was marketed. (CSO, 1989a) Maize is produced in the district by both African peasant farmers and by commercial farmers. Previously the commercial farmers produced as much as 60% of the national needs but as the maize pricing policy became less favourable to producers they gradually shifted to other crops. In 1990-91 they produced an estimated 35% of national production, with smaller scale African farmers making up the balance. (Tom Savory, personal communication) Farmers in areas bordering Malawi and Zaire have an incentive to smuggle their maize for sale across the border, but transport difficulties would limit the degree to which Monze farmers could smuggle large amounts of their maize to

appropriate neighbouring countries. Farmers in the district have been shifting to other crops for their cash needs, in particular sunflower and cotton.

3.6 The 1991-92 drought

While the main data collection was carried out in 1991, including the original patient interviews at Monze Hospital and the community survey, several parts of the study were carried out in 1992 when the drought was quite severe. These include the recruitment of patients at the health centres in Monze district and the followup of patients from the original sample of hospital inpatients. It is therefore necessary to describe the 1992 drought in some detail as it had a severe impact on virtually all households in the district, including those in the study.

The approximately 18" received in the 1991-92 season was the lowest annual rainfall since 1923-24 when only 17.85" were recorded at a government weather station located at a commercial farm, "The Moorings" 10 km north of Monze town (figure 3.1). Since maize cultivation was not widespread until the 1930s the 1991-92 drought was the worst since maize culture began in the district. The extent of the drought became clear in February 1992, when after a promising start the rains virtually stopped with only 1.35" being recorded in January (compared with a normal January rainfall of 7" or 8"). The expectation that the February rains would compensate did not materialize when only 1" fell, compared to a normal rainfall of 5" or 6".

The 1991 season had also been a poor one, with only 23" recorded in Monze, and further south in the province the situation was already grave in September 1991, with nearby Kalomo, Gwembe, and Namwala districts reporting serious shortages of both maize and water. Generally throughout the province the reserves were depleted. (CSO/UNICEF 1992a, 1992b)

The drought relief effort got underway promptly early in February 1992 at national level, with the Ministry of Agriculture of the new MMD government taking an early lead over other drought-affected countries in Southern Africa in securing available world stocks of maize. The maize entered the country via road, passing through the district, with only minor mishaps. Two lorry loads were lost between the port in South Africa and Zambia but in view of the acute shortages in the countries through which the lorries had to pass, Zimbabwe in particular, losses might have been much greater.

At the district level, the district's needs were estimated to be 271,000 bags to last until March 1992 but only 112,000 bags were in the sheds, leaving a shortfall of 159,000 bags. The immediate impact in the rural part of the district was that people had virtually no harvest. This

meant no food for the next 12 months, no seed stock to plant next year's crop, and no cash to buy food or any other necessities, or fertilizer or other inputs for next year. The risk of starvation in the district was great and it was only through a relatively efficient distribution of maize to households in rural areas that starvation was averted.

In anticipation of the need to buy food people sold off their main assets, their cattle. The main market is the Copperbelt and Lusaka, and the glut of animals on the market led to a drop in prices. Furthermore, in view of the epidemic of East Coast Fever in Southern Province (see below) measures were instituted by veterinary authorities in the receiving provinces which further complicated the efforts of Monze residents to realize their assets. Cattle arriving from Southern Province were to be slaughtered within 24 hours of arrival, and farmers found infringing this regulation were fined and their animals destroyed. The Copperbelt abattoirs could not cope with the influx to enable farmers to comply with the regulation; paradoxically despite the fact that 49% of the national herd is located in Southern Province there are no industrial abattoirs in the province so all animals are exported live. Even chickens from Southern Province were sold off on the Copperbelt to get cash for maize.

The drought meant that subsistence farmers had little or no cash on hand to buy food, no food in the granary, and no prospect of improvement in the near future. They were reliant on relief maize. More affluent farmers had borrowed from the bank to buy fertilizer and maize seed; the investment was completely wasted, but the money was still due. The government announced that it would not interfere in the private lending market, so the future production capacity of these farmers was also put into serious jeopardy by this crop failure, as was their ability to recover in time for next year's planting season. The banking system had around 30% of their portfolios tied up in lending for agriculture so their scope for flexibility was limited.

3.6.1 The bovine epidemic of East Coast fever

An epidemic of East Coast Fever or Theileriosis, a tick-borne cattle disease caused by a rickettsia (*Theileria parva*) spread through the cattle in the district in 1991 and became worse in 1992. The local name for the disease is "corridor" disease. Exact figures were unknown but anecdotal reports suggest that as many as half of the cattle in the district have died. In 1985-86, the last year for which complete data are available, 7,645 households in the district held 180,452 cattle, an average of 23.6 head per household. The district's cattle stock amounted to 10% of the national total; 49% of the national herd is located in Southern Province.(CSO, 1989a) As described below in Chapter 4 cattle have a very important economic role in the district, serving as

draught animals, sources of manure, and as a relatively secure form of holding wealth in times of very high inflation. The disease is prevented by weekly dipping of cattle for which a nominal fee of K5 per animal per dip was charged, and while more "modern" farmers managed to dip their cattle regularly, the more traditional farmers neglected to dip and lost many of their cattle. In some areas the water shortage made regular dipping impossible, but elsewhere it is unclear why farmers do not dip regularly. Treatment of the disease is very costly, ranging from K3000 to K6000 (£25-50) depending on the size of the animal, although since healthy animals were still fetching between K16,000 and K30,000 on the Copperbelt it seems that treatment is still economically attractive. (Dr Anders Pirmin, DVM, personal communication)

While the stock of cattle in the district was beginning to cause problems of overgrazing, it nonetheless appears that the loss of animals will affect poorer, more traditional households; typically these are the households with only two or three trained oxen and perhaps 10-20 animals; the loss of their oxen means that they will be unable to plough as large an area unless they are able to hire oxen elsewhere. The loss of the wealth and realizable assets which cattle represent could not have come at a worse time for the farmers, given the need to sell off the cattle for cash to purchase maize and other necessities. Farmers who have lost most of their herd have seen their assets destroyed, leaving them significantly poorer.

3.7 Health services of Monze District

Monze district's population is well-served in terms of health facilities compared to almost any other rural area in Zambia. Monze District Hospital is a 260-bed district hospital serving the district's population of about 160,000 in addition to patients who are referred, or who self-refer, from other areas. The hospital itself was constructed in the 1960s when Monze District was separated from Mazabuka District. It is the designated district hospital and as such received a grant from the Government which also pays the staff, but it also receives support from the Catholic Church and in particular the Holy Rosary Sisters of Ireland, who provide some staff and financial support. Table 3.2 provides information on the level of activity of the hospital. Although the hospital has 260 actual beds¹, there are only 200 "official" beds on which the government grant and staff allocation is based. The hospital also has a training school for

¹ The hospital administration considers that it has 250 beds but when actually counted for the purposes of a bed census carried out during the study, a total of 260 named beds were found, i.e. with bed frames and with a number on the wall.

Zambia Enrolled Nurses (ZENs) and for Zambia Enrolled Midwives (ZEMs). They receive both practical and theoretical training, and provide a large proportion of the nursing resources of the hospital.

Table 3.2. Monze District Hospital Statistics, 1991.

Month	OPD Attend.	1st Inpat. Admiss.	Inpat. Days	Avg. LOS	Deaths	Blood Transf.	Major Oper.	Minor Oper.	Patients X-rayed
Jan	2020	789	5166	6.55	58	47	18	36	129
Feb	2677	833	6515	7.82	62	95	26	62	287
Mar	2675	1091	7569	6.94	52	96	44	166	388
Apr	2678	1037	7479	7.21	69	122	40	120	107
May	2809	1271	6879	5.41	50	85	34	94	215
June	1527	613	6204	10.12	60	78	49	90	160
July	2481	718	6486	9.03	48	na	40	57	219
Aug	2894	609	6476	10.63	44	64	6	27	253
Sept	4813	942	7196	7.64	44	100	50	105	218
Oct	3376	1029	7401	7.1	53	na	na	na	na
Nov	3316	911	7056	7.7	57	na	na	na	na
Dec	4790	864	7008	8.1	52	na	na	na	na
Total	36056	10506	81430	7.75	649				
Total, Jan./Sept. 19761	6961	52774	7.58	443	587	257	652	1758	

Source: Monze Hospital records office, 1991 and Monze Hospital Annual Report, 1991.

In addition to the MDH, there is also a 70-bed health centre at Chikuni, a Jesuit mission, also staffed by missionaries and expatriates; it is designated a health centre rather than a hospital because at the time of the classification it did not have a doctor in post, but in fact it functions much like a small rural hospital. The district is also served by a network of 14 rural health centres, which have an average staff of 3-4 and 8-10 beds; utilization of most of the health centres is low, with only 20-30 patients seen per day. This is in part due to the low population density off the main road in the areas served by the health centres, and also to the propensity to bypass the health centre and go direct to MDH. The government has also established and supervised a network of approximately 100 community health workers, who are supposed to provide basic treatment for malaria, cuts and abrasions, headache, diarrhoea, etc. In practice, however, data collected by the project showed that this network is used very seldom, with none of the more than 600 patients interviewed at the hospital having consulted them for the present illness.

There are also a number of informal and traditional sources of treatment in Monze district, including a wide variety of traditional healers and herbalists; they are licensed by the local government and some are widely respected for their skills in treating specific diseases. Even the Paramount Chief Monze, the chief of all the Tonga, is reputed as a traditional healer. There are two pharmacies in Monze town but few other outlets selling pharmaceuticals, and in contrast to other neighbouring countries, drugs (other than herbal preparations) are not sold openly on the market in Zambia. Small shops in rural areas sell aspirin preparations and sometimes gripe water, but in the main the only source of "modern" pharmaceuticals are the official health services, the pharmacies, and the community health workers.

3.8 Summary

This chapter has described the economy of Zambia, characterized by a heavy reliance on sales of copper, and the oil-induced economic crisis in the early 1970s. Inflation was relatively low for a number of years but in recent years has exceeded 200% per annum, and the concurrent devaluation of the currency has caused economic hardship.

Over-reliance on copper revenues has also led to the neglect of agriculture, and imports of the staple maize have been a major drain on available foreign exchange reserves. The HIV epidemic has affected Zambia particularly hard, with an estimated 17.1% of the adult population having HIV infection by 1994, and an estimated 700,000 (just under a tenth of the population) having HIV. Only Zimbabwe with 17.4% seroprevalence, and Botswana with 18%, have a higher seroprevalence rate.

Monze District, a major maize-producing area, was heavily affected by the 1991-92 drought and by an epidemic of cattle disease which eliminated the wealth of many rural farmers and reduced the available draught power, and thus the maize production capacity, considerably. The health services of Monze district include a well-functioning district (mission) hospital plus fourteen rural health centres as well as a number of drug selling points and traditional healers.

4. Costs of treatment and impact of HIV on health services of Monze District

4.1 Introduction

In this chapter, the costs of treatment for a randomly selected sample of hospital inpatients, hospital outpatients, and rural health centre attenders are presented, as are those of running the home-based care programme for people with HIV disease.¹ The objectives of the part of the study related to the costs of treatment were to determine the costs of running and establishing Monze District Hospital and three of the 14 rural health centres in the district; to determine the costs of both inpatient and outpatient treatment for illness in adults, especially HIV disease, at Monze district's health service, in view of the high HIV seroprevalence; to provide information to help plan for the expected new cases of HIV disease; and to indicate areas where changes in practice could improve use of existing human and financial resources. A costing exercise was carried out in September-October 1991 to determine the costs of treatment and other activities, including home-based care, of Monze District Hospital, and in May 1992 of three rural health centres.

The first section describes findings with regard to HIV seroprevalence in the district. The second presents the overall costs of running the hospital and unit costs, as well as capital costs of the hospital, and the treatment costs of a sample of patients (both inpatients and outpatients) recruited to the study in 1991. The third describes the costs of treatment at rural health centres. The costs of home based care for HIV/AIDS provided at Monze Hospital are described. Finally the implications of these findings for the health services of the district are reviewed. Annex 4.1 describes the methods used to derive costs of treatment at the hospital level, in both inpatient and outpatient departments; annex 4.2 describes costing of the rural health centres; and annex 4.3 describes the costing of home-based care.

¹ Some of the data in this chapter have been previously presented in the following papers and posters: 1) "Costs of treatment for HIV disease at a district hospital in Zambia" by Foster SD, Buvé A, Kleinschmidt I, O'Connell A. VIII Conference on AIDS and STDs, Amsterdam, 19-24 July 1992; 2) "Cost of AIDS Counselling and Home Based Care at Monze District Hospital, Monze, Zambia, 1991," by Foster SD, Chibamba F, Mukonka V, O'Connell. WHO Workshop on Home and Community Based Care, Entebbe, Uganda, October 1991; and 3) "Workload associated with HIV disease at a district hospital in Zambia" by Buvé AMA, Foster SD, Kelly MP, Mukonka V. VIII Conference on AIDS and STDs, Amsterdam, 19-24 July 1992.

4.2 Epidemiology of HIV disease and HIV seroprevalence in Monze District

The HIV seroprevalence in Monze district has been estimated on the basis of two sources of data collected by the project, namely, the hospital register of the HIV results of blood donors, and a seroprevalence survey carried out among the patients attending the hospital outpatient department and the three rural health centres. (Buvé and Foster, 1993a) Findings were that seroprevalence among blood donors was 15.8% (women 15.2% and men 15.9%), which when standardized for age and sex gave an estimate of 12% in women and 10% in men for the district as a whole. These figures agreed well with the estimates derived from hospital and health centre attenders; of an estimated 65,000 adults in the district, 41,000 attended the health services at least once. Controlling for more frequent use of health services by seropositive patients, the figures for HIV seroprevalence found in hospital OPD of 32% and in health centre patients of 18% were applied to the total number of 41,000 new patients in the district, stratified by type of health facility. It was thus possible to estimate that in 1991 there were approximately 8,000 seropositive adults in the district, a seroprevalence of 12%. Table 4.1 summarizes the findings with regard to the prevalence of HIV and of HIV disease among patients and blood donors.

Table 4.1. HIV seroprevalence among Monze district patients and blood donors, 1991-2

Location	HIV seropositive (%)	HIV disease (%) (a)
Monze District Hospital:		
Inpatients	44	36.7
Outpatients	30	7.3
Rural health centres (b)	18.6	3
Blood donors:	15.8	na
Male	15.2	na
Female	15.9	na
General adult population (c)	10-12%	2-3%

(a) Patients exhibiting signs and symptoms of HIV disease according to WHO staging system (annex 2.3).

(b) Average of all attenders at three rural health centres (see text). Seroprevalence among first attenders for the year was 15%.

(c) Estimated on the basis of blood donor data adjusted for age and sex, and on the basis of health centre attendances. See text for method used.

The importance of HIV disease for households in the district can be inferred from these figures. There are approximately 20,000 households in the district, of which 3,000 are in Monze

town and 17,000 in rural Monze. These figures imply that in 1991 on average one in 2.5 households included a person with HIV infection. However, HIV infections are not evenly distributed, and many households will contain more than one person with HIV; the data suggest that the prevalence is likely to be higher in urban Monze than in the rural areas, as the hospital OPD where HIV seroprevalence was 30% serves a largely urban clientele. In any case HIV and AIDS is now perceived as a very serious and growing problem; approximately 10-20% of people with HIV infection will go on to develop HIV disease each year, and will be ill for approximately one year before death. A minimum estimate of 800 new cases of AIDS were expected to present themselves to the district's health services in 1993. (Buvé et al, 1992)

4.3 Costs of care at Monze District Hospital

4.3.1 Costing Methodology

The method used to estimate the average costs of services provided at Monze Hospital was a form of step-down cost accounting described by Puglisi and Bicknell (1990) and others. The treatment costs for individual patients were then calculated using the average costs of services consumed by individual study patients similar to the procedure described by Babson (1973) in his book *Disease Costing*. Details of the methods used for the costing of Monze Hospital are found in Annex 4.1. Monze Hospital was described above in section 3.7.

4.4 Recurrent costs

The overall recurrent cost of Monze Hospital for the first eight months of 1991 was approximately K22,538,364 (£187,820) (Table 4.2 below). For the entire year, the amount would be approximately K34m or £281,730, based on an extrapolation of the first 8 months' costs over the whole year. The monthly estimated cost was K2.8m or £23,477. On an annual per-bed basis, this amounts to approximately £1083 or US\$1625¹. This includes the value of donations of both labour and goods which the hospital receives; the hospital accounts show that excluding staff paid by the Ministry and donations received by all district hospitals, the hospital itself made

¹ This estimate of about \$1625, equivalent in 1988 US\$ to about \$1528, is roughly in line with per-bed recurrent costs from other cost accounting studies in similar sized hospitals in other low income countries; figures (in 1988 US\$) were reported for Malawi (\$1264), Niger (\$2090), and China (\$3223), and Belize (\$4714) by Barnum and Kutzin (1991).

expenditures of K8m (£66,666) for the first 8 months, or which would have been approximately K12m for the whole of 1991.

This total includes overhead costs. Approximately 57% of all costs could be directly attributed to the cost centres, i.e. wards, OPD, etc. Another 43% were overheads or indirect costs, comprised of general administration (21% of overheads), outpatient-related overheads (19% of overheads), and inpatient-related overheads (60% of overheads). Under general administration overheads were included the workshop, the records and registry office, and the administration office; these were attributed to cost centres on the basis of staff allocation. Outpatient-related overheads included half the cost of running the pharmacy, lab, x-ray/scanner, and home-based care/AIDS counselling services, plus 25% of the costs of the ZEN and the ZEM schools whose students work in the outpatient department (OPD) of the hospital. They were attributed on the basis of the percentage of the total outpatient consultations at that centre, of which 61% took place at the OPD itself. Inpatient-related overheads included the other half of the above plus the theatre, kitchen, laundry, mortuary, and IV fluids production unit, plus 75% of the ZEN and ZEM schools; these were allocated on the basis of the fraction of the total beds on that ward.

Some of the donations which Monze Hospital receives are also received by most if not all other district hospitals in Zambia; an example is the antituberculosis drugs and the drugs for sexually transmitted diseases (STDs). An attempt was therefore made to cost the donations which are not received by other hospitals, i.e. funds raised specifically by and for Monze Hospital and not available to other institutions. This amounted to K4.2m (or £35,000), or about 18.7% of the total expenditures at Monze Hospital. Table 4.2 summarizes the distribution of recurrent costs to the main patient-based cost centres in the hospital.

TABLE 4.2. RECURRENT COSTS OF MONZE HOSPITAL, 1991.

	A. Direct patient care centres											B. Ancillary clinical services			
	% of total	Male Ward	Female Ward	Maternity	Children's Ward	TB Ward	OPD	MCH Clinic	Dental Clinic	Chest Clinic	Theatre	Pharmacy	Laboratory	X-ray/Scanner	
1. SALARIES															
Nursing	5,674,620	790,548	544,928	1,542,664	581,836	240,840	283,776	571,524	0	62,888	259,552	62,888	0	0	
Medical/technical	2,244,699	131,840	131,840	22,400	131,840	32,960	592,360	85,512	62,888	148,400	385,758	58,528	251,552	123,640	
Administrative	4,332,912	116,544	116,544	155,392	116,544	77,696	427,328	115,976	38,848	0	194,240	77,696	77,696	77,696	
Allowances	147,300	3,144	2,644	5,856	2,811	1,244	3,000	31,200	222	333	2,233	444	667	444	
Total, salaries and allowances	12,399,531	1,042,076	795,956	1,726,312	833,031	352,740	1,306,464	804,212	101,958	211,621	841,784	199,556	329,915	201,780	
2. DRUGS AND SUPPLIES															
Drugs	2,452,462	232,889	155,603	291,282	129,517	240,651	1,018,251	54,562	0	155,292	177,229	0	0	0	
Ward supplies	1,507,297	195,949	241,168	316,532	195,949	105,511	105,511	0	0	0	346,678	0	0	0	
Lab supplies and reagents	1,236,005	0	0	0	0	0	0	0	0	0	0	0	1,236,005	0	
X-ray supplies	482,416	0	0	0	0	0	0	0	0	0	0	0	0	482,416	
Theatre supplies	356,840	0	0	0	0	0	0	0	0	0	356,840	0	0	0	
IV Fluids production supplies	605,000	0	0	0	0	0	0	0	0	0	0	0	0	0	
Dental supplies	263,603	0	0	0	0	0	0	0	263,603	0	0	0	0	0	
Total, drugs and supplies	6,903,624	428,838	396,770	607,814	325,465	346,162	1,123,762	54,562	263,603	155,292	880,747	0	1,236,005	482,416	
3. FOOD	853,897	110,350	121,845	174,720	112,649	78,164	0	0	0	0	0	0	0	0	
Allocation %: (beds)	100	18	20	29	19	13									
4. MAINTENANCE	501,594	33,105	60,693	85,271	27,588	27,588	16,553	11,035	5,474	5,474	49,658	11,035	11,035	5,518	
Allocation %: (actual; see text)	90	7	12	17	6	6	3	2	1	1	10	2	2	1	
5. CLEARING	103,218	10,643	7,997	14,872	7,990	3,204	29,775	4,864	341	512	9,281	683	1,024	683	
Allocation %: (staff/drug)	100	10	8	14	8	3	29	5	0	0	9	1	1	1	
6. ADMIN/STATIONERY	273,999	25,642	21,565	47,750	22,924	10,148	24,464	25,823	1,812	2,718	18,212	3,624	5,436	3,624	
Allocation %: (staff)	100	9	8	17	8	4	9	9	1	1	7	1	2	1	
7. UTILITIES	206,638	22,083	13,011	28,809	13,831	6,123	14,760	15,580	1,093	1,640	10,988	2,187	3,280	2,187	
Allocation %: (staff)	100	11	6	14	7	3	7	8	1	1	5	1	2	1	
8. TRANSPORT	523,623	40,331	30,306	56,358	30,277	12,141	112,834	46,038	1,293	1,940	35,171	2,587	3,880	2,587	
Allocation %: (see text)	100	8	6	11	6	2	22	9	0	0	7	0	1	0	
9. DOMESTIC SUPPLIES	524,425	39,263	33,019	73,114	35,100	15,539	37,459	39,540	2,775	4,162	27,886	5,549	8,324	5,549	
Allocation %: (see text)	100	9	8	17	8	4	9	9	1	1	7	1	2	1	
10. ZEN SCHOOL	174,215	27,508	27,508	2,292	22,923	9,169	13,754	16,046	0	0	11,462	0	0	0	
Allocation %: (actual)	100	16	16	1	13	5	8	9	0	0	7	0	0	0	
11. ZEM SCHOOL	73,600	0	0	40,480	0	0	0	12,880	0	0	1,840	0	0	0	
Allocation %: (actual)	100	0	0	55	0	0	18	18	0	0	3	0	0	0	
GRAND TOTAL	22,538,364	1,779,838	1,508,670	2,857,794	1,431,778	860,977	2,679,825	1,030,580	378,394	383,359	1,887,028	225,222	1,598,900	704,344	
% of total:		8	7	13	6	4	12	5	2	2	8	1	7	3	

4.5 Capital costs

The capital costs of Monze District Hospital were also calculated (described in annex 4.1) using the annualized value of capital items at a discount rate of 3%. (Creese and Parker, 1994)

The original hospital main building (now the male ward) was built in the 1940s and new buildings have been added over the years as the hospital expanded beyond its original role as a small mission facility, especially when it was designated the district hospital for the newly created Monze district in the 1960s (see Annex 4.1b). The estimation of capital costs was therefore made as if the hospital were built and equipped as it now stands in 1991, in other words, using 1991 replacement costs for building and equipping a similar hospital. The resulting capital cost of building and equipping the hospital as it stood in 1991 was £1.4 million, of which approximately £1.1 million was the building, £184,000 for equipment, £97,000 for furniture, and £52,000 for vehicles. The annualized capital cost was estimated at £128,397 per annum (in kwacha terms, K15.4m). Details of the calculations and assumptions used in estimating capital costs and depreciation are found below in Table 4.3. The estimated annual recurrent cost accounts for 20% of the capital cost, giving an r-coefficient (the ratio of annual recurrent costs to total investment outlay) of 0.2, which is in line with estimates from other work on hospital recurrent costs, which range from 0.11-0.3 at district hospitals (Waddington and Thomas, 1988).

If depreciation of £128,397 per year is added to the recurrent costs, the overall cost of running the hospital would be a total of £410,163 per year. On a per-bed basis (assuming 260 beds, see below), this works out to £1578 (US\$2366) per bed per year.

TABLE 4.3. CAPITAL COSTS OF MONZE HOSPITAL, 1991.

(All costs in UK£, K120=£1 as of 9/91, annualized at 3% discount rate)

	BUILDINGS			EQUIPMENT			FURNITURE			VEHICLES			TOTALS	
	Size in m ²	Total Cost(a)	Annual Deprec.(b)	Total Cost	Annual Deprec.(c)	Total Cost	Annual Deprec.(d)	Total Cost	Annual Deprec.(e)	Total Cost	Annual Deprec.	Overall Cost		
Male ward	487	58440	3359	1174	256	12785	1121	12785	4736	72399				
Female ward	782	93840	5393	1606	351	11958	1049	11958	6793	107404				
Maternity/labour ward	849	101880	5855	14223	3105	20520	1800	20520	10761	136623				
Children's ward	444	53280	3062	7134	1558	24419	2142	24419	6762	84833				
TB ward	263	31560	1814	1618	353	4149	364	4149	2531	37326				
Isolation/measles ward	184	22080	1269	563	123	1963	172	1963	1564	24605				
OPD	306	36744	2112	2263	494	1470	129	1470	2735	40477				
Doctor's offices	94	11280	648	3035	663	1150	101	1150	1412	15465				
Dental clinic	56	6720	386	4093	894	131	11	131	1291	10944				
Chest clinic	25	3000	172	238	52	256	22	256	247	3494				
MCH Clinic	175	21000	1207	4190	915	1430	125	1430	6487	38620				
Theatre	183	21960	1262	40870	8924	420	37	420	10222	63250				
Pharmacy	100	12000	690	888	194	1905	167	1905	1051	14793				
Laboratory	100	12000	690	14798	3231	100	9	100	3929	26898				
X-ray/US scanner	194	23280	1338	41250	9007	297	26	297	10371	64827				
HBC/counselling	50	6000	345	13	3	105	9	105	6010	22118				
IV Fluids	14	1680	97	12500	2729	50	4	50	2830	14230				
Workshop	56	6750	388	2500	546	100	9	100	943	9350				
Laundry	113	13500	776	3375	737	90	8	90	1521	16965				
Kitchen	263	31500	1810	1908	416	120	11	120	2237	33528				
Mortuary	84	10080	579	5811	1269	120	11	120	1859	16011				
Records/registry	15	1800	103	6	1	750	66	750	171	2556				
Administration/stores	829	99420	5714	14623	3193	4510	396	4510	17783	142553				
ZEN School	1119	134280	7717	2500	546	3000	263	3000	8526	139780				
ZEM School	1250	150000	8621	2500	546	3000	263	3000	9430	155500				
Staff Hostel	215	25800	1483	375	82	990	87	990	1651	27165				
Old female ward	350	42000	2414	0	0.0	0	0	0	2414	42000				
Pastoral care	290	34800	2000	0	0	1500	132	1500	2132	36300				
Total	8,599	1,066,674	61,303	184,049	40,185	97,287	8,534	52,000	18,375	128,397	1,400,010			

(a) Construction cost £/m²= 120 bldg

(b) Ann. fact. (Exp. life of bldgs 25 yrs)= 17.4 b

(c) Ann fact. (Exp. life of equip 5 yrs)= 4.58 eq

(d) Ann. fact. (Exp. life of fum 15 yrs) 11.4 fu

(e) Ann. fact. (Exp. life of veh. 3 yrs)= 2.83 veh

4.6 Average unit costs of hospital services

The average unit recurrent costs of services provided at the hospital were obtained by summing the total expenditures of that cost centre, e.g. male ward, by the number of service units provided, e.g. bed days, outpatient visits, etc. The assumption was that capacity was 100%, which is appropriate given the ebb and flow of patients over the year. The number of bed days was calculated on the basis of the 260 actual beds, not the 200 "official" beds. For purposes of the costing of treatments, two costs per bed day were calculated, one excluding drugs and one including drugs issued to and consumed on the wards; the former was used in the costing of patient treatments because data were collected on the drugs actually consumed by study patients. Recurrent unit costs of various services provided by the hospital, including drug costs and overheads but excluding capital depreciation, are presented below in Table 4.4.

Table 4.4. Average unit recurrent costs of services provided at Monze Hospital, 1991

	Unit Costs	
	Kwacha	UK£
1) Bed day:		
Male ward	272	2.27
Female ward	228	1.90
Maternity	276	2.30
Children's ward	234	1.95
Tuberculosis ward	209	1.74
2) OPD: visit	147	1.22
3) MCH Clinic: contact	128	1.07
4) Dental clinic: visit	160	1.33
5) Chest clinic: visit (incl.drugs)	1056	8.80
6) Theatre: Operation (average 31 min.)	1770	14.75
Theatre: minute	57	0.48
7) Laboratory: routine (blood, urine, etc.)	105	0.88
HIVchek (rapid test)	379	3.16
HIV ELISA	219	1.82
8) X-ray	521	4.34
9) Home-based care/counselling visit	220	1.83
10) IV Fluids: bottle	60	0.50
11) Mortuary: body prepared	128	1.06

Exchange rate UK£ = K120 at end September 1991

The differences in cost per bed day on different wards were primarily due to differences in staffing levels during the period under study, and to different patterns of use of drugs.

4.7 Cost of treatment of hospital patients

4.7.1 Inpatients

A total of 414 patients were recruited into the study, and a total of 461 admissions were recorded (some patients were admitted more than once during the study period). In addition to HIV serology, patients were examined for signs and symptoms of HIV disease and staged according to the WHO staging criteria which were available at the time (WHO, 1990; Annex 2.3); these have since been revised. HIV serology results or sufficient information on HIV stage were available for 273 patients, of whom 114 or 42% were HIV seropositive, of whom 32 (12%) were asymptomatic; 82 (30%) had HIV disease. 117 or 42.8% were seronegative; an additional 42 whose serological status was unknown had no signs or symptoms of HIV disease and were therefore classified as not suffering from HIV disease. Data were insufficient to classify 26 patients (9.5%).

The number of *admissions* of patients in each stage was as follows:

	n=	%
Stage 0 (HIV-negative)	129	38.2
Stage 1 (asymptomatic)	32	9.5
Stage 2 (early HIV disease)	5	1.5
Stage 3 (AIDS)	36	10.7
Stage 4 (AIDS)	60	17.8
Insufficient data to stage	76	22.4
Total:	338	100.0

Complete data were gathered on 338 random admissions, on 43 extra admissions for TB, and 41 extra admissions for HIV disease (total 422). Of the 338 admissions of randomly recruited patients, 161 (47.6%) had no signs or symptoms of HIV disease (stage 0, seronegative, or stage 1, HIV asymptomatic) while 101 (29.9%) had HIV disease (stage 2,3, or 4); data were insufficient to stage 76 patients (22.4%). Patients with HIV disease thus constituted at least 30% of the adult admissions at Monze District Hospital in 1991. If those admissions for which insufficient data exist are excluded, the percentage of admissions for HIV disease rises to 38.5% (101/262).

4.7.2 Overall share of costs by HIV stage

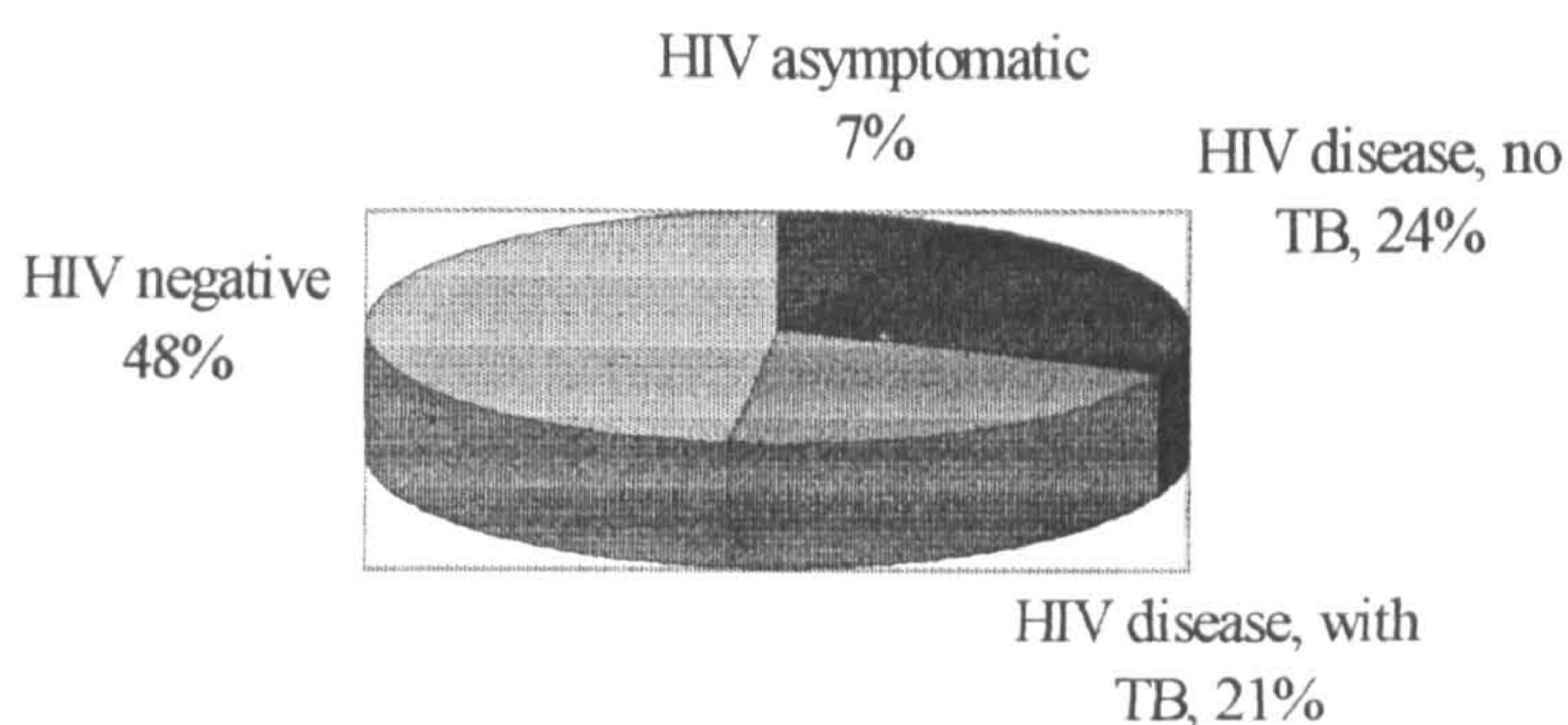
Table 4.5 summarizes the data, by HIV stage, on the costs of admission and on the length of stay in hospital.

Table 4.5. Costs of inpatient admissions and length of stay by HIV stage, Monze Hospital, 1991.

Stage	Costs: mean (kwacha)	median	% of total	Length of stay: mean (days)	median	% of total
0 (HIV-)	4013	1824	37	11.9	5	35
1	2459	962	6	8.3	2	6
2	3202	1595	1	11.8	7	1
3	6154	2660	15	21.6	11	18
4	5289	3307	21	17.9	9	24
stage unknown	3621	1892	20	9.5	4	16
all HIV+:	4689	2734	na	16.3	8	na
of which HIV, no TB	3371	2162	58	9.9	7	52
HIV with TB	10374	6779	42	36	21	48

As can be seen in table 4.5, the mean costs of treatment are highest for patients in stage 3, in part due to the fact that most of the patients with tuberculosis would be classified as stage 3. HIV negative patients (stage 0) had a mean of K4013, slightly higher than patients with HIV disease but no tuberculosis (K3371). This table shows the importance of tuberculosis in the costs of treatment of HIV disease; 25 of these admissions involved treatment for tuberculosis, which accounted for 21.5% of the overall total (all patients) and for 42% of the cost of treating HIV disease. Length of stay presents a similar picture, with HIV negative patients staying on average 11.9 days and HIV positive patients without TB, 9.9 days. HIV-related TB took up 48% of the HIV-related days in hospital. Figure 4.1 shows the share of the overall cost of treatment by HIV stage of patients whose stage could be determined. 96 admissions for HIV disease accounted for 46.5% of the cost of admissions. Data on staging were insufficient for 20% of randomly recruited admissions; excluding those data, the cost of HIV-related admissions rose to 59.8% of the total.

Figure 4.1. Share of overall costs of admissions, by HIV stage, Monze Hospital, 1991.



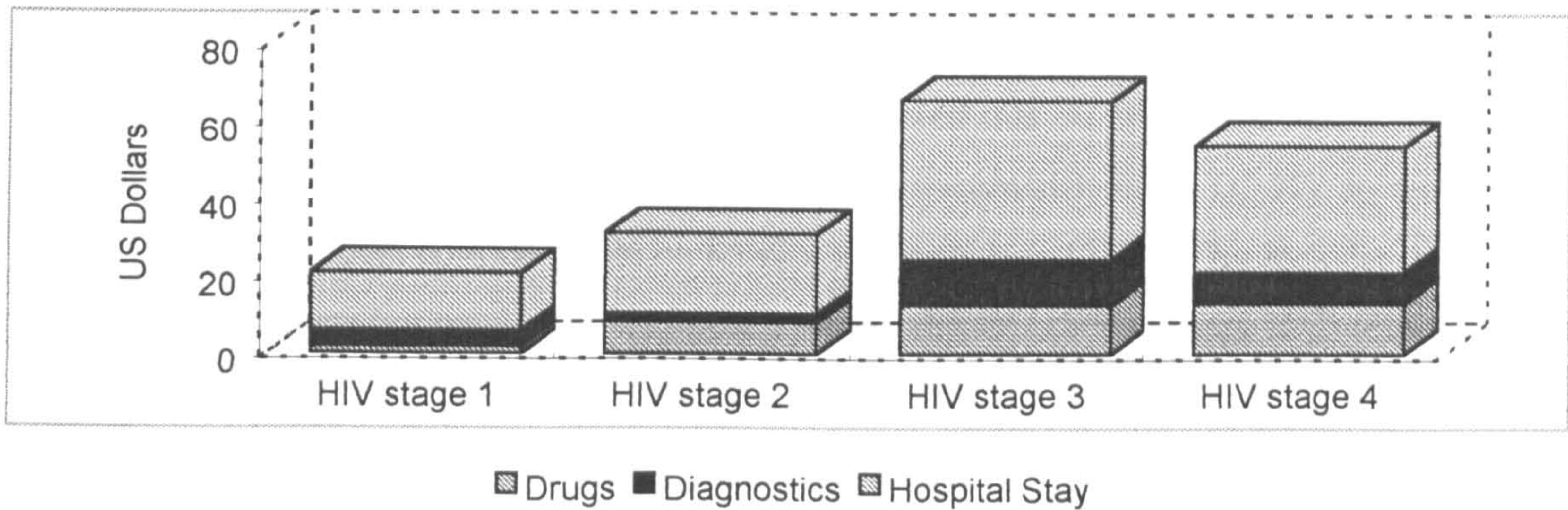
4.7.3 Components of costs of treatment

Costs were broken down into three categories, i.e. drugs, diagnostics (primarily x-ray and laboratory), and hotel costs, which includes staff, ward supplies, food, laundry, etc. Table 4.6 presents the breakdown of the different costs by HIV stage, and Figure 4.2 shows the components of the costs of admission by HIV stage.

Table 4.6. Components of costs of admission by HIV stage, Monze Hospital, 1991 (kwacha).

Stage	Drugs: mean	% of total	Diagnostics: mean	% of total	Hospital stay: mean	% of total
0 (HIV-)	422	35	842	40	2736	
1	163	3	314	4	1982	
2	283	1	153	0	2764	
3	852	18	1146	14	4840	
4	631	24	609	13	4021	
unknown	135	19	1055	29	2181	
All HIV+:	566		653		3676	
of which						
HIV, no TB	373	52	611	74	2379	55
HIV with TB	1402	48	904	26	7833	45

Figure 4.2. Components of costs of admission by HIV stage, and share of total costs of treatment, Monze Hospital, 1991.



4.7.4 Summary of inpatient costs

These data show that the burden of HIV disease on the inpatient facilities of Monze District Hospital was already significant in 1991. Excluding those on whom insufficient data were available, patients with HIV disease thus made up 38.5% of the admissions but accounted for 51% of the inpatient days and for 46.5% of the overall costs of treatment.

The average number of days spent in hospital by patients with HIV disease in the year before their death was 30. Of this approximately half was devoted to the treatment of tuberculosis.

In large measure this is due to the long inpatient stay (officially 60 days at the time) and to the use of relatively expensive drugs and repeated diagnostic procedures such as chest x-ray and sputum smears. During 1991 a mixture of rifampicin- and thiacetazone-based regimens was in use; thiacetazone has now largely been abandoned due to the unacceptably high incidence of severe and fatal reactions (Kelly et al, 1993; Elliott and Foster, 1996). The costs of TB treatment include the two month inpatient phase plus one month's supply of drugs given on discharge from hospital. The rest of the outpatient phase is accounted for under chest clinic visits, normally once a month; a month's supply of drugs is expected to be given to the patient at each review visit, but in practice this frequently does not happen due to drug shortages.

A separate analysis has been carried out of patients' and helpers' out-of-pocket expenditures during hospitalization which shows that such expenditures equal about 40% of the cost of the inpatient treatment. Details are presented below in Chapter 8.

4.8 Hospital Outpatients

Patients were recruited in the hospital outpatient department of Monze District Hospital. A total of 185 outpatient visits of 124 patients were recorded. Of these patients, 30% were HIV seropositive, and 7.3% had signs and symptoms of HIV disease. One illness episode may require several visits to the OPD; a review of cards showed that on average an illness episode requires 1.44 visits. The recurrent cost of one visit was approximately K147 (£1.22), so the overall costs of one treatment episode would be K147 x 1.44 or K212 (£1.76). This includes drugs issued by the pharmacy but would not include lab tests, x-ray, or other services. Lab tests were ordered infrequently; only 16% of patients were referred to the lab. (If the cost of lab tests were included, the price per visit would rise to approximately K155 (or K224 per episode.) An average of 2.7 drugs was prescribed per visit. Six drugs accounted for 49.8% of the total: chloroquine 5.5%, cotrimoxazole 3.3%, penicillin V 7.3%, procaine penicillin 12.4%, aspirin 14.2%, and paracetamol 3.3%. Ten visits (5.4%) did not result in a prescription.

It is perhaps worth noting that outpatient fees are very low; fees are K15 for an OPD card, which can accommodate up to 10 visits depending on the compactness of the writing of the clinical officer. When the card is full a new one is issued for K10. Administration of the OPD fee system (staff and stationery) takes up about a third to half of the OPD revenue.

4.9 Rural Health Centres

4.9.1 Introduction

The objective of the study at rural health centres (RHC) was to determine the current level of HIV treatments being provided at health centre level and to ascertain a unit cost per outpatient visit and per inpatient day in order to cost the care of patients recruited into the study, including both patients with HIV infection and those who are uninfected.

Rural health centres in Zambia are supposed to be staffed by one or more clinical officer and midwife, although in practice this is not always possible, particularly in rural areas where a clinical officer may be alone with a cleaner or other general worker. Health centres in both urban and rural areas usually have at least 6 and up to 12 beds, which are primarily used for observation of patients when deciding on a referral or while the family organizes the transport, or for uncomplicated cases which the health centres feel able to cope with such as malaria. Monze district has 14 health centres, of which three are in urban areas (two in Monze and one in Chisekesi) while the other 11 are in rural parts of the district.

Three rural health centres, at Rusangu, Keemba, and Nampeyo were chosen for the study. These were chosen non-randomly on the basis of geographical distribution (see Map in Annex 2.2) to represent the different parts of the district (east, west, and along the road and "line of rail"), and because they were known to be functioning at a reasonable level and to have facilities (toilets) which would permit the use of a urine test for HIV. Rusangu RHC is located along the line of rail only a few kilometres off the main road which bisects the district, at a large Seventh Day Adventist mission. It serves a catchment area of about 5,500 people (others estimate the catchment at 10,000 but the health centre itself uses the figure of 5,500). A Seventh Day Adventist secondary school and preacher training school is nearby. Keemba RHC is about 40 km northwest of Monze in a relatively remote part of the west of the district, near Lochinvar national park. It serves a population estimated at 15,000, including some fishing camps on the Kafue River. Nampeyo RHC is in the east about 35 km from Monze, in the hills which begin to form the escarpment down to the Zambezi valley and Lake Kariba. It serves an estimated 10,000 people.

In May 1992 patients were recruited and interviewed as to their socioeconomic and demographic characteristics, examined for signs and symptoms of HIV disease, and asked to take an HIV test. They were offered the option of being informed of their HIV result; those who wanted to know their HIV result were required to give a blood sample, while people who did not want to be informed gave a urine sample only for analysis using the experimental GACPAT urine test¹. Costing methods used at rural health centres are described in Annex 4.2.

4.9.2 Costs of treatment at rural health centres

The cost of an outpatient visit at each of the rural health centres was comparable, averaging K79; the range was from K83 at Rusangu and K81 at Keemba, to K73 at Nampeyo. At 1991 exchange rates this would be between £0.60 and £0.70. Patients made an average of 5 visits per year, for an annual cost of care at RHC level of K395 or £3.29. In addition to the costs of an outpatient visit, two sets of average inpatient costs were calculated, the first using actual levels of utilization and occupancy, and the second using the 70% occupancy rate achieved at

¹ The GACPAT (Immunoglobulin G antibody capture particle-adherence test) for HIV antibodies in urine was developed at the Public Health Laboratory Services in Colindale (Parry and Mortimer, 1989; Connell, Parry, Mortimer et al, 1990) and tested under field conditions in Monze by one of the original developers (J.V. Parry). It proved acceptable to patients and robust in comparison with the available blood tests in terms of ease of collection and use, transportation and storage of samples, etc.

Nampeyo. At existing utilization rates, the cost per bed day exceeded that of Monze Hospital at two of the centres, with K655 and K699 at Rusangu and Keemba respectively; the cost of Nampeyo was much less at K109, about a third of that of Monze Hospital. But at 70% occupancy, the costs of a bed day fall significantly to K51 at Rusangu, and to K100 at Keemba, costs which are broadly in line with those of Nampeyo at K99. This can be compared with the 1991 estimate of approximately K228-K276 per bed day on a medical ward at Monze Hospital. Interestingly the food expenditure per actual bed day of respectively K105, K333, and K35 is from 3 to 30 times higher than the estimated daily food expenditure at Monze Hospital of K10, indicating that significant wastage or pilferage is taking place.

4.9.3 HIV disease at rural health centres

One objective of the study was to determine the costs of treatment for adults suffering from HIV disease at rural health centres and to ascertain the burden of HIV on the RHCs. RHC patients were tested for HIV; table 4.7 gives information on the HIV seroprevalence of rural health centre patients in the sample. Of 235 patients on whom treatment details were obtained, serology results are available for 199.

Table 4.7. Prevalence of HIV and HIV disease among patients at three rural health centres, Monze District, 1992.

Category	All 3 RHCs n=199	Rusangu n=85	Keemba n=40	Nampeyo n=74
% seropositive	18.6% (n=37)	18.8% (n=16)	22.5% (n=9)	16.2% (n=12)
% with HIV disease (symptomatic)	3% (n=6)	1.2% (n=1)	5.0% (n=2)	4.1% (n=3)

These data show that in 1992 a small percentage of RHC care was actually devoted to the care of patients with HIV disease, and that the burden was falling primarily on the hospital. Only one patient of 235 examined had a diagnosis of AIDS, and 6 were suffering from HIV disease (in earlier stages). The data however also show that the seroprevalence among patients was quite high already in 1992 and that in the near future a growing burden of HIV cases could be expected at RHC level.

The costs of treatment for patients with HIV disease at rural health centre level could not be calculated separately from those of other patients and in practice this is not thought to pose a problem in that there is a very limited range of about 30 drugs and investigations available at rural health centres. Furthermore the number of patients with HIV disease is small, with only 6 of 235 patients meeting the criteria for HIV disease. Therefore the costs of treatment at RHCs have been calculated for all patients without distinction as to HIV status.

4.9.4 Underutilization of rural health centres

The capacity of RHCs in 1991 and 1992 was underutilized for both inpatient and outpatient care. The total numbers of outpatients per week indicate that the three centres saw an average of less than 16 patients per day, or less than 3 per hour. These data may even overstate the usual utilization of the RHCs by outpatients; there were anecdotal reports that attendance may have increased temporarily as people heard that there was a doctor at the RHC and that HIV tests were available. To some extent, this is inevitable given the low population density of the rural parts of the district of about 20-30 per km²; it is not feasible to build health centres within a reasonable walking distance of all the population, so a large percentage of the population lives beyond easy reach of the health centres. Inpatient capacity is also underutilized; on average in 1992 there were only 0.43 inpatients per day at Rusangu which has 8 beds, and 1.2 at Keemba, with 12 beds. Only Nampeyo with an average of 3.7 was using its 6-bed inpatient facility to any extent. Strengthening of the rural health centres' capacity to treat HIV disease would be advantageous for both the population and the hospital which is providing the majority of the care for AIDS and HIV disease; the changes in practice and organization of RHC care which this might require are discussed below in Chapter 6.

4.10 Costs of Home based care

4.10.1 Introduction

In view of the growing pressure on hospital beds and on the outpatient facility, there has been a trend towards discharging patients with HIV disease as early as possible, and to place them under "home based care." Monze Hospital's programme has been widely cited as a model for home-based care (WHO, 1993; Banda, 1992a and 1992b) but its costs have not been fully appreciated. (Foster et al, 1991; Foster, 1994b) The programme involves driving patients home via their local rural health centre where they are, in theory, introduced to the officer in charge

who is briefed on their health problem and asked to remain in touch with them and to oversee their care. They are then driven home and left in charge of their families or household members.

In practice many patients do not want to be taken to their health centre, in some cases due to fear that their HIV status will be revealed by the clinical officer or nurse, or due to great distance from their home to the RHC.

As part of the study of the resource implications of the patterns of care for HIV disease in the district, the costs of the activities of the AIDS home based care team were estimated for 1991. The team's main activities include pre- and post-test counselling of HIV-positive patients, home visits to patients who have been discharged from hospital, and other activities including visiting traditional chiefs and other community leaders, holding seminars, and a community survey on knowledge and intention to change behaviour with regard to HIV. The team is made up of a social worker, a family health nurse, and a driver. The team normally has the use of a four wheel drive diesel vehicle but during the period under study was sharing with the MCH programme whose vehicle was destroyed. The costing methodology is described in Annex 4.3.

TABLE 4.8. COSTS OF HOME-BASED CARE FOR HIV/AIDS AT MONZE HOSPITAL, 1991.
(all costs in Zambian kwacha*)

Item	Total	% of total	Alloc. %	Counselling at MDH	% of costs	Alloc. %	Home Visits	% of costs	Alloc. %	Other Activities	% of costs
Salaries	279,216	17	30%	83,765	83%	53%	147,984	14%	17%	47,467	10%
Vehicle fuel	213,488	13	0%	0	0%	90%	192,139	18%	10%	21,349	5%
Vehicle depreciation	645,682	40	0%	0	0%	90%	581,114	54%	10%	64,568	14%
Allowances	129,000	8	0%	0	0%	90%	116,100	11%	10%	12,900	3%
Drugs	40,482	2	25%	10,121	10%	75%	30,362	3%	0%	0	0%
Stationery	4,414	0	25%	1,104	1%	50%	2,207	0%	25%	1,104	0%
Seminars	170,092	10	0%	0	0%	0%	0	0%	100%	170,092	37%
Community visits	40,250	2	0%	0	0%	0%	0	0%	100%	40,250	9%
Counselling at MDH	6,164	0	100%	6,164	6%	0%	0	0%	0%	0	0%
Community survey	103,360	6	0%	0	0%	0%	0	0%	100%	103,360	22%
Totals	1,632,148			101,153			1,069,906			461,089	
% of total:				6			66			28	
no. of service units:				560			920			n/a	
unit cost/service:				181			1,163				
est. lifetime cost/patient:							5,815				
(assumes 5 visits per patient)											

* All costs in Zambian kwacha. The exchange rate moved from approximately K90 per UK£ in 1/91 to 124 per UK£ in 9/91 or K72=\$US. (parallel market rate = approximately K225=GBP as of 9/91)

4.10.2 *Costs of AIDS related counselling and home based care*

The results of the costing exercise are shown in Table 4.8. The total annual cost of counselling and home based care at Monze in Zambian kwacha was approximately K1.5 million or about £13,200. Of this around K101,000 (or 6%) was spent on counselling activities based at or around the hospital; 66% or K1 million was spent on home based care, and around 29% or K456,000 on other activities including the community survey and seminars.

The costs of home based care are of particular interest. Of the total of approximately K1 million, salaries account for about 14%, allowances for 11%, vehicle fuel and running costs for about 18%, and drugs and stationery for about 3% together. By far the largest element of cost is vehicle depreciation, accounting for 54% of the total. The cost per visit was estimated to be K1163 or approximately £9.69 at current exchange rates. On average the team estimates that each patient is visited 5 times, for a lifetime cost of K5815 or £48. It could be argued that vehicle depreciation should be excluded as the vehicle was provided by an external donor. In this case costs per visit would be approximately halved, at K535 per visit or K2675 lifetime cost (£22).

The study of costs at Monze Hospital estimated the cost of a day in hospital on a medical ward at approximately K250-300 per day. Therefore one home visit costs approximately as much as 3.7 days in hospital. The lifetime cost of home based care is approximately the same as 18 days in hospital, i.e. about the cost of two hospital stays of 9-10 days. Home based care, along the lines of the Monze model, is not cheap, and these costs do not compare favourably with hospital based care, especially since less than 3% of the total was spent on drugs and supplies for the patients, suggesting that the therapeutic value derived from the home based care visits was minimal, especially in comparison with care provided in a hospital.

Neither of the cost estimates includes any costs incurred by the family in providing care, and as noted above, data obtained from interviews with hospital inpatients show that about 60% of inpatients have at least one person helping them while they are in hospital. 75% of these are women, with an average age of 42. It is not clear whether home based care imposes a greater or lesser burden of care than does having the patient cared for in the hospital. In a farming community, for example that of Monze district which is based on production of maize, there are peak periods of demand for labour for preparation of land, planting, weeding, fertilizing, and harvesting, as well as processing (shucking and grinding) and many of these tasks are traditionally carried out by women. As the burden of care seems to also fall primarily on women, the home

based care option may impose unacceptable burdens on the same women who are primarily responsible for food production. These aspects are discussed more fully in Chapter 8 below.

There is also some question as to how well equipped some households might be to take on the care of a seriously ill AIDS patient. In the sample of hospital inpatients (both HIV+ and HIV-) 15.3% said they did not have soap in the house; only 43% got their water from a source in or near the house, while 26% stated that their source of water was 100 m or more from the house.

These results suggest that home based care as implemented in Monze district can be costly and with limited benefit for the patients, and that therefore other possibilities for provision of care for HIV positive patients should continue to be investigated energetically. These might include provision of beds for care at health centres, creation of hospice-type facilities, and so on.

These results also point to the need to make sure that home based care is as effective and useful to the family as possible. Emphasis should be placed not only on the counselling and preventive aspects but on providing practical help in caring for the patient. Provision of such items as soap, towels, bleach, buckets, urinals, bedpans, wheelchairs, etc. could ease the burden on the family and make the task of caring for the patient easier, and would help to justify the expenditure on home based care.

4.11 Summary: implications of HIV disease for the health services of Monze District

The preceding chapter has presented data on the costs of treatment and levels of HIV seroprevalence found in the health services of Monze district, including the hospital inpatient wards and outpatient department, and three rural health centres. In addition, the costs of home-based care for AIDS patients have been discussed. The costs per admission due to HIV disease, excluding TB, were comparable to those of admissions of seronegative patients. However, the high cost burden of TB and increase in the number of cases, points to the need for earlier diagnosis, more efficient outpatient treatment, and possibly prevention of TB through isoniazid prophylaxis. Respiratory tract infections, diarrhoea, and TB combined accounted for 62% of admissions of people with HIV disease.

Many of the HIV-related conditions could be treated adequately at health centre level – provided training and appropriate drugs were made available. Diarrhoea in particular is difficult for families to manage at home without adequate water supplies but usually does not require sophisticated hospital treatment and could be managed at health centres. The care of patients with HIV disease represents a heavy burden on Monze District Hospital. This burden is very likely to increase unless changes are made in the criteria for hospital admissions. However, more efficient use can be made of the resources available, especially those of the rural health centres.

5. Impact of the HIV epidemic on health staff

5.1 Introduction

Health staff themselves are being affected by HIV/AIDS, reducing the health services' ability to deliver care at the same time as demand for health care is increasing, as described in Chapter 4. This chapter presents background data on the situation with regard to human resources for health, nurses in particular, followed by a model to analyse the factors affecting the supply and demand of human resources. As nurses are the largest single category of health staff, and the health services rely critically on their input, the analysis will focus on the issues surrounding the supply of nurses. It will present data collected through the study on the mortality and absenteeism of female nurses at Monze Hospital as well as at neighbouring Choma Hospital, and examine the implications of this mortality with regard to the demand for and supply of nurses. It will then review four options for increasing the supply of nurses in Zambia.

5.2 Background on nursing in Zambia

The advance of the AIDS epidemic through Zambian society has had a major and measurable impact not only on the health services but on the health staff themselves. The demand for the services of health staff, nurses in particular, has increased, and their workload is increasingly comprised of seriously and fatally ill adults of their own age and socioeconomic group. All categories of health staff are affected, but due to the small numbers of groups other than nurses it was not possible to draw useful conclusions about other groups. However, data collected through the project on female nurses, by far the largest single category of health staff, show that the supply of nurses is declining at the same time, due to AIDS-related mortality and absenteeism, and the fear of contracting HIV through occupational exposure is inducing them to seek other types of work. Nurses are the "frontline" workers in a demoralized and underfunded health system, and are therefore blamed for many of its shortcomings.

Two types of nurses are trained locally in Zambia: Zambia Enrolled Nurses (ZEN) with two years of secondary education and a two year training programme, and State Registered Nurses (RN) who have completed secondary school and have a three year training programme. ZENs are trained at nursing schools established mostly but not exclusively at mission hospitals; RNs are trained at University Teaching Hospital and five other schools, and consideration is being given to upgrading the ZEN training programmes at some provincial hospitals to produce RN's. The yearly output of ZENs is about 250 and

of RN's about 200. (Ministry of Health, 1991) Currently there is on paper at least an "over-establishment" i.e. more nurses in post than posts, but the numbers of posts have not been revised since 1973 despite the fact that a number of facilities have been built or expanded. The capacity for expanding nurse training is limited, with most of the larger mission hospitals already training about as many as they can manage given the severe shortages of tutors and other higher level staff. At the same time, given the general shortage of nursing staff, many mission hospitals would not be able to provide adequate levels of patient care without the work put in by the student nurses, who are asked to take on increasing levels of responsibility with less intensive supervision.

The demand for nurses (and other categories of health staff as well) is such that virtually all nurses can find employment, although not necessarily where they might like it. Nurses are allocated by the Ministry of Health to posts in all MOH and mission facilities, so are not free to move wherever they choose, unless they leave the government service for the private sector, which although more remunerative, provides less security and less in the way of fringe benefits. In health the shortages of staff are such that recently the Minister of Health has "called on pensioners to help fill...vacancies in the health services including 10,000 nurses and 550 doctors. 'Retrenchment in my Ministry does not exist.'"¹

Many nurses in Zambia have not explicitly chosen nursing as a career². Nursing does have its attractions however, which include the prestige of a uniform (very similar to the nurses uniforms worn in the UK). Other alternatives available to young girls with a few years of secondary school include teaching and secretarial work. Teaching may be less attractive than nursing if it involves being posted to a remote rural school, whereas nursing is more likely to lead to an urban posting which most people want. Many nurses who leave the profession go into secretarial or receptionist work.

In order to promote a sense of nationality, as opposed to ethnic identity, the Government has practised a policy of not posting people to their home areas. This policy has succeeded in creating a sense of national identity and in making ethnic considerations in Zambia much less important politically and socially than in virtually any other country in the

¹ Daily Mail, 22 August 1992, cited in News from Zambia, no. 599, 10-31 August 1992.

² At the graduation ceremony of the Monze ZEN Nursing School in 1992, the Bishop of the Diocese of Monze acknowledged this, saying that "some of you did not choose to do nursing, but God chose you."

region. Many individuals are also in favour of the policy of being posted outside their home area as a way of managing, or even escaping the demands of relatives for favours, loans, etc. It has perhaps a disadvantage in that nurses, for example, are not looking after people with whom they have a great deal of natural affinity or even understanding, and the resulting cultural and social gap may be quite wide, resulting in poor quality care and friction. They have a reputation for rudeness and even cruelty towards patients. (World Bank/Euro Health Group, 1993).

In part these problems of attitude towards nursing may be a result of low pay. Nurses, like other public sector employees, are not well paid in Zambia. Virtually all professionals in Zambia (outside of the mining industry) consider themselves to be underpaid, and the drain of Zambian professionals to other parts of the region would tend to bear out the fact that they are comparatively poorly paid. Only about a third of the doctors who have been trained in Zambia are currently practising there. Nursing salaries are very low; a typical Zambia Enrolled Nurse's salary in 1991 was about K4,500 per month, or £37.50. A registered nurse could expect about K7,500 or £62.50. (By comparison, a nurse in Botswana could earn 3-4 times this amount, and would be offered a loan to buy a car -- something which is beyond imagination of most nurses in Zambia.) The difference between a nurse with 20 years' service and a new graduate was minimal, amounting to only about £2 equivalent, and this caused a problem of incentives for those with longer service.

Housing is a major benefit provided to nurses and other staff, either in the form of a government house or a housing allowance, and housing allowance was until recently a major part of the compensation package, which in many cases actually exceeded the salary. But it was not granted to everyone, and married nurses in particular were expected to be housed by their husband's employer. There could be great inequity between staff who received housing allowance and those who did not; and the situation was often a cause of much friction between hospital management and staff. The new government which came to power in 1992 abolished housing allowance, instead doubling salaries for everyone; this meant that salaries were approximately equal for all categories of staff. Salaries have been increased more than 200% since 1991, in an attempt to keep pace with inflation and reduce worker unrest.

In April 1992 both nurses and doctors in the larger urban hospitals in Zambia went on strike, demanding higher wages and better working conditions. The nurses were particularly incensed by the new Minister of Health, a surgeon, who implied that nurses were

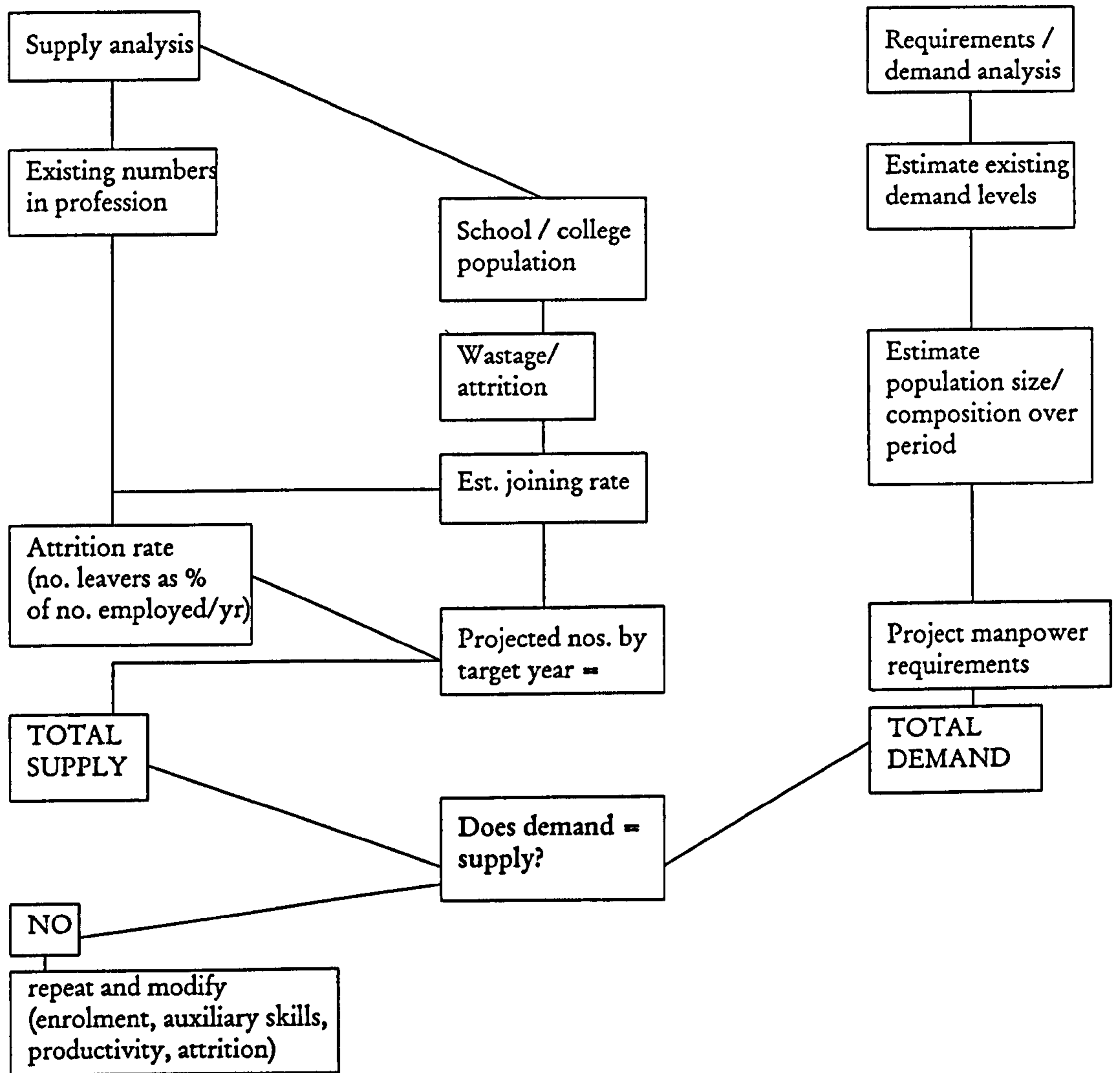
not "professionals". They were also complaining that their salaries were being matched with those of teachers who had less training. As a result of the strike, the public opinion of the nursing profession in Zambia hit a low point. The strike lasted for about two months and during that time there was considerable attention in the press, lamenting the poor performance of nurses, their rudeness, and even accusing them of pulling the IV drips out of patients and removing the mattresses from the wards so that the patients wouldn't stay on despite the strike. (Mukula, 1992) Only a few journalists defended the nurses. Underlying the problem was the overall deterioration of the health services; patients often tend to blame the shortages of drugs and other essentials on the most readily available person -- usually a nurse. Often decisions such as the use of a limited supply of oxygen were left to nurses, which created friction with patients and their families.

Another factor which had not received much attention in the press, however, was the shortages of nursing staff. With the staff shortages, nurses were having to tend to many more patients than should have been the case. At the 1800-bed University Teaching Hospital, for example, there were reported to be only 500 nurses effectively in post where there were supposed to be 1,000. (Chirambo, 1991) The extent and causes of the nurse shortage will be examined in more detail with data from Monze and Choma hospitals below.

5.3 A model of the supply and demand of health manpower

The "Baker framework" (figure 5.1) provides a useful model for the analysis of the health manpower situation in Zambia. On the right side are the factors affecting the demand for health services, and on the left, the factors affecting supply of health staff. A description of the additional demands for health care generated by the HIV/AIDS epidemic was presented in Chapter 4 above, and is summarized briefly below. In this chapter the factors affecting the demand for and the supply of nursing staff in Zambia will be considered, and an estimate made of the overall net supply of nurses on a national level.

Figure 5.1. The Baker Framework for health manpower planning.



Source: Hall, 1974.

5.4 The demand for nurses in Zambia

The situation described in Chapter 4 creates a large and growing demand for health services, largely the result of the AIDS epidemic and related epidemic of tuberculosis. Although data are not available, it seems reasonable to assume that prior to the HIV/AIDS epidemic the pattern of morbidity and resulting admissions to the health services involved a greater number of other diagnoses, many of which have been displaced by the needs of people with HIV/AIDS. The extent of this displacement might be of the same magnitude as the percentage of bed-days now devoted to the care of people with HIV/AIDS -- approximately 30%.

Other characteristics of the health services in Zambia further increase the demands for *hospital care*. These include the maldistribution of staff and other essentials such as drugs and supplies in favour of hospitals and urban areas. (World Bank/EuroHealth Group, 1993) These in turn give rise to a pattern of referral and self-referral to hospital services even for illnesses which could be treated at health centre level. Due to the sparse population in rural areas, maintaining an adequate network of rural health centres is very costly and difficult to ensure. The population's perception of the poor attitude of some staff, female nurses in particular, leads them to attend services where they have a better chance of being seen by a doctor or male clinical officer -- which are also the services which are more likely to have adequate drugs and supplies.

In any case, even if some of the characteristics of the demand for health services can be modified, the *overall* demand for health services is likely to keep rising for the foreseeable future due to the high rates of HIV seroprevalence in the population, the problem of health staffing will have to be approached from the perspective of increasing supply.

5.5 The supply of nurses in Zambia

The HIV epidemic is having a direct impact on the supply of nurses in several ways. These include HIV-related mortality and absenteeism, and the absenteeism caused by the sick leave preceding the death, the need for nurses to look after other ill family members, and the need for time off to attend the numerous funerals. These factors are in turn affecting the ease with which young people can be induced to become nurses, as well as the rate at which existing nurses are leaving the profession.

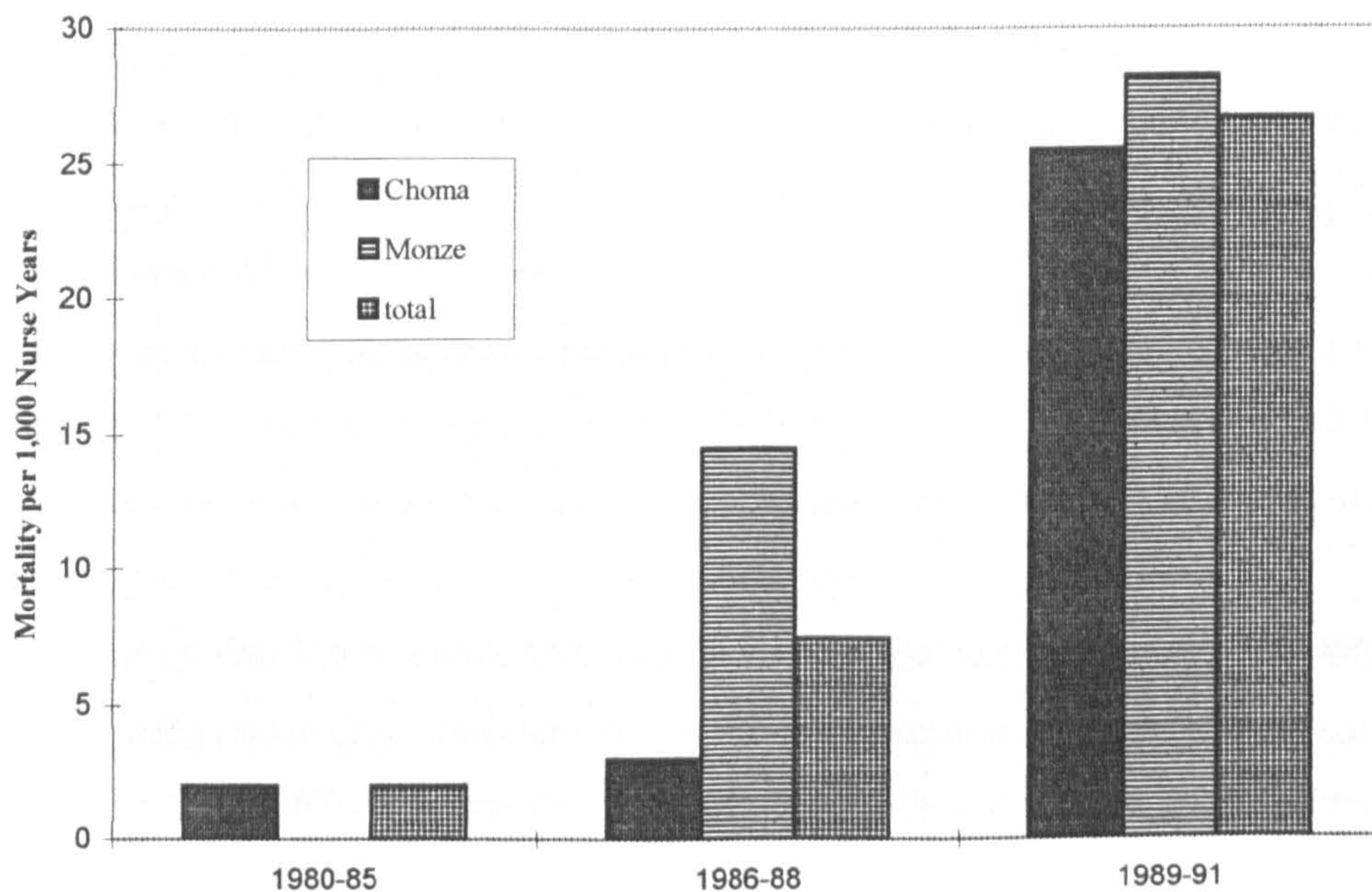
5.5.1 Causes of attrition of nurses

5.5.1.1 Mortality and absenteeism

As noted above, shortages of nurses were being experienced in hospitals. The study investigated the mortality and absenteeism of nurses in Monze and Choma hospitals, and found that there was indeed grave cause for concern. Both mortality and absenteeism had increased greatly since 1980. Mortality among female nurses has increased from 2 per 1,000 nurse years in 1980-85 to 26.7 per 1,000 nurse years in 1989-91 (Buvé et al, 1993). Mortality continued to increase in 1992, and had reached an estimated 4% by 1995. (Dr C. Mbwili, personal communication) Most of this increase in mortality was HIV-related.

Figure 5.2. Mortality of female nurses in two hospitals, 1980-1991, Zambia

Source: Buvé et al, 1994.



Absenteeism among nurses in the same two hospitals had also increased, to about 15.4% of nurse-days. (Buvé et al, 1992) Combining the information from both hospitals¹, it

¹ Combining the data from the two hospitals presents several problems in that the policies regarding sick leave and holidays appear to differ, with the average number of sick days per episode in one hospital being 56 and in the other, 10; and the amount of holiday time a nurse is allowed to carry over differs between the hospitals as well.

appears that as much as 5.5% of this (the equivalent of 2,048 nurse days in the two hospitals, or 9.3 nurses at a work year of 220 days) is potentially AIDS-related, with the rates varying from 6.5% at Choma Hospital to 3.8% at Monze Hospital. Of the combined total, 3.5% is attributable to sick leave for the nurse, 1% to care of a sick relative, and 1% to attending funerals. The "background rate" of absenteeism in the absence of HIV would be about 10%, with holidays accounting for 4.2% and maternity leave for 4.5% of leave days. (Buvé, Mungo et al, 1992) At Monze Hospital, therefore, the total absenteeism burden would be the equivalent of loss of about 16.9% of nurse-days, of which 3.8%, or the equivalent of 2-3 nurse-years, were potentially AIDS-related (and 6.3% due to holidays).

5.5.1.2 Retirement and other causes of attrition of nurses

The average nurse begins her career at about 18 and retires at 50, for a career of approximately 32 years. Nursing training has expanded in recent years, so it is likely that the age distribution of nurses is biased towards the younger age groups. The Ministry of Health does not have data on the ages of the nurses in service. If the age distribution was even, normally about 3.1% of nurses would retire each year. However, as noted above, the age distribution is skewed. In the absence of better data, a more reasonable estimate of current annual retirees would probably be on the order of 2.5%. Nationally, this would mean 216 post-holders would retire each year.

Some nurses quit nursing before retirement age. These losses of active nurses who quit nursing for other work are reported to be important, but no data are available, and it is possible that their importance is exaggerated by anecdotal reports. If 1% of nurses leave each year, this would mean the loss of about 860 post-holders.

Nurses also leave service temporarily to undergo further training. However, as this training usually involves a considerable on-the-job component, their labour is not actually lost to the health services during their training (and they continue to receive their salaries). The further training is also meant to increase their productivity. Therefore the "loss" of nurses undergoing further training has not been included in the estimates.

5.6 Implications for the national supply of nurses

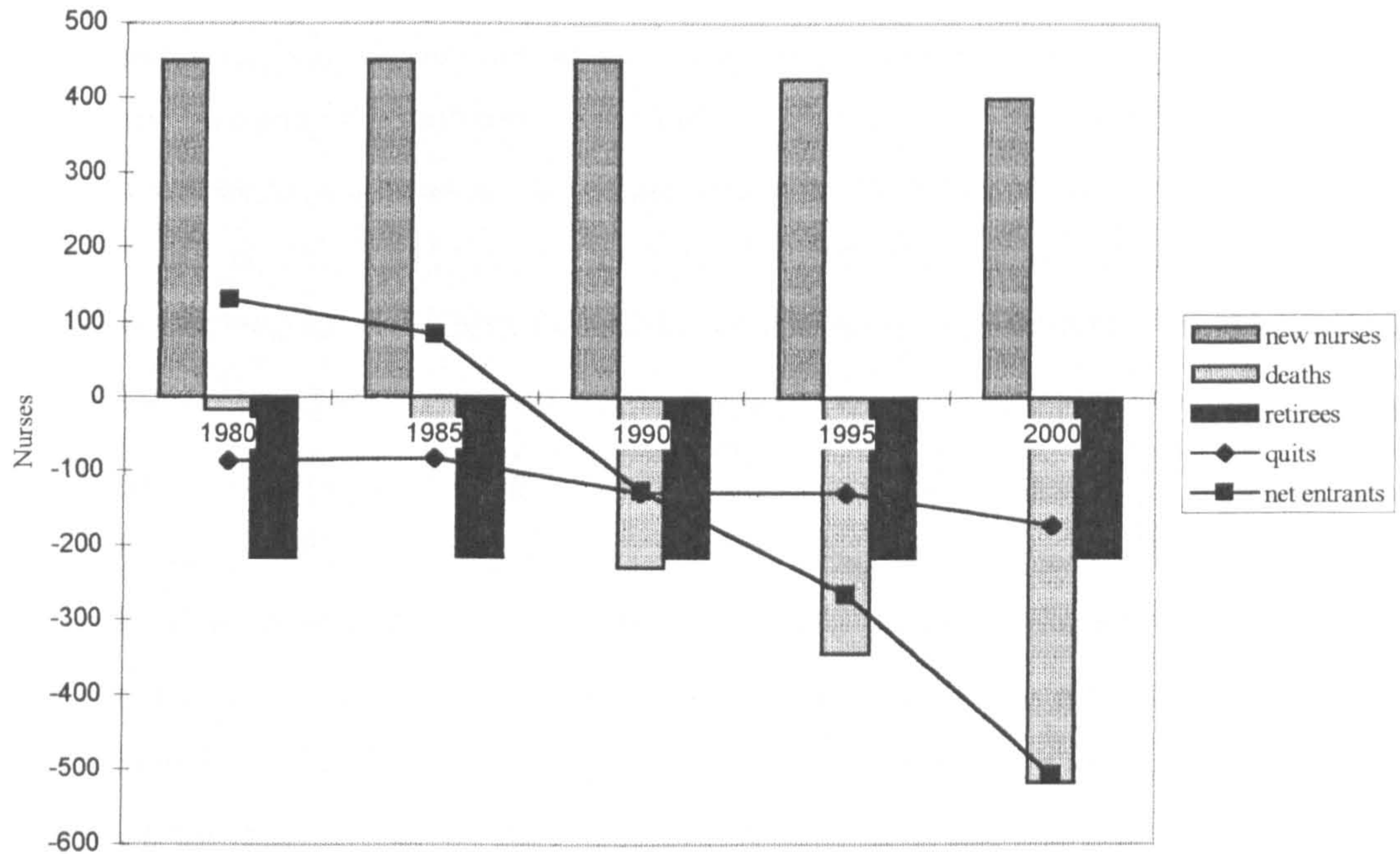
There are clear limitations to the applicability of these findings at national level. The sample is small and there may have been circumstances which caused higher rates of mortality and absenteeism at these two hospitals, although no such factors have yet been

identified. There are reasons to believe that the data from Monze and Choma represent a conservative estimate of the implications of HIV/AIDS for the nursing. Monze and Choma are both hospitals in the "line of rail" and are thereby more urbanized than truly rural health facilities might be. On the other hand, the high rate of urbanization of Zambia as a whole means that the majority of health staff are found in urban areas, where HIV seroprevalence among the community is higher. With these considerations in mind, an estimate of the implications of these findings for the national supply will be made.

Nationwide, if these figures are representative, the losses to HIV-related absenteeism at 5.5% would be the equivalent of 460 nurse-years. Likewise, if these mortality losses are representative of the general situation, then losses to mortality at 2.67% would be 233, and at 4% per year, 345. In Monze Hospital this would be the equivalent of between 1.4 and 3.2 of a complement ranging from 51 to 84 nurses.

Other factors reducing the supply of nurses include retirements, quits, and nurses leaving for additional training. The average nurse begins her career at about 18 and retires at 50, for a career of approximately 32 years. Assuming 2.5% retire each year, this would mean a retirement of 216 per year. Assuming an additional 1% of nurses quit nursing each year, this loss nationally would be about 86 nurses per year. The approximate numbers of nurses in each group can be summarized as follows: 8630 existing nurses, of whom 216 would be retiring in the current year (2.5% of the total per year) and 86 would be quitting for other reasons. There would be an estimated 450 new entrants, declining progressively as it became more difficult to recruit new nursing students, and as nursing students themselves were lost to HIV disease.

Figure 5.3. Impact of attrition and losses on supply of nurses in Zambia, 1980-2000.



Although the government does not keep records which would allow verification of these estimates, the implication is that the net number of new entrants to the nursing profession became negative somewhere between 1985 and 1990, and that there were not enough new entrants to fill existing vacancies. The net loss by the year 2000 is projected to be approximately equivalent to the number of new entrants. In other words, in order to achieve a steady state whereby all established posts could be filled without undue delay, the number of nursing students would have to double by the year 2000. Alternatively, other measures or combinations of measures, could be envisaged. These options are presented and reviewed below.

5.7 Measures to increase the supply of nurses

Four options are possible in order to increase the supply of nurses. These include increasing enrolment of nursing students; reducing attrition; increasing productivity of existing nurses; and developing auxiliary categories of staff to meet some of the demand. The factors affecting each of these will be examined. For the analysis of the measures to increase the supply of nurses it is useful to consider three categories of nurses, namely nursing students, nurses in service including those who are about to retire, and those who

have retired within the past few years (aged 51-60) or left nursing before retirement age and who might be called back into service. Taking the past ten years' leavers as a group, this would include an estimated 2430 ex-nurses, of whom about 1630 would have retired from nursing at age 50 during the past nine years, and would be aged 51-60 and therefore possibly eligible and willing to return to work. There might be another 860 or so, who would be people who had at one time been nursing but who had left sometime during the past 10 years, before reaching age 50. These figures do not take account of mortality either before or after retirement and therefore probably overestimate the size of the group.

5.7.1 Measures to increase the enrolment of new nurses

The capacity of the existing nursing schools to expand their output depends on two factors, namely the supply of secondary school graduates who are attracted to nursing, who can pay the school fees, and the ability of existing schools to take on more student nurses. With the difficulties affecting the nursing profession described above, the attractiveness of nursing as a profession will be declining and it will be more difficult to attract new applicants, as compared with other demands for secondary school graduates. Other sectors will be similarly affected by loss due to HIV/AIDS and the private sector will have more flexibility with regard to wages and terms of service, and thus be better able to attract applicants from the existing pool of graduates.

The cost of training new nurses is not large, as much of their training involves on-the-job training on the wards, mostly provided by nurses in active service (as opposed to teaching nurses). However, expansion of the numbers is constrained by limitations on the physical facilities, i.e. classroom and dormitory space. There are no plans, or funds available, to expand the nursing school. But more important are the limitations on the availability of teaching staff. At Monze Hospital, for example, two expatriate volunteer tutors running the programme were replaced by Zambian tutors. One of these tutors died; it was not possible to find a replacement for a number of months due to the shortage of appropriately trained personnel. Nursing training suffered, with less supervision being given to each student. It is likely that in the medium term, increased reliance will again have to be placed on expatriate tutoring staff, and that therefore the cost of training of nurses will begin to rise. Another important factor is that the rates of HIV infection among student nurses is high (the background rate in the community among women of that age group is over 30%), and some

of those in training will never enter nursing or will have short careers. For these reasons, the supply of new nurses is inelastic in the short run.

Ways of increasing the numbers enrolled would include increasing the intake of nursing schools and shortening the course. The issue of attracting the limited number of available adequately trained secondary school graduates into nursing would have to be addressed; and the relative importance of a higher salary, better working conditions, or other factors needs to be investigated. It seems likely that given the exposures of the AIDS epidemic, nurses will become even more scarce and difficult to attract into the profession, and that eventually they will have to receive a significantly higher salary than other less exposed professions.

5.7.2 Measures to reduce attrition:

5.7.2.1 Raise the prestige of the nursing profession

Measures to retain nurses might include improving their salaries, paying additional bonuses for nurses involved in direct patient care, and providing a more interesting career structure or training and advancement opportunities. Nurses are in general poorly paid, and often resort to striking; yet public chastisement of the nursing profession does little to encourage new entrants. In general any measures which would raise the status of the nursing profession would be helpful in recruiting new nurses and retaining existing ones.

5.7.2.2 Protective measures and universal precautions

Increasingly Zambian nurses are becoming aware of, and frightened by the risk of becoming infected by HIV in the course of their work. While one of the few published studies of occupational exposure carried out to date in Africa showed no evidence of association of HIV seropositivity with patient contact (Mann et al, 1989) nurses in Zambia are understandably concluding that the HIV-related mortality among nurses is occupationally related. Theatre nurses in Zambia have called for an AIDS allowance.¹

Not enough has been done to make the health workplace a safe one; measures to increase use of precautions and sterile technique should command high priority. The publication of the 1986 study (Mann et al, 1989, Ngaly et al, 1988) showing a lack of occupational exposure in Mama Yemo Hospital in Kinshasa appears to have contributed to

¹ "Nurses want AIDS allowance." Times of Zambia, 9 April 1992.

some complacency on the part of health service managers and donor agencies, with the former failing to make the case for precautions to the latter whose support would be needed for funding the required supplies. But nurses and midwives need to feel confident that measures have been taken to protect them from the real dangers of blood spill, needlestick, etc. Priority should be given to items such as gloves for risky procedures (including long-sleeved gloves for deliveries) and either sufficient disposable needles to allow them to be discarded, or enough reusable needles and fuel to enable them to be properly sterilized and cooled without slowing down the patient flow. Further research into the role of occupational risk factors is needed, as well as an evaluation of the true economic cost of the loss of a nurse and the role investment in protective measures could take in mitigating that loss.

5.7.2.3 Retaining existing nurses by reducing quits

Retaining the existing nurses in post is made difficult by a number of factors relating to pay, to the difficulties of the job and the low prestige attached to nursing at present (see above), and increasing competition for trained staff from other sectors with better working conditions and flexible benefits. With regard to pay, the problem is that the starting salary is very low, and the pay differential between a new nurse and a nurse with say 20 years experience is minimal, on the order of 6% (compared with a differential exceeding 100% in many European countries). Housing allowance or a government house was provided in the past and formed an important part of the remuneration package, but this was eliminated in 1992 in favour of an all-pay compensation package.

5.7.2.4 Raise the retirement age

The mandatory retirement age of 50 would seem to be a prime area for revision; offering nurses the option of staying on to 60 or beyond would do much to increase the pool of experienced nurses. If 2.5% of nurses retire annually and nurses up to the age of 60 were recalled, the number of nurses in service could be increased, at least in theory, by about 25%.

5.7.2.5 Reduce quits and bring back retirees

The extent of the phenomenon of nurses quitting to take up jobs elsewhere, either in nursing or in other fields, is poorly documented. It is reported to be considerable; nurses leave for private sector jobs either in nursing or other work; and are leaving for nursing posts

elsewhere, most recently in Botswana. The reasons for the quits are also undocumented; salary levels are probably the most important consideration, but other factors might include the small differential between new nurses and nurses with many years' experience; unsatisfactory working conditions; and fear of HIV/AIDS. Zambia's economic situation would indicate that it will not be able to compete with salaries offered in Botswana or South Africa. It could, however, attempt to retain nurses who want to stay in Zambia through payment of incentives, and provision of protective measures. More experienced nurses could be given additional responsibilities and be paid accordingly. If all the nurses who had quit in the past ten years could be induced to return, assuming the quit rate had been about 1% each year, then the potential increase of nurses could be theoretically as high as 10%.

5.7.2.6 Increase productivity

Several measures could be taken to improve the productivity of nurses and other staff. One would be to reduce the administrative burden to a minimum. Another would be to address the maldistribution in favour of urban areas of nurses (and other staff); in some cases staff are unproductive because there are too many staff for the existing patient load, and in others they are unproductive because there are too many patients for the nurses to look after properly. This might involve provision of incentives (financial or housing) for people to work in rural or other underserved areas (or disincentives to work in popular areas). The low population density in some rural areas probably does not warrant the maintenance of a health facility, but to close a health facility is politically difficult, so some inefficiency must probably be accepted. The danger in this is that the natural tendency of staff to want postings in urban areas, combined with their increased negotiating power brought on by the scarcity of their skills, will mean that urban posts become comparatively easier to fill while rural posts become even more difficult to fill, and the rural areas become even further penalized with regard to staff distribution.

In some cases staff are unproductive because needed supplies and drugs are not available; this gives rise to frustration and is a major factor behind the preference for urban postings. And finally, when staff salaries are too low, are not paid on time, or are not paid at all, productivity drops because people tend to have to take on other jobs (including "moonlighting") to make ends meet.

5.7.2.7 *Use auxiliary staff*

One further possibility would be to introduce new categories of lower-level staff to take on routine nursing tasks. The category of "care auxiliary" exists in other countries but not in Zambia, partly due to the influence of the nurses' council which opposed the move. The establishment of such a category would have to be negotiated with nurses, but if these people were viewed not as competition for nurses, but as assistants who they would supervise, it might be possible to win political backing for such a move. They would be provided with a shorter training course of perhaps six months. Unfortunately, as an attempt to raise the low prestige of nurses in Zambia, the trend is rather towards upgrading some of the ZEN schools to produce RN's. (Ministry of Health, 1991) This move would *reduce* the capacity of the existing training facilities to produce nurses by extending the length of the course, although those who graduated would have a higher standard of training.

Auxiliaries have the additional advantages that since a lower educational level would be required, more could be recruited and trained in rural areas, and they would be more likely to remain there. The skills of auxiliaries would be less transferable and marketable in either the private sector or abroad, so attrition and migration might be reduced. Their training would be shorter and less intensive, and therefore less costly; more of them could be trained for a given expenditure.

Another way to cope with the shortage of nurses in the hospitals is to take explicit account of, and make better use of, the efforts of family members and other carers. Family members, although often perceived as a nuisance by hospital staff and frustrated in their efforts to keep their relatives comfortable, nonetheless provide a significant (and increasing) amount of nursing care in Monze (and elsewhere). They could further alleviate the burden on trained nursing staff if more was done to encourage and facilitate their assistance, through explicit provision of a safe place for such carers to stay, bedding, food or cooking facilities, convenient visiting hours, etc. Deriving full benefit from their input would involve training and supervision of relatives' work by some of the nurses, as well as personal skills and patience. This investment might pay off in improved quality of care for patients at home, possibly even reducing the need for readmissions in a few cases.

5.8 Summary

Clearly the findings regarding mortality and absenteeism have important health policy implications. Despite their generally higher than average educational and socioeconomic level, good level of knowledge about

HIV transmission, access to good quality health care, and direct experience of HIV-related illness, nurses are being lost at an unsustainable rate. Of course nurses are not the only category thus affected; clinical officers, laboratory technicians, x-ray technicians, and doctors are also affected. It might be argued that of all the categories of health personnel working in a hospital, nurses are the category for which substitutes are most easily found, and that therefore in a situation of resource scarcity, emphasis ought to be placed on expanding the training of laboratory technicians, clinical officers (who take on much of the work of medical doctors), and other specialized personnel while allowing more of the nursing function to devolve to lesser qualified care assistants and family members.

The HIV epidemic is having a major impact on the characteristics of nursing in Zambia. It is largely responsible both for the increase in workload of the hospitals, and for the shortage of nursing staff. They are expected not only to care for the sick but to counsel and provide advice for those who test HIV-seropositive. However, although the demand for care of people with HIV disease is significant, with 30% of bed days at Monze Hospital going to the care of people with HIV disease (chapter 4, above) there are no plans to increase significantly the number of beds available; emphasis is rather on using existing beds more effectively, including beds at health centres which are currently under- or unutilized. It seems likely therefore that while the needs for nursing skills will increase, this will not be backed in the short run by effective supply in the form of new nurses. The result of this increasing workload, involving a young patient population which is very ill with high mortality, distressing symptoms, and the perception of the risk of infection, will be to make nursing even less attractive and to increase the loss of trained nurses. This will require the adoption of measures to increase enrolment, reduce attrition, increase productivity, and make better use of the inputs of auxiliaries and family members.

6. Wealth and socioeconomic status in Monze District

6.1 Introduction

In this chapter, socioeconomic data collected in the community survey are used to investigate the levels and distribution of income and socioeconomic status (SES) in Monze District. This will in turn make it possible to situate the patients within the community (described in chapter 7 below). This chapter describes first some general problems with the measurement of income and wealth, and some of the previous work on the measurement and distribution of income and SES in Zambia. Results of surveys carried out in the district which were used to inform the choice of measures and proxies used in the study are presented. Finally the findings from the community survey regarding income and wealth distribution, and other measures of SES are presented.

6.2 Measurement of income and socioeconomic status

As noted in Chapter 1 and Annex 1, welfare economists are traditionally reluctant to attempt to measure individual wealth and to make interpersonal comparisons. Some economists argue that there is no acceptable or scientific way to compare utility across households. Others, however, point out that if one is prepared to accept (and specify) some assumptions regarding measurability and comparability, welfare functions can be constructed. (Johansson, 1991) In order to make progress and be able to use the data collected, it is necessary to accept the possibility and usefulness of the concept of a social welfare function; and without a social welfare function, it would not be possible to establish a shadow price or a social price unless we are able to at least infer what policies regarding e.g. income distribution a government intends to pursue.¹

As the consumption of goods is widely accepted as a basis of economic welfare, Deaton (1980) proposes that a solution to the measurement problem may be to take a "standard or reference bundle of commodities" to measure welfare. He points out that if the bundle varies strongly with income or taste, this may not be applicable, but "some such methodology is frequently relevant in measuring welfare for individuals close to poverty." The question then arises as to what should be included in the "bundle". Grandin (1988) in a

¹ A government may state its intention to pursue one policy while either actively pursuing a quite different policy, or at least failing to take the necessary steps to implement its stated policy. An example is the United States government's taxation policy which is progressive on the face of it, yet nonetheless allows many tax "loopholes" for the wealthy to reduce their obligation, often to near-zero. The government thereby allows its stated policy to be undermined. Ex-hotel magnate and convicted fraudster Leona Helmsley explained that "only the little people pay taxes".

practical manual designed to help identify households to be targeted by agricultural projects, outlines a method whereby "key informants" who are familiar with a community are given cards with the names of each household head and asked to place them in piles according to wealth; she stresses the need to identify the local concept of wealth and suggests land holdings, wages, livestock, etc. as possibilities.

6.3 Other work on income in Zambia

6.3.1 National level surveys

James Fry (1979) has identified four types of income differential which drive the distribution of income in Zambia. These are the urban/rural differential, the local/expatriate differential, the skilled/unskilled differential, and differentials between sectors. One of Fry's main concerns is the urban/rural income gap; he observes that until 1945, incomes of urban African wage earners were about twice those of peasant farmers; but that with the rapid rises in urban wages brought on by the copper boom during the Korean war, the ratio rose to 3 by 1953, and to 5 by 1963.(Fry, 1979) In contrast to this gloomy picture, however, one of the interesting findings from Fry's work is that although the barter terms of trade, i.e. those measuring the purchasing power of agricultural produce in terms of goods bought from the urban sector had fallen by about 20% from 1964 to 1972 due to government intervention to control the prices of agricultural produce, at the same time peasants' cash income had more than doubled, due presumably to diversification into non-agricultural sources of income and remittances. He concludes that peasant farmers had become twice as well off during that period.(Fry, 1979)

Further work focusing on the rural/urban income gap was carried out in 1982 by the ILO's Jobs and Skills Programme for Africa (ILO/JASPA) in 1982 (although most of it was based on data collected earlier). As expected, the study found that on average in 1974-75 rural households had about one quarter of the income of urban areas; but of greater interest was the finding that these figures concealed large overlaps between groups, with a Lusaka shanty-town household having an income only half that of a Southern Province medium-scale farmer's household, as well as large inequalities within groups. (ILO/JASPA, 1982)

The ILO/JASPA study also makes use of data gathered in 1975 in a nationwide survey by Marter and Honeybone of rural incomes from the sale of crops, which ranked households in four groups, not by income but by "advantage" in access to productive resources; the criteria for a household to fall into group 1, least advantaged, included "shortage of labour resources due to migration, illness, or family breakdown....[such

households] are therefore partially dependent on non-agricultural activities." The study showed very wide variations both among provinces and within provinces and one conclusion was that in rural areas "some households (about a quarter) are very poor indeed." (Marter and Honeybone, 1976) The data they collected from 99 households in Southern province, and the nationwide totals from 683 households, are summarised below in Table 6.1.

Table 6.1. Annual rural household incomes from the sale of crops in Southern Province and Zambia, 1975, in kwacha*.

Southern Province	(1) No. of HH	(2) Population	(3) Mean HH Size* (a)	(4) Mean crop income/HH	(5) Mean crop income/person (b)
Group 1	37	184	5.0	3	0.67
Group 2	37	262	7.1	73	10.3
Group 3	14	90	6.4	201	31.2
Group 4	11	118	10.7	647	60.3
Total	99	654	6.6	127	19.5
All Zambia					
Group 1	278	997	3.6	6	1.7
Group 2	246	1465	5.9	40	6.7
Group 3	100	678	6.8	155	22.8
Group 4	59	600	10.2	805	79.2
Total	683	3740	5.4	109	19.9

* In 1975 the exchange rate was K 0.643 = US\$1.

(a) Derived from columns 2 and 3.

(b) Derived from columns 3 and 4.

Source: Marter A and Honeybone D (1976). The economic resources of rural households and the distribution of agricultural development. The University of Zambia Rural Development Studies Bureau (December 1976), cited in ILO/JASPA, 1982.

Although the original survey is not available, and the methodology for classification of households cannot therefore be described fully, nonetheless a number of useful findings emerge from this table, in particular the evidence of wide disparity of incomes within the rural areas. First, larger households had larger incomes both on a household and on a per capita basis, with the poorest households having only 3.6 persons (including children) on a nationwide basis, and about 5 in Southern Province; both nationwide and in Southern Province, the richest households had an average of about 10 people. Secondly, in Southern Province the per capita income from crop sales of the lowest group (Group 1) was about 90 times less than that of the richest group; on a nationwide basis the differential was 47 times. This disadvantaged group accounts for 27-28% of the population in both samples. In Southern Province the per capita cash income from sales of crops of the lowest group amounts to only 3.4% of the *average* income; and the per capita income of the next highest group is still only about half of the average. Although it has been mentioned above that income from the sale of crops is only one of the possible sources of cash, and that overall

the rural inhabitants' lot appears to have improved greatly in terms of cash income, these data nonetheless point to the existence of a large fraction of households without any significant cash income.

6.3.2 Data from Southern Province and Monze District

In addition to the work described above, some work was done by the colonial administration specifically on Southern Province and on Monze District (formerly a part of Mazabuka District) which also suggests that wide income disparities existed within the rural areas. Chipungu (1988) has described in detail the process of peasant differentiation which began in Southern Province in the 1920s and 1930s whereby some peasants gained access to a plough, usually through proximity to missions, which permitted the accumulation of wealth. Further opportunities for peasant farmers were presented by the Second World War, and some were able to take advantage of these to further increase their wealth. (Chipungu, 1988) A survey of expenditures carried out by the colonial administration in 1945 found that income and wealth inequalities among the African farmers living in Monze district (formerly part of Mazabuka district to the north) were pronounced. In the terminology of the survey, African peasants were classified into three categories, i.e. subsistence or "poor", middle or "smallholder", and rich or "African farmers". Some of the main findings as regards these groups are reproduced below in Table 6.2.

Table 6.2. Expenditure by rural Africans in Mazabuka (including Monze) District, 1945, in kwacha equivalent.

Characteristics of expenditure group	Poor or subsistence	Middle or smallholder	Rich or African farmers
% of population	85%	14%	1%
average sales of maize (bags)	0-9	11-100	>100
Total expenditure by Head of Household (in kwacha)	10.3	67.3	755.4
of which:			
cash savings	0.45 (4%)	1.4 (2%)	179.8 (24%)
expenditure on clothing (%)	4.8 (52%)	31.5 (47%)	80.8 (11%)
expenditure on food (%)	0.3 (8%)	0.5 (1%)	37.7 (5%)
expenditure on taxes (%)	1.4 (13.6%)	1.1 (1.6%)	1.5 (0.2%)
expenditure on capital goods and implements (%)	1.1 (11%)	17.2 (25%)	130.6 (17%)

Source: Allan, Gluckman et al, Land holding and land usage among the Plateau Tonga of Mazabuka District: a reconnaissance survey, 1945, Rhodes-Livingstone Papers, no. 14, 1948, cited in Chipungu, 1988. Expenditure data converted from British sterling by Chipungu. The kwacha equivalent was approximately UK£0.58 at the time.

No information is available on how these data were collected, and it seems likely that respondents would have reason not to give accurate information to representatives of the administration. But while care must be taken not to infer too much from these data, they do seem to indicate that by 1945 a marked differentiation and inequality among the African farmers had been created, with the highest 1% of the population having an expenditure level approximately 75 times greater than the poorest group of subsistence farmers. Expenditures on capital goods and implements are nearly 120 times greater in the high income group than in the low income group.

The data from the survey also indicate that a highly regressive taxation system was in place; expenditures on taxation and licenses were almost identical for each expenditure group, yet for the lowest group this tax represented nearly 14% of expenditures whereas for the top 1% the tax represented only 0.2% of expenditure. This is explained in part by the fact that in addition to raising revenue, one of the objectives of the head tax was to create a labour market by forcing people to offer their labour for wages, and most of the workers would of necessity have to come from the poorer segments of the population. Indeed it would have been counterproductive for the administration to have driven the more successful farmers off their farms in search of even higher wages in order to pay a more progressive, and therefore higher, tax. But clearly the burden of this tax on the lowest

income groups was very heavy.¹ European workers and settler farmers were not taxed until after the First World War, and even then the maximum marginal tax rate was only 15%.(Fry, 1979)

These data also shed some light on the extent to which expenditures can safely be taken as a proxy for income. As predicted by Deaton (1980) for both the lowest and the middle income groups -- for 99% of this population -- consumption is very nearly the same as current income; cash savings in the lowest income group amount to an average of less than one kwacha -- £0.58. For the highest 1%, however, savings amount to nearly K180 or £104 --a 400-fold difference. These data would therefore seem to argue in favour of the acceptability of using expenditure surveys as a proxy for measurement of wealth and income levels, where appropriate.

From the data in Table 6.2 it is possible to make a rough approximation of distribution of overall expenditure in the district in 1945.

¹ The tax had been instituted as early as 1908, when it was blamed by the white settler owned newspaper the Livingstone Mail for causing severe hardship or even starvation during the drought of that year, but rather than recommending abolition or reduction of the tax, the paper proposed distribution of free maize to affected areas: "...labour is one of the assets of the country: more than that, the tax is one of the greatest assets of the Chartered Company; without it...the Native Department could hardly be supported." (Chipungu, 1988, p. 27)

Table 6.3 Approximate distribution of expenditures, Mazabuka (and Monze) District, Zambia, 1945.

Expenditure group	Expenditure per household (kwacha)	Total expenditure of group	Group expenditure as % of total
Poorest 85%	10.3	875.5	34.0%
Middle 14%	67.3	942.2	36.6%
Richest 1%	755.4	755.4	29.4%
Total		2573.1	100%

Source: derived from Table 6.2 above.

These derived figures indicate that in 1945 the highest 1% of the population spent 29.4% of the income, and the top 15% accounted for 66% of expenditures. These figures do not take account of the savings made by home consumption of food produced on the farm, which accounts for the bulk of the food produced in the two lowest income groups, whereas the highest income group might buy a significant part of their food.

Differentiation and unequal distribution of wealth and income were therefore clearly established by 1945. In part this was due to the fact that during the Second World War, the rich peasants who were participating in certain agricultural development schemes, or who were recognized as practising "advanced" agricultural techniques, were granted a key concession by the colonial administration due to the shortage of maize: they were allowed to sell their maize as part of the "European pool" of the Maize Control Board, and therefore received the same higher price as commercial settler farmers. (Chipungu, 1988) This concession enabled them to advance rapidly in comparison with other farmers. But when at the end of the war, the administration wanted to rescind this privilege the rich peasants fought hard to maintain their status; one of the resolutions of the African Farmers' Association which they formed to lobby for their interests noted that "In any society of people its bound to be two classes of people....Why should not these classes be distinctive [sic] amongst us....a clear distinction of these classes should be recognised by Government." (cited in Chipungu, 1988) Peasant differentiation, and the resultant income inequality was firmly entrenched in Southern Province by this time. Chipungu also attributes the gender differences which are now such a prominent feature of rural life in Southern Province to the tendency of the administration to prefer making loans for capital equipment

to men rather than to women.(Chipungu, 1988) This conclusion tends to ignore the fact that gender differences in agriculture are a feature of rural households at all income levels, and therefore would seem to have pre-dated the arrival of the new technology.

The data and conclusions from this 1945 study give some interesting insights into the findings of the community survey and patient interviews, carried out nearly 50 years later.

Perhaps the most important change which has taken place in the intervening years is the growth of the urban population; whereas according to Colson in 1948 there was no town with a population greater than 500 in Monze district, by 1992 the population of Monze town was estimated to be about 30,000. The concerns of the ILO/JASPA survey regarding the growing urban/rural income gap, and the disparities between rich and poor within the rural areas, are borne out in Monze in 1992 as the following discussion will demonstrate.

6.4 Measures and proxies for socioeconomic status and income

In this study, data on eight different measures of socioeconomic status have been collected from the community as a whole. These include cash income, a range of household goods and assets (car, refrigerator, radio/cassette player, etc.), housing type and material, ownership of cattle and other (smaller) livestock, use of agricultural implements, and whether the respondent's household is owed money, or owes money to another household. Income data was not collected from patients for reasons which are described in Chapter 2. Furthermore, as described below, there was not a good correlation between reported income and other measures of SES.

6.4.1 Absent household members: a possible source of bias

A random sample of households in urban and rural areas was interviewed for the community survey, as described in Chapter 2. During the survey it became clear that an important source of bias might be the fact that a large number of adults were absent from the household during the survey, especially in rural areas where 31% of adults listed as belonging to the household were absent. 15% of urban residents were absent. The following table of demographic and socioeconomic characteristics demonstrates this difference.

Table 6.4. Comparison of persons present at interview with those absent, selected variables, rural Monze District, 1991

Variable	Present (n=653)	Absent (n=292)	p=
Demographic: Sex: Male Female	59.5% 77.0%	40.5% 23.0%	p=0.000
Age category: <20 20-39 >39	56.5% 73.0% 77.0%	43.5% 27.0% 23.0%	p=0.000
Marital status: never married married separated/widowed/ divorced	55% 76% 81%	45% 24% 19%	p=0.01
Education: no secondary school any secondary school	71% 60%	55% 29%	p=0.000
Work: students unskilled small farmer large farmer/skilled	45% 71% 75% 79%	55% 29% 25% 21%	p=0.000
Median income Value of assets	K3,500 K34,222	K3,500 K45,300	ns

In the rural areas, there were several significant differences between those who were present and those who were not; in particular those absent tended to be younger, more skilled, and better educated. There was more chronic illness among those present in the rural areas, and persons in female-headed households were twice as likely to be chronically ill than others.

The differences in urban households were less pronounced, as shown in table 6.5 below.

Table 6.5. Comparison of persons present at interview with those absent, selected variables, urban Monze District, 1991

Variable	Present (n=665)	Absent (n=113)	p=
Demographic: Sex: Male Female	82% 89%	18% 11%	p=0.005
Age category: <20 20-39 >39	84% 86% 87%	16% 14% 13%	p=0.6
Marital status: never married married separated/widowed/ divorced	83% 87% 87%	17% 13% 13%	p=0.01
Education: no secondary school any secondary school	85% 85%	15% 15%	p=0.8
Work: students unskilled small farmer large farmer/skilled	75% 91% 82% 88%	25% 9% 18% 19%	p=0.000
Median income Value of assets	K6,500 K20,300	K6,500 K27,422	ns

These findings have to be kept in mind when interpreting the data on income and wealth, and on health seeking behaviour. In the rural survey there were significant differences between those who were present and those who were not. The bias is not as important in urban areas where the differences between those present and those absent were slight.

6.5 Income

In this section data on cash income levels will be presented. These data show a high degree of skewness of income distribution, with a large number of households living in abject poverty, and with female-headed households especially in rural areas being particularly disadvantaged.

As mentioned in Chapter 2, respondents to the community survey were asked about the sources and amount of income received in the previous month. Originally it was intended to ask several questions on expenditures on specific categories, such as school fees,

medical care, etc. During the piloting of the questionnaire, however, it was found that respondents had great difficulty in remembering, even approximately, how much had been spent on e.g. school fees. Expenditure questions were therefore eliminated since it seemed unlikely that reliable information could result.

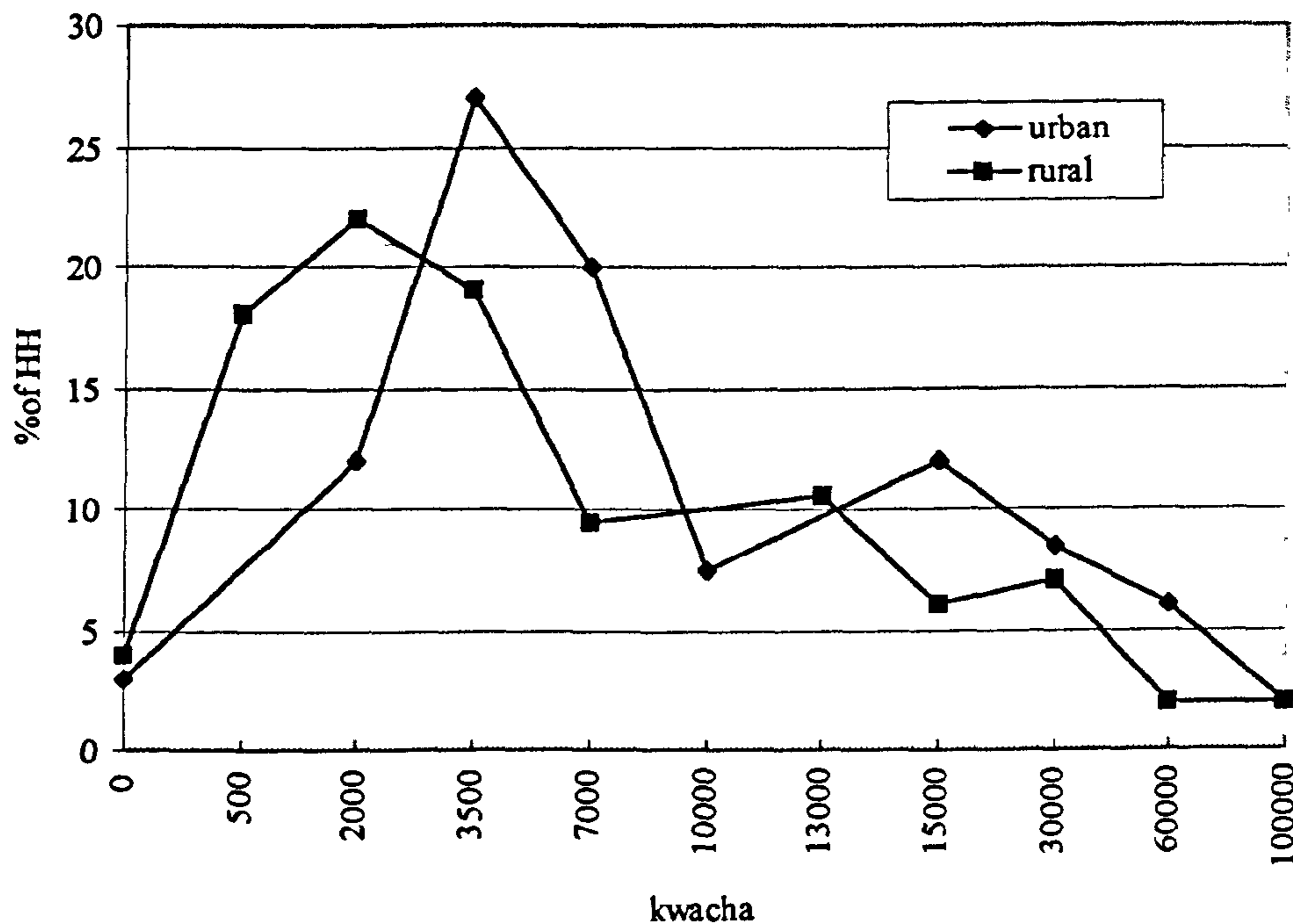
Data were therefore collected on cash income rather than on expenditures. Although it was felt that patients in the hospital would be unable to answer questions regarding income accurately, in the community survey interviews were usually attended by a number of people who contributed information on this question. They were shown a card with bands of income listed and they were asked to name the letter corresponding to the income they received. To value this income the midpoint of each band was taken and all sources were summed to reach a total income. Most households had a number of sources of income, so a recall period of only one month was chosen; it was felt to be sufficient to form a basis for comparison, yet not so long that people would have difficulty remembering.

The one-month period does however open the possibility of a bias due to seasonality, i.e. that especially for farming households who gain most of their income from sale of maize, the month chosen would significantly bias the results if it happened to be the month in which most of the maize harvest was marketed (normally November-December). Two steps were taken to minimize this possibility. First, all rural households were interviewed within a period of about 3 months. The period chosen was the few months before the beginning of the rains, traditionally a slack period; this was chosen in part for logistics reasons because the rains had not started and travel within the district was possible, and people would not be too busy in their field to attend interviews. This is the period after the maize harvest has normally been marketed, and before planting. During the year of the survey, however, the maize marketing system was very disrupted and marketing did not take place in the usual manner, with farmers unable to obtain enough bags for their maize or to secure transport to market. Most non-maize sources, i.e. remittances, marketing and petty trading, non-farm wages, etc. would be relatively stable throughout the year. Although the possibility of some seasonal bias cannot be completely ruled out it is unlikely that it would affect the overall rankings of socioeconomic status. Second, respondents were asked about the number of bags, but not the resulting income, from the main crops (maize, cotton, sunflower, etc.) which were sold in the previous year; most were able to answer easily. When income and other measures were compared, however, there was little correlation; households which fell in the upper part of the distribution as far as income was concerned did not

necessarily fall into the same part of the distribution of other measures, i.e. assets score. Other more stable measures (ownership of assets, cattle, livestock, housing material, etc.) which appear to be more reliable indicators of socioeconomic status have been included.

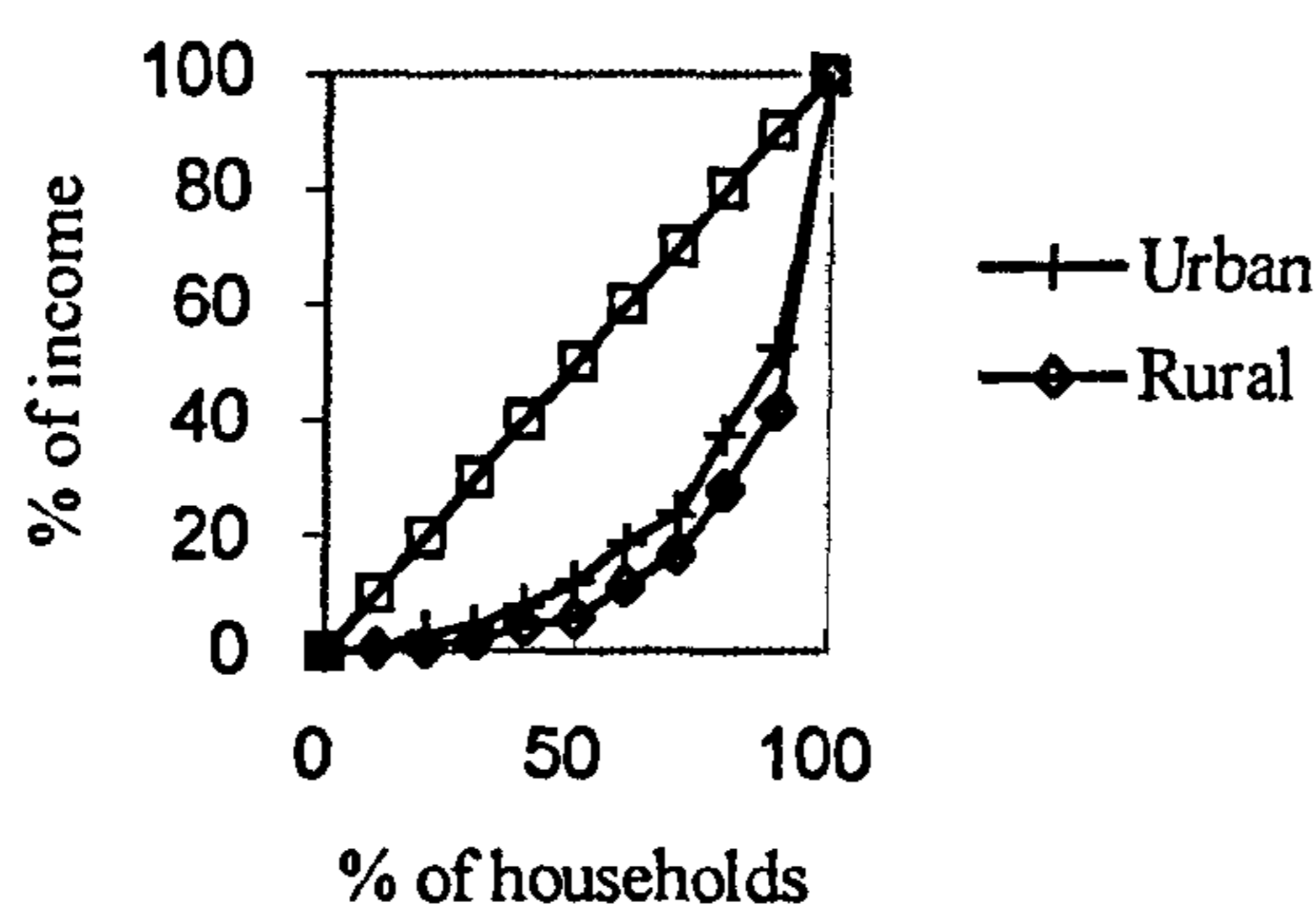
Figure 6.1 shows the income distribution in urban and rural areas, and the boundaries of the quintiles. Income distribution is highly skewed in both urban and rural areas. (NB: scale is not continuous; income distribution is much more skewed than the graph indicates.)

Figure 6.1 Income distribution in urban and rural Monze District, 1992.



There is evidence of significant inequality of income distribution in both urban and rural areas of Monze district. As can be seen in Figure 6.2 which shows Lorenz curves for income in both urban and rural Monze, income inequality is greater in rural Monze than in the town.

Figure 6.2. Lorenz curve of income distribution in urban and rural Monze District, 1992.



From the distribution of the income, quintiles were derived. These are not smooth, especially for the urban areas. This was caused by the use of the midpoint of the income band as the income from that source; 72% of households in urban quintile II rely on a single salary for their income, and the average wage in the formal sector for a general unskilled manual worker was approximately K3500, so this finding is not unexpected, although it does mean that the quintiles are not equal in size. This was less pronounced in rural areas, where fewer people have salaries and most households rely on a number of sources of income. Table 6.6 shows the resulting income quintiles in urban and rural areas.

Table 6.6. Income quintiles in urban and rural areas, Monze District, 1992.

Quintile	URBAN Monthly Income range	No. of House- holds	% of total	RURAL Monthly Income range	No. of House- holds	% of total
I	0-3000 (£0-£25)	41	16.7	0-500 (£0-£4)	53	20.7
II	3001-3999 (£25-£33)	58	23.6	501-2000 (£4.17-£17)	55	21.5
IV	4000-6999 (£33-£58)	54	22.0	2001-3999 (£17-£33)	46	18.0
IV	7000-14999 (£58-£125)	48	19.5	4000-12999 (£33-£108)	52	20.3
V	15000-120000 (£125-£1000)	45	18.3	13000-120500 (£108-£1004)	50	19.5
Total		246	100.0		256	100.0

A caution in comparing these figures between urban and rural areas is required, since the amount of rural produce consumed on the could not be measured accurately. In

addition, although sales of crops occur the year round, the bulk of maize sales will normally occur in November-December following the harvest (although as noted above the marketing of maize in 1992 was disrupted). These sales will not have been reflected in these figures, since the community survey was done in January-April. In view of this it is surprising that the difference between the mean incomes of the urban and rural respondents is not greater, since the data on the ownership of assets showed a large difference between urban and rural respondents. 3.9% of rural households, and 2.8% of urban households report a cash income of zero.

6.5.1 Female-headed households

Household income varies by sex of the head of household, with female-headed households in rural areas at a great disadvantage; the difference persists but is less in urban areas. Table 6.7 shows mean and median incomes by sex of head of household, and the mean and median per capita income figures.

Table 6.7. Total reported monthly household income by residence and sex of head of household, Monze District, Zambia, 1991 (Zambian Kwacha).

	n=	Mean	Median	Household size	Per capita income: mean	Per capita income: median
Rural:	256					
male		10,597	3,500	8.3	1413	529
female		2,922	1,500	4.6	646	500
Urban:	246					
male		13,603	6,500	6.0	2889	1300
female		11,016	3,500	4.9	2567	928

Mean per capita incomes show a wide variation, with a high among urban male-headed households of K2889 (£24), and a low of K646 (£5.38) among female-headed rural households. However the median incomes in rural areas were much closer than the means, with K529 (£4.40) for rural male-headed households and K500 (£4.16) for female-headed households. The medians in urban areas were K1300 for male and K928 for female-headed households, respectively. Somewhat surprisingly the difference between male- and female-headed households in urban areas is slight; the group of female-headed households which is most severely constrained is found in rural areas. Female-headed households are also much smaller, especially in rural areas where they average only 4.6 persons, as compared with male-headed households at 8.3; the difference persists in urban areas although is smaller (4.9 vs.

6.0). It is important to note that this average of K646 for rural female-headed households is the mean of all households in that category, and there are many households which fall well below this average. A disproportionate percentage of the poorest households are headed by women; whereas 20% of rural households are headed by females, 30% of rural households earning less than K2000 (K4) per month are female-headed. In part this is due to household size; female-headed households in rural areas comprise almost 4 fewer persons in rural areas.

Table 6.8. Percentage of female-headed households (FHH) by quintile, urban and rural
Monze, 1991.

Quintile	URBAN no.FHH (n=246)	% of FHH in quintile	% of total in quintile	RURAL no. FHH (n=256)	% of FHH in quintile	% of total in quintile
I	19	30.6	16.7	14	27.5	20.7
II	15	24.2	23.6	18	35.3	21.5
III	10	16.1	22.0	10	19.6	18.0
IV	8	12.9	19.5	7	13.7	20.3
V	10	16.1	18.3	2	3.9	19.5
Total (%)	62	25.2	100	51	19.9	100

As the data in Table 6.8 show, female headed households are disproportionately represented in the lower quintiles, especially in rural areas, where nearly 63% of female headed households are in the lowest 40% of the income distribution. 82% of households in the two top quintiles of rural households are headed by men, compared with 61% in urban areas.

6.5.2 Ownership of consumer goods and assets

A number of studies have used ownership of assets of various types, consumer goods in particular as an indicator of SES. Deaton (1980) mentions that one solution to the problem of measurement may be to take a "standard or reference bundle of commodities" to measure welfare; if the bundle varies strongly with income or taste, this may not be applicable but "some such methodology is frequently relevant in measuring welfare for individuals close to poverty." (Deaton, 1980) These data show that a large portion of the population of Monze district lives in great poverty, and the predictable and stepwise nature of the sequence of acquisitions of a limited range of basic assets in Monze district tends to bear out the validity

of this approach. For example, bicycle ownership is relatively uncommon, but almost everyone who owns a bicycle also has a radio.

Following discussions with key informants and study staff, and a survey of the shops in Monze town to see what goods were commonly on sale, a bundle of goods was selected for inclusion in the study. These included both producer goods and what might be termed "leisure" goods.(Deaton, 1980) In order to value the assets held by the Monze district population, the study staff were sent out to gather information on current prices in Monze town (the only commercial centre of any size in the district) of the most commonly held or traded assets. The computer was then programmed to sum the values of these assets to derive a total asset score. The market prices and the value attached to each item for the purpose of establishing a score, and the percentage of the urban and rural households which reported ownership, are set out in Table 6.9. It was not possible to know whether an item owned was relatively new or quite old, so where this was likely to result in a wide difference the average of the new price and the price of good quality second-hand merchandise was used.

Table 6.9. Current prices and percentages owning common assets, Monze District, Zambia, 1991 (prices in current 1991 Kwacha, K120=£1)

	Price (kwacha)	Score for valuation	% of urban HH reporting ownership (n=246)	% of rural HH reporting ownership (n=256)
kerosene lamp	300	1	60.2	68.0
bicycle	7000	7	20.7	26.6
radio/cassette player	20000	20	61.8	33.2
sewing machine	20000	20	14.6	5.9
kerosene stove	1800	2	12.6	3.1
cooker	60000	60	21.1	2.0
refrigerator	50000	50	8.1	0.8
motorbike 125cc	75000	75	0.8	2.3
television	25000	25	13.8	1.2
car (Toyota pickup equivalent)	375000	375	2.0	2.0

Source: Price data collected by ADZAM staff in Monze town, July 1991 and study data.

The results of the survey with regard to ownership of assets by income quintile for both urban and rural areas are presented below.

6.5.3 Urban assets and ownership

The 246 urban households were asked about their ownership of assets, housing characteristics including whether they had a flush toilet, and whether they listened to the radio every day. The results are shown below in Table 6.10.

Table 6.10. Economic characteristics of urban households, Monze District, 1991 (in %).

URBAN Quintile	own radio	own bicycle	sewing machine	own TV	own car	radio every day	tin roof	elect.	flush toilet
I	41.5	22	12.2	4.9	0	39	60.9	17.1	3.3
II	44.8	10.3	6.9	5.2	0	36.8	79.3	29.3	37.8
III	63	16.7	16.7	5.6	0	57.4	86.8	30.2	34.2
IV	77.1	16.7	14.6	14.6	2.1	63.8	91.7	37.5	48.3
V	84.4	42.2	24.4	42.2	8.9	80	95.5	57.8	44.4
p-value	0.0000	0.001	0.157	0.0000	0.007	0.0024	0.001	0.001	0.0003

All characteristics, except ownership of a sewing machine were significantly different between quintiles. Households were also asked whether they were owed any money, whether they had any savings, and whether they usually had soap in their house. The results are presented in Table 6.11.

Table 6.11. Further economic characteristics of urban households, Monze District, 1991 (%).

URBAN Quintile	owed money?	some savings?	soap in house?
I	21.9	26.8	82.9
II	37.9	53.4	96.6
III	24.1	63	94.3
IV	50	81.3	95.8
V	60	80	97.8
p-value	0.0003	0.0000	0.0288

As can be seen from the tables, all of the characteristics of urban households except the ownership of a sewing machine exhibit differences by quintile which are statistically significant at the 0.05 level or better.

6.5.4 Rural assets and ownership

Rural households were asked the same questions as urban households. The variables presented here are the same with the exception of flush toilet (almost unknown in rural areas); data on use of agricultural implements are presented instead.

Table 6.12. Economic characteristics of rural households, Monze District, 1991 (in %).

RURAL Quintile	own radio	own bicycle	sewing machine	own TV	own car	radio every day	tin roof	elec.	agric. implem.*
I	11.3	9.4	1.9	0	0	17	13.2	1.9	38.3
II	27.3	18.2	3.6	1.8	0	14.5	18.2	1.8	42.9
III	43.5	26.1	8.7	0	0	32.6	45.7	8.7	12.9
IV	36.5	40.4	7.7	1.9	3.8	25	30.8	15.4	25
V	50	40	8	2	6	46	38	6	8.2
p-value	0.00030	0.00058	0.49000	0.75	0.08	0.00025	0.007	0.029	0.0000

* Using hoe or shovel only.

In addition, households were asked whether they were owed any money, whether they had any savings, and whether they usually had soap in their house. The results are presented in Table 6.13.

Table 6.13. Further economic characteristics of rural households, Monze District, 1991 (in %).

RURAL Quintile	owed money?	some savings?	soap in house?
I	35.8	18.9	54.7
II	35.4	30.9	76.4
III	47.8	56.5	89.1
IV	36.5	42.3	80.8
V	68	60	88
p-value	0.00240	0.00005	0.00010

As can be seen from the tables, all of the characteristics are statistically significant at the 0.05 level or better except ownership of a sewing machine or television. Numbers of people owning these assets are very low, however. The data present a mixed picture. Several key variables decline between the third and the fourth quintiles, but interestingly households in quintile IV are more likely to have electricity than are households in the fifth quintile, possibly reflecting an atypical choice of goods which can be used with electricity. The fourth quintile is quite broad, including incomes ranging from K3501 to K12500; it would thus include both households with a single wage earner from the formal sector and households earning most of their income from successful farming. Quintile IV is more likely to be using only a hoe and shovel for farming than is quintile III, which indicates that agriculturally they would be considered less advanced than those in quintile III. It is likely that they earn much of their income from cattle trading rather than cultivation. The best predictors of income and SES, i.e. those which change the most between quintiles, appear to be ownership of a radio, bicycle, and in particular, whether the household has any savings, and inversely, whether the household uses a farming technology more advanced than hoe and shovel.

6.5.5 Ownership of cattle and other animals

Monze district residents, especially (but not exclusively) those in rural areas, tend to prefer to hold their wealth in the form of cattle rather than in bank deposits or other assets. Even residents of urban areas often have a number of cattle being kept for them in a rural area. Cattle have several advantages over money in that they are relatively inflation-proof, multiply on their own, and the traditional varieties are sturdy and require a minimum of upkeep in the form of veterinary care and food. They play an important role in traditional transactions around funerals and inheritance, marriage and bridewealth, and other important

social rites. They also give pleasure to their owners in their own right; cattle are said to "fill the eye". Their ability to hold their value has been demonstrated recently; whereas a cow brought K6,000 (or about £50) when the kwacha was approximately K120 to the UK£ in mid 1991, by mid 1992 when the kwacha had fallen to K300-400 per UK£, the price had risen to K16,000 or about £45-53--despite the drop in prices brought about by the glut of animals on the market due to the drought.¹

Patients and district residents were asked how many cattle they owned. Colson (1962) had doubts about the validity of answers people gave during her fieldwork near Monze in 1948-50 to questions about the number of cattle respondents owned.² In contrast, during fieldwork carried out in 1991 our locally recruited Tonga-speaking staff (some of whom came from cattle-owning families or owned cattle themselves) assisted with drawing up and piloting the questionnaires and reported no such reticence in either the pilot phase or the main study. The distribution of the responses does not show quite as much clustering around round numbers which might be expected if people were hiding the true number.

Table 6.14 shows the average market prices of various livestock in Monze district in July 1991 when the data collection (patient recruitment) began.

Table 6.14. Price of various livestock, Monze District, July 1991 (Kwacha)

Animal	Price
cow	6000
pig	1200
goat	800
sheep	2000
donkey	na
pigeon	30
duck	150
chicken	200

¹ Elizabeth Colson, a noted anthropologist who has spent many years doing fieldwork among the Tonga noted on the basis of field work in 1948-50 that "if you ask a Tonga why he wants cattle he is likely to reply: 'they are a good thing to have. They help you if you are in trouble.'" She observed that young men tend to spend their money on goods such as clothing, gramophones, bicycles, beer, tobacco and food; the old men say "they are fools and will never get cattle the way we have done." Even sophisticated young people, when asked to name the wealthy Tonga, "replied first with the names of the big cattle owners." (Colson, 1962)

² She notes that "even those who were usually co-operative and eager to help my work squirmed, denied, claimed to have forgotten and did everything in their power to be obstructive....They are opposed to letting anyone, friend or foe or relative, know just how many cattle they have, or where the cattle are, or indeed how they were come by." The neighbouring Ila tribe, however, boast publicly of the number of their cattle.(Colson, 1962)

To examine the distribution of cattle by income quintile, "cattle categories" were established by dividing the distribution of cattle into quintiles, with the first being 0 (no cattle and no other animals owned); 1-5 animals is category 1, 6-15 animals is category 2, 16-50 animals is category 3, and more than 50 animals, category 4. A total of 35 households reported not using any land for farming, and the interviewers' instructions were to skip the section on animals, although it is possible that small numbers of fowl etc. could be kept in a small "non-farm" plot. These data are not included, so the table somewhat underestimates the number of people who do not own cattle; including these 35 non-farming rural households, in all, 113 (44.1%) of 256 rural households do not own cattle.

Table 6.15. Cattle ownership by quintile, rural Monze District, 1991.

Quintile	Cattle category					Total
	0	1	2	3	4	
I	24 30.8%	12 25.0%	8 14.5%	1 3.2%	1 11.1%	46
II	26 33.3%	8 16.7%	9 16.4%	6 19.4%	0 0.0%	49
III	10 12.8%	9 18.8%	10 18.2%	3 9.7%	0 0.0%	32
IV	13 16.7%	11 22.9%	12 21.8%	7 22.6%	2 22.2%	45
V	5 6.4%	8 16.7%	16 29.1%	14 45.2%	6 66.7%	49
Total	78 35.3%	48 21.7%	55 24.9%	31 14.0%	9 4.1%	221

Households with no cattle are more likely to be in income quintiles I or II, with 50 of the 78 (64%) households without cattle being from the lowest two quintiles. Only 5 of 49 households (10.2%) in the top quintile have no cattle. Larger numbers of animals are to be found in higher quintiles, 8 of the 9 households with more than 50 cattle being in the upper two quintiles. Ownership of large numbers of cattle is therefore a good proxy for wealth.

6.5.6 Other livestock

Households were also asked about other livestock, including pigs, goats, sheep, donkeys, and fowl, including chickens, pigeons, ducks, and guinea fowl. Ownership of some animals was heavily concentrated, i.e. only a few households owned donkeys, but those households bred them and had large numbers of them for sale. Ownership of fowl was

widespread, and as table 6.16 shows, almost 88% of households own at least some fowl. Categories were established, on the basis of the distribution of fowl, with 0 fowl being category 0, 1-10 category 1, 11-20 category 2, 20-50 category 3, and more than 50, category 4.

Table 6.16. Fowl ownership by quintile, rural Monze District, 1991

Quintile	Fowl Category					Total
	0	1	2	3	4	
I	13 48.1%	14 28.6%	10 18.5%	8 12.1%	1 4.0%	46
II	7 25.9%	11 22.4%	12 22.2%	15 22.7%	4 16.0%	49
III	4 14.8%	7 14.3%	10 18.5%	9 13.6%	2 8.0%	32
IV	2 7.4%	10 20.4%	15 27.8%	12 18.2%	6 24.0%	45
V	1 3.7%	7 14.3%	7 13.0%	22 33.3%	12 48.0%	49
Total	27 12.2%	49 22.2%	54 24.4%	66 29.9%	25 11.3%	221

Ownership of fowl, although more evenly distributed, also is concentrated in the higher quintiles, with 57% of those owning more than 20 fowl (categories 3 and 4) being from the upper 40%, and 74% of those without fowl being from the lowest 40%. Again, missing values for animal ownership would tend to underestimate the prevalence of non-ownership, with a total of 62 (27+35) households (24.2%) owning no fowl.

6.6 Summary

Differences in income distribution and socioeconomic status were apparent as many as 50 years ago and were accentuated by policies of the colonial administration and by differential access to agricultural technology, especially the plough. Income distribution is highly skewed; the bottom 20% of the income distribution comprises households with virtually no measurable assets or cash income. These households are disproportionately headed by women.

7. Socioeconomic status of patients in comparison with the community

7.1 Introduction

In this chapter, the socioeconomic status of patients will be compared with that of the community from which they are drawn. In the early phase of the epidemic HIV appeared first in the wealthier sections of the urban Zambian community (Melbye et al, 1986), but now HIV infection is viewed as a disease of poverty and of stigmatized and marginalized groups. Which of these extremes, if any, might apply in Monze district is examined in this chapter. It seems likely that more wealthy families will be better able to cope with the impact of HIV disease than will poorer families, so it is important to establish which families and households are particularly vulnerable. Finally, the economy of the district could be severely affected by the loss of scarce skills or by the deaths of key individuals who are large employers or otherwise make a greater than average contribution to the economy. It is important to be able to situate the patients with HIV disease within the economic structure of the district. In this chapter, data are presented to establish the socioeconomic status of patients, both HIV-positive and HIV-negative, and to situate them within the overall pattern of income distribution and socioeconomic status in Monze district.

7.2 Socioeconomic status of patients

The socioeconomic status of hospital inpatients, hospital outpatients, and rural health centre patients was compared with that of the community as a whole in order to determine whether they were representative. In addition, comparisons were made to determine whether there were significant differences between patients with HIV infection and those without. Data were collected through questionnaires administered during interviews with patients. A total of 930 patients were interviewed in Monze district; details of the recruitment procedure are given in Chapter 2. Table 7.1 below shows the numbers recruited at each site and the percentage of patients for whom HIV results were obtained. Some of the inpatients recruited at Monze were not randomly recruited; all TB patients were asked to join the study, as well as a number of suspected AIDS patients in order to collect more data on the clinical presentation of AIDS and resulting costs. In the analysis below, only data from those recruited randomly are included.

Table 7.1. Numbers of patients recruited at each site and HIV seroprevalence, Monze District, 1991.

	Inpatients	Outpatients	Rural Health Centres (a)
No. recruited of which randomly recruited:	380 315	309 309	241 241
No. with HIV result (%)	242 (76.8%)	141 (45.6%)*	199 (82.6%)
HIV positive (no.) HIV positive (%)	104 42.9%	41 29.1%	37 18.6%
HIV negative (no.) HIV negative (%)	138 57.1%	100 70.9%	162 81.4%

* Only half of outpatients were asked to take an HIV test.

(a) Patients were recruited at three rural health centres (Keemba, Nampeyo, and Rusangu).

Table 7.2 compares the socioeconomic status of the community with that of the patients, stratified by urban/rural residence.

Table 7.2. Ownership and asset score of households of Monze district, Zambia, 1991

Group	n=	% reporting no asset ownership	Mean	Median
1) RURAL:				
Community	256	20.7%	21.4	0.9
Inpatients	211	10.4%	52.9	20
Outpatients	119	9.2%	55.2	21
Rural health centres	241	19.1%	33.9	10
2) URBAN:				
Community	246	12.6%	46.0	20.5
Inpatients	90	4.4%	103	35
Outpatients	99	11.1%	81.9	23
3) PERIURBAN:				
Inpatients	77	6.5%	64.8	21
Outpatients	92	7.6%	62.4	21

As table 7.2 shows, both hospital inpatients and outpatients from households in rural areas have significantly higher asset scores than does the rural community at large, with the mean being more than twice as high and the median being about 20 times higher. 21% of the rural community reported owning none of the assets on the list, but in all groups a significant fraction of the population reports owning none of the assets. The patients from urban areas are also more wealthy than the general population, although the margin is not so wide, and the median is quite similar. Periurban ("living near a town") patients are on average less well off than are urban residents but better off than the rural population.

7.3 Socioeconomic status of patients with HIV in comparison with patients without HIV infection

The next part of the analysis was to determine whether the economic status of patients with HIV infection differed in any measurable way from that of patients without HIV infection. Patients with HIV infection were compared on the basis of urban/rural residence, with others recruited from the same sample. The results for inpatients are presented below in Table 7.3. P-values are presented if they are less than 0.2.

Table 7.3. Comparison of SES of Monze District Hospital inpatients, by urban/rural residence and HIV status, 1991

Variable	Urban inpatients n=111			Rural inpatients n=131		
	HIV negative n=59	HIV positive n=52	p-value	HIV negative n=79	HIV positive n=52	p-value
Assets score:						
mean	55.6	111.7 ↑	ns	72.2	24.4 ↓	0.19
median	23	25	ns	8	14	0.19
% owning:						
radio	69.5	65.4	ns	43.0	48.1	ns
bicycle	27.1	17.3	ns	46.8	32.1	0.10
television and/or video	11.9	23.1	0.189	1.3	0	ns
car or truck	3.4	13.5	0.08	12.7	1.9	0.04
Cattle owned (no.):						
mean	19.7	40.3	ns	47.8	94.0	ns
median	0	2	ns	10	11	ns
Fowl owned (no.):						
mean	26.6	85.3	ns	31.8	49.3	ns
median	14.5	11.5	ns	20	18	ns
Maize sold (bags):						
mean	157.2	27.7	0.16	37	26	ns
median	60	0	0.16	0	0	ns
% using hoe only	37.5	33.3	ns	8.5	9.5	ns
% using oxen or mechanization	6.3	16.7	ns	25.4	23.8	ns
% with tin roof	86.2	80.8	ns	30.4	32.7	ns
% with brick walls	72.4	78.8	ns	29.1	19.2	0.236
% with electricity	24.1	44.1	0.04	1.3	0	ns
% with some savings	42.4	59.6	0.10	21.5	28.8	ns

The table shows differences among urban inpatients on several variables, with HIV positive patients being more likely to own a television and a car, to have some savings, and to have electricity in the house (although only the difference in the electricity variable is statistically significant at the 5% level). HIV positive inpatients were also likely to have produced less maize for sale, although given that this is a sample of urban residents the

numbers are small and this difference is not thought to be important. Among rural inpatients the only significant difference was in car ownership, but with HIV positive patients being less likely to own a car than their HIV negative counterparts. Overall there do not appear to be any important differences in socioeconomic status between inpatients with HIV and others.

Table 7.4 presents similar data for outpatients. Again, few variables appear to differ significantly between HIV positive and HIV negative patients, although there do seem to be differences in level of agricultural technology used by rural outpatients.

Table 7.4. Comparison of SES of Monze District Hospital outpatients, by urban/rural residence and HIV status, 1991

Variable	Urban outpatients n=82			Rural outpatients n=59		
	HIV negative n=54	HIV positive n=28	p-value	HIV negative n=47	HIV positive n=12	p-value
Assets score:						
mean	64.5	30.4	ns	61.25	46.3	ns
median	21.5	20.0	ns	21	21	ns
% owning:						
radio	59.3	50.0	ns	57.4	58.3	ns
bicycle	33.3	25.0	ns	57.4	41.7	ns
television and/or video	7.4	3.6	ns	4.3	0	ns
car or truck	7.4	0	ns	8.5	8.3	ns
Cattle owned (no.):						
mean	33.7	9.7	ns	68.2	29.4	ns
median	9	0	ns	20	15	ns
Fowl owned (no.):						
mean	33.9	16.4	ns	65.1	56.9	ns
median	15	9.5	ns	32	30	ns
Maize sold (bags):						
mean	197	0	ns	158	15	0.10
median	43.5	0	.15	16	0	0.129
% using hoe only	12.5	66.7		3.0	28.6	0.003
% using oxen or mechanization	12.5	0		6.1	42.9	0.003
% with tin roof	77.8	81.5	ns	42.6	16.7	0.09
% with brick walls	55.6	55.6	ns	21.3	16.7	ns
% with electricity	27.8	21.4	ns	0	0	ns
% with some savings	29.6	50	0.07	51.1	58.3	ns

Patients were also recruited at three rural health centres in the district; all are considered to be "rural". Again, no statistically significant differences in SES were found between patients with HIV and others. Only the higher radio ownership among HIV positive patients, and the lower mean and median number of fowl owned, approached statistical significance.

Table 7.5. Comparison of SES of Monze district rural health centre (RHC) patients, by HIV status, Monze district, 1991

Variable	RHC			
	All patients n=199	HIV negative n=162	HIV positive n=37	p-value
Assets score:				
mean	38.9		28.0	ns
median	8		21	ns
% owning:				
radio	48.1		62.2	0.17
bicycle	43.0		40.5	ns
television and/or video	4.4		5.4	ns
car or truck	4.4		0	ns
Cattle owned (no.):				
mean	38.9		10.8	ns
median	6		7	ns
Fowl owned (no.):				
mean	33.5		19.8	0.195
median	16		12	0.195
Maize sold (bags):				
mean	121		21	ns
median	3		0	ns
% using hoe only	9.2		10.5	ns
% using oxen or mechanization	23.7		31.6	ns
% with tin roof	37.7		27.0	ns
% with brick walls	25.5		21.6	ns
% with electricity	10.1		13.5	ns
% with some savings	34.0		27.0	ns

As can be seen from the table above, there were some differences between rural HIV-positive patients and those without HIV infection, including median asset score, and ownership of a radio, which were higher for people with HIV, and mean ownership of cattle (although the median was higher by one head for HIV positive patients). Quantities of maize sold by HIV negative patients was much higher than for HIV positive patients. However due to the small numbers of persons with HIV infection in this sample they did not reach statistical significance.

7.4 Summary

From the data presented in this chapter it can be ascertained that the patients who reach Monge District Hospital as a group are significantly better off than the community from which they are drawn. However, there do not appear to be any significant differences in socioeconomic status (SES) between patients with HIV infection and those without. But since it is likely that a large number of people with HIV disease never reach the hospital, no conclusions can be drawn about the SES of people with HIV, but only about patients with HIV. In chapter 8 below, data on education and occupation, stratified by HIV status, will be presented.

8. Impact of HIV on households

8.1 Introduction

This chapter describes the impact of HIV on households in Monze district. A framework of three types of impact – on household composition, production and earnings, and consumption and investment – is described as it applies to the different stages of the illness. The impact on households in urban and rural areas is described, and the expected number of orphans and the impact of HIV on their lives is presented. The characteristics of carers are presented, as well as the estimated impact of their time in terms of lost agricultural production. Regarding consumption and investment, the expenditures on health care by persons with HIV, expenditures on funerals and burial are presented, as are disposal of assets. Finally, the occupations and employment status of patients with HIV are described and some implications of their loss for the district's economy are drawn.

8.2 The impact of HIV at different stages of illness

The impact of HIV on a household will change as the disease progresses and after the household member with HIV dies. Three main areas of impact can be identified, namely the impact on household structure, on household production and earnings, and on consumption, investment and savings. These different impacts occur during the four phases of the disease, namely prior to the illness; during the illness; immediately following the death; and the longer term. Over and Ainsworth (1989) identified ways in which the household of a person with HIV would be affected and these are described below in Table 8.1. Some modifications to their original table have been made in light of the findings of the study in Monze, as described below and in the rest of this chapter.

Table 8.1. Economic impact of HIV disease at different stages of illness.

Type of economic impact / Timing of impact	Prior to illness	During illness	Immediately after death	Longer term impact
Household health and composition	household size <i>dependency ratio, producer/consumer balance</i> <i>demographic stage of HH</i> fertility <i>general health status of HH members</i>	change in allocation to health maintenance activities <i>allocation of time to caring activities</i> <i>decision to have a child</i> <i>decline in nutritional status</i> <i>difficulties in coping with care</i>	loss of HH member <i>change in dependency ratios</i>	dissolution or reconstitution of household <i>orphans</i> migration of HH members poor health of survivors (spouses HIV+?)
Production and earnings	organization of economic activity (farm size, wage earning, etc.) choice of area of residence	reduced productivity of ill person <i>reduced productivity of carers</i> reallocation of labour w/in HH	lost output of deceased HH member <i>(regain labour of principal carers?)</i>	reallocation of land and labour <i>loss of income generating assets</i>
Consumption and investment	insurance preventive health care <i>including condoms, etc.</i> <i>precautionary savings</i> <i>receipt of remittances</i> transfers to other households	costs of medical treatment <i>costs of traditional treatment</i> dissavings changes in consumption and investment <i>loss of remittances of ill person</i> <i>receipt of transfers</i>	funeral costs receipt of transfers payment of legal fees (modern and traditional) <i>loss of remittances</i>	changes in type and amount of consumption and investment <i>loss of entitlement (house or land)</i> <i>loss of household property</i> <i>loss of children's labour</i> <i>loss of educational opportunities for orphans</i>

Source: Adapted from Over M and Ainsworth M. (1989) The economic impact of fatal adult illness from AIDS and other causes in Sub-Saharan Africa: a research proposal. World Bank, Washington DC, (unpublished). (Additions and modifications to original in italics.)

8.3 Impact of HIV on household composition

The main impact of HIV disease on households will be the loss of a productive person and a consequent deterioration in the dependency ratio, with many dependent children becoming one-parent and two-parent orphans. In order to estimate this two composite measures were used. The first is the *household age*, the average age of all the members of the household. The second is the household *dependency ratio* which is the number of household consumption units divided by the household productive units. Both measures have been calculated for the households of all patients, for HIV-negative patients, and for HIV-positive patients both before and after their expected death. These take account only of the illness and death of the patient and not of any other household members who might be affected, children in particular, and thus are a low estimate of the changes the death of the patient will cause.

These measures took account of the different age structures in rural and urban areas, using data from the community survey. In rural Monze district old people (60+) constitute 9.5% of the total, compared with 2.6% in urban and periurban areas. The mean age of people 15-59 in rural areas was 28.9 and of those 60+, 70.6; in urban areas the figures were 29.1 and 64.7 respectively. Household consumption units were calculated from calorie and energy requirements, weighted for age (see note (b), table 8.2 below). Production units were derived from the expected contribution of the household member according to age. Normally women would have been weighted more heavily given their major contribution to household work and especially agriculture, but the data collected on household members other than the patient did not record sex of the other adults in the household. Accordingly a weight of 1 was given to household members aged 15-59, of 0.5 to those 60+, of zero for those aged 0-5, and of 0.3 for those children 5-15. Table 8.2 summarizes the values used in the derivation of these measures.

Table 8.2 Summary of values used in the derivation of measures.

Age group	Average age: rural (a)	Average age: urban (a)	Consumption units (b)	Productive units
under 5	2.5	2.5	0.56	0
5-14	10	10	0.77	0.3
15-59	28.9	29.1	0.88	1
60+	70.6	64.7	0.74	0.5

(a) Average ages of 15-59 and 60+ derived from data collected from the community survey.

(b) Consumption units are weighted averages of male and female energy requirements at different ages, calculated by Veronica Tuffrey on the basis of an adult male equal to 1, adult females aged 18-60 equal to 0.77, etc. References: FAO/WHO/UNU 1985 and James WPT and Schofield EC (1990).

Data were analysed by urban/rural residence. Of the 690 patients who were recruited from either Monze Hospital's outpatient department or its inpatient facility, 361 gave their residence as either "in or near a town" and 323 stated that they lived "far from town." HIV results were obtained for 192 (53.2%) of the urban and periurban residents, and for 198 rural residents (61.3%), a total of 390 patients for whom HIV results were available. For the purposes of this analysis, patients with asymptomatic HIV (e.g. not suffering from HIV disease as defined for the purposes of the study, see chapter 4) were analysed as a group together with patients suffering from HIV disease or AIDS, on the basis that their long term prognosis was similar. Table 8.3 presents a summary of household characteristics by urban/rural location. In the analysis of composite household data, single-person households were excluded; in urban and peri-urban households, 10 households (2.7%) and in rural areas, 6 households (1.8%) were thus excluded. In addition, in the analysis of persons with HIV infection, data from two persons with indeterminate HIV results were also excluded.

Table 8.3. Summary of household characteristics by urban/rural location, Monze District

Variable	Urban/periurban n=361	Rural n=323
Age of patients	28.4	34.1
Sex of patients:		
% male	47.4%	44%
% female	52.6%	56%
Household size	6.91	10.3
Household age (mean)	21.1	20.3
Household dependants (mean; see text) (a)	1.18	4.07
Household consumption units (see text) (a)	5.29	8.13
Household productive units (see text) (a)	4.17	5.95
Household dependency ratio (mean; see text) (a)	1.28	1.37

(a) Analysis excludes 10 urban and 6 rural single-person households.

8.3.1 *Impact on households in urban areas*

The impact of HIV on households will be different in rural and urban areas. The data were accordingly analysed according to the location of the households. Table 8.4 presents data for urban households.

Table 8.4. Household age, size, dependency and consumption ratios, urban households in Monze District, 1991.

Variable	HH of HIV- patients	HH of HIV+ patients	p=	HH of HIV+ patients (following death)	% change
Age of patients	28.5	29.4	p=0.0073	--	--
Household size	7.05	6.11	p=0.0416	5.11	-16.4
Household age (mean)	20.2	21.3	p=0.36	19.32	-9.3
Household dependents (mean; see text) (a)	2.29	2.09	p=0.095	2.09	--
Household consumption units (see text) (a)	5.6	4.8	p=0.04	3.95	-17.7
Household productive units (see text) (a)	4.38	3.78	p=0.042	2.79	-26.2
Household dependency ratio (mean; see text) (a)	1.29	1.28	p=0.60	1.49	+16

a) Analysis excludes 10 single-person households.

As can be seen from the table above, the loss of one household member from the average household will mean the household's average age declines by about 9%, and while the number of consumers drops by 17.7%, the drop in the number of productive units is greater, about 26%, with a consequent rise in the dependency ratio (number of consumers per productive unit) of 16%. The loss of a wage earner, whether from the formal or the informal sector, will make it difficult for the household to cope with the increase in dependency ratio. *will it?*

8.3.2 Impact on households in rural areas

In rural areas, the main impact will be on the household's ability to produce food. Table 8.5 presents data and composite variables on the present characteristics and expected changes in the households following the death of the patient from HIV disease. In the analysis of rural households, six single-person households (1.8%) were excluded from the analysis of household variables.

Table 8.5. Household age, size, dependency and consumption ratios, rural households, Monze District.

Variable	HH of HIV- patients	HH of HIV+ patients	p=	HH of HIV+ patients (following death)	% change
Age of patients	33.3	35.3	p=0.070	--	--
Household size	11.43	8.46	p=0.054	7.46	-11.8
Household age (mean)	19.29	22.29	p=0.024	21.29	-4.5
Household dependents (mean; see text) (a)	4.63	3.12	p=0.014	3.13	--
Household consumption units (mean; see text) (a)	8.89	6.68	p=0.057	5.80	-13.2
Household productive units (mean; see text) (a)	6.29	5.08	p=0.264	4.09	-19.5
Household dependency ratio (mean; see text) (a) (b)	1.41	1.31	p=0.084	1.53	+16.8

(a) Analysis excludes 6 single-person households.

(b) Number of consumption units per productive unit.

In rural areas, the effect will be similar but due to the larger average household size the impact may be more easily absorbed. The number of household productive units in the average household will decrease by 19% and the dependency ratio will increase by about 17%. In some rural households this will mean that unless agricultural productivity is somehow increased by that amount, the household will suffer a loss in welfare. Unfortunately the trend in terms of productivity is in the other direction, especially as regards rainfall (described in chapter 3).

The expected loss of hours of work will pose a problem for maize-producing households in which labour is scarce, especially where female labour is scarce. The number of (daylight) hours required for maize production varies greatly over the year, with a peak of over 200 hours per ha per month in November and December (see figure 3.4). Those months have about 360 daylight hours each, a total of 720. An estimated 94 days will be lost due to illness and provision of care in the final year of life of a person with HIV (see section 8.4 below). In 94 days there are about 1,128 hours of daylight. If the 94 days lost are spread evenly over the year, the monthly loss is about 100 hours -- about 28% of the total available.

But if the 94 days are concentrated in those key months of the growing season, production of maize will most likely suffer and carers will be torn between the need to cultivate and the need to look after the patient. For women especially this will be a difficult decision due to the possible accusation later by the husband's family that she failed to look after the husband properly and thereby hastened, or contributed to his death.

8.3.3 Impact on children and orphans

Perhaps the most important long-term impact of the HIV epidemic will be the large numbers of children who will be orphaned by either one or both parents as a result of HIV. Data were collected from the patients which allow the dimensions of the problem in Monze district to be outlined. Of the 690 patients recruited at the hospital, HIV results were available for 394 inpatients and outpatients (57.1%), of whom 161 patients were HIV seropositive (48.2%) and 2 were indeterminate. The average age of patients with HIV was younger (32.9 years) than of patients without HIV (36.6), and as a result the number of own children they reported was lower (mean 3.8 vs. 2.98) by about one child. When stratified by age, patients over the age of 20 had an average of 3.06 children, compared with 4.36 for patients without HIV. The difference was significant ($p=0.0046$). Patients with HIV over 20 were less likely to be currently married (61.2% vs. 74.2% for HIV negative patients), and 25% were separated, divorced, or widowed, compared with 10% of HIV-negative patients ($p=0.04$).

Table 8.6. Age of patients, marital status, and number of dependent children <16

Variable	HIV negative	HIV positive	p-value
Age (mean, all patients, n=394*)	30.7 (n=231)	32.2 (n=161)	p=0.002
Age (mean, patients 20+, n=313)	36.6 (n=159)	32.9 (n=152)	p=0.109
Sex (all patients):			
Male (n=183)	61.2%	37.7%	p=0.171
Female (n=211)	56.4%	43.6%	
Marital status (patients 20+)			
% Married	74.2	61.8	p=0.042
% Single (never married)	15.7	13.2	
% Divorced, separated, widowed	10.0	25.0	
Mean no. children (all patients)	4.4	3.0	p=0.004
Mean no. children (patients 20+)	4.9	3.6	p=0.006
Mean no. dependent children (children <16, patients 20+)	2.45	2.00	p=0.217

* "All patients" includes all inpatients and outpatients for whom an HIV result was available (394/690).

The sex of the parent of whom the children is orphaned is of great importance in Zambian society, as is the age of the orphan children. When a mother dies, the young children (approximately 6 and under) would be most likely to go to the mother's relatives to be looked after, whereas older children will go to the father's family. In case of the death of the father, the relatives of the man often come to claim all household goods and assets and may leave the widow and children without so much as a cooking pot; often the wife is blamed for the husband's death or for not looking after him well enough. In our sample, HIV positive patients over the age of 20 reported an average of 2.9 children for women and 3.7 for men (with a range up to 13 for women and 42 for men). The large families with HIV included 9 households with 9 children, plus one each with 13, 22 and 42 children, of whom the latter two are father orphans. Many of these are over the age of 15 and no longer dependent, however.

People with HIV tended to have fewer children than those without HIV -- most likely due to their generally younger age and lower likelihood of being currently in a partnership, and also possibly due to HIV-related infertility. Analysis by sex and HIV status shows that while the total sample of men 20 and over had an average of just over 4 children, men with HIV infection had 3.2 and men without HIV had nearly 5 -- a difference of more than 1.5 children. The difference did not reach statistical significance, however ($p=0.081$). Women with HIV had fewer children than seronegative women (2.95 vs 3.89), and the difference of approximately one child did reach statistical significance ($p=0.013$). This may be partially accounted for by the high rates of infertility and pregnancy wastage in women with HIV who may have had pelvic inflammatory disease which often leads to infertility, miscarriage or ectopic pregnancies.. HIV-positive women in Uganda has a relative risk of pregnancy of 0.5 when compared with HIV-negative women.(Gray, 1995) Women with HIV may also be abstinent either by choice or by default following the death of their husband or partner.

149 patients with HIV are leaving children. The group includes 84 women who are leaving 240 children (all ages); of these 158 are dependent children of 15 or under (65.8%). The 65 men are leaving 247 children, of whom 133 (53.8%) are 15 or under. Most worrying is that of the 109 households with dependent children 15 or under, 15.6% (17 households) have already experienced a death of an adult that year, and 19% had an adult who was unable to do his or her normal work.

Loss of entitlement to housing can be a major problem, especially in urban areas. Half of the dependent children (<16) live in rural areas (n=142) and half in urban areas (n=143). Urban children will be affected primarily by the occupation of their parents and the loss of entitlement to housing and access to schooling. This will depend on the occupation of their parents. Rural children will in general not be affected by the loss of entitlement to housing but may be subject to food insecurity as well as to loss of schooling opportunities. For the study, the occupation of the patients was recorded. Of the 91 women for whom occupations were recorded, 29 were farmers or gardeners, 27 were housewives, 12 marketeers, 9 "businesswomen", and 14 were doing other work. 16.1% were living in houses provided by a company, government, or organization and given that few of the women listed occupations in the formal sector, it may be assumed that most of this housing was provided through the husband's employer, and was therefore at risk if he should die or lose his job. Of the 69 men for whom an occupation was recorded, 27 listed occupations in the formal sector, 23 farming, and 18 were working in the informal sector or were students. Of the 48 men with children under 16, 12 (25%) of them lived in houses owned by a company, government, or organization; the families of these households would lose the rights to the house upon the death of the patient. A total of 30 children under 16 were thus affected.

Another issue is the loss of funds to pay school fees. School enrolment rates in Zambia are high, and overall patients who had children of school age or older reported that a mean of 76% of those children were in or had been to school (median 85.7%). (This figure agrees well with the reported level of 88% of patients who had attended primary school.) There was a slightly higher enrolment rate in rural areas, which reported 77.5% compared with 74.4% for urban areas but the difference was not significant ($p=0.947$). There was a small difference in enrolment between HIV positive and HIV negative parents, with HIV positive parents reporting enrolment of 79.8% vs. 73.2% for HIV negative parents, but the difference was not statistically significant ($p=0.095$).

As noted above, children especially in rural areas may be subject to food insecurity. Barnett and Blaikie (1992) define one measure of food insecurity as the lack of production of an excess for sale. In 1990 53% of the rural households with dependent children sold no maize; of those who did, the average sale was 25.6 bags. 1989 was a better year, when 43% of households sold no maize, with the average sale being 40.2 bags. In part this may be due to low producer prices and difficulty with the marketing system. As described above in chapter 3, the 1991-92 season was the worst since the cultivation of maize began, with almost no production anywhere in the district. Rainfall was poor in 1992-93 and again in 1994-95.

In any case, nearly half of children in rural areas were living with a considerable degree of food insecurity *prior to* the period of illness of the patients, and thus given the imminent and inevitable loss of at least one parent, their situation was highly precarious.

8.4 Impact on production and earnings

The impact of HIV on households' production and earnings will be primarily through the loss of the labour of the carer(s) during the period of illness, and of the patient both during illness and following death. Data were collected from carers regarding their normal occupation (presented in section 7.4 below) and the amount of time spent caring for the patient which allows an estimate of the overall economic burden to be made. Data were also collected from the patients themselves (or their proxies) regarding their health care seeking behaviour and expenditures on health care for the current episode of illness. These data are presented below.

8.4.1 Burden of HIV on patients' carers

It is customary in Zambia for someone to accompany patients to hospital to look after them, feed them, and perform minor nursing tasks. Inpatients at Monze Hospital were asked whether there was anyone looking after them in the hospital. About 60% replied with the name of a "helper" or principal carer. Those who did have a carer present reported an average of 2.4 total carers. Wherever possible the principal carer was interviewed. Table 8.7 presents data on the characteristics of these carers.

Table 8.7. Characteristics of patients' principal carers, by HIV status of patient.

Characteristic	Carers of HIV-negative patients (n=61)	Carers of HIV-positive patients (n=58)	p-value
Sex of carer (% female)	75.4	70.7	0.561
Age of carer (mean)	41.2	42.0	0.637
Usual occupation:			
farmers	46.7	50.0	0.625
marketeers/informal sector	13.3	8.6	
formal sector	20.1	16.2	
house duties	18.3	23.8	
other	1.4	1.4	
Relation to patient (%):			
spouse	13.1	32.8	0.094
sister/brother	18.0	8.6	
mother/father	26.2	32.8	
other	42.5	25.8	
Member of same household (%)	47.5	52.5	0.094
Carer has been looking after patient at home (%)	66.1	74.1	0.199

These data show that carers are primarily middle-aged women. The only differences between carers of HIV-positive and HIV-negative patients that approached statistical significance were that carers of HIV-positive patients were more likely to be the spouse, and a member of the same household, than were carers of HIV-negative patients. This seems to indicate that abandonment of the spouse with HIV, reported in other countries and societies, is not a widespread occurrence in this sample of Zambian patients.

8.4.2 Expenditures made by carers

Carers made significant expenditures on behalf of patients. In table 8.8 below, data are presented on characteristics and expenditures made by carers in terms of both money and time, to enable the opportunity cost of their time and effort to be estimated.

Table 8.8. Characteristics of carers, by HIV status of patient.

Characteristic	All carers (n=159)	Carers of HIV- patients (n=61)	Carers of HIV+ patients (n=58)	p-value
Expenditure on transport (self) (K)	494	565	671	0.536
Expenditure on transport (patient) (K)	199	300	188	0.230
Expenditures since arrival at hospital food for self	241	251	214	0.096
items for patient	327	305	317	
Carer looked after patient at home (%)	66.3	66.1	74.1	0.199
Carer not able to work while looking after patient at home (%)	57.9	46.3	59.1	0.227
No. of days lost from work at home	21.7	16.7	19.7	0.492
% having to stop usual work while looking after patient at hospital	83.4	73.8	86.2	0.08
% with small children at home	77.1	78.7	77.6	0.88
% being looked after by other children	37.5	37.5	42.2	--

The data in tables 7.7 and 7.8 show that about half of the carers are farmers, and most of them are female -- key to the production of maize. Only about half of the carers are from the patient's household, so even prior to the admission, many of them were having to give up their normal responsibilities in order to care for the patient. The average expenditure of K500-600 is equivalent to about 4-4.5 days wages of an unskilled labourer. A subset of about 50 carers was interviewed every other day during the hospital stay to ascertain the overall expenditures (beyond the date of the first interview). These interviews revealed that overall average expenditures were K849, of which 66% was for food, 27% for transport, and 7% for other items. The amount is equivalent to about 6.4 days' wages of an unskilled labourer.

8.4.3 Estimated number of days lost by patients and their carers

From these data it is possible to make a minimum estimate of the number of days lost by HIV-positive hospital inpatients and their carers due to illness. Carers of inpatients with HIV reported losing 19.7 days from work. It seems reasonable to assume that this is also the minimum number of days lost by patients themselves. Therefore each of the

episodes reported by the carers represents a minimum of 39.4 days of work lost per inpatient.

Approximately 60% of HIV-positive inpatients had a carer at the hospital, so assuming that those who had no carers at the hospital were also looking after themselves at home, the total number of productive days lost per admission per HIV positive patient would be about 32 ($19.7 \times 1 + 19.7 \times 0.6$). On average, in the year before death, patients with HIV disease had 3 admissions to hospital for a total of 94 days lost, of which 62% would be days of the patient him/herself, and 38% of the principal carer. Other patients with HIV infection, but not HIV disease, however, would not lose so many days and would not require such an intensive input from carers so this is probably a high estimate of the number of days of carers lost. On the other hand, patients with HIV disease are frequently unable to work more than sporadically in the final year of their life. It is also likely that days "lost" are not completely lost; there is always work to be done around the house. But time diverted from work outside in the home, especially agricultural time, is especially valuable especially during certain periods of the year. This therefore seems to be a reasonable approximation of the number of days lost.

8.5 Investment and savings

HIV will affect households' investment and savings in several ways. First, the costs of seeking care during the lengthy period of HIV disease may place a heavy burden on households already under stress due to the loss of earnings or productivity caused by the diversion of labour of both the patient and his/her carer(s). Secondly the stress may lead households to dispose of assets, including productive assets. Third, the expenditures on the funeral and burial may be quite significant. Finally, the loss of a person in young middle age (the average age of patients in the sample with HIV is 29.4) implies a major disinvestment especially in terms of education and work experience. The available data on these aspects of the impact on savings and investment is discussed below.

8.5.1 Health care seeking behaviour and expenditures

An estimate of the amount of time lost from work due to HIV for both patients and their principal carers was made above and its impact on the household's productive capacity assessed. Another of the major influences on the welfare of the household of patients, and potentially a major drain on investment and savings, is the direct out-of-pocket expenditures by patients on health care. Patients were asked about the sequence of actions they took when they felt ill and how much they spent on each attempt to get care, for as many as four different care-seeking actions. Table 8.9 below reports the pattern of care-seeking behaviour

by HIV status for three actions taken by patients. The numbers of patients seeking care four times are small, so those data are not reported here. Excluding data on the fourth action taken, there was no difference in the number of actions taken by patients, with HIV-positive patients reporting an average of 1.96 actions and HIV-negative patients, 1.94.

Table 8.9. Choice of health care provider, by sequence of care seeking action and by HIV status.

Source of care	First action:		Second action:		Third action:	
	HIV-	HIV+	HIV-	HIV+	HIV-	HIV+
	n=231	n=159	n=149	n=101	n=68	n=52
Herbal medicine	9.5	5.0	8.1	5.9	4.4	0
Traditional healer	2.2	3.8	5.4	5.9	2.9	3.8
Self-medication	16.0	12.6	4.0	5.9	4.4	3.8
Community health worker or TBA (a)	0	0	0	0	0	1.9
Health centre	18.6	17.6	6.7	8.9	8.8	11.5
Hospital OPD	29.9	29.6	42.3	36.6	41.2	23.1
Hospital ward	23.4	31.4	32.9	36.6	38.2	55.8
(p-value)	(p=0.637)		(p=0.971)		(p=0.186)	

(a) TBA= (trained) traditional birth attendant.

Patterns of health care seeking behaviour did not differ significantly between people with HIV and people without. Two aspects of this behaviour are noteworthy; first is the high percentage of patients who came first to the "modern" health services (71.5% of HIV negative patients and 78.6% of HIV positive patients). Second, the extremely low use of the approximately 100 community health workers in the district who have been trained and supervised at considerable expense to the Government. Despite the fact that this patient sample was drawn from among those actually using the hospital and includes both urban and rural residents, it nonetheless seems surprising to find that only one of 760 care-seeking actions involved the services of the CHW for their current illness. Similarly, the low percentage of patients who used traditional medicine or herbs in the first instance (11.7% for HIV-negative and 8.8% for HIV-positive) also seems to suggest that either these patients are more oriented towards Western allopathic (or "modern") medicine, or they viewed their illness as one for which traditional medicine was not as effective -- or that they were

reluctant to report such use. 56.9% of HIV-positive patients had previously been a patient at the hospital (vs. 50.7% of HIV-negative patients, $p=0.19$).

Table 8.10 presents expenditures by source of care and HIV status for the first and second actions taken by patients.

Table 8.10. Expenditures on health care by source of care and HIV status (in Kwacha).

Source of care	HIV-negative patients	HIV-positive patients	p-value
1. Traditional or herbal: first action	84.5 (n=24)	139.6 (n=14)	p=0.40
second action	161.5 (n=20)	184.1 (n=12)	p=0.86
2. Self-medication: first action	18.6 (n=31)	51.8 (n=19)	p=0.027
second action	16.7 (n=6)	55.3 (n=6)	p=0.128
3. Formal health care (a): first action	42.6 (n=113)	73.0 (n=74)	p=0.53
second action	16.0 (n=64)	50.1 (n=48)	p=0.62

(a) Formal health care includes health centre, hospital outpatients department and hospital inpatient wards.

As shown in Table 8.10, the similarity in care-seeking behaviour between patients with and without HIV infection was paralleled by the similarity in expenditures. The mean expenditure on all sources of care for that episode of illness for HIV-negative patients was K188.9 (median K50, $n=217$) and for HIV-positive patients, K175 (median K120, $n=156$). The difference was not significant ($p=0.246$). These out-of-pocket expenditures may be compared with the daily wage of an unskilled worker which at the time was approximately K133; they thus represent the equivalent of about 1.4 days' wages for an unskilled worker. As shown in table 8.11 below which presents expenditures by type of care and HIV status, only expenditures on self-medication differed according to HIV status, with HIV-positive patients spending 2.5-3 times more than HIV-negative patients, although the difference did not reach statistical significance. Table 8.11 presents data on the cost of the first episode of modern health care by level.

Table 8.11. Cost of the first episode of modern health care by level and by HIV status (in
Zambian kwacha, K120=UK).

Source of care	All patients (a) Mean	Median	HIV-negative (b) Mean	HIV-positive (b) Mean	p=
Self-medication	31.7	0 (c)	18.6 (n=31)	51.8 (n=19)	0.086
Health centre	48.7 (n=104)	0	79.7 (n=42)	36.3 (n=27)	0.231
Hospital OPD	25.2 (n=236)	15	21.0 (n=67)	49.4 (n=43)	0.958
Hospital wards	268 (n=19)	50	12.5 (n=4)	575 (n=4)	0.082

(a) Includes patients for whom no HIV result was available.

(b) Includes only patients for whom an HIV result was available.

(c) Some patients reported using medications "already in the house" i.e. not purchased for that episode of illness.

Interestingly, the expenditures reported by those seeking care at health centres (mean of K49) were almost twice as high as the mean of K25 reported by patients seeking care at the hospital OPD ($p=0.0007$). As this sample includes both urban and rural residents, it is likely that the lower cost of seeking care at the OPD reflects the fact that many Monze town residents are able to walk there, but it does shed some light on the reasons for patients to bypass the health centre -- in addition to the perceived better care and availability of drugs, it may also be cheaper to go to the OPD. Admission to hospital was more costly at a mean of K268 per admission. Most costly of all, however, was the traditional healer, with a mean of K416 (median K300).

These figures indicate that an episode of illness can be very costly, especially for families or households with limited access to cash. Bearing in mind that our sample was selected at a hospital, and therefore represents more serious or more intractable illnesses which were not resolved earlier on, it is worth noting from table 8.12 that of 231 people without HIV, 64% took a second action and 29% a third; and of people with HIV, 64% and 33% respectively took second and third actions in their attempts to seek care. It is therefore possible to make a rough estimate of their overall expenditures. The mean expenditures on the first actions (all sources) were K189 (£1.58) for HIV negative and K175 (£1.46) for HIV positive patients. 36.6% of second actions for people with HIV involved the OPD, and 36.6% resulted in hospital admission; the figures for the third action were 23.1% and 55.8% respectively. Taking the mean expenditures at OPD and on the wards for the first action of

K49.4 and K575 respectively gives an expenditure weighted by likelihood of using the different facilities of K175 for the first action, K145 for the second $(0.635 * (0.366 * K49.4) + (0.366 * K575))$, and K109 for the third $(0.327 * (0.231 * K49.4) + (0.558 * K575))$ for a total expenditure of approximately K429 (£3.58) on that episode of illness. This does not take account of most expenditures made on transport and food for the patient's helper, which can be substantial. If the patient seeks care three times during the final year, the out of pocket expenditure could easily exceed K1200 (£10) -- 9 days' wages in the formal sector. It must also be borne in mind that these data probably underestimate the expenditures on care in the traditional sector. Many patients leave the hospital when there is little more that can be done for them and seek care in the traditional sector, where very significant expenditures are probably being made which would not be captured by our data.

8.5.2 Expenditures on funeral and burial costs

Information on funeral and burial expenditures was collected during the follow-up study, by which time several patients had died. The main expenditure items are a coffin (approximately K2,500-K5,000), cement to cover the grave to prevent graverobbing (K20,000), transport for the deceased and the mourners (varies considerably, often around K5,000-K10,000 depending on distance), and food for as many as 200 mourners including mealie meal and livestock (usually at least one cow plus mealie meal, approximately K15,000). The picture these data give is mixed; households receive assistance with funeral and burial costs, and are also expected to bear much of the costs themselves. In one case the assistance took the form of the cancellation of a K2000 loan by an uncle of the deceased; in another case the assistance was a cow (for the feast). One household had spent K3,000 of its own resources and borrowed K7,000 for the funeral of a study patient. Another household had two funerals; on the first they spent K20,000 for cement and bought 15 bags of mealie meal (estimate K15,000). For the second funeral (that of the patient) they spent K13,900, including K9,000 for transporting the body; a son bought the coffin. The two funerals cost the household more than twice what they had spent on seeds and fertilizer that year, and the household had a debt of K15,000.

About one third of the study households had spent money on funerals for members of other households. In one case they had spent K11,500 on the funeral of two daughters and K15,000 on a brother of the husband. Another household had sold goats and chickens to pay K15,000 for the funeral of a daughter who died of AIDS who was living elsewhere; this household was headed by a couple in their 70s who had 13 orphaned children to look after, including one handicapped girl. Another woman whose husband had died, had spent

K3000 looking after him and had bought 5 bags of mealie meal for the funeral (estimated cost K5,000); following the funeral and according to the custom his relatives came and took away the bicycle, radio cassette player, and the four cattle, leaving her with few resources. In another case a young woman had to spend all her savings for the coffin for her brother, and the suggestion during the interview was that the debt incurred was the reason for which she started going to bars and became involved in commercial sex work.

These anecdotal data give some indication of the magnitude of the expenditures and the burden on households of funerals and burial expenses. Expenditures on the order of K15,000 (£125) are not uncommon; this represents about 115 days' wages for a general (unskilled) worker at the hospital, for example. There are accounts of people being forced into commercial sex work or stealing in order to pay off debts incurred for funeral expenses; the informal sector money lenders charge interest at up to 100% per month so immediate payment is imperative. Many patients and household members referred to debts which they could not pay off, some of which were inherited from the deceased family member. Clearly the expenditures on funeral and burial expenses, following on the expenditures for illnesses, can be devastating for a household, although it is important to note that this effect is primarily due to the shift in timing of the funerals and to the rapid increase in the overall numbers during a given period, rather than the expenditures on funerals themselves -- expenditures on funerals would have occurred in any case, but at a later stage.

8.5.3 *Sale of assets*

These expenditures are bound to cause economic stress in many households, and in such cases households may begin to sell off assets in order to raise cash to meet urgent expenditures. Patients and their helpers were asked whether they had sold any important items¹ in the past year, and if so, what was the reason for the sale. The most common single reason for sale of assets was to purchase food. Of the total of 213 inpatients, outpatients, and helpers who had sold an asset, 25 or 11.7% had sold the asset in order to raise money for illness or a funeral. In case of the inpatients, 1 had sold an item for a funeral, and 11 for illness; five of these items could be considered as "productive" assets -- oxen (2), a bull (1), car parts (1), and a sprayer (1). (Cattle other than oxen or a bull have not been classed as productive assets although they might be considered as such.) Other sales included bags of maize and groundnuts (3), cattle (3), and a chicken (1). 8 outpatients (11.5%) had sold items

¹ It was left to the respondent to decide what constituted an "important" asset. The items mentioned ranged from a vehicle or a refrigerator to a chicken or a pair of shoes.

to pay for illness, and five helpers (of 47) also had sold items to pay for funerals (2) and illness (3).

8.6 Lost investment in human capital

8.6.1 Investment in education of patients

The loss of human capital represented by the premature deaths of people with HIV can be estimated on the basis of their educational attainments and the occupations they hold. The study collected data which permit estimates of these parameters to be made.

Table 8.12. Educational level attained by patients, by level of education and HIV status.

Level of education	HIV negative (%)	n=	HIV positive (%)	n=
Literate (can read):				
no	26.8	33	16.4	32
in English	3.3	4	1.0	2
in a Zambian language	27.6	34	25.6	50
in both	38.2	47	55.4	108
				p=0.0213
Can write:				
no	27.6	34	18.5	36
in English	2.4	3	1.5	3
in a Zambian language	27.6	34	25.6	50
in both	36.6	45	53.8	105
				p=0.001
Primary school	76.4	123	87.7	195
				p=0.036
Secondary school:				
none	58.4	59	51.1	90
less than grade 9	8.9	9	9.0	16
grade 9	14.9	15	22.7	40
grade 12	14.9	15	13.1	23
correspondence course	0	0	2.8	5
				p=0.231
Further education:				
none	80.3	98	75.8	147
apprenticeship	34.6	9	65.4	17
college	11.5	14	12.4	24
university	0.8	1	1.0	2
				p=0.704

Table 8.12 shows the levels of educational attainment by people with HIV infection in comparison with people without HIV. As can be seen above, the patients with HIV were significantly more likely to be literate and to have attended primary school, but not to have attended secondary school or further education. The loss of the 196 patients with HIV in

this sample means that 1026 years of primary education, approximately 274 years of secondary education, 17 apprenticeships, 24 post-secondary educations, and the investment in the education of two persons having attended university (not necessarily having graduated) will be prematurely lost to the district economy. The average age of the patients with HIV in the sample was approximately 32.2 (table 8.6). A model life table for Zambia predicts a life expectancy at that age of approximately 65, so most of these people would have worked for a normal career of another 30 or so years. Assuming most of them finished school at 15, the expenditure on their education has thus yielded only approximately 15 years of benefit, rather than the 40 which would otherwise have been the case -- meaning that the cost per year of benefit is approximately 2.5 times more for the patients with HIV.

8.6.2 Loss of skills and work experience of patients

Data were collected from patients regarding their usual occupation and employment status, which allow an estimate of the economic loss to the household and by extension, to the community, to be made. Data on patients' present employment status and type of work, are presented below in Table 8.13.

Table 8.13. Employment status and type of work, by HIV status

	HIV- Men (%)	HIV+ Men (%)	HIV- Women (%)	HIV+ Women (%)
Current employment status:	(n=110)	(n=69)	(n=119)	(n=91)
Student	20.4	4.3	9.2	4.4
Never worked	2.7	0	0.8	0
Stopped working (retired or disabled)	4.5	2.8	—	1.1
Currently working	61.6	91.3	89.9	94.5
Type of work (a):	(n=72)	(n=66)	(n=107)	(n=87)
1. Working at home	0	0	32.7	35.6
2. Self-employed:				
farmer or fisherman	50.0	34.8	44.9	27.6
shop or garage owner	9.7	6.0	0.9	3.4
marketeer	9.7	9.1	15.0	25.3
3. In paid employment:				
unskilled	16.7	13.6	0	3.4
skilled manual	8.3	16.7	0.9	0
skilled non-manual	5.6	18.2	5.6	4.6
manager / professional	0	0	0	0
police / army	0	1.5	0	0

(a) Excludes those not currently working e.g. students, retired, and disabled.

As can be seen in the table, two categories stand out as more likely to have HIV infection, e.g. market sellers or "marketees" ($p=0.0019$) and skilled workers (both manual and non-manual), but this difference reached statistical significance for men only ($p=0.0109$).

Farmers of both sexes were less likely to have HIV infection ($p=0.0055$) but due to the large percentage of farmers in the sample (and in the district) they nonetheless constitute the single largest occupational group with HIV infection (30.7% of the total).

In order to estimate the impact of HIV on the district's stock of skilled human resources, patients were asked about their main occupations. The answers given by the 69 men with HIV who answered the question give some idea of the potential impact their loss

will have on the community and the district's economy. The occupations are given below in Table 8.14, grouped by category.

Table 8.14. Occupations of 69 male patients with HIV, by sector

Occupation	Number	% of total
Skilled manual:		23.2%
bricklayer	2	
carpenter	4	
borehole driller	1	
driver or lorry boy (driver's assistant)	4	
machine operator	1	
mechanic	2	
metal worker	1	
tailor	1	
Skilled non-manual:		18.8%
accounts clerk	2	
agricultural officer	2	
clerk	2	
clerk of court	1	
community service manager	1	
crop husbandry expert	1	
depot manager	1	
engineer	1	
policeman	1	
teacher	1	
Farming, fishing, gardening:		33.3%
farming	20	
fishing	2	
gardening	1	
Services:		18.8%
businessman	5	
cattle dealer	1	
general worker	3	
house servant	1	
security guard	2	
salesman	1	
Students	3	4.4%

Some of these manual skills, such as borehole driller, mechanic, depot manager, and machine operator require a number of years to learn and are scarce in the district. The skilled non-manual occupations of accounts clerk, clerk of court, crop husbandry, engineering, agricultural officer, and teacher are also jobs which require years of experience and training in order to do them well, and the loss of these men will be a significant blow to the economy.

A third of these men give their occupation as farmer, fisherman or gardener, and the loss of their labour and expertise will be a blow to their household, and on a wider scale, such losses throughout the district would have a negative impact on the agricultural production of the district. The fact that three of the sample (4.4%) are students shows that the epidemic has hit younger age groups, and that educational resources are being expended on people whose life expectancy is low, and whose ability to make use of the education, is thereby limited.

Women were asked about their occupations as well. Table 8.15 gives their responses to the question about occupation.

Table 8.15. Occupations of 91 female patients with HIV, by sector

Occupation	Number	% of total
Skilled manual: cook knitting	1 2	3.3%
Skilled non-manual: accounts clerk teacher (including retired) secretary	1 3 1	4.4%
Farming, fishing, gardening: farming (including "helping husband on the farm")	29	31.9%
Services: businesswoman marketeer charcoal burner housemaid (outside the home) housewife (own house)	9 13 1 1 26	54.9% (29%)
Students:	4	4.3%

More than half of the women interviewed were active in the services sector, especially if "house duties" are categorized in this way. Again, students make up 4.3% of the total. But farmers once again make up the largest single group of occupations. The loss to the economy of these women's input, in terms of skills, will be felt primarily at the household level where their contribution to the agricultural labour pool will be lost, and in the informal sector especially in marketing and petty trading.

8.7 Summary

This chapter has described the impact of HIV on the households of patients in the sample with respect to household composition, production and earnings, and investment and consumption. It has attempted to quantify the loss they represent to the district's economy. Household dependency ratios will rise by about 16-17% and the average household size will decline by approximately 16% in urban areas, and 12% in rural households. A large number of orphan children will be exposed to loss of entitlement to housing and schooling, and their food security will be made more precarious. The estimated 94 of days lost per patient in the final year of life of both carers and patients will represent a serious drain on the labour input of the average household, especially if those days coincide with the peak agricultural season. Expenditures on health care and on burial and funerals will pose a major problem for households, and many will dispose of useful assets in attempting to discharge debts resulting from those expenditures. The lost investment in human capital, in terms of education and occupational experience, will be significant, and a number of key skills will be lost. Some of these workers will be difficult to replace and the economy of the district is likely to suffer a decline in productivity as a result.

9. Implications for policy, future research priorities, recommendations and conclusions

9.1 Introduction

In this chapter, the policy implications emanating from the study are brought together as well as research priorities which result. The overall implications for Monze District, and by extension, rural Zambia are discussed. These include the possibility that given the loss of remittances, the increasing difficulties facing small farmers, and the lure of apparent opportunities in urban areas, that HIV/AIDS will increase the rate of urbanization. This possibility requires the consideration of policy measures to support farmers and others living in rural areas to ensure that as the mining industry declines, on which Zambia has relied for nearly all of its foreign exchange earnings, Zambia will increase its ability to feed itself.

9.2 Implications for the health services

9.2.1 Use of various levels of the district's health services

One finding of the study was that the burden of HIV disease on the hospital was significant, with about 30% of bed days going to the care of people with HIV disease, inevitably causing displacement and deterioration of care for other patients. At hospital level emphasis is placed on the care of AIDS patients -- insufficient attention is paid to the needs of people in earlier stages of HIV disease. Much useful life-prolonging and life-enhancing care can be provided in early stages of HIV infection; emphasis should be placed on maintaining "wellness".

In contrast to the overburdening of the district hospital, the impact of HIV on the health centres of the district was virtually negligible -- only 3% of health centre patients had signs of HIV disease. This was the result of a pattern both of self-referral to hospital, and of referral by health centre staff who felt themselves unprepared or unwilling to deal with patients with HIV disease. At primary health care level, health staff have had training in counselling of patients with HIV -- but not in the basic clinical care of people with HIV. Some believe that care of persons with HIV is the responsibility of the hospital, and they tend to refer patients upwards at the first suspicion of HIV infection.

Indications from the bed census (described in Chapter 2 and in Buvé and Foster 1995), subsequently confirmed by the in-depth study, showed that much of the care for HIV disease (as well as other illnesses) could have been provided at a lower level of health facility - - if such a facility were properly prepared and equipped in terms of drugs and supplies, and in terms of training. Health centres in Zambia have a number of beds which in Monze District are underutilized, with less than 50% utilization. One health centre had built a traditional-style house for the patients and their families so that they could be near the health

centre, which offered the care of a clinical officer equipped with basic drugs and a reliable water supply, but also stay in more comfortable and familiar surroundings. This might be an appropriate model for increasing the use of the health centres and decongesting the hospitals.

Of the more than 600 patients recruited at the hospital, none reported having consulted the community health worker (CHW) for that episode of illness -- even taking account of up to four separate care-seeking actions for that illness. Use of the CHWs among the community was scarcely higher, with only one patient of 690 reporting having consulted the CHW for their most recent illness. The expenditure on training, supervising, and supporting some 100 CHWs in the district might be better used elsewhere. Further research could investigate what barriers there are to their use, and what improvements might be made.

In response to the growing number of AIDS patients and the need to use hospital beds effectively, the hospital had developed a programme of home based care (HBC) for people with HIV disease. This model was very costly, involving expenditures on vehicles and salary incentives such as lunch allowances for staff, with little of the expenditure actually benefiting the patients and their families. The impact on bed utilization was positive since patients were offered transport home, which eased their discharge from the hospital. This was however offset to some degree by the fact that the HBC team often found people in very bad condition and brought them back to the hospital, where they often died. Home-based care must have clear objectives, and be based on an assessment of what families and patients actually need, and then be organized efficiently so that those needs are met as well as possible.

Better use could be made of the existing health facilities of the district by decentralizing much of the care to health centres and by either eliminating the HBC programme entirely and reallocating the resources, or by reorganizing the way in which home based care is provided. This ought to be possible because the health centres are not working at full capacity, as is the district hospital. Given the main reasons for admission to the hospital, much of the care of patients with HIV disease can be delegated to health centres. A second reason is that the seroprevalence figures of patients attending health centres indicate that HIV disease has become a major problem in rural as well as urban areas. For most people in the rural areas of Zambia, the health centres are the only readily accessible health services. Third, by virtue of the proximity to their catchment population health centres are better placed to organise home based care for patients with HIV disease than are hospitals.

HBC could be decentralized to health centre level but this would require the decentralization not only of responsibility but of resources as well. Donor agencies and hospital staff are both reluctant to see funds "dissipated" into the rural areas where accountability may be more difficult to achieve, but that would seem to be essential to enabling the health services to cope with the burden of HIV and AIDS. Effective care at health centre level can be provided using treatment protocols for common conditions and providing basic essential, inexpensive drugs. (Foster, 1994) Where HIV testing possibilities are limited, health staff need not be made to feel that an HIV test result is essential for provision of routine health care for people with HIV disease.

9.2.2 Tuberculosis

Monze district's health services are having to cope with a doubling or even tripling in the numbers of TB patients presenting for treatment due to the association of TB with HIV. Nationwide, tuberculosis notifications have quadrupled in the past 10 years. (Dr M Sichone, personal communication) More needs to be done to devise better ways to cope with this rapid expansion of cases. The trend is towards shorter regimens, including intermittent regimens, using more effective (and expensive) drugs, and towards directly observed therapy. Health centres can play an important role in TB treatment, especially following diagnosis in overseeing and supporting the patient during the maintenance phase -- possibly becoming involved in observation of therapy.

9.2.3 Preventive therapy

Ongoing research is investigating the possibility of preventive therapy for some of the most common HIV-related infections. These include isoniazid preventive therapy for tuberculosis which is cost-effective under certain circumstances (Foster and Godfrey-Faussett, 1995); and pneumococcal vaccine to prevent pneumonia and septicaemia (Gilks, 1996). An additional priority for preventive therapy is HIV-related diarrhoea; 11% of days in Monze hospital of patients with HIV were diarrhoea-related. Kelly (1996) has found that albendazole, a relatively inexpensive drug, reduces the frequency of diarrhoea in patients with HIV significantly. The growing emphasis on "wellness" and on prevention will impose additional responsibilities for health services in terms of helping to identify suitable candidates through HIV testing but in the longer run this could pay off in terms of illness episodes averted.

9.2.4 Mortuary

The inevitability of death has to be faced, and in Monze District provision will have to be made for additional mortuary space. Zambian laws (as interpreted at the time of the

study) did not facilitate patients dying quietly at home but rather encouraged families to rush dying patients to hospital so that the cause of death could be certified easily, without involving the police. This was stressful for patients, families, and staff, and was not a good use of hospital resources. Changes or clarifications to the laws regarding death certification are needed to allow patients to die comfortably at home. This should involve discussions with municipal authorities and the police.

9.2.5 Coordination and funding issues

The HIV epidemic has given rise to a worldwide mobilization of funds and this posed problems for the district's health services. The influx of NGOs, researchers, donor agencies and international "expert" missions placed a heavy burden of coordination and diplomacy on the district level health staff-- the district medical officer spent about one day a week on such activities. NGOs and donor agencies have their own priorities which may not accord with those of the health authorities, and they tend to work in isolation from, and in competition with, the government and from each other. They compete for the best staff and offer them attractive salaries; other staff are taken away from their work by workshops, report writing, etc. Jealousies and problems may arise with regard to the allocation of per diems and travel opportunities and to the international exposure that work on HIV/AIDS may bring to lower level staff. In some cases, the effort required to comply with donor accounting and reporting procedures may exceed the value of the funds to the recipient country.

9.2.6 Impact on health staff

One of the unexpected findings of the study was the high levels of HIV-related mortality and absenteeism among health staff. In Monze and Choma hospitals, mortality among female nurses had risen 13-fold between 1980 and 1991 to 2.67% (Buvé et al 1994) and appeared in 1994 to have risen to 4%. (C.Mbwili, personal communication) Medical doctors, lab technicians, and other categories of health workers are also heavily affected. Some staff fear HIV so much that they are leaving the health profession or migrating to areas or countries where the perceived risk is lower.

Staff are also experiencing high levels of stress and "burnout". Causes for this include fear of contracting HIV from patient contact, social contamination (ostracism and stigma of working with people with AIDS), discomfort with the sexual dimensions of HIV/AIDS, and a sense of professional inadequacy due to high levels of mortality among patients. Staff have also experienced "role expansion", being asked to take on new tasks for which they are not prepared, such as advocacy and counselling which is particularly stressful

when the patients and the health staff are drawn from the same community (or even from the same health facility) and may know each other well. They also may have difficulty in dealing with patients' emotional traumas regarding e.g. the future of their children. (Miller 1991)

In other cases the opposite may be true -- the health staff may dislike or feel a great social distance from the patients or clients they are asked to look after, such as commercial sex workers and patients with STDs. In Monze, where most staff were either Catholic or Seventh Day Adventists, many had religious, moral, or cultural objections to some of the advice they were expected to give, e.g. related to the use of condoms or sexual behaviour. Health staff may also feel themselves ill equipped to face some of the ethical dilemmas posed by the HIV epidemic. They are expected to keep HIV results confidential, yet they may find this difficult if they know the a person with HIV is exposing others through unprotected sexual activity. Another issue they face is the problem of displacement of non-HIV infected patients; resources are scarce and a balance needs to be struck between the needs of all patients, yet they find it difficult to discharge a patient for whom little can be done.

9.2.7 Possible solutions to the problems of health staff

Solutions to the problem of HIV among health staff would include 1) providing better information and education for health staff about their own personal risks, both personal and professional, and 2) reinforcing and adhering to safety procedures and provision of adequate protective equipment for high-risk tasks (e.g. long gloves for deliveries, etc.). HIV-positive staff are particularly vulnerable to exposure to TB, and staff known to be HIV positive ought not to be asked to care for TB patients. Better provisions need to be made for replacement of staff who are ill for a long period, to avoid the problem of "ghost workers" who are still officially in service but not available for work. Further research needs to be done on the contribution of occupational and personal risk to the high levels of HIV observed among health staff.

In the longer run, it will become more and more difficult to keep a hospital running. Scarcities of not only nurses, but of lab technologists, x-ray technicians, and doctors will become critical. Loss of these key staff can paralyze the service. At Monze, one of the two clinical officers (CO) trained in anaesthetics died and no replacement could be found for over four months; the remaining CO was on call constantly for those four months, and rarely was allowed to sleep through the night.

High levels of mortality and absenteeism have profound implications for the functioning of the health services. The demands on the health service are greater than they

have ever been. But expansion of training of new staff is constrained by the losses of appropriately trained teaching staff. Health ministries will need to consider ways to 1) *retain* existing staff (raising the retirement age, improving conditions of service, improving the public perception of health care work, etc.), ways to 2) *increase the supply* of new staff through expansion of training schemes, and possible ways to 3) *maximize the effectiveness* of existing staff through e.g. channelling the energies of family members for basic nursing tasks, reducing the time spent on paperwork, creating new cadres of staff to take on some basic nursing tasks, and using all levels of the health system. One likely outcome of this situation is that it may become necessary to create new categories of lower-level staff. Another is that it will become more difficult to find staff willing to be posted to rural areas; staff may use their increased negotiating power to be posted in urban areas, thus increasing the maldistribution of health staff.

9.3 Impact on households and the district economy

The HIV epidemic will have a profound impact on the labour market in Zambia through two main effects-- the deaths of productive adults and the resultant slowing of the population growth rate. This study has found that the seroprevalence among the general adult population was 10-12% in 1991. This implies that approximately 7,500-9,000 adults in the district were HIV positive, and that approximately 1 in 3 of the district's 20,000 households contained a seropositive member, and many of these will have experienced the death of that member from AIDS by 1997. Although the purpose of the study was not to measure demographic impact, the findings support those of other studies which suggest that population growth will slow. The finding of this study that women with HIV disease have on average one less child than women without HIV, combined with the finding from other studies that women with HIV are half as likely to be pregnant (Gray, 1995) suggest that their completed family size will be smaller by at least one child than those of HIV-negative women drawn from the same community.

The impact of the HIV/AIDS epidemic in rural and urban areas will be quite different. In rural areas, the loss of labour will make it difficult to farm enough land to feed a household adequately. The alternative of switching to more capital-intensive production methods is only available to a few relatively well-off farmers, probably not more than 5-10% of the total. Tractors are virtually unknown outside of the large commercial farms; few Africans own them. The epidemic of East Coast Fever wiped out a significant proportion of the district's draught power, and hit smaller farmers particularly hard. They will now have to

rent oxen -- if they have the cash. They will also have the traditional burden of caring for ill relatives and of funeral expenditures which has been shown to be considerable.

9.3.1 Orphans

The situation of orphans has been well described in a number of countries including Uganda (Hunter, 1990; Preble, 1990) and Rwanda (DuPont, 1993) but the particular case of some orphans in Monze District describes the potential negative impact on economic development. As HIV/AIDS is heterosexually transmitted, frequently both parents die and the children are sent to live with a relative. Quite often the children are orphaned a second time when those carers die; in Lusaka one agency began to focus its efforts solely on these "double orphans".(A.O'Connell, personal communication) In other cases they go to live with grandparents, often in the rural areas; AIDS has been described as "the grandmother's burden." This represents a major step backwards for most of these children; the grandparents worked hard to send their own children to school. They succeeded and got good jobs in urban areas, but then contracted HIV infection. These children -- the nucleus of a growing middle class -- were born and brought up, and educated, in urban areas until the death of their parents, when they return to the village where their parents began. The efforts and advancement of two generations are thus lost. The grandparents are too old and exhausted to perform the same miracle for their grandchildren.¹

9.3.2 Loss of remittances

Another long-term change will be the permanent loss of remittances from relatives who have died. For some households this loss of cash income will be devastating, making even small purchases such as candles and salt impossible, and it is likely that a household member will migrate in search of work. The impact of structural adjustment, which has removed subsidies on farm inputs and at least temporarily deregulated the price of maize and disrupted the marketing system, combined with the apparent long term decline in rainfall (Figure 3.1) will provide yet another "push" in the direction of increased urbanization. Given these circumstances, with life in the rural areas becoming even harder than it has always been, it seems likely that the urban/rural income gap will widen further and urbanization will increase.(Buvé and Foster, 1993)

¹ One 70 year old diabetic woman in Monze now has 13 orphan children of her two sons as well as her blind husband to look after. The children returned from Lusaka and the Copperbelt where they were in school when their parents died. She sells tomatoes and makes baskets in an effort to keep them in school in rural Monze district.

9.3.3 *Increased rate of urbanization?*

By comparison with life in the rural areas, life in cities may become more attractive. The lure of urban job possibilities, combined with the "push" of needed cash to maintain a rural household, as well as the greater availability of health and education services, may give rise to a new influx of people into the urban areas to replace those who have died. Large numbers of skilled workers will die from HIV/AIDS and replacements will need to be found, in many cases from among people already working in the firm and being promoted (perhaps prematurely). In cases where recruitment from outside is envisaged, competition for skilled and experienced workers will increase, and wages may rise.

9.3.4 *Strategies firms may employ to cope with losses due to HIV/AIDS*

Baggaley et al (1994) found increases in mortality among staff of Zambian firms similar to those found among the nurses in Monze and Choma (Buvé et al, 1994). Firms facing the problem of keeping a productive workforce may chose one (or more) of several strategies to cope with risks created by the epidemic.

1. They may "over-recruit" by hiring more people than they need in the expectation that one of them will survive to have a career with the firm.¹ It is likely that the firm will then make a smaller investment in training each of those people.
2. Firms may begin to value their workers more highly but also to expect higher productivity from a smaller number of existing workers; they may invest more heavily in capital equipment and training, as well as in health education and protective measures.
3. Firms may create new categories of lower level semi-skilled worker to enhance productivity of skilled workers -- such as "care assistants" to help with hospital nursing duties, "teaching assistants" to supervise some children while qualified teachers are involved in actual teaching, and so on.
4. Firms which rely on unskilled workers may assume that there is still a large pool of unskilled workers ready to replace those who die, and this may in fact be true if urbanization is increased.
5. Finally, in cases where highly skilled managerial and technical workers are essential to the running of a firm, and local replacements cannot be found, it may be necessary to (re-) import expatriate workers, at least temporarily, to replace and assist with training of replacements. Several firms and organizations, including Monze Hospital, had just

¹ In 1992 the BBC in Lusaka was recruiting two persons for each job.(Mike Hall, personal communication)

replaced expatriates with qualified Zambians who have since died; those posts have again had to be filled by expatriate workers.

In any case, opportunities will be created for healthy seronegative unskilled persons which could not have arisen prior to the AIDS epidemic. This may create an impression in the minds of the rural population that life in urban areas is full of possibilities, and to some extent this will be true.

9.3.5 Financial risks facing firms

The financial viability of firms is also threatened, and it seems possible that smaller firms will prove to be more vulnerable to the three types of exposure -- loss of productivity due to absenteeism and mortality and replacement costs; financial pressure due to "benefits exposure" e.g. payment of sick leave and funeral and death benefits; and in some cases "market exposure" whereby the death of many consumers will reduce the demand for the firm's product.

9.4 Future research priorities

From the preceding, several ideas for applied research emerge.

9.4.1 Research on health services

- 1) *Decentralization of care*: How can care be decentralized effectively to health centre level? What are the resource implications, training requirements, drug needs? How could health centre care be made acceptable to patients and their families? What are the implications for staffing in moving to an essentially 24 hour service?
- 2) *Diarrhoea*: What options are available to better manage the symptoms of HIV-related diarrhoea? What advice can be given to families to help them to cope with the distressing symptoms?
- 3) *Tuberculosis*: Two main questions emerge with regard to tuberculosis, namely:
 - i) How can the growing number of TB patients be managed more effectively? What drug regimens give the best result for the least cost, without producing unacceptable levels of adverse effects?
 - ii) What is the role of TB preventive therapy? Under what conditions would it be feasible, and what contribution would it make to reducing the overall burden of TB and morbidity due to HIV disease?
- 4) *Pneumococcal disease*: If ongoing trials of pneumococcal vaccine prove efficacious, what is the best way to deliver that intervention to people with HIV? What role would such vaccination play in reducing morbidity and mortality?

5) *Other preventive measures:* What other measures can be taken to improve the quality of life of people with HIV disease? Is there any role for vitamin supplementation, or other prophylaxis?

6) *Displacement:* How important is the problem of displacement of other HIV-negative patients? What is the effect of displacement on their care and survival?

7) *Coping with the loss of health staff:*

i) What new categories of staff could be created to assist the diminishing stock of health professionals? What would be the costs of developing and training such staff?

ii) What are the respective roles of occupational and personal exposure in the high rates of HIV infection among health staff? What can be done to reduce both personal and occupational risks, given resource constraints?

9.4.2 *Research on households and on the district economy*

With regard to the impact of HIV/AIDS on the district's agriculture-based society and economy, several issues require further research.

1) *Agriculture:* What measures can be taken to support the agricultural workforce and its productivity? What is the respective role of the HIV/AIDS epidemic and other factors (e.g. structural adjustment, drought, cattle disease, etc.) in the difficulties experienced by subsistence and commercial farmers? Which farming systems in Zambia are most vulnerable, and therefore perhaps in need of special support? Given that mining is a declining industry, how will Zambia earn foreign exchange to buy food if the agricultural sector is allowed to decline further?

2) *Orphans:* What is the best way to support orphans and prevent them from being completely disadvantaged by the loss of their parents? What is the best way to keep them in school?

3) *Firms:* What strategies can firms adopt to protect their workforces? How best can they cope with the loss of key staff? Which recruitment strategies are most appropriate for different types of firms? Which firms will be more vulnerable to loss of staff to AIDS, and why? What mechanisms can be developed to train and replace lost workers most effectively?

4) *Urbanization:* Is it likely that urbanization will in fact increase as result of HIV/AIDS? Is this a good or a bad thing? How important is it to maintain a rural subsistence sector in Zambia, and what measures could be taken to make rural life attractive? Will the influx of new arrivals overwhelm the cities and towns, or will they merely replace those lost? Will additional investment in urban infrastructure be required?

9.5 Recommendations

9.5.1 *Impact on the health services*

Some time ago an article was published in the *British Medical Journal* entitled "We cannot afford an AIDS epidemic." (Dodwell, 1990) No country, least of all Zambia, can afford an AIDS epidemic -- but that is hardly the point. It is here, and we cannot wish it away; we would do better to get used to it and start planning for the future. Efforts should be devoted to finding out first of all, what its major effects are, and secondly, how to cope with or mitigate those effects, within severe resource constraints. This thesis has shown a number of ways in which the existing health infrastructure and resource base could be better used to provide care both for people with HIV disease and for others. The main recommendations regarding the *impact of HIV on the health services* therefore are

1. to decentralize the care of people with HIV by providing a credible alternative to hospital care, especially by making more use of health centres;
2. to place special emphasis on finding better ways to manage the most important causes of morbidity and mortality, and of hospital utilization, among people with HIV, namely tuberculosis and other respiratory diseases, and diarrhoea (which together accounted for 62% of discharge diagnoses of patients with HIV disease at Monze Hospital);
3. to take steps to minimize the displacement of other (HIV-negative) patients; and
4. to take account of the impact of HIV/AIDS on health staff and take steps to mitigate it, by reducing attrition, increasing the enrolment, improving productivity (including provision of health education and protective measures) and creation of new auxiliary lower-level categories of staff.

9.5.2 *Impact on households and the district's economy*

Zambia is already the most urbanized of sub-Saharan African countries, other than South Africa. This urbanization has been made possible by the copper mining industry, which produced enough revenue to buy the food that Zambia was no longer producing for itself. Since the price of copper fell, Zambia has had increasing difficulty in buying enough food and other needed imports. But in addition to low prices, Zambia's copper reserves are now in decline and estimated to last not more than 15 years, so this industry can no longer be relied upon to feed the country. Zambia will have to turn to its long-neglected farmers for help. The country cannot afford any further decline in agricultural production, yet that is what seems to be in store at least for the drier Southern Province if the trends in Monze District have been correctly identified. Further urbanization is unlikely to be beneficial for the country unless some new industry can absorb the labour and produce enough of a

surplus to purchase imported food; an unlikely prospect given the impact of HIV/AIDS on Zambian industry. The alternative is to try to slow the pace of urbanization by taking active measures to make life in rural areas less of a struggle. The main recommendations regarding the *impact of HIV on households and on the district's economy* include:

1. investment in research on drought-resistant crops and alternatives to maize for production in Southern Province;
2. improvement of the marketing system to ensure that farmers' produce can reach the market, and that they get a fair price for their product;
3. reconsideration of the removal of subsidies on fertilizer and pesticide, given that the government has encouraged farmers to switch to hybrid varieties which require large quantities of both;
4. measures (such as financial incentives to work in rural areas, provision of housing, etc.) to ensure that the health and education infrastructure is maintained and not allowed to deteriorate in favour of the urban infrastructure;
5. research into strategies to allow firms to survive in the presence of high levels of HIV/AIDS in their workforce;
6. active encouragement of church groups, community organizations, etc. to think of ways to support orphans when the extended family can no longer cope with their needs;
7. explicit government policy to support orphans, including e.g. waiver of school fees and relaxation of the requirement for uniforms etc.

9.6 Conclusion

Barnett and Blaikie (1992) have termed AIDS a "long-wave disaster", different in scope and scale from a "short-wave" disaster such as an earthquake or a rapid epidemic which then recedes. Some predictions as to its long term impact have been made in this thesis, which outlines areas for possible intervention. Success in these interventions will require both political support and awareness, and additional funding.

At first the casual visitor to Zambia will not see the impact of AIDS. Robert Chambers describes the "active, present, and living bias" whereby the visitor sees only those who are well:

"Fit, happy children gather round...the LandRover, not those who are apathetic, weak or miserable. Dead children are rarely seen. The sick lie in their huts. Inactive old people are often out of sight...Those who are absent or dead cannot be met, but those who have migrated and those who have died include many of the most deprived. Much of the worst poverty is hidden by its removal." (Chambers, 1983, p.19)

In fact a casual visitor to Monze District might not be aware of the devastation of AIDS at all. Life goes on. Barbara Tuchman noted with regard to medieval European society in the aftermath of the Black Death, "exhausted by deaths and sorrows and the morbid excesses of fear and hate, it ought to have shown some profound effects, but no radical change was immediately visible. The persistence of the normal is strong." (Tuchman, 1978) The repeat visitor, however, gets a different impression; following the normal extensive greetings comes the list of those who have died since the last visit. AIDS is all-pervasive; it is unusual to have a conversation of more than half an hour without mention being made of "this AIDS".

If in 25 or 30 years the epidemic has waned, Zambia will be a different type of society as a result of AIDS. Predicting what those differences will be is inevitably speculative, but it seems necessary if appropriate policies are to be put into place to mitigate some of the worst possible effects. Some of the differences will be subtle; others might be quite pronounced, such as increased urbanization and a smaller overall population than would otherwise have been the case. Zambia has certain advantages in coping with the epidemic which some other countries lack. First of all, it has been by and large politically stable, and unified, since Independence. There are no Zambian refugees huddled in camps, nor any Zambian asylum seekers queuing at the airport. Secondly, the government has not been complacent. If there has been a lack of effective action, it has been caused more by a lack of resources, both human and financial, and by lack of information on what effective course to take, than by a lack of desire to act. Third, AIDS in Zambia does not carry the degree of stigma as in some other countries, which allows a frank and open discussion of the issues to take place.

Perhaps most importantly, Zambia has been open and welcoming to researchers, and the government has engaged in active dialogue with researchers who have been encouraged to share their findings, even preliminary. This research benefited from excellent cooperation and support from Zambians at all levels throughout the period of the research. Perhaps in return, this thesis will make a small contribution to an identification of the issues and of some possible ways forward.

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Annex 1. Welfare economics and its applications to the problem of HIV/AIDS in Africa

1. Introduction

The HIV epidemic, and deaths from AIDS are changing many aspects of life in Monze District and elsewhere in heavily affected countries. What is the welfare impact in a rural community which is suddenly affected by a devastating epidemic? Who is affected and in what ways? What are the mechanisms through which these changes occur? And to inform the debate on practical measures, what can be done to mitigate the negative effects of the epidemic? The branch of economic thinking which is most concerned with the well-being of individuals, households, and communities, as opposed to whole economies, is welfare economics, and is thus appropriate for the study of the welfare impact of the AIDS epidemic in a rural part of Africa. In this section the basic principles of welfare economics, some of the main criticisms, several key applications and some limitations to the applicability of welfare economics to the subject of AIDS in Africa will be described.

2. Welfare economics: basic principles

Welfare economics is the study of how choices made by members of society affect the members of society. Just as individuals are expected to maximize their own utility, society is expected to attempt to maximize the welfare of its members. (Winch, 1971) The main assumption used in assessing whether welfare is increasing (and the basis of modern welfare economics) is the value judgement originally formulated by Vilfredo Pareto that a change which makes one person better off without making anyone worse off produces an increase in welfare. When all such changes have been made, the economy is said to have achieved a Pareto-optimal allocation of resources. On the face of it, it is difficult not to accept this simple postulate. But on closer examination it is fraught with difficulties and inconsistencies, and rests on many value judgements. Winch gives the example of the use of alcohol; in some societies, for example Britain and the US, it plays a very important role in social interaction. But in Saudi Arabia the situation is quite different. Whether permitting an individual to consume alcohol makes him better off or worse off depends on a society's point of view. Even within a society, or a subset of society such as a group of friends, there can be differences of opinion; one example is the "societal view" of the acceptability of smoking tobacco. Most British people would agree to allow the consumption of alcohol, but opinions would be more divided as to whether smoking tobacco should be allowed.

The Pareto principle poses the additional difficulty of application in that in the real world, most changes which would improve the situation of one person would mean a loss to

someone else. Additionally a change which improved the situation of the rich by a large amount, but which left the poor only slightly better off, would according to the Pareto criterion, be a positive benefit, even though it would have increased inequality. An example is the distribution of North Sea oil revenues to the population through reductions in income tax. We are left with the need to compare the utility gain of the winners with loss of utility of the losers, or of the ones who gained less. As a result, the Pareto criterion on its own "is useless as a criterion for social choices in many, perhaps even most, real-world situations." (Johannson, 1991)

The main escape route from this conundrum was posed by Kaldor and Hicks in two different versions in 1939, and that is the compensation principle. In a case where there are winners and losers, the Kaldor criterion states that if the gainers could compensate the losers due to the improvement produced by the project, the project is desirable. Hicks' criterion is a slightly different formulation; a change or a project is desirable if in the original state (i.e. pre-project), it is impossible to redistribute income so that everyone is as well off as after the project. (Johannson, 1991) In either case, it is not necessary for actual compensation to be paid; for in this case there would be no change from the original situation. The Kaldor-Hicks criterion permits an evaluation to be made of situations in which there are both winners and losers.

In order to rank all possible individual utility levels a consistent ranking or ordering of the possibilities is needed. These can be translated into a social welfare function which is the function of the utility levels of all the households; a higher value of the function is preferable to a lower one. Some economists argue that there is no acceptable or scientific way to compare utility across households, and no way to settle the issue; this is the argument advanced by Arrow in his Impossibility theorem. Johannson points out, however, that if one is prepared to accept (and specify) some assumptions regarding measurability and comparability, welfare functions "can be constructed to represent the preferences of different political parties and governments, and the logical implications of these different ethical positions can be worked out." (Johannson 1991) Unless one is prepared to accept the possibility and usefulness of the concept of a social welfare function, it would not seem possible to take the issue further, and it would not be possible to extend the scope of welfare economics far enough to look at the effect of policy changes. Without some notion of a social welfare function, shadow pricing and social pricing becomes impossible unless we are able to at least infer what policies regarding e.g. income distribution a government intends to pursue.

In order to measure how much a household gains or loses, the notion of consumer surplus is crucial; this is the difference (in the case of an improvement) between what the

household would have been willing to pay for a good or a situation, and the new price. The amount in monetary terms which the household saves can be taken to represent the gain in utility which could otherwise not be observed; the advantage offered by the consumer surplus is to enable the "unobservable" to be not only observed but measured.

3. Some criticisms of welfare economics

Some of the difficulties posed by the need to stretch and reformulate the original Paretian criterion in order to overcome the difficulties in applying it to real-world situations have given rise to criticism of welfare economics as a body of thought. Some feel that some of its practitioners have oversold its advantages and power. Charles Rowley and Alan Peacock (1975) wrote a critique of welfare economics entitled *Welfare Economics: a liberal restatement* which is a fascinating and readable critique of welfare economics. They do not mince words:

The practitioners of the Paretian dogma are now so confident in their approach, so enraptured by the formal elegance and mathematical rigour of their exercises and so contemptuous of their less highly formalised and less elegant competitors, that they incline increasingly to the passing off of their normative policy judgements as positive contributions. (Rowley and Peacock, 1975)

They make a number of specific criticisms of both the value assumptions which underlie Paretian welfare economics, and with the impossibility of the necessary conditions for Pareto optimality, with which it is hard not to sympathise. Their list of the (questionable) technical assumptions of "naive Paretianism" includes the following:

- . The underlying structure of the economy is static and fixed in time, with perfect knowledge about the present being assumed and no uncertainty about the future; individual utility functions are unchanging and technical progress is absent.

- . Each individual consumes some of all the commodities in the economy and also supplies some of each of the factors in the economy.

- . Individuals' preferences are not influenced by the commodity bundles of other individuals.

- . All commodities and factors of production are assumed to be perfectly divisible.

They observe that "whenever a change is under consideration which improves the welfare of some at the cost of a reduction in the welfare of others, Paretian welfare economics necessarily is silent, crippled by its own value assumptions. For this reason the Paretian approach must be viewed as conservative, offering intellectual support to those who would maintain the status quo. A single objection is sufficient to cloud the welfare issue and to render unambiguous policy judgement impossible."

They are not mollified by the offering of the Kaldor-Hicks compensation principle, and cite the Scitovsky paradox, namely that the reverse move, i.e. from point B back to the starting point A also satisfied the Kaldor-Hicks criterion. To solve this problem, Little offered a third criterion to be applied in addition to the Kaldor-Hicks and Scitovsky, namely whether the alternative results in a better income distribution; but this merely proved their point about the fundamental flaws of Paretian thought:

As is so often the case, the posing of the additional question satisfied the misgivings of the disciples while the evident impossibility of answering the question from within the faith conveniently was forgotten. On such bases are dogma protected and indeed extended in the face of successful criticism. (Rowley and Peacock, 1975)

The mathematically dyslexic will be comforted by Rowley and Peacock's assertion that "There can be no doubt at all that recent extensions in the mathematical formalisation of Paretian welfare economics have diverted attention quite unjustifiably from the shaky foundations upon which the entire edifice has been constructed." Their views are refreshing and useful in keeping things in perspective.

4. The needs of the future: intergenerational equity

The impact of AIDS is being felt not only by those alive at present, but will also have an impact on future generations, including those already born and their children. The issue of the future is not well catered for in welfare economics generally, and one could argue, as does Pasek (1992), that economics as a discipline has not yet come to terms with the needs of future generations. Pasek notes that Pareto optimality refers to allocations of resources for members of society alive at the time; economic treatment of the future generally involves discounting future costs and benefits and thus fails to deal adequately with the ethical problems raised by the intertemporal distribution of assets. The rights of the future generations are rarely made explicit. There are special characteristics of the future generations which make them different from present ones, namely "futuraity", the issue of whether "people who do not yet exist but who will possibly exist in the future" have rights, and can be "treated as moral subjects." The second characteristic is "contingency"; the existence of future people is contingent on us. The third characteristic is our ignorance; we know nothing of future generations' needs, values, and technological possibilities; they may prefer to "do away with trees, which merely obstruct the view and reduce the landing space available for their interplanetary travel machines." (Pasek, 1992)

Johansson devotes a small section of his *Introduction to Modern Welfare Economics* to the issue, raising the point that

society and markets...demonstrate a higher discount rate (rate of time preference) than would be the case were future generations represented in the decision-making....Intergenerational equity is a public good, and markets usually fail to provide the optimal amounts of such goods....Thus, the choice of discount rate to be used in social cost-benefit analysis is similar to one of deciding upon income distribution, not only within but also across generations. (Johansson, 1991)

Discounting means that future generations are "attributed lower weights in the social welfare function". But if we set the interest rate to zero, we create a market failure; "forcing the interest rate below its equilibrium level would create excess demand and a misallocation of resources." Johansson concludes that the issue of distribution across generations remains unsolved.

Boadway and Bruce (1984) suggest that the utility of a person of "generation zero" may be comprised of the utility of his own consumption plus the utility of the next generation's representative person:

In the absence of intergenerational transfers, each generation would choose a lifetime consumption stream so as to maximize its own utility and use up all its wealth....[But] if it has a strong enough sense of altruism, the marginal utility it would get from having more wealth in the hands of its heirs would exceed the marginal loss from having less wealth itself....Intuitively it is easy to see that the end result of these transactions is an efficient allocation of resource through time. (Boadway and Bruce, 1984, p. 318)

It seems likely, however, that this altruism is more likely to be present when the heirs are related by blood to the person of "generation zero" than when we are leaving, for example, a stock of oil or woodland for a future generation to whom we have no direct links. Even within a family the heirs may be cheated of their inheritance by a spendthrift member of an earlier generation. Boadway and Bruce cite the example of pensions, which consist of a contract between overlapping generations, "whereby the current working generation agrees to fund the consumption of the currently retired in return for a commitment that the next generation does the same for it when it reaches retirement. Provided this process goes on indefinitely, all generations can be made better off. The enforcement of such a contract among generations is a difficult matter; each generation has to be satisfied that the next will not renege." (Boadway and Bruce, 1984, p. 318)

There is a growing sense among young people in parts of Africa, for example, that adults have indeed reneged on their duties to them as children and heirs; they now see that they will be inheriting a less desirable situation than would have been the case in the absence of AIDS. Ugandan schoolchildren, for example, are judgmental and moralistic about the behaviour of adults which has led to this situation; and many children, AIDS orphans in particular, are very angry. (Barnett and Blaikie, 1992)

Applied welfare economics

Pure welfare economics provides a framework for thought and debate, and the basis for applications, of which two of the most common are the analysis of wealth and income distribution, and of the benefits and costs of a programme or project. The problem comes in bridging the gap between the theoretical construct and the real-world problem, and in particular, how to make use of economic or survey data. Much of the work in this area has taken place at the World Bank, where in the 1970s under the presidency of Robert MacNamara poverty became a central concern. The research arm of the Bank became concerned with the adequacy of project appraisal methods, which tended to emphasize growth "often to the detriment, if not the virtual exclusion, of the equity objective....the equity objective could then be served by a program of taxes or subsidies that would bring about the desired redistribution of that maximum increment in national income."(Squire and van der Tak, 1975) The focus on poverty in the 1970s brought the realization within the Bank that growth could, and often did increase inequity, and that some carefully prepared Bank projects even had the unintended effect of *increasing* poverty.

As a result, a number of economists both inside and outside the Bank were working to improve the appraisal of investment projects and in particular to ensure that World Bank projects were contributing to poverty alleviation. The main tool which was developed was that of social analysis of projects, using "shadow prices" or "accounting prices" and distributional weights to assess not only the potential for economic growth of a project but also its impact on equity and income distribution, especially for the poorest. It is often the case that the market price of inputs and outputs, i.e. goods and services, does not reflect their true value to society or to the economy. Distortions can be introduced through government policy, market failures, or other mechanisms. Some inputs are not traded on the market and therefore a price would have to be "created" for that input if account were to be taken of it in an analysis. The alternative to market prices is the shadow price. Shadow pricing and cost-benefit analysis were developed primarily for evaluation of projects. Little and Mirrlees(1974) define a project as "any scheme or part of a scheme for investing resources which can reasonably be analysed and evaluated as an independent unit." By this definition project analysis may be inappropriate for analysing a phenomenon such as impact of HIV on welfare. In general cost-benefit analysis is used to compare alternatives; but in the case of HIV disease the alternative is the past, which is incompletely documented and in any case not a true alternative since there is no going back at this point.

In order to use shadow pricing within the context of cost-benefit analysis, some compromises have had to be made in a departure from "pure" welfare economics. Little and Mirrlees devote the last chapter of their book to a discussion of "the economics of the second best" and state that "it is tempting, but clearly fallacious, to suppose that when a theorem has been deduced from certain assumptions, these assumptions are necessary for all the conclusions of the theorem. In the case of the fundamental theorem of welfare economics, the usual assumptions are very far from being necessary for all the conclusions of the theorem." Further along they state that "it is certainly true—and should also be emphasized—that assumptions are required if the procedures suggested by welfare economics are to be valid." Squire and van der Tak in the appendix on the technical derivation of shadow prices specify the assumptions underlying the welfare function they have used in their *Economic Analysis of Projects*:

First, that there are no consumption externalities (that is, the individual's utility is assumed to derive solely from his own consumption);

Second, that the same utility function obtains for all individuals and displays diminishing marginal utility with respect to consumption; and

Third, that total welfare in any period is the sum of the individual utility levels.

While each of these assumptions could be questioned, and contradictory evidence found, it nonetheless seems reasonable to accept them as a starting point.

The early work on shadow pricing for project analysis had been done by Little and Mirrlees for the OECD with the publication of their *Manual of Industrial Project Analysis* in 1969; a revised and expanded version of this was produced as *Project Appraisal and Planning for the Developing Countries* in 1974. A number of case studies were carried out by economists at Oxford and Cambridge, notably those described in *Using Shadow Prices* by Little and Scott (1976). Some other case studies were carried out by World Bank staff economists such as Kevin Cleaver (1980) who recalculated the rates of return using shadow prices for agricultural projects in Morocco, and Johannes Linn (1977) who estimated shadow prices for the Ivory Coast; in both cases the conclusions of the social analysis differed from those of the strictly "economic" analysis without shadow pricing. A methodology was developed, primarily aimed at enabling Bank staff to estimate and apply shadow prices and social analysis in routine Bank project appraisals.¹

¹ This never happened to any great extent, in fact, the new methodology was met with disinterest by "working" Bank staff, and the additional effort in data collection and analysis could not be accommodated within existing project preparation budgets.

But by the early 1980s, when Robert MacNamara had been replaced at the head of the Bank by AW Clausen, former president of the Bank of America, and structural adjustment had displaced poverty alleviation as the Bank's highest priority and the main concern of both the "working" and the "research" economists, a more basic approach requiring much less complex analysis was adopted and taught in the Bank, to both Bank staff² and to government staff on training courses. Such an approach was described by Gittinger in his 1982 revised second edition of *Economic Analysis of Agricultural Projects*: "In financial analysis...the market price is always used. But in economic analysis some other price—a 'shadow price'—may be a better indicator of the value of a good or service; that is a better estimate of its true opportunity cost to the economy. When prices other than market prices are used in economic analysis, however, the burden of proof is on the analyst."³ World Bank staff are notably risk-averse, and few analysts would be willing to take on the risk of providing this "burden of proof". There is some discussion of the use of a shadow wage rate for agricultural labour, and of the calculation of a shadow foreign exchange rate, but Gittinger's comments could hardly be considered a ringing endorsement of the use of shadow prices, and the cursory treatment of the subject in this 500 page text is indicative of the relatively low esteem in which the notion of shadow prices was held at that time on the lending operations side of the Bank.

5. The measurement of welfare and the Living Standards Measurement Survey

When in the early 1980s the World Bank became involved in the Living Standards Measurement Survey (LSMS), some further analytical work was carried out under the auspices of the World Bank by Angus Deaton (1980) to try to bridge the gap between theoretical welfare economics and the needs of the LSMS, which were ultimately to make interpersonal comparisons of welfare. Welfare economics provides a theoretical framework but the traditional reticence of welfare economists to measure and compare welfare between

² Bank staff including the present author attended numerous staff training courses on various topics without hearing a word about shadow pricing; by 1980 it was not much used in the Bank's routine work.

³ Gittinger was never a strong proponent of shadow pricing; in the 1972 first edition of his book on agricultural project analysis, he notes "Shadow prices...are a very tricky and controversial aspect of the economic analysis of projects....I will suggest pragmatic solutions to some problems of shadow pricing applied to agricultural projects. More theoretical economists will not agree, probably; but we must get on somehow with our project analysis and with the development program." Gittinger, J. Price, *Economic Analysis of Agricultural Projects*, Johns Hopkins University Press, Baltimore, 1972, p. 38. Interestingly, in 1974 Little and Mirrlees in a footnote to their Project appraisal and planning for developing countries, Basic Books, New York, p.381, comment that Gittinger's "cursory treatment of shadow-pricing should be taken to be in line with the past rather than the present philosophy of the IBRD."

individuals leaves the problem of making the link between the concepts of welfare and utility, to wealth and income, using data which can be gathered in a field survey, through observation, or through a case study approach. Deaton, faced with the need to use data to compare welfare of individuals, did not hesitate to try to bridge the gap between the theory and the practice.

On page 1 he sets out his position:

The economic approach to welfare works with such concepts as preferences, utility and social welfare functions, and many economists take the view that, in these terms, even individual welfare measurement is arbitrary while welfare comparisons across individuals or combinations of welfare measures are completely unjustified. Not only does this view deprive economics of a major field of research, but it also deprives the statistical approach of both precision and methodological coherence. (Deaton, 1980, p. 1)

As the consumption of goods is the basis for economic welfare, Deaton proposes that a solution to the measurement problem may be to take "standard or reference bundle of commodities" to measure welfare. He points out that if the bundle varies strongly with income or taste, this may not be applicable, but "some such methodology is frequently relevant in measuring welfare for individuals close to poverty." He then traces the concept of preference ordering which can yield a utility function, which can then be plotted on a graph; "the problem of choosing a welfare index can be seen as one of attaching meaningful numbers to indifference surfaces." (Deaton, 1980, p. 4) Two approaches are possible, one based on quantities, and one based on prices and incomes. The former, known as "quantity metric utility" (QMU), is developed without reference to markets, while the latter, "money metric utility" (MMU), makes use of market prices and where necessary, shadow prices. QMU is based on the concept of a distance function, i.e. the distance from the origin to some point along a ray which crosses the utility functions; the distance is the measurement of the quantity of welfare, and different points along the ray can be compared with each other. Each "bundle" can then be compared with a reference "bundle", so QMU is a way of measuring welfare in terms of a reference bundle.

Deaton raises the difficulty of preferences, which are "typically revealed by behaviour subject to constraints"; and which are thus revealed by the operation of the market. It is therefore "often preferable to start from a market-based measure of welfare and to modify it as necessary for consumption which is not bought..." (Deaton, 1980, p. 11) Consumers behave by maximizing their welfare, and the sum of these functions yields the indirect utility function, which is the maximal attainable utility subject to the price constraint. In order to make this indirect utility function useful, the concept of the cost function is introduced, which is the minimum cost of reaching that level of utility at prevailing prices. The quantity which can be consumed at fixed reference prices, is the money metric utility. This can then be analysed by

separation into a money measure and a price index, with the possibility of choice of reference time period. (Money metric utility and quantity metric utility will be the same if preferences, i.e. indifference curves are homothetic; but even within a single individual's preferences may change over time.)

Deaton then introduces the concept of separability of the bundle of goods, i.e. leisure, goods, etc., each of which can be treated separately. (Deaton, 1980, p. 24) The usefulness of this concept, and the potential application, is to form indices of subgroups of household expenditure, such as food, housing, productive assets, etc., which can be thought of as welfare indicators.

The notion of intertemporal welfare, which is often neglected by welfare economics is considered by Deaton. He writes life-time utility, viewed at the beginning of the life-cycle, as

$$u = u(q_1, q_2, \dots, q_t, \dots, q_L, AL+1/P_f)$$

where q_t is the consumption vector at age t , L is the date of death, $AL+1$ are bequests and P_f is an index of prices comprising all goods in all periods from death to doomsday...the indirect utility of the consumer's heirs generated from bequests." This approach is "based on intertemporal choice with intertemporal weak separability...with total consumption expenditure [being] determined ...by all the prices, incomes and discount rates, present and future. [But] there is no reason in general to suppose that the consumer will choose to spread welfare (or real consumption) evenly over time, especially since needs are not evenly distributed over the life cycle." (Deaton, 1980, p. 28)

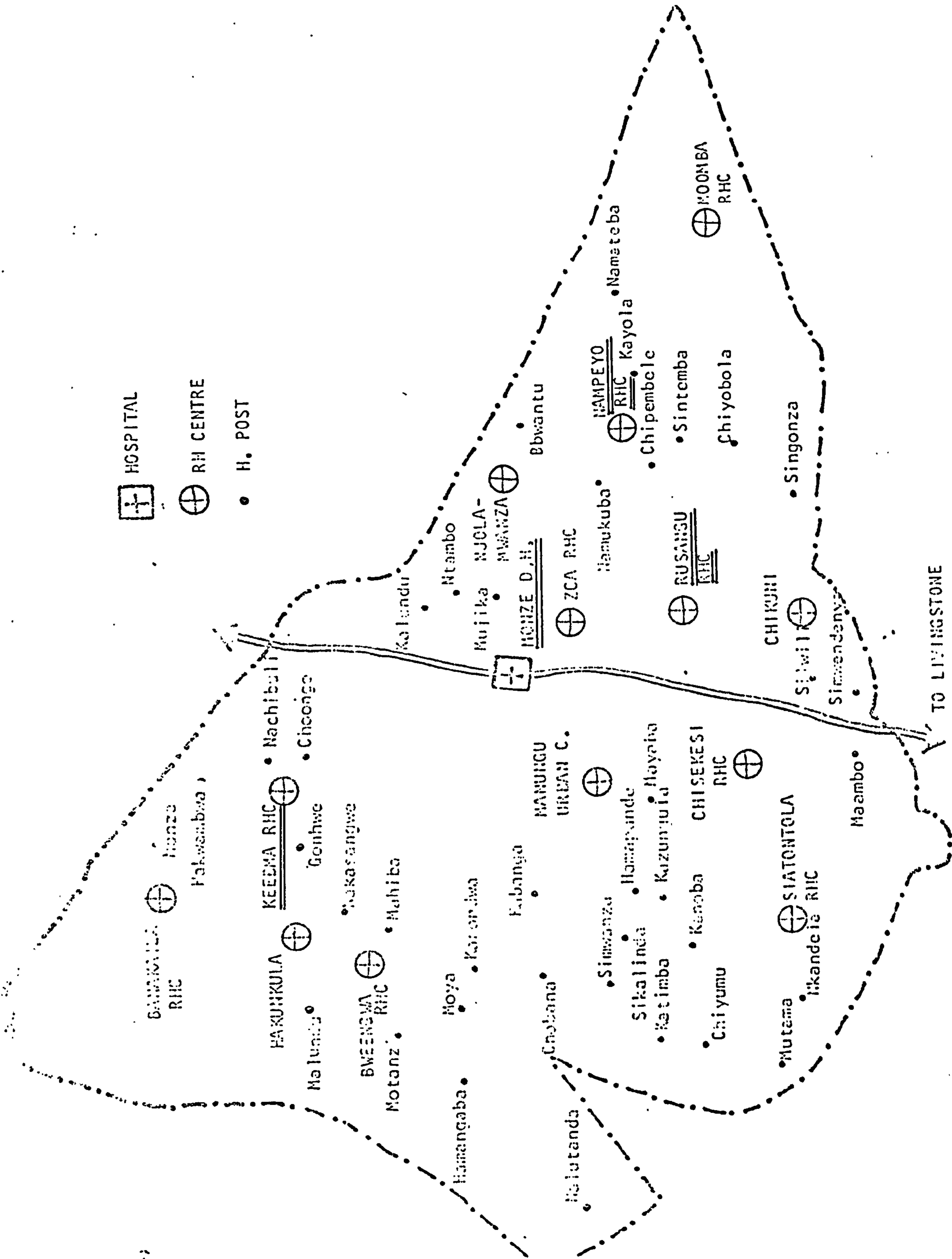
Consumers may not plan their intertemporal choice as expected where there are constraints on borrowing. He is perceptive about the problems of poor people:

Poor consumers ...often cannot borrow so that if, for example, higher incomes are anticipated later, the optimal consumption plan may require borrowing and thus cannot be realized...borrowing constraints reduce welfare... They also enforce a connection between current income and current consumption (in the extreme case, consumption equals current income)...For such consumers (and the young and poor are likely to be particularly affected), current income, appropriately deflated, is a good measure of current welfare, as, of course, is current consumption. In this case, however, current consumption does not reflect the wider life-cycle welfare as it does when there are no liquidity constraints....many poor consumers are not constrained in this way since their future expectations are no different from their current experience. For such consumers, current income, current consumption, and life-time consumption are all too closely related. (Deaton, 1980, pp. 42-3)

He thus concludes that the best measure is "deflated current consumption". (Deaton, 1980) He goes on to make suggestions for the treatment of specific groups of goods, such as durables, labour, and leisure; and offers a detailed treatment of the consumer as producer.

Comparison of welfare across households can be done using money metric utility, by labelling their standard of living by the money needed to reach them at some reference price. Once these basic assumptions have been made, and accepted, it is possible to construct a social welfare function, which is an aggregate or index of the money metric utilities of each household. Deaton's approach is useful in indicating a practical way to measure the impact of the HIV epidemic in an African context.

ANNEX 2.2. MAP OF MONZE DISTRICT SHOWING HEALTH CENTRES



ANNEX 2.3. WHO STAGING CRITERIA FOR HIV DISEASE

Clinical criteria used for the staging of patients with HIV infection.

Clinical stage 1

- asymptomatic
- persistent generalized lymphadenopathy

Clinical stage 2

- minor mucocutaneous manifestations (seborrhoeic dermatitis, prurigo, fungal nail infections, recurrent oral ulcerations, angular cheilitis)
- herpes zoster, at present or in the past 5 years

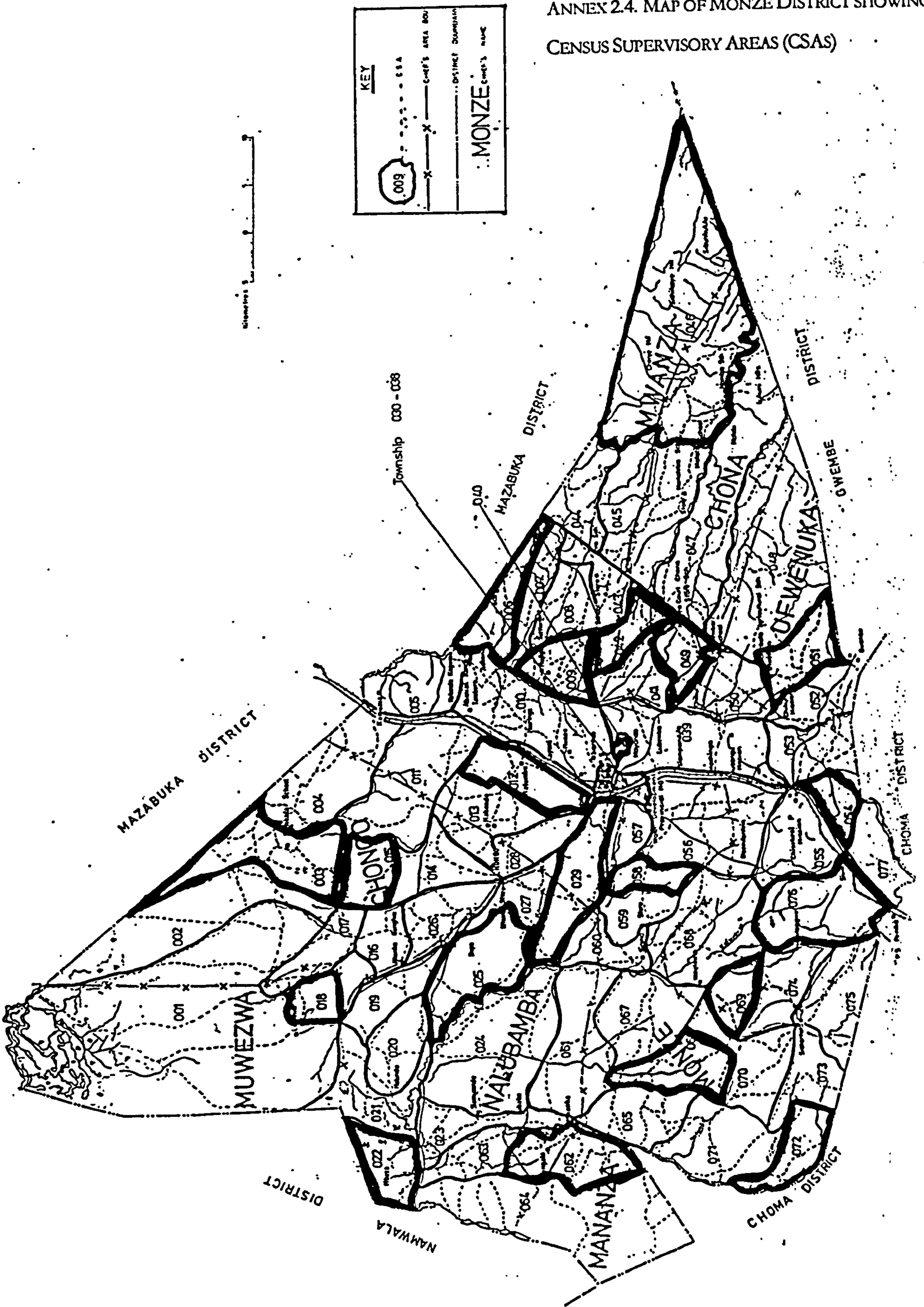
Clinical stage 3

- profound weight loss
- unexplained chronic diarrhoea of longer than a month's duration
- unexplained prolonged fever of longer than a month's duration
- oral candidiasis without dysphagia
- oral hairy leucoplakia
- pulmonary tuberculosis
- severe bacterial infection (pneumonia,

Clinical stage 4

- HIV wasting (profound weight loss with chronic diarrhoea or prolonged unexplained fever)
- oral candidiasis with dysphagia
- HIV encephalopathy
- Kaposi's sarcoma
- lymphoma
- extra pulmonary tuberculosis
- genital herpes simplex of longer than a month's duration
- salmonella septicaemia.

ANNEX 2.4. MAP OF MONZE DISTRICT SHOWING CENSUS SUPERVISORY AREAS (CSAs)



Appendix 4.1. Costing methodology: Monze District Hospital

Introduction

The method used to estimate the average costs of services provided at Monze Hospital was a form of step-down cost accounting described by Puglisi and Bicknell (1990), Mills (1992a, 1992b), Lewis (1992) and others. The treatment costs for individual patients were then calculated using the average costs of services consumed by individual study patients similar to the procedure described by Babson (1973) in his book *Disease Costing*.

The economic costs of resources used by Monze hospital, both recurrent and capital costs and including the value of donated goods and services, were calculated for the first eight months of 1991 using step-down cost accounting. These were then divided by the units of service actually provided by each cost centre, on the basis of hospital statistics, to derive an average unit cost per service provided. Between 1st April 1991 and 1st September 1991 a random sample was taken of adult patients admitted to the male, female and TB wards of Monze Hospital as described in Chapter 2. After obtaining informed consent they were tested for HIV and screened for signs and symptoms of HIV disease, as proposed in the 1990 WHO staging system for HIV infection and disease (Annex 2.3). Study patients were prospectively followed for subsequent admissions and the number of days spent in hospital in the year before death was calculated. Details of the treatments received by patients were abstracted onto a form and then entered into the computer. Once unit costs for all hospital services were derived, they were stored in a separate file which also contained the unit prices of 300 commonly used drugs and other supplies; treatment costs for each patient were built up by bringing together and summing the unit costs of services and drugs used by that patient.

Capital costs were calculated but were not included in the unit costs which were used in calculating treatment costs. The reasons for this decision are as follows. First of all, the emphasis in hospital economics in the developing world is focused more generally on resource management and allocation (Newbrander et al, 1992) and on ways to better manage recurrent resources for HIV disease and AIDS (Foster, 1994). Recurrent costs are more amenable to improvement through management whereas capital costs are a function of historical patterns. An example of this is Monze Hospital which was purpose-built as a hospital (over several decades) compared with its neighbouring Choma General Hospital which was originally built as a tobacco sorting barn (probably in the 1930s) and handed over to the Government at independence in 1960. The University Teaching Hospital in Lusaka is yet a third example, of a hospital most of which was purpose-built all at one time and survives very nearly in its original configuration, but of an Eastern European design which has proved very difficult to manage adequately. Secondly, the

share of capital expenditure going to developing country hospitals has been declining since the 1960s when donors were active in financing the construction of hospitals which were expected to have a useful life of 20-30 years; capital expenditures will need to increase in the near future as these are replaced or renovated on schedule; yet donor priorities have shifted to the funding of primary health care (Mills, 1990; Newbrander et al, 1992) and more recently to the prevention and treatment of HIV and AIDS. The necessary capital investment is unlikely to be forthcoming. Finally, the majority of similar hospital cost studies in developing countries have included recurrent costs only (Barnum and Kutzin, 1991; Newbrander, Barnum and Kutzin 1992) and if useful comparisons are to be made, they would be on the basis of recurrent costs only.

Sources of data and information

The main source of information on hospital expenditures were the hospital accounts which were kept up to date by the hospital administrator. These however did not value all the donations of goods received by the hospital, so this was done separately. Another important source of information was the key staff involved in management of the hospital. These included the administrator, the matron, the medical officer in charge, and the hospital engineer. In addition, specific information on the operation of particular cost centres was obtained from the head of the laboratory, the pharmacist in charge, the dental assistant, the x-ray assistant, and from the theatre staff.

Price information was obtained from invoices, drug and medical equipment catalogues, etc. Where donations were not valued, or were clearly overvalued, i.e. drugs, these were costed at the international bulk generic price from the International Dispensary Association (IDA) catalogue, in order to reduce distortions. This is discussed more fully below in the section dealing with drugs and supplies.

Selection of cost centres

The next decision was to specify the cost centres, or parts of the hospital where activities could be grouped and costed. For the most part these are physically identifiable as a unit, ranging in size from one room about 9 m² (IV fluids production unit) to a 50-bed ward. The main exception is administration, whose activities occur throughout the hospital, and workshop, whose work also takes place all over the hospital compound. Home-based care and counselling, and MCH services, combine outreach activities with work at the hospital. A layout of the hospital and outbuildings is provided at Annex 4.1b.

Most costing exercises have grouped all inpatient wards together and have not therefore been able to calculate a unit cost for a day on a specific ward. However, it was anticipated that

costs would vary from one ward to another, based on the use of drugs and supplies and on the allocation of staff and consequent intensity of care. Furthermore data from the patient study included the detail of which ward patients were admitted to. Therefore, unlike other studies, the costs of specific wards have been calculated and in fact they turn out to vary by a factor of 1.32 (with TB ward being the cheapest and maternity being the most expensive). The costs centres chosen for the exercise therefore include:

1. Direct patient care centres:

- . male ward (medical and surgical combined)
- . female ward (medical and surgical combined)
- . maternity (antenatal, postnatal, and labour wards)
- . children's ward (including nutrition rehabilitation and isolation ward)
- . TB ward
- . outpatient department (including STD clinic and special doctors' gynae, surgical and medical clinics)
- . MCH clinic
- . dental clinic
- . chest clinic

2. Ancillary clinical services

- . theatre (including sterile supply)
- . pharmacy (both dispensing to outpatients and allocation to wards and other parts of the hospital)
- . laboratory
- . X-ray (including ultrasound scanner)
- . AIDS home based care and counselling

3. Support and administrative services

- . IV fluids production unit
- . workshop (maintenance and repair of buildings and equipment)
- . laundry
- . kitchen
- . mortuary
- . records/registry
- . administration (including maintenance of grounds, security, etc.)
- . ZEM school
- . ZEN school

Although the hospital rents housing to some of the staff and about 10-15% of the maintenance and utilities are spent on this housing, it was considered that the rental received from the staff by the hospital offset these costs and that staff housing could be excluded from the exercise.

Units of service

The next step was to decide on units of service provided by each of the centres, where applicable. These were established as follows:

1. bed day including drugs: for male ward, female ward, maternity, children's ward, TB ward
2. bed day excluding drugs: for male ward, female ward, maternity, children's ward, TB ward
3. OPD visit: for outpatient department including the STD clinic
4. treatment/visit: for dental clinic
5. visit for review of old patients or interview with TB contacts: for chest clinic
6. major and minor procedure, and theatre minute: for theatre
7. OPD prescription filled: for pharmacy
8. examination: for laboratory and for x-ray and scanner department
9. counselling session or home visit: for AIDS counselling and home based care team
10. units of IV fluid produced: for IV fluids unit
11. bodies prepared: for mortuary

Line items and methods of allocation

The line items were those used in the hospital accounts, namely, staff, drugs and supplies, food, maintenance, clearing, administration and stationery, utilities, transport, domestic supplies, ZEN school, and ZEM school. These were allocated across the cost centres of the hospital, on the basis of a method for allocation which was determined individually for each of these items. The basis for the allocation is described below in the section dealing with that particular line item. ZEN and ZEM schools were considered as an input to the hospital as their students provide a significant part of the hospital's nursing workforce and their costs were allocated to patient care.

After this first allocation was complete, a second allocation of overhead costs to direct patient care centres was carried out. Approximately 57% of all costs could be directly attributed to the cost centres, i.e. wards, OPD, etc. Another 43% were overheads or indirect costs, comprised of general administration (21% of overheads), outpatient-related overheads (19% of overheads), and inpatient-related overheads (60% of overheads). Under general administration overheads were included the workshop, the records and registry office, and the administration office; these were attributed to cost centres on the basis of staff allocation. Outpatient-related

overheads included half the cost of running the pharmacy, lab, x-ray/scanner, and home-based care/AIDS counselling services, plus 25% of the costs of the ZEN and the ZEM schools whose students work in the outpatient department (OPD) of the hospital. They were attributed on the basis of the percentage of the total outpatient consultations at that centre, of which 61% took place at the OPD itself. Inpatient-related overheads included the other half of the above plus the theatre, kitchen, laundry, mortuary, and IV fluids production unit, plus 75% of the ZEN and ZEM schools; these were allocated on the basis of the fraction of the total beds on that ward.

A series of linked spreadsheets was created using Quattro Pro v.2 and v.4. The main summary sheet (partially reproduced as Table 4.2) is linked to two other principal sheets, one containing detailed staff costs (Appendix 4.1, table 1) and another for details of drugs and supplies used in the hospital (Appendix 4.1, table 2). Several other detailed sheets were created, for drug allocation, for theatre supplies, etc. As part of a separate exercise the costs of AIDS counselling and home-based care were estimated on the basis of time allocation.

Annex 4.1, Table 1: Monze District Hospital: Salaries and Staff Costs

A. Direct patient care centres											
	Monthly Wage	Male Ward	Female Ward	Maternity Ward	Children's Ward	TB Ward	OPD	MCH Clinic	Dental Clinic	Chest Clinic	Theatre
1. NURSING STAFF											
Nursing officer	11400										
Nurse tutor w/HA	10997										
Registered midwives w/HA	10689			117579			10689				
Registered midwives w/o HA	3189										
Registered nurses w/HA	10689	21378	10689								
Enrolled midwives/FH nurses w/HA	7861							31444			
Enrolled midwives/FH nurses w/o HA	2861							5722			
Enrolled nurses w/HA	7861							23583			
Enrolled nurses w/o HA	2861							1430.5			
Theatre nurses w/HA	7861										1000
ZEN students	200	2400	2400	200	2000	800	1200	1400			
ZEM students	7861			172942				55027			
2. MEDICAL/CLINICAL STAFF											
Consultant physicians	18909			13236.3							5672.7
General/medical officers	18333	14666.4	14666.4		14666.4	3666.6	18333				10999.8
Part time surgeons											0
Clinical officers	10689						53445	10689		10689	10689
Anaesthetist	10689										9500
Theatre attendants	4750										
X-ray assistant	4766										
Laboratory assistants	7861										
Pharmacy assistants	7316										
Dental assistant	7861								7861		
Social worker	10622										
Health assistant (Chest Clinic)											
3. ADMINISTRATIVE AND GENERAL STAFF											
Administrator	40000										
Deputy administrator	10905										
Engineer	40000										
Secretary	7701										
Clerical officers	5167										
Typists	4733										
Drivers	4785										
Classified employees	4708	9416	9416	14124	9416	4708	32956	4785	4708		11770
Dressers	4708						14124	4708			4708
Replacement workers	4708										
TOTAL		47860.4	37171.4	318081.3	26082.4	9174.6	130747	138788.5	12569	10689	65028.5

Annex 4.1, Table 2 : Monze District Hospital: Drugs and Supplies

	A. Direct patient care centres														
	Total	Male Ward		Female Ward		Maternity Ward		Children's Ward		TB Ward	OPD	MCH Clinic	Dental Clinic	Chest Clinic	Theatre
1. DRUGS															
A. Purchased by hospital Allocation % (actual)	1,124,279	126,633	11	85,733	8	128,052	11	79,992	7	28,153	3	548,261	49	127,455	11
B. Donations for general use Allocation % (actual)	439,053	49,453	11	33,480	8	50,007	11	31,239	7	10,994	3	214,107	49	49,774	11
C. Designated donations	398,184	27,077	7	23,891	6	0	0	9,955	3	183,165	46			155,292	39
1) TB drugs Allocation % (actual)	50,000											50,000			
2) MCH drugs and vaccines Allocation %	225,426											225,426			
3) STD drugs and condoms Allocation %	199,228	27,892	14	11,256	6	111,368	56	7,172	4	17,930	9	22,513	11	0	0
4) Antimalarial drugs Allocation %	16,293	1835	11	1242	8	1856	11	1159	7	408	3	7945	49	0	0
5) Cholera supplies Allocation %	2,452,462	232,889	11	155,603	8	291,282	11	129,517	7	240,651	3	1,018,251	49	54,562	28
Subtotal, drugs:														155,292	39
2. WARD SUPPLIES															
A. Purchased	602,943	78,383		96,471		126,618		78,383		42,206		42,206		0	0
B. Donated	904,354	117,566	13	144,697	16	189,914	21	117,566	13	63,305	7	63,305	7	0	0
Allocation % (actual)														0	0
Subtotal, ward supplies:	1,507,297	195,949	0	241,168	0	316,532	0	195,949	0	105,511	0	105,511	0	0	0
3. LAB SUPPLIES AND HIV TESTS (donated)															
A. Lab supplies, etc.	685,455													0	0
B. HIV test kits	550,550													0	0
Subtotal, laboratory	1,236,005	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. X-RAY SUPPLIES	482,416														
5. THEATRE SUPPLIES															
A. Purchased	150,569													150,569	
B. Donations	206,271													206,271	
Subtotal, theatre supplies	356,840	0	0	0	0	0	0	0	0	0	0	0	0	356,840	0
6. IV FLUIDS PRODUCTION (donations)	605,000														
106,000															
7. DENTAL SUPPLIES	263,603												263,603		
Total, drugs and supplies	7,009,624	428,838		396,770		607,814		325,465		346,162		1,123,862		155,292	
Total, purchased by hospital	2,360,207	205,016		182,204		254,670		158,375		70,359		590,467		0	
Total, donations	4,543,417	223,822		214,567		353,145		167,091		275,802		533,295		155,292	

Capital costs

Annualized capital depreciation was estimated using a discount rate of 3% for inclusion in the costs (Table 4.3). A chapel/conference facility under construction at the time was excluded from the calculations. The costs of the buildings were estimated using the cost of construction per square meter prevailing in 1991, based on the area of each of the buildings. An inventory was taken of equipment, furniture, and vehicles; the estimate for equipment and furniture was increased by 25% to take account of loss and breakage of these items which had not been able to be replaced, but many of which are still stored at the hospital awaiting disposal.

Other issues

A number of issues arose during the costing exercise. These are discussed briefly below and in the following sections.

1. Government funding

The government "bed grant" is the major source of finance for the hospital as it is for other hospitals in Zambia, both government and mission. During the eight month period under review, it accounted for 87% of the income received by the hospital. However, donations in kind and of labour appear to have been undervalued and would thus reduce the overall role of the grant. However, given the very severe economic problems being experienced by Zambia it has become impossible to predict either the timing or the amount of the government grant; the budgeted amount is not made available. In 1990 a ward had to be closed when the grant was not paid. The uncertainty surrounding the government grant has meant that the hospital has had to rely even more heavily on donations of both labour and of supplies. The recent 100% salary increase which was awarded during the election campaign (by the outgoing UNIP government) will further stretch the funds available for other items, supplies, etc. and may make the reliance on donations even greater.

2. Donations

The Monze District Hospital, while the designated government district hospital for Monze district's population of 157,000, is also a Catholic mission hospital run by the Holy Rosary Sisters of Ireland. As a result of active local fundraising from the Monze business community and fundraising in Ireland, Switzerland, Canada, the UK and elsewhere the hospital receives a significant part of its resources in the form of donations. Some of these donations are also made available to all other hospitals in the country, i.e. TB drugs; and others are raised specifically by and for Monze hospital. This includes a number of staff including medical doctors; donations of drugs and supplies; and donations of cash, food, blankets, clothes, etc. for

use by the hospital. In addition, as a result largely of the AIDS epidemic and also of the cholera epidemic, supplies and vehicles have been made available which has also permitted the hospital to function at a high level. There are also designated regular donations of various kinds, i.e. of drugs for treating STD's, of condoms, etc. which are available to other hospitals in Zambia as well.

Volunteer or low-cost labour has been costed at its actual cost, i.e. the wage actually received by the volunteers plus other costs. Expatriate medical staff have been paid on Zambian salaries and therefore are costed at that price, i.e. they are not costed at the opportunity cost of the wage they could make in the UK or Ireland, etc. This results in the anomaly of having a consultant gynaecologist earning £40 pounds a month; but it was felt that to cost her time at the wage she would earn in Ireland, where she has never intended to practice, would also be anomalous. Zambia receives a great deal of volunteer expatriate medical assistance at low cost while Zambian medical staff take up jobs in neighbouring countries which offer them higher wages—as expatriates.

The valuation of donated drugs and supplies posed a different set of problems. In some cases there was no way to establish a value for the very small quantities of drugs and supplies donated by individuals; an estimate was made. In other cases brand name drugs had been purchased at high prices (even at a "discount" the price paid was ten times the international price) and in these cases the price of the equivalent generic drugs purchased in bulk was used (from the IDA 1991 catalogue). Otherwise there would be a significant distortion in the price of certain drugs, antimalarials in particular.

3. Exchange rates

During the period under study the Zambian kwacha has continued to devalue, from the official rate of approximately 80 kwacha in January to 127 kwacha to the UK£ at the end of September. At the same time, a thriving parallel market has been in operation, paying approximately 75% to 100% over the government fixed rate. Since most of the supplies will have been imported at the official rate, however, the official rate of K120 to the UK£ prevailing at the end of September 1991 when the hospital costing was completed has been used.

Staff

Staff costs make up about 55% of the total recurrent expenditures of the hospital. In view of the importance of staff costs, therefore, an attempt was made to be quite precise as to the salaries and allocation within the hospital of staff. Staff were divided into three main categories: nursing, medical and technical, and administrative and support staff. In consultation with the matron (for nursing staff), the medical officer in charge (for medical and technical staff) and with the hospital administrator (for administrative and support staff) each of the 302 hospital

employees and student nurses was allocated to one or more cost centre. (Medical students who visit for brief elective periods, usually about one month, have not been included in the analysis, although they do provide a varying degree of additional labour). Next came the determination of the salary level of the category of staff and the level of housing allowance, if applicable. The variation in monthly salaries between junior and senior staff is virtually nil (100-200 kwacha, about one pound) so the midpoint of the salary scale was applied to all staff of that category. On the other hand, housing allowance can be as much as 3 times the salary and is therefore important to take into account. The primary distinction, therefore was between staff who were entitled to housing allowance and those who were not (by virtue of being housed by the government, usually as a result of their spouse's occupation). (NB: Housing allowance was eliminated by the new MMD Government shortly after this costing was completed.)

Nursing staff

Nursing staff make up the bulk of the hospital staff and account for about 25% of total recurrent costs. There are nine categories of nurse (including student nurses and midwives). The hospital has attached both a Zambia Enrolled Nursing (ZEN) School and Zambia Enrolled Midwifery (ZEM) school and the students from the schools spend about 75% of their time on the wards providing care. This input amounts to as much as 50% of the total nursing care provided on some wards. Accordingly the student nurses were also allocated to wards on the basis of their training rota and the costs of running the training schools were attributed to wards on that basis. ZEN students also receive a nominal K200 per month spending money, which was allocated as part of their salary costs. A further complication was that the ZEM students, who are already trained ZENs, continue to receive their salary and housing allowance while they are being trained to become ZEMs. This cost is borne by the Ministry of Health, however, and does not involve the hospital at all; so the cost of supporting the ZEM students has not been attributed to the hospital. In cases where a nurse spends part of his/her time on several different activities at different cost centres, the salary was allocated on a percentage basis to the cost centres involved.

Medical and technical staff

Medical and technical staff account for about 10% of the total recurrent costs of the hospital (table 4.2). The hospital usually has 4-6 medical doctors on staff and a surgeon who visits one day a week. At the time of the study only one of these was a Holy Rosary Sister; other medical staff included an expatriate British volunteer, a Philippine expatriate paid on a local salary, a Dutch volunteer gaining experience in obstetrics and being paid by a mission group, and two Zambian doctors on local salaries. In addition, as mentioned above, one day a week a surgeon visits. Previously there was a visit once a month from an orthopaedic surgeon from

Lusaka but this has been discontinued for the time being. Each of the doctors has primary responsibility for a ward and spends one day a week in the OPD; and each is responsible for visiting rural health centres on a regular basis. One of them is designated the District Medical Officer and carries out these responsibilities in addition to the clinical work at the hospital. Their time was allocated to the various cost centres on the basis of discussions with the medical officer in charge.

In addition to the medical staff there are a number of categories of technical staff. These include clinical officers, most of whom work in the OPD. One of them is trained as an anaesthetist. There are also theatre attendants, an x-ray assistant, laboratory assistants, pharmacy assistants, a dental assistant, and a health assistant who works in the Chest Clinic. The AIDS counselling and home-based care team is headed by a social worker (university graduate). For the most part the allocation of technical staff was straightforward as they spend most or all of their time in one cost centre.

Administrative and support staff

Administrative staff account for about 19% of the costs of running the hospital (table 4.2). The administrative and support staff comprises a variety of categories of staff, most of whom fall into the category of "general worker" or classified employee. These were allocated to specific cost centres on the advice of the hospital administrator. In addition, at any given time there are approximately 12 "replacement workers" taking over for general workers who are ill, attending funerals, etc. These could also be allocated to specific cost centres. The administrator, deputy administrator, clerical officers, typists, and drivers were allocated to the central administration; the engineer to the workshop; and the dressers (general workers trained to carry out some paramedical tasks) to their usual place of work. The secretary is working in the ZEM school.

Drugs and Supplies

Drugs

Drugs and supplies account for about 31% of the cost of running the hospital (table 4.2). The details of drug and supplies costing are presented in appendix 4.1, table 2. The costing of drugs and supplies posed two main problems, those of valuation of drugs and supplies, and of their allocation to cost centres. It was felt important to be able to distinguish between drugs, ward supplies, x-ray supplies, lab supplies and reagents, theatre supplies, dental supplies, and materials for the production of IV fluids; and within those groups, to distinguish between donations and items which had been purchased by the hospital.

For the drugs and supplies actually purchased by the hospital, the starting point was the hospital's overall 8 months' expenditure on drugs and supplies; from this figure the amount determined from invoices, etc. to have been spent on x-ray supplies and on other items was deducted and the remainder allocated to drugs.

The major problem regarding valuation was to establish a quantity and a value for the large amount of donated drugs and supplies. Where no invoice was available, it was possible to estimate quantities of individual drugs and to cost them on the basis of international bulk generic prices. As noted above, in a few cases the drugs were overvalued by the donors, either deliberately or unconsciously; where this was obviously the case the value was adjusted downward to international bulk generic prices.

The hospital also receives donations of drugs and materials designated for specific programmes, i.e. all the drugs for treatment of tuberculosis, drugs and condoms for treatment of STDs, for use during the cholera epidemic, and an important quantity of antimalarials for prevention and treatment of malaria in under 5's and pregnant women. As with other donations, where possible these were costed using international prices. TB drug amounts were obtained from a review of the records kept by the TB control officer and the pharmacy, as well as from the ward requisition books. The hospital receives a quarterly drug allocation from the Ministry of Health which is used both in the hospital (both on TB ward and in the chest clinic) and in the health centres.

Drugs are distributed to the wards on the basis of requests which are recorded in an exercise book maintained by each ward; the amount requested and the amount dispensed by the pharmacy do not always tally, and many items remain out of stock for months at a time. Allocation of drugs to the cost centres was done on the basis of an exercise in which all requisitions of the 30 most commonly used drugs made by the wards and different cost centres during a twenty-day period were counted and valued. The 30 drugs were estimated to account for 70% of the drugs used on the wards; an effort was made to take account of the differences in drugs used in different wards, i.e. drugs used in labour ward (ergometrine) are used nowhere else, yet labour ward uses little in the way of antibiotics. Theatre drugs (anaesthetics, injectable drugs) were estimated separately. This yielded a percentage for each of the cost centres which was used to allocate drugs generally if no more precise allocation method could be determined.

For drugs dispensed to outpatients, a total of 551 prescriptions were reviewed. Of these 180 were prescriptions dispensed to ADZAM study patients in June-July 1991; a further 371 were recorded during November 1991. Quantities prescribed of 17 drugs were noted down; these 17 account for approximately 68% of all drugs dispensed to OPD patients. The random sample of

study outpatients showed that 4.4% leave the OPD without a prescription. Those who receive a prescription received an average of just over 2 drugs per prescription. There were a number of drugs out of stock in both periods; but different drugs were out of stock. During November, there was a stockout of procaine penicillin which was prescribed to 27% of the study patients in June-July; penicillin V was substituted in most cases in November until it too ran out of stock. The results of this exercise showed that about 49% of the hospital's drugs (as distinct from ward supplies, etc.) are dispensed to outpatients or used in the OPD (procaine penicillin in particular).

In order to determine the cost per OPD prescription, it was necessary to determine the number of OPD attendances. As the hospital only records first attendances, the OPD study patient sample was used to determine the number of attendances per treatment episode within 2 weeks of the first consultation; the average for the 180 patients was 1.44 consultations. This was then applied to the number of first attendances recorded from January to August, for a total of 28,377 visits. This figure excludes revisits for the remaining four injections of a course of procaine penicillin.

Ward supplies

Ward supplies include needles and syringes, IV and blood giving sets and cannulae, swabs, bandages and dressings, gloves, urine bags and catheters, etc. Ward supplies are ordered by the wards using a method similar to that used for drugs, i.e. through dry stores and supplies requisition books. Various items needed for cleaning and the functioning of the ward such as lavatory disinfectant, bleach, toilet paper, etc. are also distributed on the basis of the requisition books. To ascertain the distribution percentage, the ward requisition books were examined and the total number of items supplied to each ward over a period of a month was recorded. The twelve most commonly supplied items were used in the cost estimates, and only the items actually supplied were costed. The items counted in the exercise accounted for an estimated 70% of the total distributed. Unit costs for each item were identified from the ECHO supply catalogue or local prices were obtained, and summed for the month monitored, which enabled an estimation of the monthly cost of ward supplies. These were then summed for all wards and the proportion of ward supplies allocated to each ward was determined. The resulting percentages were 23% for theatre, maternity ward 21%, female ward 16%, male ward and children's ward 13% each, OPD 7%, and TB ward 7%.

A large percentage of the ward supplies are donated, and no prices were available. Therefore, the valuation of ward supplies was done using the ECHO catalogue, and the total was £1090 per month. For the eight months under study, therefore, the total would be the equivalent of £8720. The items counted in the exercise accounted for an estimated 70% of the total; so the

above figure was divided by a factor of 0.7 to estimate the overall total. This gives a cost for 8 months of £12,457. As an estimated 40% of this total is purchased by the hospital and the remainder donated (source: matron and hospital administrator) the amount purchased by the hospital was the equivalent of £4983 and the amount donated was £7474 equivalent. This was then converted into kwacha at the prevailing exchange rates (see above).

Laboratory supplies and reagents

The chief of the laboratory maintains a record of materials and supplies received which made it possible to estimate the value of materials received. One main shipment of lab supplies and reagents was received in the period under study and a large shipment had been received in September 1990, much of which was still remaining in January. In addition to lab supplies per se, the lab has received HIV test kits from various sources. The estimated value of the lab reagents and supplies is £4757, and of the various HIV test kits provided, £4550. Virtually all of this was donated to the hospital or provided free of charge as part of the national blood screening programme.

X-ray supplies

The hospital purchases virtually all of the x-ray materials and developers through Medical Stores and Medical Stores Limited in Lusaka. The invoices for these materials from January-August 1991 totalled K 298,451 (approximately £2,500). Statistics kept by the x-ray assistant showed that 1,351 patients had been x-rayed from January-August 1991. This gives an average cost per patient x-rayed (including materials, labour and overheads) of K 384 (about £3.20).

The ultrasound scanner is located in the x-ray department and the main consumable item it requires is scanner gel. Small quantities of the gel were contained in one of the drug donations but since that has been used up, they are using KY jelly in its place, which is costed as part of the ward supplies.

Theatre supplies

Many of the most commonly used theatre supplies are already accounted for above under ward supplies. This includes sterile gloves, syringes and needles, IV and blood giving sets, etc. Most of the drugs used in theatre are accounted for above under drugs. However, the hospital spent K 150,569 on theatre supplies during the eight months under review. The main items included which are specific to the theatre are gases, sutures and needles, orthopaedic pins and other hardware, and sterile packs. Gases are obtained from the provincial bulk stores in Livingstone or from a supplier in Choma.

Sutures, needles and other theatre supplies are donated through various organizations and their value can only be estimated. Some of the sutures, for example, are well past their expiry

date (dates as early as 1978 were seen in 1991). On the assumption that each operation uses 3 packs of sutures at an average cost of Dutch guilder (Dfl) 3 (synthetic absorbable sutures at Dfl 111 per box of 36) plus one needle at Dfl 0.7 each, the cost of needles and sutures per operation would be approximately Dfl 10 or £3. During the period under study there were 1066 operations. Of this total, however, about half would not require sutures, (i.e. dilation and curettage, incision and drainage, evacuation, reduction of fractures, etc.). The remaining 50%, or 533 operations, would therefore have required needles and sutures worth Dfl 5330. The total cost of an operation (averaging major and minor) would be K1770 or about £,14.75.

Materials for production of IV fluids

The IV fluids production unit is a one-room operation (about 3 meters square) which was originally used as a 2-bed sideward in maternity ward. A small but efficient production unit was set up to produce normal saline 0.9%, glucose 5% and glucose 50%. It now produces an estimated 12,000 bottles per year, enough for the hospital's needs. The materials are donated through an organization in Switzerland and the estimated cost annually is £5,000 for materials (including chemicals, bottles, stoppers, etc.) purchased in Switzerland and shipped to Zambia. This works out to about £0.42 per bottle or at present exchange rates about K 50; with labour and other costs (utilities etc) included the cost comes to K 60 per unit. IV fluids produced elsewhere in Zambia are delivered to Monze at K109-K132, depending on the fluid, so the Monze production unit appears to be quite cost-effective, and the supply is more reliable than that of the local production units.

Dental supplies

Dental supplies are provided as a donation from several dentists in the UK who regularly send a supply of materials sufficient to keep the dental assistant's office running for a year. These were costed by the dentists at £329 in 1988, the most recent year for which an estimate is available. This was adjusted for inflation at 10% a year to give an annual cost in 1991 of £438. For eight months, therefore the cost would be £292.

In addition to the donated dental supplies, the hospital receives donations of dental cartridges. The dental assistant estimates that 3 cartridges are used per extraction and per filling, and extractions and fillings account for 79%, of the workload of the unit; this yields an estimated 11,625 cartridges used per year or 7,750 per eight months. The cartridges cost Dfl 64 per 100, yielding a total cost for cartridges of Dfl 4,960 for eight months supply of cartridges. The average total cost of a dental treatment, therefore is K160 or about £1.33.

Other items

Food

The hospital provides food for the patients (some of which is eaten by the "helpers" accompanying them) and for the ZEN school. The ZEM school students are expected to purchase their own food since they receive their normal MOH salaries. The expenditure on food was apportioned on the basis of number of beds; paediatric beds were allocated the same amount as the adult beds since the mothers are nearly always with the child. 30% of the total was allocated to the ZEN school. The overall expenditure for the eight months under review was K853,897 (approximately £7115), of which K597,730 was spent on the patients. This gave a cost per bed-day of approximately K10 per patient per bed day or approximately £0.08; if occupancy is taken to be only 85%, the amount spent per bed-day rises to K11.

Maintenance

The overall expenditure on maintenance for the period under review was K501,594. This was allocated on the basis of a review of the requisition book. It included about 15% for staff housing which has been excluded; the amount for allocation therefore falls to K 426,355. One of the bigger consumers of maintenance time and materials is the mortuary which accounts for 7%; due to extremely heavy use (by the police and others from outside the hospital in addition to deaths in the hospital) the refrigerators break down frequently.

Clearing charges

Clearing charges total K103,218 and are primarily payments for releasing donated goods from the customs and freight halls, mainly drugs and supplies. These charges were therefore allocated on the same basis as drugs and supplies.

Administration and stationery

Administration and stationery costs of K273,999 were allocated on the basis of staff allocation, since the amount of stationery used is a reflection of the level of activity.

Utilities

Utilities charges of K206,638 were allocated on the basis of staff distribution within the hospital, rather on the basis of square meters. The rationale for this is that the allocation of staff is a reflection of the level and intensity of use of that area. An example is a comparison of the theatre and the bulk store, which are about the same size and would therefore be allocated the same percentage of utilities if allocation was done on the basis of space. However, the theatre uses a lot of equipment, lighting, etc. and is frequently working throughout the night. In case of frequent power cuts the electricity is supplied for the theatre by a generator which is very costly to run. By contrast, the store house which has a skylight is almost never open at night, and uses very little in the way of utilities. The theatre employs 20 people; the storehouse only one person on a part-time basis. On the other hand, the mortuary employs only one person but the

refrigerators consume a lot of electricity. On balance, however, it was felt that a more accurate allocation of utilities would be made on the basis of the staff allocation.

Transport

Transport costs of K319,680 were incurred over the eight month period under review. According to the hospital administrator, this was about equally divided between transport of goods (food, drugs, and supplies) and patients and staff (including ambulance transfers to Lusaka, supervision within the district, funerals, picking up and delivering staff to the airport, errands in Lusaka, etc.). Transport of patients is also done by the home based care team which has its own transport budget. The MCH team also has a separate transport budget which has been recorded under the MCH clinic. Therefore, an allocation percentage was created which combines the allocation of drugs and that of staff (unweighted) and used to allocate the transport costs across the cost centres.

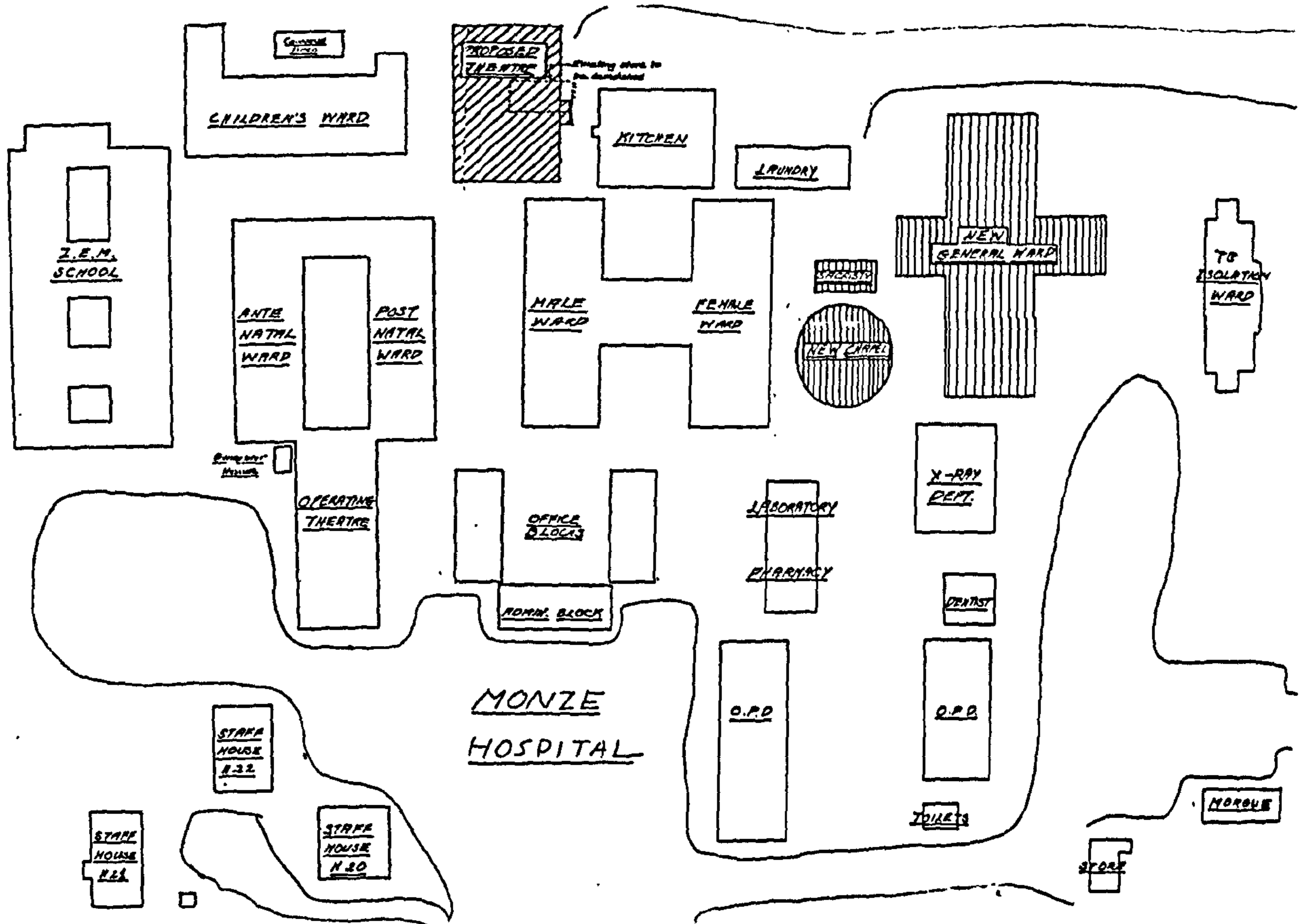
Domestic supplies

Domestic supplies worth K524,425 were supplied during the eight months period under review. These have been allocated on the basis of staff distribution, since the use of these supplies is an indicator of the level and intensity of use of space. Again, the comparison of theatre and storehouse is relevant; the theatre is cleaned thoroughly several times a day while the storehouse is almost never cleaned and when it is, it is a simple matter of sweeping it out. An estimated 20% of the total is spent on the ZEN and ZEM schools.

ZEN School and ZEM School

The ZEN and ZEM schools are treated both as line items, since they appear in the hospital accounts as such, and as cost centres, since they provide a service to the hospital. As noted above in the section on staff, a large percentage of the nursing workforce is comprised of students of the nursing and midwifery schools. They spend about 75% of their time on the wards, including night and weekend duty. However, the knowledge they acquire in the classroom is immediately applied for the benefit of the patients. Due to staff shortages they receive less supervision than might be ideal and they actually carry out many of the tasks which would be done by qualified nurses if they were available. Accordingly, 100% of the cost of running the school has been allocated to the cost centres on the basis of the allocation of the students as determined by their rota. The cost of running the ZEN school was K1,037,320 (about £8644) and of the ZEM school, K 378,508 (£3154) during the eight months period under review; together the schools account for only about 6% of the costs of running the hospital.

Annex 4.1b. Map of Monze Hospital



Annex 4.2: Costing methodology: Rural health centres

Methods for costing of RHCs

Data were gathered from the office of the District Health Inspector, from the district financial offices at the hospital, and at the health centres themselves. Monthly returns kept at the hospital were consulted for the activity levels. A series of linked spreadsheets was created using Quattro Pro version 4. Data were collected for both the entire year of 1991 and for the first 4 months of 1992; in order for RHC costs to be compared with those of Monze Hospital, the costs for 1991 have been used.

Allocation of budget items: recurrent costs

The costs which were included in the analysis included salaries, travel and lunch allowance, maintenance and upkeep costs, drugs and vaccines, community contributions, and food for inpatients. These were allocated to two main activities, outpatient consultations and inpatient care. Outpatient activities included under 5 clinic, antenatal, family planning, and immunizations as it was not possible to separate the funding of these activities. Inpatient care was taken to be 10% of the total cost of running the health centre, excluding food, in Keemba and Nampeyo, but in Rusangu referrals to Monze Hospital are much more common and frequent, so only 5% of the total cost was attributed to inpatient care. Food was entirely allocated to inpatient care. These costs exclude the expenditures on supervision and supply by the district hospital, on average two visits a month, but varying according to the season and the practicability of the roads.

Staff costs

Salaries and allowances make up approximately 67-76% of the recurrent costs of running the three health centres. These were allocated on the basis of the numbers of different categories of staff allocated to that health centre. For 1991 two different salary costs were used, as there was an increase of 100% in salary (but not housing allowance) announced in September 1991, retroactive to August 1991. A further 250% increase was announced in April 1992, so for the 1992 costs three months of the old salary was used plus one month at the new rate. The housing allowance was abolished in the April 1992 rise, however, so the increase for most staff is much less than the 250% would suggest; for example, a registered nurse or clinical officer who was receiving K13,878 including housing allowance would receive K 15,945 from April 1992. Much of this is being kept back in taxes, however, and the actual rise is negligible in most cases. A nurse who did not receive housing allowance is much better off, however, with a rise from K6378 to K 15,945.

Travel

Travel costs are minimal, with the main line item being lunch allowance which is given to people away from their station for 8 hours (but in practice it is given to people who are away over the lunch hour). Previously it was fixed at K250 per person, for a maximum of two officers and four days a month, or K2000 per month. Recently however as part of the overall salary review, the lunch allowance was quadrupled to K1000. For the health centres this will remain a small part of the budget, accounting for around 4% of the total.

Maintenance and upkeep

Most of the health centres in the district do not have electricity, with Rusangu being the exception. Kerosene ("paraffin") is provided by UNICEF for refrigerators but a problem in supply has occurred this year with health centre staff having to purchase the kerosene themselves for reimbursement later. In 1991 the price of paraffin (kerosene) rose continuously but cost an average of K30 per litre, and in 1992 the price had risen to K45. A refrigerator uses approximately 20 litres per month; some of the kerosene is used for lamps as well. Cleaning materials are provided through the district hospital and amount to less than 1% of the total cost of running the RHC's. Stationery including under 5 cards, etc. is provided in part by UNICEF and part by the government. In general patients are asked to bring an exercise book in which their details are kept; some health centres keep these books but in others the patients keep them at home.

Drugs and vaccines

Zambia's rural health centres are supplied by drugs through the SIDA and Dutch government supported kit system, with a range of essential drugs and supplies being provided in pre-packed and pre-determined amounts on a regular basis. In general this system is working very well; Rusangu is entitled to 1 1/2 kit per month, Keemba to 1 kit, and Nampeyo to 1/2 kit each month. Indications are however, that Nampeyo could now use a full kit; antibiotics in particular tend to run out before the end of the month. Vaccines and syringes are provided through UNICEF and a detailed breakdown of costs could not be obtained, but these were apportioned on the basis of the number of immunizations recorded for that RHC.

Community contribution

At some health centres the community contributes goods such as cleaning materials, construction materials, or labour. Where available, the estimated value of this contribution has been included in the budget. Some of the community contribution of past years would be reflected under the capital budget as part of the cost of the buildings.

Food

Food is supplied for inpatients through the district health authorities. As noted above, the level of inpatient use is quite low in some health centres, most notably in Rusangu in view of its proximity to Monze Hospital, so the expenditure on food is correspondingly lower. Nonetheless it would appear that a significant and possibly excessive allocation of food is being provided for the health centres in view of the low level of use of the facilities for inpatient services.

Annex 4.3: Costing Methodology: Home Based Care

The time spent by the team on the three main activities was estimated on the basis of a "typical" week. On Monday and Wednesday the team stays in Monze town, counselling patients at the hospital and visiting patients who live in the town. On average, two people per day are sought out by the team at the hospital and counselled, two more "old" patients visit the office for counselling and advice, and five are visited in their homes. On Tuesday, Thursday, and now Saturdays as well, the team has access to a vehicle. The team remains at the hospital from 8 to 10 am to counsel patients and then goes out on home visits and community activities. On average, five persons are visited per day, making a total of 15 per week for home visits. Fridays are spent either at the hospital or on community and home visits, depending on the availability of transport. A year's activities, assuming 40 effective weeks of work per year, would involve counselling of 560 persons and home visits for 920.

Next, the costs of each of the main budget items were estimated and apportioned over the three activities on the basis of the use of that item for that activity. The figures for some items are based on actual costs of the first eight months of the year annualized over twelve months, i.e. salaries, vehicle fuel and depreciation, allowances, and drugs. The costs of stationery, seminars, community visits, counselling at Monze Hospital (for staff), and of the community survey are estimates. The majority of costs for the other activities, namely, seminars (for rural health centre staff on prevention and care, for community leaders on how HIV is transmitted, condom promotion, etc., for traditional healers on AIDS case management, psychosocial aspects, etc., for school headmasters on sexual education, prevention and supervision of anti-AIDS clubs, and for community discussions on AIDS) involve the costs of holding meetings, per diems, allowances, etc. The community survey involved vehicle costs, stationery, allowances, etc. but these could not be disaggregated and are therefore grouped together.

The resulting proportions (shown in table 4.8) were, for example, 30% of salaries (i.e. staff time) spent on counselling, 53% on home visits, and 17% on other activities. Vehicle costs and depreciation, on the other hand, are allocated 90% to home visits and 10% to other activities, as are lunch allowances, since these are only paid when the team leaves Monze town. Vehicle depreciation of K645,682 (annualized at 3% discount rate) has been included even though the vehicle has been provided by outside donor funding, as a reflection of the true cost of running the counselling and home based care team. The estimated cost of the vehicle is £20,000 and the useful life is expected to be four years. The costs of home-based care amounted to 66% of the total, with only 6% going to counselling at the hospital. The cost per home visit of K1,163 (£9.69) amounted to approximately 4-5 days in hospital.

Round the World

Zambia: Drought in Monze

The 45 cm of rain that fell on Monze district in the 1991-92 season was the lowest since 1923-24. This is the worst drought since the change from drought-resistant millet and sorghum to maize was imposed on Northern Rhodesia in the colonial era. The 1991 season was also poor so food reserves were already depleted. The risk of starvation in the district is great.

The drought relief effort got underway promptly in February, 1992. The Ministry of Agriculture in Lusaka acted earlier than other drought-affected countries in southern Africa in securing available world stocks of maize. The maize is now entering the country via road, so far with only minor mishaps. People have had to sell their main assets, including cattle but the glut of animals on the market has led to a drop in prices while tick-borne East Coast fever or theileriosis (known locally as "corridor disease") in southern province may have killed up to one-third of the animals in the district and measures instituted by the veterinary authorities have frustrated the efforts of Monze residents sell their animals. Cattle have a very important economic role and the loss of trained oxen will affect ploughing next year. Subsistence farmers, with little or no money, no food in the granary, and no prospect of improvement, will be wholly reliant on relief maize. The more affluent farmers have different problems. One man borrowed nearly £1000 to buy fertiliser and maize seed but this investment is now completely wasted. Even with adequate rainfall next year the crop is unlikely to be good. The drought has halved maize seed production although the authorities have expressed confidence that sufficient seed will be available.

Despite the drought and enzootic corridor disease, agriculture could return to normal in a year or two, with adequate rain. The biggest long-term threat to maize production, and indeed to the economy of Monze district, is AIDS. Since 1987 there have been about 3600 cases in a population of 160 000, and by 1997 it is likely that about one-third of households will have experienced at least one death from AIDS. With AIDS comes a major reallocation of labour towards the care of the sick individual. On the death of the breadwinner the household is likely to split up. The tradition is that the dead man's relatives can claim all the household's possessions, right down to the cooking pot, and the widow may be left without the means to support the family, forcing her to return with the children to her own relatives. Despite legislation designed to prevent this the problem remains serious in Monze district, as elsewhere in Zambia. Maize planting and weeding are viewed primarily as women's jobs, while land preparation is the man's domain. The yield is very dependent on female labour input but the burden of caring for AIDS patients is also falling primarily on women. Unless men agree to look after the sick or to take on agricultural "women's work" farm families with one or more sick members may soon face a labour shortage for the production of maize.

In Monze, facing the triple catastrophes of drought, corridor disease, and AIDS, much effort has been devoted by district authorities to identifying the households at most risk, and the food aid now entering Zambia should reach vulnerable families in time to prevent starvation. Families weakened by AIDS or soon to be affected by the disease will have more than usual difficulty in recovering from the drought, and interventions targeted at these households could help them to avoid economic ruin and break-up of the family. Right now stocks of mealie meal are needed to see families through to the next harvest; in October they will need seed for planting—not to mention the most essential thing, rain.

London

Susan Foster

Maize production, drought and AIDS in Monze District, Zambia

SUSAN FOSTER

Health Policy Unit, London School of Hygiene and Tropical Medicine, UK

The 1992 Southern African drought focused the world's attention on the precarious food security situation of that region. In Monze District, southern Zambia, in addition to the drought there was also a serious epidemic of East Coast fever among the cattle, which resulted in the deaths of a large percentage of the district's herd causing further impoverishment among some of the district's poorer households. At the same time, AIDS and HIV disease are increasingly making an impact on the productivity of the district's population, with as many as one in 6.5 households already having experienced illness or a death due to AIDS. This paper describes the history of maize in Zambia, the impact of the 1992 drought and of the epidemic of East Coast fever, and the likely impact of AIDS on agriculture in the district.

Introduction

The 1992 Southern African drought focused attention on food security issues, particularly in Zambia where a new democratically-elected government was faced with the need to plan for food relief almost from the day it took office in November 1991. The critical issue was the availability of maize; maize is Zambia's food staple and most important single agricultural crop. It is also the major crop produced in Monze district and virtually all farming households in the district grow some maize, if only for home consumption. At the same time as the drought occurred, an epidemic of East Coast fever killed as many as half of the district's cattle herd. Against these difficulties is the increasing number of cases of AIDS and HIV disease among the district's population. This paper will review the history of how maize came to take on such importance, displacing traditionally grown crops; the local implications of the maize pricing policy; the situation as regards the 1991-92 drought; the impact of the bovine epidemic of East Coast fever ("corridor disease"); and the implications of AIDS and HIV disease for the future of maize growing in the district.

Production and marketed sales of maize

As noted above, maize is Zambia's staple food and annual requirements are estimated at 11

million 90 kg bags.¹ Until 1978 the country was largely self-sufficient in maize. In 1979, however, marketed production of maize fell to half of the estimated requirements and in 1980 imports reached 81 000 tons, at an expenditure of K11 million or £6.5m equivalent.² By 1991 imports reached 270 000 tons.³

In 1985-86, the last year for which data are available, Southern Province produced 26% of the national sales of maize, and Monze District was responsible for producing about 4.5% of the marketed national total (compared with its share of 2% of the population). Only about 35% of the district's estimated production was marketed.⁴ Maize is produced in the district by both African peasant farmers and by commercial farmers. Previously the commercial farmers produced as much as 60% of the national needs but as the maize pricing policy became less and less favourable to producers they gradually shifted to other crops. In 1990-91 they produced an estimated 35% of national production, with smaller scale African farmers making up the balance.⁵

History of maize in Zambia

As with virtually every other aspect of Zambia's economy, even the production of maize is closely linked with the development of the copper

mining industry. The line of rail runs through the district (and through the whole of Southern Province), and as recently as the 1950s Lusaka could be reached by rail in two and a half hours.⁶ This transport facility made Monze district (which was then part of Mazabuka district to the north), a logical choice for the production of maize for shipment to the Copperbelt. Until the 1930s maize was not grown by the African farmers in Monze district in any quantity; they continued to raise the traditional crops of sorghum and finger millet.⁷ Maize production was introduced to the African farmers by the colonial administration who needed a source of rations for the growing body of workers at the mines in the Copperbelt. The settler farmers could not meet the demand and imports had begun. There was a tension between those who wanted to encourage the peasants to produce maize and the proponents of the commercial farming sectors; some contended that "a villager would be 10-15 times more valuable in terms of manpower as a farm employee rather than self-employed".⁸

The choice of Southern province, and Monze district in particular, for maize production may have had as much to do with geographic suitability as with climate or the agricultural characteristics. Marter⁹ suggests that maize will

grow in a range of 300-1800 mm of rainfall, and notes that maize is susceptible to variations in the distribution of rainfall. In areas of low rainfall, such as Monze District, there is a risk of inadequate rainfall at planting time, and maize is further affected by poor soil fertility. The amount of rainfall which the district receives, on average about 700-800 mm a year is just adequate for the production of maize. The part of the district west of the road and line of rail is in the isohyet of 32 inches or 800 mm, as is most of Mazabuka district; the eastern half is significantly dryer, with 28 inches or 700 mm average.¹⁰ Most of the rest of Southern Province, especially the south-western part is also in the drier zone.

Furthermore, while the average rainfall may be adequate, as Figure 1 shows there are significant fluctuations from year to year¹¹, and ten of the 71 growing seasons since 1921 have had rainfall less than 25" or 625 mm.

The introduction of maize as a main crop in the district had a major impact on the economic life of the peasant farmers. The key was the adaptation of the ox-drawn plough for growing maize. In the 1920s there were demonstrations of the ox-drawn plough but the plough was still rare in

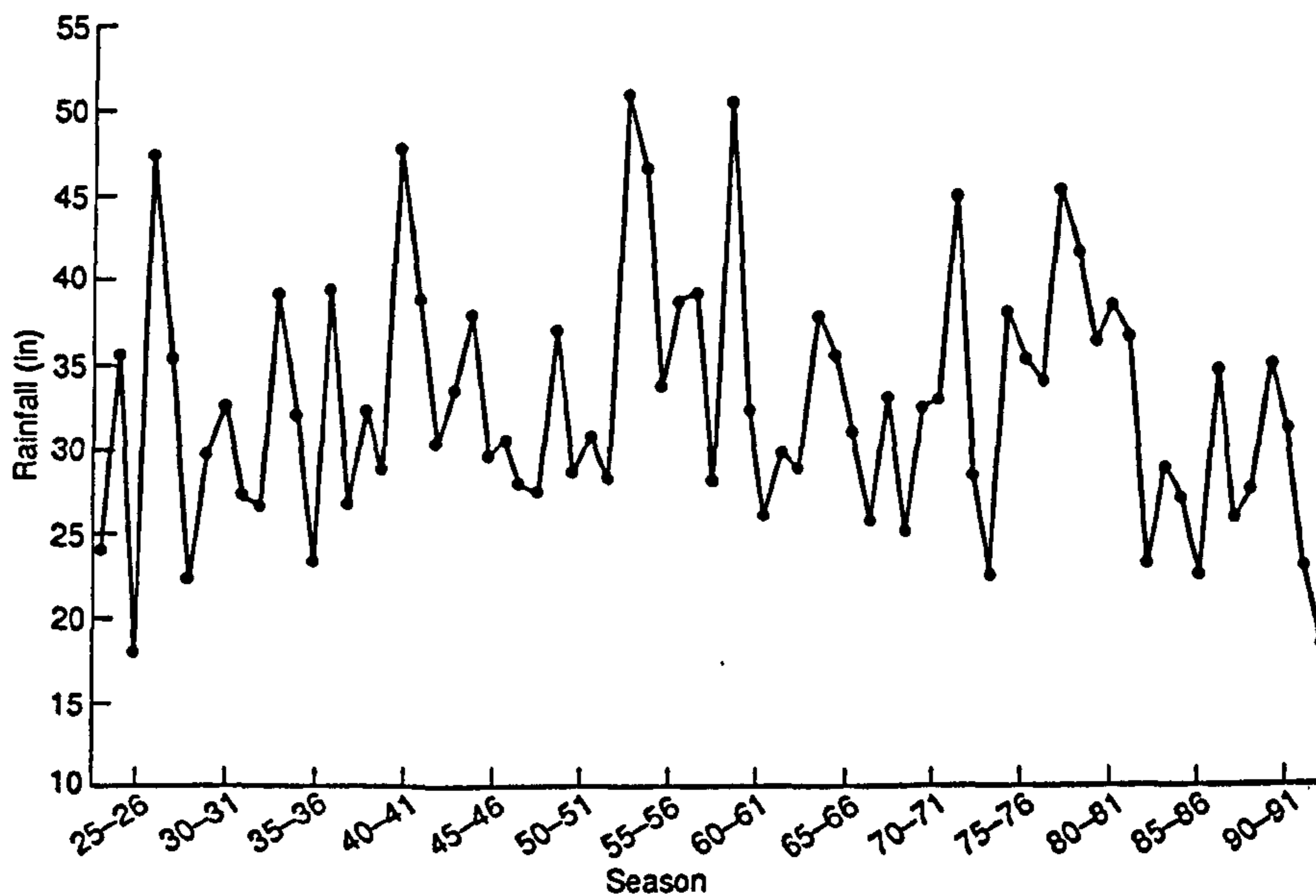


Figure 1. Annual rainfall, 1921-1992 at 'The Moorings', Monze, Zambia

1930, mostly due to the high capital requirement a plough represented. However a few peasants did acquire ploughs, mostly through associations with the missionaries especially at Chikuni mission in the south of the district; and this gave rise to the beginning of peasant differentiation in the district.¹² Peasants who acquired a plough were able to plant a larger area for themselves, and also to hire out the plough. They then also required ox carts to carry their increased production of maize to market, and these too could be rented out for numerous purposes. This gave added impetus to and coincided with the push towards maize monoculture in the 1930s; there was little point in acquiring all this capital equipment to produce the traditional crops which were not marketed.¹³ These "accumulating peasants" were often paid in calves and were thus able to concentrate their wealth in the form of cattle, which further increased their assets since cattle can be used to plough, to carry produce to market, and as a source of dung manure as well as being a (relatively) safe way to hold wealth.

Meanwhile, the majority of the population had largely abandoned the traditional drought resistant crops, sorghum and finger millet in particular, and had become vulnerable to drought and famine. In 1985-86, sorghum production by volume amounted to only 4% of that of maize, and millet only 3.5%. Only small fractions (7.35% and 5.2% respectively) of this production was marketed.¹⁴ This trend away from sorghum and millet unfortunately has coincided with a downward trend in rainfall, particularly since the 1970s, and there is some discussion of trying to reintroduce crop rotation with some of the former traditional crops as well as maize.

National maize pricing policy and local implications

The policy of keeping maize prices low in order to subsidize urban consumers is often ascribed to newly independent African governments, but in fact it dates back, at least in the case of Zambia, to the colonial administration. This policy was accentuated in the 1940s when the copper was needed for the war effort and increasing numbers of miners were recruited; the colonial administration was willing to subsidize the production of maize to keep the mines working at full speed and spent £7m from 1943-54 to keep labour costs low.¹⁵

When the Zambian government found itself unable to continue to subsidize the low price to consumers it began to shift the burden to the peasant farmers, who naturally were unwilling to produce maize for a price which did not provide a fair remuneration. At the same time, the government continued to maintain the policy of paying commercial settler farmers in foreign exchange, so they continued to produce at a reasonable level. In 1978, a peasant maize producer could expect a net return per bag of average quality maize of about 2 kwacha compared with production costs of 2.5 kwacha and a selling price of 4.8 kwacha, or a 41% return.¹⁶ By the mid to late 1980s, however, the net return per bag had dwindled to the point where African farmers were less interested in marketing their production and sold only enough to meet their cash needs for school fees, etc. When in mid-1991 the producer price was increased from K500 to K800 per bag, farmers still complained that their profit was only K17 per bag - a 2% return.¹⁷ Mealie meal in Malawi is 8 times more expensive than in Zambia, leading to smuggling of Zambian maize to Malawi and other neighbouring countries.¹⁸ There was a further policy which reduced marketed production, that of panterritorial pricing whereby the same price was offered for maize all over the country regardless of the costs of production in that locality.¹⁹

By 1991 the maize subsidy was costing an estimated K9 billion (around £90m), which the government could not pay out of revenues but only by printing more money.²⁰ Furthermore, maize was being imported from elsewhere in the region, including Zimbabwe at the equivalent of K2000 per bag, paid in foreign exchange, while Zambian farmers were paid only K800.²¹ In Zaire, a 90 kg bag could earn K1300 on the black market in July 1991²² compared to the official price of K800.

The effects in Monze district were as noted above, namely that only 35% of the estimated maize production was ever brought to market. Disaggregated figures are not available but it is likely that much of this came from the ten or so large scale commercial farmers operating in the district. Transport difficulties would limit the degree to which Monze farmers could smuggle large amounts of their maize to neighbouring countries. There is some indication that people

have been shifting to other crops for their cash needs, in particular sunflower and cotton. In a random sample of 326 inpatients who were interviewed at Monze Hospital about their socio-economic status and production, 126 reported having sold crops. Of these however, only 68 reported having sold any maize in 1990, and 49 in 1989; and of these in 1990 only 15 had sold 100 bags or more. In part this has to do with the rainfall; in 1988-89 there was nearly 35" but in 1989-90 only 31", and in 1990-91 only 23".

Several times, in response to pressure from the IMF and World Bank, the previous UNIP government tried to remove or reduce the maize subsidy but each attempt was met by riots and chaos. Zambia's high degree of urbanization (about 50%) made this a particularly risky thing to attempt but the funds to pay the farmers a better price could not be mobilized. A stated policy of the MMD government which came to power in November 1991 was to remove the maize subsidy and pay a reasonable producer price. In December 1991 the government announced that subsidies on the more refined "breakfast" mealie meal would be removed by the end of 1992, while a 20% subsidy on "roller" meal would be retained.²³ In October the (outgoing) UNIP government raised the producer price from K800 to K1200 per 90kg bag²⁴ and in May the MMD government announced a further rise to K3000 but retracted the increase a week later because of the precipitous price rises instituted by millers who had bought maize at the old price.²⁵ In some respects the drought was fortuitous for the government as the shortage of maize meal, both real and artificial in both urban and rural areas, with corresponding price rises, meant that people no longer expected to pay a low price for maize. This may reduce the pressure for reinstatement of the maize subsidies, if only temporarily.

The 1992 drought

Data on rainfall in Monze district (Figure 1) show that the approximate 18" received in the 1991-92 season was the lowest annual rainfall since 1923-24 when only 17.85" were recorded at a commercial farm, "The Moorings", 10 km north of Monze town. Since maize cultivation was not widespread at that time, this is the worst drought since maize culture began in the district. The

extent of the drought became clear in February 1992, when after a promising start the rains virtually stopped with only 1.35" being recorded in January (compared with a normal January rainfall of 7" or 8"). In February only 1" fell, compared to a normal rainfall of 5" or 6". The 1991 season had also been a poor one, with only 23" recorded in Monze, and further south in the province the situation was already grave in September 1991, with Kalomo, Gwembe, and Namwala districts reporting serious shortages of both maize and water.²⁶ Generally throughout the province the reserves were depleted.

The drought relief effort got underway promptly in February 1992 at national level, with the Ministry of Agriculture of the new government taking an early lead over other drought-affected countries in Southern Africa in securing available world stocks of maize. The maize entered the country via road, passing through the district, with only minor mishaps. Two lorry loads went missing between the port in South Africa and Zambia²⁷ but in view of the acute shortages in the countries through which the lorries had to pass, Zimbabwe in particular, it was surprising that losses were not greater.

At the district level, the district's needs were estimated to be 271 000 bags to last until March 1992 but only 112 000 were in the sheds, leaving a shortfall of 159 000 bags.²⁸ The immediate impact in the rural part of the district was that people had virtually no harvest. This meant no food for the next 12 months, no seed stock to plant the next year's crop, and no cash to buy food or any other necessities, fertilizer or other inputs for next year. The risk of starvation in the district was great and it was only through a remarkably efficient distribution of maize meal to rural areas, set up virtually overnight and in which the health services played the key role, that starvation was averted.

In anticipation of the need to buy food people were selling off their main assets, their cattle. The main market is the Copperbelt and Lusaka, and the glut of animals on the market led to a drop in prices.²⁹ Furthermore, in view of the epidemic of "corridor disease" in Southern Province (see below) measures were instituted by veterinary authorities in the receiving provinces which further complicated the efforts of Monze

residents to realize their assets. Cattle arriving from Southern Province were to be slaughtered within 24 hours of arrival, and farmers found infringing this regulation were fined and their animals destroyed.³⁰ Paradoxically, despite the fact that 49% of the national herd is located in Southern Province there are no industrial-scale abattoirs in the province so all animals are exported live. Even chickens from Southern Province were being sold off on the Copperbelt to get cash for maize.³¹

The drought affected different income groups in different ways. The subsistence farmers had the immediate problem of little or no cash on hand to buy food, no food in the granary, and no prospect of improvement in the near future. They were almost completely reliant on relief maize. More affluent farmers had a different set of problems. One large African farmer had borrowed nearly K200 000 from the bank (nearly \$1000 at the "retention rate" or \$1470 at the tourist rate) to buy fertilizer and maize seed. This investment was completely wasted, but the money was still due the bank. The government announced that it would not interfere in the private lending market,³² i.e. would not bail out such farmers, so his future production capacity was put into jeopardy by this crop failure. Other "advanced" African farmers are likely to be in a similar position, with the debt they carry hampering their ability to recover in time for next year's planting season. Much depended on the banking system's willingness to remain flexible, but with around 30% of their portfolios tied up in lending for agriculture³³ their scope for flexibility was limited.

"Corridor disease"

An epidemic of East Coast fever or theileriosis, a tick-borne cattle disease spread through the cattle in the district in 1991³⁴ and became worse in 1992³⁵. The local name for the disease is "corridor". Exact figures are unknown but anecdotal reports suggest that as many as half of the cattle in the district have died. In 1985-86, the last year for which complete data are available, 7645 households in the district were reported to hold 180 452 cattle, an average of 23.6 head per household. The district's cattle stock amounted to 10% of the national total; 49% of the national herd is located in Southern

Province.³⁶ In a community survey carried out in Monze district in 1992, 29.6% of rural households reported owning no cattle, and could be considered as very poor. Of those households which did own cattle, the mean number was 27.3, but the median was 15. Cattle ownership was highly skewed.³⁷

As noted above cattle have a very important economic role in the district, serving as draught animals, sources of manure, and as a relatively secure form of holding wealth in times of very high inflation. The disease can be prevented by weekly dipping of cattle for which a nominal fee of K5 per animal per dip is charged, and while more "modern" farmers have managed to dip their cattle regularly, it is the more traditional farmers who have neglected this step and lost their cattle. In some areas the water shortage has made regular dipping impossible, but elsewhere it is unclear why farmers do not dip regularly. Treatment of the disease is very costly, ranging from K3000 to K6000 depending on the size of the animal, although since healthy animals are still fetching between K16 000 and K30 000 on the Copperbelt it seems that treatment is still cost-effective.³⁸

While the stock of cattle in the district was beginning to cause problems of overgrazing, it nonetheless appears that the loss of animals may be affecting poorer, more traditional households disproportionately. Typically cattle-owning households had only two or three trained oxen among their 10-20 animals; the loss of their oxen meant that they would be unable to plough a large area next year unless they were able to hire oxen elsewhere. The loss of the wealth and realizable assets which cattle represent could not have come at a worse time, given the need to sell off the cattle for cash to purchase maize and other necessities.

AIDS and the maize production system

Despite the immediate problems posed by the drought and the epidemic of corridor disease, if rains return to normal, within two or three years a normal agricultural situation will have been restored (except for those farmers who have lost their only trained oxen). Farmers will then begin to reconstitute their herds and perhaps within 5 years they will be at roughly the same position as

they were in 1990 or early 1991. Therefore despite the drought and its impact, it seems likely that the biggest long-term threat to maize production and indeed to the economy of the district, is the AIDS epidemic. Approximately 18-20% of blood donors at Monze Hospital are seropositive³⁹ and blood donor data has proved elsewhere to be a reliable indication of community seroprevalence among adults.⁴⁰

Current data suggest that approximately 5% of seropositive people develop AIDS each year. If roughly 50% of the district's population of 160 000 is over 15, and therefore falling into the age group from which blood donors are drawn, there are approximately 16 000 seropositive adults in the district. Of these, assuming a steady state of the epidemic (i.e. no new infections) there will be 800 new cases of AIDS each year from now. If we assume that seroprevalence was less, i.e. 10% five years ago with a 2% annual increase, then over a 5 year period, i.e. projecting backward to 1987, there will have been in the order of 3600 cases. There are approximately 20 000 households in the district, so if these cases were evenly distributed it is likely that one in 6.5 households would have already experienced a death from AIDS. The nature of the disease, however, tends to cause a clustering of cases within families, i.e. husband and wife (and child), so it appears from preliminary data gathered from interviews with AIDS patients that while fewer households may have been affected, those which are affected tend to be very heavily affected, often by more than one death and with a resulting large number of orphans requiring care.

Projecting forward into the near future, the same situation applies; assuming no new infections there will be another 4000 deaths from AIDS in the next 5 years, and another 4000 households (of 20 000) will experience the upheaval a death from AIDS brings. Obviously projections made on the assumption of no new infections are overly optimistic, but under these assumptions, and assuming an even spread of the infections, by 1997 about one third of households in the district will have experienced at least one death from AIDS.

The presence of AIDS in the household entails a major reallocation of labour away from usual tasks towards the care of the sick individual, and

following the death of the breadwinner especially, the household is likely to split apart. Traditional custom among the Tonga as well as other groups has it that the husband's relatives arrive soon after his death (sometimes even before his death) to claim all the household's possessions, right down to the cooking pot. Despite enactment of the Succession Law designed to prevent this from happening, it remains a serious problem in Monze district as elsewhere in Zambia.⁴¹ A widow may be left without the means to earn a living or even provide for essential needs of the family, forcing her to return with the children to her own relatives.

According to one study, maize production requires an estimated 552 hours of labour per hectare per year for preparation, planting and weeding, with peak inputs of labour required in October (67 hrs/ha), November (121 hrs/ha), December (198 hrs/ha) and January (158 hrs/ha). (Cassava by comparison requires 448 hrs/ha spread out more evenly over the year, with a peak requirement of only 98 hrs/ha in March.⁴²) Traditionally, planting and weeding are viewed primarily as women's jobs, while land preparation is the man's domain. Since the yield will be primarily determined by the labour input for planting, weeding, and fertilizing the crop, the yield is very dependent on the amount of *female* labour input.

Predictably, the burden of caring for AIDS patients also appears to be falling primarily on women. As Lado⁴³ has noted, "whenever someone has to assume someone else's role, it is the women who automatically assume men's roles and not vice versa." Of the 150 "helpers" looking after inpatients who were interviewed at Monze Hospital, 75% were women, with an average age of 42, and the majority were farmers. While not all of them were looking after AIDS patients, it seems clear that care-giving is viewed primarily as a woman's task. Therefore, unless men consent to either look after the sick patients to a greater degree or to take on agricultural tasks which are traditionally viewed as women's work, or unless additional labour can be hired, in farm families with one or more sick persons there will be a labour shortage for the production of maize, particularly during the months of December and January, which could have a negative impact on the size of the harvest.

In the commercial farming sector, production is highly mechanized and most of the work is done by men for wages. Although losses due to AIDS are already significant the impact is still not great since new male workers can usually be recruited for wages, although the loss of experienced workers is bound to have an impact on overall productivity. As the epidemic grows, however, there might come a time when even unskilled additional workers become more difficult to recruit at present farm wage levels.

Conclusion

Monze district in 1992 suffered an unprecedented combination of three catastrophes, all at once – the drought, the epidemic of corridor disease, and AIDS. It is likely, although difficult to prove, that smaller households with a limited labour capacity and especially those with many young children or old people will be especially affected by the drought and by the loss of the few cattle they may possess. Some of these most vulnerable households are those already weakened by the loss of adults in the productive age groups to AIDS who have left orphan children in the care of grandparents; their only realizable asset or margin of safety on which to fall back would have been a few head of cattle, and it is these families which are most likely to have lost their cattle.

Food aid entered the country, and the district, in time to prevent starvation. In the longer run, it appears that most households will be able to reconstitute their herds and to recover from the immediate effects of the drought, but families and households already weakened by AIDS, or which will soon be affected by AIDS, will have much more difficulty in recovering. Interventions which are targeted at these households in particular could be of great assistance in helping them to avoid economic ruin and prevent the breakup of the household and family.

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Biography

Susan Foster is a lecturer in Health Economics at the London School of Hygiene and Tropical Medicine, and Principal Investigator for a study of the economic impact of AIDS in Monze District, Zambia, funded by the ODA.

Correspondence: Susan Foster, Health Policy Unit, Dept of Public Health and Policy, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK.

Cutaneous reactions to thiacetazone in Zambia—implications for tuberculosis treatment strategies

Paul Kelly, Anne Buve, Susan D. Foster, Michael McKenna, Mark Donnelly and Godfrey Sipatunyana *Monze District Hospital, P.O. Box 660029, Monze, Zambia**

Abstract

Tuberculosis in patients infected with human immunodeficiency virus (HIV) is a growing threat to public health in Africa. Thiacetazone, one of the continent's most widely used antituberculous agents, may lead to severe cutaneous reactions in the HIV infected individual. We describe the impact of this reaction on the tuberculosis (TB) control programme of a district hospital in Zambia in 1990, and examine the cost implications of changing the standard treatment regime. We carried out a retrospective survey of records of all patients beginning TB treatment in 1990, together with HIV test results and the cost of all treatments given. From this we derived estimates of costs of different regimes which are and could be used in TB control in Zambia. Severe reactions occurred in 18.7% of all HIV seropositive patients receiving thiacetazone, fatally so in 1.2% (odds ratio 16.6). The greatest part of the cost of the current regime is that attributable to the in-patient stay; we estimated that 29.4% of patients would be unable to receive drugs as out-patients but, even allowing for this, rifampicin-based regimes given to outpatients where possible would not cost more than the current strategy. We conclude that ethical and economic considerations support a change to rifampicin-based regimes in areas of Africa where HIV seroprevalence is high.

Introduction

The association of tuberculosis (TB) and human immunodeficiency virus (HIV) infection in Africa has resulted in a surge in TB notifications. This was noted in 1986 in Lusaka (MELBYE *et al.*, 1986) and the situation is worsening rapidly (ELLIOTT *et al.*, 1990). In Zambia between 1980 and 1986 the annual incidence was stable at 950 per million, but rose to 2150 per million in 1990. Of a random sample of 58 patients treated for TB at Monze hospital in Zambia in 1991, 47 (81%) were seropositive for HIV.

It is now apparent that the use of thiacetazone, for many years one of Africa's most widely used drugs against TB, is associated with severe cutaneous reactions in the HIV positive individual (NUNN *et al.*, 1991; POZNIAK *et al.*, 1992). There has been a debate for some years about the place of thiacetazone in TB control strategies. BARNUM (1986) argued that other agents, principally rifampicin, although more expensive, are better at controlling the disease and therefore a better choice for countries even with very limited resources. Indeed, poor chemotherapy may be worse than no chemotherapy at all (GRZYBOWSKI, 1991). MURRAY *et al.* (1991) found that treating sputum-positive TB patients in Africa is the cheapest intervention per year of life saved, even with apparently expensive drugs. A recent report from Botswana showed that the use of short course treatment with powerful drugs was associated with improved disease surveillance (KUMARESAN & MAGANU, 1992). TB treatment forms a relatively large proportion of small budgets (FOSTER, 1990), and it is easy to see why there is a temptation to try to save money.

We decided retrospectively to assess the impact of the problem with thiacetazone in a district hospital in rural Zambia in 1990, and to begin to answer the question of whether alternative regimes are affordable.

Methods

A thorough search was made for the records of all patients who were notified as having tuberculosis in Monze District, Zambia, in 1990. The notes were analysed to identify the chemotherapeutic regime used and the occurrence of cutaneous reactions to antituberculous drugs.

Cutaneous reactions were defined according to NUNN *et al.* (1991); a suggestive skin rash appearing after the start of treatment, and responding to drug withdrawal. Re-challenge with suspected agents was not undertaken. Laboratory records of HIV test results were also searched; all testing had been carried out with the permission of the patient during the course of routine clinical care, and in liaison with the district community and home-based care team for acquired immune deficiency syndrome sufferers. A majority of patients had undergone testing on clinical grounds in 1990.

In the group of patients receiving thiacetazone, HIV seroprevalence amongst those who sustained a cutaneous reaction was compared with seroprevalence amongst those who did not. The association between cutaneous reaction and HIV seropositivity was estimated by calculating the odds ratio.

Two of us had already undertaken a costing exercise for the entire hospital (S.D.F. and A.B.) for other purposes; this involved detailed accounting of all expenditure, including salaries, and allocation to each provider unit (e.g., ward, out-patient department) using staff distribution as a marker of level of activity. For the purposes of the present study, drug costs were excluded from the unit cost per ward as shown in Table 1. Drug

Table 1. Unit costs of hospital services used in this study

Service	Cost (Kwacha ^a)
One bed-day	
TB ward	92.1
Adult ward	134.3
One day on drugs ^b	
STH regime	4.7
RHZ regime	
Rifater [®]	60
Rifinah [®] plus pyrazinamide	17.8

^a120 Kwacha=£1 Sterling.

^bSTH=streptomycin+thiacetazone+isoniazid; RHZ=rifampicin+isoniazid+pyrazinamide.

costs have been calculated using the price list of the International Dispensary Association, Amsterdam. Details of the costing procedure will be published elsewhere, and can be supplied on request. The costs shown were used to derive a mean cost for the 2 months initial phase of treatment with different regimes. The calculation included data from a bed census carried out in April 1991, at which we assessed the proportion of patients (29.4%) who could not have been treated on an out-patient basis because of advanced or concurrent disease.

*Current addresses: Dr P. Kelly, Department of Gastroenterology, Medical College of St Bartholomew's Hospital, Charterhouse Square, London, EC1M 6BQ, UK (address for correspondence); Dr A. Buve, Health Research for Action, Laarstraat 43, 2840 Reet, Belgium; Ms S. D. Foster, Health Policy Unit, London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK; Dr M. McKenna and Dr M. Donnelly, Institute of Clinical Sciences, Royal Victoria Hospital, Grosvenor Road, Belfast, Northern Ireland, BT12 6BL, UK.

TB treatment regimes are described according to the following convention: streptomycin=S, thiacetazone=T, isoniazid=H, ethambutol=E, rifampicin=R, pyrazinamide=Z; we confined ourselves to analysis of the initial phase (2 months) of therapy. The regimes we discuss are listed below.

(i) STH. Initial phase as an in-patient with daily streptomycin injections and two daily Thiazina® tablets, followed by TH as an outpatient for 10 months; this was the standard regime in 1990.

(ii) STRHZ. Initial phase again as an in-patient with daily injections and 4-5 Rifater® (Merrell) tablets daily, followed by TH as an outpatient for 6 months; this was recommended for sputum positive, miliary or meningeal TB.

(iii) RHZ. Initial phase treatment administered as an out-patient to ambulant patients in either of 2 forms. Rifater® tablets (4-5 daily for an average weight adult in Zambia), or as a mixture of Rifinah® tablets (Merrell; 2 daily) and pyrazinamide tablets (3 daily). Both of these initial phase regimes were followed by RH for 6 months. This regime was not standard in Zambia in 1990.

Results

In 1990, 396 patients started treatment for TB in Monze Hospital; 279 of these were adults, and we traced the notes of 211. Most of the notes which were not found were discovered to have followed the patient on transfer to another hospital.

Altogether, 166 patients for whom records were available began their treatment with T-based treatment (TH), and 41 with non-T-based regimes. Four died within 2 weeks of commencing treatment, and are not included.

Of those given TH initially, 45 (27%) had cutaneous reactions, but only from 31 (18.7%) was treatment withdrawn. In the remaining 14, therefore, we assume the reaction to have been mild. Two patients died, probably due to the reaction.

Of the 41 given non-T treatment initially, 21 were given TH after the completion of the initial phase of therapy; this led to one severe and one mild reaction.

HIV test results were found for 118 (71%) of the 166 patients who received thiacetazone. The relationship between HIV serology and thiacetazone reactions is shown in Table 2. Among the patients who reacted, 96% (24/25) were seropositive, compared to 59% (55/93) of the non-reactors. We have shown only those reactions which necessitated withdrawal of therapy.

Table 2. HIV serology and cutaneous reactions to thiacetazone^a

HIV status	Reaction	No reaction
Positive	24	55
Negative	1	38

^aOdds ratio 16.6; exact 95% lower confidence limit 2.45.

Cost of care attributable to thiacetazone reactions, and of different treatment regimes

Analysis of reasonably complete records of patients whose reactions required withdrawal of T revealed that the mean additional stay in hospital attributable to TH reactions was 18.5 d (standard deviation=26; range 0-101). Prednisolone was prescribed in 75% of cases (mean consumption 86×5 mg tablets), and chlorpheniramine in all cases (mean 37×4 mg tablets). Our calculated estimate of the additional costs incurred by treatment of cutaneous reactions is 1937 Kwacha (K) per reaction or 362 K (i.e., 1937×18.7%) when averaged per TB patient treated [120 K=£1 Sterling]. This represents 5.9% of the total cost of initial phase TB treatment, but is a considerable underestimate if we take into account the cost to the community and home based care service of dealing with a proportion of patients who would not otherwise have

Table 3. Cost estimates for initial phase TB therapy (1991 prices) per case treated, given for 2 months, including drugs, nursing and hotel costs, but excluding any surgical costs

Regime ^a	Cost (Kwacha ^b)
STH given as inpatient	6103
STH given as outpatient	2657
RHZ (Rifater®) regime given as outpatient	5975
RHZ (Rifinah® plus pyrazinamide) regime given as outpatient	3443

^aSTH=streptomycin+thiacetazone+isoniazid; RHZ=rifampicin+isoniazid+pyrazinamide.

^b120 Kwacha=£1 Sterling.

required intensive support (current cost per patient=874 K). Longer stay in hospital also entails more costs to the patient's relatives; at Monze hospital, these costs amount to an average of 53 K per day (A. Buve and S. D. Foster, paper in preparation).

The calculated cost of different regimes is shown in Table 3; costs of RHZ are given for the 2 formulations described above. The costs have been calculated in the following way. We assumed that virtually all patients would spend one week in hospital for diagnosis and initiation of treatment, in a general ward (7×134.3=940 K). If the remainder of the initiation phase were spent as an in-patient, this would incur a cost of 53×92.1=4881 K, but when a regime was given primarily to out-patients, this cost would be incurred only by the 29.4% of patients who were too ill to discharge at this stage. Thus, we added a notional cost of 0.294×4881=1435 K to each out-patient regime cost. Using this approach, we derived a cost for initial phase TB treatment for the STH regime (in-patient based) of 282 (drugs)+940+4881=6103 K. For out-patient STH, the calculation was 282+940+1435=2657 K. If the out-patient RHZ regime used Rifater®, the cost would be 3600+940+1435=5975 K, but if Rifinah® with pyrazinamide was given, 1068+940+1435=3443 K. This is summarized in Table 3.

Discussion

Among our patients receiving treatment for TB with thiacetazone, we found cutaneous hypersensitivity reactions in 18.7%. We also found a strong association of such reactions with HIV seropositivity, with an odds ratio of 16.6. This is broadly in line with the results of NUNN *et al.* (1991) in Kenya, who found a relative risk of 18. We found a mortality rate due to the reaction of 1%, compared to 3 in the Kenyan study and 1% in the Zimbabwe study (POZNIAK *et al.*, 1992).

The only rationale for the continuing use of thiacetazone-based regimes in Africa is the low cost. A major disadvantage, however, is their lower efficacy. Furthermore, they require 12 months of treatment in all, with a major in-patient load. Even before the problems with thiacetazone use in a setting of high HIV seroprevalence were recognized, and the onset of the recent loss of control over TB, BARNUM (1986) argued that rifampicin-based regimes represented a better choice for countries with low resources. Now that there is strong evidence for an association with HIV, thiacetazone becomes a dangerous drug to use where HIV seroprevalence is high. One solution discussed by NUNN *et al.* (1991) is testing all TB patients for HIV antibodies to identify those for whom thiacetazone must be avoided. They recognized that this would be logistically difficult. If the HIV seroprevalence is high, e.g. over 70% as in Monze patients, we expect that the costs of testing and counselling patients would cancel out what would be saved by continuing to use a cheaper regime for the seronegative individuals. Withdrawal of the drug from those who develop

reactions is unsuccessful in preventing deaths, which still occur even in the relatively well supervised environment of the hospital. This damages the credibility of the programme. As a last option, NUNN *et al.* (1991) suggested the use of thiacetazone after the initial phase had been completed. However, we observed at least one severe reaction when following this suggestion, and so cannot recommend it.

It is clear from our figures that a high proportion of the cost of the initial phase of therapy is related to in-patient care. According to our calculations, even if 29.4% (18 of 60) of the treatment days of the initial phase are spent in hospital, a regime of RHZ (given to out-patients whenever possible) is still no more expensive than giving in-patients STH. We have not, however, analysed the costs of the consolidation phase of treatment, and this would need to be taken into account alongside greater efficacy and shorter courses. Furthermore, good results from out-patient treatment require investment in the skills and motivation of the rural health centres. If it is still felt necessary to admit patients for compliance reasons, despite the excellent results achieved in Botswana with out-patients, then changing to rifampicin-based regimens will indeed increase the cost. It must be borne in mind, too, that the purchase of drugs for TB treatment is often undertaken by agencies who do not directly bear the cost of hospital provision. They would not, therefore, benefit from the balancing of economies which we suggest is possible.

We believe that there is enough evidence to conclude that the disadvantages of thiacetazone far outweigh any apparent saving from its use, particularly from an ethical viewpoint. In our view there is no longer a place for thiacetazone use in those parts of the world where HIV seroprevalence is high amongst TB patients, as it is in Zambia.

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Mortality among female nurses in the face of the AIDS epidemic: a pilot study in Zambia

AIDS-related conditions have been recognized in Zambia since 1983 [1]. The epidemic has progressed rapidly in this country and Zambia is currently among the worst affected countries in sub-Saharan Africa. HIV serosurveillance studies performed in 1990 revealed seroprevalence levels in pregnant women of 24–25% in Lusaka, 30% in the periurban area of Solwezi and 13% in one rural district [2]. Health services which are already overstretched now have to cope with increasing numbers of seriously ill patients. At the same time, there is great concern within the Zambian Ministry of Health about a perceived increase in absenteeism and mortality among health personnel (M.S. Choongo, personal communication, 1992). We conducted a study on mortality among female nurses at two hospitals.

Based on the employment register, the number of person-years in service and the mortality rate were calculated for three time-periods: 1 January 1980 to 31 December 1985, 1 January 1986 to 31 December 1988, and 1 January 1989 to 31 December 1991. At Hospital A the register is complete from 1980 onwards, at Hospital B from 1986 only.

The mortality rates for the three time-periods and the two hospitals are shown in Table 1. The mortality rate in the second-time-period showed a four-fold increase [rate ratio, 3.7; 95% confidence interval (CI), 1.0–9.5] compared to the mortality rate in the first-time period, the mortality rate in the third-time period a 13-fold increase (rate ratio, 13.4; 95% CI, 7.8–21.4). The death certificates were retrieved for nine nurses who died in 1989–1991. Four certificates documented HIV infection; a fifth recorded tuberculosis as the cause of death. The remaining certificates recorded causes of death as: diabetes mellitus (two), carcinoma of the cervix (one) and severe anaemia with congestive cardiac failure (one). This suggests that the observed increase in mortality was probably largely attributable to HIV infection.

The high mortality among nurses in the range found (i.e., 27 per 1000), has serious implications for manpower planning at the Ministry of Health and for the health services' ability to cope with the increasing burden of AIDS-related disease. There is already a shortage of nurses in most government institutions in Zambia. The decreasing purchasing power of government salaries has led to an exodus of health staff to neighbouring countries and to the private sector. A high mortality rate would not only lead to a further loss of trained personnel through death, but would be linked to occupational risk of HIV infection, leading to demotivation and attrition. Zam-

Table 1. Mortality rates among nurses 1980–1991.

	1980–1985	1986–1988	1989–1991
Hospital A			
Nurse-years	510.0	334.8	353.3
Deaths	1	1	9
Mortality	2.0	3.0	25.5
Hospital B			
Nurse-years		207.0	283.3
Deaths		3	8
Mortality		14.5	28.2
Total			
Nurse years	510.1	541.8	636.6
Deaths	1	4	17
Mortality (per 1000)	2.0	7.4	26.7
95% confidence intervals	(0.05–11.0)	(2.0–18.8)	(15.5–42.7)

bian nurses have already made demands for risk allowance [3]. We were unable to compare the mortality rates in the nurses with the mortality rates in other occupational groups, so our study cannot give any indication about the occupational risk of HIV infection. At the Mama Yemo Hospital in Kinshasa in 1986, no difference was found in seroprevalence between staff who were in direct contact with patients and those who were not [4]. However, we feel that more research is needed in this field. Policy-makers urgently need estimates of the relative and the attributable risks of occupational exposure to HIV infection because decisions about the allocation of funds for protection of health staff against occupational infection and possible incentives to retain them in service have to be made.

A. Buvé, S.D. Foaster*, C. Mbwili†, E. Mungo†, N. Tollenare‡ and M. Zeko‡, ADZAM (Adult Disease in Zambia) Research Project and HERA (Health Research for Action), Laarstraat 43, 2840 Reet, Belgium, *ADZAM Research Project and London School of Hygiene and Tropical Medicine, London, UK, †Choma General Hospital and ‡Monze District Hospital, Zambia.

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Carrying out a bed census at a district hospital in Zambia

ANNE BUVÉ¹ AND SUSAN FOSTER²

¹*Institute of Tropical Medicine, Antwerp, Belgium, and* ²*Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, UK*

Introduction

Many hospitals in developing countries are faced with high and still increasing rates of bed occupancy, to the extent that concerns are being raised about the quality of care. Resources available for health care are shrinking due to declining economies, but at the same time population growth alone produces increases in the demand for care. In some of the poorest regions in the world, these problems are compounded by the HIV/AIDS epidemic with its resultant increase in demand for care made by HIV-infected patients.

In most of these hospitals the information that can be extracted from routine statistics is limited, the most commonly available data being average length of stay in hospital, bed occupancy rates, hospital mortality rates and discharge diagnoses. Comparisons over time and between hospitals can give indications about the existence of problems, but a more refined analysis for the elaboration of solutions requires a more sophisticated assessment of the use of hospital beds.

We report here on our experiences with a bed census in a district hospital in Zambia. The bed census was carried out as part of a larger study of the impact of HIV and AIDS on Monze District, southern Zambia. The study was based at Monze District Hospital, a 250-bed mission hospital which is also the official district hospital. One of the objectives of the larger study was to find ways to improve use of hospital resources in

copied with the epidemic of HIV. We therefore wanted to know who was in the hospital, how the beds were being used, what bed occupancy rates were, whether any of the patients in beds could have been treated elsewhere (especially at health centres or through the outpatient department (OPD)), or whether they were in hospital primarily for non-medical reasons. We also suspected that delays, especially in the processing and reporting of lab results, might be responsible for a significant proportion of bed use. We wanted to have an approximate idea of how much HIV related disease was felt to be on the wards; subsequent to the bed census, the study found that at this hospital about 42% of medical and surgical inpatients, and 70% of TB patients, were HIV seropositive; 30% of bed days were used for the care of patients with HIV disease.¹ The bed census was also used as an exercise in data collection and organization as part of the training programme we provided for our research staff.

Methodology

In essence a bed census is a cross-sectional 'snapshot' of the utilization of hospital beds on one particular day. In the type of bed census described here, for each patient occupying a hospital bed the reason(s) for him/her being in hospital on that particular day is noted. Using a pre-set list of criteria of appropriateness of bed utilization, for each patient an assessment is made of whether the reason(s) for his/her presence in hospital on that day is appropriate. The outcomes of this exercise include 1) the proportion

of hospital beds occupied; 2) the proportion of beds that are inappropriately occupied; 3) the reasons for inappropriate bed occupation. In the literature there are several reports of such censuses carried out in the US,^{2,3} the UK⁴ and South Africa.⁵ However, to our knowledge no such exercise has been reported from a developing country setting.

The first step in the exercise was to make a list of reasons why patients may be in hospital. We used as a guide the lists of criteria for appropriateness of hospital days and reasons for not being home, which were used in a study conducted in Oxford in 1986.⁴ These lists were adapted to suit better the realities of a district hospital in Zambia. The reasons for being in hospital were grouped in three categories: 1) clinical reasons for being in hospital; 2) non-clinical reasons for being in hospital; 3) 'waiting for . . .' reasons. In addition to this an open-ended question was added to the form asking for any other reason for being in hospital on that day. More than one reason for being in hospital could be ticked. The doctors filling out the questionnaire were also asked whether they were of the opinion that the patient could have been managed at a more peripheral level of health service, i.e. a health centre or an outpatient department. A question relating to blood transfusion policy was included to see whether a large proportion of patients were waiting for a unit of blood to be procured; due to the HIV epidemic it had become very difficult to secure safe units of blood. In order to increase compliance with the exercise, we made an effort to keep the form to one page (Annex 1).

The doctors were asked to fill out the forms, each for his/her own ward. One day in the week was chosen to carry out the bed census. This day was not randomly chosen, but took account of theatre days and of the doctor's availability to fill out the forms. The data were entered into a computer and analyzed using Epi-Info v. 5.01.

Results

On the day of the bed census 246 of the 250 beds were occupied (98.4% occupancy). The distribution of the broad categories of reasons for being in hospital on that day was as follows: 87% of the patients had one or more clinical reasons for being in hospital; 12% of patients had a non-

clinical reason; and 24% of patients were waiting for a lab test result or another opinion, visit of a consultant, etc. Some patients had more than one reason for being in hospital that day. Interestingly, although 87% of patients were in hospital because of one or more clinical reasons, in 24% of cases it was felt by the doctor filling out the form that the patient could have been treated at a lower level, including approximately 70% of TB patients. Conversely, of all the patients who - according to the doctors - could have been treated at a lower level health facility, 82.5% were in hospital because of clinical reasons. Paradoxically although they *could* in theory have been treated at a lower level facility, those facilities in Monze District are for the most part not geared up to provide inpatient treatment, so such patients have to be admitted to hospital.

Discussion

Though we did not label reasons for being in hospital as appropriate or not appropriate, we implicitly assumed that the clinical reasons were appropriate, whereas the other reasons were not. We had only briefly discussed the list of reasons with the doctors working in the hospital, but by and large this list was made up by researchers coming from outside the health services of Monze hospital. Judgments about the appropriateness of hospital bed utilization will vary from one situation to another, and from one doctor to another. In fact, whether a hospital bed is used appropriately will depend on the perceived role of the hospital in the area. This in turn will depend on the services it can offer, i.e. its technical level, and on the availability of alternative services. As such it is impossible to develop widely applicable gold-standard criteria against which appropriateness of hospital bed utilization can be judged.

This disadvantage of the method can be turned into an advantage: hospital staff wishing to embark on a bed census ought to start by reflecting on the role of their hospital in order to set out criteria for judging the appropriateness of bed utilization. A consensus has to be reached on which reasons for bed occupation are appropriate. The development of this consensus ideally should also involve staff from services outside the hospital, e.g. health centres in the

catchment area of the hospital. The lack of such consensus is probably responsible for our seemingly contradictory finding that the majority of patients whom the doctors thought could have been managed at a lower level of health facility were in hospital for 'clinical reasons'. This exercise in consensus building would then be a first step towards solving a problem of high bed occupancy.

A second problem relates to the day chosen for the bed census. Patient flows differ markedly from one day to the next. On Mondays the hospital would be crowded, and on Fridays there would be an extra effort made to discharge patients. Moreover, there can be marked seasonal variations in bed occupancy. In Zambia it is well known that during the rainy season hospitals are more crowded than during the dry season, due - amongst other reasons - to higher transmission of malaria.

This need not be a problem if the bed census is seen as an exercise to identify problems and to evaluate interventions to solve these problems. In the South African study the bed census revealed that 98% of admissions were appropriate, but that the level of care was appropriate for only 49%; and that 62% of the reasons for delay were related to the hospital's own procedures vs. 20% family-related and 18% related to inadequate lower level facilities. One conclusion was that there was a need for greater provision of adequate community-based care.⁵ In Oxford, the study found that 38% of days were appropriate, but this varied by ward and by age of the patients, with 50% of days being deemed appropriate for patients of 16-64 years, but only 19% for patients over 84; 'appropriateness' declined from 74% on the first day after admission to only 22% on the eighth day, and was related to the patterns of consultants' ward rounds; a suggestion was to delegate the discharge decision to other staff, and to involve GPs more in discharge planning.⁴

Conclusion

There are major advantages to conducting such a bed census. Once the list of criteria is drawn up, the exercise itself is fairly straightforward and can be completed, including data entry and writing of a report, in a few days. We were concerned about the extra burden it would put on

already overburdened hospital staff, but in fact most of the doctors were quite happy to do it, and depending on the complexity of the form to be filled in, it could be combined with a regular ward round. The survey could thus easily be repeated at a later date, for instance to evaluate the implementation of an intervention.

The bed census proved useful on several counts. First of all, it gave the staff an opportunity to reflect on their practice and on the reasons for variations between wards. We were able to verify the impression that the hospital was working to full capacity, and that most of the beds were being used appropriately. On the other hand, the bed census gave an indication, later verified by other work, that there was much to be gained by strengthening the health centres in the district, all of which have an inpatient capacity which is for the most part under- or unutilized, and which would be especially useful in treating patients with HIV disease. Our finding that approximately 70% of TB patients could be treated at a lower level of the health service was reassuring to the Ministry of Health, which was contemplating a change of TB treatment policy in Zambia in favour of outpatient treatment; but that finding has also been useful in estimating the percentage of TB patients who are too ill to be treated on an outpatient basis because of advanced or concurrent disease and in planning for their care.⁶

In conclusion we feel the bed census is a useful method, worth further exploration in developing country settings, to be used at district level to judge the appropriateness of bed use. Its interest resides not only in the actual data that are collected, but also in the process of reflection and consensus building at district level that is needed to draw up the list of criteria against which the appropriateness of use of hospital beds will be judged.

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don School of Hygiene and Tropical Medicine and was involved in the Study of Adult Diseases in Monze, Zambia, funded by the Overseas Development Administration (UK). She is co-founder of Health Research for Action (HERA) in Belgium and currently she is an epidemiologist at the Institute for Tropical Medicine in Antwerp.

Susan Foster is a health economist at the London School of Hygiene and Tropical Medicine, and has been the principal investigator on the ODA-funded Study of Adult Disease in Monze, Zambia. Previously she worked as an economist at the WHO Essential Drugs Programme and in the World Bank's Population, Health and Nutrition Department.

Biographies

Anne Buvé was a District Medical Officer in Zambia and Sierra Leone. She has an MSc in Epidemiology from the Lon-

Correspondence: Susan Foster, Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, Keppel Street, London, WC1E 7HT, UK.

Annex 1.

ADZAM Bed Census Form — Use BLOCK CAPITALS please

WARD: FS Female Surgical FM Female Medical
 MS Male Surgical MM Male Medical
 PD Paediatrics TB TB
 MA Maternity

Bed Number: Date of Admission (DD/MM):

Is the patient a resident in Monze District? YES NO

Filled in by (initials):

Patient was admitted: Direct to ward Via OPD

Clinical reasons for being in hospital on Friday:

- invasive procedure Wednesday/Thursday/Friday
- treatment requiring frequent monitoring and close adjustments (including IV-therapy)
- requiring close monitoring (at least once a day by a doctor)
- care of major wound or drainage
- other nursing care
- requiring daily injection(s)
- requiring physiotherapy/orthopaedic traction

Non-clinical reasons for being in hospital on Friday:

- waiting for transfer to another hospital
- waiting to be taken home
- uncertainty over medical aftercare/nursing care
- uncertainty over compliance
- inadequate social support at home
- uncertainty over ability to return in case of complication

Waiting?	waiting this day	delay in the past
laboratory	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
radiology	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
other investigation	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
drugs/supplies	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
other opinion	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
blood transfusion	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>
consent of relatives	<input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/>

Other reason(s) for being in hospital this day:

In hospital this day because of blood transfusion policy? YES NO

Could the patient have been treated at a lower level facility? YES NO

Serological Status: POS NEG WAITING N/A

Thank you for your co-operation

Use of thiacetazone

SIR—We welcome the contribution made by Okwera and colleagues (Nov 12, p 1323) to the now overwhelming evidence about the dangers of thiacetazone use in areas with high rates of HIV infection in tuberculosis patients. Although thiacetazone is inexpensive, it has hidden costs that should be taken into account when deciding whether it should still be used. Okwera and co-workers speculate that RHZ regimens (isoniazid, rifampicin, and pyrazinamide initially, followed by isoniazid and rifampicin) might be more cost-effective in populations with high HIV seroprevalence. Our findings from a district hospital in Zambia confirm that this is so.¹ We have gone on to analyse the costs of a policy of testing for HIV in all patients with tuberculosis before giving treatment, as suggested by Nunn et al.²

We compared the costs of two regimens for initial phase—namely, STH (streptomycin, isoniazid, and thiacetazone, then isoniazid and thiacetazone) and RHZ and examined the costs of implementing a policy of HIV testing. The drug costs of RHZ for all patients would be £890 per 100 patients. If HIV testing were introduced, the costs of testing per 100 patients (with one ELISA test at £1.50) would be £200. This figure includes a nominal £0.50 to cover the costs of pre-test and post-test counselling. In our patient sample, and elsewhere in Zambia, rates of HIV seroprevalence among tuberculosis patients are about 70%, so after testing, 70% of patients would require RHZ and 30% could be given STH. The drug costs would be £694 (£71 for STH and £623 for RHZ), and thus the overall costs of carrying out HIV testing and counselling would be £894. We therefore conclude that at HIV seroprevalence rates of about 70% there are no savings to be made by introducing HIV testing of tuberculosis patients.

Such a policy would raise other issues—namely its acceptability to patients and the possibility that coercive measures would be needed to force reluctant patients to accept an HIV test; the impact on case detection; the identification and resulting stigmatisation of HIV-positive patients; the availability of counsellors; the additional workload for the laboratory of HIV testing of tuberculosis patients; and the availability of a steady supply of adequate numbers of HIV test kits in the country. On this last point we are concerned that testing of tuberculosis patients would not be the best use of the limited number of HIV tests available, and might compete with, for example, screening of blood for transfusion, which in our view is a better use of available tests.

We conclude that it is both uneconomic and impractical to institute HIV testing of patients with tuberculosis to continue to use thiacetazone which we believe, no longer has a place in the treatment of tuberculosis in areas where HIV prevalence among such patients is high.

*Susan Foster, Paul Kelly

*Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London WC1E 7HT, UK; and Department of Gastroenterology, St Bartholomew's Hospital, London EC1

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Treatment of tuberculosis in developing countries

SIR—Ipuge and colleagues' report (Sept 9, p 657) represents a retrograde step in the fight to implement good tuberculosis treatment worldwide. These researchers argue from their data that the toxicity of thiacetazone has been overstated and that with improved management it might be possible to retain thiacetazone in "national tuberculosis programmes even where infection with HIV is prevalent". We disagree.

The data provided by Ipuge et al from the National Tuberculosis Control Programme in Tanzania should not be allowed to supersede information obtained from several carefully conducted, prospective, cohort studies which have shown the frequency of rashes associated with thiacetazone in HIV-positive patients to be of the order of 20%.¹⁻³ Ipuge and co-workers suggest that the higher frequency recorded in these studies might be because they were done at referral centres. We think this an unlikely explanation: for example, in our study in Lusaka, Zambia, patients were recruited at the teaching hospital, which was the only public centre for the diagnosis of tuberculosis in the city at that time, and they were therefore regarded as representative of all cases.³ Similarly, at Monze Hospital, where all tuberculosis patients from that district of Zambia were treated, the frequency of rashes associated with thiacetazone was 19% for all cases.⁴ By contrast with these studies, Ipuge and colleagues do not define the HIV status of their subjects, and do not tell us what proportion completed treatment without a rash, or what proportion were lost to follow-up. We do not know what proportion received the regimen of 2 months' streptomycin/isoniazid/rifampicin/pyrazinamide, followed by 6 months' thiacetazone and isoniazid (2SHRZ/6TH), and what proportion had 12 months' thiacetazone and isoniazid with streptomycin for the first 2 months (2STH/10TH). Moreover, thiacetazone was given only in the self-administered phase, so that an unknown number of patients could have developed rashes, lost faith in the programme, or even died, and thus never returned.

In our studies in Zambia, in both Lusaka and Monze, the prevalence of HIV among tuberculosis patients was over 70% (considerably higher than the 30% given for Tanzania). In this setting we learned that the problems of thiacetazone use where HIV is highly prevalent are not limited to the numbers of patients with rash. The rashes can be so horrifying to both the public and physicians that patients will ask not to be given "the drug that causes the rash" and physicians will refuse to prescribe it, wreaking havoc with the drug supply. Of further concern is the finding that patients who develop rashes and require a change of treatment have an increased risk of relapse.⁵

But the argument against thiacetazone goes beyond the situation in which HIV is highly prevalent. UK Medical Research Council studies showed that the drug was more toxic and less effective than other agents, and it was abandoned in Europe and the USA decades ago. Shorter, more effective regimens were instituted. Some of these are also described by De Cock and Wilkinson (Sept 9, p 675), who emphasise the use of intermittent forms to simplify supervision of therapy within the community. Intermittent therapy can also reduce drug costs for these better regimens. On the other hand, if the true costs of the use of the daily thiacetazone regimens are taken into account—hospitalisation for 2 months (the mode of supervision in the Tanzanian Programme, which is no longer feasible in Zambia because of the high case load), treatment of severe rashes,⁶ and (unmeasurable) loss of confidence in tuberculosis control programmes produced by toxic and ineffective therapy—the so-called low cost of thiacetazone is seen to be illusory.

There is, therefore, much evidence that regimens relying on thiacetazone are more toxic, less effective, and, when all costs are taken into account, more expensive per cure than true short-course regimens. The conclusions of one study using control programme data should not outweigh the other evidence against thiacetazone. Better and more cost-effective regimens are available. We do not need to continue to use thiacetazone.

*Alison M Elliott, Alwyn G Mwinga, Susan D Foster

Division of Infectious Diseases, University of Colorado Health Sciences Center, Denver, CO 80262, USA; Department of Medicine, University of Zambia, Lusaka, Zambia; and Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London WC1, UK

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Counterpoint

Thiacetazone: time to call a halt?

Considerations on the use of thiacetazone in African populations with a high prevalence of human immunodeficiency virus infection

A. M. Elliott*, S. D. Foster†

**Division of Infectious Diseases, University of Colorado Health Sciences Center, Denver, Colorado, USA,*

†*Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London, UK.*

No-one who has been involved in the care of tuberculosis patients in those parts of Africa where human immunodeficiency virus (HIV) prevalence is high can have failed to be horrified by the severe, drug-induced, skin rashes which are attributable largely to the use of thiacetazone in patients co-infected with HIV (illustrated in Nunn et al, 1991).¹ Yet in this issue of *Tubercle and Lung Disease* van Gorkom and Kibuga assert that thiacetazone must continue to be used because alternative regimens for tuberculosis treatment are too expensive. We, however, believe that in patients who are co-infected with HIV the poor efficacy and high toxicity of thiacetazone are sufficiently critical to make its use virtually unethical. Furthermore, we believe that the supposed cost benefits of using thiacetazone are illusory and that this will be demonstrated if costs are analyzed by patient cured, rather than by 'cost per averted death (due to rash)' (as in van Gorkom and Kibuga's paper) or by cost per patient starting treatment.² We argue that, rather than compromise by developing strategies for the continued use of thiacetazone in such populations, we should strive towards the goal of global implementation of the safer and more effective short course regimens for treatment of tuberculosis which employ better drugs. We will address each of these issues in turn.

The case against thiacetazone falls into two categories, which are first, that it is ineffective, and second, that it is toxic. The first issue, the poor efficacy of the drug, means that regimens which depend on thiacetazone must be taken for longer to achieve a good outcome.³ Compliance with therapy declines with increasing duration of the regimen, and so the rate of failure to complete treatment and the rate of subsequent relapse is high, and additional

contacts become infected unnecessarily.⁴ The second issue, the toxicity of the drug, has been recognized for several decades and was addressed in detail in the 1960s when significant haematological, cutaneous and hepatic adverse effects were noted, with racial variation in their incidence.⁵ These reasons were sufficient for thiacetazone to be abandoned years ago as a first-line drug for the treatment of tuberculosis in Europe or the USA. Its use continued in Africa because it could be purchased cheaply, and because severe cutaneous adverse reactions were less frequent among Africans than among other racial groups. The current association between tuberculosis and HIV has, however, rendered both the poor efficacy and the high toxicity of thiacetazone more critical, as we shall see.

Let us consider the effect of a weak drug for the treatment of tuberculosis in a patient with HIV. There is no longer any question that HIV infection increases the susceptibility of an individual to developing active tuberculosis. However, the converse is also likely to be true: that active tuberculosis promotes the proliferation of HIV, and hence the progression of HIV disease. Active tuberculosis probably does this by activating T-lymphocytes, which are necessary for the virus to complete its cycle of infection and replication. There are now data to suggest that this is a significant clinical consideration. In a study in Haiti, preventive therapy for tuberculosis in HIV-positive, tuberculin-positive individuals not only prevented active tuberculosis, but also slowed progression of HIV disease;⁶ and a recent report from the USA suggests that HIV-positive patients with tuberculosis have a higher mortality than HIV-positive patients without tuberculosis, matched by CD4+ T-cell count.⁷ This suggests that rapid suppression of active tuberculosis may be crucial to limit the progression of HIV disease and to prolong life in HIV-positive patients with tuberculosis. In support of this hypothesis, several studies have now shown that regimens which employ a

Correspondence to: A. M. Elliot, Division of Infectious Diseases, National Jewish Center, 1400 Jackson Street, 5th Floor Goodman Building, Denver 80206/276, Colorado, USA.

potent intensive phase (isoniazid, rifampicin, pyrazinamide and either streptomycin or ethambutol) are associated with a lower mortality in HIV-positive tuberculosis patients than 'standard' therapy with streptomycin, isoniazid and thiacetazone, which takes longer to reduce the bacterial load.⁸⁻¹⁰ By allowing active tuberculosis to persist, and to stimulate HIV, for a longer period, the relative ineffectiveness of thiacetazone may therefore be singularly detrimental to HIV-positive tuberculosis patients.

The toxic effects of thiacetazone, specifically the severe skin reactions, are also of much greater consequence in patients co-infected with HIV. The reported incidence of skin reactions in African HIV-positive tuberculosis patients treated with thiacetazone ranges from 15% to 32%.^{1,9,11-15} Skin reactions in HIV-positive tuberculosis patients are associated with significant mortality (of the order of 3%);^{1,15} change of therapy following such a reaction may be a risk factor for recurrence of tuberculosis after completion of treatment;¹⁶ and severe reactions require hospital admission and are costly to treat.¹⁷ In addition to these objective data, we should remember that severe rashes with desquamation of skin cause terrible suffering. They are also unforgettable to those who have seen them, clinicians and patients alike. In centres with a high prevalence of HIV among tuberculosis patients, the patients themselves see these reactions and cannot fail to become both aware of the problem and afraid of the drug that causes the rash. It is likely that this reduces the credibility of the tuberculosis treatment programme, increases the rate of absconding, and damages the uptake of, and compliance with, tuberculosis treatment, as van Gorkom and Kibuga suggest.

Thus the ineffectiveness of thiacetazone, and its serious adverse effects, speak cogently against its use among HIV-positive patients, and we advocate that HIV-positive tuberculosis patients should receive a regimen which includes a potent intensive phase and which does not include thiacetazone.

We turn now to the issue of cost. We must first address the important issue of what cost measures are appropriate for planning of tuberculosis control programmes, and how we measure success. The cost measure should be related to the measure of success — which we take to be the number of patients cured. Therefore, an appropriate cost measure is the cost per patient cured. The measure used by van Gorkom and Kibuga ('cost per averted death.[due to rash]') and the measure used by Harries and colleagues in their recent article from Malawi² (cost per patient starting treatment) fail to encompass several important considerations. In tuberculosis control, with such long courses of therapy and consequent low completion rates, costing the drugs for patients who begin a course of therapy is analogous to a surgical unit measuring its success by the number of patients admitted to the surgical ward, without reference to the outcome of the surgery. And a cheap drug regimen which cures fewer patients can paradoxically turn out to be more expensive when outcome is taken into account. This is pertinent to the use of thiacetazone for a number of reasons.

Cure rates may be low for thiacetazone-containing

regimens because of their long duration. This was observed in treatment programmes in Tanzania, Malawi and Mozambique during the 1980s where the rate of cure using 'standard' therapy (2STH/10TH) was about 40%, much lower than using a short course regimen (2SHRZ/6EH) (70-87%). In this analysis the short course regimen was therefore less expensive per patient cured.⁴

As a result of the interaction between tuberculosis and HIV there are additional reasons why thiacetazone-containing regimens are likely to be associated with a lower rate of cure. The first strategy suggested by van Gorkom and Kibuga to allow the continued use of thiacetazone, is to educate patients about the possibility of adverse effects and instruct them to stop the medication if itching occurs. They state that at HIV prevalence rates of 1-90% thiacetazone may be used cost-effectively by following this strategy, but also that, even with such education, severe reactions occurred in 6% of HIV-positive patients in the study by Nunn and colleagues on which their calculations were based. If patients' awareness of reactions leads to lower uptake of treatment or a higher rate of absconding the apparent cost benefit of using thiacetazone will readily be lost, as we shall see shortly.

The second strategy (which was also addressed by Harries and colleagues in Malawi in their paper in the October 1995 issue of this journal²) is to test tuberculosis patients for HIV and to replace thiacetazone with ethambutol for those who are HIV-positive. The process of HIV-testing of all tuberculosis patients presents logistical difficulties. Although most patients consented to HIV-testing in Harries' study, only 61% of patients were effectively tested for HIV. This means that the costs of HIV testing were lower than they would have been if 100% of patients had been tested. It also means that of the 39% who were not tested there were probably quite a few who were in fact HIV-positive, despite having no clinical signs, and who were nonetheless given thiacetazone. If all patients had been tested and allocated to treatment on the basis of their HIV result, the savings would have been more modest, in the order of US\$300 rather than the US\$1563 reported. The costs of treating any side effects which might have resulted in the untested group were not taken into account: neither were the costs of counselling, because the service was provided free of charge during the study.

HIV testing of tuberculosis patients has a number of other drawbacks,¹⁸ of which perhaps the most important for tuberculosis — control programmes is that knowing they are HIV-positive may alter patients' approach to their treatment, or their readiness to continue with treatment. In a treatment programme in South Africa it was observed that 21% of HIV-positive patients absconded, compared with 7% of HIV-negative patients; most of the HIV-positive patients 'absconded' in search of traditional healing for their HIV infection.¹⁹ It could be argued that remaining on tuberculosis treatment would have been much better for their health than seeking traditional treatment for their HIV, and therefore that knowledge of their HIV status was detrimental to their health. Similarly, in Kenya more than 25% of antenatal women who were

tested and informed of their (positive) HIV status never returned to the antenatal clinic, thereby denying both themselves and their babies access to beneficial antenatal care.²⁰ Furthermore, many of the women who shared their HIV status with a partner, as instructed by the research staff, became subject to domestic violence. It cannot automatically be concluded in the African context that knowledge of one's HIV positive status is a good thing.

In summary, there is reason to believe that both the first strategy — of continued use of thiacetazone, with 'education', which will not prevent all skin rashes — and the second strategy — of HIV-testing to determine treatment — are likely to lead to a decrease in uptake and completion of treatment for tuberculosis, and hence a reduced rate of cure. The importance of even a small effect on cure rate can be seen if we take, for example, the apparently very similar regimens compared by Harries and colleagues² (2SHRZ/6EH at \$52 and 2SHRZ/6TH at \$43). We can calculate that a 10% reduction in completion of treatment from 60% to 50% would lead to a true cost per cure for the first of \$86.67 and for the second, \$86 — virtually identical costs.

What, then, shall we conclude? If there were no alternatives to thiacetazone the search for ways to continue to use it might be appropriate. But this is not the situation we face. The fact is that there ARE alternatives which are more effective, less toxic, and cheaper when compliance and efficacy are taken into account. We should not allow the quest for appropriate drug therapy for tuberculosis to be sidetracked by the efforts to try to retain thiacetazone as a first-line drug. Our priority should rather be to search for ways to use better drugs in the most cost-effective manner, i.e. with intermittent therapy, directly-observed therapy, by use of lower levels of health services and outpatient treatment,^{21,22} by improved caseholding and encouragement of patients to complete therapy (possibly involving payment of incentives to patients and to staff), and especially, implementation of shorter treatments. The cost effectiveness of short course regimens using more effective but expensive drugs has been amply demonstrated in countries as diverse as Botswana,²³ Indonesia²⁴ and Uganda.²²

Given the rise in tuberculosis cases worldwide, it is clear that the overall global cost of tuberculosis treatment will inevitably rise. We must accept this fact of life and begin to search actively for the needed funds. But while the overall costs will rise, it is possible to make important reductions in the COST PER PATIENT CURED. The percentage of cures can be increased and costs per patient will fall. In our view, the research agenda should shift toward finding ways to improve the rates of cure. Let us abandon thiacetazone — it is toxic and obsolete and has had its day.

Note: The views expressed by Elliott and Foster are solely their own and do not reflect the policy of the IUATLD concerning the use of thiacetazone in low-income countries. Further discussion of this complex subject will appear in subsequent issues of TLD. *John F. Murray and Donald A. Enarson, Associate Editors.*

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Clinical practice

Benefits of HIV screening of blood transfusions in Zambia

Susan Foster, Anne Buvé

Summary

Blood transfusion continues to be an important route of transmission of HIV in developing countries, especially for young children following the perinatal period. Testing for HIV is costly and reliable donor support for the purchase of test kits is often essential, yet difficult to secure. The costs of screening of transfusions for HIV and the financial benefits in terms of savings on treatment costs averted were calculated for a district hospital in Zambia where seroprevalence among donors was 15.9%.

Financial benefits exceed costs by a factor of 2.7–3.5. In 1991, 1073 transfusions were given and an estimated 150 cases of transfusion-related AIDS were prevented by screening, of which 59% were in children aged 5 years or under and 31% were in women. The total cost of HIV screening was £3061 (\$4745), and the cost per case of HIV infection prevented was £20.40 (\$31.62); the cost of this protection for the population served by the hospital was £0.02 (\$0.03) per person. An estimated 3625 undiscounted healthy years of life were saved, of which nearly 69% were in children under 6, at a cost of £0.85 (\$1.32) per year of life saved.

It is essential that financial and political support for HIV screening of blood for transfusion is maintained.

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Introduction

In the developing countries, HIV transmission via blood transfusion still accounts for about 5–10% of all infections.¹ After transfusion of an HIV-infected unit the risk of infection is 95–100%,² although rates of seroconversion as low as 90% have been reported.³ The blood transfusion service is one of the most expensive parts of most health systems. Adequate and stable financing is a prerequisite for success of a transfusion service,³ yet many developing countries with high rates of HIV infection are dependent on donor funding for the screening of blood for transfusions, as well as for other key aspects of the prevention and control of AIDS. The cost of the HIV testing and the perception that blood transfusion is an unimportant route of HIV transmission threaten to lead to a decline in support for this essential activity. Aid donors often prefer to invest in prevention in terms of health education and behaviour change. However, although transfusions are a minor route of transmission overall, for children aged 1–15 years they are a major source of largely preventable exposure to HIV. Doubts are sometimes expressed as to the cost-effectiveness of blood screening compared with other interventions. Whereas it is not possible to compare directly the cost-effectiveness of blood screening with other interventions due to the lack of information on the effectiveness of the other interventions,⁴ it is nonetheless possible to examine the costs and benefits of screening blood for HIV. We have done so with data gathered at Monze District Hospital, Zambia.

Blood transfusion at Monze Hospital

Monze Hospital is a 250-bed hospital located in the southern province of Zambia. In 1991 overall seroprevalence of HIV was about 15.9% (table 1) among the hospital's blood donors and "replacement donors" recruited from among the relatives and friends of patients requiring transfusion.⁵ Many more men than women donate blood, possibly because many women are pregnant or lactating and therefore ineligible to donate, or are excluded on the basis of low haemoglobin concentrations.

Age group	Male		Female	
	Number in age group	% HIV +ve	Number in age group	% HIV +ve
10–19	104	1.0	25	8.0
20–29	561	15.4	73	31.5
30–39	301	21.9	38	11.1
40–49	141	26.2	27	3.7
50–69	61	7	11	9
Age unknown	2	0	0	0
Total	1170	15.6	172	18.0

Table 1: HIV seroprevalence among blood donors by age and sex

Department of Public Health and Policy, London School of Hygiene and Tropical Medicine, London WC1E 7HT, UK (S Foster MA); and Institute for Tropical Medicine, Antwerp, Belgium (A Buvé MD)

Correspondence to: Ms Susan Foster

Ward	Infections prevented (% total infections prevented)*	Mean age of patients†	Years of life saved/person†	Total years saved per ward (% of total years saved)‡
Male	12 (8)	36.9	33.2	199 (5.5)
Female	20 (13)	34.9	32.7	327 (9.0)
Children's	88 (59)	3.0	56.4	2482 (68.5)
Tuberculosis	1 (1)	35.9	32.9	33 (0.9)
Maternity	27 (18)	24.4	40.8	551 (15.2)
Other§	2 (1)	35.0	32.9	33 (0.9)
Total	150 (100)	3625 (100)

*Window period infections subtracted from children's ward (3) and maternity ward (3). †Calculated from an appropriate model life table for eastern Africa fitted to the Zambian under-5 mortality rate of 177.5 (World Bank Social Indicators of Development, 1994). ‡Assuming only half of transfusion recipients live out their normal life expectancy. §Assumed to be adults.

Table 3: Undiscounted years of healthy life saved by blood screening for HIV

number of years saved is about 3625 of which 68.5% are years of life of children under 6. The cost of HIV screening at this hospital per year of healthy life saved is £0.85 (\$1.32).

We also estimated the financial savings from preventing HIV infection. Our study gathered data on the costs of treatment for HIV disease in inpatient wards and the outpatient department. We estimated that the cost to the health services of treating HIV disease in the 2 years before death was about £72 (\$110.60) per person. Treatment of the 150 AIDS cases that would have been caused in 1991 by transfusion of unscreened blood would have cost £10 800 (\$16 740); these are the undiscounted financial savings from screening. The cost of screening blood in 1991 was estimated at £3061 (\$4745). Thus, the benefit/cost ratio (BCR) is 3.5/1. Given that most of the benefits will be incurred in the future, it is appropriate to examine the effect of discounting those benefits. The resulting BCRs from progression rates of 5% and 8% and a discount rate of 3% are 2.7/1 and 3.0/1, respectively. BCRs would be higher at higher levels of donor seroprevalence: at 20% the undiscounted BCR is more than 4.0/1. At seroprevalence levels below about 3% the BCR becomes less than 1—ie, costs exceed savings as defined above, but the cost per life saved remains low.

Discussion

We have shown that HIV screening of blood for transfusion has financial benefit in areas with high seroprevalence among blood donors. Under plausible conditions, at seroprevalence among donors of about 16%, savings from blood screening exceed costs of screening by a factor of between 2.7 and 3.5. We have chosen a narrow definition of the benefits of screening as the financial savings to the health services of not having to treat HIV disease that would otherwise have been caused. This approach does not take account of the other advantages of preventing a case of HIV disease and a death from AIDS—eg, no pain and suffering, loss of income, lost productivity, and disruption to the household. Over⁹ estimated that such indirect costs made up 83–99% of the total costs of a case of AIDS. The annual cost of screening per person protected of £0.02 (\$0.03) compares favourably to other methods of HIV prevention. Condoms in Zaire and Ivory Coast cost £0.07 (\$0.11) and £0.10 (\$0.16) each, respectively; assuming a low rate of usage of one condom per month, the annual cost of such protection for two partners at a time would be £0.84–1.20 (\$1.3–1.86). Costs of treatment of sexually transmitted diseases to reduce HIV transmission range

from £6.30 to £37 (\$9.77 to \$57.35) in Mozambique, South Africa, and Kenya.¹⁰

The risks of transfusion could be reduced by better selection of donors, and, in particular, by a more systematic effort to recruit low-risk volunteer donors. Older people and male adolescents might be more suitable donors, as might religious communities. In Monze, one possibility might be to make use of women's groups or church groups where older women are well represented.

Blood screening will not prevent all transfusion-related cases of HIV infection, and this point emphasises the need to reduce transfusions to the absolute minimum, or to use blood substitutes, plasma expanders, and autologous transfusion wherever possible. Elsewhere¹¹ it has been shown that many transfusions are unnecessary, and it is possible that despite attempts to reduce use, some transfusions of limited value are still occurring. However, on male, female, and tuberculosis wards at Monze Hospital, only 50% of transfusions ordered seem to have been given.

Our findings clearly demonstrate that blood screening is a child health issue. 59% of those protected, and nearly 69% of the healthy years of life saved by blood screening are years to be lived by children under 6. HIV screening of blood donations is thus a paediatric priority as well as a good economic choice for countries with high rates of HIV seroprevalence among blood donors. It is essential that financial and political support for blood screening for transfusion is maintained.

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Efforts are made to minimise use of transfusions, with an average of 1.45 units per adult. Children aged 5 or under receive half or sometimes a third of a unit. All blood collection and testing is done in the hospital's own laboratory because there is no centralised blood transfusion service in Zambia for the rural areas. Blood donors are usually the relatives of the patient who needs the transfusion. The usual procedure is to interview and weigh the donor, measure his or her haemoglobin concentration, and then to collect the blood. Blood is tested for HIV with HIVChek (HIVChek 1 & 2, DuPont de Nemar's, Geneva, Switzerland) or another rapid test when available, or by ELISA when not. Blood is usually collected before the HIV result is available. During the interview the donor is asked questions on travel abroad, occupation, visits to bars, and previous sexually transmitted diseases, but this information is not used to reject donors.

The cost of testing is dependent on which HIV test is available at the time. A rapid test such as HIVChek is preferred because individual units can be tested, but the price is high. The alternative is an ELISA such as the Wellcozyme ELISA (Wellcozyme HIV 1 & 2, Wellcome Diagnostics, Dartford, UK), which is cheaper but which cannot be read immediately. Blood donors in Monze are not told their HIV results, so no counselling is provided either before or after the test, and accordingly our costs do not include costs of counselling or of any confirmatory tests that would be required if the donor were to be informed. Furthermore, we do not take account of any benefits that might accrue to blood donors from knowledge of their HIV status in terms of impact on behaviour or early treatment or prophylaxis of HIV-related conditions. If a rapid test is not available, blood is collected and stored until it can be tested by ELISA. The total cost of collection of 1 unit of blood is £7.59 (about \$11.76) when HIVChek is used, of which the cost of HIVChek amounts to 37.5% of the total; when ELISA is used, the cost of 1 unit is £6.25 (\$9.69) and the cost of the test falls to 24% of the total.

The costs of the programme of screening blood for HIV at Monze Hospital can thus be estimated. For the 1073 units transfused in 1991, 1276 units had to be tested and 203 were rejected. In practice, a combination of HIVChek and ELISA (Wellcozyme) was used, with about two-thirds of units screened by HIVChek and one-third by ELISA. The approximate cost of blood collection was £9115 (\$14 128), of which HIV tests accounted for £3061 (\$4745), 33.6% of the total. As noted above, about 16% of units are discarded because of HIV positivity and the costs of this wastage brings the total cost per usable unit to an average of £8.27 (\$12.82).

Cost per infection prevented

If blood had been not screened for HIV, 203 units of HIV-infected blood would have been transfused in Monze Hospital in 1991. However, a significant percentage of the inpatients receiving blood transfusions are already HIV seropositive, so these should be subtracted from the total number of cases prevented. On male and female wards the percentage of HIV-infected patients was about 44%, on the tuberculosis ward 75%, and on the labour ward about 25%. Data on seroprevalence are not available for the children's ward, so an estimate of 10% is used. This estimate is based on the assumption that almost all HIV-positive children under 6 will have been infected

Ward	Units issued to ward	Infected units not issued*	Mean units per patient	Infections potentially prevented	Estimated HIV seroprevalence (%)†	Infections actually prevented (% of total infections prevented)‡
Male	158	32	1.45	22	44	12 (8)
Female	307	54	1.45	37	44	20 (13)
Children's	252	49	0.50	98	10	88 (59)
Tuberculosis	31	5	1.45	3	75	1 (1)
Maternity	299	59	1.45	40	25	27 (18)
Other/unspecified§	26	5	1.45	3	20	2 (1)
Total	1073	203	0	203		150 (100)

*Assuming the 203 screened and rejected units would have been distributed and transfused in the same proportions as uninfected units. †Source: ADZAM (adult disease in Zambia) data, Monze Hospital, 1991. ‡Assumes infectious window period transfusions were used by children's ward (3 units) and maternity (3 units) (see text). §Assumes other/unspecified units were used by adults.

Table 2: Number of transfusion-related HIV infections prevented by blood screening

perinatally. About 25% of women in the maternity ward and female blood donors aged 20–39 are HIV seropositive. If about 39% of their children are infected perinatally,⁶ that would imply a seroprevalence of about 10% among young children.

Screening will not prevent all HIV transmission because of the likelihood of false negatives, in particular when the donor is in the "window" period and has not yet seroconverted.⁷ Savarit et al⁸ estimated that in Abidjan, Ivory Coast, in 1991 the overall rate of potentially infected units (units that had been screened but which were nonetheless still infectious) was between 5.4 and 10.6 per 1000; in their sample, seroprevalence was 11.0% in first-time donors and 2.1% in repeat donors, considerably lower rates than those found in Monze. From the higher value of 10.6 per 1000, we can estimate that despite screening, a minimum of 11.4 of the 1073 units transfused were probably infected but were not detected by screening. Of these—given that about 30% of recipients are already seropositive—about 8 units would have caused new infections. If we assume the distribution of units described in table 2, these units would have caused three infections in children and three infections in adults. Therefore, 150 infections were prevented by screening, and the cost of HIV screening per infection prevented was £20.40 (\$31.62). Table 2 shows that about 59% of infections prevented would have been in children aged 5 or under and 31% in women.

Monze Hospital serves a rural population of about 150 000, and about 30% of its inpatients are drawn from outside the district. Screening of blood for HIV infection is, therefore, protecting about 200 000 people who might receive a transfusion in the hospital. The cost of HIV screening was £3061 (\$4745), an annual expenditure of £0.02 (\$0.03) per person.

Benefits of HIV screening of blood

We estimated the number of years of healthy life saved by blood screening in 1991. Assuming, conservatively, that only half of those protected who did not already have HIV infection when in hospital would live out their normal life expectancy—ie, would not die of the illness for which they received a transfusion and would not succumb to HIV later in life—the number of years of life saved can be calculated (table 3). Taking account of infections caused by screened but infectious units, the undiscounted