

## COMPETING DEMANDS AND LIMITED RESOURCES IN THE CONTEXT OF WAR, POVERTY AND DISEASE: THE CASE OF LACOR HOSPITAL

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### INTRODUCTION

Difficult choices have to be made among competing demands for health care in the context of severely limited resources and persistent humanitarian crisis prevailing in Northern Uganda. In particular, the challenge of a burden of disease from largely preventable and treatable conditions, the spread of emerging or re-emerging infections, the appearance of new, previously unknown, diseases (such as Ebola), and the heavy burden of poverty and war on health, make it imperative for getting information for identifying priorities and for decision making.

However, major information gaps exist, and the little data available has been provided from scattered surveys and from incomplete reporting systems. In this context, readily available information collected using standardized procedures, such as data from hospital discharge records, becomes extremely important, in that these data can provide useful indications on the health situation at a low cost, in a long-term, sustainable way.

This study is based on 155,205 medical records of inpatients admitted to the Lacor Hospital during the period 1992-2002, and its objective is to describe the health profile of the population of Northern Uganda, in order to estimate the impact of war, poverty, and social disruption in terms of morbidity and mortality. It analyses also the performance of Lacor Hospital in coping with this emergency situation, exploring pathways and mechanisms that link disease patterns, hospital performance, quality of care, and health outcomes, therefore providing an example of the thinking process leading from information to decision to action.

### THE SETTING

St. Mary's Hospital Lacor (referred to as "Lacor Hospital"), is located in Gulu District in Northern Uganda; it is a private, non-profit hospital divided into four wards: a general medicine ward, a surgical ward, a paediatric ward, and an obstetrical-gynaecology ward. The number of beds increased over time from 356 in 1992 to 446 during the period 1993-1997, reaching the current number of 460 beds in 1998. Since then, the number of beds has been stable, but their distribution by ward has changed, with an increase from 88 to 157 beds in the paediatric ward, from 48 to 65 beds in the obstetrical-gynaecology ward, and from 121 to 128 beds in the surgical ward (LH, 2002). Conversely, after 1999, the number of beds has decreased in the medical ward from 203 to 110, with a decrease from 90 to 30 beds in the tuberculosis (TB) unit in 2001, following the implementation of community-based Directly Observed Therapy Short-Course (DOTS), and the closure of the cancer unit in 2000 because of the creation of the national referral center for cancer treatment in the capital.

The hospital has a full range of diagnostic and curative services. It is also a site for HIV surveillance; the HIV prevalence among pregnant women attending the Antenatal Clinic, although decreasing from 27.1% in 1993 to 11.3% in 2001, is still much higher than the national average (STD/ACP, 2002). Lacor Hospital also has a busy outpatient department (with about 150,000 consultations a year), a community health department, and 2 peripheral health centres (Pabo and Opit Health Centres, both located at about 30 Km. from the hospital).

Therefore, Lacor Hospital is offering services of: 1) first contact (general outpatient); 2) first referral (rural hospital); 3) second referral (more specialized hospital); 4) third referral (some services of national relevance) (Giusti, 2002). The policy of the hospital is to give priority to accessibility of quality services for the poor and vulnerable, offering a large range of health services at subsidized price with flat rate fees.

Gulu District has been affected by the civil war during the study period, and, after the 1996-97 escalation of rebels' activities, over 50% of the population (250,000) was displaced and is currently living in rural protected camps (Gulu DMO, 1998). As a result of many years of civil strife and neglect, there is a massive backlog of dilapidated infrastructure and a collapse of the referral system. Gulu District was hit by Ebola outbreak (HPAU, 2001) from October 2000 to February 2001 when the outbreak was finally declared to be over in Uganda. The outbreak resulted in a total of 193 deaths out of 396 cases in the district (Lamunu, 2001). Half of these cases were admitted to Lacor Hospital. The hospital paid a very high price for the dedication of its staff, as 12 members of personnel died after having contracted the disease, including the Hospital's Medical Superintendent, Dr. Matthew Lukwiya (LH, 2001).

### SOURCES OF DATA

This study is based on 155,205 medical records of inpatients admitted to the Lacor Hospital during the period 1992-2002. Of these records, only 154,870 were fully completed, including demographic and clinical data (such as diagnosis at discharge). The diagnoses at discharge were coded according to the reporting system of the Ugandan Ministry of Health based on the ICD-10 (International Classification of Disease, 10<sup>th</sup> revision) (WHO, 1994), and entered in a computerised database. Data collection and storage procedures were consistent over time, and data analysis was based on the principal cause of admission only.

The practice in Lacor Hospital is that morbidity and mortality indicators are calculated based on the data registered at discharge on the patients' medical charts, whereas hospital indicators (such as the number of admissions and the service indicators) are calculated based on the data registered in the admission book. These different data sources can explain the discrepancy between the number of admissions (168,231) and the number of inpatients having the final diagnosis at the moment of the hospital discharge (154,870) during the period 1992-2002. This discrepancy is due to medical charts that were incompletely filled out or lost and to patients who absconded before the final diagnosis was made.

Furthermore, patients transferred from one ward to another ward in the hospital were counted twice in the admission book, while only the final diagnosis at discharge was recorded in the database. The time-frame is also different; for example, the 2002 hospital indicators include the patients still admitted at the end of the year, while the morbidity indicators will include the same patients in the 2003 statistics.

### ANALYSIS OF DATA

Data analysis has been developed according to the traditional criteria of descriptive epidemiology: time (evaluation of trends), place (comparison between units), and person (comparison between risk groups on the basis of individual characteristics, such as age and sex). The analysis relies on the transformation of the data collected into meaningful indicators that provide pictures of a comparative nature and give clues as to possible reasons for differences in time trends or among risk groups. Three main hospital indicators are used to assess performance:

- Bed Occupancy Rate (BOR): it measures the percentage of beds occupied by the patients in the year, reflecting the efficiency in the use of hospital resources
- Bed Turnover Rate (BTR): it measures the average number of inpatients per bed in the year and, like bed occupancy, is an indicator of the efficiency of hospital resource use
- Average Length of Stay (ALOS): it measures the average duration of inpatient hospital admissions (mean number of days from admission to discharge); ALOS is also an important indicator of hospital efficiency.

In order to estimate the impact of different diseases on the hospital-based care system, we have to take into account that the use of hospital inpatient services varies according to three major features:

- Frequency of admissions due to the condition
- Duration of the service provided (expressed in days of hospital stay) and
- Intensity of the service (expressed as the proportion of total charges represented by laboratory, radiology and ancillary services).

The percentage of hospital bed days (related to both frequency of admissions and duration of hospital stay) can be considered a good indicator of the relative burden of different diseases on hospital services.

Three main measures are used to describe the mortality profile:

- In-hospital mortality by cause: it is the number of hospital deaths, reflecting the absolute burden of mortality attributable to the disease
- Proportional Mortality Rate (PMR): it is the proportion of hospital deaths for a disease out of the total deaths, reflecting the relative mortality burden attributable to the disease
- Case Fatality Rate (CFR): it is the proportion of people with a particular disease who die from it, reflecting the risk of dying during the hospital stay and, therefore, representing a measure of the outcome of hospital care.

### RESULTS

#### Number of hospital admissions

The number of hospital admissions per year doubled over time from 12,702 in 1992 to 25,348 in 2002, with the paediatric ward accounting for most of this increase (Figure 1). The trend of admissions by ward is as follows:

- from 5,266 in 1992 to 15,425 in 2002 in the paediatric ward (+192.9%)
- from 3,264 in 1992 to 4,471 in 2002 in the medical ward (+37.0%)
- from 2,071 in 1992 to 2,872 in 2002 in the surgery ward (+38.7%)
- from 2,101 in 1992 to 2,580 in 2002 in the obstetrical-gynaecology ward (+22.8%).

The general upward trend in admissions showed a first peak in 1992 (related to a meningococcal meningitis epidemic) and a second peak starting in 1996-97 (due to the escalation of the insurgency), and was reversed during the Ebola outbreak from October 2000 to February 2001, with temporary interruption of all activities except for emergencies and admissions to the Ebola isolation ward (LH, 2001). This was followed by a return to the pre-Ebola levels of admissions in the second-half 2001. The new escalation of the insurgency, the peak in malaria cases and the dramatic increase in demand for health care may account for the high peak in admissions, mainly paediatric, observed in 2002.

Table 1 shows the number of hospital admissions, Bed Occupancy Rate (BOR), Bed Turnover Rate (BTR), and Average Length Of Stay (ALOS) during the period 1992-2002.

Year	Number of admissions	Bed Occupancy Rate (%)	Bed Turnover Rate	Average Length Of Stay
1992	12,702	N.A.	N.A.	N.A.
1993	11,034	118.0	24.7	17.4
1994	10,948	109.1	24.5	16.2
1995	11,762	107.9	26.4	14.9
1996	13,437	101.3	30.1	12.3
1997	15,377	131.0	34.4	13.9
1998	15,438	129.0	33.9	13.9

1999	17,649	128.0	38.0	12.3
2000	17,065	97.9	36.8	9.7
2001	17,471	81.7	37.3	8.0
2002	25,348	116.9	55.4	7.7

Table 1: Hospital indicators (Lacor Hospital, 1992-2002).

### Hospital performance

The integrated analysis of the service indicators allow for the evaluation of hospital performance. Figure 2 shows the relationship between the three indicators in graphical form (Pabon Lasso, 1986). A line starting from the origin of the Cartesian plan represents a constant ALOS, and its measure increases consistently from left to right across the top and down the right hand side of the graph (Barnum, 1993). The graph is divided into four boxes by two intersecting lines drawn from the average values of BOR (78.8%) and BTR (38.4 patients per bed per year) observed in 30 Ugandan Hospitals, used as reference (MOH, 2003). These values are roughly consistent with the BOR (80%) and BTR (30 patients per bed per year) observed in Tanzanian Mission Hospitals in 1989 (CMBT, 1991) and in US Hospitals during the 1980s (AHA, 1989). The upper right box (with high BOR and BTR) represents the area of efficient provision of inpatient services and good hospital performance. The bottom left box (with low BOR and BTR) represents what may be described as low performance in hospital service delivery.

In recent years, Lacor Hospital has coped with the increasing demand for hospital care by reducing the length of stay and increasing the bed turnover, while keeping high the bed occupancy rate. In particular, the BTR increased consistently in the study period, from 24.7 admissions per bed in 1993 to 55.4 in 2002, and the ALOS decreased from 17.4 days in 1993 to 7.7 days in 2002. It is worth noting that the poor health status of the population and the high demand for hospital care led to the overcrowding of the hospital, especially in the paediatric ward, with a bed occupancy rate of over 100% for most of the study period. This means that the number of inpatients outnumbered the number of beds, and inpatients shared the same beds and/or lay on the floor.

### Leading causes of hospital admissions

Table 2 shows the distribution of the ten leading causes of admission in Lacor Hospital during the period 1992-2002, and their profile in hospital service use (number of bed days and average length of stay).

Table 2-Distribution of admissions, bed-days, and average length of stay (ALOS) for the ten leading causes of admission (Lacor Hospital, 1992-2002).

Cause	No. of admissions	%	No. of bed-days	%	ALOS (days)
1. Malaria	40,488	26.1	173,764	9.5	4.3
2. Pneumonia	9,983	6.4	72,120	3.9	7.2
3. Delivery	8,982	5.8	29,050	1.6	3.2
4. Tuberculosis	7,498	4.8	379,508	20.8	50.6
5. Malnutrition	6,707	4.3	128,433	7.0	19.2
6. Diarrhoea	5,709	3.7	32,435	1.8	5.7
7. Measles	4,211	2.7	31,925	1.7	7.6
8. Injuries	3,886	2.5	77,708	4.3	20.0
9. Septicaemia	3,380	2.2	23,783	1.3	7.0
10. Diseases of upper respiratory tract	3,303	2.1	21,244	1.2	6.4
Other	60,723	39.2	857,696	46.9	14.1
Total	154,870	100.0	1,827,666	100.0	11.8

Malaria is the most frequent cause of admissions (26.1% of the total), showing the steepest -five-fold- increase in admissions during the period 1992-2002 (from 1,643 admissions in 1992 to 8,625 in 2002). It accounts also for an increasing number of outpatient attendances over time (from 17,398 in 1992 to 36,563 in 2002), representing over one third of the total outpatient attendances at Lacor Hospital (34.8% in 2002).

Pneumonia is the second leading cause of admissions (6.4% of the total), showing a four-fold increase in admissions in the same period (from 451 in 1992 to 1,833 in 2002). The number of admissions related to trauma (mostly war-related injuries) shows an upward trend over time, with a sharp increase in 1997 (with 744 cases) related to the escalation of the civil conflict in Northern Uganda, followed by fluctuations over time and, finally, by a new increase in 2002.

Malnutrition also shows two peaks in 1997 (778 admissions) and in 2002 (875 admissions) in correspondence with the increase of rebels'activities. An epidemic peak of measles cases is observed in 1996 (with 956 admissions), followed by a decline culminated in 2001/02 with about 50 admissions per year.

### Users of hospital services

Concerning the profile of users of hospital services, vulnerable groups (children under five and women) account for 79.8% of the admissions to Lacor Hospital during the period 1992-2002, with a consistent increase over time from 75.5% in 1992 to about 84.6% in 2002. This percentage is much higher than their share in the population of Gulu District. In particular, children aged 0-4 years account for 78,724 (50.7%) out of the total 155,205 admissions during the period 1992-2002, and diseases in childhood shape the epidemiologic profile in Lacor Hospital.

Malaria affects mostly children, with a mean age of 3.8 years, as well as malnutrition (1.9 years) and measles (1.7 years). Pneumonia and diarrhoea occur usually later, with a mean age of 8.8 years and 9.3 years, respectively. Tuberculosis and injuries (mostly war-related) especially affect young adults, with a mean age of 27.0 years and 24.7 years, respectively.

### Utilization patterns

Concerning the utilization of hospital services, the pattern of Average Length Of Stay (ALOS) seems to be consistent with the complexity of case-mix, with tuberculosis showing the longest ALOS (50.6 days), followed by crushing injuries and traumatic amputations (43.5) and cancer of urinary tract (43.0). Of note is the fact that, among the diseases with at least 20 admissions, six out of the top ten conditions in terms of duration of hospital stay are neoplasms of different types and locations (urinary tract, skin, oral cavity and pharynx, cervix, breast, eye and adnexa), three are communicable diseases (tuberculosis, trypanosomiasis and poliomyelitis) and one is related to injuries/amputations.

Tuberculosis is the most important condition in terms of service utilization, accounting for about one fifth (20.8%) of the total bed days during the period 1992-2002; this high percentage is related to both the frequency of admissions (7,498) and the long hospital stay (50.6 days). A steep decrease in bed days is observed for tuberculosis since 2001, following DOTs implementation. Although malaria is the most frequent cause of admission to Lacor Hospital, it accounts only 9.5% of the total hospital bed days because of its short ALOS. However, it is the disease showing the highest increase in bed days, from 4.4% in 1992 to 19.5% in 2002.

Tuberculosis and malaria are followed by malnutrition and injuries, accounting for 7.0% and 4.3% of bed days, respectively. Injuries show a peak in bed days (over 9%) in 1996-97, which corresponds to the increase of rebels'activities. Pneumonia is the fifth condition in terms of service utilization, increasing from 2.7% of bed days in 1992 to 6.8% in 2002.

### Proportional Morbidity Rate

The age-specific distribution of the Proportional Morbidity Rate of selected diseases is illustrated in Figure 3. Of note is the fact that the Proportional Morbidity Rate is a relative measure, and disease-specific Proportional Morbidity Rate depends on the morbidity pattern related to other diseases.

Malaria accounts for 26.1% of the overall admissions, and its Proportional Morbidity Rate is very high in infant age (45.2%) and in childhood age (43.8%), then decreasing with increasing age (15.9% in the 5-14 age group, 7.4% in the 15-24 age group and so on). Pneumonia, malnutrition and measles are also important childhood diseases, accounting together for almost a quarter of the admissions in the 0-4 age group.

In the adult ages, delivery is the leading cause of admission in the 15-24 and 25-34 year groups, while tuberculosis becomes the most important condition in the 35-44 year group. An increase in Proportional Morbidity Rate attributable to neoplasms, hypertension and other cardiovascular diseases is observed in older ages, with neoplasms becoming the leading cause of admission from age 45 onwards.

Differences in Proportional Morbidity Rates by age and sex are also important. It is obvious that gynaeco-obstetrical conditions account for most of these differences, especially among young adult females. Delivery accounts for over half (51.0%) of the female admissions in the 15-24 age group, therefore affecting the overall admission profile. Childhood communicable diseases do not show any marked difference by sex, whereas tuberculosis, liver diseases and injuries account for a higher proportion of admissions in adult males with respect to females.

### Mortality in Lacor Hospital

In Lacor Hospital, 12,365 deaths were registered in the total 155,205 medical records of inpatients admitted during the period 1992-2002, with an in-hospital mortality rate of 8.0%. Of the total 12,365 deaths, only 12,293 had the cause of death recorded in the medical chart. Children aged 0-4 years account not only for a high percentage (50.7%) of the admissions in Lacor Hospital, but also for an even higher percentage (60.4%) of hospital deaths, yet representing only 16.3% of the population in Gulu District (MFER, 1994).

The patterns of in-hospital mortality, Proportional Mortality Rate (PMR) and Case Fatality Rate (CFR) are summarised in Table 3 for the ten leading causes of hospital death during the period 1992-2002.

Table 3-Distribution of in-hospital mortality, PMR and CFR by cause (ten leading causes of hospital death, Lacor Hospital, 1992-2002)

Cause	No. of deaths	PMR (%)	CFR (%)
Malaria	1,655	13.5	4.1
Malnutrition	1,410	11.5	21.0
Pneumonia	1,118	9.1	11.2
Meningitis	842	6.8	26.7

Diarrhoea	806	6.6	14.1
Tuberculosis	777	6.3	10.4
Measles	690	5.6	16.4
AIDS	668	5.4	30.2
Septicaemia	482	3.9	14.3
Anaemia	445	3.6	14.7
Others	3,400	27.7	5.0
<b>Total</b>	<b>12,293</b>	<b>100.0</b>	<b>7.9</b>

The relative contribution of the different diseases to the overall mortality burden across age groups is illustrated in Figure 4, showing the age-specific distribution of the Proportional Mortality Rate for the ten leading causes of hospital deaths and other selected diseases.

Malaria accounts for 13.5% of the overall deaths, and the Proportional Mortality Rate related to this condition is very high in infant (20.6%) and childhood ages (19.0%), then decreasing with increasing age (7.6% in the 5-14 age group, 4.9% in the 15-24 age group and so on). Pneumonia and diarrhoea are important causes of mortality, showing a different, bimodal mortality pattern (with higher mortality burden in childhood and in adult/old ages).

HIV/AIDS and tuberculosis are consistently the leading cause of death in all the age groups between 15 and 54 years, with a peak in mortality in the 35-44 age group (Proportional Mortality Rate =18.7% for AIDS and 17.9% for tuberculosis).

Cancer accounts for a heavy mortality burden in the older age groups (with a Proportional Mortality Rate of 11.7% and 13.5% in the 55-64 and over 65 age groups, respectively), reflecting the increasing contribution of cancer to adult mortality in Africa. As already discussed for the morbidity profile, injuries and liver diseases show a higher mortality burden among male adults.

The majority of the hospital deaths due to AIDS occurred among male patients (60.9%), who accounted for 407 of the 668 AIDS-related deaths. The age-sex distribution of hospital deaths due to AIDS shows a female-to-male ratio greater than one in the younger ages, then approaching unity around 27 years and finally reversing in the older age groups.

Among the diseases with at least 20 admissions, the highest CFR is observed for tetanus, other severe communicable diseases, neoplasms, and stroke. This CFR pattern seems consistent with the severity of the disease profile, and a general decrease in CFR is observed over time for most conditions (except for TB). The trend of CFR for the five leading causes of admissions is shown in Figure 5.

In particular, after the peak in 1995, CFR for malnutrition has almost halved in the recent years, reaching about 15% in 2001-02. This may reflect the improved case management related to change in treatment protocols and training of the staff. Downward trend is observed for pneumonia in the last years. CFR for malaria also shows downward fluctuations over time (from 5.0% in 1992 to 3.0% in 2002, with an average of 4.1% in 2002 (4.2% in the paediatric ward and 3.8% in the medical ward). It is worth noting that only severe malaria cases are admitted to Lacor Hospital, and the current malaria CFR is lower than the international standard (CFR=4%), which is considered as acceptable for sub-Saharan Africa, and is lower than CFR observed in other Ugandan hospitals (Talisuna, 2001). It is estimated that the average malaria CFR in children under five is 7.0% at the national level (MOH, 2002).

CFR for delivery is very low, reflecting both the high proportion of normal deliveries and the availability of quality care in case of obstetrical emergencies. In particular, the rate of caesarean section was 16% in 2002, which is consistent with a reasonable estimate of the proportion of all deliveries that can benefit from such intervention (Barnum, 1993).

Tuberculosis is the only condition showing an increase in CFR in 2001-02, related to the implementation of community-based DOTS. According to this strategy, most TB cases are currently treated at the community-level, while only severe cases in need of hospital care are admitted to the TB unit for the duration necessary for the hospital treatment, to be continued at the community-level after discharge. This explains the decrease in the number of admissions, in length of hospital stay and in bed days, as well as the increase in Case Fatality Rate, observed in 2001-02.

#### DISCUSSION

Hospital discharge records are an important source of data, because they are readily available in the health facilities and are useful not only for planning and evaluating hospital services (Oleske, 1995) but also for epidemiological surveillance (Gordis, 1996). However, hospital data also have some limitations: hospital records are not designed for research but rather for patient care, and they may be incomplete, illegible, or missing (Donabedian, 2003). Moreover, hospital-based studies are prone to selection bias (Berkelman, 2002); therefore, patients admitted to the hospital may not be representative of all patients in the community, and no community-wide inference should be made from hospital data (Steinwachs, 1998). However, for monitoring trends, the low sensitivity of the surveillance system may be acceptable if it remains consistent over time and across the spectrum of diseases (Buehler, 1998).

Despite these limitations, the morbidity and mortality patterns derived from hospital statistics are important to describe the disease profile in Gulu District. Accessibility of quality services, application of low flat rate fees, and breakdown of the overall health system in Gulu District, have important implications for the composition of the hospital population, making Lacor Hospital a "natural experiment" to describe the disease burden of poverty. In fact, costs to patient and cost-recovery mechanisms in large part determine where health care is available and who has access to service (Whitehead, 2001), affecting not only equity but also the degree to which the users' profile and disease patterns derived from hospital statistics reflect the demographic and epidemiological profile of the population.

In order to describe the "disease profile of poverty", we have to take into consideration not only the direct impact of war and famine on population health in Gulu District (as shown by the disproportionately high burden related to war-related injuries and malnutrition), but also their indirect effects (Holdstock, 2001). In fact, while civilians' deaths may be the direct result of military operations, increased mortality among civilians in time of conflict are usually a reflection of the combined effects of social disruption, poor environmental conditions, psychosocial distress, reduced access to health services, and increased risk of communicable diseases. In particular, the increased risk of communicable diseases stems from the breakdown of control programmes, population movements and overcrowding in protected camps, greater exposure to vectors and environmental hazards (such as polluted water), and the lack of access to health care services (WHO, 2002). The victims are mostly infants and children: it is estimated that infant mortality rose above 600 per 1000 in some conflict-affected areas in Uganda in the mid-1980s (Dodge, 1990).

The analysis of the users' profile offers interesting insights into the interaction between demand and supply of hospital services, and reveals whether the necessary inputs are reaching the intended target populations. In sub-Saharan Africa, it is usually found that not only do adults and the elderly use hospitals more than their share of the population would indicate (Barnum, 1993), but also that patterns of hospital resources use tend to favour the rich (Castro-Leal, 2000). It is estimated that adults comprise approximately 70 percent of hospital admissions in Uganda (Over, 1992), as well as in other African countries (Barnum, 1993).

Furthermore, hospitals are primarily located in urban areas, and even when they are intended to provide a referral service for a broad geographical population base they in actuality serve a disproportionately urban clientele ("urban bias"). Because urban populations generally have higher incomes than those living in rural areas, the urban location of most hospitals has implications for income equity as well as geographic equity. It is estimated that, on average, the richest 20% of the population in sub-Saharan Africa receive well over twice as much financial benefit as the poorest 20% from overall government health service expenditures and the difference is particularly notable with respect to hospital services (Castro-Leal, 2000).

Therefore, there are distributional biases that favour adult/old people and urban population (representing higher income groups). Since socially marginal and economically deprived groups have the greatest overall need for health care but are least able to obtain it, the policy of the hospital is to give priority to accessibility of quality services for the poor and vulnerable, providing care at subsidized price with flat rate fees. Therefore, the admission profile at Lacor Hospital is peculiar: it is located in a rural area, serves a largely poor population incapacitated by insurgency and disease, and vulnerable groups account for most of the admissions.

Over four-fifths of the inpatient services are currently targeted to the vulnerable groups (infants, children and women), as a result of the priority given to the protection of maternal and child health. The focus on infant, child and maternal care provides more of a poverty orientation than reliance on other services, since the disease burden at an early age or at childbirth is particularly important among the poor (Gwatkin, 2001).

The description of the disease profile is crucial to guide health strategies and to address the key issues of resources to be mobilized, equitably distributed and efficiently utilized for reducing the inequalities gap in health (Kawachi, 2000, Graham, 2001). In fact, there is important heterogeneity among causes of death in terms of their association with poverty (Wadsworth, 1999). It is estimated that, in the high-mortality African countries, complications of pregnancy show the highest poor-rich mortality ratio (mortality in the poorest quintile of the population as a multiple of mortality in the richest quintile), followed by infectious/parasitic diseases and by perinatal conditions (Gwatkin, 2001).

In particular, not only are death rates among the poor higher than among the rich, but the poor-rich differences are also considerably larger at younger ages with respect to communicable diseases than with respect to noncommunicable diseases (Gwatkin, 2000). It is worth noting that communicable diseases are, in general, more amenable to broad-based primary prevention efforts than are noncommunicable diseases. Thus, the heavy burden of communicable diseases in childhood reflects in part the collapse of the primary health care system in Northern Uganda and the subsequent failure in disease prevention and control, in addition to the socio-economic disruption and the underlying disease profile at the early stage of the epidemiologic transition. In particular, the high peak of mortality in early age reflects, in an even more marked fashion, the heavy burden of childhood mortality in sub-Saharan Africa, where half of all deaths in the general population occur among children under the age of five (WB, 1994).

Malaria and other communicable diseases, together with malnutrition and injuries (mainly war-related) contribute disproportionately to the high levels of ill health of the population. Malaria is the leading cause of morbidity and mortality, showing the highest increase in admissions and hospital deaths during the period 1992-2002. Several factors may have contributed to this upward trend in recent years, including the escalation of the insurgency, the poor living conditions and the mass displacement of the population, the disruption of the health system (Accorsi, 2001), the increase in drug resistance (Kanya, 2001), as well as climatic and ecological factors (Talisuna, 2001). In particular, the 1997 El Nino phenomenon may have contributed to outbreaks of water-related diseases, such as malaria (Didas, 2002).

The heavy burden of malaria reflects the disease profile at the national level, where malaria constitutes the most important threat to the health of the population, accounting for up to 38% of the outpatient attendances, 20% of the hospital admissions (Talisuna, 2001) and 22% of the annual deaths in the country (MOH, 1997). Conversely, the mortality burden attributable to malnutrition and injuries (mainly war-related) appears to be disproportionately high with respect to the national average, reflecting the food shortage and the insecurity prevailing in Gulu District.

It is worth noting that the trend in admissions, bed days and hospital deaths due to AIDS is quite stable, or even declining, during the period 1992-2002. Several factors may contribute to this downward trend, including the decline in HIV prevalence observed in Gulu District (STC/ACP, 2002), the shift from inpatient to outpatient care (Accorsi, 1999), the availability of alternative community-based services, and the healthcare-seeking behaviour of the affected population. In particular, in order to cope with the HIV/AIDS epidemic, an integrated approach was implemented, including inpatient, outpatient, and outreach home care, therefore providing a continuum of care to AIDS patients.

This strategy has been effective in relieving the pressure for admissions, improving the linkage with the community, and strengthening preventive and promotive AIDS interventions. This pattern of hospital resource use seems to be different from that observed in other African hospitals where the increased demand for care of HIV-related conditions has resulted in health care resources being shifted away from non-HIV-related conditions (Armstrong, 1995; WB, 1997).

Conversely, in Lacor Hospital, no evidence is found that HIV-negative patients have been displaced from admission to the wards by AIDS patients in recent years, nor has there been a reduction in the availability of hospital beds for non-HIV-related diseases (Accorsi, 1999). Similarly, in an attempt to improve TB case management and to alleviate its heavy burden on hospital services, DOTS strategy and other community-based support services for TB patients have been implemented, accounting for the declining trend in bed days attributable to TB in 2001-02.

The example of tuberculosis illustrates the importance, from the public health point of view, of curative services and the relationship between prevention and treatment. As a matter of fact, the best way to prevent tuberculosis is to provide effective treatment to patients with open pulmonary tuberculosis in order to interrupt the chain of transmission: good treatment programmes are the best prevention programmes (Harries, 1996).

Other disease trends are related to factors amenable to local policy decisions. For example, decreasing measles morbidity and mortality in 2001-02 may be related to the improving routine immunisation coverage and to the implementation of supplementary vaccination campaigns in high risk areas (e.g., protected camps), as well as to the change in hospital policy with reduction of missed opportunities and modification in immunisation schedule (with the first dose of measles vaccine at 6 months and routine second dose at 9 months).

Long-term war and population displacement, sudden destitution, the collapse of social structures and the breakdown of the health system put people at much greater risk of HIV, TB, emerging infectious diseases, malnutrition, and war-related injuries, shaping the "disease profile of poverty". In this context, increasing demand for health care coupled with scarce resources created an emergency situation. However, it has been possible to cope with this increase in health demand by overstretching limited hospital resources, and by targeting the most vulnerable groups in order to ensure equity of access to quality care.

In particular, Lacor Hospital tried to cope with the increasing demand for health care by reducing the length of stay (from 17.4 days in 1993 to 7.7 days in 2002) and increasing the bed turnover (from 24.7 admissions per bed in 1993 to 55.4 in 2002), while keeping high the bed occupancy rate (over 100% for most of the study period). Several factors may account for the decrease of ALOS during the period 1992-2002:

- change in demographic profile of inpatients with increase of short-term paediatric admissions
- change in case-mix with increase of communicable diseases (such as malaria) requiring fewer days of hospital stay
- increase in efficiency in hospital resource use, leading to the reduction of the number of unnecessary days of hospital stay through improvements in case management as well as in scheduling for diagnosis and surgery
- shift from inpatient to outpatient and community-based care for some burdensome conditions, such as tuberculosis and AIDS
- implementation of early discharge policy, under the pressure of high demand for hospital care and overcrowding of wards.

To note is the fact that the reduction in length of stay has been achieved without compromising, and even enhancing, the outcomes of hospital care, as shown by the high level of users' satisfaction (Angura, 2002) and by the decrease in

case fatality rate for most conditions. Furthermore, reducing the duration of hospital stay with high bed occupancy enables turnover rates to increase and thus allows hospital benefits to be extended to a greater number of people. This increases the cost-effectiveness of services by reducing the average cost per admission of specific treatments (Barnum, 1993). However, it seems that the hospital has already utilised all of its available resources and has reached the limits of its capacity.

Gender-related analysis is useful to give clues as to possible reasons for differences in distribution of the disease burden by sex. For example, the disease burden related to injuries is much higher in adult males, who are at higher risk of trauma from most causes, including war-related injuries, occupational accidents, and individual risk-taking behaviours, such as alcohol consumption. Gender-related analysis highlights also that HIV infection is gender sensitive in terms of acquisition and consequences (Roseberry, 1996). Earlier sexual activity by young females, and the fact that they often have older partners, may contribute to explain earlier infection, disease and death among females. This trend is thought to be related not only to biological factors, such as greater female biological susceptibility, but also to socio-economic and cultural factors, such as poverty, education, social status, and low power in sexual decision-making (Stoneburner, 1996, UAC, 1997). Therefore, inequalities in health may be due to differential exposure or vulnerability, and suggests that gender differences may not be as constant over time, cultural context, and health intervention as has often been assumed (UNDP, 1995).

The overall disease burden highlights the interplay between war, socio-economic disruption, food shortage, epidemic dynamics, and humanitarian crisis. Most of this burden results from diseases, such as malaria, measles, diarrhoea and respiratory infections whose occurrence could be dramatically reduced by low-cost and effective preventive and curative interventions. In other terms, the marginal social and economic returns from investments in health are highest in avoiding these premature deaths (WB, 1994). Moreover, a double burden of disease is already emerging at the early stage of the epidemiologic transition, with a mix of persistent, new and re-emerging infectious diseases and increasing chronic conditions and injuries. This will lead to fundamental changes in the volume and composition of demand for health care, with a more complex case mix and a more costly service utilisation patterns.

In this perspective, monitoring epidemiologic patterns and trends is essential, and the cost of obtaining health information has to be weighted against its use. Using inputs based on readily available data may ensure sustainability of the information system and support evidence-based health practice.

#### REFERENCES

1. Accorsi S., Fabiani M., Dente MG., Lukwiya M., Corrado B., Onyut A., Cosulich A., Aloï A., Giusti D., Manenti F., Declich S. Trends of AIDS-related hospital admissions in northern Uganda. (Abstract 13BT2-1). In: I.C.A.S.A. X<sup>th</sup> International Conference on AIDS and STDs in Africa: "Looking into the future, Setting priorities for HIV/AIDS in Africa", Lusaka, Zambia, 12-16 September 1999.
2. Accorsi S., Fabiani M., Lukwiya M., Onek PA., Di Mattei P., Declich S. The increasing burden of infectious diseases on hospital services at St. Mary's Hospital Lacor, Gulu, Uganda. *American Journal of Tropical Medicine and Hygiene* 2001, 64 (3): 154-158.
3. AHA (American Hospital Association). *Hospital statistics*. Annual. Chicago, IL: AHA, 1989.
4. Angura TO. Response of local communities to health problems and the role of Lacor Hospital. In: *The challenge of sustainability in Lacor Hospital*. Workshop held at Lacor Hospital, Gulu, on the 18 May 2002 (Second Edition). Gulu, Uganda: Lacor Hospital, 2002.
5. Armstrong J. Uganda's AIDS crisis: its implication for development. Washington, D.C.: World Bank, 1995. 90 p. (World Bank discussion series, No. 298).
6. Barnum H., Kutzin J. Public hospitals in developing countries: resource use, cost, financing. Baltimore, Md: Johns Hopkins University Press, 1993.
7. Berkelman RL., Stroup DF., Buehler JW. Public health surveillance. In: Detels R., McEwen J., Beaglehole R., Tanaka H. editors. *Oxford textbook of public health*. 4<sup>th</sup> edition, Oxford University Press, 2002.
8. Buehler JW. Surveillance. In: Rothman KJ., Greenland S. editors. *Modern Epidemiology*. Philadelphia: Lippincott Williams & Wilkins, 1998.
9. Castro-Leal F., Dayton J., Demery L., Mehra K. Public spending on health care in Africa: do the poor benefit? *Bulletin of the World Health Organization* 2000; 78 (1): 66-74.
10. CMBT (Christian Medical Board of Tanzania). *Medical Statistics 1989*. Unpublished data. Dar es Salaam, Tanzania: CMBT, 1991.
11. Didas NB. Weather change and disease outbreaks: a warning bell! *IDS Bulletin (Integrated Disease surveillance, Uganda)* 2002; 7: 8-9.
12. Dodge CP. Health implications of war in Uganda and Sudan. *Social science and Medicine* 1990, 31: 691-698.
13. Donabedian A. An introduction to quality assurance in health care. Oxford University Press, 2003.
14. Giusti D. The challenge of sustainability in Lacor Hospital: external context and prospective analysis. In: *The challenge of sustainability in Lacor Hospital*. Workshop held at Lacor Hospital, Gulu, on the 18 May 2002 (Second Edition). Gulu, Uganda: Lacor Hospital, 2002.
15. Gordis L. *Epidemiology*. Philadelphia: W.B. Saunders Company, 1996.
16. Graham H. From science to policy: options for reducing health inequalities. In: Leon D., Walt G. *Poverty, inequality and health. An international perspective*. Oxford University Press, 2001.
17. Gulu DMO (Gulu District Medical Office). *Gulu District Health Services-Draft work plan, 1998-99*. Unpublished data. Gulu, Uganda, 1998.
18. Gwatkin DR. Health inequalities and the health of the poor: What do we know? What can we do? *Bulletin of the World Health Organization* 2000, 78 (1): 3-17.
19. Gwatkin DR. Poverty and inequalities in health within developing countries: filling the information gap. In: Leon D., Walt G. editors. *Poverty, inequality and health. An international perspective*. Oxford University Press, 2001.
20. Harries AD., Maher D. *TB/HIV. A clinical manual*. Geneva: World Health Organization, 1996.
21. Holdstock D. War: from humanitarian relief to prevention. In: McKee M., Garner P., Stott R.
22. *International co-operation in health*. Oxford University Press, 2001.
23. HPAU (Health Policy Analysis Unit-Ministry of Health). Update on Ebola and other epidemics in Uganda. *Uganda Health Bulletin* 2001, 7 (1): 40-43.
24. Kanya M. Antimalarial drug resistance: a critical problem for sub-Saharan Africa. *Uganda Health Bulletin* 2001, 7(3): 51-54.
25. Kawachi I. Income inequality and health. In: Berkman LF., Kawachi I. editors. *Social epidemiology*. Oxford University Press, 2000.
26. Lamunu M. Revitalization of registration of vital statistics (Deaths and Births) in Gulu District (February-June 2001). *IDS Bulletin (Integrated Disease surveillance, Uganda)* 2001, 5: 12-14.
27. LH (Lacor Hospital). *Activity Report 2001*. Unpublished data. Gulu, Uganda: LH, 2001.
28. LH (Lacor Hospital). *Activity Report 2002*. Unpublished data. Gulu, Uganda: LH, 2002.
29. MFEP (Ministry of Finance and Economic Planning). *The 1991 Population and Housing Census (National Summary)- Uganda*. Entebbe, Uganda: MFEP, 1994.
30. MOH (Ministry of Health). *Health policy statement 1997/98* by Hon. C. W. C. B. Kiyonga Minister of Health. Entebbe, Uganda: MOH, September 1997.
31. MOH (Ministry of Health). *Annual Health Sector Performance Report, Financial Year 2001/2002*. Kampala, Uganda: MOH, September 2002.
32. MOH (Ministry of Health). *Statistical abstract (working paper)*. Kampala, Uganda: MOH, April 2003.
33. Oleske DM. *Epidemiology and the delivery of health care service: methods and applications*. New York and London: Plenum Press, 1995.
34. Over M., Ellis RP., Huber JH., Solon O. The consequences of adult ill health. In: Feachem RGA., Phillips M., Kjellstrom T., Murray C., Over M. *The health of adults in the developing world*. Oxford University Press, 1992.
35. Pabón Lasso H. Evaluating hospital performance through simultaneous application of several indicators. *Bulletin of the Pan American Health Organization* 1986, 20: 341-357.
36. Roseberry W. AIDS prevention and mitigation in sub-Saharan Africa. An updated World Bank strategy. AFTHR, World Bank, 1996.
37. STD/ACP (STD/AIDS Control Programme - Ministry of Health). *HIV/AIDS Surveillance Report - June 2002*. Kampala, Uganda: STD/ACP MOH, 2002.
38. Steinwachs DM. Management information in decision-making. In: Armenian HK., Shapiro S. editors. *Epidemiology and health services*. New York and Oxford: Oxford University Press, 1998.
39. Stoneburner RL., Low-Beer D., Tembo GS., Merrens TE., Asimwe-Okiror G. Human Immunodeficiency Virus infection dynamics in East Africa deduced from surveillance data. *American Journal of Epidemiology* 1996, 144: 682-695.
40. Talisuna AO., Bakyaite N., Langi P. Malaria: current situation and way forward. *Uganda Health Bulletin* 2001, 7(3): 34-43.
41. UAC (Uganda AIDS Commission). *The national strategic framework for HIV/AIDS activities in Uganda (1998-2002)*. Kampala, Uganda: UAC, December 1997.
42. UNDP (United Nations Development Programme). *Women, the HIV epidemic and human rights: a tragic imperative*. New York: UNDP, October 1995 (HIV and Development Programme. Study paper No 8).
43. Wadsworth M. Early life. In: Marmot M., Wilkinson RG. editors. *Social determinants of health*. Oxford University Press, 1999.
44. WB (World Bank). *Better health in Africa. experience and lessons learned*. Washington, DC: World Bank, 1994.
45. WB (World Bank). *Confronting AIDS: public priorities in a global epidemic. A World Bank policy research report*. New York: Oxford University Press, 1997.
46. Whitehead M., Dahlgren G., Gilson L. Developing the policy response to inequities in health: a global perspective. In: Evans T., Whitehead M., Diderichsen F., Bhuiya A., Wirth M. editors. *Challenging inequities in health. From ethics to action*. Oxford University Press, 2001.
47. WHO (World Health Organization). *1992-1994. International Statistical Classification of Diseases and Related Health Problems, Tenth Revision*. Geneva: WHO, 1994.
48. WHO (World Health Organization). *World report on violence and health*. Geneva: WHO, 2002.