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## Morbidity and mortality among a cohort of HIV-infected adults in a programme for community home-based care, in the Kilimanjaro Region of Tanzania (2003–2005)

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### Abstract

Community home-based care (CHBC) plays an integral role in the care of HIV-infected patients living in resource-limited regions. A longitudinal cohort study has recently been conducted, in the Kilimanjaro Region of northern Tanzania, in order to identify the components of an effective CHBC programme. Structured questionnaires were administered to clients over two census rounds, one in October 2003–February 2004 and the other in January 2005–October 2005. In the second round, follow-up interviews were completed for 226 (87.9%) of the 257 clients included in the first round. The clients included in the first round had a median (range) age of 38 (20–66) years and 182 (75.2%) of them were female. Although only 27 (12.9%) of them were using antiretroviral therapy (ART) when first interviewed, 108 (44.6%) were taking trimethoprim–sulfamethoxazole (SXT) prophylaxis. By the time of the follow-up interviews, 102 (45.1%) of the clients included in the first round had died, giving a mortality of 51/100 person-years of observation. The primary cause of death for 87 (85.3%) of the clients who had died was respiratory and/or gastro-intestinal infection, and the most common contributory causes of death were malnutrition (81.4%) and anaemia (42.2%). On bivariable analysis, the following first-round conditions were found to be significantly associated with death by the second census round: weakness for >1 month [odds ratio (OR)=2.64; *P*=0.008]; oral thrush (OR=2.31; *P*=0.015); painful swallowing (OR=2.02; *P*=0.036); staying in bed for part of the day over most of the previous month (OR=1.94; *P*=0.017); fever for >1 month (OR=1.95; *P*=0.016); and severe bacterial infections (OR=1.80; *P*=0.036). The high mortality was associated with advanced, symptomatic HIV disease for which antiretroviral therapy was indicated. Clients who were in the advanced stages of HIV disease (as defined by the World Health Organization's criteria) in the first census round were significantly more likely to have died by the time of the second round than the other clients investigated (log-rank  $\chi^2=8.115$ ; *P*=0.044).

The high level of morbidity observed in this study, and the causes of mortality that were identified, emphasise the need for CHBC programmes to provide HIV-infected patients with improved access to basic resources such as SXT and isoniazid prophylaxis, clean water, oral rehydration therapy, and micronutrient supplementation, in addition to increased access to ART.

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The current burden posed by HIV/AIDS is estimated at 33 million infected people, with two-thirds of those infected living in sub-Saharan Africa. In Tanzania, the prevalence of HIV/AIDS among adults aged 15–49 years was estimated at 6.2% in 2007, indicating that about 1.3 million adults in the country were HIV-infected (Anon., 2008).

The current capacity of Tanzania's health services to care for the country's HIV-infected individuals is limited. A survey of healthcare facilities in the Northern Zone of Tanzania in 2004 (Landman *et al.*, 2006) revealed a need for additional trained personnel, medications and laboratory capacity to care for the region's HIV-infected patients — a challenge also illustrated by the results of a nation-wide survey in 2006 (Anon., 2007a). In government hospitals in the Kilimanjaro and Kagera Regions, 21.6% and 32.8% of inpatient beds, respectively, may already be occupied by patients living with HIV/AIDS (Kwesigabo *et al.*, 1999; Ole-Nguayine *et al.*, 2004). It has been estimated that delivering antiretroviral therapy (ART) to all those in need of such treatment in Tanzania would require the full-time services of almost half of the country's current healthcare workforce (Beckmann and Rai, 2004). With formal healthcare services overwhelmed, alternative models — such as community home-based care (CHBC), a service in which basic care is delivered to a patient's home by trained members of the community — will become increasingly important in delivering healthcare to Tanzania's HIV-infected population.

CHBC has already been recognised as a vital component of the care of HIV-infected populations by both the World Health Organization (WHO) and the Tanzanian government (Anon., 2001; WHO, 2002). It has the potential to provide care for large numbers of HIV-infected patients, especially in rural areas, where the majority of Tanzanians live and where prevention and care services are often lacking (Somi *et al.*, 2006). Unfortunately, although such data are needed to determine the essential components of successful CHBC programmes, and to help structure such programmes to deliver effective care, few data exist on the current needs of the HIV-infected clients whose main care is community home-based (Bowie *et al.*, 2006). To address this issue, a longitudinal cohort study among HIV-infected adults receiving CHBC in the Kilimanjaro Region of northern Tanzania was recently conducted. The methodology, results and conclusions of this study are detailed below.

## Subjects and Methods

### Location

The Kilimanjaro Region of northern Tanzania has an estimated population of 1.4 million (Anon., 2003). At the time of the present study (2003–2005), the region was divided into the six districts of Hai, Moshi Rural, Moshi Urban, Mwanza, Rombo and Same. The subjects of the present study, who were all HIV-infected individuals ('clients') receiving CHBC, were surveyed through an existing AIDS-service organization in Moshi, known as Women Against AIDS in Kilimanjaro or, in the local Swahili, *Kikundi cha Wanawake Kilimanjaro Kupambana na UKIMWI* (KIWAKKUKI). This organization is a community-based women's organization that provides HIV voluntary counselling and testing (VCT), CHBC for HIV-infected individuals, and education and support for people living with HIV/AIDS.

## Home-based Care

Clients presenting to KIWAKKUKI are each checked for anti-HIV antibodies (Chu *et al.*, 2005) using two commercial rapid tests: the Capillus™ HIV-1/HIV-2 (Trinity Biotech, Bray, Ireland) and the Determine™ HIV-1/2 (Abbott Laboratories, Abbott Park, IL). All clients found seropositive are offered enrollment in KIWAKKUKI's CHBC programme. At the start of the present study, this programme provided care for approximately 800 of the estimated 98,000 HIV-infected individuals in the Kilimanjaro Region. It was maintained by 180 'providers' who each visited a median of five clients/month. A typical home visit included basic nursing care, health education, nutritional and spiritual counselling, and the provision of food and basic medications. The providers were community members who volunteered their services, and who had received training according to a Tanzania Ministry of Health curriculum. The training included an intensive, 5-day course, covering topics such as social and emotional support, basic medical care and essential medications, networking with community members, and assessing the need for referrals to formal healthcare services.

## Questionnaire Administration

Those HIV-infected clients enrolled in the KIWAKKUKI's CHBC programme who received home visits during the period of the organization's first census of its clients, which ran from October 2003 to February 2004, were recruited for participation in the present study. The aim of the first census round was to improve the quality of the CHBC programme, by improving understanding of the number and health status of the clients and by providing the information needed to advocate for increased resources for rural clients who could benefit from CHBC. The programme's providers administered structured questionnaires during home visits in both this first census and, as follow-up for the present study, in a second census round that ran from the January to the October of 2005. All those clients for whom identifying information was available and who were aged  $\geq 18$  years at the time of the first census round were sought for follow-up in the second round.

The questionnaires captured information on socio-demographic characteristics, self-reported medical history and symptoms, measured height and weight, and medication usage. No laboratory data were recorded as a part of this study. If, in the second census round, a client was found to have died since the first census round, a verbal-autopsy form was administered, by the CHBC provider, to a member of the client's family (Anon., 1997). The autopsy forms captured information on symptoms experienced prior to death, medical history, and the documented causes of death. Each autopsy form was reviewed by two physicians, who independently coded the primary and contributory causes of death, using a condensed list from the tenth revision of the International Classification of Diseases (Anon., 1997).

## Analysis

Data were entered into electronic databases using the Epi Info 2004 software package (Centers for Disease Control and Prevention, Atlanta, GA). They were validated by sampling 10% of the questionnaires, with less than one error/five pages being considered acceptable. Analysis was carried out using Epi Info 2004 and the JMP IN 2005 software package (SAS Institute, Cary, NC). Limited clinical staging was performed using the following criteria (WHO, 2005): weight loss and herpes zoster (stage 2); diarrhoea for  $>1$  month, fever for  $>1$  month, oral thrush, pulmonary tuberculosis within the previous year, and severe bacterial infections (stage 3); and oral or genital ulcers for  $>1$  month, presumed to result from infection with *Herpes simplex* virus (stage 4). These clinical criteria were recorded by the CHBC providers on the basis of the clients' self-reported clinical histories (during both census rounds), with the corresponding staging assigned during the data analysis. The level of mortality recorded between the census rounds was expressed as

deaths/100 person-years of observation. Survival curves were constructed using the Kaplan–Meier method and compared using the log-rank test. Bivariable analysis was performed to determine which of the first-round characteristics of the clients were significantly associated with mortality by the second census round. A *P*-value of <0.05 was considered indicative of a statistically significant difference.

### Research Ethics

Ethical approval for the study was obtained from the Kilimanjaro Christian Medical Centre's Research Ethics Committee, an Institutional Review Board of Duke University Medical Center, and the Tanzania National Institute of Medical Research's National Medical Research Coordinating Committee. All clients included in the second census round gave their written informed consent for use of the data collected on them in both census rounds.

### Results

Overall, 378 CHBC clients were surveyed during the initial census round, which was carried out as an internal quality-improvement activity. Although age eligibility ( $\geq 18$  years at the time of the first round) and the availability of identifying information allowed follow-up to be attempted, in the second census round, on 257 clients, only 226 (88%) of these were successfully followed up. The 31 clients lost to follow-up had all reportedly moved out of the study area between the two census rounds. The median time elapsed between the interviews in the two census rounds was 16.6 months (range=12.1–24.6 months).

### Demographic Characteristics

The socio–demographic characteristics recorded, in the first census round, for the 257 clients for whom follow-up was attempted are summarized in Table 1. All districts of the Kilimanjaro Region were represented. Most (75.2%) of the clients for whom follow-up was attempted were female, most (62.4%) were farmers, and most (92.1%) had completed no more than primary education. Only 34% were married. Most (62.3%) spent  $\leq$ U.S.\$6.68/week on household expenses (Anon., 2007b). The median age of these clients was 38 years (range=20–66 years).

### Morbidity

Table 2 depicts the morbidity reported by clients during the first census round. Most (66.9%) of the clients were categorized as being in WHO stage 3, with a history of severe bacterial infections being the most common stage-3-defining condition (52.5% of all clients). The median body-mass index (BMI) was 20.3 kg/m<sup>2</sup> (range=12.5–39.3 kg/m<sup>2</sup>), and having to stay in bed for part of the day over most of the previous month was the predominant functional capacity among the clients (50.4%).

The predominant symptoms reported included any weight loss in the previous 3 months (81.7%), weakness for >1 month (78.5%), chronic headache (52.7%), and fever for >1 month (51.4%).

### Mortality

Of the 226 clients who were successfully followed up in the second census round, 102 (45%) had died since the first round [Fig. (a)]. There were 51 deaths/100 person-years of observation. The median time to death, since interview in the first census round, was 5.6 months (range=0.2–25.1 months).

## Causes of Death

Coding of the verbal-autopsy forms (Table 3) revealed that the primary cause of death was infectious for 94 (92.2%) of the deceased clients and non-infectious or unknown for the other eight (7.8%). Among the infectious causes, respiratory and/or gastro-intestinal infections accounted for the majority of the deaths (85.3% of all deaths). Of the deaths attributed to respiratory and/or gastro-intestinal infections, 25 (24.5% of all deaths) were attributed only to acute or chronic diarrhoea, 17 (16.7%) to pulmonary tuberculosis, 11 (10.8%) only to chronic cough, and 31 (30.4%) to a combination of chronic cough and chronic diarrhoea. Among the eight deaths with non-infectious or unknown causes, two (2.0% of all deaths) were attributed to complications of pregnancy/childbirth, and two (2.0%) to suicide. The most common contributory causes of death included malnutrition (81.4%), anaemia (42.2%), infectious skin diseases (38.2%), and liver diseases (26.5%).

## Predictors of Mortality

Advanced WHO stage at the first census round was found to be significantly positively associated with between-census mortality [log-rank test  $\chi^2=8.115$ ;  $P=0.044$ ; Fig. (b)]. Certain first-round symptoms were also strongly associated with mortality, the clients who died between censuses being more than twice as likely to have reported weakness for >1 month [odds ratio (OR)= 2.64;  $P=0.008$ ], oral thrush (OR=2.32;  $P=0.015$ ), and painful swallowing (OR= 2.02;  $P=0.036$ ) during the first round than the clients who survived to the second round. Other first-round conditions found to be significantly associated with mortality by the second round included having to stay in bed for part of the day over most of the previous month (OR=1.94;  $P=0.017$ ), fever for >1 month (OR=1.95;  $P=0.016$ ), and a history of severe bacterial infections (OR=1.80;  $P=0.036$ ).

## Medication Use

At the start of the present study, ART in Tanzania was only available to those who could afford to pay for it themselves, at a cost of approximately U.S.\$35/month. The Tanzanian government began providing free ART to patients with disease of WHO stages 3 or 4 in September 2004 (i.e. shortly before the second census round), starting at referral hospitals and expanding to regional and district hospitals.

At the time of the first census round, ART use — reported by 27 (12.9%) of the clients investigated at that time — was uncommon. It remained just as uncommon by the time of the second census round, when only 15 (12.7%) of the clients were recorded as using ART ( $P=0.970$ ). The use of SXT prophylaxis was much more wide-spread and increased, among the clients investigated, during the present study. Overall, 108 (44.6%) of the clients investigated in the first census round and 77 (63.6%) of the clients surviving at the time of the second round were recorded as receiving such prophylaxis (at the time of the first and second rounds, respectively;  $P<0.001$ ). Neither the use of ART at the time of the first round nor the use of SXT at that time was, however, significantly associated with survival to the second round.

## Discussion

In the present study, baseline morbidity and mortality in a cohort of HIV-infected adults receiving CHBC in northern Tanzania were found to be high. The majority of the clients had advanced, symptomatic HIV disease for which treatment with ART was indicated. The level of morbidity and causes of mortality indicate that CHBC programmes need to improve access to basic medications and resources, in addition to expanding ART, in order for effective care to be delivered to HIV-infected patients.

The socio-demographic characteristics of the present CHBC cohort were generally representative of the wider Tanzanian population (Anon., 2002), with the majority of clients being farmers and having only a primary or lower level of education. The proportion of women in the cohort was, however, high, which may reflect KIWAKKUKI's original status as a women's organization (although it now serves both men and women). There is some gender bias in HIV infection in Tanzania, with females accounting for 58.5% of the HIV burden in individuals aged  $\geq 15$  years (Anon., 2008).

A high level of morbidity was seen at the time of the first census round, with the majority of clients having WHO stage-3 disease and almost half having had to stay in bed for part of the day over most of the previous month. The symptoms reported are similar to those found in a cohort in Malawi, in which 95% of patients were clinically diagnosed with AIDS-related disease and were receiving home-based care (HBC) services from teams consisting of community volunteers and healthcare workers (Bowie *et al.*, 2006). The majority of the patients in the Malawian cohort had disease of WHO stages 3 or 4 (95%), and experienced symptoms including weight loss (94%), headache (74%), and fever (70%). The level of debility in both the Malawian and the present, Tanzanian cohort can be attributed to the progression of HIV disease in the absence of wide-spread ART. In addition, the prevalence and range of symptoms indicate that basic medications and resources, such as antimicrobials, antipyretics and adequate nutrition, were also scarce in the Tanzanian cohort, with many clients probably lacking the financial resources and physical strength to visit centralized medical centres.

In the present study, as described in several other investigations, mortality was found to be associated with advanced WHO clinical stage (Jerene and Lindtjørn, 2005). Weakness, oral thrush, painful swallowing, fever, severe bacterial infections, and being bedridden were all independently associated with mortality. These are same or similar to the predictors of mortality detected in other studies. Lindan *et al.* (1992), for example, described low BMI, chronic diarrhoea, a history of herpes zoster disease and oral thrush as being associated with mortality in a cohort of HIV-infected women in Kigali, Rwanda.

The mortality rate in the Tanzanian cohort was high but similar, as far as can be seen from the limited data available, to that of other HIV-infected cohorts receiving HBC but without widespread access to ART. Among a cohort of HIV-infected Ugandan children receiving HBC services from a state hospital, for example, O'Hare *et al.* (2005) observed mortality of 26% over a period of 10 months. Similarly, of the HIV-infected patients receiving HBC in Malawi investigated by Bowie *et al.* (2006), 56% died within the first 18 months. In contrast, only 5% of a cohort of HIV-infected Ugandan adults receiving SXT and ART as part of their HBC died over a period of 16 weeks (Mermin *et al.*, 2008).

The use of ART by the clients investigated in the present study remained low, even though most of the clients had advanced HIV disease. The Tanzanian government began distributing free ART to government healthcare centres in September 2004, shortly before the second census round. It is therefore likely that, during the period of the present study, patients in rural communities would not have access to such medications. The use of SXT increased over the study period, a trend that may indicate that CHBC services are becoming more informed and effective at providing clients with some essential medications and services. The lack of a statistically significant association between ART or SXT use and survival, although disappointing, is probably the result of factors such as the targeting of medications towards the sicker clients and the sporadic access to such medications.

The primary and contributory causes of death, as well as the conditions associated with mortality, indicate that improved access to ART, as well as the provision of other

medications, nutrition and care, is essential. A basic prevention and care package, tailored to the region and resources available, has previously been advocated to reduce morbidity and mortality in HIV-infected patients living in Africa (Mermin *et al.*, 2005). In the present cohort, of HIV-infected patients in northern Tanzania, much of the mortality was attributable to chronic illness and infections of the respiratory and gastro-intestinal systems, with malnutrition and anaemia among the most common contributory causes of death. Besides ART, SXT and isoniazid prophylaxis, micronutrient supplementation and the provision of safe drinking water have been shown to prevent respiratory and gastro-intestinal disease in people living with HIV in Africa, and many such interventions have been shown to be cost-effective (Rose, 1998; Anglaret *et al.*, 1999; Fawzi *et al.*, 2004; Lule *et al.*, 2005). The present results indicate that a treatment package targeted at respiratory and gastro-intestinal disease may be of benefit to HIV-infected patients receiving CHBC.

Following the dissemination of the data collected in the present study to KIWAKKUKI, a CHBC liaison officer was placed fulltime at the Kilimanjaro Christian Medical Centre (KCMC) — the government referral hospital serving northern Tanzania. This liaison officer now helps link CHBC clients with the government services offering free ART. Given the need for a two-pronged approach, with provision of both ART and basic resources, the liaison officer also provides KCMC patients with information on KIWAKKUKI's CHBC programme, through which patients could receive home visits and basic treatment needs. It is recommended that four basic and cost-effective components be incorporated into all CHBC programmes in order to improve care for HIV-infected patients: SXT and isoniazid prophylaxis; micronutrient provision; oral rehydration therapy; and supplies to generate clean water. The trends in morbidity and mortality following the incorporation of such improvements (which would be useful topics for future research) need to be carefully monitored, so that CHBC programmes can be optimised.

Some limitations in the present study must be noted. As mentioned above, most of the clients investigated were female. The main findings are not, however, gender-specific. Approximately 12% of the initial cohort was lost to follow-up, apparently because they had moved out of the region. It is unknown whether the clients lost to follow-up had travelled home to die, or whether they were travelling because they were well. The WHO staging was based on an abbreviated list of criteria. More detailed staging would, however, only be expected to show increased severity of a client's HIV-associated disease.

Along with efforts to scale-up access to ART and prevent the further spread of the HIV epidemic in sub-Saharan Africa, there is great need for basic care and treatment to be delivered to the large numbers of patients living with HIV. CHBC and other alternative methods of delivering healthcare are becoming increasingly important in managing some of this healthcare burden. The present results indicate that countries need to address both basic interventions and ART access when scaling-up CHBC programmes for HIV-infected patients living in resource-limited settings.

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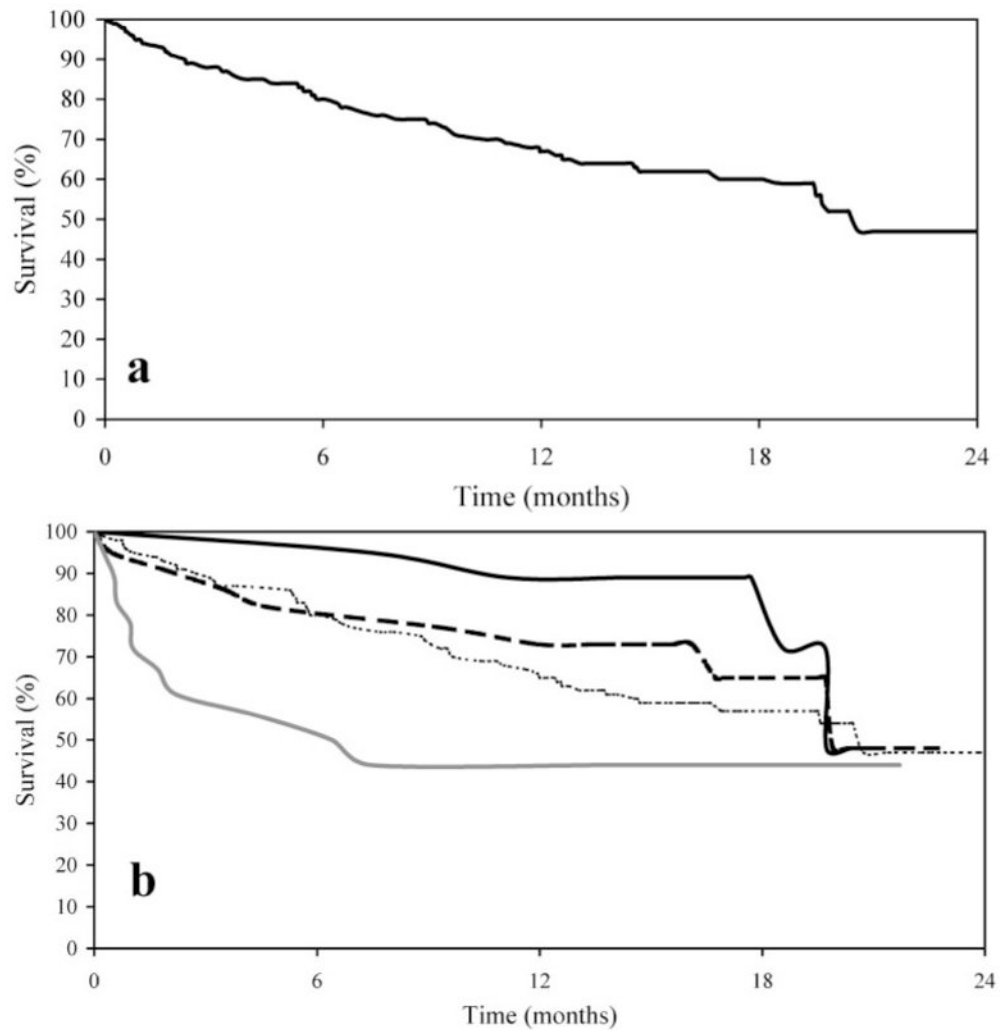
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**FIG.** Kaplan–Meier survival curves for 189 of the 226 clients surveyed in both the first and second census rounds for whom follow-up or death dates were available. The curves show the overall results (a) and the results stratified according to whether, in the first census round, the clients were in (World Health Organization) stages 1 (—), 2 (---), 3 (....) or 4 (— · —) of their HIV disease (b). Of the 189 living clients considered from the first census round (time ‘0’), 149, 125, 115 and 110 remained alive 6, 12, 18 and 24 months later, respectively.

**Table 1**  
**The socio–demographic characteristics, in the first census round, of the 257 clients on whom follow-up was attempted in the second census round**

Characteristic	Value
NO. AND (%) OF CLIENTS:	
Female	182 (75.2)
District of residence	
Hai	50 (19.5)
Moshi Rural	41 (16.0)
Moshi Urban	46 (17.9)
Mwanga	17 (6.6)
Rombo	42 (16.3)
Same	61 (23.7)
Occupation	
Farming	146 (62.4)
Business	55 (23.5)
Skilled work	12 (5.1)
Other	14 (9.0)
Education	
Primary or less	220 (92.1)
Secondary	19 (7.9)
Marital status	
Single	73 (31.5)
Married	80 (34.5)
Widowed	49 (21.1)
Other	30 (12.9)
Weekly household expenditure (Tanzanian shillings)	
0–7000 (U.S.\$0–6.68)	154 (62.3)
>7000 (>U.S.\$6.68)	93 (37.7)
Median age and (range) (years)	38 (20–66)

**Table 2**  
**Common symptoms and conditions experienced during the first census round among the 257 clients on whom follow-up was attempted in the second census round**

Symptom/condition	No. and (%) of clients
WORLD HEALTH ORGANIZATION DISEASE STAGE	
1	26 (10.1)
2	31 (12.1)
3	172 (66.9)
4	28 (10.9)
ACTIVITY LEVEL IN PREVIOUS MONTH	
No symptoms	71 (28.9)
Had symptoms, but normal activities possible	51 (20.7)
Bedridden for less than half of each day	22 (8.9)
Bedridden for most of each day	102 (41.5)
BODY-MASS INDEX (kg/m <sup>2</sup> )*	
<18.5 (underweight)	60 (30.2)
18.5–24.9 (healthy weight)	121 (60.1)
25.0–29.9 (overweight)	12 (6.0)
≥30.0 (obese)	6 (3.0)
WEIGHT CHANGE OVER PREVIOUS 3 MONTHS	
Increased	15 (6.3)
Decreased	196 (81.7)
No change	29 (12.1)
Weakness for >1 month	193 (78.5)
Chronic headache	129 (52.7)
Previous bacterial infection	125 (52.5)
Fever for >1 month	125 (51.4)
Skin rash	96 (39.3)
Oral or genital ulcers	81 (34.6)
Herpes zoster in previous 5 years	70 (29.4)
Diarrhoea for >1 month	69 (27.6)
Pulmonary tuberculosis in past year	66 (27.4)
Vaginal candidiasis >1 month	46 (25.3 of women)
Swollen lymph nodes	57 (23.4)
Painful swallowing	51 (20.9)
Oral thrush	46 (18.6)
Urethral discharge in men	10 (16.7 of men)

\* Categorization of underweight, healthy weight, overweight and obese according to Anon. (2006).

**Table 3**  
**The primary and contributory causes of death for the 102 clients who died between the first and second census rounds**

Cause of death*	No. and (%) of dead clients	
	Primary cause	Contributory cause
INFECTIOUS	94 (92.2)	–
Acute diarrhoea	10 (9.8)	9 (8.8)
Chronic diarrhoea	15 (14.7)	2 (2.0)
Chronic cough	11 (10.8)	15 (14.7)
Chronic diarrhoea and chronic cough	31 (30.4)	1 (1.0)
Pulmonary tuberculosis, probable or confirmed	17 (16.7)	–
Acute respiratory-tract infection	3 (2.9)	4 (3.9)
Respiratory disease, unknown cause	–	1 (1.0)
Febrile illness, acute or chronic	4 (3.9)	1 (1.0)
Infectious skin disease	2 (2.0)	39 (38.2)
Herpes zoster	–	1 (1.0)
Meningitis	1 (1.0)	13 (12.7)
NON-INFECTIOUS/UNKNOWN	8 (7.8)	–
Maternal death	2 (2.0)	2 (2.0)
Intentional self-harm/suicide	2 (2.0)	–
Alcohol-related	–	13 (12.7)
Anaemia	–	43 (42.2)
Malnutrition	–	83 (81.4)
Renal failure	–	6 (5.9)
Diabetes mellitus	–	4 (3.9)
Hypertensive diseases	–	6 (5.9)
Blood loss	1 (1.0)	5 (4.9)
Gastric/duodenal ulcer	–	2 (2.0)
Excessive vaginal bleeding	–	7 (6.9)
Liver disease	1 (1.0)	27 (26.5)
Skin disease	–	2 (2.0)
Skin cancer	–	2 (2.0)
Lymphoma/leukaemia	–	2 (2.0)
Cancer, unspecified	–	1 (1.0)
Nervous system problem	1 (1.0)	8 (7.8)
Epilepsy/status epilepticus	–	2 (2.0)
Paraplegia/quadriplegia	–	2 (2.0)
Headache	–	2 (2.0)
Blindness	–	1 (1.0)
Ear disease	–	1 (1.0)
Other family member died of HIV	–	1 (1.0)
Unknown	1 (1.0)	–

\* Results were obtained by coding verbal autopsy forms using a condensed version of the tenth revision of the International Classification of Diseases (Anon., 1997).