

A three-year follow-up survey of demographic changes in a Ugandan town on the trans-African highway with high HIV-1 seroprevalence



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Abstract

A 1991 serosurvey in a Ugandan trading town on the trans-African highway reported a 40 per cent HIV-1 prevalence in adults. Three years later in a repeat survey of the 531 adults resident in 1991, 279 (53%) were still present, 196 (37%) had left and 56 (11%) had died. There were 138 new residents and 46 children had become adults, making a total of 463 adults in 1994, 13 per cent less than 1991. Most immigrants (91%) came from the surrounding rural district whereas 38 per cent of emigrants went to an urban area. A significant inverse association between wealth and seropositivity was found for women but not men. Of the original residents 157 were known to be HIV-1 positive in 1991; 31 (20%) had died compared to 10 (4%) of the 232 known to be seronegative, representing an HIV-1 attributable mortality fraction of 60 per cent.

High prevalences of HIV-1 infection have been reported from towns and main road trading centres in East Africa. In Tanzania urban prevalences of 24 per cent have been recorded in Mwanza and Bukoba towns (Barongo et al. 1992; Killewo, Dahlgren and Sandstrom 1994). In Uganda a longitudinal study in Rakai district has reported adult HIV-1 seroprevalences ranging from 24 to 53 per cent in main road trading centres (Wawer et al. 1991).

In developing countries HIV infection has been linked to both high and low socio-economic groups. In Kinshasa it was reported that HIV infection was associated with wealthy men who were able to pay for many sexual partners (Ryder et al. 1990). In rural areas HIV infection is more often associated with poverty (Obbo 1989; Schoepf 1992; Seeley et al. 1994). Poor women are reported to be forced to sell sex in order to survive or to provide for their children (Obbo 1980; Ankrah 1991). Poor men may not be able to afford to keep a wife and family and may therefore have a series of casual sexual encounters with high-risk women. Those who are married may be infected through their wives, who may supplement the family income through the sale of sex. Both men and women of lower socio-economic status are unlikely to be able to obtain adequate treatment for other sexually transmitted diseases, which may make them more susceptible to HIV-1 infection (Garrison 1988). In developed countries progression of HIV infection to AIDS and death has been reported to be more rapid among members of marginalized or lower-income groups (Sampson and Neaton 1994).

In 1991 an HIV-1 sero-survey was carried out in a small trading town located on the main trans-African highway in Masaka district, Uganda. Five hundred and thirty one adults (aged 13 years or above) living in 154 randomly selected households were censused and an unambiguous HIV-1 result obtained for 389. The overall prevalence was 40 per cent. HIV-1 infection was associated with number of lifetime sexual partners, marital status (those who were married had a higher prevalence than those who had never married) and age-group (highest rates were in women aged 20-34 years and men aged 35-44 years) (Nunn et al. 1996).

In 1994, just over three years later, we returned to the 154 households originally surveyed in 1991 to determine what demographic changes had occurred in the intervening period and to assess the relative wealth of households and individuals.

Methods and location

The study was carried out in a small trading town-truck stop with a population of just over 6000 in the 1991 census (Uganda Government 1991). The town is spread out along the main trans-Africa highway about 90 kilometres from Kampala, and carries traffic from Kenya and other countries in north east Africa to southern Uganda, north-west Tanzania, Rwanda and Zaire. On any one day between 50 and 80 lorries stop for periods ranging from one hour to overnight. In addition over 1000 men enter and leave the town by bicycle daily, the majority carrying agricultural produce for sale in the town. Along with established shops the town has numerous restaurants, hotels and bars catering to passing traffic. In many of these commercial sex is available. There are relatively few itinerant traders or hawkers. Health facilities consist of a government health clinic, opened in 1991, together with a number of private pharmacies and clinics.

The mean number of adults living in a household in 1991 was 3.4, most of whom were family members. In a small number of cases there was a dependent resident, usually a servant, who was not related to other members of the household. Household structures ranged from detached individual homes with several acres of gardens to single rooms in a large building, or terrace.

In 1994 the 154 households studied in 1991 were re-surveyed. Demographic changes in the adult population were obtained by a questionnaire administered to a senior adult member of the household. Basic demographic details and the relationship of all residents were obtained. In households where there had been a death current residents were asked for the cause of death; this did not involve symptomology. If residents had left the area information was obtained from neighbours or local councillors.

Death rates have been calculated per 1000 person-years of observation and standardized to the total censused adult population. For those still resident at the time of the 1994 survey, exposure has been calculated from the date when they were seen in 1991 until the start of the 1994 survey. Deaths and those leaving the area were censored midway between the two surveys.

After the re-census a wealth ranking exercise was carried out based on the Grandin method (Grandin 1986). This involves putting each household and adult occupant on a card and asking a small number of male and female local residents with a good knowledge of the community to rank them independently on a five-point scale according to their wealth. Where known, 1991 residents who were no longer present were included in this exercise. In most cases individuals within each household were given the same wealth ranking. In a few households some individuals were assigned a different category to that of the majority of household members.

Results

Changes in household residents

Of the 531 adults censused in 1991, 279 (53%) were living in the same household in 1994, 196 (37%) had moved from their 1991 place of residence and 56 (11%) had died; 46 children had reached the age of 13 years or older and 138 adults were new residents in the study

households. This gave a total number of 463 adults in the 154 selected households; a drop of 13 per cent in three years (Table 1).

Table 1
Changes in the study households over three years

	Total	%	local ^a		rural		urban	
			N ^a	%	N	%	N	%
1991 adults	531							
1994 remaining	279	53						
Emigrants	196 ^b	37	65	33	54	28	75	38
Immigrants	138		82	58	44	32	12	9
Grown-up	46							
Died	56	11						
Total in 1994	463							

^a within 1 hour walking distance

^b 2 left for Zaire

Of the 196 adults who had left their 1991 household 65 (33%) had moved within the town or within one hour's walking distance, 28 per cent had gone to a rural area, 38 per cent to Kampala or other urban centres in Uganda and two had emigrated to Zaire. Those who moved into the study households were more likely to have come from within the town (58%) or from a rural area (32%) than from urban areas (9%). The difference between the areas to which out-migrants went and from which in-migrants came was highly significant ($P < 0.0001$, 3df).

Twelve of the 154 houses censused in 1991 were unoccupied at the time of the second survey; in five of the twelve a resident had died, compared to 43 houses reporting a death among the 142 houses still occupied. One of the houses was currently being used as a school, one as a coffee store and the remainder had been left empty. In 32 households (21%) there had been a complete change of residents. In three of these the new occupants were related to those who had left. In 23 (15%) households there was no change in the adult residents; nearly all of these were rented premises. Many comparatively wealthy families, who owned houses and other assets, had a high turnover of extended family members.

Household change and HIV-1 status

HIV-1 serology was not performed in 1994, therefore the status of immigrants is unknown. In 1991 HIV-1 serostatus was available for 389 (73%) of the 531 residents. Of the 157 who were seropositive 50 per cent were still resident in the same house, 30 per cent had moved and 20 per cent had died. The corresponding figures for the 232 seronegatives were 61, 34 and 4 per cent (data not tabulated).

The age-standardized death rates in the follow-up period among the seropositives and seronegatives were 99 per 1000 person-years (95% CI 64.4 - 135.7) and 19.8 per 1000 person-years (95% CI 7.7 - 31.9). This represents an HIV-1 attributable mortality fraction of 60 per cent.

Details of causes of death as reported by those still resident are given in Table 2. It is of interest that the proportion of deaths attributed to AIDS in those from whom a blood sample was obtained, 71 per cent, is very similar to that in those who were not sampled, 67 per cent.

The standardized death rate among those who had blood samples taken was 59.4 per 1000 person-years compared to 65.9 per 1000 for those not sampled. Three deaths in seronegative persons aged 18, 28 and 44 at the time of the 1991 survey were attributed to AIDS.

Table 2
Reported cause of death

Cause of death	Serostatus			Total
	Pos	Neg	Unknown	
AIDS	26	3	10	39
Road crash	0	2	1	3
Old age	0	1	1	2
Headache	0	1	0	1
Leg wound	1	0	0	1
Malaria	0	0	1	1
Murder	0	0	1	1
Sickle cell	0	1	0	1
Tuberculosis	1	0	0	1
Sudden	1	1	0	2
Don't know	2	1	1	4
Total	31	10	15	56

Of the 39 who were reported to have died of AIDS, 26 were found to be HIV-1 positive in 1991, ten had not been tested and three were HIV-1 negative in 1991. Of the 17 adults reported to have died of other causes five had been HIV-1 positive, seven HIV-1 negative and five had not been tested. The average age of those said to have died of AIDS was 32.4 years and of those who died of other causes was 42.1 years.

Wealth

Nearly half of household members in this sample were classified as 'poor' (21%) or 'very poor' (28%). Criteria of poverty included: renting rooms, having no capital assets and being self-employed in jobs such as carrying water or employed either as a day-labourer or in government jobs such as teaching. Many poor people lived alone, with no support from kin. It was frequently mentioned that very poor men were unable to afford a wife.

There were three types of 'wealthy' families; first, old or established wealth which was based on capital assets such as extensive farm land, livestock, coffee factories or transport facilities; secondly, new, possibly transient, wealth from activities such as smuggling, from which sources income was usually dissipated within a short time; thirdly, wealth that was being built up through the accumulation of capital assets. A few families were said to be relatively well off in terms of assets but were classified as poor or medium on the basis that they had large families to support.

Household members were not always given the same wealth status. In one case the sons of a very wealthy man were classified as poor in that they had no access to their father's money and had to work as wage labourers. In others, extended family members, while being given a home and food, were excluded from productive assets.

Those who were classified as wealthy were less likely to be HIV-1 positive than were those who were poor. There was a significant inverse relationship between wealth and HIV-1 status for women but there was no such association for men (Table 3). The findings remained the same when limited to heads of households or their spouses for whom the wealth status is likely to have been more accurately assessed than for other household members.

Table 3
Wealth and HIV status in 1991

Wealth	Males			Females			Total		
	N	pos	%	N	pos	%	N	pos	%
V. rich	23	7	30	32	8	25	55	15	27
Rich	26	9	35	35	13	37	61	22	36
Medium	29	7	24	55	26	47	84	33	39
Poor	29	15	51	49	24	49	78	39	50
V. poor	52	18	35	58	30	52	110	48	44
Trend	P = 0.46			P = 0.014			P = 0.019		

There was little difference in movement and vital status according to the individual's wealth ranking (Table 4); the wealth ranking of those joining was very similar to that of those leaving the area. If, however, the analysis is limited to heads of households or their spouses, there is a significantly increasing trend in the proportion dying as wealth status decreases, from 7 per cent of 30 rich or very rich to 25 per cent of 44 classified as very poor ($P < 0.05$); reflecting, at least in part, the inverse relationship between wealth and HIV serostatus referred to above.

Table 4
Wealth and change of status between 1991 and 1994

Wealth	1991 pop		Stayers		Emigrants		Died		Immigrants
	N	%	N	%	N	%	N	%	N
V. rich	67	100	36	54	25	37	6	9	10
Rich	80	100	42	53	33	41	5	6	18
Medium	118	100	74	63	32	27	12	10	32
Poor	112	100	59	53	41	37	12	11	25
V. poor	151	100	67	44	64	43	20	13	51
Total	528	100	278	53	195	37	55	10	136

Wealth assessment was not available for 5 persons (1 stayer, 1 emigrant, 2 immigrants and 1 death)

Poor individuals were more likely to move to rural areas and wealthier individuals to urban centres. Two-thirds of poor immigrants came from within one hour's walking distance and the remainder from other rural areas. There were no very poor immigrants from urban areas. Ten immigrants were classified as very rich. Four were from one household while the other six joined families whose wealth was already established.

In only three households did an adult death result in a change of wealth category. One household was said to be 'very rich' in 1991; following the death of the head of household his wife migrated to Kampala and two sisters in their twenties remained and were classified as 'very poor' in 1994. A second household was reclassified from 'very rich' to 'rich' following the death of the wife of the head of household. In the third case the death of a 'very poor' head of household and his wife resulted in the remaining family (two sisters) being reclassified as 'rich'. In this case the two sisters took over the running of a bar and residential building.

Discussion

In main road towns such as this, where considerable numbers of people are economically dependent on passing traffic, the population will vary with the amount of through traffic.

Anecdotal evidence suggests that during the period of political unrest in Rwanda traffic through the town was reduced and that now these troubles have subsided there will be an increase in movements and prosperity. It is possible that the drop in residents in the survey households was at least partly the result of reduced economic opportunities in the town during this period.

The difference between the place of origin of immigrants and destination of emigrants suggests that this town is being used as a staging post between rural areas and larger urban centres. Those who moved to Kampala or district capitals were largely successful business people. Many of the 'very poor' emigrants returned to rural areas and others moved locally within the immediate area, often seeking wage labour.

At least one occupant was tested for HIV-1 from 148 of the 154 households surveyed in 1991. In 99 (67%) of these one or more people were seropositive. In 20 households all occupants were tested and found to be seronegative and in 29 households all those tested were seronegative but some members were not tested. The study does not permit a systematic assessment of the effects of AIDS in the town or on a household. We have no way of knowing whether before the 1991 survey those households in which all members were seronegative had previously had members who were seropositive die or emigrate. It is well known that seriously sick people often return to their natal homes before dying and this is likely to have resulted in an underestimate of the number of deaths and the mortality rate but this effect is likely to be independent of serostatus. The proportions of HIV positives and HIV negatives leaving the town are similar as are the proportions moving to a rural area.

One possible source of bias is among those from whom blood samples were not obtained, in 1991, either on account of absence or because they refused. The death rate and the proportion reported to have died of AIDS in this group is almost identical in the combined group of seropositives and seronegatives suggesting that the overall infection rate in those from whom no blood samples were taken is likely to have been similar to that among those who were sampled.

During the survey period local field staff pointed out prosperous houses the owners of which 'had died of AIDS'. It was noted that they frequently commented that 'all the rich people have died/are dying of AIDS'. It was these comments that prompted the wealth-ranking exercise. In fact poor people were as likely to have died (10%) as those who were classified as rich (7%), however women who were very poor were more likely to have been HIV-1 positive (52%) than those who were very rich (25%).

In contrast to findings from a study in a neighbouring rural area, where both men and women who were poor were more likely to be HIV-1 positive (Seeley 1994), we found no such association for men. Opinions in the urban and rural areas differed as to what constitutes wealth or poverty. One of the main criteria of poverty in rural areas is small family size resulting in reduced labour and a smaller circle of kin on whom to depend during times of crisis. In the present urban area the opposite appeared to be the case. Large families are considered to be a drain on resources; children require school fees and extended families need to be provided with housing and food to which they may contribute very little. Access to land or other assets was the most important criterion of wealth, in urban areas; cheap labour could easily be hired to work it.

In conclusion, it appears that while HIV/AIDS undoubtedly causes considerable hardship at the individual level it is difficult to demonstrate a measurable effect at the level of communities such as this. The use of small towns as temporary stopping places before moving on to more established urban centres or returning to rural areas means that there will always be a high population turnover based as much on economic as social or medical factors.

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