

## **The declining HIV seroprevalence in Uganda: what evidence?**



**Joseph K. Konde-Lule**

*Institute of Public Health, Makerere University, Kampala*

Papers presented at the ninth International Conference on AIDS and STDs in Africa, held at Kampala in December 1995, show that HIV prevalence has apparently been on a downward trend in several sectors of the population of Uganda over the past few years. This article reviews the relevant presentations.

### **Background**

Uganda is a landlocked country in East Africa astride the equator with a population of about 18 million people increasing at an annual rate of 2.5 per cent. The country is divided into 39 administrative districts, each with an average population of about half a million. The population structure is similar to that of other countries in the region where half the population is below 16 years old. Uganda is one of the countries in Africa where AIDS was recognized as a public health problem relatively early, in the mid-1980s. HIV seroprevalence among pregnant women in the capital city, Kampala, was found to be about 15 per cent in 1986 when HIV screening was first done. The prevalence levels rose steadily until 1989-1990 when levels in various prenatal clinics in Kampala city stabilized between 25 and 30 per cent. Reports of falling HIV prevalence rates in 1995 were therefore received as very good news in a society where virtually everyone has in some way been affected by the epidemic and where health workers, public leaders and the general public have all been severely demoralized by the epidemic.

### **Sources of available evidence**

The downward trend in HIV seroprevalence was reported from the following sources: studies of HIV among pregnant women in Mulago hospital, which is the main referral hospital in Kampala; sentinel surveillance data from antenatal clinics around the country; community-based studies of HIV in Masaka and Rakai districts; and persons attending voluntary HIV screening centres.

### ***Studies among pregnant women in Mulago hospital, Kampala***

Information on pregnant women in Mulago hospital is obtained from a presentation made by the Human Reproduction Research Unit, Department of Obstetrics and Gynaecology, Makerere University, Kampala (Bagenda et al. 1995). This paper had two sets of data. The first data set showed HIV seroprevalence figures from persons attending various prenatal clinics in Kampala during 1993, and demonstrated the variation of HIV infection rates by age and other socio-demographic variables. The overall HIV prevalence among all women attending eleven prenatal clinics in the city in 1993 was 20.5 per cent (95% CI 18%-23.1%).

The second set of data was obtained from the Mulago hospital prenatal clinic alone and it compared the 1993 HIV-1 prevalence figures with earlier, 1989 screening data from the same clinic. The data show that during the 1989 screening HIV seroprevalence among pregnant women attending this unit was 28.1 per cent (95% CI 26.6%-29.6%). In contrast, during 1993, the HIV seroprevalence among pregnant women attending the clinic was 16.2 per cent (95% CI 12.2%-20.8%). The age distribution of HIV prevalence in 1993 was similar to that in 1989, with pregnant women aged 20-22 years having the highest HIV prevalence rate. Levels in 1989 and 1993 are shown in Table 1.

**Table 1**  
**HIV-1 prevalence among pregnant women attending Mulago hospital prenatal clinic by age group, 1989 and 1993**

Age group	% HIV-positive (95% CI)			
	1989-90		1993	
Less than 17	23.5	20.3-27.1	8.2	2.3-19.6
17-19	32.3	29.4-35.2	12.6	6.9-20.6
20-22	37.9	33.6-42.2	29.7	15.9-47.0
23-25	27.4	23.0-31.8	26.9	11.6-47.8
26-28	25.4	21.2-29.6	20.8	7.1-42.1
29-31	24.8	20.0-29.6	14.7	4.9-31.0
32-34	21.8	15.5-28.1	12.5	1.5-38.3
35-37	16.3	9.9-22.7	11.1	0.3-48.2
38+	14.1	6.7-21.5	16.7	0.4-64.1
Total	28.1	26.6-29.6	16.2	12.2-20.8

There was a decline in HIV prevalence in all age groups except in persons aged 38 years and above. The decline, however, was only statistically significant in the youngest age groups below 17 and 17-19 years of age and in the overall rate. The presenters concluded that there was a significant decline in the HIV prevalence rate of persons attending the Mulago hospital prenatal clinic and that the biggest decline occurred in the youngest age groups.

### **Sentinel surveillance data**

The HIV trends in sentinel surveillance sites were present in a paper from the STD/AIDS control program of the Uganda Ministry of Health in collaboration with the WHO/GPA (Asiimwe-Okiror et al. 1995). The team also provided the following background information on sentinel surveillance in Uganda.

Sentinel surveillance for HIV was instituted by the Ministry of Health AIDS Control Programme in 1989 with the aim of monitoring HIV prevalence trends in Uganda. In 1992 it was observed that HIV prevalence rates at some urban sites were declining. In view of this the surveillance unit planned an evaluation of the HIV sentinel surveillance system in 1994 to determine whether the procedures used still adhered to the WHO protocol.

The evaluation showed that the procedures which were used in the surveillance system were still in line with the recommended WHO protocol at all the sites. The results from all six sites showed a statistically significant decline in HIV prevalence rates. HIV infection rates between 1991 and 1994 at the sentinel surveillance sites which were evaluated are shown in Table 2; there are 20 surveillance sites in the country but only six were evaluated.

The first two sites, Nsambya and Rubaga, are situated in different parts of Kampala city. All sites show a declining trend in HIV prevalence rates between 1992 and 1994. The

presenters concluded that the decline of HIV prevalence rates is real, although the rates are still high.

**Table 2**  
**HIV infection rates (%) among pregnant women attending clinics at sentinel surveillance sites in Uganda 1991-1994**

Site	HIV infection rate (%)			
	1991	1992	1993	1994
Nsambya	27.8	29.5	26.6	21.8
Rubaga	27.3	29.4	24.4	16.5
Mbarara	24.4	29.4	18.1	17.3
Jinja	22.0	19.9	16.7	16.3
Tororo	12.8	13.2	11.3	10.2
Mbale	12.0	14.8	8.7	10.2

### ***Community-based study of HIV in Masaka district***

Data from the Masaka cohort were presented by researchers from a collaboration of the Medical Research Council (UK) program on AIDS in Uganda and the Uganda Virus Research Institute (Kengeya-Kayondo et al. 1995). The presentation had details of the dynamics of HIV-1 and associated mortality among adults. The study is conducted in a rural area of Masaka district, in 15 neighbouring villages with a total population of about 10,000. Since 1989 all consenting adults aged 13 years and over resident in the villages, about 4,000, have been kept under surveillance through annual demographic and serological surveys.

#### ***Results***

1. Overall adult HIV-1 seroprevalence rates have remained stable at about eight per cent during the course of five annual screenings (rounds).
2. Prevalence rates in young men 13-24 years declined significantly with the figures from the five rounds being 3.4, 3.6, 2.3, 1.6 and 1 per cent. The trend is significant ( $p < 0.001$ ).
3. Prevalence rates in young women 13-24 also declined but the trend was not significant. The figures in the five rounds were 9.9, 8.2, 7.8, 8.1 and 7.3 per cent.
4. Incidence rates do not show a clear trend but are around 8 per 1,000 person-years. The incidence figures in the periods between the five rounds are 8.1, 6.8, 6.0, 9.4 cases per 1,000 person-years.
5. Death rates overall, calculated per 1,000 person-years, show a rising trend in the four one-year periods between the five rounds. The figures are 16.4, 19.5, 22.1 and 24.3 deaths per 1,000 person-years.

The researchers concluded that the decline in seroprevalence in young people is encouraging, although there is little change in other indicators.

### ***Community-based study in Rakai district***

Data from the Rakai district cohort were presented by researchers from Rakai Project which is a long-term collaboration between Makerere University (Uganda), Uganda Ministry of Health, Columbia University (USA), Johns Hopkins University (USA) and the Uganda Virus Research Institute in Entebbe, Uganda where the project is based (Serwadda et al. 1995).

The purpose of the presentation was to assess the trends of HIV incidence and prevalence in rural Rakai district, Uganda between 1990 and 1992. Data were obtained from 1945 households in 31 randomly selected clusters.

### *Results*

**1. Prevalence.** Adult prevalence declined in the general cohort from 23.4 per cent to 20.9 per cent between 1990 and 1992 ( $p < 0.04$ ). The decline was most pronounced in the main road trading centres where prevalence fell from 37.8 per cent in 1990 to 31.1 per cent in 1992 ( $p < 0.02$ ). There was less change in trading villages (25.7% to 22.7%) and in rural villages (13.6% to 13.1%), both not significant.

**2. HIV incidence.** Among persons 15-59 incidence declined in main road trading centres and trading villages from 3.3 per 100 person-years of observation in 1990 to 2.1 per 100 in 1992; but this was not significant. In agricultural villages incidence increased from 1.1 to 1.9 per 100 person-years (not significant).

**3. Mortality.** Mortality numbers of HIV-positive persons were higher than incidence numbers in the two periods of follow-up, 1990-1991 and 1991-1992.

**4. Persons 13-24 years old.** In this age group, combining both sexes, prevalence declined from 17.3 per cent in 1990 to 15.7 per cent in 1991 and to 12.6 per cent in 1992 ( $p < 0.001$ ). The trends were similar in both sexes although prevalence was higher in females. Incidence rates, however, remained constant in both sexes, being 1.4 per cent among males in both follow-up years, while in females they were 3 per cent in the first and 3.1 per cent in the second follow-up year. Significant declines in prevalence among the young are not associated with any change in HIV incidence: serial prevalence measures may be misleading indicators.

### *Conclusions*

HIV prevalence declined significantly in both open and closed cohorts in Rakai district; HIV incidence did not decline in the cohort. Mortality among HIV-infected persons exceeded HIV incidence in each follow-up year and influenced the observed secular decline of HIV prevalence. Surveillance of the epidemic based on HIV prevalence figures alone can be misleading in the absence of information on the balance between incidence, mortality, migration and compliance.

### ***Persons attending voluntary HIV testing in Uganda towns***

Voluntary testing for HIV infection is conducted by a local private organization, the AIDS Information Centre, which submitted no abstract or paper concerning HIV trends to the main conference, but during the satellite meeting some data were presented from their records (AIC 1995). The centre started to offer HIV screening services for a modest fee in Kampala in 1990. Demand grew rapidly and three other branches were opened in provincial towns. The people seeking the screening service commonly include those who suspect themselves to be infected with HIV, or those planning to get married. The service is currently offered to over 30,000 people every year.

The data presented showed HIV prevalence for all the persons screened in each year. Beginning in 1990 the annual HIV prevalence rates for all persons who attended the voluntary screening sites were 29, 28, 28 and 22 per cent, and 23 per cent in 1994. There was a fall in HIV prevalence especially after 1992. The AIDS Information Centre shares its data with any interested groups but goes to great lengths to explain that the data are not generalizable to any other population since the persons who were screened are self-selected.

The observed fall in HIV prevalence rates can be explained in many ways, including that high-risk persons sought HIV screening earlier than others, and that more persons from rural areas may be seeking HIV screening: their infection rates are known to be lower than those of people from the towns.

Whereas the correct explanations probably include these and many others, it is notable that there was a big drop in HIV prevalence after 1992, a trend which is not very different from that observed in the other 'properly' designed studies. There was also a decline in HIV seroprevalence among the youth aged 15-19 years. In this age group the prevalence figures are available for three consecutive years beginning with 1992. Among males the prevalence rate was 4.0 per cent in 1992, 3.2 per cent in 1993 and 3.1 per cent in 1994. Among females the corresponding rates are 12, 12.2 and 10 per cent.

## **Discussion**

All the five presentations under review report declining trends in HIV prevalence in the populations which were studied. Two critical questions need to be answered: whether these findings represent what is happening in the general population, and what the explanation is for the downward trend in HIV seroprevalence. Of particular interest is whether the downward trend is the result of a declining incidence rate of HIV which has in turn been brought about by changes in behaviour.

Whereas most of the data presented come from urban areas, about 90 per cent of the Uganda population live in rural areas. On the basis of the presentations which were made during the conference it appears that the main factors which are affecting HIV seroprevalence trends include HIV incidence, HIV-related mortality and demographic changes. The role of each of these is now discussed in light of the available evidence.

### ***Incidence***

The very high prevalence rates observed in urban areas indicate that at some stage in the past, HIV incidence rates must have been higher than those currently prevailing. The available incidence figures were all measured at different times after 1990. Many workers in the field agree that the current levels of incidence cannot sustain such high prevalence rates as are seen in Kampala and other urban areas in Uganda. There is therefore some general consensus that although HIV incidence levels must have declined, the main decline probably occurred before the studies of HIV incidence. No one knows what the incidence rate in Kampala, Rakai or any other part of Uganda was in the period 1985-1990. The community-based studies in Masaka and Rakai show stable incidence rates in the period 1990-1993. If there has been any big decline in incidence, then it is very likely to have predated this period.

The research team which presented the sentinel surveillance data worked on the assumption that the downward trend in HIV sero-prevalence was the result of concurrently declining incidence rates. They developed a model which attempted to explain the observed seroprevalence trends in terms of reduced incidence rates. Unfortunately there has not been any measure of HIV incidence in Kampala or in any of the sentinel surveillance sites which would validate the assumption. If the incidence pattern which is reported from Rakai and Masaka is generally similar to that which obtains in Kampala, or in the other areas where sentinel sites are based, then we may have to search for another explanation of the falling HIV seroprevalence levels than concurrently declining HIV incidence rates.

### **Mortality**

In the community-based studies which measured HIV incidence and HIV-related mortality, it is quite clear that the numbers of HIV-positive persons dying each year far exceed the new (incident) HIV infections during the same periods (Kengeya-Kayondo et al.; Serwadda et al.) The researchers from the Rakai cohort felt that excess mortality among HIV-positive persons could almost entirely explain the decline in HIV prevalence (Serwadda et al. 1995).

HIV-related mortality in Kampala or in any other urban areas in Uganda has not been measured, but it is known to be quite high. The extent to which this is affecting HIV seroprevalence is not known, but if findings from Masaka and Rakai are anything to go by, then it is likely to be substantial. The HIV epidemic in Uganda started in urban areas and later spread to rural areas, a process which is probably still continuing.

The districts of Masaka and Rakai are some of the few rural districts in Uganda where HIV infection happened to spread fairly early. The epidemic in these two districts has therefore 'matured'. This is reflected in the high HIV-related mortality figures and stable or declining HIV prevalence rates. In areas where HIV infection is newly introduced there is very little HIV-related mortality and prevalence figures can only rise even when incidence rates are very low. A 'young' HIV epidemic is little influenced by mortality, while a 'mature' one, which is the type of epidemic in many of the areas where the studies under review are based, is heavily affected by mortality. At this stage, the HIV epidemic in most parts of Uganda, including the rural areas, is becoming mature and the situation may be getting generally similar to that in the study area.

### **Demographic transition**

This term is used in reference to the continuous movement of young persons below 13 years of age into the 'adult' category of persons 13 years old and above. Many studies have shown that persons aged 5-15 years in the African region are essentially free of HIV infection, and some workers have labelled this age group 'window of hope'. If with time these people move into the 'adult' category while retaining their HIV-negative status, then they could conceivably be in a position to pull down the general HIV seroprevalence rate. This appears to have happened in some parts of Uganda. During the period 1986-1990, persons in the age group 15-24 were driving the epidemic, and many surveys showed that this age-group had the highest HIV seroprevalence rates. This was particularly true for females. The individuals who were in this age group have now moved into the older age groups. The younger people who replaced them appear to have largely retained their HIV-negative status. This may be a major factor in the decline of HIV prevalence. The drastic fall in HIV prevalence among those aged 13-24 has been reflected in all studies which have HIV infection rates by age (Bagenda et al. 1995; Kengeya-Kayondo et al. 1995; Serwadda et al. 1995; AIC 1995). In the Mulago hospital data, the decline in seroprevalence among the youth below 20 years was the only statistically significant age-specific decline.

The fall in HIV prevalence in persons aged 13-24 years probably reflects behaviour change, and it may reflect the impact of the various intervention measures. The effect is easier to demonstrate among young people in this age group because they join the adult group when they are uninfected. Safe behaviour is therefore easily translated into remaining HIV-negative. The older age groups may have had a change in behaviour but since they already have high rates of HIV seroprevalence, behaviour changes among them take much longer to be reflected in lower HIV seroprevalence rates.

HIV seroprevalence in the Mulago hospital prenatal clinic during 1993 was found to be 16.2 per cent, while the prevalence rate in all eleven clinics which were studied was 20.5 per

cent. One of the possible explanations for the lower rate in Mulago hospital is that being a referral hospital, Mulago gets many young pregnant women. Small units routinely refer first pregnancies (primigravidae) to the hospital, and this gives the referral hospital a higher proportion of pregnant women below 20 years old. The large numbers of these young mothers probably pulled down the overall HIV seroprevalence at the unit. If this should be the real explanation for the lower HIV prevalence rate in Mulago hospital when compared to all the other prenatal clinics which were studied in the city, then the youth factor may be playing a very significant role in the downward trend of HIV seroprevalence, not just in Mulago hospital pregnant women, but in many other parts of the country. Both hospital-based and community-based data appear to give this impression.

## **Conclusions**

There appears to be a real decline in HIV seroprevalence in some population groups in Uganda. The explanations are many and they vary between population groups. These include a very high HIV-related mortality, demographic changes with many young persons joining the adult category while retaining their HIV-negative status, and probably a lower HIV incidence rate than that prevailing before 1990.

## **References**

### **Unpublished data**

AIDS Information Centre (AIC). 1995. Medical records. PO Box 10446, Kampala.

### **Papers presented at Ninth International Conference on AIDS and STD in Africa, Kampala, 10-14 December**

Asimwe-Okiror, G., J. Musinguzi, G. Tembo et al. 1995. Declining trends in HIV infection in urban areas in Uganda. Abstract WeC206.

Bagenda, D., F. Mmiro, F. Mirembe, C. Nakabito, D. Mugenyi and L. Mukasa. 1995. HIV-1 prevalence rates in women attending antenatal clinics in Kampala, Uganda. Abstract MoC016.

Kengeya-Kayondo, J.F., A.J. Nunn, A. Kamali and D.W. Mulder. 1995. Trends in HIV-1 incidence, prevalence and associated mortality in a rural Ugandan population: four years of follow-up. Abstract WeC202.

Serwadda, D., M.J. Wawer, N.K. Sewankambo et al. 1995. Trends in HIV incidence and prevalence in Rakai district, Uganda. Abstract MoC085.