

# HIV infection in Bophuthatswana

## Epidemiological surveillance 1987 - 1989

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**Abstract** To assess the degree of HIV endemicity and the extent of its penetration into the general population in Bophuthatswana, a sentinel network of all the 11 hospitals and 3 prisons in the country was established in 1987. In addition, a population seroprevalence study was conducted in 1989. Between 5 January 1987 and 31 December 1989, serum specimens from 19941 persons of all ages were tested for HIV. Overall, 34 subjects were found to be seropositive (prevalence 0,17%). Between 1 April and 31 August 1989, an HIV seroprevalence survey in a stratified multistage random sample of the resident population aged 15 years or older was also conducted. In this study, 2 111 persons were sampled but HIV antibody tests were done on 1553 only. A total of 12 serum specimens (0,8%) were reactive for anti-HIV by both Abbott EIA and Serodia HIV kits. However, in only 2 of these 12 sera was Western blot analysis positive. The overall prevalence of HIV infection in this study was 2/1 553 participants (0,13%). These results demonstrate not only that HIV infection and the potential for its transmission are present in the Republic of Bophuthatswana but that they call for energetic and well-targeted control programmes.

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In 1987, when the Bophuthatswana government launched a national programme on AIDS, very little was known about HIV infection and AIDS in the country. However, the health authorities were aware of the report of possible endemicity of HIV in central Africa before its recognition in the West.<sup>1-3</sup> Such reports suggested the possibility that HIV infection might also occur in other parts of Africa where it had not as yet been detected. This assumption prompted the epidemiological unit to study the degree of HIV endemicity as well as the extent of its penetration, if any, into the Republic of Bophuthatswana in 1987 - 1989.

The population of Bophuthatswana (about 1,9 million people) lives in seven geographically defined regions. About 85% of the population live in the rural area, and 68 - 75% of males are migrant workers.<sup>4,5</sup> In 1986 - 1987, the country had 11 hospitals, 152 static clinics and 3 prisons<sup>7,8</sup> and was divided into 5 health zones. Each zone was provided with an Abbott quantum machine for the screening of HIV infection. In January 1987, an epidemiological surveillance of HIV infection through a sentinel network of 11 hospitals and 3 prisons was initiated. In addition, an HIV seroprevalence survey in a stratified multistage random sample of the resident population<sup>9,10</sup> aged 15 years or older was also conducted between 1 April and 31 August 1989. To the author's knowledge these represent the first studies of the preva-

lence of HIV infection in the Republic of Bophuthatswana.

### Materials and methods

Between 5 January 1987 and 31 December 1989, blood specimens from prisoners, blood bank services, hospitalised patients and patients attending the medical, antenatal, family planning and sexually transmitted diseases clinics<sup>11,12</sup> at all the hospitals were collected to monitor the endemicity and penetration of HIV infection in Bophuthatswana. The 152 static clinics were excluded because of budgetary constraints, the epidemiological knowledge of HIV infection in the country at the time, and the fact that a large number of patients with a variety of diseases prefer to attend the outpatient department clinics in the hospitals because of the availability of facilities and the possibility of immediate admission. The criteria for inclusion into the network were as follows:

1. For hospitalised patients, the WHO clinical diagnostic criteria to identify African cases of AIDS<sup>13,14</sup> were used and any patient fitting these criteria, irrespective of age, was eligible. Any abnormal increase of the common and/or uncommon clinical features of the known diseases (tuberculosis, gastro-enteritis, pneumonia, any type of cancer, psychiatric disorders and malnutrition) was also included.

2. For the hospital outpatient clinics, all patients aged between 15 and 49 years (unmarried, divorced, widowed and/or cohabiting) attending the family planning and sexually transmitted diseases clinics were eligible. At the time, married women were excluded on the assumption that they were at lower risk. Both married and unmarried women attending antenatal clinics were eligible.

3. All new prisoners (aged 15 years or older) were eligible. Using a questionnaire designed to assess possible exposure to HIV infection and associated risk factors, information regarding demographic data, blood transfusion history, travelling from/to HIV endemic countries, history of imprisonment in the past 5 years, symptoms and signs of AIDS, lifestyle (number of sexual partners, heterosexual, homosexual, etc.) was collected for infected persons only. The questionnaires were filled in by either the physicians or the nursing clinicians. For verification purposes, the laboratories were also requested to report all the positive results separately to the epidemiological unit. For the population seroprevalence study, a proportional, stratified multistage probability sample design was used. Thirty-nine rural and 18 urban localities were then randomly selected and, in each selected site, the first household to be surveyed was determined from the centre of the chosen site by a randomly selected compass direction. Any person aged 15 years or more in that household and 19 subsequent households was enrolled. From each health zone, an immunisation team consisting of 2 professional nurses, 2 enrolled nurses, 3 nursing assistants, a technical assistant and a clerk was trained to use identical survey methods consisting of administering a questionnaire and collecting a 10 ml sample of intravenous blood from the participants.

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HIV antibody determinations were made using Abbott Recombinant HIV-1 enzyme immunoassay (EIA) and Serodia HIV particle agglutination tests. A result was considered positive if these 2 tests and 1 Western blot assay were positive for antibodies to HIV-1. Western blot analysis was performed by the South African Institute for Medical Research (SAIMR) in Johannesburg using an in-house Western blot antigen supplied by Organon Technika. Quality control was obtained by constant monitoring of results with Du Pont Western blot strips and participation in reveal quality control programmes (Centers for Disease Control (CDC) and College of American Pathologists (CAP)). HIV antibody-positive WBs were based on the criteria used by the CDC,<sup>15</sup> namely the presence of any two of bands p24, gp41 and gp120/gp160. All the screening tests in Bophuthatswana were standardised and performed under quality control at the Bophelong Hospital laboratory. Informed consent was obtained from the participants. Those found to be seropositive were counselled by teams based in their district hospitals. Confidence intervals for prevalence estimates were calculated based on the Poisson distribution,<sup>16,17</sup> and to permit statistical inferences a Z-test concerning the difference between two proportions was used.

**Results**

During the 36-month period between 5 January 1987 and 31 December 1989, a total of 19 941 blood specimens were collected and tested for HIV infection in the sentinel network system. Over 70% of the samples were from women (Table I). The mean age of the men was slightly lower than that of the women.

**TABLE I.**  
**HIV surveillance — number of participants and mean age according to sex**

	No.	%	Mean age (yrs)
Men	5 731	28,7	33
Women	14 210	71,3	35
Total	19 941	100,0	

Thirty-four specimens were positive for HIV antibodies (prevalence 0,17%) (95% confidence interval (CI) 0,12-0,24) (Table II). These figures exclude 4 cases (3 of HIV infection and 1 of AIDS) reported by Ga-Rankuwa Hospital in 1987 and 1988.

The seroprevalence rate was higher for women (25/14 210; 0,18%) than for men (9/5 731; 0,16%) (P < 0,05). HIV seropositivity rates differed markedly according to clinic category (Table II). Of the 34 seropositive subjects 21 (61,8%) were single, 6 (17,6%) were married, 2 (5,9%) were divorced and 1 (2,9%) was cohabiting; in 4 cases (11,8%) marital status was unspecified. With the exception of a 4½-month-old baby girl, all the seropositive subjects had acquired their infection through heterosexual activities; whether the antibodies detected in the baby were passively or actively acquired will be ascertained when she is 2 years old. Nine per cent of the seropositive subjects had resided in central Africa; the remainder had not travelled outside the RSA in the past 5 years. Completed forms returned by both clinicians and laboratories were available for 25 of the 34 seropositive subjects (73,5%), and the remaining 26,5% were reported by the laboratories alone. Of the 25 seropositive subjects with completed forms, 11 (44,0%) met the case definition criteria for AIDS and 1 (4,0%) those for ARC, as defined by the CDC and the

**TABLE II.**  
**Prevalence (/100 subjects tested) of HIV according to clinic and year of test**

	Inpatient		Medical OPD		STD clinic		ANC		Blood bank		FP		Prison		Total		95% CI
	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	No. tested	No. positive	
1987	500	2	500	2	852	0	882	0	723	0	1 000	0	975	0	5 432	4	0,07 (0,02-0,19)
1988	500	2	500	4	852	2	906	0	1 242	2	1 000	0	1 120	0	6 120	10	0,16 (0,08-0,29)
1989	500	6	500	6	1 310	1	1 282	6	1 716	1	1 300	0	1 781	0	8 389	20	0,24 (0,15-0,37)
Total	1 500	10	1 500	12	3 014	3	3 070	6	3 681	3	3 300	0	3 876	0	19 941	34	0,17 (0,12-0,24)

OPD = outpatient department; STD = sexually transmitted diseases; ANC = antenatal clinic; FP = family planning.

World Health Organisation.<sup>18,19</sup> At the end of 1989, the case fatality rate for AIDS was 63,6% (7 out of 11). The clinical features of the illness among the hospitalised patients are shown in Table III.

TABLE III.  
Clinical features of AIDS in Bophuthatswana patients

Clinical features	No. positive/No. examined	%
Symptoms		
Cough	7/11	63,6
Loss of appetite	5/11	45,4
Confusion	2/11	18,2
Signs		
Diarrhoea	9/11	81,8
Loss of weight	9/11	81,8
Fever	3/11	27,3
Ulcers in and/or around the mouth	3/11	27,3

Of the 2111 persons sampled for the seroprevalence study, 284 (13,4%) refused to donate blood. A total of 1827 blood specimens was collected, and of these 77 (4,2%) were lost and a further 197 (10,8%) were haemolysed and hence unsuitable for HIV testing. Thus, HIV antibody determinations were made on 1553 sera only. Age and sex distributions for the sample are shown in Table IV. The mean ages for males and females were 38 years and 37,8 years respectively (range 15 - 94 years). Female participants predominated, comprising 72,7% of the sample. A total of 12 specimens (0,8%) was reactive for anti-HIV on testing with both Abbott EIA and Serodia HIV kits. However, in only 2 of these 12 sera was Western blot analysis positive (seroprevalence 0,13%) (95% CI 0,02 - 0,48). These subjects were a man and his wife, aged 34 and 24 years respectively, both from a rural area. The prevalence was higher in males (1/400) than in females (1/153) (0,25% v. 0,09%;  $P < 0,0001$ ).

Among the 12 doubly EIA-positive sera, the SAIMR reported 2 further indeterminate Western blot results.

## Discussion

The results of these studies demonstrate that HIV infection and the potential for its transmission are present in Bophuthatswana. Although the seroprevalence in the sentinel network was slightly higher than that in the population-based study (0,17% v. 0,13%), both rates were lower than rates in other parts of Africa and the Caribbean.<sup>20-22</sup> The groups surveyed through the sentinel network were known high-risk groups, which may account for some of the difference. Such a low seropositivity rate, combined with absence of HIV infection in people aged 50 years and over, suggests that penetration

of HIV infection into the general population has just started and/or that the traditional values and norms of sexual behaviour in this age-group have resisted the recent wave of 'modernisation'. There was a slow but continuous increase of HIV infection during the period under review. As the prevalence increases the general population becomes at greater risk, primarily through heterosexual transmission. The results of these studies are consistent with those of most surveys conducted in South Africa,<sup>23-25</sup> indicating that the HIV epidemic in southern Africa is still at its beginning and that it is still predominantly urban, with a decreasing gradient from major urban centres to the small urban and rural localities. On the basis of surveillance data, HIV antibodies were not found in prisoners and people attending family planning clinics. The data suggest that being a sexual partner of an HIV-infected person was a major risk factor associated with HIV infection. Since the average number of sexual partners per person (3,5, range 2 - 9) was only available for the seropositive subjects, number of partners could not be assessed as an associated risk factor for HIV infection. These studies also show that the people of Bophuthatswana have fully endorsed the health policy of contact tracing by providing freely the identity and address of sexual partners for confidential counselling.

Certain limitations of the results should be noted. Firstly, the sample presented in the sentinel network was not representative of the entire population. None the less, the findings can still be used as one source to estimate the degree of HIV endemicity and penetration in defined subgroups of the population.<sup>26</sup> Secondly, although all laboratory procedures were standardised and performed under quality control at Bophelong Hospital in Bophuthatswana and the SAIMR in Johannesburg, technological limitations with regard to specimens tested while in a window period could also have affected the results. Furthermore, the unusual fall-off in Western blot-confirmed positivity, to only 2 of the 12 doubly EIA-positive specimens, could be due to factors such as specimens quoted as positive being borderline cases and/or errors made in the Bophelong laboratory (high false-positive results were not uncommon in many laboratories initially). It is also worth reporting that of the 12 doubly EIA-positive sera 2 had indeterminate Western blot results and were labelled indeterminate, i.e. the p24 band only was present. Taking into account the definition of a positive result used in this study and the fact that the sampling design did not make provision for action or classification in the case of indeterminate results, these two cases were considered negative. Thirdly, the low participation of men in both studies, due to the migrant labour system, might have accounted in part for the lower seropositivity rate. An attempt to assess the theory that HIV seropositivity would be higher in male migrant workers than in male workers at home was indirectly made using the maternity reports from all hospitals<sup>27,28</sup> (1987 - 1989). In effect, every year in November - December there is an influx of migrant workers who travel to Bophuthatswana to spend the festive season with their families. This invariably results in an increase in the number of deliveries during the following September - October. During the period under review, this increase was not accompanied by a substantial increase in the rate of HIV infection in newborns and/or women attending the antenatal clinics in the hospitals.

Present indications are that HIV infection rates in Bophuthatswana will continue to increase unless imaginative intervention programmes are initiated immediately. A potentially useful means of preventing HIV infection from spreading in the sexually active subgroups of the general population is to promote the use

TABLE IV.  
Sex and age groups

Age groups (yrs)	Male	Female	Both sexes	%
15 - 24	178	402	580	31,8
25 - 34	85	307	392	21,5
35 - 44	65	190	255	13,9
45 - 54	64	182	246	13,5
55 - 64	52	146	198	10,8
65 - 74	42	85	127	6,9
75 - 84	10	14	24	1,3
85 - 94	2	3	5	0,3
Total	498	1 329	1 827	100,0

of condoms.<sup>29-31</sup> This should be initiated together with the introduction of sex education in the primary and secondary schools. Since the participation of the hospital patients in the HIV sentinel network was excellent, there is a growing interest in extending HIV screening to all hospitalised patients and attenders at antenatal and sexually transmitted diseases clinics as a public health measure. The benefits of such a programme have been discussed by others.<sup>32,33</sup> However, any suggested programmes must not only be evaluated with regard to their conformity with cultural and social values and economic costs<sup>34</sup> but should be conducted in such a way that people are protected against discrimination and confidentiality is promoted.

At the time of submitting this paper (June 1992) a cumulative total of 275 HIV/AIDS cases from 30 454 persons tested had been recorded through the sentinel network system in Bophuthatswana.

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