HIV/AIDS prevalence among South African health workers

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Introduction. Studies on HIV prevalence among health workers usually focus on occupational exposure to HIV. Little is known about HIV prevalence in this group. However, it is expected that HIV prevalence among health workers will reflect prevalence in their society.

Objective. To determine HIV prevalence among South African health workers.

Method. A stratified cluster sample was drawn of 5% of health facilities in South Africa (N = 222) representative of the public and private health sectors in South Africa. The sample was designed to obtain a nationwide representative sample of medical professionals and non-professional health workers. A subsample comprising health workers in four provinces was tested for HIV status. The Orasure HIV-1 device in combination with the Vironostika HIV UNI-Form II plus O enzyme-linked immunosorbent assay (ELISA) kits were used to collect oral fluid specimens for HIV testing.

Results. Based on a sample of 721 health workers and a response rate of 82.5% (or 595 respondents), the study found that an estimated 15.7% (95% confidence interval (CI): 12.2 - 19.9%) of health workers employed in the public and private health facilities located in four South African provinces, were living with HIV/AIDS in 2002. Among younger health workers, the risk is much higher. This group (aged 18 - 35 years) had an estimated HIV prevalence of 20% (95% CI: 14.1 - 27.6%). Non-professionals had an HIV prevalence of 20.3%, while professionals had a prevalence of 13.7%.

Conclusion. HIV prevalence among health workers in South Africa is high; this calls for the introduction of antiretroviral programmes targeting them. In addition, there is a need for the development of new policy regarding placement of infected health workers in tuberculosis (TB) wards, coupled with vigorous human resource planning to replace the health workers likely to die from AIDS. Infection control procedures also need to be reviewed.

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As of the year 2000, there were no reported studies investigating the prevalence of HIV among health workers. The only reported studies available estimated AIDS mortality among health workers. One such study was conducted by the US Centers for Disease Control and Prevention (CDC),[1] which reported that between the time the epidemic started and December 2002, 5.1% (23 951/469 850) of all reported AIDS cases for whom occupational information was available, had worked in the health sector.

Most of the studies that have reported HIV/AIDS mortality among health workers are based on indirect estimates of HIV/AIDS. In Malawi,[2] researchers reported that in 1999 2% of health care workers died of AIDS (60 deaths out of 2 979). Among female health care workers, the highest death rates were among those aged 25 - 34 years. The cause of death was reported to be tuberculosis (TB) in 47% of deaths, chronic illness in 45% and acute illness in the remainder. Chronic illness was thought to be due to AIDS, with TB being the most common cause of death. The study did not measure AIDS mortality directly.

In a hospital study of deaths of female nurses in Zambia, Buve *et al.*[3] estimated that the HIV/AIDS mortality rate was 2 in every 1 000 in 1980 - 1985, increasing to 7.4 in 1986 - 1988 and 26.7 in 1989 - 1991.

Several researchers and organisations have attempted to use the limited data available to raise the issue of the impact of HIV/AIDS on the supply and demand of health workers. These studies have alluded to AIDS-attributable morbidity and mortality among health workers as being a major contributor to health worker attrition, and therefore the need to plan the development of human resources in the health sector.[4-7]

Given that health workers are critical in the management of HIV/AIDS patients, it is important that planners have information on health workers' serostatus. Such information will be useful in planning the supply of health providers, especially as increasing numbers of people infected in the 1990s are becoming ill due to AIDS and needing care. For this reason the objective of this study was to determine HIV prevalence among South African health workers employed in the public and private sectors at primary health care centres, and district,

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regional and tertiary hospitals.

Method

The prevalence of HIV/AIDS among health workers was determined as part of a much larger study on the impact of HIV/AIDS on the South African health sector.[8] The five components of this study were: (*i*) substudy no. 1 — HIV/AIDS prevalence among South African health workers and ambulatory and hospitalised patients; (*ii*) substudy no. 2 — the impact of HIV/AIDS on health workers employed in the health sector; (*iii*) substudy no. 3 — the impact of HIV/AIDS on health services; (*iv*) substudy no. 4 — the total cost of administering prophylaxis therapy to pregnant women and newborns; and (*v*) substudy no. 5 — AIDS-attributable mortality among South African health workers.

This article reports on HIV/AIDS prevalence among 721 health workers located in four provinces of South Africa (Free State, KwaZulu-Natal, Mpumalanga, North West). Data for substudies 1 - 3 were collected simultaneously from the same sample of health facilities.

Sampling frames

A complex multistage probability sample of 5% (N = 222) of all health facilities representative of public and private health facilities was drawn from the 1996 South African National Department of Health's database (Fig. 1). The aim was to obtain a nationwide representative sample of health facilities and health workers who treated patients at those facilities. Health workers comprised medical professionals, i.e. specialists and medical practitioners, nurses on registers and rolls, other professionals such as social workers and physiotherapists, and non-professional health workers such as ward attendants and cleaners. Two separate sampling frames were used to obtain the sample of 222 health facilities — one consisted of all public clinics in the country (excluding mobile, satellite, part-time and specialised clinics), and the other of all hospitals (public and private) and private clinics. In a second step a random sample was drawn of 2 000 health workers employed at these facilities.

The process of sampling health workers is described using a flow chart (Fig. 2).

Data collection

Fieldwork teams consisting of a fieldwork co-ordinator and four fieldworkers conducted fieldwork over a period of 2 months across South Africa. Professional nurses were appointed as fieldworkers and were trained in ethics, the interview process, and the taking of oral fluid from health workers using the Orasure specimen collection device during 2-day training sessions presented in the major centres. Information was collected during

Realised sample of health facilities

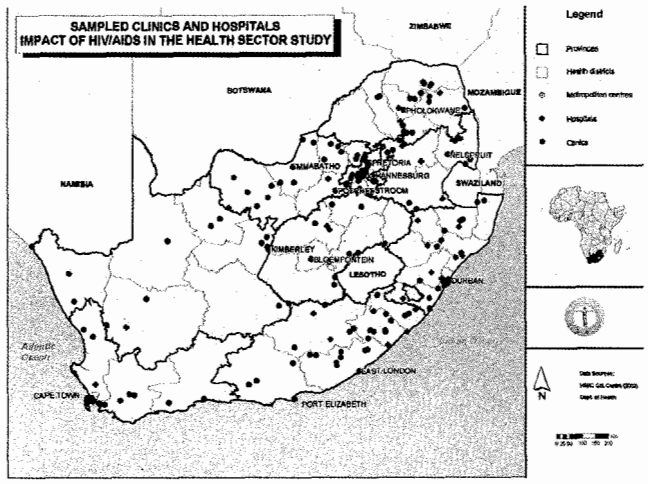

Fig. 1. Selected health facilities in South Africa

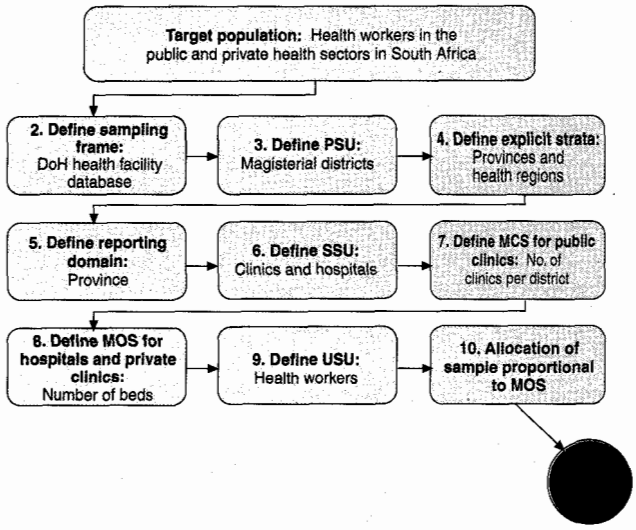

Fig. 2. The process of sampling health workers (PSU = primary sampling unit; SSU = secondary sampling unit; prov = province; MOS = measure of size 2; USU = ultimate sampling unit).

personal interviews at health facilities by means of structured questionnaires. All the interviews were confidential and non-compulsory and respondents were asked to give their informed written consent before being interviewed and tested. Only those who consented participated in the study.

Questionnaires

Biographical information on respondents and additional information on the impact of HIV/AIDS on health workers in

their workplaces was collected by means of a number of closed and open-ended questions.

HIV testing

Oral fluid specimens were obtained from participants using the OraSure HIV-1 oral specimen collection device and were transported to laboratories for testing. The Orasure/Vironostika combination was used for all of the selected health workers in Mpumalanga, KwaZulu-Natal, Free State and North West so that the same methodology was applied, ensuring comparability across provinces. Testing was anonymous, but the results of the HIV test were linked electronically and anonymously to a questionnaire using a bar code. Specifically, by separating the questionnaires from the consent forms, anonymity was ensured. Individual's names and unique identifying information were not collected and therefore could not be linked to an individual's HIV test results. While this ensured the confidentiality of the HIV test, it also meant that HIV results could not be returned to individuals who wished to know their HIV status. However, individuals wanting to know their HIV status could enquire at the health facility whether they could undergo voluntary counselling and testing (VCT), which included providing new specimens to be tested.

Oral fluid specimens were collected from all the health workers and patients at the time of interview. As the test is non-invasive and only requires individuals to stick a pad between their cheek and gum for approximately 2 - 5 minutes, the logistics of this procedure were simple. Furthermore, the specimen collection device was sent to the laboratory for analysis. Thus the individual and the interviewer had no way of knowing the tested individual's HIV status, making acceptability of the test higher.

Ethics

The study was guided by three ethical principles, viz. respect for persons, beneficence, and justice. We actuated the principle of respect for persons by obtaining informed consent from participants and by maintaining confidentiality. By using a systematic sample, every health worker had a known chance of being selected to participate. It is important for health workers who work in areas where they can contract infections to know their HIV status; hence through the study they were sensitised about the need to know their HIV status. Since the study was conducted to assist the Department of Health to plan health services, the results of the study are directly beneficial to South African health workers. Draft informed consent forms, data collection instruments, the proposal and study protocol were subjected to an ethical review process by the Ethics Review Committee of the National School of Public Health at the Medical University of Southern Africa (MEDUNSA). This Committee reviewed the documents for ethical considerations and methodological appropriateness, and subsequently approved them.

Results

Response rates, validity of HIV prevalence estimates and study results are presented.

Response rates

A few selected health facilities refused to participate and were replaced by other equivalent health facilities. From the 85 health facilities selected in the four provinces, a sample of 721 health workers was drawn. Of these workers 83% consented to an Orasure test.

Validity of HIV prevalence estimates

Based on the Kish method[9] which is considered to be most rigorous in determining the validity of findings, the estimates of HIV prevalence among health workers should be considered valid for public sector health workers and less so for private sector health workers. This is because of the small sample size in the latter group. For male professional health workers, aged 36 - 45 years, estimates are not precise and are at the statistical borderline. For this reason the results (Table I) on these subgroups should be treated with caution and coefficients of relative variation* (CVrs) are also included in the table. Very high CVrs in some subgroups (health workers in the private sector aged 46 years and older and of race group other than black) clearly indicate that the survey was not able to produce valid estimations of prevalence owing to small sample sizes.

The CVrs are examined jointly with the design effect. We calculated design effect, that is the loss of effectiveness when using cluster sampling instead of random sampling procedure. Design effect is generally used to determine the desired sample size or confidence intervals necessary to estimate reliability of the population parameters. In this study the design effects for HIV prevalence among health worker and patients (adults and children) are listed in Table I. Because of insufficient funds we could not sample health workers and patients in large numbers to test them for HIV status and hence some of the findings cannot be relied upon. These are the estimates of HIV prevalence in the private sector patient population, among coloured, Indian and white patient population groups, among male patients, patients in the North West, and among children.

HIV test results

The study results are presented in Table I.

Table I shows HIV prevalence among health workers by type of health facility. The results show that an estimated 16.3% of all public sector health workers in the four provinces were HIV-positive. This figure is not significantly different from the figure for those working in primary health care facilities and those in state hospitals.

* As a rule of thumb the Kish guideline of CVr of < 20% is used as a reference threshold to determine the validity of prevalence estimates.[9] Consequently, if a CVr value is relatively 'large', the estimate has low reliability.

Table I. HIV prevalence and response rates among health workers by socio-demographic and health facility characteristics, coefficient of variation, and the design effect

	Count	*N*	Response rate (%)	HIV prevalence (%)	SE	95% CI	CVr	Deft	Deff
Total	721	595	82.5	15.7	1.915	12.24, 19.88	0.12	1.28	1.65
Sector of facility									
Public	625	512	81.9	16.3	2.072	12.55, 20.84	0.13	1.45	2.12
Type of facility									
Primary health care facility/clinic	305	264	86.6	17.5	2.736	12.72, 23.7	0.16	3.49	12.18
Public hospital	320	248	77.5	15.9	2.432	11.2, 21.96	0.15	2.08	4.34
Province of facility									
Free State	172	142	82.6	9.6	1.389	7.061, 12.91	0.14	2.08	4.31
KwaZulu-Natal	284	231	81.3	17.1	3.055	11.69, 24.26	0.18	2.86	8.20
Mpumalanga	109	79	72.5	19.6	3.571	12.99, 28.58	0.18	8.84	78.12
North West	156	143	91.7	19.7	2.692	14.61, 25.93	0.14	3.11	9.65
Occupation status									
Professional	440	349	79.3	13.7	3.215	8.467, 21.46	0.23	2.66	7.07
Non-professional	281	246	87.5	20.3	3.494	14.2, 28.14	0.17	3.56	12.69
Gender									
Male	120	97	80.8	18.9	4.77	11.05, 0.48	0.25	8.07	65.12
Female	601	498	82.9	15.3	2.132	11.51, 20.04	0.14	1.51	2.29
Age (yrs)									
18 - 35	254	203	79.9	20.0	3.378	14.09, 27.63	0.17	3.28	10.76
36 - 45	263	221	84.0	16.6	3.634	10.53, 25.13	0.22	3.74	14.01
Race group									
Black	577	473	82.0	21.1	2.287	16.91, 26.01	0.11	1.59	2.54

Count = total size of the sample; *N* = number of tested respondents in the sample; SE = standard error of the prevalence ratio; 95% CI = 95% confidence interval; CVr = coefficient of variation of prevalence ratio; Deft = design factor (square root of Deff); and Deff = design effect.

Fig. 3 shows that the prevalence of HIV among health workers in the North West, Mpumalanga and KwaZulu-Natal differed. The differences were not large enough to reach significance.

Table I also shows HIV prevalence among health workers categorised by professional status. The prevalence appeared to be higher among non-professionals than professionals. However, the differences were not large enough to reach statistical significance.

Furthermore, Table I shows HIV prevalence among health workers by various demographic characteristics. When the prevalence ratios were examined by the sex and age of health workers, the observed differences were not statistically significant. When the prevalence ratios were examined by race of all health workers, major differences were observed. Black health workers had a much higher HIV prevalence than all other race groups.

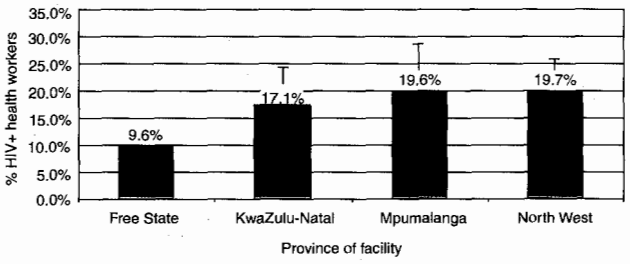

Fig. 3. HIV prevalence among health workers.

Caution needs to be exercised in interpreting these results because the figures among all other race groups were too small to yield meaningful results.

It was also found that health workers' level of education was not significantly related to HIV prevalence, but marital status was strongly related to it. Health workers who were unmarried were more likely to be HIV-positive than those who were married.

Several demographic variables were included in a logistical regression model to examine their relationship to HIV status, after controlling for other variables. Results showed that race was significantly related to HIV status — black African health workers were more likely than workers of other combined race groups to be HIV-positive (odds ratio (OR) 6.6, $p < 0.001$). Marital status was also related to HIV status — we found that unmarried health workers were more likely to be HIV-positive than married health workers (OR 1.7, $p < 0.01$).

Discussion

The observed HIV prevalence of 15.7% among health workers aged 18 years and older is very high. This is not surprising because HIV prevalence among South Africans of reproductive age (15 - 49 years), was found to be 15.6%.[10] Therefore the prevalence of HIV/AIDS among this sample reflects that of the community of their origin. However, such high HIV prevalence

among health workers has serious implications for the health system.

First, sick health care workers will not be able to carry out their responsibilities effectively because of frequent absenteeism.

Second, non-infected workers will be overloaded with work since they will be expected to fill in the gap left by their sick colleagues, which may lead to low morale and burnout.

Third, occupational exposure to HIV is highly likely in health care settings. Infected workers are likely to be doubly infected because of such exposure. Of great concern is the risk of exposure to TB and drug-resistant TB. Evidence shows that TB is a common opportunistic disease among HIV-positive patients. These factors, singly and in combination, impact negatively on quality of health care. A vigorous VCT service targeted at health workers is necessary to afford them the opportunity to learn their HIV status so that appropriate action can be taken regarding allocation of responsibilities.

While the risk of health workers being infected by patients is real, HIV-infected health workers are less likely to transmit HIV to their patients. In the international literature there are extremely few cases of infected health workers having transmitted HIV to their patients. The reported cases are a Florida dentist who infected 6 patients, and 1 patient of a French orthopaedic surgeon.[11]

Some governments, such as in Australia, have developed policies to prevent nosocomial infection from health workers to patients by requiring that all public health workers who perform exposure-prone procedures know their blood-borne virus status, including HIV, and that such health workers do not perform exposure-prone procedures.[12]

The New South Wales health department defines exposure-prone procedures as a subset of invasive procedures that involve the possibility of the skin of health care workers (usually a finger or thumb) coming into contact with sharp surgical instruments and needles or sharp tissues (such as teeth). Procedures that do not have these features are considered less risky. Compliance with infection control is required as a means to prevent infection from health worker to patients or from patient to patient.

The UK has established an advisory committee to inform the government on how to manage health workers who have blood-borne diseases, including those living with HIV/AIDS. The committee has published a paper for comment that includes the following key principles: (*i*) maintaining confidentiality of the HIV status of health workers; (*ii*) criteria for notifying a patient of the risk of having been exposed to HIV from a health worker, recognising that the risk of transmission is low; (*iii*) care of the health care worker.[13]

The extent to which lack of infection control contributes to HIV transmission from health worker to patient, or more likely from patient to patient, in South Africa is unknown and needs to be investigated. We recommend that the South African Ministry of Health establish a committee to advise it on the development of policy guidelines for health facilities with regard to the management of HIV-positive health workers, and also to ensure training in universal precautions against infection.

Conclusion

We conclude that the observed HIV prevalence rate of 15.7% among health workers is very high. This is comparable to HIV prevalence among South Africans of reproductive age (15 - 49 years). South Africa needs to provide antiretroviral therapy targeting health workers who are currently living with HIV/AIDS. A vigorous VCT service targeted at health workers may also be necessary to afford them the opportunity to learn their HIV status and then reassign those who are positive to work in non-TB patient wards.

In addition, there is a need to train more nurses to replace those who may be dying of HIV/AIDS. Given the high prevalence of HIV in the younger population of health workers, it is critical to increase the number of nurses to be trained, particularly if one considers that from 1997 to 2001 the country experienced a 6.86% decline in the number of nurses registering with the South African Nursing Council, a requirement for practice.

In addition to training more nurses, the National Health Ministry needs to conduct an in-depth investigation into the factors that cause nurses to leave the profession and/or emigrate overseas. Another area of concern is the closure of nursing colleges in South Africa, creating a proliferation of private training colleges with serious accreditation problems.

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