The quality of HIV/AIDS case-detection and case-reporting systems in Mozambique

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Despite the underlying importance of surveillance systems for the management of HIV/AIDS prevention and control programmes, there has been limited analysis of the quality of HIV/AIDS case-detection and case-reporting systems, beginning with peripheral facilities through to those at national levels. In Mozambique, HIV cases are generally correctly detected despite some unreliable use of test kits beyond their expiry date, uneven distribution of test kits among facilities, frequent disregard for bio-safety measures and irregular external quality assessment. Furthermore, HIV/AIDS case-reporting is compromised by poor data quality, including under-reporting and discrepancies across different reporting channels and organisational levels, as well as a lack of standardised data forms, data items collected and report formats. Our analysis of HIV/AIDS surveillance systems in Mozambique leads to the following key recommendations: (1) a strengthening and standardisation of both the case-detection and case-reporting systems at all levels; (2) the regular training of staff at peripheral facilities, to allow for better testing and improved local data analysis, validation and interpretation; (3) the redesign of reporting systems for blood banks, including integration of the AIDS case-reporting subsystems into one; and (4) the use of baseline data as a foundation for more comprehensive analysis across the country, in response to UNAIDS advice regarding second-generation HIV surveillance.

Keywords: Africa, data quality, developing countries, standardisation

Introduction

The efforts of national HIV/AIDS programmes worldwide have centred on informing individuals and institutions of a range of preventive measures. Currently, strategies to improve care to infected people and to enhance the availability and accessibility of anti-retroviral drugs, especially within the prevent-mother-to-child-transmission programme (PMTCT), have become issues that significantly influence the politics of funding and contribute to debates over the rates of growth of the disease (Barnett & Whiteside, 2002).

A key to effective support for these national programmes is a well-functioning surveillance system. Broadly, surveillance refers to the methods and procedures for collecting essential data sets needed to provide information for advocating, designing, planning and evaluating public health actions (Langmuir, 1963). We describe the HIV/AIDS surveillance systems as consisting of two key elements: case detection and case reporting. Effective surveillance can reveal trends within the epidemic and so inform sound decision-making on how best to respond. To date, a wide variety of indicators have been used to monitor the epidemic, including measures of disease occurrence (e.g. prevalence estimates through sentinel surveillance and case-reporting sites) as well as indicators of risk and impact (GTZ, 1999).

Although many countries worldwide have established specific HIV/AIDS surveillance systems with guidelines and financial support from global organisations such as the World Health Organisation (WHO) and the Joint United Nations Programmes on HIV/AIDS (UNAIDS), the quality of data gathered and its usefulness for decision-making has been questioned (GTZ, 1999; WHO, 2004). In many developing countries, a gap remains between the collection of data and its effective application to ultimately reduce people’s exposure to HIV infection or to improve the lives of those already infected (WHO, 2004).

This paper analyses the quality of two key components of an HIV/AIDS surveillance system, namely case detection and case reporting. In particular, we examine the existing interconnectedness between case detection and case reporting: in order to be accurately reported, cases need to be correctly identified according to standardised procedures. Any HIV/AIDS case-detection error (e.g. false-positive cases) will feed into case reports, just as subsequent faults in reporting such as incorrect, inconsistent or incomplete data will be transmitted to various levels of the surveillance...
system (e.g. provincial and national levels). Consequently, such an accumulation of inaccurate data provides a poor basis for decision-making (Wang, Storey & Firth, 1995). Clearly, surveillance systems that produce or include poor data will lead to policy conclusions that are ineffective or irrelevant, and so undermine efforts to slow the HIV/AIDS epidemic (WHO, 2004).

We argue that, in practice, the case-detection and case-reporting systems tend to operate quite independently from one another. Meanwhile, finding ways to strengthen their weak links becomes more relevant, especially as many countries begin to implement Highly Active Antiretroviral Therapy (HAART) in HIV focal groups such as pregnant women. Poor linkage between these two systems will not only affect individual pregnant women and their future offspring, for example, but will also weaken the follow-up and monitoring of the entire surveillance system.

The empirical data for our analysis comes from Mozambique, a sub-Saharan country dramatically affected by the HIV epidemic, and also one of the world’s poorest countries (UNDP, 2004). Specifically, we focus on the following questions:

- Are HIV tests being performed according to UNAIDS/WHO standards in the various case-detection facilities of Mozambique?
- By what process do testing facilities report HIV/AIDS cases to the relevant national decision-makers?

**HIV/AIDS in Mozambique**

The 2002 Sentinel Surveillance Report (INE, MISAU, MPF, CEP, UEM, CNCS & MINED, 2004) has estimated Mozambique’s national HIV prevalence rate at 13.6% among people aged 15–49 years (INE et al., 2004). Table 1 summarises the HIV prevalence rate by region and province; Figure 1 depicts the prevalence estimates for the year 2000 by age and gender.

While the prevalence rate for either boys or girls under 14 is less than 3%, prevalence among women between 15–29 years appears higher than for men in the same age group. The HIV prevalence among women between 20–24 years is estimated at four times higher than among men of the same age group (INE, MISAU, MPF, CEP, UEM, CNCS & MINED, 2002).

Over 500 new infections occur daily, and it is estimated that the incidence of HIV will not begin to plateau until the end of the decade. By 2010, without lifesaving treatment and aggressive prevention, an estimated 1.9 million people will be infected and 167,000 people will die, 19,000 of whom will be children under the age of 15. It is projected that by the end of the decade the epidemic could lower life expectancy from the anticipated 50.3 years to 36.5 years (INE et al., 2002).

The principal mode of transmission among adults is unprotected sex, and women are the most vulnerable. It has been estimated that in a population with 10% HIV prevalence, approximately 40% of TB cases can be attributed to HIV infection; in addition, 50% of HIV-positive persons in sub-Saharan Africa are likely to develop TB in their lifetime (Mozambique Country Co-ordinating Committee, 2002).

A strategic framework for the period 2004–2008, recently released by the government’s health sector, identifies three main goals. These are (1) to offer an integrated network of combined and adequate health services that are both preventive and curative in order to reduce vertical (mother-to-child) and sexual transmission; (2) to avoid HIV transmission in health facilities; and (3) to prolong the quality of life for HIV-infected people through the introduction of HAART (MISAU, 2003). Several specific services have been created by the Ministry of Health since 2000, including

<table>
<thead>
<tr>
<th>Region</th>
<th>Province</th>
<th>Population</th>
<th>Prevalence (15–49 years)</th>
<th>Regional prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>South</td>
<td>Maputo city</td>
<td>1 044 618</td>
<td>17.3%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Maputo Province</td>
<td>1 003 992</td>
<td>17.4%</td>
<td>14.8%</td>
</tr>
<tr>
<td></td>
<td>Gaza</td>
<td>1 266 431</td>
<td>16.4%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inhambane</td>
<td>1 326 848</td>
<td>8.6%</td>
<td></td>
</tr>
<tr>
<td>Centre</td>
<td>Sofala</td>
<td>1 516 166</td>
<td>26.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mancia</td>
<td>1 207 332</td>
<td>19.0%</td>
<td>16.7%</td>
</tr>
<tr>
<td></td>
<td>Tete</td>
<td>1 388 200</td>
<td>14.2%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Zambézia</td>
<td>3 476 484</td>
<td>12.5%</td>
<td></td>
</tr>
<tr>
<td>North</td>
<td>Nampula</td>
<td>3 410 141</td>
<td>8.1%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Niassa</td>
<td>916 672</td>
<td>11.1%</td>
<td>8.4%</td>
</tr>
<tr>
<td></td>
<td>Cabo Delgado</td>
<td>1 525 634</td>
<td>7.5%</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td></td>
<td>18 082 518</td>
<td>13.0%</td>
<td>13.6%</td>
</tr>
</tbody>
</table>

Source: INE, MISAU, MPF, CEP, UEM, CNCS and MINED (2004)
voluntary counselling and testing (VCT), day clinics/hospitals, Friendly Services for Youths, PMTCT and domiciliary care. Other efforts to fight the epidemic are being implemented through various public and private entities, including non-governmental organisations (NGOs) and religious partners, under the National AIDS Council. However, little attention has been given to strengthening the informational basis in the management of the disease, despite acknowledgement by the health authorities that the quality of data routinely collected is not reliable (MISAU DPC, 2003; MISAU, 2003).

Methodology

Study area and design

The study focussed on two of Mozambique’s 11 provinces, both located in the south, namely Inhambane Province (two of 14 districts) and Gaza Province (two of 11 districts). Both provinces have relatively different HIV prevalence profiles (see Table 1). Our study adopted a relatively small sample (two provinces) and selected facilities within them. While this limits statistical generalisations, our aim was rather to gain qualitative insight into the case-detection and case-reporting systems in the two provinces, which we considered representative of the national prevalence rate of the disease.

The research took place in March and August–September 2003. The empirical investigation was carried out in health facilities variously administered by district, provincial and national directorates of health. We selected facilities with a view to obtaining a broad picture of the routine work practices regarding HIV/AIDS testing procedures, counselling sessions and patient care. The districts were chosen to provide us with a sample from both rural and urban health facilities. Our intention was to monitor how data is gathered from selected health facilities (health centres and district hospitals), and then to assess data flow and quality from the district to the provincial and national levels.

Data collection and analysis

The data was gathered at four organisational levels, namely:

- facility (Maxixe and Urbano health centres and Chicuque rural hospital, Inhambane Province; Chókwe-Sede health centre and Chicumbane and Chókwe rural hospitals, Gaza Province)
- district (health directorates of Maxixe and Inhambane City, Inhambane Province, and Chókwe and Xai-Xai, Gaza Province)
- provincial (Inhambane and Gaza directorates of health)
- national, in the HIV/AIDS programme headquarters, in the departments of epidemiology and endemics (National Health Directorate) and the department of health information (Planning and Co-operation Directorate).

Data was gathered through observation of work practices and through semi-structured interviews with key informants, including health staff involved in HIV-testing (agents and technicians at blood banks and laboratories, and counsellors from VCT centres), clinicians (doctors, medical technicians and nurses), people working with health statistics and managers (e.g. district and provincial managers responsible for implementing the HIV/AIDS programme). Table 2 lists respondents in relation to their workplace and function. Lastly, an in-depth review of secondary data (including official reports and registers) was conducted.

Observations were made over an eight-week period by the first author (BC). Initially, the work practices of HIV case-detection and AIDS patient management staff were observed during two weeks in Chókwe-Sede health centre, Chókwe Rural Hospital and Chókwe VCT Centre. In other facilities, one or two days were spent in each in order to understand similarities and differences in the testing procedure and case-reporting across the facilities. The main aims of the empirical work were to compare the HIV-testing procedures with UNAIDS/WHO standards, and then to assess the quality of request forms, register books and

<table>
<thead>
<tr>
<th>Table 2: List of respondents in relation to their workplaces and function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working level</td>
</tr>
<tr>
<td>------------------------</td>
</tr>
<tr>
<td>Inhambane Province</td>
</tr>
<tr>
<td>Maxixe Health Centre</td>
</tr>
<tr>
<td>Urbano Health Centre</td>
</tr>
<tr>
<td>Chicuque Rural Hospital*</td>
</tr>
<tr>
<td>Maxixe District Office</td>
</tr>
<tr>
<td>Inhambane City District Office</td>
</tr>
<tr>
<td>Provincial Directorate of Health</td>
</tr>
<tr>
<td>Gaza Province</td>
</tr>
<tr>
<td>Chókwe-Sede Health Centre</td>
</tr>
<tr>
<td>Chókwe Rural Hospital</td>
</tr>
<tr>
<td>Chókwe VCT Centre</td>
</tr>
<tr>
<td>Chicumbane Rural Hospital*</td>
</tr>
<tr>
<td>Chókwe District Office</td>
</tr>
<tr>
<td>Xai-Xai District Office</td>
</tr>
<tr>
<td>Provincial Directorate of Health</td>
</tr>
<tr>
<td>National level</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

* VCT centres also operate within Chicuque and Chicumbane rural hospitals. The infirmaries at rural hospitals (generally seen as district hospitals) were also visited
reports, in terms of consistency, correctness and completeness. Typically, one to four days were spent in the district and provincial offices, depending on the availability of the health workers and managers. At those levels we attempted to identify the channels through which HIV/AIDS case data is transmitted, assess the frequency and purpose of supervision visits and match the data registered in the testing facilities and infirmaries with the corresponding reports sent on to the provincial or national level. Each facility was visited more than once—to confirm observations and to discuss our main impressions with the respondents and to get their feedback. A research diary was maintained during visits, and in some cases a tape recorder was also used, with respondents’ approval.

Through interviews (formal and informal), health workers were asked questions regarding clinical practices, counselling and testing procedures, management and treatment of AIDS patients, the use of register books and statistics, the usefulness of data reported and the relationship between the people responsible for statistics and the managers. Laboratory workers, blood bank workers and counsellors at VCT centres were all asked similar questions relating to the procedures they followed in laboratory work, testing, maintaining quality control and case reporting. Managers and people working on statistics were asked questions pertaining to the collation of data and forms, the usefulness of the data collected, their data quality-control measures, their use of software for statistical analysis, the use of reports and the types of decisions made.

Findings

The findings are presented in two subsections. The first describes the HIV/AIDS case-detection system in terms of testing procedures (e.g. testing strategies, quality assurance processes and bio-safety for conducting an HIV assay in various testing facilities), and the second provides an analytical description of the HIV/AIDS case-reporting system and how it is shaped by the existing work practices of the staff.

HIV/AIDS case-detection system

Presently, Mozambican national health services record HIV infection cases among four population segments. These are:

- pregnant women subjected to anonymous testing without informed consent in sentinel antenatal clinics as part of the periodical surveys
- people who voluntarily check their HIV status in VCT centres
- blood donors donating to blood banks
- patients who visit health facilities and show symptoms of AIDS

Our study focussed on the second, third and fourth segments; we excluded the first segment (that of pregnant women) since cases of infection there are detected only through periodic surveys (performed in selected antenatal clinics during two consecutive months, once every two years) rather than on a routine basis.

HIV tests are routinely performed in the VCT centres, blood banks and clinical laboratories. Usually the blood banks and laboratories are located in the same building, sharing the staff members of a given peripheral health facility. In some districts, however, the VCT centres are located outside the health facilities. Performing an HIV test can be a complex socio-technical process influenced by a wide variety of factors, including:

- testing strategies and types of HIV assays
- validity date of test kits
- bio-safety measures
- internal and external quality control.

These influences on the quality of the testing procedures are schematically depicted in Figure 2 below, and then briefly described.

Testing strategies and types of HIV assays

UNAIDS/WHO (2001) recommends the following combined criteria for selecting an HIV test or test combination:

- test objective: surveillance, blood screening or diagnosis
- known HIV prevalence in the general population
- sensitivity and specificity of the test(s) being used.

Similar to most other African countries, the majority of testing facilities in Mozambique use the rapid or simple assays as both a screening and confirmatory test (CDC/WHO-AFRO, 2001; UNAIDS/WHO, 2001). These are serological tests that detect antibodies to HIV rather than the virus itself. They are called ‘rapid’ in the sense that the HIV test result is provided rapidly (in minutes) and are simple in the sense that they do not require additional reagents or equipment. These tests can be easily conducted in a clinic (on-site testing) and in laboratories without electricity or those having limited infrastructure (i.e. lacking highly-skilled staff and special equipment). Thus, these rapid/simple assays are compatible with the existing constraints that exist nationwide in Mozambique’s peripheral testing facilities.

The commercial rapid tests currently used in all provinces and districts are Determine and Uni-gold. Both are in vitro qualitative immunochromatographic assays able to detect antibodies to HIV1 and HIV2, present in serum, plasma or in the whole blood of infected individuals. Both

Figure 2: The complex aspects involved in HIV-testing procedures
test kits have a shelf life of 18 months at temperatures of 2–28/30°C and sensitivity of about 100%. The test kit called Determine has a specificity of 99.4%, and Uni-gold 100%. Determine is utilised to screen for ‘positives’, while Uni-gold is utilised for confirmation, given its higher specificity, to ensure that all truly negative test results are identified as negative, thus ruling out false-positive results (UNAIDS/WHO, 2001).

UNAIDS/WHO (2001, p. 22–23) have proposed three testing strategies, presented here in Box 1. The testing facilities seemed to adequately follow the first two strategies (the third strategy is not applicable because no third test was in use in Mozambique at the time of our study).

Validity date of the test kits
Among the seven testing facilities visited, one was found to be using expired Determine test kits, apparently because the local health worker was not aware of the validity period: ‘I've never seen the expiry date on the test kits’. Up to 31 days after the expiry date, the kits were used to screen blood for transfusion purposes and for confirming new AIDS inpatients. We were also concerned with the validity of Determine test kits that were to expire in 20 days, as a large number remained in stock at all the VCT centres visited. This represented a paradoxical situation given that the majority of AIDS inpatients were only clinically diagnosed (without an HIV test being performed) — supposedly due to a shortage of these test kits.

Bio-safety measures
No EDTA capillary tubes were available at the testing facilities visited; these are normally used to collect blood specimens and prevent immediate coagulation. As a result, health workers sought alternative solutions. For example, after collecting a fingerstick specimen, the blood was dropped directly onto a sample pad. Surgical gloves were adequately available at the facilities, but some health workers did not use them, saying they were too busy to bother (Figure 3), while some workers who used gloves did not change them between patients.

There was no system to incinerate hazardous materials at the health facilities. Rather, used lancets, gloves and blood samples were burnt in the open (Figure 4).

Waste liquids from the laboratories were released directly into the sewerage system without pre-treatment with chemicals or any other sterilisation techniques (Figure 5).

Quality control
Besides the universal precautions required in handling blood products, such as glove use, adequate disposal of wastes, hygiene and sterilisation, a range of measures exists to ensure the quality of HIV tests being performed. These include both internal and external quality control. Internal quality control includes a set of procedures to be followed by the testing staff to achieve continuous test quality and reliable results (and consequently, data). In Mozambique, all rapid tests in use are ones that incorporate internal quality control to help reduce technical errors. For example, in the Uni-Gold assay, a pink or red band appears to indicate that the test is functioning correctly. However, the formation of the control line does not validate that the patient’s specimen has actually been added to the test; consequently, a test with no blood specimen added will appear the same as a test with a negative result (i.e. with a band in the ‘control’

External quality assessment (of laboratory results and procedures) is expected to be performed on a regular basis by an external agency or supervisor in order to identify and correct testing facilities that exhibit poor performance. We found such external checking was seldom done. However, we found that on-site evaluation through supervision visits by either provincial or national managers regularly occurred at VCT centres. Laboratories and blood banks appeared to be infrequently and irregularly supervised. For example, the testing facility using outdated test kits had not been visited by a supervisor in the previous two years, despite the fact it was only about 30 kilometres from provincial headquarters.

**Summary of the HIV case-detection system**
Table 3 summarises the factors that we found most influenced the quality of HIV case detection in Mozambique.

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**Figure 6:** HIV data flow – an overview of HIV case-reporting in Mozambique

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**Box 1:** UNAIDS/WHO (2001) HIV testing strategies

**Strategy 1**
- requires one test
  - for use in diagnostic testing in populations with an HIV prevalence >30% among persons showing signs and symptoms of AIDS
  - for use in blood screening, at all levels of prevalence
  - for use in surveillance testing in populations with an HIV prevalence >10% (e.g. unlinked, for anonymous testing for surveillance among pregnant women at antenatal clinics). No results are provided.

**Strategy 2**
- requires up to two tests
  - for use in diagnostic testing in populations with an HIV prevalence ≤30% among persons with clinical signs or symptoms of AIDS or >10% among asymptomatic persons
  - for use in surveillance testing in populations with an HIV prevalence ≤10% (e.g. unlinked anonymous testing for surveillance among patients at antenatal clinics or clinics for sexually-transmitted infections). No results are provided.

**Strategy 3**
- requires up to three tests
  - for use in diagnostic testing populations with an HIV prevalence ≤10% among asymptomatic persons.
**HIV/AIDS case-reporting system**

In general, HIV/AIDS data in Mozambique originates from four types of case-detection facilities, namely: (1) sentinel antenatal clinics, (2) VCT centres, (3) blood banks, and (4) infirmaries (including laboratory data).

The existing work practices around data collection and reporting in what amounts to a multiplicity of case-reporting channels contributes to poor data quality (as mentioned, data from antenatal clinics has been excluded from this study).

**HIV case-reporting from Voluntary Counselling and Testing centres**

One case-reporting channel includes people who seek to check their HIV status through Voluntary Counselling and Testing (VCT) centres. Launched in 2001, the VCT services are provided as a result of collaboration between government, bilateral agencies and NGOs. People from both rural and urban areas are strongly advised by Mozambican health authorities to seek these services (in 2003, at least 83 000 people reportedly sought VCT services). In 2003 there were 40 VCT centres unevenly spread across rural and urban areas countrywide (for example, there were 11 VCT centres in the capital, Maputo City, and none in Cabo Delgado). The uneven regional distribution of these centres (about 60% in the south, 30% in the centre and the remaining ones in the north) makes it likely that prevalence reports are biased — with over-representation from certain regions and under-representation from others.

When a client comes to a VCT centre, s/he is first given information about the aims and advantages of taking an HIV test. Counsellors keep a daily register for counselling activities, which identifies clients by a numerical code instead of by name. Gender, age group, HIV test result, education level and pregnancy status are also registered in the book. These data items are aggregated and totalled on a monthly form for summarising counselling activities. On the fifth day of each month, the forms are meant to be sent to provincial HIV programme managers; the managers assemble the monthly summaries and send a copy of their report to the national level. We were not given any indication that there were systems in place for regular data validation or analysis, in regard to either the forms received by provincial managers or the reports sent to higher administrative levels.

The VCT centres appeared to be well-resourced (e.g. equipped with new computers) although not necessarily well-run. In many of the facilities we visited, we typically found VCT workers experiencing constraints in entering data into the existing database (based on Epi Info 6, called Data System for VCT in Mozambique: a Local System for Collection, Analysis and Data Processing). Their experience was in line with other criticisms made by health information systems specialists about the inadequacies of the Epi Info application for routine data management (Braa & Biobel, 2003).

Overall, we found few data quality problems in this reporting channel. For example, we compared the data reports from the Chokwe VCT centre (paper-based) with corresponding data from the national database (electronic-based) for the first half of 2003. As shown in Figure 7, variations of only 2–8% indicated that limited distortions were taking place as the case-reporting data was moved from local VCT centres to the national level.

HIV prevalence in Mozambique, as reported by VCT centres, was 24.9% in 2003. Nevertheless, this figure must be interpreted with caution, since a significant proportion of the clients/volunteers seeking VCT includes those already manifesting symptoms of AIDS, as they had been advised by a medical doctor to be tested at a counselling facility.

Current policies are considering providing HAART to infected people, especially pregnant women within the PMTCT initiative. Based on the current strategic framework (2004–2008), the expected coverage of the HAART treatment will be cumulative, as follows: 7 924 (in 2004); 20 805 (in 2005); 57 954 (in 2006); 96 418 (in 2007) and 132 280 (in 2008). Total coverage for approximately 4 320 000 people represents an estimated coverage for the whole period of only around 3% of the infected clients.

**HIV case-reporting by blood banks**

Another case-reporting channel includes people who donate their blood to blood bank services. Since the aim of donating blood is to save the life of someone who is lacking it (e.g. patients during surgery and children with anaemia due to malaria), blood donors are thus categorised as ‘benevolent’.

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**Table 3: Summary of the various aspects involved in HIV case-detection in Mozambique**

<table>
<thead>
<tr>
<th>Factors</th>
<th>Characterised by</th>
<th>How they influence quality testing procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Testing strategies</td>
<td>WHO-UNAIDS Recommendations well followed in testing facilities</td>
<td>No advice influence seen</td>
</tr>
<tr>
<td></td>
<td>Infrequent use of gloves</td>
<td>High transmission risk to health workers and patients</td>
</tr>
<tr>
<td></td>
<td>Hazardous waste liquids dropped directly into the sewerage system without any</td>
<td>Environment polluted and increase in nosocomial infections</td>
</tr>
<tr>
<td></td>
<td>pre-treatment with the chemicals</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hazardous waste solid not incinerated</td>
<td></td>
</tr>
<tr>
<td>Bio-safety measures</td>
<td>Infrequent</td>
<td>Use of expired reagents</td>
</tr>
<tr>
<td></td>
<td>Irregular</td>
<td></td>
</tr>
<tr>
<td>External quality control</td>
<td>Use of expired reagents</td>
<td>HIV may be transmitted through transfusions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>False-positive or false-negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Results may influence the case management and reporting</td>
</tr>
<tr>
<td>Validity of reagents</td>
<td></td>
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</tr>
</tbody>
</table>
At many of the health facilities we visited, the register books were improvised from ordinary exercise books, with no clearly-defined report format. As a result, they contained mistakes caused by illegible handwriting, ink blots and incomplete entries. The absence of a standardised report format obviously led to data quality problems (e.g. blood donations reported without HIV screening data, discrepancies between the total number of donations that tested positive for HIV or syphilis and instances of discarded blood — which, in theory, should be equal). Furthermore, blood donation reports were apparently not sent on a timely basis to the national level, especially from the district blood banks. In contrast, the provincial and regional blood banks seemed to send more reliable and timely data. National blood bank managers admitted that they were concerned with the negative influence of existing practices on the quality of data captured and reported. In order to compensate for estimated errors in the figures sent from the district blood banks, the national managers stated that at the time of compiling an annual report, they would add on a correction factor of 40% to the data received from district, provincial and central blood banks. This ad hoc method of ‘correction’ will surely distort the ultimate estimate for HIV prevalence among blood donors.

### AIDS case-reporting from inpatient wards

This case-reporting channel includes people who are admitted to district hospitals exhibiting clinical AIDS. The number of AIDS patients is reported monthly by district hospitals via two parallel reporting systems, namely an AIDS inpatient case-reporting subsystem and the summary of inpatients at district hospitals. Central and provincial hospitals report the data in a largely ad hoc manner because no formal system has been set up to report AIDS cases to officials at a national level (MISAU DPC, 2003). Hence, this data is not explicitly addressed in this paper.

The AIDS inpatient case-reporting subsystem includes both a record of confirmed cases, received from the laboratories, and the suspected number of clinical AIDS patients admitted to the medical, paediatric or surgical wards of the district hospitals. Clinical AIDS is defined according to the Bangui criterion: a standardised set of clinical symptoms proposed by the WHO in 1986 for the establishment of AIDS diagnosis in Africa without the use of laboratory tests (GTZ, 1999; Fiala, 2000). The district hospital’s report is sent in a paper format from the infirmary successively to the district, provincial and national offices of the Department of Epidemiology and Endemics. At the national level, data from the paper reports is entered into a computer (the Epi Info system) before being sent to the National HIV/AIDS Control Programme.

The monthly summary of inpatients is an integral part of Mozambique’s main health information system within the National Directorate of Planning and Co-operation. A summary form was created in order to categorise data from inpatient wards (e.g. surgical, maternity, paediatric and medical) including the important reasons for admission (e.g. malaria, diarrhoea, AIDS, tuberculosis, anaemia). This summary data is first aggregated in a paper format at the district level and then computerised at the provincial level before being sent electronically to the National Department of Information for processing and analysis.
When AIDS is suspected in a patient, hospital admission is dependent on severity criteria. This means that ‘non-severe’ patients are usually treated as outpatients who are typically referred to VCT services or else to day clinics providing specific follow-up services; these patients are excluded from the registration system for the purposes of reporting. Patients admitted to a district hospital are guided to the inpatient case-reporting system (AIDS notifications). There, the majority of ‘AIDS patients’ are ones not yet confirmed through laboratory tests (due to resource constraints at testing facilities) while the Bangui criterion is most commonly used for diagnosing clinical AIDS. The small number of patients actually tested is usually made up of those who do not clearly satisfy the diagnosis for clinical AIDS, leaving the clinician uncertain.

The majority of health centres and district hospitals lack the necessary equipment to perform HIV tests, with the majority of patients receiving care at VCT centres. Blood banks and laboratories also lack adequate HIV test kits; in general, the available assays are used primarily for screening blood donors and clients tested at VCT centres.

In cases where the clinician requests a laboratory test, s/he fills in a paper form stating the patient’s name and age and the clinical diagnosis. A nurse collects a blood sample, and then the request form and sample are sent to the laboratory. The blood specimen is tested in the laboratory using the Determine test kit; the result is noted on the request form which now becomes the laboratory report. The laboratory report is sent back to the infirmary where the patient’s HIV status is registered in the individual’s clinical records; later it is added to the monthly statistics.

Unfortunately, these two AIDS case-reporting subsystems present a range of concerns for data quality, including under-reporting. For example, in 2001 the total number of AIDS cases reported was far below the projections made using sentinel surveillance data which anticipated 82,192 new cases of AIDS. In fact, the AIDS inpatient case-reporting subsystem had reported 10,772 cases, representing only 13% of projected cases, and the monthly summary of inpatients had reported only about 2,600 cases (3%) (MISAU DPC, 2003). Furthermore, more than 50% of the new cases reported were from one region (Maputo City) with the percentage increasing to >75% with the inclusion of Gaza Province in the sample. This would imply that the remaining nine provinces reported almost no AIDS cases (MISAU DPC, 2003).

A closer look at the specific AIDS case-reporting subsystem exposed a range of inconsistencies and errors, including many data items omitted from forms, and confirmed cases of AIDS often falsely reported as outnumbering the suspected cases. A major flaw contributing to these inconsistencies was the poor design of the data collection form, which left space for non-compliance by the health workers, and did not include instructions on how to fill it in. Figure 8 depicts the degree of reporting inaccuracy as we encountered it.

As mentioned, AIDS patient data from the district hospitals was aggregated at the provincial level, onto a paper form, by the person responsible for HIV/AIDS data collection, and then sent to the Department of Epidemiology and Endemics to be entered into the Epi Info computer application for analysis. However, the use of this data is primarily limited to bureaucratic reporting purposes. Some managers interviewed confirmed that the reports were of limited value because prevalence was obviously calculated without regard to under-reporting. The reports were seen as contrary to an observed reality (a progressive increase in AIDS inpatients and an increase in bed occupancy rates, which reduced the possibility of admitting new patients, including those with ailments other than AIDS).

Summary of the HIV/AIDS case-reporting system

Table 4 presents a summary of the problems encountered within the HIV/AIDS case-reporting system involving three categories of healthcare services.

We found that problems in the case-reporting system related mostly to the multiplicity of reporting channels, lack of standardisation of forms and data items and irregular supervision of data quality and reporting methods.

Discussion and recommendations

This study is among the first to systematically examine the quality of an HIV/AIDS surveillance system in a developing country. An integrated look at the two main components of the system (case detection and case reporting) (Figure 9) has identified problems that would not be apparent if these were studied separately (for example, how false-positive test results contribute to poor-quality summary reports). Overall,

<table>
<thead>
<tr>
<th>Types of case-reporting systems</th>
<th>Identified problems</th>
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<tbody>
<tr>
<td>VCT centres</td>
<td>HIV data sent directly to national level with no clear validation and processing at local and intermediate levels; problematic use of Epi Info database for routine data; counsellors need to have better computer skills; little integration into general health services — it still looks like a stand-alone facility</td>
</tr>
<tr>
<td>Blood banks</td>
<td>Absence of formal and standardised register books and reporting forms; blood donations reported with no HIV data; HIV data not matching with discarded blood; very irregular reporting frequency; district under-reporting compensated for by a correction factor of 40% to the figures reported by national managers</td>
</tr>
<tr>
<td>AIDS inpatient notification</td>
<td>Two parallel reporting systems contribute to duplication of efforts, under-reporting and poor data quality; few suspected inpatients being tested; reports sent only from district hospitals while the majority of AIDS patients are seen in the provincial and central hospitals; most AIDS cases reported based only on clinical criteria; collection form does not include instructions on how to fill it in and leaves spaces for non-compliance; confirmed cases reported appear abnormally higher than suspected</td>
</tr>
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</table>
the strength of an HIV/AIDS surveillance system relies on the quality of data items that form the broad informational summaries on which health-sector decisions are based.

To achieve an integrated analysis, we examined the quality of Mozambique’s HIV case-detection system in regard to testing procedures and strategies, validity of test kits, bio-safety measures and quality-control processes at various testing facilities (blood banks, clinical laboratories, VCT centres etc.). We also considered the reliability of the case definition (both clinical and laboratory), the consistency, completeness, correctness and timeliness of data flowing through various levels of the administrative hierarchy, and the usefulness (potential accuracy) of the data reported for the purpose of effective decision-making.

We suggest that the linkage between the two components of the surveillance system is still weak and is further undermined by procedural and material inadequacy in terms of both case-detection and case-reporting. The HIV-testing procedures at the sites we visited did not fully follow UNAIDS/WHO recommendations, especially in regard to use of test kits within the validity period, uneven distribution of test kits across facilities, disregard for bio-safety measures and infrequent external quality control. These factors taken together clearly undermine the quality of testing and eventually contribute to incorrect results, which in turn influences the quality of data that is fed back to clients or assembled in the system. The current HIV/AIDS surveillance system in Mozambique displays important discrepancies in data quality and a clear lack of integration of the data as it is reported through several channels.

VCT centres seem to be an exception as the services there appeared to provide better-quality data (in terms of completeness, correctness and consistency) as compared to data that was collected through other reporting channels. However, the uneven distribution of VCT centres (the majority located in the south of the country) and the lack of computer skills among staff using the Epi Info application for routine data management greatly undermine the quality of data generated by the service. The HIV case-reporting system linked with blood banks is poorly-designed, with a noticeable absence of standardised procedures contributing to a range of data inconsistencies, incorrectness and incompleteness, significantly distorting the overall assemblage of reported data.

Finally, the case-reporting system reports only AIDS cases appearing in the district hospitals, leaving the majority of the AIDS patients admitted to central or provincial hospitals unaccounted for. Moreover, the two subsystems appear to report incongruent data, leading to a distortion of the overall picture for the national authorities.

The incompleteness and poor quality of data currently generated within Mozambique’s surveillance system seems not exceptional, as many developing countries show similar faults and weaknesses, especially under-reporting (GTZ, 1999). GTZ reports on the situation in the Caribbean in the following way:

- The completeness of reporting was not only affected by the quality of reporting itself and by the diagnostic skills of health personnel, but also by the degree to which infected persons seek care in public health services and the availability of test kits. The usefulness of HIV case-reporting is severely compromised where financial constraints do not allow for the testing of all those seeking to know their sero-status (p. 35).

We emphasise the need to strengthen the linkage between the case-detection and case-reporting systems, as well as improve the individual quality of these subsystems. Specifically, we recommend standardisation of the case-detection and case-reporting systems, at all levels, by stipulating minimum data sets, creating standardised forms and providing clear instructions on their use. AIDS case-data from central and provincial hospitals needs to be integrated with district data, and the two reporting subsystems may also be integrated into one to avoid duplications and inconsistencies. Regular professional training and supervision schemes in a more integrated system would allow for better testing, local data analysis, validation and interpretation. Such improvements could significantly contribute to achieving the aims of Mozambique’s otherwise ambitious strategic framework (2004–2008) by making the surveillance system more effective, which could provide an example to other countries.

The need to strengthen ‘first-generation’ surveillance systems has already been acknowledged by epidemiologists and policy-makers in several countries; ‘second generation’ HIV/AIDS surveillance must be able to more effectively monitor HIV infection rates and high-risk behaviour trends over time, and provide good-quality data that is needed for the development of interventions and the evaluation of their impact (UNAIDS/WHO, 2002).

This study, which we argue is unique by way of its focus on strengthening the quality of the informational base of a surveillance system, contributes to the domains of both public health and information systems. A stronger interface between these two domains will surely contribute to the fight against the frightening HIV/AIDS pandemic.
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