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

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Abstract
In the developing world, HIV is pandemic and responsible for high mortality rates and decreasing life expectancy. Despite the underlying importance of the surveillance systems for the management of HIV/AIDS prevention and control programmes, there has been limited analysis of both the quality of HIV/AIDS case-detection and case-reporting systems from the peripheral facilities to national levels. In this paper, we analyse this crucial issue from Mozambique. Our analysis shows that HIV cases are generally correctly detected despite limitations in terms of the use of test kits within the expiry period, uneven distribution of test kits across facilities, bio-safety measures largely disregarded and irregular external quality assessment. Furthermore, HIV/AIDS case-reporting is found to be plagued with problems of data quality including issues of underreporting, discrepancies across different subsystems and organisational levels and lack of standardisation. These lead to the following key recommendations: (1) to strengthen and standardise in an integrated manner both the case-detection and case-reporting systems at all levels; (2) to provide regular training of staff at the peripheral facilities for allowing better testing, local data analysis, validation and interpretation; (3) to redesign the reporting systems for blood banks and to integrate the AIDS case-reporting subsystems into one; and (4) to use these findings as the primary baseline for a much more comprehensive analysis across the country, following UNAIDS advice towards the establishment of the “second generation” HIV surveillance.

Key words: case-detection, HIV/AIDS case-reporting, standards, data quality, developing countries.
1. Introduction

Despite global efforts being made against the Acquired Immunodeficiency Syndrome (AIDS), this devastating pandemic continues to undermine and threaten the social and economic life of individuals, families and nations. In 2003, AIDS has killed more than 3 million people. An estimated 5 million people have reported to be infected with the human immunodeficiency virus (HIV), raising the global estimate of people infected to around 40 million human lives (UNAIDS/WHO, 2003).

The core efforts of the national HIV/AIDS programmes worldwide have been around a range of preventive measures targeted towards individuals and institutions. Currently, strategies to improve care to infected people and enhancing the availability and accessibility of anti-retroviral drugs, especially to Prevent Mother-To-Child Transmission (PMTCT) have become issues significantly influencing the politics of funding, and contributing to debates over the rates of growth of the disease (Barnett and Whiteside, 2002).

One of the key bases in the effective support to these national programmes is the need for a well functioning surveillance system. Broadly, surveillance refers to the methods that collect essential data sets needed to provide information for advocating, designing, planning and evaluating public health actions (Langmuir, 1963). For this paper, we describe the HIV/AIDS surveillance systems to include two key elements: the case-detection and case-reporting, which refer to the systems and practices around how cases are detected and reported respectively.

Effective surveillance allows understanding of the trends of the epidemic and in making sound decisions on how best to respond it. A wide variety of indicators have been used to monitor the epidemic, including measures of disease occurrence (e.g. HIV/AIDS prevalence estimated from data gathered in sentinel surveillance and case-reporting sites) as well as indicators of risk and impact (GTZ, 1999).

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

The quality of the elements of the surveillance system, namely HIV and AIDS case-detection and their reporting is analysed in this research. An important aspect of this analysis is the examination of the interconnectedness between case-detection and case-reporting because in order to report cases, they need to be first, “correctly" defined according to pre-established standard procedures. Any HIV/AIDS detection error (e.g. false-positive case) will feed into the reports, and/or subsequent reporting faults such as data incorrectness, inconsistency or incompleteness will be transmitted to the various levels of the reporting system (for example province and national levels), and consequently provide a poor basis for decision making (Wang, Storey and Firth, 1995). Reporting systems that rely on and produce poor data will lead to policy conclusions that are irrelevant or even inaccurate, and will undermine efforts to reverse the HIV/AIDS epidemic (WHO, 2004). As argued in the paper, in practice the case-detection and case-reporting systems tend to operate quite independently from one another, and developing mechanisms to strengthen the weak links becomes relevant, especially as many countries are starting to implement Highly Active Antiretroviral Therapy (HAART) in HIV focal groups, including pregnant women. Poor linkages of these systems will not only affect individual pregnant women and their future offspring, but will also make weaken the follow up and monitoring of the entire HIV surveillance system.

In this paper we analyse this crucial, but hitherto overlooked issue concerning the quality of both the HIV/AIDS case-detection and case-reporting and their linkage. The empirical basis for this analysis is from Mozambique, a Sub-Saharan country, that has been dramatically affected by the HIV epidemic, and categorised by the United Nations Development Population (UNDP) as one of
the poorest in the world (UNDP, 2003). Specifically, the focus of this paper is on analysing the following questions:

♀ Are HIV tests being performed according to UNAIDS/WHO standards in the various case-detection facilities of Mozambique?
♀ What is the process by which HIV/AIDS cases detected are reported from the testing facilities to the national decision-makers?

The next sub-section describes the current situation of HIV/AIDS epidemic in Mozambique.

1.1. The current situation of HIV/AIDS in Mozambique

The 2002 Sentinel Surveillance Report has recently estimated national HIV prevalence rate of 13.6% amongst people aged 15 to 49 years, with regional variations of 14.8% in the south, 16.7% in the centre and 8.4% in the north (MISAU PNC DTS/HIV-SIDA, 2003). Table 1 below summarises the prevalence rates by regions and by provinces, and following it, Figure 1 graphically depicts the prevalence estimates of the year 2000 by age and gender.

<table>
<thead>
<tr>
<th>Region</th>
<th>Province</th>
<th>Population</th>
<th>Prevalence rate (15-49 years)</th>
<th>Regional prevalence rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>South</td>
<td>Maputo city</td>
<td>1,044,618</td>
<td>17.3%</td>
<td>14.8%</td>
</tr>
<tr>
<td></td>
<td>Maputo province</td>
<td>1,003,992</td>
<td>17.4%</td>
<td></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>16.7%</td>
</tr>
<tr>
<td></td>
<td>Manica</td>
<td>1,207,332</td>
<td>19.0%</td>
<td></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>8.4%</td>
</tr>
<tr>
<td></td>
<td>Niassa</td>
<td>916,672</td>
<td>11.1%</td>
<td></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>

Figure 1 illustrates the distinct prevalence segments. While the prevalence amongst children, both male and female is less than 3%, women between 15-29 years show a higher prevalence rate than men in the corresponding age group. The prevalence among women between 20-24 years is estimated to be fourfold higher than men of the same age group (INE et al., 2002).

Over 500 new infections occur daily, and it is estimated that HIV incidence 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 which 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 (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, it has been reported that 50% of HIV persons will have developed TB in their lifetime in Sub-Saharan Africa (Mozambique Country Coordinating Committee, 2002).
Within the health sector of Mozambique, a new strategic framework recently released for the period 2004-2008 has identified three main key goals: (1) To offer, in an integrated network, combined and adequate health services both preventive and curative in order to reduce vertical (i.e. mother-to-child) and sexual transmission; (2) to avoid HIV transmission in health facilities; and (3) to prolong the quality life of the HIV infected people through the introduction of HAART (MISAU, 2003). Several specific services have been created by the Ministry of Health since 2000, including the Voluntary, Counselling and Testing services (VCT), Day Clinics/Hospitals, Friendly Services for Youths, PMTCT and Domiciliary Care. Other efforts to fight this epidemic are being implemented through other public and private entities including Non-Government Organisations (NGOs) and religious partners under the National AIDS Council. However, little attention has been paid to strengthening the informational basis in the management of the disease, despite acknowledgement by the health authorities that the quality of routine data being collected is not reliable (MISAU DPC, 2003; MISAU, 2003). It is to understand the issues underlying the problems of data quality that this paper seeks to examine.

The remainder of the paper is organised as follows: In the next section, 2, the research approach adopted is described followed by the presentation of the findings in section 3. Section 4 provides an analysis of the findings and finally, some conclusions are pointed out in addition to key recommendations.
2. Research Methodology

This section is presented in two main subsections including a description of the study area and design followed by data collection and analysis.

2.1. Study area and design

The study focused on two of the eleven Mozambican provinces both located in the south, namely Inhambane (in 2 out of 14 districts) and Gaza (in 2 out of 11 districts) with different HIV prevalence profiles (refer to Table 1). Our study adopted a relatively small sample of two provinces and selected facilities within them. While this could be seen as a limitation from the perspective of making statistical generalisations, that was not our aim. Our aim was instead, to develop qualitative insights into the case-detection and case-reporting systems in the selected provinces which were seen to be quite representative of the national prevalence rate of the disease.

The research took place over two different time periods: March 2003 and August to September 2003. The empirical investigation was carried out in health facilities, and district, province, and national directorates of health. The facilities were selected in order to obtain a broader picture of the routine work practices regarding testing procedures, counselling sessions and patient care surrounding HIV/AIDS, mainly in the case-detection facilities and infirmaries. The reason was to understand the information flows, i.e. how data were gathered first from selected health facilities (health centres and district hospitals), and its flow and quality from the district to the province and national levels. The districts were selected so as to get a sample of both rural and urban health facilities because of the variations in demographics of people coming for health care.
2.2. Data collection and analysis

The data gathering process was performed at four organisational levels, namely:

1. Facility (Maxixe and Urbano health centres and Chicuque rural hospital in Inhambane province; Chókwe-Sede health centre and Chicumbane and Chókwe rural hospitals in Gaza province);

2. District (health directorates of Maxixe and Inhambane-City in Inhambane province and Chókwe and Xai-Xai in Gaza province);

3. Province (Inhambane and Gaza directorates of health); and

4. National, in the HIV/AIDS Programme headquarters, in the Departments of Epidemiology and Endemics (National Health Directorate) and of Health Information (Planning and Cooperation Directorate).

Data were gathered through observation of work practices, and semi-structured interviews with key informants including health staff dealing with testing (agents and technicians of the blood banks and laboratories, and counsellors from VCT centres), clinicians (doctors, medical technicians and agents, and nurses), people working with health statistics, and managers (such as persons responsible for HIV/AIDS programme, district and province managers). See Table 2 for a summary of respondents in relation to their working place. In addition, an in-depth review of secondary data including official reports and registers used to document the data was conducted.

The observations took place over 8 weeks by the first author. Initially, the work practices of HIV case-detection and AIDS patient management were observed during two weeks in Chókwe-sede health centre, Chókwe rural hospital and Chókwe VCT centre. In other facilities one to two days each were spent in order to understand similarities and differences in the procedure of testing and case-reporting across the facilities. The main aims of the empirical work were to firstly, compare the procedures for HIV tests with UNAIDS/WHO standards; and to secondly, assess the request forms, register books and reports for data quality in terms of their consistency, correctness and completeness. Typically, in the district and provincial offices, one to four days were spent depending on the availability of the health workers and managers. At these levels, we attempted to
identify the various channels through which HIV/AIDS case-data were being transmitted; to assess the frequency and purpose of supervision visits; and to match the data registered in the testing facilities and infirmaries with the respective reports sent to the province and national levels. Each facility was visited more than once to reconfirm or not the earlier observations and to discuss our main impressions with the respondents and to get their feedback on it. During visits, a research diary was maintained to take relevant notes and in some cases, a tape recorder was also used after taking prior approval of the concerned respondents.

<table>
<thead>
<tr>
<th>Working level</th>
<th>Persons dealing with testing</th>
<th>Clinicians responsible for statistics</th>
<th>Managers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Inhambane Province</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maxixe health centre</td>
<td>1</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Urbano health centre</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chicuque rural hospital*</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Maxixe District Office</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Inhambane-City District Office</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Provincial Directorate of Health</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>Gaza Province</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chokwe-Sede health centre</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Chokwe rural hospital</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chókwe VCT centre</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Chicumbane rural hospital*</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Chokwe District Office</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Xai-Xai District Office</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Provincial Directorate of Health</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><strong>National Level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>13</td>
<td>17</td>
<td>14</td>
</tr>
</tbody>
</table>

*Within Chicuque and Chicumbane rural hospitals there are also in operation VCT centres. In the rural hospitals generally seen as district hospitals, the infirmaries were also included in the study visits.

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

3. Findings

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

3.1. HIV and AIDS case-detection system

Presently in Mozambican National Health services, HIV cases are being detected in four population segments. These are:

1. Pregnant women being submitted to unlinked anonymous testing without informed consent in sentinel antenatal clinics as part of the periodical surveys;
2. People voluntarily checking their HIV status in Voluntary, Counselling and Testing (VCT) centres;
3. Blood donors donating blood in blood banks; and
4. Patients visiting health facilities and showing semiology of AIDS.

Our study focused on the second, third and fourth mentioned segments, excluding that of pregnant women segment because cases are detected only through periodic surveys (performed in selected antenatal clinics in two consecutive months, once in two years) rather than on a routine basis which was a focus of this study.
3.1.1. HIV case-detection

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 same human resources of a given peripheral health facility. In some districts, the VCT centres are located outside the health facilities. Performing an HIV test is a complex socio-technical process that is influenced by a variety of factors, including:

- Testing strategies and types of HIV assays;
- Validity date of test kits;
- Bio-safety measures; and
- 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.

![Figure 2 - The complex aspects involved in HIV testing procedures](image)

3.1.1.1. Testing strategies and types of HIV assays

UNAIDS and WHO (2001) recommend the combination of the following three criteria for selecting an HIV test or a combination of tests. These are:

(a) Objective of the test (surveillance, blood screening or diagnosis),
(b) HIV prevalence in the population being tested, and
(c) Sensitivity and specificity of the test(s) being used.
Similar to most other African countries, a majority of the testing facilities in Mozambique are using the Rapid or Simple assays as both screening and confirmatory tests (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 result is provided rapidly (in minutes) and are simple since they do not require additional reagents or equipment. These tests can easily be conducted in a clinic (on-site testing), laboratories without electricity and those having limited infrastructure (such as highly skilled staff and special equipment). These rapid/simple assays are thus compatible with the existing constraints that nationally exist in the peripheral testing facilities.

The commercial rapid tests being used in all the provinces and districts are called “Determine” and “Uni-gold”. Both are In Vitro qualitative immunochromatographic assays able to detect antibodies to HIV 1 and 2 in serum, plasma or in the whole blood from infected individuals. Both the tests have a shelf life of 18 months at temperatures from 2 to 28/30ºC and sensitivity of about 100%. The “Determine” has specificity of 99.4% and “Uni-gold” 100%. The first test (screening) is “Determine” and is used to detect “all” positives and the second test (confirmation) is “Uni-gold”, given its higher specificity, seeks to ensure that all truly negative test results are identified as negative, thus ruling out false positive results (UNAIDS/WHO, 2001).

Based on these criteria, UNAIDS and WHO have proposed three testing strategies, presented below in the Box 1 (UNAIDS/WHO, 2001, p.22-23).

So, based on the UNAIDS/WHO criteria and given the HIV prevalence rates of the visited provinces (Gaza 16.4% and Inhambane 8.6%), the testing facilities were seen to be adequately following the first two strategies described above. The last strategy was not applicable for Mozambique, because at the time of the study there was no third test in use.
**Box 1 – UNAIDS/WHO testing strategies**

<table>
<thead>
<tr>
<th>Strategy I</th>
</tr>
</thead>
<tbody>
<tr>
<td>✰ Requires one test,</td>
</tr>
<tr>
<td>✰ For use in diagnostic testing in populations with an HIV prevalence &gt;30% among persons showing signs and symptoms of AIDS,</td>
</tr>
<tr>
<td>✰ For use in blood screening, for all prevalence rates,</td>
</tr>
<tr>
<td>✰ For use in surveillance testing in populations with an HIV prevalence &gt;10% (e.g. unlinked, anonymous testing for surveillance among pregnant women at antenatal clinics). No results are provided.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy II</th>
</tr>
</thead>
<tbody>
<tr>
<td>✰ Requires up to two tests,</td>
</tr>
<tr>
<td>✰ For use in diagnostic testing in populations with an HIV prevalence ≤30% among persons with clinical signs or symptoms of AIDS or &gt;10% among asymptomatic,</td>
</tr>
<tr>
<td>✰ 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 sexually transmitted infection clinics). No results are provided.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strategy III</th>
</tr>
</thead>
<tbody>
<tr>
<td>✰ Requires up to three tests,</td>
</tr>
<tr>
<td>✰ For use in diagnostic testing in populations with an HIV prevalence ≤10% among asymptomatic persons.</td>
</tr>
</tbody>
</table>

**3.1.1.2. Validity date of the test kits**

From the seven testing facilities examined, one was found to be using expired test kits for the “Determine method”, apparently because the local health worker was not aware of the validity period: “I’ve never seen the expiry date of the test kits” – said the worker. Even thirty-one days after the expiry date, these reagents were being used to screen blood for transfusion purposes and for testing suspected AIDS inpatients.

We were also concerned with the validity of “Determine” test kits that were to expire in 20 days, even though extremely large amounts still remained in stock in all the VCT centres visited. This represented a paradoxical situation given that the majority of AIDS inpatients were only being clinically diagnosed without performing HIV tests, arguably due to shortages in the availability of these tests.
3.1.1.3. **Bio-safety measures**

In the testing facilities visited, there were no available EDTA capillary tubes used to collect blood specimens to avoid its immediate coagulation. As a result of this non-availability, health workers had to find alternative solutions. For example, after collecting a finger stick specimen, instead of touching the tip of the EDTA capillary tube to the drop of blood, the blood was directly dropped onto the sample pad. While gloves were to be found adequately available in all visited testing facilities, some health workers did not use them saying they were too busy to bother with gloves. In Figure 3 below, we present a picture that portraits the lab staff working without gloves. Some other workers using gloves did not change them between patient contacts.

**INSERT FIGURE 3 ABOUT HERE**

There was no system to incinerate hazardous materials in the health facilities. The used lancets, gloves, blood samples were burnt in the open. In Figure 4 below, we show a picture of a site for disposing hazardous material around a particular facility.

**INSERT FIGURE 4 ABOUT HERE**

Waste liquids from the laboratories were released directly into the sewerage system without any pre-treatment with chemicals or other sterilisation techniques. In Figure 5 below, a picture of the disposal system for waste liquids in one of the health facilities visited is provided.

**INSERT FIGURE 5 ABOUT HERE**

3.1.1.4. **Quality control**

Besides the universal precautions required in handling blood products such as glove use, adequate disposal of wastes, hygiene, sterilisation, etc. there are a range of other measures also necessary to ensure the quality of tests being performed. These include both internal and external quality control. The internal quality control includes a set of procedures that needs to be undertaken by the testing staff for continuously assessing the quality of the test and the reliability of the corresponding results, before they are released. In Mozambique, all rapid
tests in use have incorporated internal quality control that helps to reduce technical errors. For example, the internal control for “Uni-Gold Assay” – a pink/red band appearing in the “control” region – indicates the test is functioning correctly. However, the formation of the control line does not validate that the patient specimen has been added to the test. Consequently, a test with no specimen added will appear the same as a negative test (i.e., a band in the “control” region and no band in the “test” region) (CDC - Divisions of HIV/AIDS Prevention, 2003; Branson, 2003). External quality assessment (i.e. of laboratory results and procedures by means of an external agency or supervisor) is expected to be performed on a regular basis to identify and correct those testing facilities that exhibit poor performance: we found these external checking to be seldom done, with the VCT service being an exception where on-site evaluation through supervision visits was found to be regularly performed by either provincial or national managers. The laboratories/blood banks were supervised very infrequently and at irregular intervals. For example, the testing facility that we identified to be using outdated test kits had not been visited by a supervisor in the last two years, despite it being only about 30 kilometres from the provincial headquarters. So, it can be inferred that the lack of supervision may have contributed to the use of expired reagents.
**Summing up the HIV case-detection system**

The Table 3 below provides a summary of the various aspects that were found to influence HIV case-detection quality in Mozambique.

<table>
<thead>
<tr>
<th>Factors</th>
<th>How they influence quality of testing procedures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Testing strategies</strong></td>
<td>WHO-UNAIDS recommendations well followed in testing facilities - No advice influence seen.</td>
</tr>
<tr>
<td><strong>Bio-safety measures</strong></td>
<td>Infrequent use of gloves; Hazardous waste liquids dropped directly into the sewerage system without any pre-treatment with chemicals; Hazardous waste solid not incinerated - High transmission risk to health workers and patients. Environment polluted and increase of nosocomial infections.</td>
</tr>
<tr>
<td><strong>External Quality Control</strong></td>
<td>Infrequent; Irregular - Use of expired reagents</td>
</tr>
<tr>
<td><strong>Validity of reagents</strong></td>
<td>Use of expired reagents - HIV may be transmitted through transfusions; False positive or false negative; Results may influence the case management and reporting.</td>
</tr>
</tbody>
</table>

3.1.2. **AIDS case-detection**

AIDS cases are detected through two procedures namely, the clinical diagnosis and the laboratory test of HIV. The later was described in the previous subsection.

Clinical AIDS is defined according to the *Bangui criterion*, that is a set of standardised clinical signs and 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).

3.2. **HIV and AIDS case-reporting systems**

In general, as depicted in Figure 6 below, HIV/AIDS data are being reported from the four types of case-detection facilities above mentioned, namely: (1) sentinel antenatal clinics; (2) VCT centres; (3) Blood banks; and (4) Infirmaries (including laboratory data).
The multiplicity of reporting channels contribute to the overall complexity of the HIV/AIDS case-reporting system. In the following subsections we describe how the existing work practices around data collection and reporting in each of these channels contribute to issues of adverse data quality. As mentioned earlier, data from antenatal clinics were excluded from this study.

### 3.2.1. HIV case-reporting from Voluntary Counselling and Testing (VCT) centres

This case-reporting channel includes people who voluntarily seek Voluntary, Counselling and Testing (VCT) services to check their HIV status. The VCT services are provided as a result of a collaborative strategy between government, bilateral agencies and NGOs, launched in 2001. People, from both the rural and urban areas, have been strongly advised by health authorities to seek VCT services. In 2003 there were 40 VCT centres unevenly spread out in both rural and urban areas countrywide. For example, while there were 11 VCT centres
only in the capital, Maputo City, there were none in Cabo Delgado. The regional distribution of VCTs (60% in the south, about 30% in the centre and the remaining in the north) makes it likely that the disease prevalence gets reported more from certain regions than others because of the sampling techniques employed. During 2003, at least 83 000 people were reported to have sought VCT services.

When a volunteer comes to a VCT, s/he is first given information about the aims and advantages of taking the test. The counsellor has a register book (daily register for counselling activities), which identifies the client using a numerical code instead of the name. In this book, the gender, age group, test result, education level and the status of pregnancy are also registered. These data items are aggregated on a monthly basis in another form (monthly summary for counselling activities) and the total for each variable is written at the bottom of the form. On the fifth day of each month, the monthly form is supposed to be sent to the province, where the HIV manager aggregates them and sends a copy of the report to the national level. We were not given any indication that there were regular systems in place for data validation or analysis, of both the forms received and those aggregated and transmitted to the higher levels of the administrative hierarchy.

The VCT services appear to be well resourced, e.g. equipped with new computers, although not necessarily well run. In many of the facilities we visited, we found several of the 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”. This experience in the use of the Epi Info application was in line with other criticisms made by health information systems specialists about the inadequacies of Epi Info for routine data management (Braa and Blobel, 2003).

We found negligible data quality problems in this reporting channel. For example, we compared the data reports from the Chokwe VCT centre (paper-based) with corresponding data available in the national database (electronic-based) for the 1st semester 2003. As shown in Figure 7, this comparison was nearly identical,
showing variations of only 2 to 8%, indicating limited changes taking place as the data moved from the local to the national level.

**Figure 7 - Comparison of Chokwe VCT case-reporting between paper-based (local) and electronic-based (national) data, 1st semester 2003**

Source: Chokwe VCT centre and national HIV/AIDS Programme

<table>
<thead>
<tr>
<th></th>
<th>Volunteers attended</th>
<th>Volunteers HIV+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-based data at local VCT</td>
<td>1594</td>
<td>516</td>
</tr>
<tr>
<td>Electronic-based data at national level</td>
<td>1528</td>
<td>477</td>
</tr>
</tbody>
</table>

In 2003, the prevalence rate reported from VCT centres was 24.9% (21 331/85 787). Nevertheless, this number will have to be interpreted with caution, since a significant proportion of the “volunteers” seeking VCT includes those already manifesting AIDS symptoms, who have been advised by the doctors to perform the test in a counselling facility.

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

### 3.2.2. HIV case-reporting from blood bank services

This case-reporting channel includes people who donate their blood in blood bank services. The aim of donating blood is to save the life of someone who is
lacking it (e.g. patients under surgery, children with anaemia due to malaria, etc.). Blood donors are thus categorised as benevolent (voluntary charity, usually attracted by campaigns) and also restorers (replacing the blood used to treat some relatives or loved ones). The former tend to be the group with low risk to have HIV (e.g. youth in the schools) because organisations collecting blood try to exclude HIV positive people. The later group, usually representing the family members of someone in need of a blood transfusion, come from different settings and cannot be easily related to risk behaviour. Regardless of its origin, all blood collected in blood banks needs to be routinely screened prior to blood transfusion. So, in general blood donors constitute a particular low risk HIV sample group. Their HIV status is reported by the blood banks on a quarterly basis in summary reports without individual names. The reports include details about blood bank activities’ such as number of blood donations, blood derivates, blood requests, screening tests performed for infectious diseases like syphilis and HIV, and the amount of discarded unsafe blood. The report is sent from the district level blood banks that are physically located within health centres or district hospitals to the next level of hierarchy of blood bank management which is the provincial hospital. The provincial blood bank manager is the person responsible for aggregating data per health facility into one form to send to the National Programme of Blood Transfusion where the data are computerised.

Prior to the blood donation, the technician explains to the donor the internal procedures that are followed in relation to the blood collected, including information about the tests performed to screen for infectious diseases (HIV and syphilis) before further processing steps towards transfusion. The blood donor is advised that if his/her blood is considered inappropriate (unsafe) for transfusion it will be discarded without informing him. If s/he intends to know the HIV result, then is referred to the VCT service for required counselling. All samples collected are identified by names and registered in specific register books. In many of the health facilities visited, the register books being used were seen to be improvised from ordinary exercise books, with no clearly defined report formats. As a result, there were many mistakes caused by illegible handwriting, the spread of ink
blots, and incomplete entries. The absence of standardised reporting formats led to a number of problems such as blood donation data being reported without HIV screening data, and discrepancies between the totals of HIV and syphilis positive cases and that of discarded blood. These totals should theoretically be equal. Furthermore, the reports were observed to not be sent on a timely basis to the national level, especially from the district blood banks. In contrast, the province and central level blood banks were seen to be sending more reliable and timely data.

The national blood bank managers were concerned with the negative influence of existing practices on the quality of data captured and reported. In order to compensate for the estimated errors in the figures sent from the district blood banks, the national managers stated that they had to apply a correction factor of 40% to the reported district data, to add to the province and central blood bank data at the time of compiling the annual report. This ad hoc correction tends to potentially distort the picture of the HIV prevalence rates of blood donors.

3.2.3. AIDS case-reporting from inpatient wards

This case-reporting channel includes people who are admitted in district hospitals exhibiting the AIDS clinical pattern. The AIDS patients are then routinely reported on a monthly basis through two parallel 'standardised' reporting systems from the district hospitals, namely (a) AIDS inpatients case-reporting subsystem and (b) the monthly summary for inpatients from district hospitals. The more advanced hospitals (central and provincial) report the data in a largely ad hoc manner because no formal system has been set up to report AIDS cases and is thus excluded from the official national reports (MISAU DPC, 2003). These data are thus not explicitly addressed in this paper.

The AIDS inpatients case-reporting subsystem includes both the confirmed cases from the laboratories and the clinically suspected AIDS patients admitted in the medicine, paediatric or surgery wards. The report is sent in a paper format from the infirmary and successively goes to the District and Provincial and afterwards to the National Department of Epidemiology and Endemics. In the
national level, the paper reports are entered in the computer (Epi Info system) before they are sent to the National HIV/AIDS Control Programme. The *monthly summary for inpatients* is an integral part of the main health information system within the National Directorate of Planning and Cooperation. The form was created in order to provide data from inpatient wards in categories such as surgery, maternity, paediatric and medicine including the important causes of admitting patients e.g. malaria, diarrhoeas, AIDS, tuberculosis, anaemia, etc. These data are first aggregated in a paper format in the district and are computerised at the province level to be sent electronically (usually floppy diskette) to the National Department of Information for processing and analysis. When an AIDS condition is suspected, the admission of a patient is dependent on the severity criteria. This means that the non-severe patients usually are treated as outpatients and typically referred to the VCT services or to the day clinics that provide specific follow up services. So, these patients are excluded from the registration system for the purposes of reporting. The ones admitted to the district hospitals are guided to the infirmaries. In the infirmaries, the majority of “AIDS patients” are not objectively confirmed in the laboratories due to resource constraints on testing facilities. The clinical Bangui criterion to establish AIDS diagnosis is most commonly used. The small group being tested is usually those that do not clearly fulfil the AIDS clinical diagnosis and therefore the clinician is uncertain about the cause of the clinical pattern. The majority of health centres and district hospitals frequently lack adequate HIV test kits, so in general, the assays available are primarily for screening blood donors and clients tested in VCT centres.

In the cases where the clinician requests the laboratory test, s/he fills in a paper form request identifying the patient’s name, age and the clinical diagnosis. A nurse collects the blood specimen and then both the request form and the specimen are sent to the laboratory. In the laboratory, the blood specimen is tested, using the “*Determine method*”, and the result is translated into the same paper form request which then becomes the laboratory report. The report is then
sent back to the infirmary where the patient’s HIV result is registered in the individual’s clinical records and later on it becomes part of the monthly statistics. Unfortunately, these two AIDS case-reporting subsystems present a range of data quality concerns, including of AIDS cases being inadequately reported. For example, in 2001 the total number of AIDS cases reported was by far less than the projections made from the sentinel surveillance data where there were an expected 82,192 new AIDS cases. The specific AIDS patients subsystem had reported 10,772 cases which represented only 13%, and the monthly summary for inpatients had only reported about 2,600 cases (3%) (MISAU DPC, 2003). Furthermore, more than 50% of the cases reported were from one province (Maputo-city) with the percentage increasing to above 75% with the inclusion of Gaza province in the sample. This implies that the remaining nine provinces in the country were reporting nearly no AIDS cases (MISAU DPC, 2003).

A more detailed analysis of the specific AIDS case-reporting subsystem helped to identify a range of further inconsistencies and errors, including many data items being not filled in, and AIDS confirmed cases often being reported falsely higher than the suspected cases. A major problem contributing to these inconsistencies was the design of its data collection form, which left space for non-compliance by the health workers, and also did not include instructions on how to fill it in. The chart presented in Figure 8 below depicts some of these abnormalities.
The AIDS patients' data sent from the district hospitals were further aggregated at the provincial level in one form by the person responsible for HIV/AIDS data, and then sent to the Department of Epidemiology and Endemics to be entered into the EPI Info application for analysis. However, the use of these data is primarily limited to reporting purposes. Some of the interviewed managers confirmed that these reports were of limited value as the prevalence was obviously being calculated from underreported cases. These reports were seen to be contrary to the reality observed of a progressive increase in AIDS inpatients leading to an increase in bed occupancy rates which reduced the possibility to admit new patients including those with ailments other than AIDS.
**Summing up the HIV/AIDS case-reporting system**

A summary analysis of the problems encountered within the three case-reporting systems is presented in the Table 4.

*Table 4 – Summary of the main problems identified in HIV/AIDS case-reporting systems*

<table>
<thead>
<tr>
<th>Types of case-reporting systems</th>
<th>Identified problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) 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 <em>Epi Info</em> 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>(2) 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 underreporting compensated by a correction factor of 40% to the figures reported by national managers;</td>
</tr>
<tr>
<td>(3) AIDS Inpatients Notification</td>
<td>Two parallel reporting systems contribute to duplication of efforts, underreporting, 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 space for non-compliance; Confirmed cases reported appear abnormally higher than suspected;</td>
</tr>
</tbody>
</table>

More general problems across the system were multiplicity of reporting channels and irregular specific supervision schemes mostly oriented to VCT centres.
4. Discussion and recommendations

The present study is amongst the first systematic analysis of the quality of both the HIV/AIDS case-detection and case-reporting systems from a developing country.

As schematically shown in Figure 9, an integrated analysis of the two systems helps to identify problems that would have been not visible when studied independently, for example how false-positive results contribute to the poor quality report. Such an interconnected analysis can potentially contribute to strengthen the overall surveillance system by improving the quality of the overall informational basis on which decisions are taken.

![Figure 9 - the interconnectedness between HIV case-detection and case-reporting](image)

This integrated analysis was done by examining the quality of HIV case-detection system in terms of testing procedures as related to testing strategies, validity date of the test kits, bio-safety measures and quality control processes from testing facilities (e.g. blood banks, clinical laboratories and VCT centres). In conjunction, the quality of case-reporting system was analysed in terms of: (i) trustworthiness of the case definition (both clinical and laboratorial); (ii) consistency, completeness, correctness and timeliness of data flowing through various levels of the administrative hierarchy and; (iii) usefulness of the information for effective decision-making.

Based on the findings from Mozambique, we infer that this linkage between the two systems is still weak and is further undermined by the poor quality of both the individual case-detection and reporting systems. The testing procedures are not being fully followed according to UNAIDS/WHO recommendations, especially in terms of the use of test kits within the expiry period, uneven distribution of test kits across facilities, bio-safety measures being largely disregarded and
infrequent external quality control. These factors taken together undermine significantly the quality of tests and may lead to incorrect results, which in turn influence the quality of data being fed back to the client and reported for surveillance action. The HIV and AIDS case-reporting systems present important quality discrepancies and clearly a lack of integration of the HIV/AIDS data reported from several channels. The VCT services seems to be an exception providing better quality data as compared to other reporting channels in terms of completeness, correctness and consistency. However, the uneven distribution of VCT centres (the majority located in the south of the country) and the lack of computer skills associated with the use Epi Info for routine data management potentially undermine the data quality. The HIV case-reporting system of the blood banks is poorly designed with a noticeable absence of standard procedures contributing to a range of data inconsistencies, incorrectness and incompleteness, distorting significantly the overall quality of data. Finally, the AIDS case-reporting system reports only AIDS cases captured in the district hospitals, while excluding the majority of the AIDS patients being admitted in the central or provincial hospitals. Moreover, the two existing parallel subsystems report incongruent data leading to a distortion of the overall picture to the national authorities.

Indeed, these adverse trends in quality identified in Mozambique are not an exception and many developing countries show similar weaknesses, especially underreporting (GTZ, 1999). GTZ (1999) reports 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).

The recommendations made in this paper about the need to strengthen the linkage between the case-detection and reporting systems, and improving the quality of these individual systems, thus have wider implications than just
Mozambique. A further specific recommendation concerns the need to standardise the case-detection and case-reporting systems at all levels by stipulating minimum data sets, making uniform the collection forms, and providing clear instructions on their use. AIDS data from central and provincial hospitals needs to be integrated with district data, and the two reporting subsystems should also be integrated into one to avoid duplications and inconsistencies. Regular professional training and supervision schemes on the integrated system can potentially allow for better testing, local data analysis, validation and interpretation. These improvements can significantly contribute to achieving the aims of ambitious strategic framework (2004-2008) by making the surveillance system more effective.

The need to strengthen the existing “first generation” system has already been acknowledged by epidemiologists and policy makers in several countries, and to develop a “second generation” HIV/AIDS surveillance to more effectively monitor HIV and high-risk behaviour trends over time, and to provide essential data needed for the development of interventions and the evaluation of their impact (UNAIDS/WHO, 2002). Thus, the implementation of these recommendations can help provide the basis for running the UNAIDS guidelines regarding the introduction or enhancement of the “second generation” HIV surveillance system (UNAIDS/WHO, 2002) and contribute to improve the coordination between the surveillance and prevention programmes.

This study, which we argue is unique by way of its focus on strengthening the quality of the informational bases of the HIV/AIDS surveillance system, contributes to the domains of both public health and information systems. A strengthening of the interface between these two domains, can in the long run, we argue, contribute in a small but important way to fight the frightening HIV/AIDS pandemic.
Acknowledgment

We are grateful for the cooperation from the staff of the Health Districts in Mozambique, with special attention to the health workers and managers in Maxixe, Inhambane-city, Chókwe and Xai-xai districts. We are especially grateful to Dr Francisco Saúte (Department of Epidemiology and Endemics), Dr Joel Samo Gudo (Blood Bank of Maputo Central Hospital), Dr Langa and Mr Tchaka (National Programme of Blood Transfusion), Dr Artur Machava (Chokwe Rural Hospital), Dr Ladino (Chicuque Rural Hospital) and Dr Naftal Matusse (Maxixe Directorate of Health).

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5. Reference list


GTZ (1999) HIV/AIDS Surveillance in Developing Countries: Experiences and Issues, University in Heidelberg.


ADDITIONAL FILES

Figure 3 – A laboratory worker collecting blood sample without gloves

Figure 4 – the fate of lancets, gloves, syringes and other hazard material in health facilities - burnt in the open

Figure 5 – The fate of wasted liquids