Blood Transfusions and HIV Risk in Kumba, Cameroon

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ABSTRACT

Studies of non-sexual risk factors for the spread of Human Immunodeficiency Virus (HIV) in central Africa have been limited. As blood transfusion is an extremely effective route for blood-borne infection, we examined transfusion practices in a town in northern Cameroon. We interviewed blood transfusion providers and transfusion recipients over a two-week period as to screening practices and knowledge of transfusion risk. We met with three transfusion centers and 13 patients and found that, although blood is currently screened for HIV, testing only became widespread in the mid 1990's. Additionally, no screening is currently being done for hepatitis C, a prevalent disease in Central Africa. Although our study was small, we demonstrate that Cameroon has made improvements in securing their blood supply, but practices are far from ideal and have quite possibly contributed to the current Acquired Immunodeficiency Syndrome (AIDS) epidemic in Africa through years of untested transfusions.

INTRODUCTION

Traditionally, the spread of the Human Immunodeficiency Virus (HIV) in sub-Saharan Africa has been primarily attributed to heterosexual and vertical transmission (Buve et al., 2002). However, recent studies have suggested that the prevalence of Acquired Immunodeficiency Syndrome (AIDS) in Africa is not adequately explained by these factors alone (Simonsen et al., 1999; Drucker et al., 2001; Gisselquist et al., 2002). Gisselquist and Potterat (2003) claim that non-sterile, invasive medical procedures may have played a more significant role than generally thought and may account for more than 25% of infections. Consequently, there have been concerns about the dangers of syringe re-use and other potential iatrogenic causes of blood borne infection, particularly transfusions, which transmit blood-borne pathogens very efficiently. Although the World Health Organization (WHO) sets standards for protection of the blood supply in all countries, and efforts are made to assure blood safety, the transfusion systems in many parts of Africa has remained poorly protected. Mbanya et al (2001) studied transfusions at hospitals within Yaounde, the capital and second largest city of Cameroon, and found that even in the capital, 50% of blood donations were associated with adverse reactions including hemolysis, fluid overload and death, although blood was screened for HIV and hepatitis C. Areas with less developed medical infrastructure, where many transfusions occur, were not examined in that study. We sought to assess the patterns, practices, and safety of blood transfusion in Kumba, the main town of a rural regional health district in northern Cameroon.

METHODS

As part of a larger study of HIV origins and medical practices in the region approved by the Tulane University Institutional Review Board, we examined transfusion practices in the rural Meme division of the southwest province of Cameroon, with a particular focus on the central market town of Kumba, which has an estimated population of 50,000. The Kumba health district encompasses a region of small villages, many only with vehicular access during the dry season. Throughout the region, most medical care is provided by clinics found in the larger villages, the majority being government-run. Missionary/church based and private clinics are also present and account for over 20% of the injections in the area. Nurses and midwives are the predominant caregivers in all settings, with physicians found mostly in the government-funded clinics in Kumba. For most tertiary care needs, patients travel to the large governmental hospital or a number of larger private clinics located in the town of Kumba.
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For more specialized medical needs and testing, patients need to travel to larger cities several hours away, including Lembe, Douala, and Yaounde (the nation’s capital). Transfusions in the Kumba health district are only performed at three centers, all in Kumba proper. Patients are referred from all surrounding villages, but some travel from more distant districts as well.

We surveyed the three providers of transfusions in Kumba, the General Hospital, the St. Francis clinic, and the Ejed clinic, as to their transfusion and blood screening practices. In all three clinics we met with the head laboratory technicians responsible for the transfusions and administered a questionnaire (see Questionnaire 1). We then followed all transfusions performed in the city over a two-week period in February 2003. To best ensure that we were notified of each transfusion, we distributed phone cards to each clinic along with our mobile phone number. We were notified of the transfusions of 16 patients and met with all individuals (and/or the family members currently responsible for their health care decisions) to confirm the prior estimates about transfusions and assess patients’ perceptions and understanding of transfusions. One child died prior to being seen by us and two parents refused to speak to us. Of the 13 patients who agreed to be interviewed, 12 received transfusions, and one was unable to find a donor over a period of two days. Informed consent was obtained, and standardized questionnaires were administered to the patients or guardians regarding information ranging from the reason for the transfusion to cost and understanding of testing procedures (see Questionnaire 2). Thirteen questionnaires were received.

RESULTS

Blood Transfusion in Kumba

The majority of the transfusions are performed at the General Hospital (a government-run hospital), which reports performing approximately 15 transfusions per week. Two private clinics also perform transfusions: the Ejed clinic (which performs about one per month) and the St. Francis clinic (which performs about one per week). According to the senior technician at the General Hospital, the majority of transfusions are performed for malaria and sickle cell disease. St. Francis also performs many transfusions for malaria but additionally reports a large number of transfusions for cesarean section and post-partum hemorrhage. Ninety percent of transfusions performed by the Ejed Clinic are for malaria and 10% are for complications due to pregnancy.

The demographics of transfusion patients seem similar in all three of the clinics. The reported age distribution for all three clinics (as estimated by technicians responsible for the transfusions) shows a bimodal distribution with the most frequent transfusions performed in children between the ages of 0-4 (see Figure 1). The General Hospital estimated the sex distribution of their transfusions as 80% female and the Ejed Clinic estimated their recipients to be 90% female.

Because there is no blood banking system in Kumba, all patients are responsible for providing their own blood donors. If patients cannot find donors, other individuals are sought out through networks of donors known to the clinic or hospital. Officially, donors are not paid

FIGURE 1: ESTIMATED AGE OF TRANSFUSION RECIPIENTS IN KUMBA

![Graph showing estimated age of transfusion recipients in Kumba]
for donations but patients may resort to paying if they cannot find friends or family with matching blood. In this unofficial system, donors can be paid up to 12,000 Communauté Financière Africaine (CFA) [about $20 USD]. All three clinics charge between $20-$25 USD for transfusions (St. Francis and the General Hospital both charge $20 USD and Ejed clinic charges $25 USD), which includes all testing and equipment. St. Francis clinic and the General Hospital currently screen all their donors for syphilis with a Venereal Disease Research Laboratory (VDRL) test, and Hepatitis B and HIV using rapid antibody tests. Ejed clinic does not perform Hepatitis B or syphilis screening but does use a rapid test for HIV. During our study, Ejed Clinic and the General Hospital were using the Abbott Determine test for HIV screening (General Hospital previously used HIVCheck). St. Francis was using the Savyon diagnostics HIV rapid test.

All three clinics reported that they occasionally change the test they use, depending upon cost and availability, but the two using the Determine test had been using it for over one year at the time of this study in 2003. All three clinics reject HIV positive blood but handle positives in different manners. The General Hospital performs pre-test counseling for all donors, informs positive patients of their status and will then refer them with a stored blood sample to Lembe (a larger city several hours southwest) for a confirmatory enzyme-linked immunosorbent assay (ELISA) test. Ejed clinic also notifies patients when they are positive, but has a less formal system for confirmatory testing, whereas St. Francis clinic reports to donors and patients that the blood is “incompatible” but does not reveal their HIV status. Table 1 summarizes the characteristics of blood transfusions in the three clinics.

### HIV Screening for Transfused Blood in Kumba

The prevalence of HIV in adults ages 15-49 in the different regions of Cameroon ranges from 4.8%-9.8% (mean 6.9%) as reported by the 2004 Report on the global AIDS epidemic [Joint United Programme on HIV/AIDS/World Health Organization (UNAIDS/WHO, 2004)] The earliest HIV screening for blood transfusions began in 1989 at the General Hospital, while Ejed initiated screening in 1993, and St Francis began in 1994. According to Sam Enow, a medical supplier interviewed in Douala, very few tests were available for import to Cameroon prior to 1993 (personal communication). His company began importing tests in 1993 and had difficulties with quality control of the tests at the time. He recalls one incident when imported rapid HIV tests from an American company had almost a 30-40% failure rate. According to his sales and internal quality control analyses, HIV tests became significantly more available in 1998 as a large number of companies entered the marketplace. At that time, he also claimed the tests became much more reliable and the price decreased from 3000 CFA ($5 USD) in 1993 to 1500-1700 CFA ($2-3 USD) in 1998. As per Mr. Enow, ELISA tests were first available in Cameroon in 1992, but are still not widely used due to limitations of trained personnel and facilities. Currently in Kumba, the only facility doing ELISA tests is the Tropical Medicine Research Station, mostly as a confirmation for a study of mother to child transmission of HIV. ELISA tests are also being performed in major cities such as Lembe, Douala and Yaounde.

In screening donated blood for HIV, each of the medical centers performs one rapid test and, if negative, uses the blood. However, at about the time of this study, the Cameroon AIDS taskforce introduced blood screening guidelines calling for two rapid tests to be used prior to transfusion because of the chance of a defective test. However, we found that the directors at each of the clinics were unaware of these guidelines and felt the double screening would be unnecessarily expensive.

### Demographics of Patients Receiving Transfusions

Over a period of two weeks we met with 13 patients with demographics described in Table 2. The documented transfusion was the first for ten of the 13 patients; two received transfusions for the same condi-

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**TABLE 1: A SUMMARY OF TESTING AND SCREENING PERFORMED AT THREE KUMBA CLINICS**

<table>
<thead>
<tr>
<th>Clinic</th>
<th>HIV Test Used</th>
<th>Hepatitis B Screening</th>
<th>Syphilis Screening</th>
<th>Tranfusions per Week</th>
<th>Estimated Cost of Transfusion/Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Hospital</td>
<td>Abbott Determine</td>
<td>Yes</td>
<td>Yes (VDRL)¹</td>
<td>15</td>
<td>$20</td>
</tr>
<tr>
<td>Ejed Clinic</td>
<td>Abbott Determine</td>
<td>No</td>
<td>No</td>
<td>&lt;1</td>
<td>$25</td>
</tr>
<tr>
<td>St. Francis Clinic</td>
<td>Savyon Diagnostics</td>
<td>Yes</td>
<td>Yes (VDRL)</td>
<td>1</td>
<td>$20</td>
</tr>
</tbody>
</table>

1. VDRL, Venereal Disease Research Laboratory

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TABLE 2: RESULTS OF PATIENT QUESTIONNAIRE

<table>
<thead>
<tr>
<th>Patient age/ informant</th>
<th>Location</th>
<th>Sex</th>
<th>Residence</th>
<th>Donor</th>
<th>Condition</th>
<th>Prev Tx</th>
<th>Last injection</th>
<th>Traditional healer intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 mo/ Parents</td>
<td>Gen Hosp</td>
<td>M</td>
<td>Matoh Butu</td>
<td>Father</td>
<td>Malaria</td>
<td>No</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>7 mo/ Father</td>
<td>Gen Hosp</td>
<td>M</td>
<td>Kumba</td>
<td>Father</td>
<td>Malaria</td>
<td>No</td>
<td>1 day</td>
<td>No</td>
</tr>
<tr>
<td>20/ Self</td>
<td>Ejed clinic</td>
<td>F</td>
<td>Laduma</td>
<td>Neighbor</td>
<td>Abortion</td>
<td>No</td>
<td>1 year</td>
<td>No</td>
</tr>
<tr>
<td>61/ Daughter</td>
<td>St. Francis</td>
<td>M</td>
<td>Kumba</td>
<td>Cousin</td>
<td>Urological procedure</td>
<td>No</td>
<td>1 day</td>
<td>Tattoo x 1</td>
</tr>
<tr>
<td>28/ Self</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Kumba</td>
<td>Friend/ paid</td>
<td>Heart disease</td>
<td>No</td>
<td>1 year</td>
<td>Cutting x5</td>
</tr>
<tr>
<td>31/ Sister</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Kumba</td>
<td>2 brothers</td>
<td>Malaria</td>
<td>1x13y/a</td>
<td>2 weeks</td>
<td>No</td>
</tr>
<tr>
<td>2/ Mother</td>
<td>Gen Hosp</td>
<td>M</td>
<td>Baminda</td>
<td>Mother</td>
<td>Hem. Anemia Malaria</td>
<td>2x</td>
<td>3 days</td>
<td>No</td>
</tr>
<tr>
<td>21mo/ Mother</td>
<td>Gen Hosp</td>
<td>M</td>
<td>Bete</td>
<td>Aunt</td>
<td>Malaria</td>
<td>No</td>
<td>4 weeks</td>
<td>No</td>
</tr>
<tr>
<td>68/ Daughter</td>
<td>Ejed clinic</td>
<td>F</td>
<td>Kumba</td>
<td>No donor found</td>
<td>Malaria</td>
<td>1x recently</td>
<td>1 week</td>
<td>No</td>
</tr>
<tr>
<td>32/ Self</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Kumba</td>
<td>Brother</td>
<td>Childbirth/ C-section</td>
<td>No</td>
<td>4 weeks</td>
<td>Cutting x2</td>
</tr>
<tr>
<td>27/ Self</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Ekumbe Muche</td>
<td>Friend/ paid</td>
<td>Anemia</td>
<td>No</td>
<td>5 months</td>
<td>No</td>
</tr>
<tr>
<td>18/ Self and Mother</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Kokatu</td>
<td>Neighbor</td>
<td>Malaria</td>
<td>No</td>
<td>Same Day</td>
<td>No</td>
</tr>
<tr>
<td>8 mo/ Mother</td>
<td>Gen Hosp</td>
<td>F</td>
<td>Kumba</td>
<td>Father</td>
<td>Pneumonia</td>
<td>No</td>
<td>1 day</td>
<td>No</td>
</tr>
</tbody>
</table>

In addition to questioning about transfusion populations and procedures, we sought to assess the patients’ understanding of the transfusion procedure and HIV testing procedures. Transfusion recipients were questioned about whether the donated blood was tested, what diseases they thought should be assayed for, and situations when no testing would be appropriate. Nine of the 12 transfused patients were aware that the blood was tested and felt testing was always appropriate—especially for HIV/AIDS (9/13) and malaria (6/13) (although none of the clinics test for malaria). Patients also felt that testing would be appropriate for venereal diseases and hepatitis B. One respondent felt disease testing should be bypassed in situations such as motor vehicle accidents or in other emergencies when time is limited. Three respondents were unable to understand the question. The remaining nine patients felt blood should always be tested.

DISCUSSION

This study examines the details and conditions of transfusion practice in a typical mid-sized market town in central Africa: Kumba, Cameroon. Although our sample size was small and the observation period only lasted one month, the literature suggests that these observations are applicable to many similar locations in Africa and describe a potential iatrogenic risk of HIV transmission. Even as individual facilities in Kumba work to protect their blood transfusions, the procedure has no...
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governmental regulation, and efforts to improve safety are solely dependent on each clinic manager's and/or technician's compliance with sound practices. Without a blood bank, transfusions are performed only when donors can be found and when patients can afford to pay at least $20-25 USD, a sum equal to a months wage for most in this rural setting. Recently, rapid HIV testing has allowed for simple screening of blood donors, but Kumba has inadequate confirmatory testing available. The city maintains only one location with ELISA facilities; further testing necessitates a trip to a distant city—with the resulting expenses. Each clinic does seem concerned about protecting its patients, and the Kumba clinics are working to control disease spread within their budgetary and facility constraints. However, they may not be using the most effective means available for disease screening. Without comprehensive oversight, it remains unclear as to the effectiveness of current screening procedures.

In studies examining effectiveness of rapid test in screening, WHO guidelines recommend combinations of at least two tests (World Health Organization, 1992). In those studies, there was decreased performance of tests in high HIV prevalence populations (HIV prevalence used in the studies was 30.5%), but overall performance when two tests were combined was effective (Stetler et al., 1997). The Cameroon HIV Task Force appears to agree, as their current recommendations call for routine use of two rapid HIV tests for transfusion screening. Additionally there are no standardized approved types of tests or recommendations on proper test usage. As seen in a test approved for use in Canada, which was subsequently found less effective than previously thought, rapid HIV test sensitivity in field-testing can vary from numbers published by the manufacturer (Rekart et al., 2002). A study in Kenya looking at 1,800 blood donations with facilities using rapid antibody tests estimated that about 2% of transfusions transmitted HIV (likely secondary to lab errors or inaccurate testing) (Moore et al., 2001). Nonetheless, field-testing in South Africa funded by Abbott found the Determine test performed well with a sensitivity of 99.6% and a specificity of 98% (Sauer et al., 2000). Unfortunately, similar data on the Savyon diagnostics test was unavailable.

Although we were only able to capture one small part of the picture of current transfusion practices in Cameroon, there is little reason to conclude that transfusion procedure or technique has dramatically changed in the past 20 years in a region that performs only direct whole blood transfusions—a situation that is common throughout the region. With the high prevalence of HIV among adults in Cameroon (approaching 10%), current screening procedures for blood transfusion need to be more thoroughly examined as they do not follow practice guidelines of the WHO or recommendations of the Cameroon HIV/AIDS task force.

A central problem in Kumba, and many other rural areas of Africa, is the lack of a blood banking system. A case study in Tanzania demonstrated that hospital-based blood banks can be financially feasible in low-income African countries (Jacobs and Mercer, 1999). Further work is needed to see if that case is applicable in locations such as Kumba. Additionally, other diseases remain unscreened such as hepatitis C, with an estimated prevalence in Cameroon of 12% (Madhava et al., 2002). Notably, the majority of transfusion recipients recognized transfusion as a risk for HIV. This can be seen as a victory for public health awareness and education in Kumba. It is encouraging to see that initiatives to reinforce the idea of HIV being a bloodborne pathogen have been effective.

We were able to only partially describe health care risk factors in one small town in Cameroon, and more complete descriptions of risks such as unsafe injections and scarification are needed to complete the picture. But it is likely that across sub-Saharan Africa, transfusion risks in many rural areas resemble those in Kumba. HIV transmission through blood transfusion should be fully preventable by enhancing effective educational practices and increasing resources. Additionally, although Cameroon does universally perform HIV screening, hepatitis C screening was not performed in any of the three clinics. Given the high prevalence of this disease in the general population, could this be the beginning of a future epidemic?

Our study was limited by the use of questionnaires and self reports, as well as by our small sample size. Local hospital technicians report that approximately 16 transfusions are performed per week. However, during our sample, we were only notified of 16 potential transfusions over two weeks, but it is possible it was a slower period than usual or the clinic overestimated its transfusion frequency. Additionally, it is likely that we missed some transfusions on weekends and evenings when other people were working at the hospital and did not inform us of the procedures. A further limitation was in the administration of the surveys to the patients. The parochial language of Kumba is a pidgin English. Most of the surveys were conducted with a translator; however, many of the concepts discussed in the survey did not translate easily into pidgin. For example, some of the respondents had difficulty with the concept “should” as in “should the blood always be tested for safety and, if so, for what diseases”... translations often resulted in leading explanations. That problem was also very relevant for the question asking whether transfusions must always be tested. Another frequently encountered problem was the difficulty in isolating the respondent. Everyone surrounding the patient (other family members, nurses and patients in neighboring beds) was eager to help in the questionnaire. Consequently, many of the answers (e.g. understanding if the blood was tested) were often arrived at.
QUESTIONNAIRE 1

TRANSFUSION QUESTIONNAIRE FOR CLINIC MANAGERS/DIRECTORS

Date: ______________________________________________________________________________________________________
Clinic Name: __________________________________________________________________________________________________
Provider Name: __________________________________________________________________________________________________
Provider Title: __________________________________________________________________________________________________
Education: __________________________________________________________________________________________________

1. How many transfusions does this clinic perform each week on average?

2. Can you estimate what proportion of those receiving blood transfusions fall in the following categories?
   A. AGE: 0-4___ 5-10____ 11-15___ 16-19 ___ 20-30____ 31-40____ 41-50____ >50___  
      (must equal 100%)
   B. Male___ Female ___
   C. Reasons for blood transfusions
      Malaria _____ Sickle Cell Disease _____ Pregnancy Complications____
      Accidents (Trauma) ______ Other ________ (write in others)  
      (must equal 100%)

3. Can you describe the system for obtaining blood donors?

4. Are donors ever paid for their blood: YES/NO
   And if so, by whom?

5. What percentage of blood transfusions at this clinic is screened for HIV?

6. If less than 100% to #5, for what reasons?

7. Do you screen for hepatitis?

8. What is the procedure for blood that tests positive?
   A. Is positive blood ever used?
   B. How do you obtain another donor?
   C. Is the donor notified?

9. What year did the clinic first start testing blood for transfusions for HIV?

10. What tests do you use?

11. A. What is the charge for a blood transfusion?
    B. Does this price include the cost of screening for HIV?

12. Have you ever needed to reuse equipment/needles between transfusions?
    If yes, then how often does this happen?
    When was the last time that this happened?

13. How would you improve your transfusion practice?

14. Do you feel transfusions in other clinics in Kumba may use less safe practices?
    What types of practices?
QUESTIONNAIRE 2

INJECTION AND TRANSFUSION SAFETY STUDY
Medical Research Station, Kumba

Informed Consent for Transfusion Group

A research study of medical procedures in and around Kumba, Cameroon is currently underway by the Medical Research Station. This program wants to know how people in clinics and hospitals around Kumba do blood transfusions. To accomplish this, researchers will be visiting many local clinics in the area to observe how things are done. We are going to ask you a few questions about this transfusion and past medical care. Some general information about the patients seen at this clinic will also be collected. This part of the project should show us how transfusions could be made safer in Kumba. The information obtained through this study will be provided to public health authorities so as to improve healthcare in this community.

We respectfully ask for your participation in this study. You are under no obligation to be in the study and can say “no” at any time without any effect on the medical care you receive here. All information is anonymous and confidential. If you agree and would like to participate please say so by initialing or signing in the space below. Thank you for your time and cooperation.

Initial or sign here: _______________________________________________________________________________________

Date:_______________________________________________
Clinic Name:_____________________________________________________________________________________________ __
Pt Gender:________________________________________________________________________________________________
Pt Age:___________________________________________________________________________________________________
Pt Residence:____________________________________________________________________________________________ __
Informant relationship to Pt:
1. For what reason are you (or other) being transfused today?
2. Who will be the donor of the blood for this transfusion? (relationship to patient)
3. Is this your first blood transfusion?
4. If not, how many times (not including this episode) have you (or other) been transfused in the past?
5. When, and for what reasons, were you transfused each time previously (for example: malaria, pregnancy)?
   1. ___________________________ Date:_________________________ Where:
   2. ___________________________ Date:_________________________ Where:
   3. ___________________________ Date:_________________________ Where:
6. Who has been the donor each time you (or your son/daughter) required a blood transfusion? (include relationship to the patient)
   1. _____________________________________________________________________________________________________
   2. _____________________________________________________________________________________________________
   3. _____________________________________________________________________________________________________
   Do you know how much a transfusion costs?
7. Do you know if the blood that was used in this transfusion was tested for safety?
8. Do you know if testing of blood for transfusion costs extra? If so, how much?
   YES/NO  Cost:_______
9. Do you think blood for transfusion should always be tested for safety, and if so, for what diseases should it be tested for?
10. Can you think of any times in which blood for transfusion should not be tested?
   Now, I will ask a few other questions about other medical care before finishing
11. When did you (or other) have their last injection (in weeks)?
12. Where did you (or other) receive their last injection?
13. What was your last injection for?
14. Have you ever been “cut” by a traditional doctor (Candastick) or for a “tattoo?” YES/NO
15. If yes, how many times for each?
   Cut:_________  Tattoo:_____
with some neighborly input. Fortunately, the outside
input and lack of effective translation did not interfere
with the objective questions. Nevertheless, the prelimi-
ary information gleaned from the questionnaire is
informative despite these limitations and suggests that
future, more comprehensive studies should be
performed to more closely examine the blood transfu-
sion system in sub-Saharan Africa.

Finally, although this study has noted that current
transfusion providers have significant awareness of
HIV, our data suggest that many HIV-positive trans-
usions occurred in Cameroon (and throughout Africa) in
the period prior to the mid 1990s—when testing in
Africa first became widespread. This was 25 years after
the AIDS epidemic began in that region, and represents
a window of time in which millions of untested trans-
fusions are now known to have occurred (Schneider
and Drucker, 2005), transfusions which are likely to
have contributed significantly to the growth of the
AIDS epidemic in Africa.

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