AIDS Crisis in Africa: Health Care Transmissions
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Witness:
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Testimony:
It is a privilege and a challenge to address this committee on a matter so important to the health of people in Africa and by extension in Haiti and much of Asia as well. With a better understanding of the HIV epidemic in Africa, the new resources that President Bush has asked for could make an enormous difference to almost immediately stop and even reverse epidemic growth in developing countries.

If we consider all of the evidence about HIV in Africa, from the time AIDS was first recognized on the continent 20 years ago to the present, this evidence suggests that the driving force for the epidemic – what allows the epidemic to grow rather than to die out – has been and continues to be unsafe health care. This view of the epidemic challenges the conventional wisdom that over 90% of HIV in African adults is from heterosexual transmission. In this testimony, I first summarize the evidence showing that health care rather that heterosexual transmission drives Africa's epidemic, and I then consider implications for HIV prevention.

Evidence for HIV from health care and heterosexual transmission through 1988

After early debates about the relative importance of unsterile health care and heterosexual transmission in Africa's AIDS epidemic, most AIDS experts reached a consensus no later than 1988 to focus on heterosexual transmission. In that year, WHO circulated estimates that 80% of African HIV came from heterosexual transmission, just over 10% from mother-to-child transmission, 6% from blood transfusions, and less than 2% from unsafe medical injections. We have been unable to find an explanation of how WHO experts or anyone else derived these estimates from evidence.

To determine the facts behind these estimates, we looked at all of the studies of risk factors for HIV in Africa with field work completed through 1988. We found 13 studies that tested and questioned a total of more than 25,000 adults from the general population. In these studies, people who reported medical injections in previous years were more likely to have HIV infections; across all studies that asked about injections, an average of 48% of HIV infections were associated with injections. Similarly, 5% of HIV infections were associated with blood transfusions and some with scarification, so that health care exposures were associated with over 50% of infections. In contrast, across all studies that asked about numbers of sexual partners, only 16% of HIV infections were associated with having more than one sexual partner. The measure of association that we have used is the crude population attributable fraction, which for various reasons may overestimate or underestimate the causative association.

Another dozen studies during 1984-88 looked at HIV in African prostitutes, and characteristically found high HIV prevalence. However, prostitutes get a lot of injections for sexually transmitted disease (STD), so they have at least two important risks – health care and sex. No study of African prostitutes through 1988 – or later – has collected and reported enough information on medical exposures to sort out how much HIV is coming from sex versus health care.

Despite high HIV prevalence in prostitutes, most HIV in Africa in the 1980s was in men

and women in the general population with very normal and even conservative sex lives – with 0-1 sexual partners in the last six months, last year, or even lifetime. And in the general population, more HIV was associated with medical than with sexual exposures. Hence, WHO's 1988 estimates that over 90% of HIV in African adults was from sexual transmission and less than 2% from medical injections disagreed with available evidence. From the beginning, this estimate has floated above the facts.

Evidence for HIV from heterosexual transmission through 2003

Nevertheless, the estimate was widely accepted, and the dominant view from the late 1980s has been that HIV in African adults is spread primarily by heterosexual contact. For this to be true, heterosexual transmission would have to be much faster in Africa than in the US and Europe. Rough calculations can show how big this difference would have to be. In the US, there are about 800,000 men and women with HIV, and of this total, about 400,000 are heterosexually active, including men and women infected from injection drug use or heterosexual partners and bisexual men infected by male lovers. Whatever the source of their HIV infections, these 400,000 men and women are a threat for heterosexual transmission. According to recent estimates, there are in the US about 40,000 new HIV infections each year of which roughly a quarter – 10,000 – are from heterosexual contact. From this, we can estimate that 400,000 heterosexually active men and women with HIV infect 10,000 through heterosexual contact in a year, or on average 40 people infect 1 in a year. Hence, in the US, HIV would not even survive as an epidemic through heterosexual transmission alone. Without treatment, people with HIV live on average about 10 years, while they would have to live 40 years on average to infect another person through heterosexual contact. It is noteworthy as well that many of the heterosexuals with HIV in the US, including prostitutes and drug users, are not low risk and conservative in their sexual behavior.

We can compare this US experience with what has been supposed about sexual transmission in Africa. In Africa, the HIV epidemic has often been observed to double in as little as 1-3 years in low risk populations such as antenatal women in Botswana and South Africa in the early 1990s. For heterosexual transmission to explain such rapid growth, on average each man or women with HIV would have to infect another in 1-3 years, or roughly 15-30 times faster than average heterosexual transmission in the US. Hence, there is much to explain.

Initially, AIDS experts supposed that faster heterosexual transmission in Africa than in the US could be explained by greater promiscuity among Africans. However, studies of sexual behavior in 12 African countries in 1989-93 derailed this hypothesis, showing Africans to have on average no more partners than Americans or Europeans. A 1995 WHO publication noted that "These results are totally incompatible with the view, prevalent only a few years ago, that the HIV pandemic in Africa was fuelled by extreme promiscuity" (page 211).

Another proposed explanation for much faster heterosexual transmission in Africa is that more Africans are infected with STD such as gonorrhea and syphilis, which are co-factors that increase the rate of HIV transmission. However, the size of the impact is the issue. In many African studies, different levels of STD prevalence across communities or time do not correlate with and hence cannot explain differences in HIV prevalence or incidence. For example, a major study in 1997-98 tested and questioned roughly 1,000 men, 1,000 women, and 300 prostitutes in four African cities – two with high and two

with low HIV prevalence. The study reported that high rate of partner change, sex with prostitutes, concurrent partnerships, gonorrhea, chlamydia, syphilis, and lack of condom use were “not more common in the two high prevalence cities.” Notably, Yaounde in Cameroon, one of the two cities with low HIV prevalence, had the highest rates of gonorrhea and chlamydia.

Other factors that have been proposed to explain Africa’s heterosexual epidemic include lack of male circumcision and genital herpes. Lack of circumcision appears to increase risks for males by a factor of about two. Similarly, a recent review of research on genital herpes suggests that it, too, increases risks to contract HIV by a factor of about two. These co-factor effects are too small to explain the supposed differences in sexual transmission between Africa and developed countries. Furthermore, genital herpes and uncircumcised males are common in the US and/or Europe.

From 1988 through 2003 repeated efforts to explain Africa’s supposed much faster heterosexual transmission have foundered on the facts. Nevertheless, AIDS experts have not abandoned the vision. An important 2002 article in Lancet asserts that a “complex interplay of behavioral factors and factors that effect the transmission of HIV-1 during sexual intercourse” explains HIV epidemics in Africa. Translated into plain English, what this means is that “We think it’s a sexual epidemic, but we can’t explain how.”

In the years since 1988, research in Africa has produced an increasing body of evidence measuring the association between HIV and various sexual exposures. We have used this evidence to make the first empiric estimates of the proportion of HIV in African adults from heterosexual transmission. One important category of evidence comes from five studies that show the annual rate of HIV transmission between serodiscordant partners in Africa who continue unprotected sex. In these studies, either the husband or wife is HIV-positive while the other is HIV-negative, most did not know their own or spouse’s HIV status, and condom use was rare. Across these five studies the average annual rate of incidence in HIV-negative men was 7.1%, and in women, 10%. These rates are somewhat higher but comparable to what has been found in similar studies in the US and Europe. From this and other empiric information on HIV in married partners, we can calculate that spouse-to-spouse transmission explains roughly 10-14% of total incident (or new) infections that would be required to explain even a slow-growing epidemic.

The other important category of evidence that we use is the proportion of new HIV infections in African adults associated with having multiple sexual partners. For this, we use data from studies that followed people who initially tested HIV-negative, and then re-tested and questioned them later to identify risks for those that seroconverted before follow-up tests. We found 10 such studies. From these, we calculated an (unweighted) average of 15% of new HIV infections associated with having more than one sexual partner.

To estimate all HIV infections associated with sexual transmission, we add 10-14% from spouse-to-spouse transmission and 15% from multiple partners, and we add some infections that unmarried people contract from their first or only partner in a year. From these calculations, which we report in detail in a recent paper, our best point estimates (we do not estimate confidence intervals) are that heterosexual transmission is responsible for 25-35% of HIV in African adults. Since these are the first evidence-based estimates of the proportion of HIV in African adults from sexual transmission, we recognize that there will be questions about data and analyses, and we invite revisions

and refinements.

Evidence for HIV from health care through 2003

If we assume that most of the HIV in Africa that is not from sexual transmission is from health care, we can estimate that health care is responsible for 60-70% of HIV. This indirect approach gives us no information about specific health care risks. The direct approach is to build up estimates of health care transmission from studies that associate HIV with injections, blood transfusions, dental care, and so on.

Taking the direct approach, health care injections appear to be the biggest single risk. From the 16 available large studies in Africa with sufficient data on injections, an average of 28% of HIV infections is associated with medical injections. Some studies associate HIV with blood transfusions and/or scarification, but we know little about dental care, drawing blood for tests, traditional operations, and other blood exposures.

Even so, there is other evidence for health care transmission. For example, a number of studies show unexplained high HIV incidence in African women from first antenatal visit to delivery and for the first year postpartum. In 1990 in Malawi, for example, HIV-negative antenatal and postpartum women were observed to contract HIV at the rate of 21% per year. This is, notably, double the rate that one would expect if all their husbands were HIV-positive. No one tested the husbands, but we can estimate how many would be HIV-positive and how many new infections would be due to spouse-to-spouse transmission, and we are left with unexplained incidence of 19% per year. Another similar study in Zimbabwe in 1990-94 shows unexplained incidence of 14% per year in antenatal women and 10% per year during 0-6 months postpartum. This evidence suggests possible HIV transmission through blood tests, vaginal exams, tetanus vaccinations, and/or other pregnancy-related health care. If so, this could explain an important proportion of HIV in young women in many African countries.

Many studies have reported HIV-infected children with HIV-negative mothers. In Kinshasa in 1985, for example, 17 of 44 HIV-positive inpatient and outpatient children had HIV-negative mothers. In Kigali in 1984-86, 15 of 76 children with AIDS or AIDS symptoms had HIV-negative mothers. In Uganda in 1989-94, 19% of 26 children with Kaposi’s sarcoma and HIV had HIV-negative mothers. And in a large study of inpatient children and mothers in four African cities ca. 1990-91, 61 (1.1%) of 5,593 children were HIV-positive with HIV-negative mothers (the study did not report total HIV-positive children, so we don’t know the proportion with HIV-negative mothers).

In addition, a number of studies have reported levels of HIV prevalence in children too high to be explained by mother-to-child transmission. In a random sample survey in Rwanda in 1986, for example, 4.2% of urban children 6-15 were HIV-positive. Most of these infections would be from health care, since these children were born when HIV prevalence in mothers was low, and most of the children infected from their mothers would have died before reaching 6 years old. In 2002, a national random sample survey in South Africa reported 5.6% HIV prevalence in children 2-14 years old. One quarter of this total can be explained by what we know about mother-to-child transmission and child survival with HIV, leaving roughly 500,000 unexplained infections. A comment in the British Medical Journal proposes that child abuse might be a factor; however, child abuse would have to be a thousand times more common than reported to account for the infections. In other words, if the data is correct, health care is suspect.

Some evidence suggests that large scale HIV transmission through health care in Africa

is plausible. At least three large iatrogenic HIV outbreaks have been documented outside Africa. In Russia in 1988, doctors who found one child with HIV set in motion an investigation that identified 250 children infected through health care. During this outbreak, the number of infections in two hospitals in Elista increased from one to 90 in 11 months, doubling on average in less than two months, which is faster than HIV spread among gay men attending bathhouses in San Francisco in the early 1980s. Other comparable iatrogenic outbreaks have been uncovered in Romania in 1989 with over 1,000 infected children and in Libya in 1998, with almost 400 infected children.

What has happened in Russia, Romania, and Libya has no doubt happened in a number of African countries. As already noted, from the mid-1980s, many studies have reported HIV-infected African children with HIV-negative mothers, but there have been no follow-on investigations to find the numbers infected and clinics and procedures involved, allowing informed action to stop transmission. One wonders what would have happened in Russia or Libya, for example, if doctors had not sounded the alarm after finding one unexplained infection, and if outbreaks had been allowed to continue, doubling every several months. From this perspective, it is possible that hundreds of thousands of African children have HIV infections from health care, which could explain the 5.6% prevalence in children 2-14 years old in South Africa's 2002 household census.

Several recent WHO studies report hundreds of millions of unsafe injections in Africa each year. These occur in formal as well as informal settings. For example, in early March 2003, a nurse in Botswana was observed reusing the same needle without sterilization on 170 children. What may be remarkable about this incident is that teachers objected and someone reported it to the newspaper, but it is also noteworthy that teachers allowed the injections to continue. Hospitals and clinics often operate without running water. Doctors and nurses may reuse gloves with many patients, if they have gloves at all. Since formal systems are often not able to meet the demand for health care, people go to a variety of informal providers, including pharmacists, untrained injection doctors, and neighbors. The situation is certainly much worse on average than in Russia, Romania, and Libya, where hundreds to thousands of iatrogenic infections have been found.

Implications for community HIV prevention

If the arguments and estimates that we present about the proportions of HIV from sex and health care are even partially correct, we can expect much more success in slowing the HIV epidemic with a combined program that addresses both sets of risks. From 1988, efforts for HIV prevention among Africa youth and adults have focused almost exclusively on sexual risks, promoting behavior change – fewer partners and more condom use – and improved STD treatment. A variety of evidence suggests that these and other interventions targeted at sexual transmission can be expected to have only modest impact on the spread of HIV in a community. For example, studies of sexual behavior in 12 African countries in 1989-93 showed little or no correlation between average numbers of sexual partners in a country and level of HIV prevalence. Similarly, the 1997-98 four-city found no correlation between most measures of sexual exposure and HIV prevalence. And a recent large trial of behavior change interventions on HIV incidence in Masaka, Uganda, reported that increased condom use with last casual partner had no significant impact on HIV incidence.

From 1991, three large trials in Tanzania and Uganda tested the impact of improved STD treatment on community HIV incidence. In two of these trials, in Rakai and Masaka in

Uganda, STD treatment reduced STD prevalence but had no significant impact on HIV incidence. In a third trial in Mwanza, Tanzania, which was the first to report in 1995, improved STD treatment had little impact on STD prevalence, but HIV incidence was much lower in intervention than in control communities. These results are a puzzle, since it is not possible from the data to explain lower HIV incidence on the basis of modest and questionable reductions in STD prevalence. However, the Mwanza trial coincided with an injection safety initiative, which might well be the missing factor that explains it's apparent success.

Among the many developing countries with generalized HIV epidemics, Uganda is one of the few to show falling HIV prevalence, which appears to have peaked around 1990 and then declined. Experts debate the relative importance of less extramarital sex (abstinence and faithfulness) versus condom use to explain this success. However, this debate ignores big improvements in health care safety. From the late 1980s, the government of Uganda, as part of its response to HIV, arranged special training for health care workers in infection control. In addition, both government campaigns and private radio have educated the public about risks from unsterile health care. When Ugandans go for injections, they often bring their own syringes. A 1998 study reported that Ugandans taking relatives to the hospital bring saucepans and cookers to sterilize instruments every night at the foot of the bed, not trusting hospital sterilization. A 2001 WHO-funded study reports that "Private medical practices are very popular…in Uganda where public facilities are often mistrusted and held responsible for the spread of the AIDS epidemic." Hence, attempts to explain the observed fall in HIV prevalence in Uganda are incomplete without attention to changes in health care practices. The same goes for Thailand, another country where success against HIV has been claimed for interventions targeting sexual transmission (particularly the 100% condom program for prostitutes), and where large improvements in health care practices are plausible and ignored.

Overall, repeated findings of weak or absent correlations between levels of HIV infections and community levels of sexual behavior, condom use, and STD prevalence suggest that even aggressive and successful efforts aimed at sexual risks may have little impact on the trajectory of epidemic expansion in countries with generalized epidemics. This makes sense if health care rather than sex drives HIV growth. The consequences of continuing failure to control emerging and ongoing generalized epidemics can be measured in tens of millions of new infections over the next decade, many of which can be expected in populous Asian countries such as India, Pakistan, and Indonesia. Even if we are only partially correct about the role of health care transmission in generalized AIDS epidemics, we can expect much better success with programs that address both health care and sexual risks.

Implications for helping individuals reduce personal risk

People living and raising families in communities where 1%-30% or more of adults are HIV-positive face a variety of risks. UNAIDS, for example, advises UN employees going to many developing countries to bring their own syringes and to ask about sterilization when seeking health care. Similarly, a young African couple trying to raise a family safely has to consider whether or not to send the wife to the public antenatal clinic, where nurses take tetanus vaccine out of multidose vials, and specula may be reused without sterilization. When children are young, the couple has to balance risks from measles and other diseases against risks with immunization. Even if they buy and bring their own

disposable syringe, they don't know what other needles have gone into multidose vaccine vials, and single-dose vials may not be available. When someone has a toothache, they face risks in dental care. In Harare, for example, people are advised to go to the dentist early because it's cleaner; with about 30% adult HIV prevalence, if one is the fourth person in the chair, chances are better than 50% that one of the previous patients was HIV-positive.

In addition to these health care risks, people need information about sexual risks, including their own and their partner's HIV status and options to reduce sexual risks. When someone is looking for a spouse or a young couple is planning to have a child, for example, they need access to HIV tests to make informed life decisions. However, in most African countries, test kits are strictly controlled through public trade, which means that tests are not conveniently available. In 2001, for example, only two sites in Cote d'Ivoire offered HIV tests, and only 16 sites in Zimbabwe. Testing sites are often far away, and two visits may be required to draw blood and to receive one's results. Without a major relaxation of controls on HIV tests, over 90% of Africans with HIV will continue to live and die without they or their partner ever knowing they are HIV positive. This situation undermines all efforts to control sexual transmission. Hence, big changes are required in regulation of HIV testing to enable people to see and control their sexual risks. Rapid tests are available for less than $2.

Once people are tested and know their status, if both partners are HIV-negative they can throw away condoms and save money as long as they stay with current partners. If one partner is HIV-positive, they will presumably be attentive to advice about condoms and other options.

The WHO Constitution affirms that "Informed opinion and active cooperation on the part of the public are of utmost importance in the improvement of the health of the people." Since Africans are on the front lines facing multiple risks from HIV, we can be more effective against HIV to the extent that we help them get the information and life skills that they need to live safely in the midst of a terrible epidemic. Considering all the risks that they face, the current focus on condoms and sexual behavior simply does not speak to all their concerns and does not meet all their needs.

Recommendations

This review of evidence and issues in prevention leads to four recommendations.

1. The research agenda needs a major overhaul. Over the last 10 years – after some good early research – we have learned very little about HIV transmission through health care and other blood exposures. Changes in personnel and structure of agencies directing HIV research may be considered to strengthen research management in NIH, CDC, and WHO. It is unreasonable, for example, to expect the vice squad to solve the Enron scandal; we need some accountants. In the same vein, if we want new research to give us better information about health care risks, it may be useful to bring in infection control experts, anthropologists, and some new epidemiologists interested and committed to explore health care risks.

2. To give people in developing countries the information they need to plan their lives and to protect themselves and their loved ones, controls that currently limit import and sale of HIV test kits should be relaxed to allow uncontrolled private import and sale of kits approved by WHO, or if that is too radical to allow private import and sale to all nurses, doctors, and clergymen, so that people can either buy kits to test themselves or

can go to people in their community for tests.
3. Efforts to educate people about sexual risks for HIV and options to reduce those risks – such as condoms and abstinence – should continue. When more people are able to get themselves and their partners tested for HIV, we can expect increased interest in these options.
4. Both to control the epidemic and to help individuals control their risks, it is crucial to ramp up programs promoting health care safety. This is at the same time a human rights issue. The most important – and relatively low-cost – component of such programs is public education, so that health care consumers know the importance of safe care and will demand and pay for it if necessary. There are, however, other components that will take more money, including provision of autodisable syringes and single-dose vials, cleaning up the blood supply, in-service training for a wide range of health care personnel including dentists, and provision of autoclaves and spare parts to sterilize reusable medical equipment (such as scissors and specula). The low priority accorded to health care risks for HIV over the last 15 years means that we have a major job ahead over the next year or two to design effective programs for HIV prevention and to decide how best to proceed.