S. HRG. 108–34

AIDS CRISIS IN AFRICA: HEALTH CARE TRANSMISSIONS

HEARING

BEFORE THE

OF THE

COMMITTEE ON HEALTH, EDUCATION, LABOR, AND PENSIONS UNITED STATES SENATE

ONE HUNDRED EIGHTH CONGRESS

FIRST SESSION

ON

EXAMINING THE FEDERAL ROLE IN COMBATING THE GLOBAL TRANSMISSION OF AIDS, IN AFRICA, FOCUSING ON ISSUES RELATING TO RESEARCH, PREVENTION, CARE AND TREATMENT, HIV TRANSMISSION THROUGH UNSAFE MEDICAL PRACTICES, AND GLOBAL CONTROL OF TUBERCULOSIS AND MALARIA

MARCH 27, 2003

Printed for the use of the Committee on Health, Education, Labor, and Pensions

U.S. GOVERNMENT PRINTING OFFICE

86–273 PDF WASHINGTON : 2003

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512–1800; DC area (202) 512–1800
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C O N T E N T S

STATEMENTS

THURSDAY, MARCH 27, 2003

	Page
Sessions, Hon. Jeff, a U.S. Senator from the State of Alabama	1
Enzi, Hon. Michael, a U.S. Senator from the State of Wyoming	2
Allen, Claude A., Deputy Secretary, Department of Health and Human Services, Washington, DC	5
Gisselquist, David and Maria Wawer, M.D.	14

ADDITIONAL MATERIAL

Statements, articles, publications, letters, etc.:	
Claude Allen	30
David Gisselquist	35
Milton B. Amayun, M.D.	62
Lillie C. Thomas	64
Marie J. Wawer, M.D.	66
World Health Organization	69

AIDS CRISIS IN AFRICA: HEALTH CARE TRANSMISSIONS

THURSDAY, MARCH 27, 2003

U.S. SENATE,
COMMITTEE ON HEALTH, EDUCATION, LABOR, AND PENSIONS,
Washington, DC.

The committee met, pursuant to notice, at 10:03 a.m., in room SD–430, Dirksen Senate Office Building, Senator Sessions, presiding.

Present: Senators Sessions, Enzi, and Alexander.

OPENING STATEMENT OF SENATOR SESSIONS

Senator SESSIONS. Good morning. Today's hearing will focus on the AIDS crisis in Africa and the role of medical transmissions in the spread of this epidemic. This is a critically important issue. The idea of a young person or any person, for that matter, going into a clinic to have an immunization or a shot for an infection and departing after having been inadvertently infected by a deadly disease like AIDS is too horrible to contemplate. If health care procedures account for a significant percentage of the cases of HIV infections in Africa then we must immediately and radically change our prevention procedures.

The good news is that with an intensive effort, immediate changes for the better could occur. Even if the proportion of cases from injections is much lower than that by heterosexual transmission, it is an important component of the problem and we must act quickly. It would be the height of immorality to allow this horror to continue if it is preventable.

We know there is a dispute over the issue. The World Health Organization says that the Gisselquist study, which we will hear from today, is not correct. They may be right. What we are here today to do is to air this issue. We have years of study and much research into the epidemiology of AIDS and we have experts who have analyzed this data to give us their judgment as to the causes of this epidemic and the most effective solutions. We have three experts here today and we are eager to hear from you.

The specific question for the committee today is what is the role of health care, particularly injections, in the spread of this disease? This has been a subject of much discussion over the last several weeks, largely due to a series of articles published by Dr. Gisselquist and others in the Journal of STD and AIDS. Their research, based on an analysis of existing studies, indicates that

medical transmissions from dirty needles, tainted blood, play a much larger role than previously thought.

I am approaching this data with a naturally critical eye. We want to know the truth and I will be asking the witnesses today two questions. Based on all available data, what is the role of the health care setting in the African AIDS epidemic? And two, what should Congress do to address this problem? We are not looking for hyperbole or generalizations; we do not have time for that. Lives are at stake and we have had over a decade to look at this problem. I want to hear the facts. What are the statistics? Have they been properly evaluated over the years? What do those statistics tell us? And based on that information, what can we do to address these problems and save lives?

Our first panelist will be Claude Allen, deputy secretary of Health and Human Services. Mr. Allen has previously served as secretary of Health and Human Services for the Commonwealth of Virginia. Before that he was counsel to the Virginia Attorney General.

The second panel will consist of two witnesses, both of whom have impressive credentials and experience in these matters. The first is Dr. David Gisselquist. Dr. Gisselquist is the co-author of a series of article in the International Journal of STD and AIDS, a publication of the Royal Society of Medicine.

Dr. Maria Wawer is a professor of clinical population and family health. Dr. Wawer has an impressive record of experience in the area of AIDS and particularly in Africa and has written extensively on this important issue.

I thank each of you for being here and we look forward to your testimony.

I am glad to see my colleague, Senator Mike Enzi, here. Senator Enzi, do you have any comments before we get started?

OPENING STATEMENT OF SENATOR ENZI

Senator ENZI. Thank you, Mr. Chairman. I have a few words I would like to say. I want to thank you for convening this hearing. I know that you have been investigating and exploring and interested in this for some time and I thank you for the panel members that you have assembled who will be sharing their time, their expertise and their experience with us today.

It is important for us to determine whether sexual behavior or unsanitary medical procedures are more to blame for the AIDS crisis. However, it is also important that we provide treatment and care to the millions of Africans afflicted with HIV and AIDS. Risky sexual behavior is usually cited as the main cause for HIV transmission in Africa. However, in October 2002 a team of researchers and independent consultants led by David Gisselquist published a series of articles that challenged the conventional hypothesis that sexual transmission is the primary driver of the HIV and AIDS pandemic. I am pleased that Dr. Gisselquist is here today to discuss his conclusions in detail.

The World Health Organization and UNAIDS have reviewed Dr. Gisselquist's findings but they disagree with his conclusions. They have reiterated their current view that unsafe sex is the primary mode of transmission of HIV in Africa and they estimate that un-

safe injection practices account for only about 2.5 percent of the HIV infections in Sub-Saharan Africa. I believe that Dr. Wawer shares this view and I look forward to hearing her assessment of the data.

The debate over the primary modes of HIV transmission suggests that we may need a closer examination of the data. If we need further research, the results of such studies should certainly be factored into our global prevention strategies. However, we should not let this debate slow our efforts to provide treatment and hope for the millions of African men, women and children afflicted with the disease.

We are holding this hearing at a very propitious time. During this year's State of the Union Address President Bush announced his emergency plan for AIDS relief in Africa and the Caribbean. I understand that Mr. Allen from our Department of Health and Human Services will outline the proposal in some detail in his testimony. This five-year plan would escalate our commitment to fighting AIDS across the globe by focusing our resources on the 14 nations that account for 50 percent of all HIV infections. The plan will focus both on treating the currently infected and on preventing future infections through the employment of proven education and intervention programs. As a member of this committee and the Foreign Relations Committee, I am working with my fellow committee members to help bring the president's proposal to fruition.

Without question, AIDS is one of the main contributors to the deterioration of families and the instability of societies in Africa. If we can reverse the course of this tragedy, we will provide the people of Africa with a better future. In the highly interconnected world in which we live, more security for the people of one region also means security for people all over the globe.

I thank Senator Sessions for calling and chairing this hearing and I look forward to the testimony of our witnesses.

Senator SESSIONS. Thank you, Senator Enzi. I know Senator Kennedy planned to be here but there is a very significant Judiciary Committee hearing going on at this moment and perhaps he will be able to join us later.

[The prepared statement of Senator Kennedy follows:]

PREPARED STATEMENT OF SENATOR KENNEDY

I commend Senator Sessions for calling this hearing on the AIDS crisis in Africa. We are now in the third decade of this worldwide epidemic, and every nation, including our own, has an obligation to do more to end it. Almost 22 million lives have been lost because of AIDS, and the need is urgent to develop more effective measures for its prevention and treatment, and for the care of those who suffer from it.

We already know how to help those infected by the virus to lead long and productive lives through the miracle of prescription drugs.

Thirteen years ago, we demonstrated our commitment to the care and treatment of our citizens living with AIDS by passing the Ryan White Care Act. Since then, community-based care has become more widely available. Drug treatments have been developed that nearly double the life expectancy of HIV-positive individuals. Public campaigns have increased awareness of the disease. Tragically,

advances such as these remain largely available only in wealthy nations. We have an obligation to continue to combat this disease at home, but we should also share what we have learned, so that we can help other countries deal with this life-and-death battle. We must do all we can to provide new resources to help those who cannot afford today's therapies.

AIDS imposes a heavy toll on developing countries. Of the 42 million people who have HIV/AIDS today, the overwhelming majority are in the poorest countries. Sub Saharan Africa is the most affected region. Nearly all of the thirteen million children who have been orphaned by AIDS live in those nations.

AIDS robs poor countries of the workers they need to develop their economies. They lose teachers needed to combat illiteracy and train workers for modern challenges. Africa has lost seven million farmers needed to meet the food requirement of their nations. AIDS plunges poor nations into steadily deeper, more desperate poverty.

The challenges are great, but not insurmountable.

Governments can make the difference in battling scourges such as AIDS. Where these governments obtain the resources, their infection rates have dropped by 80 percent. But they cannot do it on their own. These governments deserve the technical assistance and resources to carry out educational campaigns. They deserve financial help to pay for needed drugs, and drug companies must do their part to make their products more accessible to the poor. These countries also need assistance to develop the infrastructure to provide health care and deliver the drugs to the patients who need them.

Solving the AIDS crisis in Africa and in other parts of the world requires a broad approach that takes into account all the aspects of the transmission of this disease, including steps to prevent unsafe sex practices, mother-to-child transmission of the disease, and infection from contaminated blood and unsafe injections.

We know that AIDS ends lives, destroys families, undermines whole nations, and threatens their stability and progress. President Bush deserves great credit for proposing $15 billion over the next 5 years to combat the global AIDS epidemic. Together with legislation that Congress should pass soon, we can lead the world community in defeating one of the greatest public health threats of our time.

Senator SESSIONS. Senator Enzi, I thank you for those comments.

I do support and I believe this Congress will support the president's plan to triple the amount of money that we spend on fighting AIDS globally. It is a scourge of unprecedented proportions. It is something that I believe in and support. We had Sir Elton John testify before our committee and he also challenged us to use that money wisely and he pointed out the difficulties of making sure that our money is applied in a most effective way to have the greatest possible impact on eliminating this disease. So that is where we come from today.

It is good to see Mr. Allen. We had some difficulty with rural health clinics in Alabama and I called him and asked for his help and not only did he help; he came down. He spent 2 days traveling the State, visiting poverty, rural health clinics, and helped us re-

constitute them in an effective way. Mr. Allen, it is a pleasure to have you before us and we would be delighted to hear your comments at this time.

STATEMENT OF CLAUDE A. ALLEN, DEPUTY SECRETARY, DEPARTMENT OF HEALTH AND HUMAN SERVICES, WASHINGTON, DC.

Mr. ALLEN. Thank you, Mr. Chairman.

Senator SESSIONS. By the way, I understand you have taken a real personal interest in this issue and we thank you for that.

Mr. ALLEN. Thank you, Senator. Indeed, Mr. Chairman, Senator Enzi, members of the committee, it is a privilege to be here before you on behalf of the Department of Health and Human Services, to have an opportunity to talk with you this morning about our global response to the HIV/AIDS pandemic. Senator, as you pointed out, it is not only a subject that is very personal to the president, to Secretary Thompson, but to all of us in the Department of Health and Human Services.

The United States is a blessed Nation and the president has called upon us to provide hope to millions upon millions of people around the world who are suffering from HIV/AIDS, tuberculosis and malaria. When the president announced his emergency plan for AIDS relief at the end of January, he said it is "a step toward showing the world the great compassion of a great country" and "a work of mercy." Indeed, the president's $15 billion plan will prevent 7 million new HIV infections, treat 2 million HIV-infected people with anti-retroviral drugs, and care for 10 million HIV-infected individuals and AIDS orphans. This initiative will virtually triple our commitment to international HIV/AIDS assistance in 14 countries in Africa and the Caribbean, two area of the world that are being devastated by this disease right now.

Since the impact of HIV/AIDS in the world is so severe, we need to be flexible with this program. As an example, we have decided that while our projected figure for anti-retroviral treatment is 2 million people, all persons who receive HIV diagnostic testing through the president's plan and who meet the medical criteria for anti-retroviral therapy will receive it.

The president wants to make sure that the taxpayers' dollars are making the maximum difference for the maximum number of people. Ensuring that people are in treatment will allow families to stay intact longer and reduce the horrific number of AIDS orphans that is on the horizon.

The president's plan follows on the heels of his new mother-to-child transmission prevention effort, which he announced last year. The mother-to-child initiative is a strong model of good government and demonstrates how quickly the United States can get much-needed resources out the door through our bilateral mechanisms.

HHS, the State Department, and the United States Agency for International Development have all worked cooperatively with the White House Office on National AIDS Policy to ensure that the mother-to-child program pools all of the resources of the U.S. government that we have to offer to countries desperate to prevent children from coming into this world HIV-positive. The mother-to-child transmission initiative is part of our overall global AIDS pro-

gram or what we call GAP program at HHS. We work directly with 25 countries in Africa, Asia and Latin America and the Caribbean to prevent new infections, provide care and treatment to those already infected, and develop the capacity and infrastructure needed to support these programs.

The president's emergency plan for AIDS relief includes both a pledge of support for a dramatic increase in our bilateral assistance and a multiyear commitment to the global fund to fight HIV/AIDS, tuberculosis and malaria.

Mr. Chairman, as you know, Secretary Thompson is now the chairman of the global fund. The secretary and I hope the president's commitment to HIV/AIDS will encourage other donors, countries and the private sector, to partner with us by increasing their bilateral assistance in countries where they are present, in addition to making contributions to the global fund.

We must never forget how important a component research is to fight HIV/AIDS throughout the world, tuberculosis and malaria. In fiscal year 2003 the National Institutes of Health will devote $251 million for AIDS-related international research. We are working here in the United States and around the world to develop laboratory capacity, train scientists, and help nations develop prevention and treatment research agendas to deal with these diseases. We are working aggressively also to develop clinical research and trials for HIV/AIDS vaccines. And while we have made tremendous progress in this area, we are still years away from a vaccine. That is why we have to focus our attention on prevention, care, and treatment.

Finally, I want to mention recent reports that unsafe medical practices, including unsafe injections, are responsible for a more significant percentage of HIV infection in Africa than previously thought. We believe certainly that unsafe injections and medical practices do contribute to the spread of HIV/AIDS and do require further scientific evaluation. Estimates vary as to what percentage of HIV infections are due to unsafe practices, but we know one fact with complete certainty—even one is too many. This is one reason why the president's plan has a component to cut such transmission. Prevention activities will be directed at all modes of transmission, including improving safe blood supplies, and we will have the flexibility to adjust resource allocation based on scientific data as it becomes available.

As we discuss international programs for prevention, it is important that we as Americans do not export our own ideas but rather, allow the countries we aid develop prevention methods and treatment programs that are sensitive to their own culture. Uganda is a shining example of a country that has turned around the HIV pandemic successfully within its own borders. Uganda is the only Nation in Africa with an increasing life expectancy. They did this by reaching back into their own culture and employing what they call the ABCs of prevention. A is for abstinence in young people, B is for being faithful within a relationship, and C is for condom use in high-risk populations with the knowledge that condoms are not as effective in preventing all sexually transmitted diseases as they are with HIV/AIDS.

Uganda has shown us a proven method of prevention that can be measured in real lives. As we develop domestic and international models for prevention, we need to look at their success.

Mr. Chairman and members of the committee, we have a real opportunity to effect change in the world with the president's new initiative. The administration is ready to work with you to put together a bill that we can all be proud of and Secretary Thompson and I look forward to working to make sure that it becomes a reality.

I want to again thank you for allowing me to be with you this morning and I am happy to answer any questions that you may have at this time.

Senator SESSIONS. Well, thank you very, very much. I think it is important to highlight some of the successes that have occurred in Africa, particularly in Uganda, and there are other things that show real potential and we need to be supportive of that.

You know, the first question I ask is a question that Senator Kennedy had and it is one that is really my first question to you, also. The question is this, Mr. Allen. What impact will the recent studies by Dr. Gisselquist and other authors about the significance of health care practices on the transmission of HIV/AIDS have on your department? Is it causing you to reevaluate and are you taking any action since you have learned of these studies?

Mr. ALLEN. Mr. Chairman, we have looked at the Gisselquist study, along with the UNAIDS and WHO in reviewing that, and while we believe that the primary mode of transmission of HIV continues to be sexual, we do believe that as we have stated already, any transmission mode will be looked at and investigated. We believe that in terms of unsafe medical practices, the president's proposal actually provides a tremendous opportunity to focus prevention activities in targeting at ending unsafe practices.

If I may just briefly address that, in terms of not so much in a research agenda but actually in the treatment, prevention and care agenda, we will focus our activities. The president's proposal calls for us to partner with countries, right now the 14 countries that we have identified, and using what we call a network model. The network model consists of working with countries that will work with their primary institutions, medical institutions, which typically are in their major cities, and going out from there so that we will be not only focussing on testing but we will also focus on unsafe medical practices, blood safety practices, education and research, and then from those urban areas reach outward into primary clinics that would be in more remote areas, ultimately reaching rural areas where we believe much of the issue in terms of unsafe medical practices exists, and that is in the case of traditional healing practices, and that is what we need to reach.

Senator SESSIONS. You know, when we visited clinics in Alabama, as you do all over the country, is it not a particularly horrible thought that a young person or an adult goes to that clinic for medical treatment and could come home infected by AIDS? And do you think the department has seriously examined this study and report at this time?

Mr. ALLEN. I think yes, we have examined the report and study and that is why we are not allowing the study or the report to be

pushed aside. We would not suggest pushing it aside because it does add value. At the very least, what the study has done is that it has caused the research community to go back and reevaluate their data, to reevaluate the modes of transmission.

So there is value of the study, but I want to make sure that as we look at the study we will be employing and continuing to look at moving safe medical practices into the more remote areas.

Senator, as you know, as we have traveled throughout the country and particularly in Alabama, in many ways my travels throughout Africa and rural Africa mimicked in many ways very much what we see in rural areas in this country, with this exception. In this country in rural areas you still can get access to medical care and that medical care oftentimes uses the very modern methods of safe medical practices—blood safety, handling of needles and blood products.

In rural areas, much of the health provision is not provided by the formal sector, it is provided by the informal sector, and that is where you go to a traditional healer and that healer will use traditional methods but also giving injections for vitamins or even for immunizations, and that is where we need to tackle and the way we tackle it is twofold—one, by moving the formal setting farther out under the president's proposed plan, but also by education and training and providing safe needles for the use by those who are providing health care in those settings.

Senator SESSIONS. Mr. Allen, I know that your department adheres to the view that the majority of the transmission are by heterosexual sex and sexual relations and that may be true. The question is is it 35 to 30 or is it what WHO is maintaining, that for adults, 90 percent of the transmissions are sexual transmissions? Are you prepared to defend that 90 percent figure?

Mr. ALLEN. Yes, we would be prepared to defend the 90 percent figure but——

Senator SESSIONS. Let me ask you this.

Mr. ALLEN. Sure.

Senator SESSIONS. Do you know if the department has done a peer-reviewed study of all the peer-reviewed studies of AIDS in Africa to reach that conclusion, focussing particularly on the potential for transmission of HIV/AIDS by medical injections? Has your department specifically studied all those studies and done an in-depth mathematical analysis of it to determine whether or not that position of WHO is correct?

Mr. ALLEN. Senator, we have gone back and looked at the studies that have been done in Africa. I cannot say that we have concluded a peer-reviewed study of all the studies that are being done. What I can say is happening is that those primary researchers who have done those studies are actually going back and looking at that data themselves.

What I can point you to is one case as an example of why we believe that the rate of transmission for children is not as high as 30 to 35 percent is just one example in countries such as Uganda, as I pointed out earlier. In Uganda when you look at the curve of the disease, progression of the disease, and you look at that population of zero to 15, we find that the primary mode of transmission has been mother-to-child. In those cases if there were unsafe nee-

dle practices, you would expect to see more cases in the zero to 15 population once you have excluded the mother-to-child transmission and the studies that we have looked at show that that is a very low transmission rate.

Again in terms of unsafe needle practices, a study in South Africa that looked at these issues once again looked at other anecdotal data, looked at transmission of hepatitis-C virus, for example, which is a much easier disease to transmit via needle than would be HIV/AIDS, and in that study in South Africa there was about a 201 percent difference between HIV transmission as compared to hepatitis-C transmission.

So we are very confident that the primary mode of transmission in Africa is heterosexual sex. We do know also that there are issues of blood supply, we do know that there are issues of unsafe needle practices, so I do not want to minimize the significance of that because again, if there is one child that is getting HIV/AIDS because of an unclean needle or unsafe medical practices, that is unacceptable. So we will continue to look at those issues but we think the research is very sound in the area that we have been discussing.

Senator SESSIONS. We will talk more about that as Dr. Gisselquist has, in fact, studied rigorously all the tests and reached a different conclusion. It will be interesting.

Senator Enzi?

Senator ENZI. Thank you, Mr. Chairman.

I do appreciate the president's effort in this. I think that he has placed the United States as a leader in getting not only the United States more involved in this issue but in encouraging other nations to participate.

I am one of the two congressional delegates to the United Nations and I have met with the Geneva group, which is the group that contributes about 80 percent of all the revenues to the United Nations, and those are the people that we will be encouraging, as well, to give their proportion to this particular effort.

I do know from meetings with that group, though, that there is quite a concern with a number of agencies, and UNAIDS has to be included in that, with the amount of overhead that actually keeps the money from getting to the customer, the person that has AIDS or that we need to prevent from having AIDS. So I hope that the administration will continue to both lead and encourage other countries and to see if we cannot cut down on the amount of overhead and that amount that is wasted money.

In another capacity I am the subcommittee chairman for Employment, Safety, and Training and we have just finished legislation to address needle stick problems in hospitals, both of the nurses who might accidently get stuck or the employees who, when they are taking care of refuse, might get stuck and then not know for 6 months or so what might have happened to them. I have seen the kind of tension that that generates.

One of the things that we know is that there are now needles that after use, retract and cannot be used again. Are there some barriers to wider use of these retractable needles in Africa?

Mr. ALLEN. There are some barriers and some of the ones I have cited but on the positive side of it, I can certainly say that what we are doing as a department and what we are doing as a govern-

ment in terms of our supplying needles for use is that we are using the auto-disabled syringes that self-destruct after use, that are single-use needles.

The barriers that exist in terms of getting those needles in wider places are in the very remote and rural areas where you have traditional medical practices taking place. In those areas what we do is that we have begun with our vaccination programs through the Global Alliance for Vaccination and Immunization initiative is a public/private partnership that is working throughout the world in terms of immunizations. Within those programs, for example, all the needles that are being utilized are the auto-disable type of needles, but they only account for about 25 percent of the needles that would be utilized in immunizations.

So one of the key steps that we need to take is as the United States continues to encourage childhood immunizations, adult immunizations, that we would more and more begin to utilize the newer technology, the auto-disabled needles or auto-destructing needles, so that there can be one-time use.

What we need to also do is we need to reach into those informal sectors where health care is often delivered in Africa, and that is the traditional healers, and we are reaching out to them, as well. As we are doing education and training, we are reaching into those pockets where there are traditional healers who are practicing, but the challenge again is the vast number of needles that are already in the marketplace and how do we get those back and, at the same time, get safer needles in their hands that will encourage safe medical practices but also decrease the unnecessary use of needles, anyway?

Senator ENZI. For my help and for the record, can you explain in a little more depth what traditional healers are?

Mr. ALLEN. Yes. Traditional healers very much practice in many cases alternative medicine using herbs, using roots, using in some terms potions that are derived within the community. These are individuals who are often looked to for health care practices. In many of these countries they are very informally organized. In many places, in villages, rural villages, this is the person you go to who would concoct some medication for you. And one of the areas that oftentimes traditional healers will recommend is they will recommend vitamin shots for children. They will recommend medication in terms of antibiotics that are administered by needle that oftentimes is unnecessary.

They are a large population throughout Africa, indeed throughout the world, where you have traditional practices taking place.

Senator ENZI. Thank you. And you mentioned the Uganda prevention model, the ABC model. Are there more statistics that have been gathered on how effective that has been? It sounds like something that ought to be more extensively used in the United States. What are some of the barriers for doing more of that here?

Mr. ALLEN. Senator, we would very much agree with you that it is a model that has worked effectively and it is a model that really deals with age-appropriate massaging and situation-appropriate massaging.

In Uganda the data is very significant that comes out on Uganda and other countries that are applying the ABC approach. What

that data shows, for example, in Uganda is that they were able to turn around the pandemic in Uganda because of three things. First of all, with the youth they focus on a strong message of abstinence until marriage and what they were able to do in that country was be able to increase the age of sexual debut, the age of first sexual experience for young women, by as much as 2 years. Because they were able to do that, that reduced the infection rate by somewhere around 50 percent is what some studies have shown.

The second thing they did is they reached back to their culture and they challenged adults to be faithful in their relationships. They used a concept called zero grazing, which basically meant that you should not go outside of the bonds of the unit to which you were married in. What that did in particular regions of Uganda is that it reduced the number of partners that men had drastically, very significantly, and that by itself also had a direct impact on the spread of the disease.

Then the last thing they did is they focussed on those high-risk populations, the commercial sex workers, itinerant workers, the military, and urged the use of condoms consistently and correctly and that is what drove the disease down.

I would agree with you. We need to be looking at that as a model here in this country. We need to have a strong message to young people in the United States about preserving themselves until marriage. That is the safest way to prevent transmission of not only HIV/AIDS but the contraction of other sexually transmitted diseases. We also need to emphasize fidelity in relationships, with mutually monogamous relationships with uninfected partners. And in those circumstances where there is high risk that takes place in sexual relationships, that condoms are an appropriate means of preventing the transmission of the disease. So we think that that would be a good model and one that we support here both domestically and internationally.

Senator ENZI. It seems like success stories might have an effect all over the world but even in the United States.

Mr. ALLEN. Here, here.

Senator ENZI. Thank you, Mr. Chairman.

Senator SESSIONS. Well said, Senator Enzi. We are really impressed with the success of the Ugandan model and this hearing is not in any way intended to denigrate that but I worry a little bit when I read the study that is intensively done, a number of scientists concurring on it, having published it, and the establishment basically saying that we cannot be wrong; we still think it is 90 percent sexual and only 2 percent health care transmission.

Do you think it could be an error? Are you open to the fact that there may be an error there?

Mr. ALLEN. Absolutely we are open to that fact but I will go back and say that we could be wrong but the point being that even if we were wrong as to the percentage, that does not change our commitment to ending that method of transmission as a vector for transmitting HIV/AIDS.

Senator SESSIONS. Well, yes. The percentages that people agree on today, everybody agrees on, is 50,000 to 100,000 infections per year, which is a stunning number in itself. And if it is 10 percent

or 20 percent, you know, those figures would be stunningly higher, also. So I think you are correct to proceed with that.

Let me ask you this, Mr. Allen. Would you and would the department support a new study, and I assume one could be crafted, that could help answer this question?

Mr. ALLEN. One of the challenges—the short answer to that, Mr. Chairman, would be yes, but I would have to quality it. One of the challenges with a directly observed study is that we would have to be in settings where actually unsafe practices would be taking place and that would be unethical and immoral to allow to take place, so we would——

Senator SESSIONS. What do you mean it would be unethical to be in a place where people are using dirty needles?

Mr. ALLEN. Meaning that if we were in that place we would seek to ensure that dirty needles would not be used at all. So to be in a place, for example, in a setting where unsafe medical practices were taking place, we would not simply observe that. We would seek to intervene at that point because the most important thing is the health of that individual.

So medical ethics would dictate that we would not be put in a setting where we would allow for unsafe medical practices to take place.

Senator SESSIONS. Well, let us assume there might be another way to skin that cat and come at that issue from another way. Would you support that?

Mr. ALLEN. We would support additional research in this area, yes. In fact, what is already happening, as I pointed out earlier, the one thing that the Gisselquist study has done is that it has challenged the scientific community to look back at their own data and to determine what is actually happening. But it also has put us on notice to focus in on unsafe medical practices as we are going forward. So I think that it has already had an effect not only on research but on practice.

Senator SESSIONS. Well, I am a lawyer and you are a lawyer, so I am sure we are probably not the best in the world equipped to design a study that could define for us the real situation and I hope that you would look at that. I think there are some ideas that I have heard floated that could give us a good indication.

I do not think any broad-based study has been conducted to my knowledge specifically designed to deal with this and if they have, they have had some flaws to them. Dr. Gisselquist, I think, would point that out.

One more question. Let me ask you this. We will be changing how the United States conducts this effort. It may not all be in your department. But if we were to study the health care transmissions of AIDS would your department be the one in charge of that? And have you taken any steps to create a committee or a section that would focus explicitly on that?

Mr. ALLEN. We have, through the Centers for Disease Control and through the National Institutes of Health, we have two networks that focus in terms of vaccine and what would be needle—programs that include immunizations and vaccinations. One is the HIV prevention vaccine trial network that looks at—it has an intake function where we are trying to discern the modes of trans-

mission of HIV/AIDS. And in that program we would be evaluating, whether it was through needle usage, whether it would be through scarring, which is traditional, or tattooing, very common methods of transmission of not only HIV but hepatitis-C, hepatitis-B, other forms of infectious diseases, we already are looking at that.

We also partner with an international organization, the United States Help, set up through the World Health Organization, called the Safe Injection Global Network, which is housed within the World Health Organization, and the Centers for Disease Control contributes about $200,000 a year to this organization and they promote safe needle practices in terms of the health care setting.

The last piece I would suggest to you for that is in terms of the president's emergency relief program, about a third of the funding from that program is targeted toward prevention and in that prevention mode we spending money specifically targeted at blood safety, at safe medical practices, at education and training of health professionals, again beginning using the network model in urban settings and moving out from there to build the capacity to address it.

So yes, we will be working very aggressively in that through Department of HHS but also with our partners through the State Department and through the United States Agency for International Development.

Senator SESSIONS. Well, I thank you for that. I do think we need to proceed with this and I suppose you would not disagree that if health care transmission turns out to be more significant than we have thought, that it provides an opportunity for maybe more rapid prevention activity than other transmission forms.

Mr. ALLEN. We would certainly respond to that. If we find that health care practices are contributing more and more to the spread of the disease, we will go after that method of transmission aggressively and collaboratively to end that as a mode of transmission.

It is important because what is important about this disease and ending this disease, particularly in countries like Africa, is that we want to have a generation that comes into this world and is able to grow up in this world disease-free. That is the key. And the key to doing that is not only in terms of reaching the mother, preventing transmission from mother to child, but it would be unsafe medical practices that would put those kids at risk in their later life. So we would work very aggressively with you in that, as well.

Senator SESSIONS. Thank you.

Senator Enzi?

Senator ENZI. Just one final quick question. The San Francisco Chronicle pointed out that there was a study under way with Ethiopia and Cameroon where they are intercepting needles after use to test them for viruses. Is Health and Human Services involved in that in any way?

Mr. ALLEN. I was recently in Ethiopia back in December and saw much of what they were doing there. We would be tangentially involved through our multilateral partnerships, through the WHO, very likely through working with the Ministry of Health in Ethiopia. We are very interested in partnering with countries, both bilaterally and multilaterally, in their efforts to try to determine the methods of transmission and to reduce the risks associated with

them, so that would be one example that we would very likely be working with.

Senator ENZI. Thank you very much, Mr. Chairman.

Senator SESSIONS. All right, thank you very much, Mr. Allen. We appreciate your response and I have enjoyed working with you. Thank you for your leadership for America.

Mr. ALLEN. Thank you. It was a pleasure to be here with you. Thank you, Senator.

[The prepared statement of Mr. Allen may be found in additional material.]

Senator SESSIONS. Our next panel will be Dr. David Gisselquist, Ph.D. He is from Pennsylvania. He has over 20 years of experience in international economics, rural development and health. He lived and worked in Bangladesh for 10 years and in Thailand for 2 years and has worked short-term in many African, Asian, East Asian and Central European countries. He has worked for the World Health Organization as a consultant, the World Bank, the Food and Agricultural Organization, USAID, GTZ, the German AID, and many other organizations.

For the last several years he has worked with an informal team of medical experts to review the transmission of HIV/AIDS in Africa and his publications have been the basis of this hearing.

Maria Wawer is an M.D. M.H., professor of clinical and population and family health at the School of Public Health, Columbia University. Her expertise is AIDS in Africa and Asia. She is one of the key researchers in a five-year joint study in Uganda funded by the National Institutes of Health, the Rockefeller Foundation and World Bank on whether intensive control of sexually transmitted diseases will reduce HIV transmission. She is a member of the Working Group on Population Conception Usage in Subsaharan Africa, the National Academy on Committee on Population, and in the study section Division of AIDS NIAID. She also a director of the International Operations Research Program at Columbia.

We are delighted that you are here and appreciate this exchange. In my view, I am a believer in science, not much of a scientist myself, but I do believe that science can put us on the right track and those of us in policy positions need to have our best hands on the best science that we can get as we decide the policies that will affect the direction of our country and our policies.

Dr. Gisselquist, if you are ready we would be delighted to hear from you at this time.

STATEMENTS OF DAVID GISSELQUIST, PH.D., AND MARIA WAWER, M.D., MHSc

Mr. GISSELQUIST. Mr. Chairman, Senators, thank you for the opportunity to address this committee.

Based on 20 years of evidence about HIV in Africa, a strong case can be made that the driving force for the epidemic, what allows it to grow rather than to die out, has been unsafe health care. In this testimony I first summarize some of this evidence and then consider implications for HIV prevention.

After some early debates about health care and sexual transmission in Africa's AIDS epidemic, most experts reached a consensus no later than 1988 to focus on sex. In that year the World

Health Organization circulated estimates showing over 90 percent of HIV in African adults from heterosexual transmission and less than 2 percent from unsafe medical injections. We found no paper that shows how these estimates were derived from evidence.

So in order to find the facts behind these estimates, we looked for studies of risk factors for HIV in Africa with field work that had been completed through 1988 and we found 13 studies that had tested and questioned a total of more than 25,000 adults from the general population. Across all studies that had asked about injections, an average of 48 percent of HIV infections were associated with injections. In contrast, only 16 percent of HIV infections were associated with having more than one sexual partner.

Now the measure of association that we are using here is the crude population attributable fraction, which is a standard measure for epidemiological research, and for various reasons it may somewhat overestimate or underestimate causation, so that it is an approximate figure. But even so, from the beginning the estimate that over 90 percent of HIV in African adults is from heterosexual transmission and less than 2 percent from medical injections disagreed with available evidence.

Nevertheless, the estimate has been widely accepted and most experts believe that sex drives Africa's HIV epidemic. For this to be true, heterosexual transmission would have to be much, much faster in Africa than in the U.S. or Europe. It is not clear how this could be so, since there have been many studies of sexual behavior that show Africans, on average, to have no more sexual partners than Americans or Europeans and the impact of other factors, such as lack of circumcision and presence of other sexually transmitted diseases, appears to be too small to explain this supposed much faster sexual transmission in Africa.

In a recent article we assembled evidence from African studies through 2002, as late as we could get, to make the first empiric estimate of the proportion of HIV in African adults from sexual transmission and what we found from the evidence is that sexual transmission accounts for about 25 to 35 percent only, which is far less than the 90 percent that has been supposed and repeated since 1990.

Now if we assume that most of the HIV in Africa that is not from sex is from health care, then we can estimate that health care accounts for 60 to 70 percent of HIV. Now this is an indirect estimate. An alternate and a preferred approach would be to build up estimates of health care transmission from studies that look at specific categories of health care. With this direct approach, injections are the biggest risk. From 16 large studies through 2002, an average of 28 percent of HIV infections is associated with medical injections.

There is also some information on HIV associated with blood transmissions, around 5 percent maybe, and from ritual scarification, but we know very little about dental care, about drawing blood for tests, about traditional operations, and other blood exposures.

Overall, the available evidence suggests very roughly about a third from sex and a third from injections, but that leaves large

areas of ignorance and there are large margins of error around the estimates that we do have.

Other evidence for health care transmission of HIV includes many reports of children with HIV who have HIV-negative mothers, and just one example. In Kinshasa in 1985 39 percent of HIV-positive children had HIV-negative mothers, and there are many other examples that are in the literature throughout the years, and I have circulated some statistical information and you can find some of those in Table 4 starting on page 9.

In addition, a number of studies report more HIV in children five to 14 years old than can be explained by mother-to-child transmission. Last year, for example, a South African national survey in December 2002 reported 5.6 percent HIV prevalence in children two to 14 years old and only a quarter of this total could be explained by mother-to-child transmissions, which would leave roughly 500,000 unexplained infections, and on-going studies are now trying to figure out what is really happening there—is the data right and what is happening?

It is also well known among health experts familiar with Africa that health care is very often unsafe. Several recent studies by the World Health Organization report hundreds of millions of unsafe injections in Africa each year and these come from formal, as well as informal, providers, including pharmacists, untrained injection doctors, and neighbors.

These findings have implications for HIV prevention. In much of Africa and Asia, HIV epidemics have continued, despite aggressive promotion of behavior change in condoms. But even if we are only partly correct about the contribution of health care transmission to Africa's AIDS epidemic, we can expect much better success with programs that address both health care and sexual risks.

However, HIV prevention is not only a social and a government goal but it is also a personal challenge. UNAIDS, for example, publishes its book on AIDS and HIV prevention and in this—this is for distribution to U.N. employees—and in this book they advise U.N. employees to carry their own syringes for personal use. Similarly, a young African couple that is trying to raise a family in a community with 20 percent HIV prevalence faces a variety of risks. When the wife is pregnant they have to decide if she will go to the public antenatal clinic. When someone has a toothache they face risks in dental care. In Harari, for example, people are advised to go to the dentist early because it is cleaner, and this is in a country where there is about 25 percent HIV prevalence, so if you are the fourth one in the chair, the chances are better than 50/50 that somebody before you had HIV.

Since Africans are on the front lines against HIV, we can be more effective in stopping HIV to the extent that we help them get the information and the life skills that they need to live safely in the midst of the epidemic. The current focus on condoms and sexual behavior simply does not speak to all of their concerns. It speaks to some of them but not all of them, and it does not meet all their needs.

This review of the evidence and issues in prevention leads me to three recommendations. First, the research agenda needs a major

overhaul. We know too little about injections and other health care and blood exposures as risk for HIV.

Second, efforts to educate people about sexual risk for HIV and options to reduce those risks, such as condoms and abstinence, should continue. Everything we have said, if it is 25 to 35 percent or 90 percent, you still have to worry about sexual transmission, so we are not challenging those programs.

And third, both to control the epidemic and to help individuals control their personal risk, 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 low-cost task in this effort is public education so that health care consumers are aware of the risks and they know the importance of sterile care and they are ready to demand it and pay for it if they have to. Other components, such as provision of auto-disabled syringes and single-dose vials and cleaning up the blood supply, will take more money.

The low priority that has been accorded to health care risk for HIV over the last 15 years means that we have a major job ahead—to redesign HIV prevention programs.

Senator SESSIONS. Thank you very much, Dr. Gisselquist. You certainly challenge the established numbers on this subject.

[The prepared statement of Mr. Gisselquist may be found in additional material.]

Senator SESSIONS. Dr. Wawer, we are delighted to have you and I think you tend to favor the established numbers, so we would be delighted to hear your comments.

Dr. WAWER. Mr. Chairman, members of the committee, thank you very much for this opportunity to testify regarding HIV transmission in Africa. Since 1988 I have worked on HIV epidemiological, behavioral and preventive research in international settings and have been the principal investigator or co-investigator on more than 20 HIV-related studies, most of them carried out in Uganda and funded by NIH.

Mr. Chairman, available data indicate that sexual and mother-to-child transmission are the major causes of HIV in Africa. Although HIV can be spread by unsafe injections and blood transfusions, such transmissions contribute only a minor proportion of new infections in the region. The patterns of HIV infection in infants and young children provide evidence of route of infection. Infection in infants and young children results predominantly from mother-to-child transmission. In the absence of preventive therapy, approximately 25 percent of mothers will transmit HIV to their infant before or during delivery or through breast milk. Many infants and young children are exposed to multiple injections for therapies, etc. However, if their mothers are not infected, very few contract HIV. I will give just a few examples out of many studies.

In a study in Kampala, Uganda conducted in 1992, 98 percent of HIV-infected children had an HIV-positive mother. Transfusions and injections were the probable causes of infection in the 2 percent of HIV-positive children whose mother was HIV-negative. Studies conducted in the late 1990s in Cote d'Ivoire, Tanzania, Kenya and other countries observed no HIV infection to children born to HIV-negative mothers. Of almost 4,000 initially HIV-negative children aged zero to 12 followed in rural Masaka District,

Uganda in the mid-1990s, only one child became HIV infected over the subsequent year and this is a region in which health care is not very well developed in the sense that access to truly safe services would be less ideal than one would like.

Dr. Gisselquist quotes data on infant and childhood infections from the mid-1980s and arrives at high rates of HIV infection in children born to HIV-negative mothers in that period. At that time, however, HIV testing in African populations was unfortunately less reliable than today, resulting in some false positive results. That is, not all of the positive kids are likely to actually have been positive and actually infected. Also, HIV transmission via breast milk had not yet been recognized. Thus, the earlier data need to be examined with great caution.

More recent data collected in the past decade show low rates of HIV infection, generally below 1 percent, in children aged five to 14 in most African countries with available data. Children in this age range are not exposed to mother-to-child transmission; nor do they have frequent sexual risk.

However, after childhood, the rates of HIV infection increase, often dramatically, during adolescence and young adulthood, reflecting the onset of sexual activity. The increase is usually more rapid among females, reflecting the fact that in many African settings girls become sexually active before boys and are also more likely to have older partners who are themselves already infected. Similar patterns in age curves are observed for other STDs, such as HSV-2, the virus that causes genital herpes. In addition, rates of new infection of HIV decline after age 40 or 50, commensurate with decreased number of partners and decreased coital frequency in older individuals. In the great majority of HIV studies, rates of infection are closely associated with reported sexual activity, including numbers of partners.

With respect to unsafe injection, there can be no doubt that such injections represent a public health problem. For example, they have been implicated as major routes of transmission for hepatitis-B and hepatitis-C. However, the epidemiological evidence does not support the hypothesis that unsafe injections result in substantial HIV transmission in Africa.

Based on data previously collected by other researchers, Dr. Gisselquist indicates that HIV-infected persons report more injections. That is entirely to be expected. Persons with HIV are more likely to seek health care because of HIV-related symptoms. One needs to assess whether the injections preceded HIV infection in order to avoid a classical case of epidemiological confounding—in this case, the possibility that the higher use of injections is the result of, rather than the cause of the HIV infection.

In our own studies in Rakai, Uganda we conduct long-term HIV surveillance in over 50 villages and also ask questions about multiple risk factors, including injections. We recently reexamined our Rakai data and found no association between reported injections and the acquisition of new HIV infection.

In addition, any analysis of injection risk must consider the procedure being carried out and the type of equipment being used for the procedure. Transfusion of blood from an HIV-infected person represents a very high risk of transmission, but transfusions are

much less common than injections. Also, needles used for intravenous injections or blood sample collection can retain blood. However, the most common injections—subcutaneous and intramuscular—are given in a way as to minimize drawing up blood.

Using highly sensitive tests, researchers have examined syringes which have been used to actually provide subcutaneous or intramuscular injections to HIV-infected persons. Less than 4 percent of these syringes contained HIV viral particles. Most injections provided in health care facilities in Africa are IM or subcutaneous and not intravenous. In developing his estimates, Dr. Gisselquist did not differentiate between types of procedures and the types of equipment used to the degree that would have been desirable.

The World Health Organization, as was indicated, estimates that approximately 2 to 3 percent of new cases of HIV are transmitted annually in Africa through unsafe injections. These risks, of course, may differ somewhat between countries depending on background HIV rates and injection practices but overall, the data from children, the data from infants, the data on older adults support that these estimates are in a correct range.

We do thank Dr. Gisselquist for pointing out important areas and all researchers in the health care establishment should be looking at these issues. However, his analyses do suffer from selective use of data, particularly older data, confounding in that the injection, the timing of injection versus the timing of HIV acquisition have not been assessed.

Dr. Gisselquist, among others, has quoted our data, data of other of our colleagues, and in some instances it is very difficult to understand how these data, which we know very well have been interpreted since our own conclusions looking at these data with very detailed analyses, with epidemiologists, biostatisticians, modelers, lab people, behavioral people, do not provide us with the same conclusions.

In conclusion, transmission of HIV via unsafe injections does occur in Africa but the contribution of this route of infection to the overall epidemic is modest. However, since any HIV transmission via health care is unacceptable, efforts to reduce unsafe injections should be encouraged and in this we absolutely agree with Dr. Gisselquist and his colleagues.

HIV researchers should obviously and objectively assess existing empirical data for potential injection-associated transmission and for the circumstances under which such transmission may occur in order to develop and target preventive programs. Whenever possible, HIV studies should include questions on injection and transfusion practices, again to help dissect how much may be due to such practices and to target exactly where prevention should go. Efforts to provide an adequate and long-term supply of clean injection equipment, coupled with educational programs to promote needle safety and reduce unnecessary injections, would be of great public health benefit. However, an operative term here is long-term provision of safe equipment because in resource-poor settings, if individuals do not trust that the equipment will be available for the long run, then hoarding of supplies and so on does occur, and it is in those kinds of circumstances that re-use of injection equipment

can also occur. Obviously, single-use injection equipment is also highly desirable. And again in this we absolutely agree with Dr. Gisselquist.

However, the data to date indicate that sexual transmission and mother-to-child transmission represent the most common routes of HIV in Africa and continued efforts to prevent such spread are crucial. If we reduce resources to prevent sex spread we will, in effect, wind up with more HIV infected adults, more HIV-infected children through mother-to-child transmission, and this would be a tremendous tragedy. Thank you.

Senator SESSIONS. Thank you very much.

[The prepared statement of Dr. Wawer may be found in additional material.]

Senator SESSIONS. The mother-to-child transmission, I do not think we stated, is so preventable. We have such a capacity if we act promptly in advance of the birth to avoid that tragedy, that we certainly do not need to overlook that.

Dr. Gisselquist, in terms of your study would you give us some of the background of the people who participated with you in the analysis of this data and where you had it published and was it peer-reviewed?

Mr. GISSELQUIST. There have been a number of co-authors involved in the various studies. I have worked quite a bit with John Potterat, who has been an epidemiologist specializing in STDs and HIV and published extensively for 25 years and has worked in Colorado particularly tracing STDs.

Another co-author that has been involved is Dr. Rothenberg, who teaches at Emory and is the editor of one of the foremost journals on epidemiology in the world, Annals of Epidemiology.

Dr. Drucker is at Albert Einstein Institute of Medicine and Dr. Vachon is a doctor in France who has had experience in Africa and was involved in some of these dates, making the same points in the mid-1980s. So we come from various places.

Senator SESSIONS. Well, I noticed the World Health Organization, before you completed your presentation, had restated their position publicly in a press release or press statement. Mr. Allen still maintains that 90 percent of adults infected in Africa are through sexual relations. Dr. Wawer disagrees. Why should we believe your study? What would you summarize for us?

Mr. GISSELQUIST. Well, what we have done with this is we make the claim that we are making the first empiric estimates and we have put them into the journals and we are asking for people to review them and come back at them. Some of the charges are——

Senator SESSIONS. When you say first, do you mean this is the first time anybody has analyzed all the studies for this particular method of transmission? Is that pretty undisputed, that no one else has looked at all the studies focussing solely on health care transmissions?

Mr. GISSELQUIST. The study that we have done in assembling the estimates for injections, yes, is the first time, and this was actually also repeated by CDC and UNAIDS and they have a paper that is circulated but it does not seem that it is getting to see the light of day. It basically confirms what we have done. It is also the first

estimate that is tied into epidemiology data that is estimating the proportion from sexual transmission.

So we have put these things out in excruciating detail and we are waiting for responses. The charge that we selected the data—we looked for what we could find and we used what we could find. The questions about whether the tests were good so many years ago and whatever, these are the kinds of questions that we need to thrash out in the refereed medical journals.

Senator SESSIONS. Dr. Wawer, you know, these numbers in his study are a pretty dramatic challenge to the establishment view. The establishment view is around 2 percent transmitted through health care. Would it be a shocking thing to you if the figure were 8 percent or 10 percent? Is that possible? Do you have enough data to say it is not at least that high?

I guess my question is could we design some studies that could give us a more accurate picture of the conditions?

Dr. WAWER. Mr. Chairman, these are very important questions. Certainly at this time when we look at primary data that is not a compilation of analyses based on secondary data but primary data, the proportions of transmissions we see in children whose mothers are not HIV-positive, the low rates of HIV in children who are not sexually exposed, the overall researchers, both in Africa and in Europe and the U.S. are very comfortable that the rates of HIV transmission through the health care system or through injections in Africa is not up to 8 percent.

Again these are estimates, but estimates around 2 to 3 percent, we believe, are quite accurate, given particularly the patterns of disease we see in those individuals who are not sexually active, less sexually active compared to individuals who are more sexually active.

It is very difficult to take data from a number of studies, many of them designed for different purposes, group them together and try to arrive at estimates, the kind of global estimates that Dr. Gisselquist and his colleagues have tried to do. It is a formidable effort that they did. It poses a challenge to us all. But the way the data have been analyzed really does present us with some problems.

Again we have empirical data that specifically track individuals—I mean not only in Rakai project in Uganda where I work but in Masaka District in Uganda—in other studies that have actually tracked children, know which mothers are HIV-positive, know which mothers are HIV-negative. The early data from Uganda where they went into hospitals and looked at of the children who were actually HIV-positive, what proportion had a negative mother, and that was only 2 percent.

So again we would all agree that 1, 2 or 3 percent of transmission through health care systems is unacceptable but what we would argue is that to reduce the relative importance of sexual and mother-to-child transmission could be very deleterious, both from the resource level but also we do not want to—certainly my colleagues in Uganda would not want to give their counterparts in Uganda the false hope that if they can just avoid unsafe injections, other things are not as huge a risk factor as has been considered.

Uganda has made its efforts because they have been extremely open on the issue of sexual transmission. President Museveni came out back in the 1980s discussing how important it is to have safe sex.

Senator SESSIONS. Senator Alexander, we are delighted you can join us.

Senator ALEXANDER. Thank you, Mr. Chairman and thanks to the witnesses for coming today.

I congratulate Senator Sessions for putting the spotlight on this discussion. One of the difficulties in with dealing with the AIDS crisis has been poor information sometimes, and political leaders not recognizing the truth and telling people within their countries that one thing is right when another thing is wrong.

So, it is tremendously important that we know what the truth is here as we make policy and as we go forward with President Bush's effort and the effort of many senators on both sides of the aisle, especially in Africa, to try to combat this terrible crisis. This is a good first step to help those of us who are lay people to try to evaluate the work that is done here and decide what we think is correct.

I wanted to discuss this situation with the two of you, since you are respected academicians. It is not so unusual in the academic world to have an established view and then have a paper or a set of researchers who challenge the established view. In fact, it is common. Usually you have a set of established procedures for going about how you evaluate whether the established view still is right or whether the challenge is more correct and you come to a conclusion about that.

What could this committee do to take the work that has been done here and create a fairly prompt independent evaluation of who is right and who is wrong so that those of us who are in a policy position can make intelligent decisions? I wonder, for example, could we ask a respected medical school or an institution? Should we go to a school of government and ask them to assemble a group of statisticians and epidemiologists and review the work and review the competing claims and give us a report? What in the ordinary course of business would be a way to evaluate the conflicting information we have heard today? I would like to ask each of you for your suggestion.

Dr. WAWER. Senator Alexander, certainly having a panel that would review, an independent panel composed of epidemiologists, clinicians, behavioral scientists, etc, who would review the existing literature would make a lot of sense.

Senator ALEXANDER. Who would be a sponsor of such an independent review? Who would put that together?

Dr. WAWER. The IOM, for instance, would be an excellent sponsor for that. The Institute of Medicine.

The other thing that can be done, and I agree entirely with Mr. Allen that one could not do a trial of safe versus unsafe injection—we are completely all in agreement on that—but what could be done is that researchers could be encouraged within different countries to go to clinic settings, for instance, and test children who are both of positive mothers and of negative mothers, to do that in a systematic way in a number of countries, in a number of different

kinds of health care settings—big city hospitals, small urban clinics, rural villages—to see what proportion of children who have a negative mother, for instance, are HIV-positive.

That is an excellent indicator. It is like a canary in the coal mine, in effect, that if children who have negative mothers are getting HIV, that would be an indication of HIV transmission. Current data from the studies that do exist suggest that is not happening, but a systematic effort to do these kinds of studies would be relatively quick, relatively low-cost, and a very good indicator.

Children get a lot of injections, not only immunizations. And I should stress that most immunizations given in the world these days are given through programs such as the EPI, the Expanded Program for Immunization, and those programs use very safe needles. But children are exposed to an awful lot of injection from low-level health workers for vitamins, to give antibiotics, and also traditional healers.

Senator ALEXANDER. Is not the first question, though, that you raise, a challenge his statistical methods? Before I came here, I was, I hasten to add, a professor of practice at the Harvard School of Government. I attended on a weekly basis meetings where researchers, like Dr. Gisselquist, would present their findings in a preliminary way and other faculty members would work them over pretty hard if there was anything about their method that they needed to rethink.

Now would that not be the first thing to do, to have a panel that would look at the methods and see if there are suggestions that would either discredit or cause Dr. Gisselquist to take another look or that would suggest to you to take another look? Then maybe we should go out in the field and do things. That might be step two, it would seem to me.

Dr. WAWER. I do not disagree. I think that is an excellent idea.

Senator ALEXANDER. Well, let me ask Dr. Gisselquist, how would you suggest that we persuade ourselves that you right rather than wrong by some independent review? Or how are you looking forward to testing your own findings?

Mr. GISSELQUIST. Yes, your suggestions about the procedures of academic review and scientific review, I think we have started that in some circles by getting these publications into the refereed medical literature and we need some reactions.

Senator ALEXANDER. So by publishing your work you are inviting reaction, which you are getting.

Mr. GISSELQUIST. Exactly. I am looking for all the hard questions anyone can think up because I want this debate to find out what is going on. And if panels can be assembled, including some people who are neutral, who have not made a career out of saying one thing and now they are being challenged, we need some people who are willing to go one way or the other.

Senator ALEXANDER. Where would you find such people? Where would we if we wanted to encourage such a panel?

Mr. GISSELQUIST. Well, we are raising questions about how the epidemiology was done and so just good epidemiologists that can deal with the questions we are raising about the techniques that were used in the research.

Senator ALEXANDER. Epidemiologists? I assume statisticians would be people who understand methods and statistics of research to verify what you have done and the way you have gone about it?

Mr. GISSELQUIST. And then people who have worked at solving other diseases, figuring out where they are coming from and how to attack them.

Senator ALEXANDER. What sort of institution would you suggest would be the right sort of institution to organize such a panel?

Mr. GISSELQUIST. Well, there are a lot of them that could do it. I guess——

Senator ALEXANDER. Would a medical center be one? Would a school of government be one? Would you think of other institutions if you had to think of three or four types of institutions? You do not have to name one but just a type of institution.

Mr. GISSELQUIST. me of the academic societies could nominate a team or take part in nominating people on a team.

Senator ALEXANDER. Like an academic society of epidemiologists could nominate a team?

Mr. GISSELQUIST. Yes.

Senator ALEXANDER. And they could organize such a thing and give a report to a Senate committee.

Mr. GISSELQUIST. Yes.

Senator ALEXANDER. Dr. Wawer, do you agree with that? Does that sound like a reasonable approach?

Dr. WAWER. I certainly agree, yes.

Senator ALEXANDER. Well, Senator Sessions, I think you have done a service here. I want to congratulate the witnesses and I have a suggestion to make. There will be a process that naturally occurs over the next several years as researchers in this area consider Dr. Gisselquist's comments and recommendations and he himself, if he is a superior researcher, which I am sure he is, welcomes that, invites that, and he is looking forward to being challenged to see what he can learn further about the area that he is interested in. Then the other side will say if we are wrong, we need to know it, too, or if we have overlooked something, we would like to know about that.

Now that will take a while. I would suggest that this committee consider working with either a medical center or the appropriate medical society, and since we have a majority leader who is a physician and is also very interested in this subject, we might ask his advice and ask one of those societies to organize an independent panel to look at this research and give us a preliminary review of what they think about this while this other natural process is occurring.

For example, if there are significant flaws in statistical method or in use of statistics, that might help us know that. If there are not, we ought to know that, too, as we go about making policy.

Senator SESSIONS. Well said. I thank you for those very wise comments. At 2 percent we cannot go wrong in improving that number, reducing that number, and if it is higher than that, it is even more intensively important that we act. And frankly, since it is a life and death matter, I do not think we need to delay.

Senator ALEXANDER. Also, we are getting ready to spend a lot of money and go to a lot of effort and we need to make sure that our

money and our effort is directed in the most precise way at a massive problem.

Senator SESSIONS. Dr. Gisselquist, Dr. Wawer mentioned the children being infected and some numbers that she thinks supports the current figures. You have some numbers of child studies. Could you share those with us and share what you think those numbers imply?

Mr. GISSELQUIST. Yes, the situation is that if you look around, you can find populations where it is very low and you can find populations where there is more. Particularly in Uganda, where there has been a very aggressive effort from the late 1980s of public education about health care risks, the explanation and our understanding of why HIV actually declined in Uganda may have overlooked some of these changes in health care. But let me give some other data, for example.

Around 1990-1991 there was a four-city study that looked at in-patient children in four African cities in Rwanda, in Tanzania, Uganda and Zambia. They studied over 5,500 children and their mother and they found from these 5,500 children, including positive and negative children, the in-patient children, 1.1 percent of the children were HIV-positive with HIV-negative mothers. That was 61 kids. They did not report how many children were HIV-positive with HIV-positive mothers so we do not know the percentage, but I would say it is probably around 7 percent. This is in four cities. These children were only six to 59 months old, so they had had a lot of time for a lot of health care transmission, but that is the most likely explanation for this.

The WHO remarkably said after this that it looks like health care transmission is not a serious risk and basically closed the book on this issue. You can imagine what would have happened if that had occurred in Chicago or Brussels, if 1.1 percent of the in-patient kids had HIV that we cannot explain.

Senator SESSIONS. So this is 1.1 percent of the in-patient children had AIDS when their mothers did not?

Mr. GISSELQUIST. Yes, sir.

Senator SESSIONS. So there is very little explanation of that infection except a health care situation; is that correct?

Mr. GISSELQUIST. Exactly. Exactly.

Then there are other studies. For example, in Cote d'Ivoire a study around 1994 reports 21 percent of HIV-plus children had HIV-negative mothers. This was a small study.

In Uganda in 1989 to 1994 26 children with HIV and Kaposi's sarcoma at the Uganda Cancer Research Center, they were able to test their mothers and five of the mothers were HIV-negative, so that means 19 percent of these children that had HIV had it from some other source. Then there are other studies that have reported rates of 3, 4, 5 percent of children five to 14 with HIV and it is pretty hard to explain much of that from their mothers.

Senator SESSIONS. Dr. Gisselquist, is there research that shows the relative transmission rates from utilizing a dirty needle, as opposed to heterosexual sex? What kind of likelihood or chance would the transmission occur from sex, as opposed to HIV-infected needles?

Mr. GISSELQUIST. Yes, sir. The best estimate we have for transmission per coital act is about one in a thousand, and that has also been found in an excellent study in Uganda that Dr. Wawer was associated with, as well. So it is about one in a thousand per coital acts for transmission between sero-discordant partners.

For transmission through an unsafe injection, the number that has often been used is three in a thousand. What this comes from is needle stick accidents, from health care workers. And 97 percent of the needle stick accidents do not pierce the skin. If you look at only the deep needle stick accidents—that is, where the needle goes in enough so that you could actually—the needle goes through the skin—the average risk would be about 2.3 percent, so significantly higher.

That is really not entirely satisfactory evidence. What we would like to do is look at an iatrogenic outbreak where we have actually seen a lot of children get HIV through the medical system and there are a number of cases like that. Just one of them, for example, in Russia in 1988 doctors found one child with HIV that had an HIV-negative mother and said something is wrong here, so they tested tens of thousands of kids throughout a huge part of Russia and they identified 250 kids that had gotten HIV from medical care and were able to trace it all back to one index case. They did the sequencing of the virus, so they knew exactly where it came from and it came from this one case.

And in two hospitals in Elista it had gone from one case, one child, to 90 inside of 11 months. That is an amazingly fast expansion. That is doubling every 2 months. You did not even get that kind of expansion in San Francisco bathhouses in the early 1980s. So it can go extremely efficiently through the health care system.

Senator SESSIONS. And in Africa I saw some of the studies that talked about children or people who had had 40 injections or 30 injections. In the health care systems in Africa are people regularly given inoculations and shots, as we do here in the United States? What is their rate of injections compared to the United States?

Mr. GISSELQUIST. The estimates that WHO has compiled is around two per capita. You find some studies where it is higher. For example, it might be 10 per year in children and five per year in adults in some populations.

Senator SESSIONS. That is two per capita per year?

Mr. GISSELQUIST. Yes, yes, that's the best estimate that we have.

Senator SESSIONS. So at age 10 a person could have had as many as 20 injections.

Mr. GISSELQUIST. Yes.

Senator SESSIONS. And do you have any scientific study that could give us any indication about how often bad health care practices occur and needles are being reused? Do we have any indication at this point of what that number might be?

Mr. GISSELQUIST. The numbers that are compiled by WHO, they estimate I think around 20 percent, but those estimates are based on a protocol to look at safety where they go to the ministry of health and they select 80 health care centers around the country and then they go out to those health care centers, they interview the director, they interview the nurse, and then they watch the

nurse give two injections and then they say whether it is safe or not.

So in a situation like that, when you have notified people that you are going to watch them and then you are watching them and you are still having 20 percent, you can be pretty concerned about what kinds of percentages you would have when you are not watching.

Even so, we are still not looking at what the pharmacists are doing, what the injection doctors are doing, what is going on in the traditional medicine. So we can be pretty sure that it is higher than 20 percent.

Senator SESSIONS. Dr. Wawer, do you agree with that number, that the numbers are as much as 20 percent of needles are not cleaned or are being reused?

Dr. WAWER. That will be very site-specific, Mr. Chairman. It will depend on whether you are looking at large facilities, small facilities, and the country. Countries like South Africa, for instance, have made a major effort to provide clean needles throughout the country. Other resource-poor places will have much lower use of clean needles and much higher use of unsafe injections.

Again the bottom line is we all agree that unsafe injections should be stopped, must be stopped, but the numbers that Dr. Gisselquist was just quoting, 1 percent of children in the four-city study being HIV-infected, children who had an HIV-negative mother, are very much in keeping with the numbers that we were discussing earlier. It is a problem. It is not the single predominant problem for HIV transmission either in children or in adults in Africa.

Also, it is very difficult to interpret numbers if one does not know with very small numbers of children or children where one is only looking at the children who are HIV-positive with a negative mother without knowing what the full denominator, what the whole population at risk is, and also knowing what the proportion of HIV infection is in those kids who have positive mothers. That is the way that one can really assess the proportion of overall HIV infection that is being contributed by unsafe injections in all likelihood versus maternal-to-child.

Senator SESSIONS. And we do not have that data to rely on at this moment but we could obtain that?

Dr. WAWER. We have those data in some places. We do not have them in many places.

The other quick point I would like to make, Mr. Chairman, if you permit, is that basically there is no doubt that transfusions are a much more effective way of transmitting HIV than even injections and a lot of the horrific epidemics that we have seen in children, whether it is in Rumania or in Russia, were as a result of micro-transfusions to children, that a single infected blood donor, that blood would then be made into small transfusions, in effect, that were given to children who had anemia or whatever. There you are actually not just using dirty needles; you are actually putting in infected blood into the child, so one would expect extremely high rates of infection.

It is a tragedy. It should not occur. We must do everything to keep it from happening. But those kinds of micro-epidemics, how-

ever awful, one has to carefully assess exactly how they were caused.

So again this is not to take away from the importance of having clean injections, but we have to keep it in proportion, how it is playing into the overall terrible epidemic of HIV in Africa and the world.

Senator SESSIONS. Well, with this number of 20 percent being unclean needles, and I think Dr. Wawer indicated that people who have AIDS may not know it and that they go to the doctor more often, which could skew the numbers somewhat, and by the time a person is 20 they have had 40 shots, is that what you are talking about? I believe you used the phrase—you said it was a driving force here, a factor that seems to be at play in Africa that is not in play somewhere else. The numbers in Africa are so dramatically higher than in other areas.

Is that what you are getting at, Dr. Gisselquist? Do you think this may be an unknown accelerating factor?

Mr. GISSELQUIST. Yes, exactly. And the injections are particularly dangerous in particular settings. For example, if someone has an STD and goes to an STD clinic there are high rates of infection in the other people where you are sharing the needles.

And, for example, if a woman is going to an antenatal clinic there is also high infection in the clinic and it is dangerous for another reason, because they are going back several times. So they will go once, they will give a blood test to test for syphilis and they might get an injection of tetanus because they get a series of tetanus immunizations so the child does not have neonatal tetanus. Then they come back another month later before birth and maybe they have a primary infection and they have hyperemia before the antibodies kick in, so they are very dangerous for transmitting it again.

So it is the settings where you have high background prevalence and then you have repeat visits that can be extremely dangerous, and that is where you are getting an intersection between sex and injections. And because people have not been looking at information about injections and health care, this has all been attributed to sex. We need to do the studies the right way to figure out what is going on here.

Senator SESSIONS. And I believe you indicated to Senator Alexander that some studies could be designed that would give us a pretty clear picture of the situation. I know that it has been said—Mr. Allen said it—that somehow you are violating privacy or medical ethics to go in and allow unclean needles to be used in your presence but surely there is a different way we could analyze this. Could we establish a clinic in a substantial area and make absolutely sure that no needles were reused and then compare that to an area where we may not know what the behavior pattern is or have a suggestion that may not be as good? Would that not give us some indication of what the situation is?

Mr. GISSELQUIST. Yes, there are ways to do it without watching somebody give a bad injection. Another way to do it would be to go around to clinics and use the secret shopper technique where you hire somebody to pose, like a truck driver, and he says, "I need an injection; I have an STD." So they will say this is the guy you

go to to get it. So in that way you find out the informal providers, as well. Then when they are ready to give you an injection you say, "Thank you; please give me the needle; please give me the multidose vial. Here are new needles, new vials; this is a study; it is all confidential." We could do those kinds of things.

You could also go to antenatal clinics and just collect whatever is available to be used and collect the multidose vials, give them replacements, take them back and test them.

So we could do some of these studies. I mean there really should be almost regular monitoring to find out whether things are safe. Remarkably, these have not been done. I have not seen anybody that has tested a multidose vial in Africa to find out if there is any bacteria or any pathogens in it.

Senator SESSIONS. Well, perhaps, like all of us in any area of business, we had businesses transmitting asbestos and being blind, deliberately blind to the problems, just refusing to acknowledge it and infecting people throughout this country. It just seems to me that maybe if we do have a larger problem than we think and if we make that public and make a clear commitment to not allow it to continue, you could probably have a significant improvement in conditions overnight. Now you do not want to scare people if it is not true.

So I think we are moving forward in a historic acceleration of our efforts against AIDS. This Congress is going to be increasing funding to a dramatic degree. We want to see it wisely used. So I think we have a right to expect our governmental agencies that will be expending this money to examine the situation carefully.

Do either of you have any final comments before we adjourn?

Dr. WAWER. Thank you very much for this opportunity.

Senator SESSIONS. Thank you.

Mr. GISSELQUIST. Thank you.

Senator SESSIONS. Dr. Gisselquist, we thank you. When you challenge the establishment it is always an interesting experience. We thank you for coming forward here and sharing your information.

This is a life and death matter. This very day even at the low numbers we are looking at, some child is being infected by a health care injection and will die as a result of it. If we can stop that, we should do so. Thank you very much. Additional statements will be made part of the record.

Senator SESSIONS. The hearing is adjourned.

[Additional material follows.]

ADDITIONAL MATERIAL

PREPARED STATEMENT OF CLAUDE A. ALLEN

Mr. Chairman and Members of the Committee. I am Claude A. Allen, Deputy Secretary of the U.S. Department of Health and Human Services. I am pleased to be here today to provide an overview of the Department of Health and Human Services' activities to combat the global spread of HIV-AIDS, Tuberculosis (TB), and Malaria. I bring greetings from Secretary Thompson, and his thanks as well, for your tireless efforts to address these worldwide pandemics.

At the outset, I would like to acknowledge that we, at HHS, are in your debt, Mr. Chairman, and in the debt of your colleagues on this Committee, and others in this Chamber, for your support of prevention, care, and treatment of these diseases. The leadership of this Committee has been crucial to the U.S. Government's response to these devastating diseases, and will continue to be, as Congress and the Administration work together to support the Global Fund for AIDS, TB and Malaria, implement the President's Emergency Plan for AIDS Relief, announced in the State of the Union address in January, and implement his international Mother and Child HIV Prevention Initiative, announced last summer. The broad bipartisan support that these initiatives enjoy—as well as the strong public support—speaks to their vital importance. I look forward to continuing to work with each of you to make them reality.

The United States has a long history of assisting other countries in need. And I am pleased to report that the Department of Health and Human Services is continuing that humanitarian tradition in a variety of ways, but most particularly in helping developing countries address the devastation caused by AIDS, TB and malaria.

From Tanzania to Vietnam to Haiti, HHS employees are on the ground, working with Ministries of Health, nongovernmental organizations (NGO), faith-based groups, and—equally important—with other U.S. government entities, such as the Department of State and the U.S. Agency for International Development (USAID), to develop country-specific solutions to the ravages of AIDS. Together with USAID, we are working with 16 countries and with international organizations such as the World Health Organization (WHO) to address TB—which infects nearly eight million persons per year. Worldwide. TB kills two million people each year and is the leading cause of death for one-third of persons infected with HIV, causing fully one-third of all AIDS deaths. Further, we work with the WHO and other partners to address malaria, which kills an estimated one million children in the developing world each year.

Today, I will provide you with an overview of HHS activities and, I hope, reinforce your longstanding, demonstrated commitment to U.S. support in this essential endeavor.

Three HHS operating divisions are most actively involved in fighting AIDS, TB, and malaria worldwide. The National Institutes of Health (NIH) has a strong portfolio of basic research in the areas of HIV and TB, including vital efforts to develop a vaccine to prevent HIV infection and new treatment technologies and strategies. NIH also trains U.S. and foreign scientists as a critical part of its mission. The Centers for Disease Control and Prevention (CDC) has engaged in international applied AIDS research and programmatic efforts since the beginning of the pandemic and supports bilateral and multilateral efforts to address TB and malaria. And the Health Resources and Services Administration (HRSA), through a cooperative agreement with CDC, works to train health care workers internationally to care for people living with HIV and AIDS.

While there is not time today to go over all that we do to address HIV, TB and malaria, permit me to briefly illustrate how, at HHS, the pieces fit together into a strategic plan to combat AIDS around the globe.

RESEARCH ON AIDS

Guiding principles for the National Institutes of Health's global research are to: 1. Target research efforts to develop prevention and therapeutic strategies adapted for the unique needs of developing countries;2. Develop multidisciplinary research programs on AIDS, TB, and malaria; 3. Build and sustain research capacity in developing countries; 4. Stimulate scientific collaboration and global, multi-sectorial partnerships; and 5. Work with scientists in countries hardest hit to develop training, communication, and outreach programs.

The United States has been the world's leader in research and practical assistance to battle HIV AIDS, and NIH's budget confirms that commitment. In fiscal year 2003, NIH will devote over $2.7 billion to AIDS research, with over S250 million to be spent on AIDS research and training efforts abroad.

To conduct clinical research on vaccines for HIV AIDS, the NIH supports the HIV Vaccine Trials Network—or HVTN—a network of 16 domestic and 13 international sites. Directly and through collaborations with investigators, mostly university-based, the HVTN also supports laboratory research worldwide to ensure that vaccines are efficacious against a variety of HIV strains found in different parts of the world. The HVTN currently is conducting a phase II clinical trial in Haiti, Brazil, and Trinidad/Tobago. NIH is working with the CDC in several countries to identify cohorts of populations at risk for HIV infection and build the infrastructure necessary to conduct large-scale efficacy trials of potential vaccine candidates worldwide when they become available.

NIH supports a growing portfolio of university-based biomedical and behavioral research for the discovery, development, preclinical testing, and clinical evaluation of interventions to prevent HIV transmission, slow disease progression, and limit disease mortality. NIH-sponsored programs target studies in Africa, Asia, Latin America and the Caribbean on factors related to HIV transmission and the mechanisms associated with HIV disease progression. The HIV Prevention Trials Network—or HPTN—is a worldwide collaborative network designed to conduct research in 16 international and nine domestic sites on promising and innovative biomedical, behavioral strategies for the prevention or reduction of HIV transmission among at risk adult and infant populations.

A critical element of NIH's research portfolio is efforts to strengthen—or create—the research infrastructure of developing countries as well as the capacity of in-country investigators to conduct clinical trials of therapeutic and preventive therapies. These therapies include treatment for opportunistic infections, such as TB, which kills a third of those infected with HIV, AIDS vaccines, microbicides, and interventions to prevent mother-to-child transmission.

Capacity-building for international research is a critical issue in all the countries where NIH funds research activities. NIH focuses its efforts in three essential areas:

Training Research Scientists—It is critical to the success of international studies that foreign scientists be full and equal partners in the design and conduct of collaborative studies. To help build capacity in developing countries, NIH, through the Fogarty International Center, funds the AIDS International Training and Research Program (AITRP). The AITRP provides research training to foreign scientists through grants to U.S. universities. The program has provided training in the U.S. for scientists from developing countries in Africa, Asia, Latin America and the Caribbean, 85 percent of whom return home, and training courses have been conducted in 60 countries. Over 200 senior investigators and health officials in Africa have been trained through the AITRP, and thousands at more junior levels. With 85% of trainees returning home, the AITRP is a model of capacity building. It is no wonder that Dr. Salim Abdool-Karim, Deputy Vice Chancellor for Research and Development at the University of Natal in South Africa, and Principal Investigator of a highly successful Fogarty AITRP grant has described this program as the pre-eminent model of capacity-building, for developing countries.

Laboratory Capacity—NIH-supported HIV-related research helps to build laboratory capacity in developing countries, where the research is conducted, through purchase of laboratory equipment and transfer of research technology.

Comprehensive International Program of Research on AIDS (CIPRA)—has launched CIPRA to provide long-term support to developing countries to plan and implement a comprehensive HIV AIDS prevention and treatment research agenda relevant to their populations, and to enhance the infrastructure necessary to conduct such research. Through this initiative, funding will be provided directly to foreign institutions for HIV research that is relevant to the host country.

A safe and effective HIV preventive vaccine is essential to controlling, the AIDS pandemic. But, while we have made tremendous progress in vaccine development, the deployment of a vaccine is likely years away. Other biomedical interventions, such as microbicides, are likewise not yet proven or ready for widespread use.

In the interim, the world's best—and only—hope for controlling the epidemic is through sound prevention programs. And care and treatment programs are essential to helping the millions already infected to diminish the likelihood of infecting their partners, furthering the aims of prevention and helping to keep productive workers and citizens alive.

I will now discuss some of the prevention, care, and treatment work HHS staff are performing in countries hardest hit by this terrible disease. HHS scientists, public health experts, and specialists in AIDS care and treatment form a critical component of the U.S. Government's interagency response to the international HIV AIDS pandemic.

PREVENTION, CARE AND TREATMENT

Through the HHS Global AIDS Program, CDC works directly with 25 countries in Africa, Asia, Latin America, and the Caribbean to prevent new infections, provide care and treatment to those already infected and develop the capacity and infrastructure needed to support these programs. We calculate that these 25 countries account for more than 90 percent of the world's AIDS burden, based on prevalence estimates released at the end of last year by the WHO and UNAIDS. Targeting our resources to those countries most in need makes sense, and allows us to achieve the greatest results for our modest investment. For this fiscal year, the budget for the Global AIDS Program is $143 million, plus $40 million directed by Congress to the President's international Mother and Child HIV Prevention Initiative, jointly implemented by HHS and USAID. In addition, CDC supports approximately $11 million in applied prevention research to support these programs.

CDC's highly trained physicians, epidemiologists—who have special training in the causes, distribution and control of disease in populations—virologists and other laboratory scientists, and public health advisors—who are experts in the science and practice of protecting and improving the health of a community through a variety of measures, including preventive medicine, health education, disease control, refugee health, and sanitation, for example—are providing technical assistance to host-country governments and others working to prevent and control HIV AIDS.

CDC staff is often located directly in host-country ministries of Health or their affiliated National AIDS Control Programs. Working in close proximity with public health and medical colleagues for both government and non-governmental organizations allows CDC experts to enhance their services to host-country programs. They are also co-located with USAID colleagues, promoting complementary programming between the two agencies.

In addition to CDC employees, the HHS Global AIDS Program currently has nearly 400 locally employed staff, who serve in a range of capacities, from research scientists, laboratory technicians, nurses, and midwives to computer specialists, statisticians, sociologists, and support staff. One of the primary goals of the HHS Global AIDS Program is to develop in-country capacity to address HIV AIDS. Local staff are employed to form a national cadre of trained professionals who can share their knowledge with others, developing an ever-growing cadre of trained personnel.

The Global AIDS Program was first funded in fiscal year 2000. It builds on HHS's long and successful history of global initiatives to promote health, in areas such as immunization. For example, in Thailand, CDC staff worked with the Thai government to develop a national mother-to-child HIV prevention program, the first of its kind in the developing world. As a result of this effort, testing has been implemented in all public hospitals and it is estimated that perinatal transmission has been reduced to less than 10 percent preventing more than 1,000 HIV infections in children each year.

All of this work now forms the foundation for HHS support for and involvement in the President's Emergency Plan, which is focused on 14 of the hardest-hit nations, accounting for 50 percent of all HIV infections. This five-year plan is expected to prevent seven million new infections—60 percent of the projected new infections in the targeted countries. Two million HIV-infected people will be treated with anti-retrovirals, and care will be provided to 10 million HIV-infected individuals and AIDS orphans. Implementation will be based on a "network model" being employed in countries such as Uganda: a layered network of central medical centers that support satellite centers and mobile units, with varying levels of medical expertise as treatment moves from urban areas to rural communities. The model will employ uniform prevention, care, and treatment protocols and prepared medication packs for ease of drug administration. It will build directly on clinics, sites, and programs established through USAID, HHS, non-governmental organizations, faith-based groups, and willing host governments.

Let me emphasize that all persons who receive HIV diagnostic testing through the President's Emergency Plan for AIDS Relief and who meet the medical criteria for anti-retroviral therapy will receive it.

Now, let me explain how we derived that goal of putting two million people on anti-retrovirals, which some people have tried to claim is too small, given the more than 20 million people estimated to be HIV-positive in our 14 target countries. First, let us remember that the World Health Organization endorsed a world-wide target to put three million people on anti-retrovirals by 2005.

Second, our goal is based on field experience and research. The President's Plan projects that 50 percent of patients who are HIV-infected in the 14 countries will enter voluntary counseling and testing programs during the five years of the program, an optimistic projection, but one supported by data from Brazil and here in

the U.S. So, approximately 10 million of the 20 million HIV-infected persons in our 14 target countries will be diagnosed with HIV-infection and receive counseling. All of these persons will receive appropriate medical care through the Emergency Plan.

Most important, according to medical criteria and international guidelines, an estimated 20 percent of HIV-infected persons in resource-limited settings at any one time require antiretroviral therapy. Twenty percent of 20 million infected would be four million, but remember that we estimate that only half of the infected population will come in to receive testing to find out their status and receive medical attention. Therefore, approximately two million of the 10 million persons who are diagnosed with HIV infection in our 14 countries will require antiretroviral therapy during the five years of the program.

Because those with advanced disease who are very sick are most likely to come in for care through the plan. it is possible our partners in the Plan will treat more than two million people with anti-retroviral therapy: if more than two million people require such therapy, the Emergency Plan will provide it. If this scenario were to occur, economies of scale should allow for a reduction in the price of anti-retroviral medications and certain laboratory tests to keep the Plan within the budget the President has requested.

Although the President's Emergency Relief Plan will not begin until next fiscal year, the first stage of this unprecedented effort is his Mother and Child HIV Prevention Initiative, which has already begun in the same 14 countries and is jointly implemented by HHS and USAID. HHS and USAID staff have worked with host governments and NGO's to develop preliminary country-specific plans of action that will target one million HIV-infected women annually within 5 years or less, provide them with HIV counseling and voluntary testing, essential prenatal care and support services and—most importantly—with the life-saving drugs that will help their babies be born free of HIV infection. We expect that this initiative will reduce mother-to-child HIV transmission by 40 percent among the women treated. A second goal of the initiative is to improve health care systems to provide care and treatment not only to mothers and babies, but to fathers, other children, and the broader community as well. Strengthening health care systems is essential to the success of the President's broader Emergency Relief Plan.

HRSA is lending its strength to this initiative through the training of health care providers and the facilitation of partnerships between U.S. hospitals and clinics and their counterparts in the 14 countries ("twinning"). HRSA also supports broader HIS/AIDS international training initiatives through a cooperative agreement with CDC.

The President's Emergency Plan also increased our pledge to the Global Fund to Fight AIDS, Tuberculosis and Malaria to $1.65 billion, 50 percent of the total $3.36 billion pledged to date. Our fiscal rear 2003 commitment alone accounts for 45 percent of all resources available to the Fund this year ($350 million of a total $780 million pledged or in the bank), and the U.S. is responsible for 37 percent of the Fund's cash on hand. With the exception of Germany and Ireland, major donor countries have not increased their initial pledges, which in most cases extend over several years. Secretary Thompson, who was elected to serve a one year term as Board Chair during the last Global Fund Board meeting in January, is committed to mobilizing additional resources from both donor nations and the private sector. The U.S. supported strongly the creation of the Global Fund and continues to support its efforts through technical assistance to partnerships as they develop proposals for the Fund and helping to implement and monitor Global Fund financed programs.

For too long, people in the developing world have seen a diagnosis of HIV infection as a death sentence. And it has been. But with the promise of care and treatment, for the first time, learning your HIV status can be seen as a stepping stone to needed care. An HIV test will be the gateway to services. For those who are infected, they will be able to receive treatment—and essential prevention and support services to keep from transmitting the virus to others. For those who are not infected, they can receive vital prevention services to learn how to remain HIV-free, emphasizing the ABCs of HIV prevention. "A" is for abstinence in young people. "B" is for being faithful within a relationship, and "C" for condom use in high risk populations with the knowledge that condoms are not as effective in preventing all sexually transmitted diseases as they are with HIV. I have traveled to Uganda, and I have seen that ABC is working. Uganda is the only country in Africa with an increasing life expectancy. The ABC prevention concept is something that we should seriously examine in our own country.

All this is possible because of the hope of care and treatment. We at HHS, in partnership with USAID and other organizations, are making good on this promise. We are providing the essential training, technical assistance and financial support to

governments and scientific institutions around the globe to help them help their people. None of this would be possible without the continued support of members of this Committee and your colleagues in the House and Senate.

HIV TRANSMISSION THROUGH UNSAFE MEDICAL PRACTICES

As the focus of today's hearing, I will now briefly speak about recent reports that unsafe medical practices, including unsafe injections, are responsible for a more significant percentage of HIV infection in Africa than previously thought.

A clear understanding of the modes of HIV transmission will contribute to achieving our goal of turning the tide of this epidemic. We at HHS are committed to exploring all avenues of inquiry that may hasten the achievement of that goal. We acknowledge, and have acknowledged publicly, the contribution of unsafe medical practices to HIV in resource-limited settings. HHS, through CDC, has been a major proponent of the need for safe blood practices and provides technical assistance in this regard throughout the world. However, it is important to acknowledge that the contribution of such practices to HIV infection in resource-limited settings is unknown. There are a few key points regarding the recent publication in this regard.

First, the publication was not a study, it did not perform primary research and did not perform actual surveillance. Rather, the authors reviewed previously published data and came to conclusions different from the authors of those studies, and of the global scientific community in general.

Second, I should note that the vast majority of scientists, and we at HHS, accept the premise that the contribution of unsafe injection and medical practices discussed in the paper does require further evaluation. However, the preponderance of experts reviewing the same data have concluded that the author's estimate that medical practices are responsible for 20 to 40 percent of infections in Africa is likely a significant overestimate.

Finally, however high the percentage of infections in Africa contributed by unsafe injections and medical practices really is, I want to assure you that the President's Emergency Plan for AIDS Relief in Africa and the Caribbean has a component to reduce transmission from unsafe injections and medical practices. Each and every infection with a dirty needle is whooly presentable and should be presented. Under the President's initiative, prevention activities will be directed at all modes of transmission, including improving safe blood supplies, and the Emergency Plan will have the flexibility to adjust resource allocation based on scientific data as it becomes available.

In addition, the Emergency Plan will enhance the medical capacity and infrastructure in the countries participating in the program: these activities in and of themselves should have a "spillover" effect to promote safer medical practices. Finally, it is important to note that the Emergency Plan is committed to providing medical care and treatment, including anti-retroviral therapy, for those who are infected with HIV regardless of hogs they acquired the virus. However a person obtained HIV, the President's bold and compassionate Plan will provide the necessary care and treatment.

An important target of HHS HIV prevention activities is to present the infection of children. Although the contribution of unsafe medical practices to the infection of children has not been fully quantified, there is no question that transmission of HIV from mothers to their infants is the most significant cause of infection among children. For this reason, the Congress has supported the President's Initiative to prevent vertical transmission of HIV. As noted above, this Initiative hopes to present 40% of HIV infections from mothers to their infants. However, one of the most effective ways to present a mother from infecting her infant, and to protect the child from becoming an orphan, is to present the mother from becoming infected in the first place. The President's Emergency Plan provides broad prevention activities that have had great success in reducing infections of mothers in Uganda, Senegal, Brazil, and Thailand. It is important that we continue to support these proven strategies.

GLOBAL CONTROL OF TB AND MALARIA

Thus far, I have focused on HIV and AIDS in this testimony. Let me now make a few comments regarding HHS's contributions to the global control of tuberculosis and malaria. HHS's approaches to both TB and malaria are similar to that of HIV AIDS, but are more limited in terms of scope and resources.

Both NIH and CDC work to address TB. TB is a global emergency and a leading infectious killer of young adults worldwide. Approximately one-third of the world's population is infected with the bacterium that causes TB and 80 percent of active TB cases originate in 22 high-burden countries. As I noted earlier, TB accounts for

one-third of deaths among persons with AIDS. Basic research on TB, including research on a vaccine, is conducted at NIH. CDC supports applied research, including operational research to improve programs and clinical research to evaluate new drugs and diagnostics, and program implementation.

In addition to addressing HIV and TB coinfection through the Global AIDS Program, CDC works closely with USAID, international organizations, and 16 countries around the globe to control TB. International partners include the WHO and the International Union Against TB and Lung Diseases (IUATLD). Collaborative efforts include the Stop TB Partnership, technical support to USAID, and technical assistance to specific countries. Technical assistance is focused on countries that contribute most to U.S. cases, are high burden countries, have High rates of multi-drug resistant TB (MDR-TB), are of strategic importance (e.g. countries participating in the HHS Global AIDS Program), or provide opportunities to improve diagnosis and treatment of TB, MDR-TB, and HIV-associated TB.

Spearheaded by the WHO and its international partners, including HHS, a proven effective national case management strategy has been applied increasingly in developing nations. This strategy is termed DOTS—Directly Observed Therapy, Short-Course—which emphasizes consistent drug supply, microscopic based diagnosis, and direct observation of each dose of life saving medication. The World Bank has ranked DOTS as one of the most cost-effective of all health interventions. CDC works with WHO and other partners to expand the current DOTS strategy so that people with TB have access to effective diagnosis and treatment, and to adapt this strategy to meet the challenges of HIV and multi-drug resistance.

CDC and NIH are also involved actively in research on global malaria prevention and control. NIH is engaged in research both domestically and globally with a focus on malaria vaccine development and optimal use of the information on newly characterized malaria genome and the mosquito vector genome. CDC continues to work on U.S. domestic prevention and monitoring and on global collaborations with Ministries of Health, U.S. universities and schools of public health, and non-governmental and faith-based organizations in the prevention and control of malaria in malaria-endemic settings—mostly in sub-Saharan Africa. In fact, much of the HHS global work on malaria is in the same setting where HIV prevention work is underway.

The HHS effort in malaria is widely collaborative with the Department of State, USAID and the Department of Defense. The U.S. leadership in the Global Fund to Fight AIDS, TB, and Malaria has been especially well-received in the malaria community.

Currently available control strategies for malaria have proven to be highly effective in saying lives. Effective antimalarial treatment exists that cures infection and disease. Effective prevention exists, as evidenced by the 20 percent reduction in child mortality with the use of insecticide-treated bed nets in Africa. Use of insecticide treated bed nets and preventive treatment can alter the impact of malaria dramatically in pregnant women and their newborns, improving newborn birth weight and reducing anemia in the mother and the newborn, and saying lives.

Finally, as a with TB, malaria must also be seen in the context of HIV and AIDS prevention and control. Recent studies have shown that malaria and HIV interact broadly. Malaria causes anemia and the needed blood transfusions can be a source of HIV transmission. HIV-infected pregnant women contract the disease disproportionately and exhibit more severe complications, conferring a greater risk to the developing fetus and the newborn. Most recently, studies suggest that malaria is more severe in HIV-infected adults and that malaria may stimulate HIV viral replication, with potentially greater increased risk for HIV transmission. The widespread coexistence of malaria and HIV in Africa likely means that each is making the other worse and that addressing both is a good police.

I thank you again, and welcome any questions you have for me.

PREPARED STATEMENT BY DAVID GISSELQUIST

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 A1DS 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.[1] 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.[2] 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 blond 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 prey hence 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.[3] 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 198Os 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 I in a year.[4] [5] Hence, in the US, HIV would not even survive as an epidemic through

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[1] Chin J, Sato PA, Mann JM. Projections of HIV infections and AIDS cases to the year 2000. WHO Bull 1990; 68: 1-11.

[2] Gisselquist D, Potterat JJ, Brody S, Vachon F. Let it be sexual: how health care transmission of AIDS in Africa was ignored. Int J STD AIDS 2003; 14: 148-161.

[3] Gisselquist D, Potterat JJ, Brody S, Vachon F. Let it be sexual: how health care transmission of AIDS in Africa was ignored. Int J STD AIDS 2003; 14: 148-161.

[4] Karon JM, Fleming PK, Steketee RW, De Cock KM. HIV in the United States at the turn of the century: an epidemic in transition. Am J Public Health 2001; 91: 1060-1068.

[5] Centers for Disease Control and Prevention. CDC guidelines for national human immunodeficiency virus case surveillance, including monitoring for human immunodeficiency virus infection and acquired immune deficiency syndrome. MMWR Morb Mortal Wkly Rep 1999; 48: (RR-13): 1-31.

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.[6] 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).[7]

7 Cleland J, Ferry B, Carael M. Summary and conclusions. In: Cleland J, Ferry B, editors. Sexual behavior and AIDS in the developing world. Geneva: WHO, 1995.

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 cofactors 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[8] "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.[9] Similarly, a recent review of research on genital herpes suggests that it, too, increases risks to contract HIV by a factor of about two.[10] 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[11] "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.[12] 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

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[6] Carael M, Cleland J, Deheneffe JC, Ferry B, Ingham R. Sexual behaviour in developing countries: implications for HIV control. AIDS 1995; 9: 1171-1175.

[7]

[8] Buve A, Carael M, Haves RJ, et al. The multicentre study on factors determining the differential spread of HIV in four African cities: summary and conclusions. AIDS 2001; (suppl 4): S127-S131.

[9] Weiss HA, Quigley MA, Hayes RJ. Male circumcision and the risk of HIV infection in sub-Saharan Africa: a systematic review and meta-analysis. AIDS 2000; 14: 2361-2370.

[10] Wald A, Link K. Risk of human immunodeficiency virus infection in herpes simplex virus type 2seropositive persons: a meta-analysis. J Infect Dis 2001; 185: 45-52.

[11] Buve A, Bishikwabo-Nsarhaza K, Mutangadura G. The spread and effect of HIV-1 infection in subSaharan Africa. Lancet 2002; 359: 2011-2017.

[12] Gisselquist D, Potterat JJ. Heterosexual transmission of HIV in Africa: an empiric estimate. Int J STD AIDS. 14: 162-173.

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. [13]

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. [14] 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. [15] 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. [16] 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. [17] 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

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[13] Gisselquist D. Unanswered questions about sexual transmission of HIV in Mwanza, Tanzania. J Acquir Immune Defic Syndr 2003; 32: 349-351.

[14] Gisselquist D, Potterat JJ. Heterosexual transmission of HIV in Africa: an empiric estimate. Int J STD AIDS. 14: 162-173.

[15] Gisselquist D. Proportion of HIV in African adults associated with medical injections and multiple partners (unpublished paper distributed at a meeting on Unsafe injection practices and HIV infection, Geneva, WHO, 14 March 2003). See also: Gisselquist D, Rothenberg R, Potterat J, Drucker EM. H TV infections in sub-Saharan Africa not explained by sexual or vertical transmission. Int J STD AIDS 2002; 13: 657-666.

[16] Gisselquist D, Rothenberg R, Potterat J, Drucker EM. HIV infections in sub-Saharan Africa not explained by sexual or vertical transmission. Int J STD AIDS 2002; 13: 657-666.

[17] Gisselquist D, Rothenberg R, Potterat J, Drucker EM. HIV infections in sub-Saharan Africa not explained by sexual or vertical transmission. Int J STD AIDS 2002; 13: 657-666.

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).[18]

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.[19] In 2002, a national random sample survey in South Africa reported 5.6% HIV prevalence in children 2-14 years old.[20] 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,[21] 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.[22] 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.[23] 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.

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[18] Hitimana D, Luo-Mutti C, Madraa B, Mwaikambo E, Malek A, Nkowane B. A multicentre matched case control study of possible nosocomial HIV-1 transmission in developing countries. In: Abstracts of the IXth International Conference on AIDS: 6-11 June 1993, Berlin, Germany. Abstract WS-C13-02, p 94.

[19] Rwandan HIV Seroprevalence Study Group. Nationwide community-based serological survey of HIV-1 and other human retrovirus infections in a central African country. Lancet 1989; is 941-943.

[20] Shisana O, Simbayi L, Bezuidenhout F, et al. Nelson Mandela/HSRC Study of HIV/AIDS: South African national HIV prevalence, behavioral risks and mass media: household survey 2002. Cape Town: Human Sciences Research Council, 2002.

[21] Sidley P. HIV infection rate among South African children found to be 5.6%. BMJ 2002; 325: 1380.

[22] Simonsen L, Kane A, Lloyd J, Zaffran M, Kane M. Unsafe injections in the developing world and transmission of bloodborne pathogens: a review. WHO Bull 1999, 77: 789-800.

[23] Mukumbira R. 200 kids, one syringe. News 24. 6 March 2003. <www.news24.com/News24/South—Africa/AIDS—Focus/0,6119,2-7-659—1329560,00.html>

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. [24]

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 [25] and Masaka [26] 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. [27] These results are a puzzle, since it is not possible from the data to explain lower MV 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. [28] 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. [29] A 2001 WHO-funded study reports that [30] "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 10090 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

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[24] Kamali A, Quigley M. Nakiyingi J, et al. Syndromic management of sexually-transmitted infections and behavior change interventions on transmission of HIV-1 in rural Uganda: a community randomized trial. Lancet 2003; 361: 645-652.

[25] Wawer MJ, Sewarikambo NK, Serwadda D, et al. Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomized community trial. Lancet 1999; 353: 525-535.

[26] 26 Kamali A, Quigley M, Nakiyingi J, et al. Syndromic management of sexually-transmitted infections and behavior change interventions on transmission of HIV-1 in rural Uganda: a community randomized trial. Lancet 2003; 361: 645-652.

[27] Gisselquist D, Potterat JJ. Confound it: latent lessons from the Mwanza trial of STD treatment to reduce HIV transmission. Int J STD AIDS 2003; 14: 179-184.

[28] Hogle J, Green E, Nantulya V, Stoneburner R. Stover J. What happened in Uganda? Declining HIV prevalence, behavior, and the national response. Washington DC: USAID, 2002.

[29] Birungi H. Injections and self-help: risk and trust in Ugandan health care. Soc Sci Med 1998; 47: 14551461.

[30] Priotto G. Injection use in the population of Mbarara District, Uganda. WHO, 2001 (unpublished).

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 arid 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.[31] 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.[32]

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

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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.

U.S. Senate Committee on Health, Education, Labor, and Pensions
AIDS Crisis in Africa: Health Care Transmission
27 March 2003

Statistical notes to accompany testimony by David Gisselquist

Table 1: Crude PAFs for incident and prevalent HIV associated with >0 injections and >1 sex partner*

Country, year, reference	Sample or cohort, sex, and number	Crude risk measures for >0 injections			Crude risk measures for >1 sex partner‡		
		p (%)	RR	PAF (%)	p (%)	RR	PAF (%)
Incidence							
DRC, 1984-86[5]	Workers A 1,905	73	1.54	28			
Uganda, 1989-90[6]	GP A 442	76	1.12	8	13	3.40	23†
Kenya, 1990-92[7]†	FP F 17/51				4	0	< 0
Malawi, 1989-93[8]	PP 687				0	Und	0‖
Rwanda, 1989-93[9]	ANC 1,143	59	2.42	45	4.3	11.0	30¶
Malawi, 1990-94[10]	ANC 1,160				8.4	1.90	7
Tanzania, 1992-95[11]	FP W 1,370				22	1.87	16
Tanzania, 1991-96[12]	Workers M 1,427				21	2.11	19†
	Wives 745				10	1.85	8‡
Uganda, 1990-97[13]†	GP M 37/93	17	5.21	41	29	1.92	21
	GP W 46/87	32	1.60	16	0	Und	8‖
Uganda, 1994-98[14]	GP A 9,376				23	1.5	11
Prevalence (risk measures from exposures during the past 1-12 years)§							
DRC, 1984[15]	Workers A 2,384	81	1.83	40			
Rwanda, 1985[16]	Workers A 452	77	2.42	52			
Uganda, 1987[17]	R GP A 3,907	66	1.68	31			
Tanzania, 1987[18]	R GP A 1744	79	2.6	56	55	2.3	41
	U GP A 553	90	3.0	64	77	1.7	34
DRC, 1987-88[19]	Wives 4,548				0.68	4.29	2.2
Congo, 1987-88[20]	ANC 1,766				11	1.79	8.1
Uganda, ca 1989[21]	GP M 593	42	1.67	22	50	2.03	34
	GP W 698	57	1.75	30	20	3.15	31
Malawi, 1989-90[22]	ANC 6,506	~64	0.91	< 0	29	1.54	14
Uganda, 1990[23]	GP M 1,058				36	1.44	14
	GP W 1,586				9.8	2.09	9.6
Kenya, 1989-91[24]	ANC 4,404	97	0.73	< 0	6.7	2.72	10
Kenya, 1989-91[25]†	ANC 325/302				24	1.41	9.0
Rwanda, 1989-91[26]	ANC 5,666				16	3.38	28
Tanzania, 1990-91[27]	Village GP M 974	40	1.65	21	55	1.90	33
	Roadside GP M 431	39	1.72	22	66	2.43	49
	U GP M 595	51	1.94	32	75	1.56	30
	Village GP W 1,045	57	1.16	9	21	1.34	6.6
	Roadside GP W 527	57	2.42	45	30	1.32	8.6
	U GP W 589	61	1.45	22	33	2.67	35

Zambia, 1980-92[28]	Nurses, teachers, workers W 1,110	84 47	0.89 1.04	< 0** 2††	5.0	1.51	2.5‡
Tanzania, 1991-92[29]	FP W 2,285	99	1.38	27	47	1.83	28
Tanzania, 1991-92[30]*	GP M 149/394	48	2.07	34	56	1.06	3.1
	GP W 188/573	51	1.66	25	11	1.98	9.6
Zimbabwe, 1993-95[31]	Workers M 2,691				43	2.29	34‡
Uganda, 1994[32]	GP W 3,639				5	1.33	1.6
Uganda, 1994-95[33]	GP M 5,645				59	1.48	22
Uganda, 1994-2000[34]	GP M 1,996				36	1.84	15
	GP W 2,145				4.8	1.98	4.1
	GP 13-19 yrs A 646				15	0.63	< 0
Prevalence (risk measures from lifetime exposures)							
Zambia, 1987[35]	PP 1,899				54	1.27	13
Zimbabwe, 1987[36]†	BD: M 69/119	95	3.61	71			
Rwanda, 1988[37]	ANC, PC W 1452				32	1.89	22
Kenya, 1989-90[24]	ANC 4404				74	3.09	61
Kenya, 1989-91[25]†	ANC 325/302				67	1.30	17
Tanzania, 1991-92[30]†	GP M 149/394				97	4.53	77‡
	GP W 188/573				69	2.63	53‡
Tanzania, 1993[38]	ANC W 484				41	6.19	68
Tanzania, 1995[39]	GP 15-24 yrs A 699				57	1.26	13
South Africa, 1999[40]	GP 14-24 yrs M 558				77	1.68	34
	GP 14-24 yrs W 619				66	2.66	52
Uganda, 1994-2000[34]	GP M 2,408				91	3.41	69
	GP W 3,109				72	2.84	57
	GP 13-19 yrs A 926				50	2.62	45

ANC: antenatal clinic. FP: men or women at family planning clinics. GP: general population adults. M: men. W: women. A: adults. PP: postpartum or peripartum. PC: pediatric clinics. und: undefined.

* PAFs for incident and prevalent HIV for >0 injections are repeated from Gisselquist and colleagues[1], except that one PAF for Rwanda 1985[16] and two from Zambia 1992[28] have been added. PAFs for men and women from Uganda 1990-91[27] are split into PAFs for village, roadside, and urban men and women, one PAF for Tanzania 1991-92 has been cut (risks reported for 4 months only); and I include PAFs from the baseline case control study for the Mwanza STD trial[30] instead of the baseline survey. PAFs for incident HIV for >1 sex partner are repeated from Gisselquist and colleagues[2] except that I exclude one PAF from Rwanda from a case control study based on a cohort of less than 250 women. PAFs for prevalent HIV associated with >1 sex partner appear first in this paper.

† Case control study, for which the table shows numbers of cases/controls, exposures among controls, odds ratio (OR) instead of RR, and approximates the PAF as $\rho(OR-1)/(1+\rho[OR-1])$

‡ When data allow, PAFs and APAFs are calculated from data for persons with sex partners in the reporting interval (or lifetime for prevalence related to lifetime exposures); marked PAFs are calculated from data including persons with no sex partners.

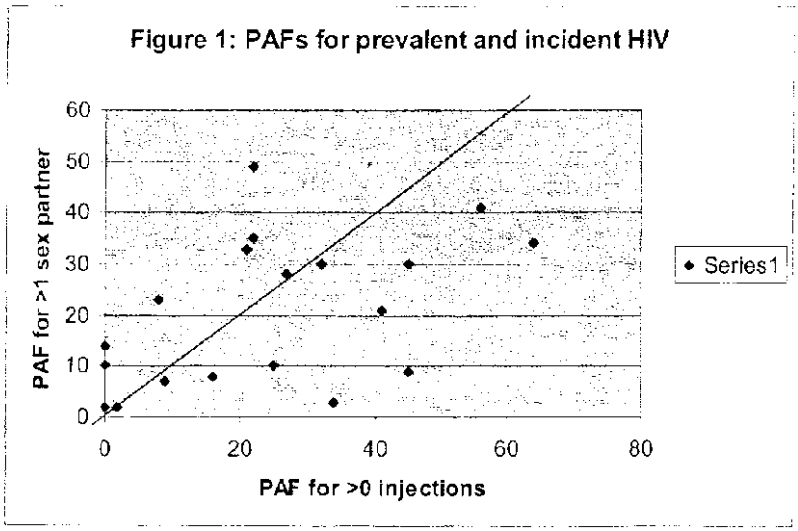
§ Table 6 gives the length of the reporting periods for injections and >1 sex partner in each study.

‖ Since the OR is undefined; the PAF has been estimated by assuming that the cases plus controls comprise a representative sample.

¶ Risk measures for sexual contact with someone other than the current child's father.

** PAF for intramuscular injections.

†† PAF for intravenous injections.



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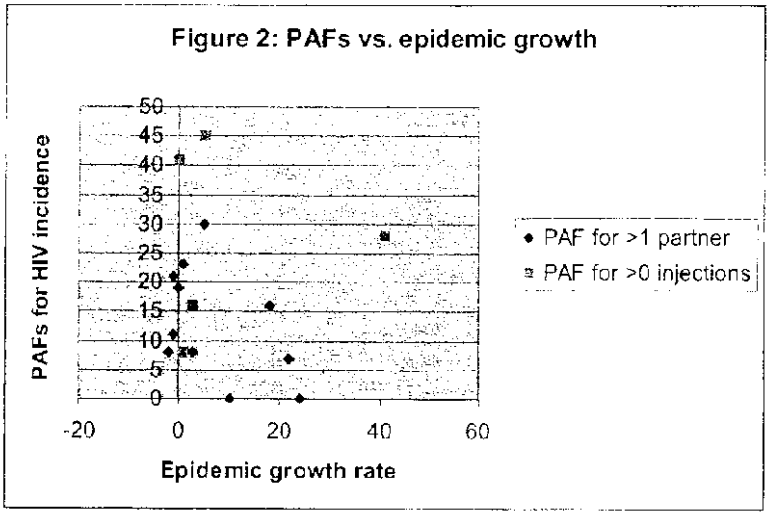

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Table 2: Summary of crude PAFs associated with >0 injections and >1 sexual partner

Risk factor	Number of studies	Number of PAFs	PAFs (%)		
			Range	Median	Average
Injections					
Incidence	4	5	8-45	28	28
Prevalence (1-12 years' exposures)	11	20	0-64	25-27	27
Prevalence (lifetime exposures)	1	1	71	-	71
Men: Multiple partners					
Incidence	2	2	19-21	-	20
Prevalence (1-8 years' exposures)	7	9	3-49	30	26
Prevalence (lifetime exposures)	3	3	34-77	69	60
Women: Multiple partners					
Incidence	7	7	0-30	7-8	9
Prevalence (1-8 years' exposures)	14	16	2-35	9-10	13
Prevalence (lifetime exposures)	8	8	13-68	52-53	43
Adults: Multiple partners					
Incidence	2	2	11-23	-	17
Prevalence (1-8 years' exposures)	2	3	0-41	34	25
Prevalence (lifetime exposures)	2	2	13-45	-	29

Source: Table 1.
PAF: population attributable fraction.

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Table 3: Prevalence of HIV, hepatitis B virus (HBV), and HTLV in population samples with hepatitis C virus (HCV) prevalence ≥5%*

Country	Year of sample	Ref	population	Prevalence (%)			
				HCV	HIV	HBV†	HTLV1
Burundi	1991	7ab	OP	9.3	22		
Burundi	1991-92	7.8a	OP	33	25		
Burundi	1991-92	7.8b	LD	55	19		
Cameroon	1992	12	GP-R (Pygmies)	7.9	0.7	94	10.9
Cameroon	no date	13b	AN-U	5.5		77	
Cameroon	no date	13f	CSW-U	15		86	
Cameroon	1991-92	16	AN	6.8	3.5	94†	
Cameroon	no date	19b	AN-R	6.1	2.9	87	
Cameroon	no date	19c	BD-R	6.4	2.3	90	
Cameroon	1994	21a	GP-R (Pygmies)	7.8	0		0
Cameroon	1994	21b	GP-R (Bantus)	22	0		0
Cameroon	1998	21.8	HIV+STD+OP	12	26		
CAR	no date	22	STD-U	5.1	20	89	
CAR	1992	23b	GP-R (Bantus)	2.8	0.4		0
CAR	1998	25+	BD-U	6.1	15		
Congo,	1986-88	28a+	LP-R	9.2	3.8‡		9.7‡
Cote d'Ivoire	1986-88	30a+	LP-R	8.2	4.8‡		9.9‡
DR Congo	1988	32a	CSW-U	5.6	34		
Eritrea	1995	34b	Wrk (truck drivers)	6.0	0		
Ghana	no date	40	ST-R	5.4		61†	
Niger	1990	57	CSW-U	7.6	29		
Nigeria	no date	60a	SC	5.1		44	
Nigeria	no date	60d	BD-U	5.8		48	
Rwanda	no date	64b	AN-U	9.4	31		
Rwanda	1985	65b	BD-R	17		56†	
Somalia	1995	75b	IP	7.0	0		0
Togo	1993-94	98b	IP-U	6.1	36		
Uganda	1986	100	OP+IP+AN+Mil+HIV	14	12	74	
Zimbabwe	1994	104	GP-R	7.7		75†	
Averages				10.9	13.1	75	4.4

GP: non-random or random general population sample. U: urban. R: rural. BD: blood donors. LP: leprosy patients. AN: antenatal or other pregnant women. OP: outpatients (includes persons with sickle-cell anemia [SC] without lifetime transfusions). IP: inpatients. STD: persons attending an STD clinic. CSW: female commercial sex workers. HIV: persons with HIV. Mil: military. SC: sickle-cell anemia. St: students. Wrk: workers.

* The population samples in this table come from a review of HCV prevalence in sub-Saharan Africa. The table shows all population samples with confirmed (RIBA, LIA, or other) HCV prevalence >5% and with information on prevalence for HIV, HBV, and/or HTLV1, excluding population samples selected for HIV and samples reporting HBV prevalence selected for liver disease.

† Figures with an asterisk show percent with any HBV marker; other figures show percent with anti-HBc, with or without other HBV markers.

‡ Samples for HCV, HIV, and HTLV may not be identical.]

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Table 4: Reported C+M- Children (HIV+ children with HIV- mothers)

Where, when, how, who	HIV+ children with HIV- mothers	Source
African multi-center study (Rwanda, Tanzania, Uganda, Zambia), 1990-91(?); prevalence; 5,593 children 6-59 months "admitted to pediatric medical care" (inpatient only?) and their mothers	* 1.1% (61/5,593) of children in parallel studies in four countries were C+M-, of which 5% only had blood transfusions. The report does not say how many children were C+M+. * In a companion study, 0.2% (4/2,005) HIV- children discharged from hospital seroconverted in 3 mos.	(a) Global Program on AIDS. 1992-1993 Progress Report. Geneva: World Health Organization; 1993(?). (b) Hitimana D, Luo-Mutti C, Madraa B, Mwaikambo E, Malek A, Nkowane B. A multicentre matched case control study of possible nosocomial HIV-1 transmission in developing countries. In: Abstracts of the IXth International Conference on AIDS: 6-11 June 1993, Berlin, Germany. Abstract WS-C13-02, p 94.
Angola, Cabinda, 1988-93; prevalence; 60 HIV+ children	42% (25[?]/60) of HIV+ children infected through blood products, 56% (34/60) had HIV+ mothers, and risk factors unknown for 1. [It's not clear how the children were selected.]	Gama A, Silva PC, Ferreira S, Cruz A, Carvalho A, Soares A. Epidemiology and clinical features of HIV infection among children in Cabinda, Angola, West Africa [abstract, paper presented at: Second Residential Meeting, Royal Society of Physicians of Edinburgh, Edinburgh, Scotland, 5-7 July 1993]. Transactions of the Royal Society of Tropical Medicine and Hygiene 1993, 87: 367.
Belgium, Brussels, no date; HIV among children of families immigrating from Africa	12% of HIV+ children reported in the study were C+M-: 7 children were HIV+ with HIV- mothers; 50 (44% of 112) children were HIV+ with HIV+ mothers. How were these children and parents chosen for study?	Irova TI, Burtonboy G, Ninane J. HIV infection in children born before and after immigration to Belgium. Journal of Travel Medicine 1995; 2: 169-173. [abstract from Medline]
Burkina Faso,	23% (11/48) of HIV+ (46 HIV-1, 2	Prazuck T, Tall F, Nacro

Bobo Dioulasso, 1989-90; prevalence, 425 children with severe malnutrition at Sanou Souro National Hospital	HIV-2) children >12 mos old were C+M- (mothers tested HIV-). Of 11 C+M- children, 6 had been transfused, and the remaining 5 had multiple injections. "…mothers could have acquired infection after delivery. Thus horizontal transmission was responsible for at least 23% of infection" (p 107).	B, et al. HIV infection and severe malnutrition: a clinical and epidemiological study in Burkina Faso. AIDS 1993, 7: 103-108.
Cote d'Ivoire, Dabou, 1987-88, prevalence, mothers of 192 HIV+ pediatric patients	13.5% of 192 mothers of HIV+ children were HIV-	Schuerman L, Seynhaeve V, Doustin P, et al. HIV-1 and HIV-2 infection and pediatric AIDS in Dabou protestant hospital -- Ivory Coast. IV international conference: AIDS and associated cancers in Africa, Marseille, 18-20 Oct 1989, poster 246, in: HIV/AIDS surveillance data base. June 2000 version. Washington DC: US Census Bureau, 2000.
Cote d'Ivoire, Abidjan, 1989, prevalence, 501 hospitalized and 502 well children, 972 mothers	8% of all HIV+ children were C+M-. However, most HIV+ (44/66) children were < 15 mos, so many C+M+ children were passively positive. 23% (5/22) of HIV+ children 15-60 mos had HIV- mothers. All 5 had reportedly received a blood transfusion.	Gayle HD, Gnaore E, Adjorlolo, et al. HIV 1 and HIV-2 infection in children in Abidjan, Cote d'Ivoire. J Acquir Immune Defic Syndr 1992, 5: 513-517.
Cote d'Ivoire, Abidjan, no date; 194 mother-children pairs	21% (3/14) of HIV-1+ children had HIV-1- mothers. 50% (1/2) of HIV-2+ children had HIV-2- mothers.	De Cock KM, Zadi F, Adjorlolo G, et al. Retrospective study of maternal HIV-1 and HIV-2 infections and child survival in Abidjan, Cote d'Ivoire. BMJ 1994, 308: 441-442.
DR Congo, Kinshasha, 1985, prevalence, 258 children 2-24 mos in hospital,	39% (17/44) of HIV+ children had HIV- mothers (50% [16/32] among hospital children; 8% [1/12] among clinic children). However, 4/6 clinic HIV+ children re-tested later	Marin JM, Francis H, Davachi F, et al. Risk factors for immunodeficiency virus seropositivity among

191 children 1-20 mos at a well-child clinic, and mothers of both groups	had become HIV-, so the % of C+ children with M- mothers was at least 43% (17/40). Among hospital children with HIV- mothers, HIV+ children had more transfusions (31% vs 7% transfused), more injections (44 vs 23 lifetime or average 4.2 vs 2.0 per month), and more previous hospitalizations (50% vs 13%).	children 1-24 months old in Kinshasha, Zaire. Lancet 1986, ii: 654-657.
Ethiopia, Addis Ababa, 1994, prevalence, 3,853 stored sera from community-based measles study, all ages	Of 3 HIV+ children ≤5, 1 had HIV- parents, and the other parents' sera were not tested	Fontanet AL, Messele T, Dejene A, et al. Age and sex-specific HIV-1 prevalence in the urban community setting of Addis Ababa, Ethiopia. AIDS 1998, 12: 315-322.
Guinea-Bissau, Bissau, 1987-89; HIV-2 prevalence and incidence, community-based random sample	2 of 654 children (10 year-old boy, 9 year-old girl) tested in 1989 were HIV+ (not counting 2 babies who later became HIV-); the boy's mother was HIV- (he had an injection when <1 year old); the girl's mother was not available	Poulsen AG, Aaby P, Gottschau A, et al: HIV-2 infection in Bissau, West Africa, 1987-89: incidence, prevalence, and routes of transmission. Journal of Acquired Immune Deficiency Syndromes 1993, 6: 941-948.
Nigeria, Enugu, 1989-1996; 63 HIV+ children 0->14 yrs at U Nigeria Teaching Hospital	Of 63 HIV+ children, 13 mothers HIV+ (not clear how many tested). 30 of 63 children had been transfused where blood not tested. No risk factor identified for 20. "In no child above 4 years [22 of 63 children] could infection be related to vertical transmission."	Emodi IJ, Okafor GO. Clinical manifestations of HIV in children at Enugu, Nigeria. J Tropical Pediatrics 1998, 44: 73-76.
Rwanda, Kigali, 1984-86, prevalence, 76 hospital children with AIDS or AIDS related complex and their mothers	24% (18/76) of HIV+ children had HIV- mothers. For C+M- children: 39% (7/18) had been transfused, 44% (8/18) had previous hospitalizations, and the average number of injections was 1.8/mo (mean age 21 mos). On re-testing, 3/12 C+M- mothers were HIV+. However, many C+M+ children were young and may not have been infected, so more than 20% (15/76)	Lepage P, Van de Perre P, Carael M, Butzler JP: Are medical infections a risk factor for HIV infection in children? Lancet 1986; ii: 1103-1104. Lepage P, Van de Perre P. Nosocomial transmission of HIV in Africa: what tribute is paid to contaminated transfusions

	C+ children may have been C+M-.	and medical injections. Infect Control Hosp Epidemiol 1988; 9: 200-203.
Rwanda, Kigali, 1984-90; prevalence, 845 children (no age distribution given) with AIDS seen at Centre Hospitalier de Kigali	From 845 children with AIDS, 7.3% (54/704) of mothers tested HIV-. "The proportion of children whose mother's serological status was investigated decreased over time during the study period" [p 1517]. 7.3% may underestimate % C+M- among HIV+ children in the community since: (a) some C+M+ <1 yr may have been passively HIV+; (b) 5-10% of the mothers may have new and unconnected infections (the HIV incidence for community women over 3 yrs postpartum was 3.4/100 PYs); and (c) children infected after birth will on average develop AIDS later than children with perinatal infections. The study looked at risk factors for only 25 of 54 C+M- children, reporting that 22 of 25 had been transfused (cf, Lepage et al. [Lancet 1986 ii, pp 1103ff] reported 9 C+M- children not transfused in a study from the same hospital at the same).	Commenges D, Alioum A, Lepage P, Van de Perre P, Msellati P, Dabis F. Estimating the incubation period of paediatric AIDS in Rwanda. AIDS 1992, 6: 1515-1520. Information on postpartum transmission from: Leroy V, Van de Perre P, Lepage P, et al. Seroincidence of HIV-1 infection in African women of reproductive age: a prospective cohort study in Kigali, Rwanda, 1988-92. AIDS 1994: 8: 683 6.
Uganda, Kampala, 1985-90; prevalence, 191 HIV+ children at Rubaga Hospital	2% (4/191) of HIV+ children (median age 10 months) had HIV- mothers; if half of HIV+ children less than 10 months were passively positive, then ca 4/145 or 3% HIV+ children would have HIV- mothers	Muller O, Moser R. Risk factors for paediatric HIV-1 infection in Uganda [abstract]. VIII International Conference on AIDS, Amsterdam, July 1992. Abstract no. PoC4733.
Uganda, rural southwest, 1989-90, prevalence, population-based research	(a) 7% (1/15) HIV+ children < 5 yrs had an HIV- mother (however, 11 C+M+ children were less than 15 months and may not have been infected). Injections are suspected as the transmission route for the C+M- child. (b) at least 20% (2/10) HIV+	Kengeya-Kayondo J-F, Malamba SS, Nunn AJ, Seeley JA, SSali A, Muldere DW. Human immunodeficiency virus (HIV-1) scropositivity among children in a rural population of south-west

	children 5-12 yrs with HIV- were C+M-; 3 mothers tested HIV+, 3 others suspected HIV+, 2 tested HIV-, 2 other children suspected sexual transmission.	Uganda: probable routs of exposures. Annals of Tropical Pediatrics 1995, 15: 115-120.
Uganda, 1986-90; prevalence; children <16 yrs admitted to Uganda Cancer Institute with Kaposi's sarcoma	4 (24%) of 17 children with KS and HIV and with known risk factors for HIV are C+M-; 13 of 17 had HIV+ mothers; 6 of 17 had been transfused, including 2 with HIV+ mothers	Katongole-Mbidde E, Kazura JW, Banura C, et al. Latency period to the development of childhood AIDS-associated Kaposi's sarcoma (KS) in African children [abstract]. Int Conf AIDS 1991, 7: 344.
Uganda, 1989-94; prevalence, children <15 yrs old admitted to Uganda Cancer Institute with Kaposi's sarcoma	Of 26 HIV+ children with Kaposi's sarcoma and HIV for which the mother was tested for HIV, 5 mothers (19%) were HIV-	Zeigler JL, Katongole-Mbidde E. Kaposi's sarcoma in childhood: an analysis of 100 cases from Uganda and relationship to HIV infection. Int J Cancer 1996, 65: 200-203
Zambia, Lusaka, 1990-91; prevalence; 1,266 in-patient children 6-60 mos and their mothers	The article reports 28% of children and 39% of mothers are HIV−, but does not report % of HIV+ children that are C+M-. Table 1a shows at least 2 C+M- among children 48-53 mos (of total 354 HIV+ all ages).	Chintu C, Luo C, Bhat G, et al. Impact of the human immunodeficiency virus type-I on common pediatric illnesses in Zambia. Journal of Tropical Pediatrics 1995, 41: 348-353.

Notes: RR risk ratio; OR odds ratio; CI confidence interval; PAF population attributable fraction. Underlined sections present calculations from data in the articles.

Table 5: Reports of HIV in 5-14 Year Old African Children

Where, when, how, who	Evidence for HIV+ children 5-14 years old	Source
DR Congo, Equateur Provence, 1976; prevalence, 659 serum samples	1 of 5 persons found HIV+ in 1976 from stored sera from an Ebola study was a boy 7 yrs old in 1976 who died in 1984.	Nzilambi N, De Cock KM, Forthal DN, et al. The prevalence of infection with human immunodeficiency virus over a 10-year period in rural Zaire. N Eng J Med 1988, 318: 276-279.
DR Congo, Kinshasha, 1984-85; prevalence, children 5-14 admitted to Mama Yemo Hospital	11% (24/228) of children 5-14 yrs admitted to Mama Yemo Hospital (except for measles) during 1/11/84 31/3/85 were HIV+	Mann JM, Francis H, Davachi F, et al. Human immunodeficiency virus seroprevalence in pediatric patients 2 to 14 years of age at Mama Yemo Hospital, Kinshasha, Zaire. Pediatrics 1986, 78: 673-677.
DR Congo, Kinshasha, 1984-85; 5,099 healthy persons	Males: 1% (1/98) of children 2-14 yrs HIV+ vs 3.7% for 15-19 yrs Females: 1.5% (2/132) of children 2-14 yrs HIV+ vs 9.8% for 15-19 yrs	Quinn TC, Mann JM, Curran JW, Piot P. AIDS in Africa: an epidemiologic paradigm. Science 1986, 234: 955-963.
Rwanda, urban and rural areas, 1986; prevalence, national sample survey	Urban: 4.2% (10/238) of children 6-15 yrs were HIV+ vs 21% (307/1,484) for adults ≥ 16 yrs. Rural: 1.7% (2/115) of children 6-15 yrs were HIV+ vs 1.5% (8/517) for adults > 16 yrs.	Rwandan HIV Seroprevalence Study Group. Nationwide community-based serological survey of HIV-1 and other human retrovirus infections in a central African country. Lancet 1989, i: 941-943.
Rwanda, 1997 population-based serosurvey	29 (4.1%) of 701 children 12-14 years old were HIV+ vs 6.1% of youths 15-19 and 12.3% of adults 20-24.	Ministry of Health. 1997 Population based serosurvey Report (Kigali: MoH, 1998).
South Africa, 2002; national household random sample, 2 yrs and older	5.6% of 2,348 children 2-14 yrs old HIV+, including 5.4% of black children and 11.3% of white children.	Shisana O, Simbayi L, Bezuidenhout F, et al. Nelson Mandela/HSRC Study of HIV/AIDS: South African national HIV prevalence, behavioural risks and mass media household survey 2002. Cape Town: Human Sciences Research Council, 2002. Available from: www.cadre.org.
Tanzania, rural Kagera District, 1989;	3.3% (30/921) of youths 10-15 yrs were HIV+, including 2.8% (13/458) for boys and 3.7% (17/463) for girls.	Barongo LR, Rugemalila JB, Gabone RM, Senkoro KP. Kagera 1989 health survey: 1

prevalence, all persons 10-19 yrs old in four villages	Only 7 boys and 12 girls 10-14 yrs old admitted to sexual experience, and HIV prevalence was "not significantly higher in those with sexual experience."	human immunodeficiency virus in adolescents. East African Medical Journal 1992, 69: 323-326.
Tanzania, Dar es Salaam, 1995-96; pediatric inpatients at Muhimbili Medical Center	19% (47/251) of children 4-7 yrs admitted to medical pediatric wards were HIV+ (cf: 19% [386/2,015] HIV+ for all admitted children 0-7 yrs)	Kawo G, Karlsson K, Lyamuya E, et al. Prevalence of HIV Type 1 infection, associated clinical features and mortality among hospitalized children in Dar es Salaam, Tanzania. Scand J Infect Dis 2000, 32: 357-363.
Uganda, rural southwest, 1989-90; prevalence, population-based research	0.4% (10 of 2,500+) of children 5-12 yrs were HIV+, vs 8.2% of adults ≥ 13 yrs. Of the 10 HIV+ children: 3 mothers tested HIV+; 3 suspected HIV+, 2 tested HIV-; 2 other children suspected non-vertical transmission.	Kengeya-Kayondo J-F, Malamba SS, Nunn AJ, Seeley JA, SSali A, Muldere DW. Human immunodeficiency virus (HIV-1) seropositivity among children in a rural population of south-west Uganda: probable routs of exposures. Annals of Tropical Pediatrics 1995, 15: 115-120.

Table 6: Evidence from published studies of African adolescents and adults contracting HIV without sexual exposures to HIV (articles listed alphabetically by country and then by year the field study was completed; entries in bold report studies of HIV incidence)

Where, when, how, who	Evidence for no-sex transmission	Source
Guinea-Bissau, Bissau, 1987-89; HIV-2 prevalence and incidence, community-based random sample	**Of 330 adults HIV- in 1987 and retested in 1989, 7 seroconverted. All were 26-64 yrs old. Of these, 2 widows had had no sex for several years, 1 spouse was HIV- in 1987 and not retested in 1989, and 4 spouses not found or tested.**	**Poulsen AG, Aaby P, Gottschau A, et al: HIV-2 infection in Bissau, West Africa, 1987-89: incidence, prevalences, and routes of transmission. Journal of Acquired Immune Deficiency Syndromes 1993, 6: 941-948.**
Kenya, Kisumu, 1997; prevalence, community-based random sample of adults	(a) 22 women reported 1 lifetime partner who tested HIV-; 2 (9.1%) of these women were HIV+. (b) 7 (11%) of 65 women who reported no lifetime sex were HIV+ vs 122 (34%) of 362 women reporting lifetime sex; some evidence suggests under-reporting of sexual behavior.	Glynn JR, Carael M, Auvert B, et al. Who do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia. AIDS 2001; 15 (suppl 4): S51-S60. Buve A, Lagarde E, Carael M, et al. Interpreting sexual behavior data: validity issues in the multicentre study on factors determining the differential spread of HIV in four African cities. AIDS 2001; 15 (suppl 4) S117-S126.
South Africa, Carletonville, 1999; HIV prevalence, 723 men and 784 women 14-24 yrs in community-based random sample	1.2% of men with no lifetime sex partners were HIV+ vs 11.8% among sexually active men. 6.8% of women with no lifetime sex partners were HIV+ vs 41.6% of sexually active women. Sex partners may have been under-reported: in a validation study 5 mos later, 20% (11 of 54) who reported no sex in the initial survey said they had had sex by that time.	Auvert B, Ballard R, Campbell C, et al. HIV infection among youth in a South African mining town is associated with herpes simplex virus-2 seropositivity and sexual behavior. AIDS 2001, 15: 885-898.
Rwanda, Kigali,	60% (15/25) of HIV+	Allen S, Tice J, Van de Perre

1988, prevalence, 420 couples recruited from women visiting prenatal and pediatric outpatient clinics	women with HIV- partners reported only 1 lifetime partner	P, et al: Effect of serotesting with counselling on condom use and seroconversion among HIV discordant couples in Africa. BMJ 1992, 304: 1605-1609.
Rwanda, Kigali, 1991-92; 684 couples followed for 1 yr: 109 M+F+, 43 M+F-, 23 F+M-, and 509 F-M-	**Of 5 new infections in sero-cordant negative couples, 3 denied sexual exposures (1 of 3 reported 10 injections) and the remaining 2 infections occurred in one couple where the man was suspected to have sexual exposure(s)**	**Roth DL, Stewart KE, Clay OJ, van der Straten A, Karita E, Allen S. Sexual practices of HIV discordant and concordant couples in Rwanda: effects of a testing and counseling programme for men. Int J STD AIDS 2001; 12: 181-188.**
Tanzania, rural Moshi District, 1995, population-based random sample of 1,104 youths 15-24 yrs, of which 1,003gave blood sample	Among men who did not report sexual activity, 5.6% (8/141) were HIV+ vs 4.8% (16/335) for those who reported 1-4+ partners. Among women who did not report sexual activity, 3.6% (6/163) were HIV+ vs 12% (45/364 who reported 1-4+ partners.	Tengia-Kessy A, Msamanga GI, Moshiro CS. Assessment of behavioural risk factors associated with HIV infection among youth in Moshi rural district, Tanzania. East African Medical Journal 1998, 75: 528-532.
Uganda, 1987; prevalence, 1,328 in-patients and out-patients in 15 hospitals throughout Uganda	4% (22/559) of HIV+ patients denied sex last 5 yrs vs 12% (90/745) of HIV- persons. Of the 22 with no sex in 5 yrs, 3 had been transfused and 15 injected in the last 5 yrs (p 27).	Berkeley S, Widy-Wirski R, Okware S, et al. Risk factors associated with HIV infection in Uganda. Journal of Infectious Diseases 1989, 160: 22-30.
Uganda, Rakai District, 1989(?); prevalence; population-based survey, 1,292, ages 13 and over	Prevalence for 0 partners last 5 yrs: men 1.9% (2/108) vs 19% (86/444) for others; women 9.2% (13/142) vs 24% (167/684) for others.	Serwadda D, Wawer MJ, Musgrave SD, Sewankambo NK, Kaplan JE, Gray RH. HIV risk factors in three geographic strata of rural Rakai District, Uganda. AIDS 1992; 6: 983-9.
Uganda, rural Rakai, 1989-90; incidence, random sample, 774 adults (442 aged 15-39) HIV- at baseline	**Incidence among adults w/ no sex partners: 1.1/ 100 PYs; 1 incident HIV among 71 with no sexual partners vs 17 among 371 w/sex partners**	**Wawer MJ, Sewankambo NK, Berkley S, et al. Incidence of HIV-1 infection in a rural region of Uganda. BMJ 1994, 308: 171-173.**
Uganda, rural	Of 7 HIV+ cases with only 1	Malamba SS, Wagner HU,

Masaka District, 1990, case-control study; 132 cases, 161 controls	sexual partner (6 women, 1 man), 3 had HIV+ partners, 2 had HIV- partners, one partner had died, and one couple had separated	Maude G, et al: Risk factors for HIV-1 infection in adults in a rural Ugandan community: a case-control study. AIDS 1994, 8: 253-257.
Uganda, Rakai District, 1990; prevalence	(a) 6 (6.9%) of 86 women 13-19 yrs with no sex partners last 5 yrs were HIV+ vs 58 (23%) of 250 women with sex partners last 5 yrs. (b) 1% (1/101) of men 13-19 yrs with no lifetime sex were HIV+ vs 2.5% (3/119) of men reporting lifetime sex.	Konde-Lule JK, Wawer MJ, Sewankambo NK, et al. Adolescents, sexual behavior and HIV-1 in rural Rakai district, Uganda. AIDS 1997, 11: 791-799.
Uganda, Masaka, 1991; prevalence	1 of 13 women (0 of 20 men) with no lifetime sex partners was HIV+	Nunn AJ, Wagner HU, Okongo JM, Malamba SS, Kengeya-Kayondo JF, Mulder DW. HIV-1 infection in a Ugandan town on the trans-African highway: prevalence and risk factors. Int J STD AIDS 1996; 7: 123-130.
Uganda, Rakai, 1994-96(?), incidence, 9,376 adults in intervention and control communities	6 persons seroconverted in 1,667 yrs of observation with no sexual exposures for a no-sex incidence of 0.36/100 PYs vs 184 seroconversions in 11,000 yrs of observation, or 1.67/100 PYs for those with sexual exposures.	Wawer MJ, Sewankambo NK, Serwadda D, et al. Control of sexually transmitted diseases for AIDS prevention in Uganda: a randomised community trial. Lancet 1999, 353: 525-535.
Uganda, Masaka, 1999-2000; prevalence, 6,111 general population adults >13 yrs old	The study reports 6.1% of 6,111 (ca 373) adults w/ HIV vs 7.6% of 2,388 (ca 181) sexually active men and 7.2% of 1,863 (ca 134) women sexually active women. Subtracting, 58 of 1,860 (3.1%) adults with no lifetime sex were HIV+.	Mbulaiteye SM, Mahe C, Ruberantwari A, Whitworth JAG. Generalizability of population-based studies on AIDS: a comparison of newly and continuously surveyed villages in rural southwest Uganda. Int J Epidemiol 2002; 31: 961-967.
Zambia, Ndola, 1997; prevalence; community-based random sample of adults	(a) 71 women with one lifetime partner had HIV-negative husbands; of these women, 6 (8.5%) of 71 were HIV+. (b) 8 (7.6%) of 106 women	Glynn JR, Carael M, Auvert B, et al. Why do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia. AIDS 2001;

	who reported no lifetime sex were HIV+ vs. 119 (35%) of 341 sexually active women; (c) 3 (4.8%) of 63 men who reported no lifetime sex were HIV+ vs. 19 (10.4%) of 182 sexually active men. Some evidence suggests under-reporting of sexual behavior.	15 (suppl 4): S51-S60. Buve A, Lagarde E, Carael M, et al. Interpreting sexual behavior data: validity issues in the multicentre study on factors determining the differential spread of HIV in four African cities. AIDS 2001; 15 (suppl 4) S117-S126.
Zimbabwe, Manicaland, no date; prevalence, 5,129 women 15-49 years old	20 of 933 women who had never had sex were HIV+ vs. >20% for women who had ever had sex.	Zaba BW, Carpenter LM, Boerma JT, Gregson S, Nakiyingi J, Urassa M. Adjusting ante-natal clinic data for improved estimates of HIV prevalence among women in sub-Saharan Africa. AIDS 2000, 14: 2741-2750.

Notes: RR risk ratio; OR odds ratio; CI confidence interval; PAF population attributable fraction. Underlined sections present new calculations from data in the articles.

PREPARED STATEMENT OF MILTON B. AMAYUN, M.D.

WORLD VISION INTERNATIONAL IN AFRICA

World Vision International (WVI) is a large faith-based non-governmental organization working in nearly 100 countries around the globe. Twenty-five national offices are located in Africa: all of them are engaged in relief and development work, including the delivery of services at the grassroots, or intensive support to different health efforts at the periphery of the health system. Many of them have been engaged in AIDS prevention and care of orphans in the last two decades.

All of WVIs activities are intended to enable the young child to reach her/his God-given potential as an individual precious in God's sight. To achieve this, we aim to eliminate the root causes of poverty in and together with communities. In 2002, over 2.1 million children were assisted through World Vision sponsors worldwide.

MY INVOLVEMENT AS A HEALTH SPECIALIST FOR WVI IN AFRICA

I am currently working for WVI as the Senior Technical Advisor for the Hope Initiative, our global response to HIV/AIDS. I travel the globe developing programs, evaluating projects, and writing proposals.

As a family physician whose career has focused on public health problems around the world. I am very familiar with the state of health services in many countries of Africa, and where it intersects the HIV/AIDS pandemic. During the period 1981-2001, it was my privilege to be involved in the delivery of essential health services in different locations of Africa, under various conditions and levels of responsibility:

In 1981-82, I directed a health service program in a large refugee camp in northern Somalia.

In 1985-86, I led a relief team to provide food and basic health services to an isolated district of northern Ethiopia, where a civil war was in progress.

Between 1986 and 1989, I managed a large USAID-funded regional child survival project in Senegal, where my team and I vaccinated tens of thousands of young children against six childhood killer diseases. Many mothers received the UNICEF-recommended five tetanus toxoid shots to prevent neonatal tetanus. At one point when Chad reported cases of meningitis, we gave meningitis vaccinations to the whole population of nearly half a million.

Between 1989 and 1998, as the Director of International Health Programs at World Vision]United States. I supervised and frequently visited child survival projects in Senegal, Mali, Mauritania, Niger, Uganda, Kenya, Mozambique, Malawi and Zimbabwe. The main components of these projects were childhood immunizations, oral rehydration therapy for diarrhea, nutrition promotion and control of endemic diseases.

It was during the above period that HIV/AIDS emerged as a major global problem and WVI was at the forefront of prevention efforts. I wrote the first USAID-funded HIV/AIDS prevention for Africa projects for World Vision in Senegal, Kenya, Tanzania and Zimbabwe. I was also involved in the development and implementation of the first World Bank-funded project to assist AIDS orphans in Uganda in 1991-1995. I testified before the Select Committee on Hunger of the US House of Representatives in 1991 to warn Congress of my observation that HIV/AIDS was eroding our gains in child survival and maternal health in sub-Saharan Africa.

OBSERVATIONS ON HEALTH CARE DELIVERY, IN SUB-SAHARAN AFRICA

Many remote locations of sub-Saharan Africa have no access to basic health services. The reasons are many and here are a few: inadequate transportation, especially during the rainy season, to enable mothers to consult at the antenatal clinic or to bring their children for immunizations at a health post: lack of trained personnel who can provide safe deliveries and emergency, care for the sick; poor supply of life-saving medicines for malaria, TB and AIDS; lack of infrastructure, e.g., electricity to run sterilizers, refrigerators and laboratory equipment; and inadequate resources to develop systems, maintain equipment, and compensate health professionals.

The projects I led or supervised had the backing of a large non-governmental organization, and in most locations, they were well funded over several years. We had the resources for immunizations. We ensured our needles were used only once, and we emphasized proper disposal practices. We had gloves when handling blood or treating wounds. We had refrigerators to keep vaccines and reagents fresh. To the best of our ability, we practiced proper protocols to prevent blood-borne infections, such as hepatitis and HIV/AIDS, for our own and our patients' protection.

The practice of such protocols in those Ministry of Health locations where health service delivery was led by a midwife, a dresser or volunteer health worker was

often different. Asepsis and proper disposal of used supplies were not major preoccupations. I saw needles, blades and catgut re-used, with little concern for sterile techniques. Very often, re-use of supplies was necessary to ensure injections were given or simple surgeries done. In many cases, there was neither electricity—to boil the items being re-used nor solutions to soak them in.

EXPECTED AND ACTUAL OUTCOMES

My experiences in rural Africa showed me that the situation described above was neither rare nor infrequent. It was and still is common to many remote corners of most countries mentioned above. Health systems that were not in crisis were the exception, and these were the health systems that were struggling with war, economic dislocation or disasters. It was against such a background during the last two decades that HIV/AIDS emerged as another public health crisis. I saw it first publicly recognized in Uganda and Tanzania, whose adjacent border districts constituted the epicenter of a growing pandemic in its early days.

I have followed the trends of the pandemic as well as those of the health systems in WVI's portfolio over the years. As a public health professional. I think it is safe to say the following:

1. The problems of supplies, sterilization, inadequate training and poorly staffed health systems have not changed much in the last decade, and they persist today. One can assume that if HIV/AIDS transmission has predominantly had an iatrogenic transmission, the HIV prevalence rates among rural populations of subSaharan countries would be uniformly high today. Injections are commonly given, and immunization rates among mothers and children are high. These alone would have been enough to be the virus' entry point to infect the majorities of populations of all ages. Thankfully, we have not seen any evidence in the communities that WV serves that this has happened.

2. If the predominant mode of HIV transmission were iatrogenic, persistently high prevalence (old and new cases at a given point in time) and incidence rates (new cases per year) would have been observed over several years. This also has not happened. Of the countries that I mentioned above, three trends could actually be observed. Uganda's HIV prevalence rate has gone down from a peak of 19-20% among pregnant mothers visiting antenatal clinics in 1991 to about 6-7% in 2001. Senegal's never took off and it remains low today. On the other hand, Kenya's and Zimbabwe's have soared, in spite of efforts at prevention.

3. If HIV/AIDS transmission were predominantly iatrogenic, the two countries with the greatest potential to address the specific weaknesses of their health systems would have been South Africa and Botswana. These two countries have the highest proportions of HIV prevalence today.

4. Most countries in sub-Saharan Africa have achieved full immunization rates of eligible children at 70-80%. If HIV/AIDS transmission were predominantly iatrogenic, we would have across Africa a cohort of young adults 15-20 years with an unusually high HIV prevalence rate. This has not happened anywhere.

CONCLUSIONS

Knowing the modes of transmission of the HIV virus as well as the status of health service delivery systems in Africa, we can be certain that there have been cases of HIV/AIDS transmission through improperly sterilized needles, poor surgical protocols and other weaknesses of inadequately funded health systems. However, from my observations, I believe that the predominant mode of HIV transmission is not iatrogenic.

Having said that, I must emphasis that I do not know for certain what proportion of HIV/AIDS cases have been due to services delivered by the health system. It probably varies from country to country, and some countries are more vulnerable than others. This should be a priority theme for further studies.

Finally, I am thankful that this issue has been raised as a major concern. I have been involved in child survival in Africa at a time when HIV/AIDS was emerging. I have seen my fears in my 1991 testimony to the Select Committee on Hunger happen over the last twelve years. I would like to see the many national immunization programs strengthened and given more resources so that needles do not have to be re-used and that adequate supplies are available at any time that a young child or her/his mother needs to be immunized. If the safety of national immunization programs is compromised, we would see the eventual diminution of parents' confidence in having their infants and young children immunized. If such a scenario happens, such programs would eventually die, opening the door to the re-emergence of the childhood diseases they were meant to conquer.

It is my hope that the discussions that have begun on this issue will lead to re-invigorate attention to child survival programs, and increased protection of infants, young children and their mothers from HIV/AIDS.

STATEMENT OF LILLIE C. THOMAS—LMR INTERNATIONAL INC.

I read with interest the announcement of the hearing you will chair of the Senate Health Committee on March 27, 2003 regarding Dr. David Gisselquist's study concerning the source of the AIDS pandemic in Africa being related to needles rather than sexual transmission.

HIV/AIDS has multiple modes of transmission, some involving medical practices, some involving high risk behaviors (i.e. IV drug use) and some involving sexual transmission. It is first important to note that HIV/AIDS is a disease that takes time to develop, and in some individuals they may remain symptom free for long periods of time. Given that Dr. Gisselquist's study is not a study per se, (he did not study human populations) but is really a review of studies that have been conducted, from a statistical viewpoint, it is important to examine his methodology because it could have a significant impact on his conclusions. Further, he makes assumptions about methodology and during the twenty year period he studied, there have been advances in how studies of this nature are conducted. His conclusions, then, could be biased because of the nature of his data. His two main thrusts, the rate of disease progression and the speed it can spread through heterosexual contact does not withstand analysis. The HIV disease progression that Dr. Gisselquist discusses has a fundamental assumption that all STDs (including HIV) are the same. They are not. He also assumes that the spread through heterosexual contact cannot be as fast as the rise in cases indicates. This is not supported by the data. Figures from the U.S. (where medical precautions are strictly enforced) do not support his conclusion. The number of women infected via heterosexual sex has doubled to 45% of all new cases in just ? years. The pandemic in Africa has been a fact of life for more than ten years. If the assumptions that Dr. Gisselquist makes are not correct, then the consequences for those who suffer the risk of exposure to HIV/AIDS in Africa (and logically other areas of the world that could experience equal of more severe rates of infection like China and India) could be devastating.

In the Associated press article I read concerning the hearing your committee will be conducting, Dr. Gisselquist was quoted as saying "The AIDS industry to date is giving signals they want the whole thing focused on sex and treatment. We need to fight to get the message in there to look at prevention." There are several parts of this statement that concern me. First, there is no "AIDS industry". There are many government organizations, non-profit organizations and faith based organizations that are working to change long held attitudes and cultural mores for the purpose of improving conditions and limiting the spread of disease. There are companies that support this process. The agencies are driven. not as an industry, but as a humanitarian project for the prevention of HIV/AIDS. Dr. Gisselquist's assertion that it is all about condoms and not prevention is contrary to the humanitarian efforts underway in Africa today. For all of the condoms that USAID has given away since the programs began, the yearly total only reflects an average of 4 condoms per sexually active male per year. John Hopkins estimated that condom use should increase from 6 to 9 billion to over 24 billion annually to prevent disease.[1] In cultures where multiple partners and multiple wives are generally accepted, the Western concept of monogamy is not an applicable prevention tool. Multiple sex partners have been proven to be a significant risk factor for the transmission of HIV/AIDS.

Condoms become a significant prevention tool because HIV transmission is more likely to occur in the receptive partner. Condoms are protective of that partner. The U.S. Public Health Service concluded in 1995 that 90% of the sexually transmitted infections are passed from men to women. The Department of Health and Human Services said in 1996 that 66% of all persons with HIV/AIDS contracted the disease during sexual activity with an infected partner. Using statistics available regarding the American population, one of the most highly educated and one with the best access to healthcare, and a system that observes Universal Precautions. 80% of the infected population do not know they are infected with HIV/AIDS according to a UNAIDS report in 1997. The rates of sexually transmitted diseases are significantly higher in the United States that anywhere else in the industrialized world. If it were, as Dr. Gisselquist suggests, merely a matter of better public health control, the U.S. would see very little disease. This is not the case.

In Africa, it is true that healthcare is more like to reuse devices, even the ones designed for single use. In Africa, needles are less likely to be treated as a biological

[1] http://www-nehc.med.navy.mil/downloads/hp/990806.pdf

waste and destroyed after single use. However, I would contend that it is not the medical situation, where medical staff knows the consequences for medical needle reuse, but the IV drug user who takes the needles after they are properly used, but improperly disposed. These individuals have a higher risk of transmission, not only because of their drug use, but because they will engage in unprotected sexual activity at times to get the funds necessary to support their habits or while they are under the influence of drugs. Data from Birmingham, AL reports this happens in the U.S. Dr. Wang indicated that non-injecting cocaine users were at an increased risk for HIV/AIDS due to increased numbers of partners, less condom use, and use of drugs during sexual activity. Dr. Wang found that drug use is associated with more risky sexual behaviors increasing significantly the risk of HIV transmission.[2] Dr. Gisselquist, in an article in 2002 concluded that the researchers "did not know the direction of the causation". This is a telling admission. If the individual was already infected through sexual activity, the injections just furthered the spread, but they did not start it. If, on the other hand, the injections started the infection, then risky sexual behavior only furthered the progress of the disease. Either way, the causation could not be positively established.[3]

Dr. Gisselquist has stated that HIV disease progression has not followed the patterns of STD progression. The assumption that the two would be the same would be expected if the latent period for the diseases were the same. They are not. For many sexually transmitted diseases, the latent period (time from exposure to active disease) is shorter for the common STI like syphilis and gonorrhea than it is for HIV. Thus, an attempt to compare the two rates of infection is not meaningful because of the latent period of HIV. Further, as HIV does have several modes of transmission and it is common for more than one risk factor to be present in any discrete case of HIV/AIDS, the fact the two rates would not match is further explained.

Dr Gisselquist has stated that the infection rate could not have been as fast via heterosexual sex. In many cultures in Africa, body piercings, cultural exchanges of blood products, and other tribal behaviors between men could provide a mode of transmission that could allow a rapid entry into heterosexual activity. Using the U.S. experience, HIV/AIDS started as a male to male transmission, and has now become a primarily heterosexual transmission in the last 5 years, with the rates of infection in women increasing dramatically, until 460 of all new cases for HIV/AIDS are women who only engage in heterosexual sex. In Africa, because of the patriarchal societies, women may not be able to ascertain their partner's HIV/AID risk, and even if they could, not be able to anything other than use a condom to protect themselves.

It is important to understand that Dr. Gisselquist worked with studies, not people as the medical researcher he studied had. The statements Dr. Gisselquist made are not supported by those who work with the suffering populations in Africa. Dr. Chris Ouma ActionAid Kenya said that medical procedures have been largely made safe in Kenya, yet infections rates continue to rise.[4] This is not to say all injections are safe. According to UNAIDS/WHO release March 14th concerning the Gisselquist study, potentially 30% of the 16 billion injections worldwide are unsafe because of needle reuse. For those populations that already have significant risk, reuse may increase transmission, but did not necessary provide the sole source of transmission. In many impoverished areas, women are forced into prostitution to support their children and this amplifies the spread of AIDS. However, the majority of women who become infected in Africa do so with one partner.[5] In populations like Africa where medical care is an occasional experience, to assume that it can transmit at the same rate as sexual activity, a much more frequent occurrence, is not logical.

As an Alabama manufacturing company actively involved in the public health mission of USAID, we know that increased condom use is a significant factor in the decline of HIV/AIDS. Condoms, however, are only part of an overall education and prevention program required to eliminate HIV/AIDS. We also believe that the necessary AIDS drugs are important to assure that those in Africa with AIDS are able to maintain a good quality of life. To the extent that programs are successful in preserving the lives of those with AIDS, it becomes even more important to assure that adequate condom supplies are available to prevent the spread of the disease further. It is essential that the number of condoms increase significantly on a per sexually active adult basis. Longer lives could mean more opportunities for infecting those

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[2] Min Qi Wang, et al., "Drug, Use and HIV Risk Behaviors: A Street Outreach Study of Black Adults" Feb., 2000, Southern Medical Journal, 93(2):186-190

[3] Gisselquist, D., et al. "HIV infection in sub-Saharan Africa not explained by sexual or vertical transmission" International Journal of STD and AIDS, Oct., 2002, 13910:657-66

[4] ActionAid comment in the International Journal of STDs and AIDS March, 2003.

[5] Gender and the HIV Epidemic, UNDP, 1999.

who are negative, not from intentional actions, but because education is needed to cure misconceptions about disease. We do believe that there is a need for more condoms in Africa and in new emerging areas of HIV infections in China and India, and the education programs to support safe behaviors and medical service provision.

Thank you for considering our information as part of your fact finding process.

PREPARED STATEMENT OF MARIA J. WAWER, M.D.

THE ROLES OF SEXUAL TRANSMISSION AND UNSAFE INJECTIONS IN THE HIV EPIDEMIC IN SUB-SAHARAN AFRICA

Mr. Chairman, Members of the Committee, thank you for this opportunity to testify regarding the very important topic of HIV/AIDS prevention in Africa. Given the AIDS crisis on the African continent, every effort must be made to determine optimal approaches to prevention.

CREDENTIALS AND EXPERIENCE

I am Maria Wawer, Professor of Clinical Public Health, Mailman School of Public Health, Columbia University, and Adjunct Professor of Public Health, Johns Hopkins Bloomberg School of Public Health. I a in also a Principal Investigator on the Rakai Project, one of the largest HIV/AIDS research collaborations in Sub-Saharan Africa.

I received my MD degree in 1977, from McMaster University, Hamilton, Ontario, Canada; an MHSc in 1980, from the University of Toronto, Toronto, Canada; and have been a Fellow, of the Royal College of Physicians and Surgeons of Canada [FRCP(C)] since 1984. The latter is equivalent to Board Certification in preventive medicine in the US.

Since 1988, I have worked in the area of HIV/AIDS epidemiological, behavioral and preventive research in international settings. During this period, I have been the Principal Investigator on 11 HIV scientific studies, and a senior co-investigator on more than 10 other HIV related studies. Most of this research has been supported by the National Institutes of Health. I have authored and co-authored over 60 peer reviewed papers and 6 book chapters on HIV/AIDS, and have delivered or contributed to over 120 presentations at international HIV/AIDS/STD meetings.

My primary HIV-related research for the past 15 years has been conducted in Rakai District, Uganda. With my colleagues at Makerere University, the Uganda Virus Research Institute/Uganda Ministry of Health, Columbia University and Johns Hopkins, we have conducted detailed examinations of risk factors for HIV acquisition and transmission, in order to develop and test HIV prevention and care strategies. We have also worked closely and exchanged data with other HIV/AIDS researchers in Uganda and throughout Africa, as members of international research networks and collaborations, and through international meetings and consultancies.

WHAT DO THE DATA TELL US ABOUT HIV TRANSMISSION IN AFRICA?

1. The HIV epidemic represents a crisis in the Sub-Saharan region of Africa.

WHO estimates that there are 29.4 million HIV infected persons living in Africa, and that approximately 3.5 million new infections occurred in 2002 (WHO, 2002) This represents a severe humanitarian, social and economic burden.

Although the epidemic has stabilized and abated somewhat in Uganda, we still observe HIV rates of over 10% among adults in towns and cities. Among the 300 Ugandan researchers and health staff who work with me in Rakai, every one has lost family members to the epidemic. We thus urge that every effort be made to curb the spread of HIV.

2. What are the major routes of HIV spread in Africa?

HIV can be spread via unsafe injection practices and blood transfusion. Efforts to reduce such transmission by provision of single use syringes and needles, appropriate sterilization equipment, facilities for the disposal of contaminated injection materials, and high quality HIV screening of potential blood donors, are all highly desirable.

However, data from Africa do not support the hypothesis that unsafe injections represent a common route of HIV transmission in the Sub-Saharan region. Available evidence from abroad range of sources points to heterosexual transmission, followed by mother-to-child transmission, as the major routes of HIV spread on the continent.

EVIDENCE REGARDING ROUTES OF HIV TRANSMISSION IN AFRICA

To assess the main routes of HIV transmission, we must first examine the epidemiological pattems of infection by age, gender and reported behaviors, and assess which modes of transmission (unsafe injections, heterosexual and/or mother-to-child) are most plausible.

Age and gender patterns of HIV infection

Table 1 (attached) summarizes data from a number of African countries, showing the proportions of persons infected with HIV by age group and gender. The countries are illustrative of general patterns observed in the region. The data can be summarized as follows:

Rates of HIV infection are low (below 1%) in children aged 5-14, and age at which mother-to child transmission does not occur and when sexual exposure is unlikely (Table 1).

Rates of HIV infection increase, often dramatically, during adolescence and young adulthood, reflecting the onset of sexual activity (Table 1). The increase is usually more rapid among females. Our data and those of others show that girls in many African settings become sexually active at younger ages than boys, and sexual debut frequently occurs with men who are some years older. this places adolescent girls at higher risk than adolescent boys. We reviewed our most recent data on HIV acquisition in Rakai, and again found these patterns: only 1% of new infections occurred among persons aged 15-16, while over 90% occurred in persons aged 17-49, the age range of peak sexual exposure. In women in particular, the rate of new infections dropped to very low levels above age 50.

In the great majority of HIV risk studies, rates of infection are closely associated with reported sexual activity, including numbers of partners. Similar patterns are observed with other STDs, such as HSV-2 (genital herpes).

The age and gender distribution of HIV in Africa does not follow the pattern of receipt of injections (for vaccination and treatment in young children; for treatment in older persons).

HIV acquisition in infants and young children

Although most infants and young children are exposed to multiple injections (for example, for immunization) the great majority of HIV-positive children in Africa acquire HIV from their infected mothers. In the absence of preventive therapy, approximately 15-20% of HIV infected mothers transmit the virus to the infant in utero or at time of birth, and 10-15% transmit through breast milk.

Early in the recognized epidemic in Kinshasa, Zaire (currently Congo), Mann et al. reported that over a third of early childhood HIV infection was associated with blood transfusion and injections. However, it should be noted that infant testing was still under development in the mid 1980s, and such high rates of non-vertical transmission have not been reported by other researchers or in more recent years. In a study in Kampala, Uganda, 98% of HIV-infected children had an HIV-positive mother (Muller and Moser, 1992). The probable causes of infection in the 2% of HIV+children who had uninfected mother were transfusion and injections. Researchers in Cote d'Ivoire, Tanzania and Kenya followed a total of over 660 children born to HIV-negative mothers for two years on average, and observed no HIV infections in these children (Sherry et al., Karlsson et al., Ekipni et al.). In a separate study in rural Masaka, Uganda, over 2,500 children aged 5-12 were tested for HIV and only 10 (0.4%) were found to be infected: one of these 10 infections was attributed to transfusion and one to unsafe injections (Kengeya-Kayondo et al). When 3,941 initially HIV-negative children aged 0-12 were followed in the same district, only one child became HIV-infected over the subsequent year, probably through breast milk (the mother was HIV-positive). The authors concluded that, in this setting, no infections had arisen as a result of injections (Mulder et al).

Biological evidence for modes of transmission

Studies have shown that transmission from an HIV-infected person to a sexual partner is strongly associated with the infected person's HIV viral load (the amount of HIV in the blood). (Gray et al, Wawer et al, 2003), and with the presence of genital ulcer.

Comparison of HIV rates with rates of hepatitis C, an infection which is readily spread by injections, shows no common patterns throughout Africa. For example, South Africa has very high HIV rates but relatively low hepatitis C seroprevalence, whereas the opposite situation occurs in Tanzania (Madhava et al, WHO). However, HIV rates generally mirror those of HSV-2 (genital herpes) which is transmitted sexually, but not through unsafe injections (Wawer et al, 2001).

Unsafe injections

There can be no doubt that unsafe injections represent a public health problem. For example, they have been implicated as major routes of transmission for hepatitis B and hepatitis C (Simonsen et al).; Also, many injections given world wide are unnecessary.

Hollow gauge needles, especially those used for intravenous injections or sample collection, can retain blood. HIV has been recovered from such needles for up to up to several weeks (Abdala et al). It is less clear whether syringes used for non-intravenous injection (i.e., subcutaneous or intramuscular injections, the types generally administered for immunization and therapy) pose a severe risk of HIV transmission. When syringes used to provide subcutaneous or intramuscular injections to HIV-infected clinic patients were subsequently tested for HIV content using highly sensitive HIV tests, only a small number (<4%) revealed the presence of potentially infectious material (Rich et al.). There is thus likely to be variability in the risk posed by unclean needles, depending on their type, use, and whether blood is left in the needle or syringe.

Although in some studies persons with established HIV infection report receiving more injections and uninfected persons, this may reflect receipt of injections for treatment of HIV-related illness. We recently re-examined our Rakai data and found no association between reported injections and the acquisition of new HIV infection: persons who did not acquire HIV actually reported slightly more injections from all sources (government clinics, medicine shops, traditional healers) than persons who acquired HIV during follow up.

The World Health Organization estimates that approximately 1.4-2.9% (or about 50,000–100,000) cases of HIV are spread annually in Africa through unsafe injections (WHO 2002). However, the risk may be spread unevenly between countries and regions, depending on background HIV rates and injection practices. Clearly, improving injection safety and reducing the number of unnecessary injections would be of public health benefit.

3. Conclusions

The data indicate that sexual transmssion, and in infants, mother-to-child transmission, represent the most common routes of HIV infection in Africa.

However, there are also data that transmission via unsafe injections does occur in Africa, although it is not a main cause of the infection. Given the diversity of the African continent, great differences in medical resources and practices, and in the background rate of HIV infection, it is not possible to arrive at a meaningful summary estimate of the proportion of infections contributed by unsafe injections. The data, however, suggest that it is low and probably below 3% in the great majority of settings.

This should not be a reason for complacency. HIV researchers should reassess existing data to provide greater precision regarding the extent of potential injection-associated transmission, and of the circumstances under which it occurs. Wherever possible, HIV studies should include questions on injection and transfusion practices. Efforts to provide an adequate and long term supply of clean injection equipment, coupled with educational programs to promote needle safety and reduce unnecessary injections, would be of public health benefit.

From the viewpoint of HIV prevention, however, the data argue for continued, concerted efforts to reduce risks of HIV transmission associated with unsafe sex and to improve prevention of mother-to-child HIV transmission.

Table 1.

Prevalence (% of persons with infection) of HIV infection by age and gender in a number of African countries.

	Males % infected	Females % infected	Both sexes combined % infected
Botswana, VCT clients (n = 49,726) (P. Kilmarx)			
Age 15-19	0.8	8.3	
20-24	6.6	21.4	
25-29	18.7	37.0	
30-34	34.5	41.1	
35-39	41.5	35.2	
40+	35.2	33.4	
Burundi, 1989, national survey			
Age 5-14 (n = 225)	0.9	0.9	
15-24 (n = 477)	6.5	12.8	
25-34 (n = 468)	10.2	10.7	
Ethiopia, 1994, random household survey			
Age 5-13 (n= 621)	0	0.3	
5-19 (n = 793)	2.1	3.9	
20-29 (n = 879)	10.4	10.0	
South Africa, 1990, children with malaria			
Age 10-14 (n = 744)	0	0.5	
Tanzania, 1987, one region			
Age 5-9 (n = 531)			0.4
10-14 (n = 454)			0
15-24 (n = 626)			3.5
25-34 (n = 510)			6.9
Uganda, 1992, rural surveillance cohort (Kengeya-Kayondo et al).			
Age 0-4 (n = 1,411)			1.7
5-12 (n = 2,500)			0.4
13+ (n = 4,183)			8.2

STATEMENT OF THE WORLD HEALTH ORGANIZATION

SUMMARY

Sexual transmission of HIV is the predominant mode of transmission globally and in sub-Saharan Africa.

Adults account for an estimated 80% of new HIV infections in sub-Saharan Africa, of which 909 is due to sexual transmission. At least 90% of new HIV infections among children under 15 is attributable to mother-to-child transmission.

Measuring sexual behaviour is complex, especially as individuals tend to under-report behaviours perceived to be socially undesirable, but there is a large body of evidence on the drivers of sexual transmission of HIV in sub-Saharan Africa.

Around 2.5% of HIV infections in sub-Saharan Africa are caused by unsafe injections. Improving the safety of injections and other medical procedures globally is an important health issue. WHO is taking an active lead in improving the global safety of injections.

The weight of scientific evidence does not support speculation that unsafe injections are responsible for a far higher proportion of HIV infections in sub-Saharan Africa than hitherto assumed.

In sub-Saharan Africa there is no association between rates of infection with HIV and the Hepatitis C virus (spread mainly through blood, in injecting drug use or in medical settings), thereby strongly supporting the view that sexual transmission accounts for the vast majority of HIV infections in this region.

BACKGROUND

1. Globally, the major mode of HIV transmission is sexual, with additional transmission peri-natally (from mother to child), or in blood-borne transmission via medical procedures (e.g. transfusion or unsafe injection) or injecting drug use. Other modes of transmission. for example from mosquito to human, have been widely scientifically discounted.

There has been recent controversy concerning the extent to which unsafe injections may account for a larger proportion of HIV infections in sub-Saharan Africa than hitherto accepted. In particular, a recent series of articles by a number of independently-based authors and consultants, including Gisselquist and others, speculate that unsafe injections may account for more HIV infections than sexual transmission.

3. This position paper presents current evidence and conclusions of the World Health Organization (WHO) and the Joint United Nations Programme on HIV/AIDS (UNAIDS) in relation to HIV transmission, especially in sub-Saharan Africa.

MODES OF HIV TRANSMISSION IN SUB-SAHARAN AFRICA

4. WHO and UNAIDS estimate that there were 3.5 million new HIV infections in sub-Saharan Africa in 2002 (UNAIDS and WHO 2002). Eighty per cent of new HIV infections in sub-Saharan Africa occur among adults. Twenty per cent of new infections occur among children aged 0-14 years (720,000 infections among children in 2002).

5. Of the adult infections, 90% are attributable to sexual transmission. Other modes of transmission include blood transfusion, other medical procedures including unsafe injection, and injecting drug use.

6. Of the infections among children, at least 90% are attributable to transmission from mother-to-child. The remaining infections are attributable to medical procedures and to sexual transmission.

SEXUAL TRANSMISSION OF HIV IN SUB-SAHARAN AFRICA

In 1988, WHO estimated that heterosexual transmission accounted for 80% of all HIV infections in Africa (Chin et al., 1990).

8. Measuring sexual behaviour is complex, and patterns of sexual mixing are important for the spread of HIV and other sexually transmitted infections. Therefore, the emphasis in survey data collection has shifted to obtaining better data on sexual partnerships. In the early 1990s a series of national surveys by WHO showed an average of 28% of men in sub-Saharan Africa reported sex with a non-regular partner in the last 12 months (country results ranged from 5% to 50%). Forewomen the average was 8%.

9. Behavioural factors affecting the sexual spread of HIV include the lifetime number of sexual partners, the rate of sexual partner change, the extent of sex with non-regular partners (e.g. in commercial sex), age at first sexual intercourse, and condom use (Plot and Bartos 2002). The presence of sexually transmitted infections appears to be a strong co-factor in transmission. Other factors which may have some impact on HIV transmission include male circumcision and genetic variation in different strains of HIV, although the extent of their contribution remains controversial.

10. Relatively high prevalences of sexually transmitted infections in sub-Saharan Africa may be a particular factor in fuelling the epidemic. For example, population estimates have suggested the proportion of HIV infections associated with a sexually transmitted infection are be considerably higher for sub-Saharan Africa (44-69%) than for the United States (7-18%) (Fleming 1999).

11. HIV is found in semen, vaginal/cervical secretions, blood in the genital tract, and secretions associated with sexually transmitted infections, Higher viral load (i.e., the amount of virus present, commonly measured in the blood), has been associated with greater likelihood of HIV transmission (Quinn 2000).

AGE AND SEX DISTRIBUTION OF HIV INFECTION

12. One of the most consistent features of the distribution of HIV in sub-Saharan Africa is its distribution by age and sex. Female prevalence climbs during the teens and early twenties and peaks in the late twenties or early thirties. Male prevalence

follows a similar pattern at some five to ten years older. This age gap is very similar to the age gap between spouses.

13. Urban areas and rural trading areas, where sexual mixing is more extensive, have 17 higher HIV rates, as do divorced or separated men and women—typical of the pattern in sexually transmitted infections.

14. While HIV may be present in those who report never having had sex, this is likely to be due to underreporting of sexual activity. For example in one study from Africa, 23 of 980 women aged 15 to 24 who reported never having had sex were infected with HIV, but 15 women who reported never having had sex were in fact pregnant (Gregson 2002).

HIV INFECTION IN CHILDREN

15. HIV prevalence among children under five years of age is dominated by infections transmitted from the mother to the child prior to or during delivery, or through breastfeeding. Survival of most of these infants is poor, although a proportion of children infected through mother to child transmission survive beyond the age of 5 years.

16. In studies of infants of HIV-negative mothers (i.e where transmission would be attributed to a mode other than mother-to-child), zero or very small rates of HIV infections have been found:

o In an Abidjan, Cote d'Ivoire, study no infections occurred over 48 months in children born to HIV-negative mothers.

o In Kinshasa. Democratic Republic Congo, 1 of 287 children born to HIV-negative mothers seroconverted during 1003 person years.

17. Although data are limited, there is consistent evidence that HIV prevalence (and incidence) is love in children 5-14 years.

In Masaka (Uganda), 10 (0.44) of children 5-12 years of age were infected vs. 84 of adults (Kengeya-Kayondo et al., 1995). Of the 10 children. 6 had a mother who was HIV+ or who had died of AIDS, one had received a blood transfusion, one was thought to have been infected by injections and the route of infection of the remaining two was unknown.

In Ethiopia no infections occurred in 6-13 year-olds, while infection began at age 14 and reached an adult peak prevalence in the 25-29 year-old age band of 13.94 (Fontanet et al., 1998).

In South Africa, one figure from a recently released study reported 5.4% of children aged 2-14 years were infected, however this is more likely to be due to data quality problems than to unexpected modes of transmission.

18. Population-based studies find very little infection among 15 year olds, suggesting very low incidence in the preceding years (Auvert 2001).

UNSAFE INJECTIONS

19. The issue of unsafe injections is a serious one for global health. An estimated 16.7 billion injections were given annually in recent years throughout the world. an average of 3.4 injections per person per year in developing countries and countries in transition (Hutin 2000). In Africa, the average is between 2 and 2.2 injections per person per year. Injections are commonly given to children, as part of immunization programmes during the first two years of life and as part of treatment for infectious diseases throughout childhood, so injections safety is clearly an issue for this population.

20. WHO estimates that Globally nearly 409 of injections are given with syringe or needles reused in the absence of sterilization, with the highest rates in South Asia, the Eastern Mediterranean and the Western Pacific. In Africa, systematic WHO surveys of injection practices in 10 countries found between 179 and 1990 of injections were given with reused equipment, and average of 0.38 per person per year. There is considerable country by country variation in the proportion of unsafe injections, e.g. South Africa and Zimbabwe are thought to have extremely safe injection practices.

21. WHO has estimated that, globally, reuse of injection equipment led in 2000 to 21 million new cases of hepatitis B, two million cases of hepatitis C and 260,000 cases of HIV.

22. Injections are vital for immunization programmes and for the provision of life-saving treatment. Injections should be used only when medically necessary, and should be given using single use equipment which is then disposed of safely. In the past several years, major efforts and resources have been devoted to enhancing injection safety in the healthcare setting through better planning of services including immunization, training of care providers and vaccinators, provision of single-use injection equipment and proper 'sharps' disposal. More needs to be done to eliminate

unsafe injection practices throughout the world. To further this work, WHO has recently issued a framework to assist countries with all aspects of the provision of safe injections, entitled "Managing an Injection Safety Policy".

RATES OF HIV TRANSMISSION THROUGH UNSAFE INJECTIONS

23. It has long been accepted that unsafe injections are responsible for some proportion of HIV infections. In the 1980s, WHO estimated that unsafe injections and the use of other adequately sterilized skin-piercing instruments caused 1.6% of HIV infections in Africa. In 1999, a WHO model estimated 1.4-2.9% of total HIV infections in sub-Saharan Africa were caused annually by unsafe injections. WHO subsequently sponsored a systematic review of the studies that examined the association of unsafe injection practices and HIV transmission (Segury nd) as part of a global initiative to achieve the safe and appropriate use of safe injections and as a result refined its model to estimate that 2.5% of HIV infections in sub-Saharan Africa are caused by unsafe injections.

24. The possibility of HIV transmission by means of an unsafe injection depends on whether the source needle or syringe was previously used on an HIV-positive person. and if so, whether there is sufficient virus in the needle to be capable of transmission (e.g. it may have been washed or otherwise disinfected).

25. A study of unsafe injections in 39 health care facilities in Tanzania in the early 1990s (Hoelscher 1994) showed nearly 60% of needles were not sterile but only 12.6% contained enough blood to be capable of transmitting HIV, and none had an appreciable volume of blood (>0.09 ul). This study concluded that in a population with HIV prevalence of 3090 and where 2.11 million injections are given annually. <0.490 of the estimated 4,500-8,500 annual HIV infections were caused by unsafe injections.

26. Many of the at least 23 studies which have examined the association of injections with prevalent HIV infection have found an association, with odds ratios ranging from 1.16-2.96 (Seguy nd). However in cross sectional studies it is not possible to attribute causality, viz. it is likely that people who are HIV infected will have been sick and have had a higher number of injections than the rest of the population. Even in longitudinal (prospective) studies it is possible that an individual will be given injections due to illness in the interval between their contracting HIV and their study recording their sero-conversion.

27. There are four published longitudinal studies with number of injections as one of the variables examined. Two, from Kinshasa, DR Congo and Rakai, Uganda, found no association of injections and HIV infection, while a third, from Rwanda, found no association after adjustment for other variables. The fourth study, from Masaka, Uganda, found an association but questions were asked. on average, a year after seroconversion (Quigley 2000).

INFECTION RATES OF HIV AND HEPATITIS C VIRUS DO NOT COINCIDE

28. Hepatitis C virus (HCV) is efficiently spread by blood, either in injection drug use or in medial procedures. It is not efficiently spread otherwise (e.g. sexually). The risk to a health care worker following percutaneous exposure to an HCV-positive source is 1.890, six times the rate for HIV transmission (CDC 2001).

29. If HIV were substantially transmitted via unsafe injections, one would expect to generally find similar trends in HCV and HIV infection within populations. The epidemiology of HCV infection in sub Saharan Africa has recently been reviewed (Madhava 2002). Although prevalence of HCV varied considerably among countries. a trend with increasing age suggested that cases may be spread by unsafe medical practices.

30. Comparing prevalences of HCV with those of HIV shows little correlation, suggesting that while unsafe injection may be a significant mode of transmission for HCV in sub-Saharan Africa, it is not so for HIV.

Comparison of Hepatitis C and HIV prevalence rates in sub-Saharan Africa

	HIV prevalence General population*	HepC prevalence General population∝	Ratio HIV to HepatitisC prevalence
Ethiopia	6.4	1.9	3.4
Kenya	15.0	0.9	16.7
Mozambique	13.0	2.8	4.6
Somalia	1.0	1.5	0.7
South Africa	20.1	0.1	201.0
Tanzania	7.8	3.2	2.4
Zambia	21.5	0.2	107.5
Zimbabwe	33.7	2.0	16.9

*Legend: * HIV percent prevalence amongst the general population between 15-49 years (source UNAIDS).*

∝ The general population estimates for Hepatitis C are based on women seeking antenatal care and blood donors as well as samples from inpatients or outpatients for reasons other than those with known or suspected liver disease and illnesses involving multiple blood exposures or blood transfusions.

31. In the countries with arguably the most highly developed safe injection programmes, i.e., Zimbabwe and South Africa, while having low HCV prevalences (consistent with safe injection practices) have extremely high rates of HIV, suggesting the main mode of transmission of the two diseases is different.

THE ARGUMENTS OF GISSELQUIST ET AL

32. A recent series of publications by Gisselquist et al. have speculated that unsafe injections may be the main mode of HIV transmission in sub-Saharan Africa, with relatively less significance of sexual transmission. If this were so, it might suggest 17 some reorientation of programming priorities in responding to HIV was required. It may also constitute a significant deterrent to valuable health interventions, for example childhood immunization, in sub-Saharan Africa.

33. WHO and UNAIDS welcome continued attention to the need to promote injections safety as the cause of a relatively small but nevertheless appreciable number of HIV infections in sub-Saharan Africa and globally. However, WHO and UNAIDS disagree with the analysis of Gisselquist et al that the proportion of infections attributable to unsafe injections is greatly higher than hitherto estimated, on the following grounds:

34 Gisselquist and colleagues claim there are lower rates of HIV prevalence in Northern industrialized countries compared to sub-Saharan Africa despite similar sexual

behaviours. However the proportion of married or cohabiting men in Northern industrialized countries who report two or more sexual partners in the past year is around 5% while in studies in Africa, the typical value is closer to 20% (Carael 1995) (see paragraph 8 above).

35. If injections are a common mode of transmission, one would expect to find HIV infection to be common among children before the age of sexual debut (see paragraphs 15-18 above).

36. Gisselquist et al. (2003) re-analyze data from a series of cross-sectional studies in the 1980s using self-reported sexual behaviour which may under-estimate exposure. They neglect limitations in self-report data on sexual behaviour (see paragraphs 8 and 14 above)

37. Gisselquist et al. make extensive use of population attributable fractions (PAF) which estimate the fraction of all disease cases in the population attributable to a particular risk factor. However PAFs establish association not causality, they often add up to more than 100% because there is overlap of risk factors, they are

subject to reporting bias (e.g. individuals may under-report sexual activity because it is more socially acceptable to do so, but over-report recent medical procedures) and they depend on accurate measurement of exposure and the rate at which exposure will lead to infection.

38. The reinterpretation by Gisselquist et al relies on an estimate that the transmission probability from unsafe injection is 2.3%, whereas estimates based on needlestick injuries place it at 0.3% (c.f. Gerberding CDC studies). In modeling WHO's estimate of HIV infections due to unsafe injection, transmission efficiency of 1.3% was assumed. WHO believe its estimate is generously high. given evidence from needlestick injury, from tests of the amount of HIV in exposed needles (Rich), given that in practice in Africa individuals with HIV will have lower viral loads than those in patients in hospital studies from which needlestick transmission rates are derived. and the common practice of washing syringes between use (not considered in the models of Gisselquist et al.)

39. Gisselquist and colleagues claim that a sexual route cannot explain the wide spread of HIV (Gisselquist, 2003) but underestimate sexual transmission risk, and estimate risk on the basis of a snapshot of late-stage epidemics, when the epidemic has already moved from those with many partners to those with very few, thus underestimating the dynamics of spread in an early rapidly-growing epidemic.

40. Gisselquist et al neglect the extent to which sexually transmitted infections are an important co-factor in the spread of HIV in sub-Saharan Africa (see paragraph 10 above).

41. The case of South Africa presents an important counterfactual to the speculation that unsafe injection is responsible for a high proportion of HIV infections. According to

the South African Ministry of Heath, HIV prevalence among women in antenatal care clinics reached 24.8% in 2001, but at the same time, South Africa has the most highly developed health care system in sub Saharan Africa with routinely good injection safety.

42. Gisselquist and colleagues have argued that a recent population survey finding of 5.69c HIV prevalence in 2-14 year old children in South Africa is evidence of widespread transmission from medical practices, but there is no evidence for this. Higher rates for boys than girls in this study, and rates that do not increase with age, suggest it is unlikely unsafe injection is the cause. The hypothesis of unsafe injections as a major cause HIV infection in South African children is also not supported by the ethnic differences in the study, where white children were found to have higher rates than African children, while they could be expected to be more likely to receive injections in contexts of higher safety. This suggests that data quality issues (e.g. mixing of test results, and high non-response rates) are important in explaining the results. In fact, quality control measures were limited in this study, and the survey's authors have themselves suggested further investigation is required to understand their unexpected finding. Inyany event, if the 5.6% HIV prevalence figure among children were correct and was caused by unsafe injections, then South African children would have had to have received at least 30 unsafe injections every year from 0 to 10 years of age.

[Whereupon, at 11:41 a.m., the committee was adjourned.]

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