

MEDICAL GRAND ROUNDS

THE HETEROSEXUAL TRANSMISSION OF AIDS

JUNE 1, 1995

J. DONALD CAPRA, M.D.

Heterosexuals need to heed warning of deadly AIDS virus



DR. JOYCE BROTHERS
PEOPLE PROBLEMS

Dear Dr. Brothers: I know that every once in a while my husband gets drunk and is unfaithful with prostitutes. A long time ago I thought of

The Dallas Morning News

Texas' Leading Newspaper

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Dallas, Texas, Tuesday, November 12, 1991

6 Sections HF

AIDS
threat
assessed
75% of cases tied to heterosexual sex

AIDS' new risk

Casual sex by heterosexuals increases their chance of infection, figures show

By Bill Deener
Staff Writer of The News

The fatal disease AIDS — which has been primarily striking gay men and intravenous drug users — now is being linked by researchers to heterosexual contact.

As the AIDS epidemic enters its sixth year, researchers believe that men and women who have casual sex with one or more partners could be placing themselves at risk in contracting the disease.

"The average heterosexual in a monogamous relationship is relatively at no risk, but the young people who are going through their development and sexual experimentation between the ages of 18 and 25 and individuals with multiple sex-

■ New hope for vaccine. 7A

■ Funding dispute. 29A

ual partners are clearly at risk," said Dr. Robert Redfield, an AIDS researcher at Walter Reed Army Medical Center in Bethesda, Md.

Thus far, 862 of the 22,792 AIDS cases reported since 1981 have been attributed to heterosexual contact, according to the Centers for Disease Control in Atlanta. And those cases — more than half of them foreign-born victims — have been more than doubling each year since 1981, the centers' records show.

"We are not naive and don't believe all these cases represent true heterosexual transmission," said. Please see AIDS on Page 10A.

6 A The Dallas Morning News

Friday, June 13, 1986

U.S. predicts tenfold rise in AIDS

Monday, September 29, 1986 The Dallas Morning News 3 C

Heterosexual transmission of AIDS raises new concerns

Introduction

One of the privileges of being an academician is having the opportunity to study from an ivory tower issues of considerable concern to the population at large and to scientists in particular. Most often, we deal with subjects that are not controversial and generally pontificate in areas in which we are experts. Today I will attempt something entirely different by tackling a subject that is enormously controversial, politically explosive, and in an area in which I am hardly an expert. Assembling and digesting this information has been an exciting and challenging task.

In June of 1981, the Centers for Disease Control reported that five young male homosexuals had been recently treated for *Pneumocystis carinii* pneumonia at three separate hospitals in Los Angeles. All five had laboratory-confirmed cytomegalovirus infection and mucosal candidiasis. Three of the five individuals' immunological testing revealed depressed cell-mediated immunity. Since *Pneumocystis carinii* pneumonia is almost unheard of in adults without a known underlying condition resulting in immunosuppression, this cluster of cases caused the CDC to suggest that there might be "an association between some aspect of a homosexual lifestyle or disease acquired through sexual contact and *Pneumocystis pneumonia*". During the next month, the CDC reported ten additional cases of *Pneumocystis pneumonia* occurring in homosexuals (Friedman-Kein, et al., 1981; Gottlieb, et al., 1981). The report of these cases signalled the beginning of an epidemic of a disease characterized by profound immunosuppression, opportunistic infections, and neoplastic malignancies which has come to be known as the Acquired Immunodeficiency Syndrome or AIDS, (Lipsky, 1983). The HIV-1 virus was isolated, a blood test was developed, and a few years later Margaret Heckler, then Secretary

of Health and Human Services, said we would surely have a vaccine against AIDS in the next decade--a time that is now here (quoted in Maddox, 1993).

Fifteen years into the epidemic, the long slow tragedy of AIDS continues to unfold. The most recent figures from the World Health Organization estimate that, worldwide, at least 3 million people have AIDS and that, cumulatively, at least 18 million people have been infected by the human immunodeficiency virus. By the year 2000, it is estimated that 40 million people will have been infected since the start of the epidemic. The scale of this tragedy is immense, but because the epidemic's effects are insidious rather than instantaneous, localized rather than universal, the response has been uneven.

Surprisingly in this age of instant gene cloning, AIDS researchers have become increasingly concerned with things as mundane as gonorrhea, syphilis, and chancroid. The reason is that AIDS spreads more easily among people carrying these diseases. More and more we face the sobering realization that the "high-tech wizards don't have anything else up their sleeves that's even close to working against AIDS" (quoted in Cohen, 1993). Most have concluded that for now at least our best hope for fighting AIDS is prevention.

Seventy years ago, when diphtheria was a serious public health problem, it was said,

"When ignorance, superstition and prejudice prevail, preventable disease will be allowed to slay right and left. With the practical knowledge already at our command, every case and every death therefore, is a direct challenge to our intelligence" (quoted in Kleinman, 1992).

Since the beginning of the AIDS epidemic, there have been documented cases of the transmission of HIV-1 from infected individuals to their heterosexual partners. Despite a decade and a half of study many questions about such transmission linger (Padian, 1987, 1990, 1991). The most striking of these is why the descriptive epidemiology of AIDS differs among the

continents. In parts of Africa, Asia and Haiti, AIDS follows the traditional pattern of a bi-directional, heterosexually transmitted disease, whereas in the United States, Australia, and Western Europe, the epidemic remains largely confined to homosexual men and needle-sharing intravenous drug users. Despite this, the American public has been told repeatedly that “No one is safe from AIDS” and more particularly, that heterosexuals (95% of our sexually active population) are at considerable risk for getting this disease. Indeed, there has been a major effort to persuade the American public that the heterosexual transmission of AIDS is or will become a serious public health problem. It has even been heralded as a “Public Health Disaster”. However, it seems clear that the American public does not believe the message. Poll after poll documents that the sexual behaviors of heterosexuals have changed only marginally since the start of the AIDS epidemic. One may argue that major segments of our population are in a state of denial.

MAJOR DISTINCTIONS

- Female --> Male vs. Male --> Female Transmission
- Developed World vs. Developing World Transmission
- People with AIDS vs. People Who are HIV Positive

Figure 1. Important distinctions in discussing the Epidemiology of AIDS.

At the outset, it is important to separate several issues that will be addressed in turn. First, we must distinguish the transmission of AIDS from females to males versus the transmission from males to females. Second, we must distinguish the transmission AIDS in parts of the developing world from transmission of AIDS in the industrialized western world. Finally, we must distinguish those people who have clinical AIDS from those who test positive for HIV-1 but

are asymptomatic or indeed unaware of their serologic status, clearly, a much larger group of people.

TWO DISCLAIMERS

- HIV-1 Causes AIDS
- AIDS can be Transmitted Heterosexually

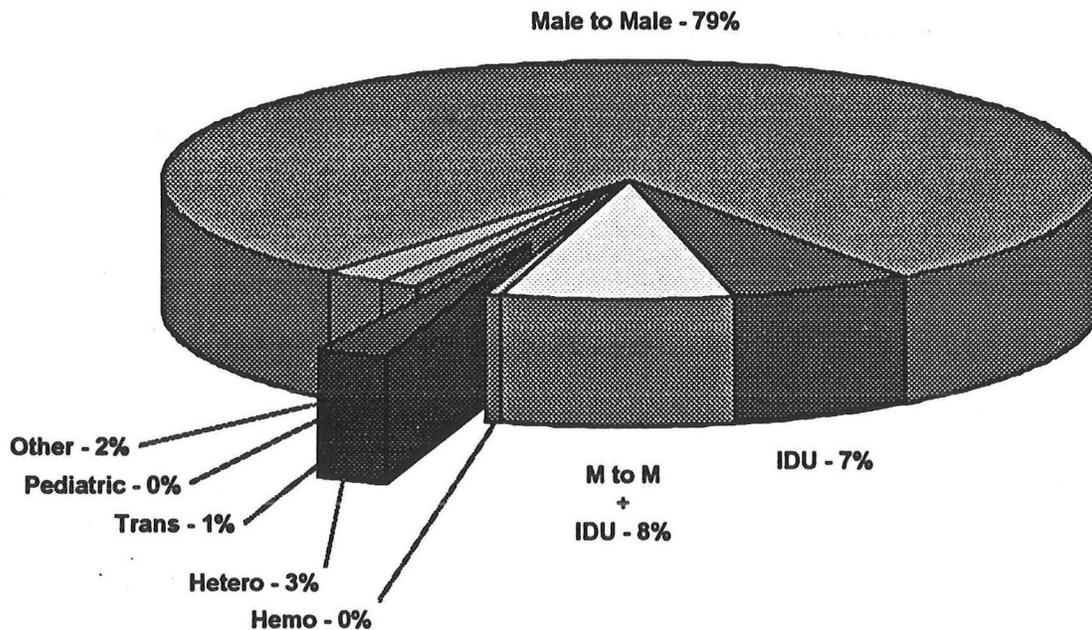
Figure 2: Important disclaimers

Before going on however, I want to make two things absolutely clear. First, I believe, as does the vast majority of the scientific community, that the human immunodeficiency virus causes AIDS. It is important to distinguish certain concepts concerning the heterosexual transmission of AIDS and the so-called “Duesberg hypothesis” which teaches that HIV-1 does not cause AIDS (Duesberg; 1992, 1995). Second, AIDS can be transmitted heterosexually in the Western developed world. Although rare, one can get AIDS through penile-vaginal intercourse. What I wish to address is the magnitude of the problem, and some specific recommendations to slow its heterosexual spread.

In the United States over 93% of AIDS cases occur in homosexual and bisexual men and injecting drug users (IDU). Today’s Grand Rounds will spotlight the less than 7% of cases that occur in heterosexuals. The position I will take is that the major risk factors for the heterosexual transmission of AIDS are receptive anal intercourse, and untreated genital ulcer disease. I find no concrete evidence that a heterosexually transmitted epidemic is sustainable in the U.S. I will argue that our education efforts among heterosexuals should focus on women who engage in receptive anal intercourse and the focus of our treatment efforts in the heterosexual population should be at vigorously treating genital ulcer disease in certain high risk groups. Many have come

to believe that our efforts to reach the entire heterosexual population deplete precious resources and are probably counter productive. I will attempt to be as apolitical as possible--despite the statement in a recent *New York Times* article that "the subject is so political, that realistic scientific discourse is not possible." While he was referring to the Medical Professions changing and contradictory advice on diet, Dr. Donald Louria, Chairman of Preventive Medicine at the N.J. Medical School could be speaking for many about our approach to AIDS prevention when he recently said "We are grotesquely overselling the American people" and he cautioned, "the danger of that is that they will not believe us when it is really important". As an aside, as a nation, we spend 3 billion dollars annually (or 1½ times the entire AIDS effort) to reduce power-line electromagnetic fields because of a perceived link to Cancer!

CUMULATIVE AIDS BY RISK CATEGORY - DALLAS, TEXAS (Thru 1994)



The Numbers

The cumulative number of AIDS cases reported to the CDC at the end of 1994 was approximately 400,000 (Table 1). Of those, all but 5,700 were in adults and of adults with disease almost 90% are males.

Table 1. Aids Cumulative Cases (USA)*

Adult and Adolescent AIDS	396,015	
Males	344,776	(87%)
Females	51,235	(13%)
Children (<13)	<u>5,734</u>	
TOTAL	401,749	

*CDC document 320200

There is no question that our nation is facing the most critical and devastating epidemic in recent history. It is currently estimated that 1,000,000 Americans are infected with HIV-1.

Table 2. Heterosexual Cases of AIDS (USA)

Heterosexual Cases	27,281	(6.7%)
Males	9,063	(2%)
Females	18,217	(4.5%)

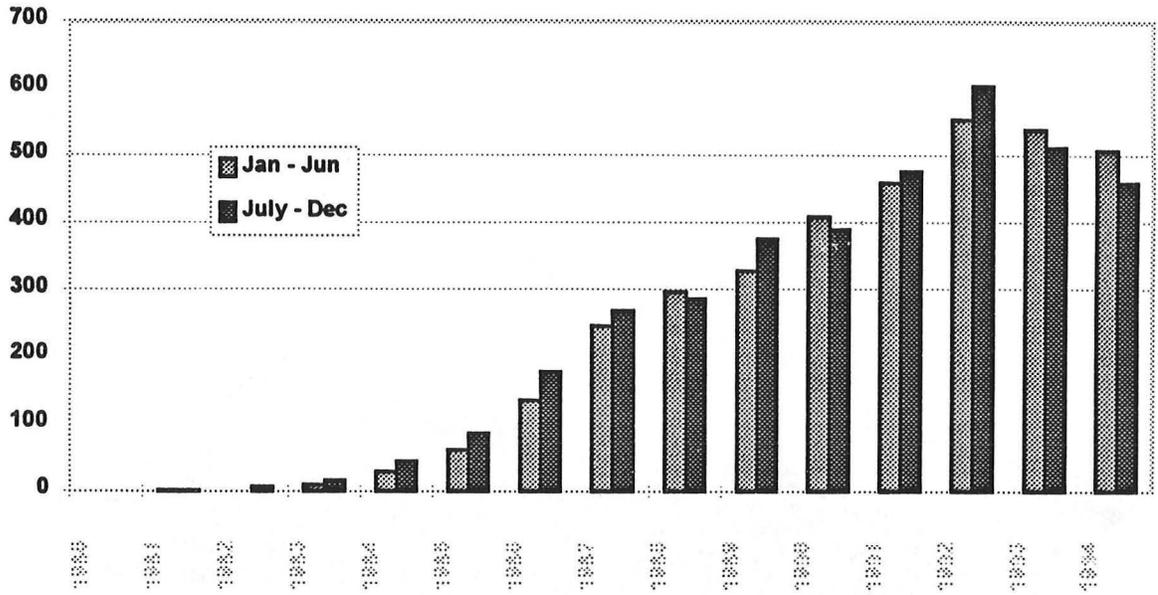
The most recent surveillance reports concerning the distribution of reported cases by exposure category among adults and adolescents is shown in Table 2 (USA) and Table 3 (Dallas). The most recent CDC report list, 6.7% of AIDS cases due to heterosexual risk factors. Of these, 9,000 are in men or 2% of total cases and 18,000 are in women or 4.5% of total cases. At the present time 1 in 250 Americans are infected with HIV-1. AIDS is currently the third leading cause of death among adults, age 25-44, the leading cause of death in males 25-44, and the fourth leading cause of death in women in this age group.

In Dallas, Texas the numbers parallel the national statistics although the proportion associated with the various risk categories is significantly different. I will return to this point later. Reported cases of AIDS by half year of diagnosis in Dallas County are shown below. There appears to be a lessening of the epidemic during the last two years, however, this abatement must be interpreted with caution. The 1992 statistics are increased significantly because of the redefinition of AIDS and if those cases are eliminated there is not a great deal of difference between the 1991 and 1994 numbers. At the very least, the increase does not seem to be as dramatic as it has been since the beginning of the epidemic. We currently encounter approximately 1,000 new cases of AIDS each year in Dallas County.

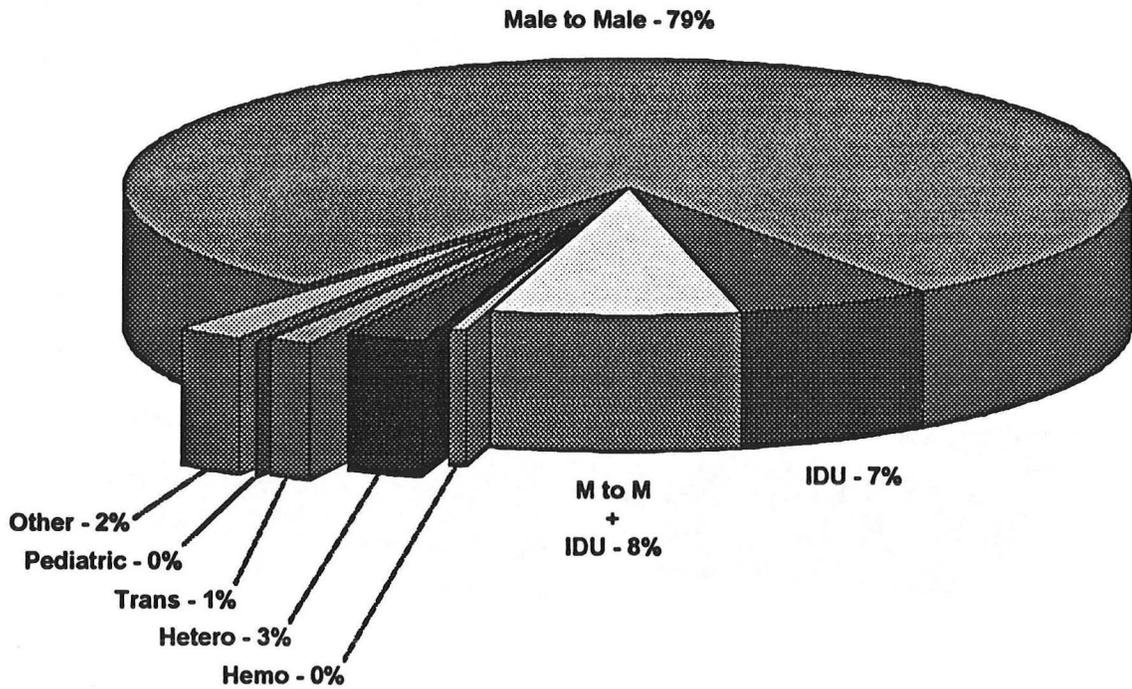
Table 3. Acquired Immunodeficiency Syndrome (AIDS) Dallas, TX

Patient Groups	Adult/Adolescent Transmission Modes		Total (%)
	Males (%)	Females (%)	
Homosexual or bisexual Men	5642 (83)	0 (0)	5642 (79)
Intravenous (IV) drug User	353 (5)	128 (38)	481 (7)
Homo/Bi IV drug User	567 (8)	0 (0)	567 (8)
Coagulation disorder	22 (0)	0 (0)	22 (0)
Heterosexual contact	72 (1)	147 (44)	219 (3)
Transfusion with blood/products	43 (1)	33 (10)	76 (1)
Risk not reported/Other	93 (1)	25 (8)	118 (2)
Total	6792 (100)	333 (100)	7125 (100)

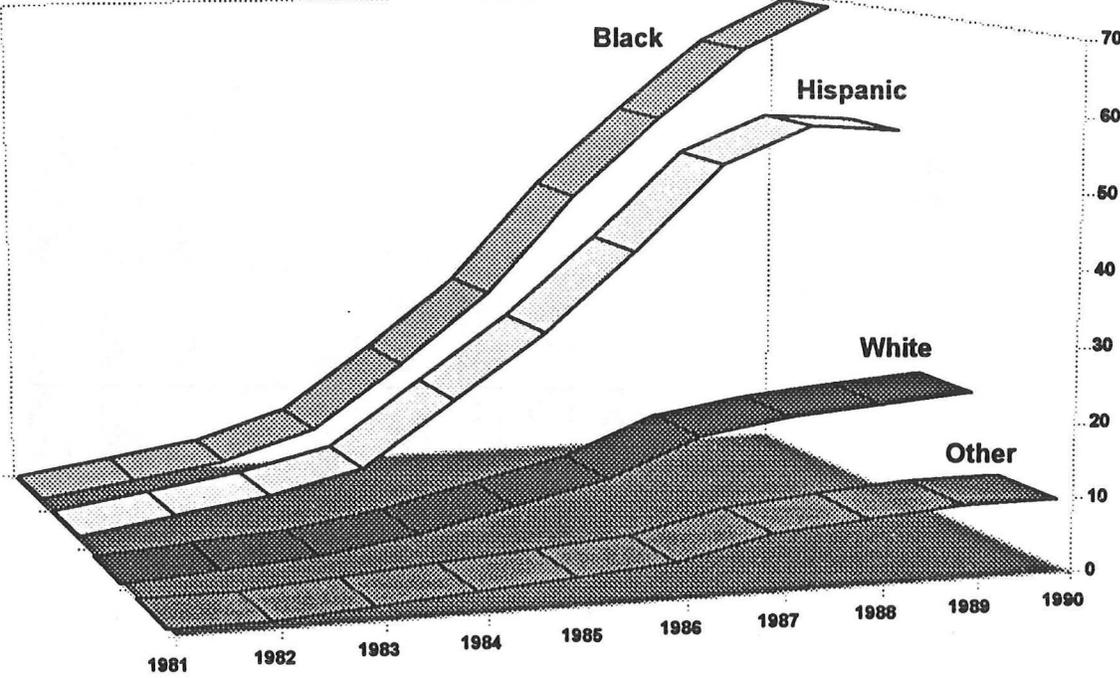
REPORTED CASES OF AIDS BY HALF-YEAR OF DIAGNOSIS, DALLAS COUNTY



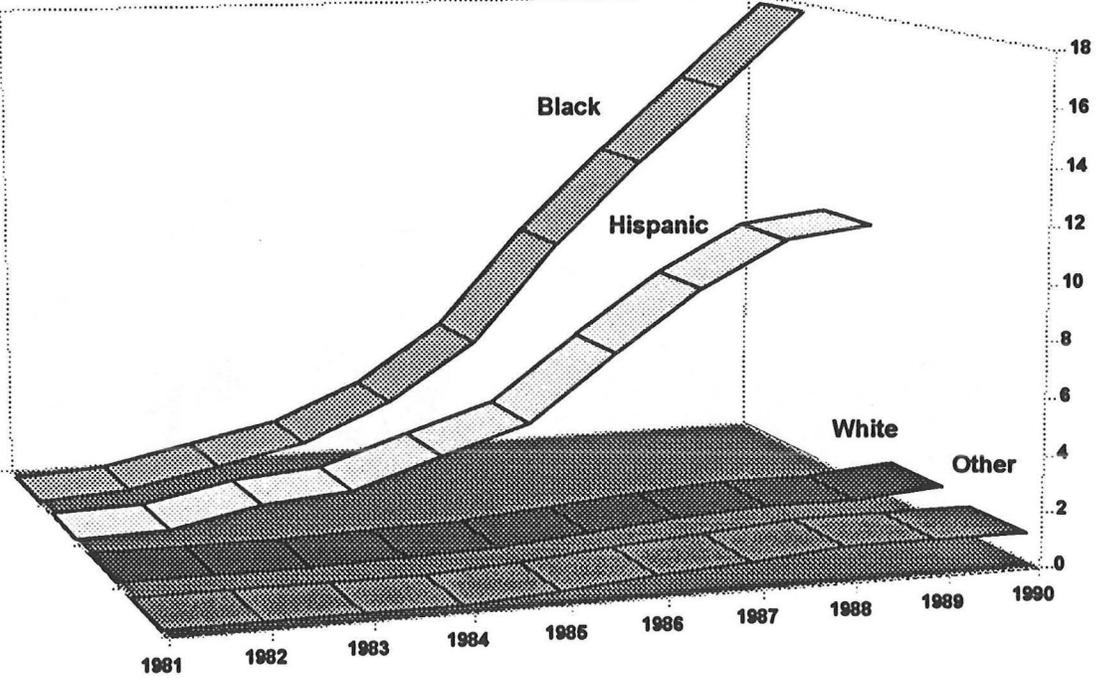
CUMULATIVE AIDS BY RISK CATEGORY - DALLAS, TEXAS (Thru 1994)



U.S. MALE AIDS CASES PER 100,000 MEN - BY RACE



U.S. FEMALE AIDS CASES PER 100,000 WOMEN - BY RACE



Heterosexual Transmission of HIV Infection Does Occur

A chilling example of the heterosexual transmission of AIDS was reported six years ago in the *New England Journal of Medicine* by Clumeck, et al., (1989) who described a cluster of HIV infections among heterosexuals without apparent risk factors in Brussels, Belgium. The index patient was a civil engineer from Africa who had moved to Belgium in 1969, but had traveled regularly to central Africa. He had never used intravenous drugs or received a transfusion. In Africa he had sexual contact with several prostitutes. After being diagnosed with AIDS, he identified 19 women who were his sexual partners in Brussels. Among the 19, 8 were married, (mean age was 35), 11 were described as "middle to high level employees", 6 were university students and 2 were non-employed. None had ever used intravenous drugs, received a blood transfusion or had sex in areas where HIV was common. None were prostitutes. Their mean number of sexual partners during the three years before meeting the index case was 2.5 well in the range of the norm for Western European and American females. Eleven of the nineteen women tested positive for HIV and one transmitted the disease to a male sexual partner. Only one of the women reported engaging in anal sex with the index case. Two of the seropositive women had a history of genital herpes as was true for the index patient. This case dramatically illustrates that women who are not intravenous drug users, the sexual partners of such drug users, or the sexual partners of bisexual men, can become infected by HIV.

How Did We Get Here

For the first five years of the epidemic only 2% of AIDS cases in the United States were attributed to heterosexual risk factors whereas heterosexual transmission is currently reported to be responsible for 7% of cases. How did this happen? Is it real?

Until 1986 the CDC only counted “native-born Americans” in their heterosexual risk category. Africans and Haitians living in the US were classified into a separate risk group because they generally denied IDU or engaging in homosexual activity, but they did recently arrive from countries in which the transmission of AIDS appeared to be fundamentally different than in the United States. In 1986, the CDC combined these groups into the “heterosexual risk” category. Thus, the number of cases of “heterosexually acquired” AIDS almost immediately jumped from 2% to 4% causing considerable alarm. The merging of the two risk groups was generally lost on the media and *Time*, *Newsweek*, *US News and World Report*, *USA Today*, and the *New York Times* carried headlines announcing an explosion of heterosexual AIDS in the United States and citing the CDC statistics as evidence.

A second complication of the numbers came with the redefinition of AIDS which occurred in 1993. Defining AIDS as less than 200 CD4 positive lymphocytes led to an increase in all categories of infection including the heterosexual risk group. Another round of headlines accompanied the redefinition further frightening the heterosexual population.

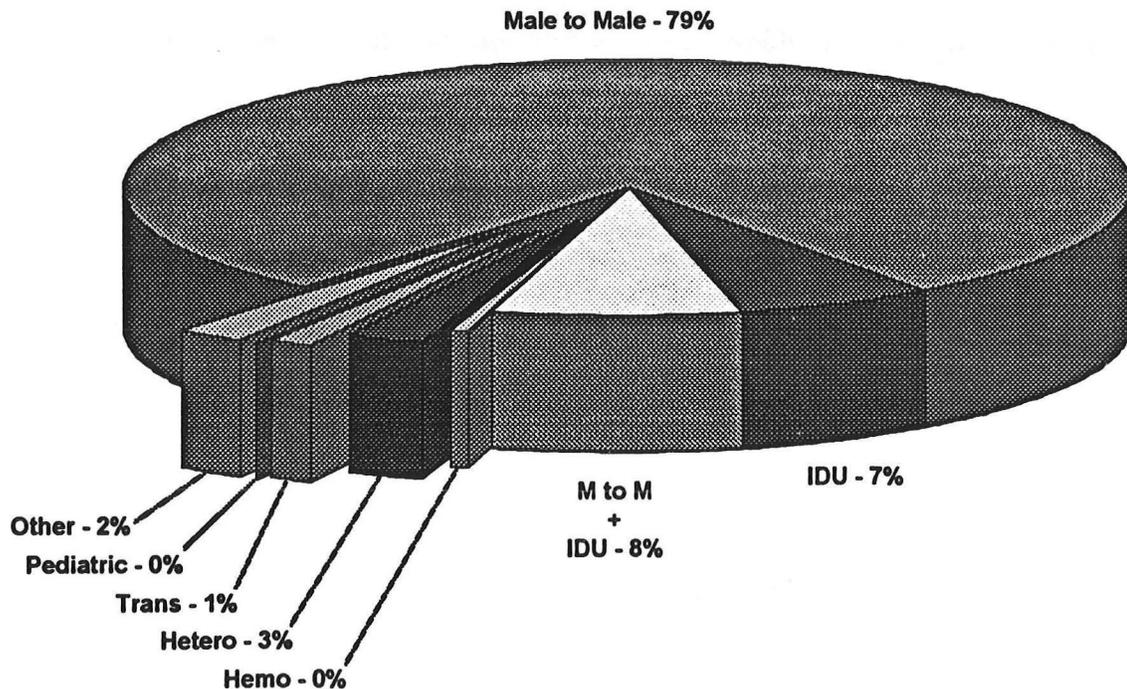
A third issue which confounds the numbers is that the increasing blurring of the distinction between individuals who contract AIDS heterosexually, and persons with no identifiable risk factor. This latter category has always comprised approximately 5% of all cases of AIDS. However, it is well known from an enormous literature on this subject that the vast majority of

individuals who are classified as having AIDS with no identifiable risk are almost always redefined, and few turn out to be in the heterosexual risk group. The “no identifiable risk” or “other” group, consists of individuals who die prior to investigation as well as those who are being investigated at the time. However, the largest group of “other” are men who initially deny IDU or homosexual activity but who on re-interview admit to one of these two activities. For example, in a recent extensive reanalysis of 34,952 cases of AIDS classified initially as “risk not reported” the CDC was able to assign only 11% as heterosexually transmitted.

Newspapers began to predict “the real possibility that heterosexual infection will account for 20% of all cases of AIDS in the U.S. by 1991” and that “by the mid 1990’s a quarter to a third of all cases of AIDS will be in the heterosexual community.” Oprah Winfrey opened a show in 1987 saying “Research studies now project that one in five heterosexuals could be dead from AIDS at the end of the next three years (Winfrey, 1987).

Individual scientists played a role in this media hype. Dr. William Hazeltine was extensively quoted in the press not for his pioneering discoveries in virology but for his

CUMULATIVE AIDS BY RISK CATEGORY - DALLAS, TEXAS (Thru 1994)



predictions of heterosexual AIDS in the United States. He is quoted on several occasions saying that “10% of all Americans will be infected with this virus in the foreseeable future.” Dr. Robert Redfield predicted (in 1991) that “more Americans will die of AIDS in the next 15 years than died in all our wars!” Masters and Johnson who had received considerable media attention for their pioneering studies of sexual behavior argued that the virus was “running rampant in the heterosexual community”. Dr. Mathilde Krim and New York’s Commissioner of Health, Dr. Steven Joseph were both critical of their book saying that their conclusions could “only cause hysteria”. Others said “Tens of millions of heterosexual Americans have been unduely terrorized”. The dangers of AIDS have received and continue to receive enormous media attention--far more, surely, than the dangers of cigarette smoking have ever received.

Both before, during and after this time the senior epidemiologists at the CDC, Rand Stoneburner (Stoneburner, et al., 1986; Schultz, et al., 1986), Harold Jaffe (Jaffe, et al., 1985) and Alexander Langmuir, all stressed that the “epidemic” in the heterosexual population did not exist. Jaffe was the chief AIDS epidemiologist for the CDC and at one time was said to have conducted “risk factor” interviews on 75% of all the living AIDS patients in the nation. Thus, by the late 1980s there were two very different views of heterosexually transmitted AIDS.

The Restless Tide

Ten years ago Richard Krause former Director of the National Institute of Allergy and Infectious Diseases wrote The Restless Tide. In his book he described how the Microbiological world would continue to impact our culture despite our apparent advances as a civilization. Recently, the book, The Hot Zone and the movie, "Outbreak" have been popular versions of this thesis. Even more recently the headlines have been dominated by yet another eruption of the Ebola virus. Contemporary events underscore the potential for the sudden appearance of infectious diseases in currently unaffected populations. Contamination of the municipal water supply in Milwaukee, Wisconsin, in 1993 resulted in an outbreak of cryptosporidiosis that affected an estimated 400,000 people; approximately 4,400 of whom required hospitalization. In the 1990s, epidemic cholera reappeared in the Americas, after being absent for nearly a century; from 1991 through June of 1994 more than one million cases and nearly 10,000 deaths were reported. During the 1980s, tuberculosis increased in the United States after decades of decline, and drug-resistant strains have made its control more difficult. The increasing prevalence of antibiotic-resistant strains of gonococci, pneumococci, enterococci, and staphylococci portend other serious treatment and control failures. New infectious diseases, often with unknown long-term public health impact, continue to be identified. Table 4 lists major diseases or etiologic agents identified just within the last 20 years. Others include infant Botulism, hepatitis D (delta), hepatitis E, Lassa, HPV, Norwalk, etc. A major challenge to our Department of Microbiology is to introduce young physicians to an essentially new agent which causes significant human suffering every year. At the same time few infectious diseases "go away!"

Table 4. Emerging Infections

Year	Agent	Disease
1973	Rotavirus	Major cause of infantile diarrhea worldwide
1975	Parvovirus B19	Fifth disease; Aplastic crisis in chronic hemolytic anemia
1976	<i>Cryptosporidium parvum</i>	Acute enterocolitis
1977	Ebola virus	Ebola hemorrhagic fever
1977	<i>Legionella pneumophila</i>	Legionnaires' disease
1977	Hantaan virus	Hemorrhagic fever with renal syndrome (HFRS)
1977	<i>Campylobacter</i> sp.	Enteric pathogens distributed globally
1980	Human T-cell lymphotropic virus-I (HTLV I)	T-cell lymphoma--leukemia
1981	<i>Staphylococcus</i> toxin	Toxic shock syndrome associated with tampon use
1982	<i>Escherichia coli</i> 157:H7	Hemorrhagic colitis; hemolytic uremic syndrome
1982	HTLV II	Hairy cell leukemia
1982	<i>Borrelia burgdorferi</i>	Lyme disease
1983	Human immunodeficiency virus (HIV)	Acquired immunodeficiency syndrome (AIDS)
1983	<i>Helicobacter pylori</i>	Gastric ulcers
1988	Human herpesvirus-6 (HIV-6)	Roseola subitum
1989	<i>Ehrlichia chaffeensis</i>	Human ehrlichiosis
1989	Hepatitis C	Parenterally transmitted non-A, non-B hepatitis
1991	Guanarito virus	Venezuelan hemorrhagic fever
1992	<i>Vibrio cholerae</i> 0139	New strain associated with epidemic cholera
1992	<i>Bartonella</i> (=Rochalimaea) <i>hemsela</i>	Cat-scratch disease; bacillary angiomatosis
1993	Hantavirus isolates	Hantavirus pulmonary syndrome
1994	Sabia virus	Brazilian hemorrhagic fever

*Dates of discovery are assigned on the basis of the year the isolation or identification of etiologic agents was reported. Modified from Satcher, et al., 1995.

How Does HIV Get Transmitted

I will only briefly discuss this issue as it has been well covered in recent Grand Rounds presentations and in the literature. I have compiled some tables that emphasize those portals of entry (Table 5) and exit (Table 6) that highlight the major issues. Arrows emphasize the portals that account of over 99% of cases of AIDS in the United States (*MMWR*, 1987, 1988).

Table 5. Estimates Of Risk Of Acquiring HIV Infection By Portals Of Entry*

Entry site [†]	Type Risk [‡]	Risk Gets To Site [§]	Risk Virus Enters [¶]	Risk of Inoculation ^{**}
Conjunctiva	Random	Moderate	Moderate	Very low ^{††}
Oral mucosa	Random	Moderate	Moderate	Low ²
Nasal mucosa	Random	Low	Low	Very low ²
Lower respiratory	Random	Very low	Very low	Very low ²
Anus	Behavior	Very high	Very high	Very high ←
Skin-intact	Accident	Very low	Very low	Very low
Broken	Accident	Low	High	High
Sexual				
Vagina	Behavior	Low	Low	Medium
Penis	Behavior	High	Low	Low
Ulcers (STD)	Behavior	High	High	Very high ←
Blood				
Products	Behavior	High	High	High
Shared needles	Behavior	High	High	Very high ←
Accidental				
needle-stick	Accident	Low	High	Low
Traumatic wound	Accident	Modest	High	High
Perinatal	Accident	High	High	High ←

*Data from: Recommendations for prevention of HIV transmission in health-care settings. *MMWR* 36:3S, 1987; and from Update: Universal precautions for prevention of transmission of HIV, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR* 37:377, 1988.

[†]Potential site where HIV might enter susceptible host

[‡]Type of exposure risk - random: from victim's perspective risk is not predictable; accident: risk occurs with events considered to be accidental; behavioral: risk is a recognized high risk behavior

[§]Chance of infected fluid reaching this portal of entry given the type of risk

[¶]Chance that infected fluid reaching the portal of entry gains access to the host's blood stream

^{**}Overall chance that a person will become infected if the person has the usual exposure for this portal of entry

²Moderate risk for HCWs with potential exposure to splatter of blood and bloody fluid.

Table 6. Estimates Of Risk Of Acquiring HIV Infection By Portals Of Exit*

Portal of Exit [†]	Virus Content [‡]	Potential For Spread [§]	Chance Inoculate [¶]
Respiratory secretions			
Nasal secretions	Very low	Efficient	Very low
Sputum	Very low	Efficient	Very low
Saliva	Very low	Efficient	Very low
Tears	Low	Variable	Very low
GI			
vomitus	Very low	Variable	Very low
stool	Very low	Variable	Very low
Urine	Very low	Inefficient	Very low
Sweat	Very low	Inefficient	Very low
Skin fomites	Very low	Inefficient	Very low
Wounds			
Intact skin	Very low	Variable	Very low
Broken skin	Low	Variable	Low
Bleeding	High	Efficient	Moderate to high
Fluids exchanged during sexual activity			
Ejaculate	Very high	Efficient	Very high ←
Vaginal secretions	Moderate	Efficient	Low to moderate
Purulent discharge	Very high	Efficient	Very high ←
Blood Transfusion	Very high	Efficient	Very high ←
Shared needles	High	Efficient	Very high ←
Accidental needle-stick	Low	Inefficient	Low
Body fluids, usually blood-tinged			
Cerebrospinal fluid	Low	Inefficient	Very low
Synovial fluid	Low	Inefficient	Very low
Pleural fluid	Very low	Inefficient	Very low
Peritoneal fluid	Very low	Inefficient	Very low
Pericardial fluid	Very low	Inefficient	Very low
Amniotic fluid	Low	Efficient	Very high ←
Perinatal			
Breast Milk	Low	Unknown	Low

*Data from: Recommendations for prevention of HIV transmission in health-care settings. *MMWR* 36:3S, 1987; and from Update: Universal precautions for prevention of transmission of HIV, hepatitis B virus, and other bloodborne pathogens in health-care settings. *MMWR* 37:377, 1988.

[†]Route by which HIV leaves infected person

[‡]Expected virus content for that portal of exit

[§]Effectiveness with which fluid from that portal of exit spreads

[¶]Chance that fluid from this portal of exit will transmit to a portal of entry of a susceptible host.

The African Experience

There is no currently credible single explanation for the entirely different profile of the epidemic in Africa (and India and Thailand) as opposed to Western Europe and the United States. While most experts consider Africa to be the center of the AIDS epidemic, officially only 100,000 cases have been reported to the World Health Organization, 85% of which have been reported from east and central Africa (WHO, 1990). Some experts suggest that 60% of all people presently infected with HIV live in Africa (Wilkins, 1992) and some have estimated that over 10 million Africans are infected (Glick, 1995). In Uganda, 1 million adults are reported to be seropositive or 1 in every 17 people (Goodgame, 1990). The major routes of spread are thought to be through heterosexual contact, contaminated blood transfusions and perinatal transmission. Patients with venereal disease and prostitutes have very high rates of infection. For example, eighty-eight percent of prostitutes in Butare, Rwanda (Van de Perre, et al., 1985), 67% in Nairobi, Kenya (Plummer, et al., 1991a,b), and 27% in Kinshasa, Zaire (Mann et al., 1988) had antibodies to HIV.

The Plummer, et al., studies are especially impressive. They followed 124 prostitutes in Nairobi and 83 (67%) seroconverted while being followed. If the seroconverters were separated from the nonconverters, genital ulcer disease and *Chlamydia trachomatis* infection were associated with increased risk of HIV-1 infection. They concluded that "the presence of sexually transmitted diseases may in part explain the heterosexual HIV-1 epidemic in Africa" (Plummer, et al., 1991a,b).

In a companion study, Cameron, et al., (1989) investigated female --> male transmission of AIDS in Nairobi by studying 422 men who had acquired a STD from a group of prostitutes

with a prevalence of HIV-1 infection of 85%. Newly acquired infection was independently associated with the acquisition of genital ulcer disease (odds ratio 4.7) and being uncircumcised (odds ratio 8.2). **No man without a genital ulcer seroconverted.** While overstated, they concluded that there was a “causal relationship between lack of male circumcision, genital ulcer disease and susceptibility to HIV-infection” (Cameron, et al., 1989).

Table 7. Major Hypothesis That May Account For Differences In The Epidemiology Of AIDS In The United States And Africa.

-
- (1) Earlier introduction of human immunodeficiency virus into the heterosexual community in Africa
 - (2) Concurrent infections that render African heterosexuals more susceptible to HIV infection
 - (3) Larger numbers of heterosexual partners in Africa
 - (4) Differences in sexual practices
 - (5) More frequent parenteral transmission in Africa through contaminated needles, blood transfusions, and scarification
 - (6) Differences in viral strains
-

Modified from Padian, 1987

Explanations for the very different character of the epidemic abound; none seem satisfying: 1) Reporting: The exact number of cases in Africa is not known because of poor diagnostic testing and grossly disorganized reporting systems. 2) Circumcision: Circumcision is extremely prevalent in the US but not in Africa and there is evidence that circumcision protects against the transmission of many viral diseases. The argument against this is that the incidence of AIDS among Europeans is not significantly different than in the US and Europeans have a relatively low circumcision rate compared to Americans. 3) STD: There are many more patients with sexually transmitted diseases (particularly genital warts) in Africa, than in the US. 4) Sterilization: Sterilization of needles is not as sophisticated in Africa as it is in the US and there is the possibility of transmittal of the disease by health care workers in at least some cases (as in the

1976 Ebola outbreak). 5) Scarification is common in Africa and could possibly have been a way AIDS was transmitted to heterosexuals. 6) Different virus: Most of the US cases are caused by clade B viruses whereas in Thailand and Africa other clades are more common. For example, in Thailand where the early disease was mainly associated with IDU, clade B was the major virus isolated particularly around Bangkok. At this point, clade E appeared and is now the predominant virus in Thailand, particularly in northern Thailand. Thus, it's possible that the explanation for the prominent heterosexual transmission in Africa, Brazil and Asia is that these are largely nonclade B stains.

In sub-Saharan Africa the rapid recent growth of the disease probably reflects the normal development of an epidemic. Assuming exponential growth with a doubling time of three years, it would take 30 years for the prevalence of HIV infection to change from a thousandth of a percent to 1 percent, but only three years to change from 10 to 20 percent. The doubling time could well have been slower in earlier years. Various social and economic factors are likely to have contributed to accelerating the advance (and shortening the doubling time): population movements caused by conflict, for example, and the relocation of men to jobs far from home, which spurred frequent contact with prostitutes because of separation from wives (Anderson and May, 1992).

Thus, we have no satisfactory single explanation for the dramatically different face of the epidemic in Africa vs. the Western Developed World. However, it is clear that in Africa, a history of genital ulcers, having multiple sexual partners, contact with prostitutes, and alcohol consumption are all risk factors (Moss, et al., 1991; Allen, et al., 1991a,b).

IV Drug Use

The statistics nationwide, in New York City, and in Dallas reveal some interesting differences in the epidemiology of the AIDS epidemic. In New York City nearly 50% of all cases of AIDS are traceable to IDU whereas in Dallas less than 7% are associated with IDU (IDU and homosexual risk factor combined not included). Nationally, the numbers are somewhere in between (Table 8). Part of the explanation for this is probably related to the subcultures of IDU drug users in the two communities. Large numbers of New Yorkers participate in so-called “shooting galleries” where individuals enter a room, thrust their arm anonymously through a screen with money in hand, and a hidden individual injects them intravenously, generally with a “disposable” syringe and needle. Typically, the needle is not changed until it is incapable of penetrating the skin! Obviously, if one infected individual contaminates the needle, the next several people can become infected. The subculture of IDU in Dallas is considerably different. That is, it is a small, almost intimate, group and shooting galleries are almost unknown here. It is likely that these two distinct methods of IDU represent the explanation for the dramatic difference in the numbers of AIDS cases in the two cities being ascribable to IDU (Haley, personal communication).

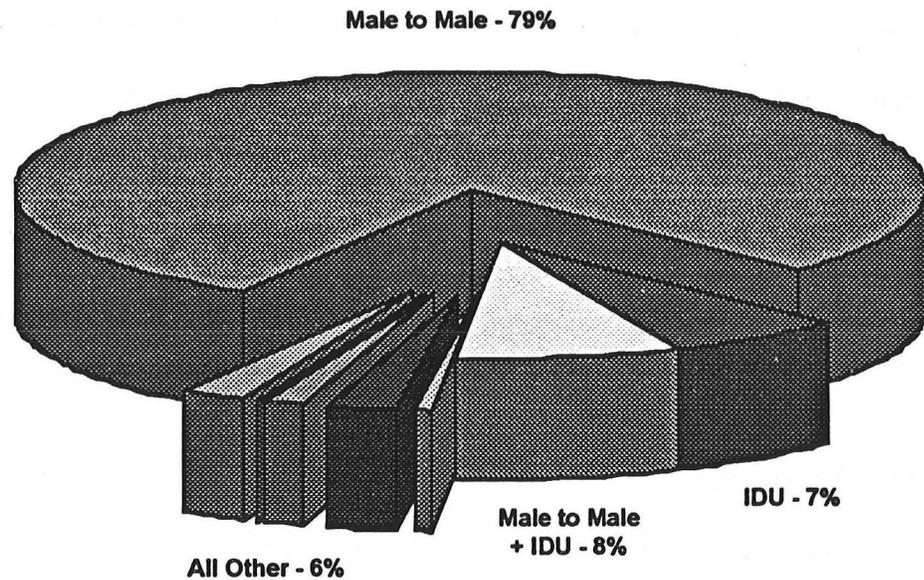
Table 8. Intravenous Drug Use and AIDS (Total Cases to 1994)

	Males	Females	Total
New York City	24,758 (43%)	8,522 (60%)	33,280 (45%)
Dallas, TX	353 (5%)	128 (38%)	481 (7%)
CDC (USA)	73,705 (21%)	24,660 (48%)	98,367 (25%)

Additionally, for several years, the Dallas County Health Department has distributed about 1000 bleach kits per year to IDU in an attempt to clean needles between use. The relatively few cases of AIDS among IDU in Dallas may also reflect this intervention.

An extensive unpublished analysis by the CDC (recently reported in the *New York Times*) (Kolata, 1995a) concludes that nearly 75% of the 40,000 new infections with HIV last year were among drug addicts. Only a quarter of the most recent infections are in gay men.

CUMULATIVE AIDS BY RISK CATEGORY - DALLAS, TEXAS (Thru 1994)



Sexual Behavior Before and During the AIDS Epidemic

There have been relatively few high quality representative of the sexual behavior of Americans. However, recently large random surveys of sexual attitudes and life styles each comprising approximately 20,000 people have been done in France and England. These studies were performed by some of the top epidemiologists in both countries and were initiated in order to get a grasp on issues that specifically related to AIDS risk. While the lay press has played up the differences between the sexual behaviors of the French vs. the British, in their most critical elements, their findings are remarkably similar and indeed they are consistent with most estimates in the United States that have been based on more flawed sampling. These studies conclude that 3 to 5 percent of the population are involved in homosexual relationships, that approximately .5 percent use intravenous drugs, that 40% of men and 20% of women have had more than 5 sexual partners in the last five years and that 3% of men have frequented prostitutes in the past 5 years (Johnson, et al., 1992; ACSR Investigators, et al., 1992). Some comparable studies were recently reported widely in the lay press in the U.S.

Several studies document that behavior in the Western Developed Countries has been hardly impacted by the enormous campaign conducted in schools, newspapers and on television concerning HIV risks. There are a few studies that deserve a closer look.

Brown University: DeBuono, et al. (1990) studied over 750 women who consulted a gynecologist at the student health service at Brown University in Providence, Rhode Island. These women were asked detailed questions about their sexual practices 486 were surveyed in 1975, 161 in 1986 and 132 in 1989. There were no statistically significant differences in age, age of menarche or reasons for visiting the gynecologist. The number of women in the population

who were sexually experienced was essentially the same in all periods of study. During this time the number of women who smoked decreased, and the number who used seatbelts increased. At the same time, in the 15 year interval very few of their sexual practices changed. Table 9 shows that the lifetime number of male sexual partners and the number of partners in the past year had not changed. More importantly, as shown in Table 10, the sexual practices these women engaged in (particularly anal intercourse) was largely unchanged. Forty of the women did not report regular use of condoms and although not where the respondents were asked if they were “worried about being infected with HIV”, 60% responded they were not. These authors concluded that “public health campaigns have not had a substantial influence on the habits and behaviors on these well educated young adults.”

Table 9. Sexual Activity of College Women in 1975, 1986, and 1989*

	1975 (N=486)	1986 (N=161)	1989 (N=132)
<i>% of subjects</i>			
Lifetime number of male sexual partners			
0	12.1	13.0	12.9
1	25.1	24.8	12.1
2-5	40.5	42.2	52.3
≥6	22.2	19.9	21.2
Number of sexual partners in past year			
0	14.2	18.0	17.4
1	43.8	44.7	43.9
2	20.0	18.6	17.4
≥3	21.6	18.6	21.2

*No statistically significant differences were found in the three study years.
 From DeBuono, et al., 1990.

Table 10. Sexual Practices of College Women in 1975, 1985, and 1989*

	Frequency of Anal Intercourse		
	1975 (N=486)	1986 (N=161)	1989 (N=132)
Never	87.4	89.4	90.2
Occasionally	9.7	7.5	8.3
Regularly	0.6	0	0.8
No answer	2.3	3.1	0.8

*No statistically significant differences were found in the three study years.
 From DeBuono, et al., 1990.

“Magic” Johnson: Another example of the lack of significant impact of the AIDS message comes from a study reported by the CDC in 1992. This study was done before and after “Magic” Johnson’s HIV infection announcement. To examine the effect of the announcement on reported sexual behavior, interviews were conducted with 186 participants. These were predominantly black males, average age 25 who had been to an STD clinic in the past 12 months. Follow up was for 12 weeks post announcement. While some trends reached statistical significance, by and large few behaviors had been impacted by the announcement. For younger patients (i.e., aged 16-24 years), no significant behavioral difference occurred between the two periods (Table 11).

Dallas, Texas: Finally, in Dallas, Texas, in the HIV Household survey, (when asked about condom use) only 12% of women reported using condoms “usually or every time” (Table 12).

Table 11. Sexual Risk Behaviors For Sexually Transmitted Disease (STD)/HIV Infection Reported By STD Clinic Patients During The 14-Week Periods Before And After "Magic" Johnson's HIV-Infection Announcement On November 7, 1991--Maryland, July 29, 1991-February 14, 1992

Behavior*	Preannouncement period [†]		Postannouncement period [§]		p value
	No. surveyed	Reporting behavior (%)	No. surveyed	Reporting behavior (%)	
Never used a condom during vaginal sex					
With steady sex partner(s)	144	42	73	53	0.10
With nonsteady sex partner(s)	102	24	48	23	0.93
Had "one-night stand(s)"	185	31	97	20	0.04
Had ≥ 3 sex partners of the opposite sex	186	32	97	21	0.04

*During the 3 months preceding the interview

[†]From July 29, 1991, through November 1, 1991

[§]From November 11, 1991, through February 14, 1992

Table 12. Dallas HIV Survey*

In the past 12 months, about how often was a condom or "rubber" used when you had sex with a man?

	<i>% of population</i>	<i>Dallas County Estimate</i>
Never	70	336,400
Sometimes	20	99,100
Usually	5	25,000
Every time	2	10,000

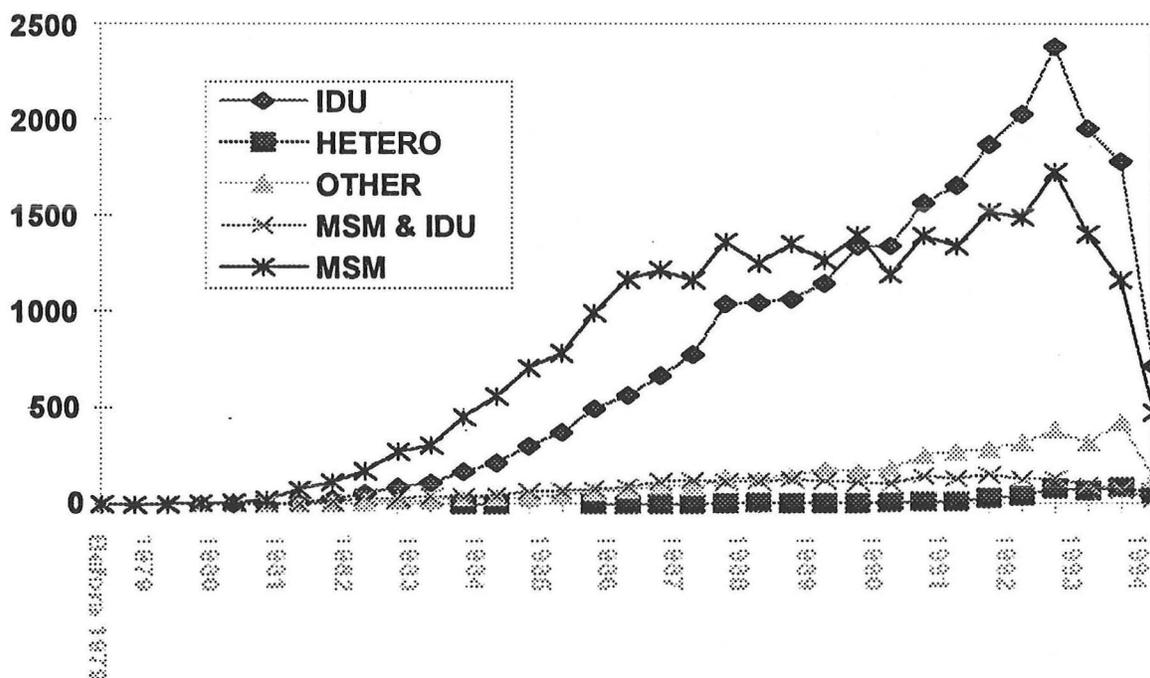
*From Dallas Country Household HIV Survey, 1990

One "problem" with heterosexuals and AIDS is that several studies have shown that a person is more likely to adopt safe sex if he knows someone who has AIDS. Few heterosexual, non drug users know any peers who got AIDS heterosexually, thus the message does not get reinforced as it did in the homosexual community.

The Miniepidemics Within the AIDS Epidemic

In a sense the AIDS epidemic has been a series of miniepidemics. Early on in United States the disease was almost exclusively seen in gay and bisexual men. Later, it moved into the IDU community and more recently we have seen the disease increasingly entering the heterosexual population (Nightingale, 1991). It clearly became epidemic in the gay population; and similarly, in the intravenous drug using community. However, while many believe that it will become a serious problem in the United States in the heterosexual community many view this an unlikely scenario.

AIDS CASES AMONG MEN BY RISK - BY HALF YEAR OF DIAGNOSIS (NYC)



The epidemic has clearly crested among homosexual men. Three factors, or some combination of them, could explain the decrease in this group. First, it could reflect changes in behavior as a result of education and media coverage. Second, it could be a reflection of the

natural pattern of the epidemic, where saturation of infection in high-risk groups reduces the rate at which secondary cases arise (“exhaustion of susceptibles”). Third, it could be spurious, and a direct consequence of assumptions underlying the methods used to study these populations. The first explanation is probably an important component, but direct quantitative evidence of behavior change is surprisingly limited although some evidence from the San Francisco cohort study is impressive (Philipson and Posner, 1993). The second explanation must also be important, as simple theory reveals a bell-shaped incidence curve for infections in a naive population, with a long right-hand tail in the absence of any change in behavior. The third explanation has not been explored sufficiently. First, the back-projections of HIV incidence are sensitive to many assumptions especially as to when the epidemic started. Second, the back calculation method tends to allocate most HIV infections to as early a time point as possible (Anderson, 1993).

Why does the epidemic not easily move from the bisexual and intravenous drug using community into the heterosexual community? Also, why does the virus not move within the heterosexual community very well? I emphasize very well because it clearly does move within this community although the transmission rate is relatively lower.

The critical elements appear to be the mode of transmission as well as the life styles of the various groups within the respective communities. There is abundant evidence to suggest that the number of sexual encounters of any kind required for an infection to occur differs depending upon the group involved. Table 13 shows this in some detail. The overall risk of two people at random within the population, even not using condoms is approximately 1:5,000,000. With several sexual encounters this number increases, but, the numbers by themselves strongly argue this will never become a public health peril. If one person is known to be HIV positive, then the likelihood of

transmission alters the statistic and the chances of transmitting the virus to a sexual partner obviously increases (Table 13). However, the sociology of the populations involved are quite different, preventing the epidemic from moving very fast.

The conventional view of an epidemic has people who engage in an activity that promotes the epidemic (whether its coughing on each other, drinking from the same water fountain or having sex). In this model the epidemic is maintained because there are new susceptibles that enter the population. With a disease like AIDS, where the incubation period is long, the disease can be transmitted to other susceptibles before the transmitter is even aware he/she is infected. This model assumes that whatever activity is transmitting the disease occurs randomly within the population.

With odds like this many have argued that it is inappropriate to tell patients that they must use condoms when having sex with partners who are not members of a high-risk group. In such situations, the risk of infection per episode of sexual intercourse is only about 1 in 5 million even without a condom. Many people who do not like to use condoms and who have no doubt about the HIV risk status of their partner consider this an acceptable level of risk. While some maintain that no amount of risk for a fatal disease like AIDS is acceptable, most people willingly take risks on this order of magnitude every day. For example, the risk of AIDS from a low-risk sexual encounter is about the same as the risk of being killed in a traffic accident while driving 10 miles on the way to that encounter (Hearst, et al., 1988). Similarly, just to put this in context, more people die in swimming pool accidents in Dallas each year than get AIDS heterosexually. People tend to address such risks each day and accept or reject them. This is apparent from observing

Table 13. Risk of HIV Infection for Heterosexual Intercourse in the United States

	Assumptions			Estimated Risk of Infection	
	Prevalence of HIV Infection	Condom/spermicide Failure Rate	Infectivity†	1 Sexual Encounter‡	500 Sexual Encounters§
HIV serostatus unknown					
Not in any high-risk group					
Using condoms	0.0001	0.1	0.002	1 in 50,000,000	1 in 110,000
Not using condoms	0.0001	...	0.002	1 in 5,000,000	1 in 16,000
High-risk groups 					
Using Condoms	0.05 to 0.5	0.1	0.002	1 in 100,000 to 1 in 10,000	1 in 210 to 1 in 21
Not using condoms	0.05 to 0.5	...	0.002	1 in 10,000 to 1 in 1,000	1 in 32 to 1 in 3
HIV seronegative					
No history of high-risk behavior¶					
Using condoms	0.0000001	0.1	0.002	1 in 5,000,000,000	1 in 11,000,000
Not using condoms	0.0000001	...	0.002	1 in 500,000,000	1 in 1,600,000
Continuing high-risk behavior¶					
Using condoms	0.01	0.1	0.002	1 in 500,000	1 in 1100
Not using condoms	0.01	...	0.002	1 in 50,000	1 in 160
HIV seropositive					
Using condoms	1.0	0.1	0.002	1 in 5000	1 in 11
Not using condoms	1.0	...	0.002	1 in 500	2 in 3

†The value 0.002 represents an upper limit on the probability that an infected male will transmit HIV to an uninfected female during one episode of penile-vaginal intercourse with ejaculation. Female-to-male infectivity is lower, and infectivity for anal intercourse or intercourse when genital ulcers are present is higher. The value is a group mean.

‡The risk of infection for one encounter is the product of the values in columns 2 through 4 of the Table ("Assumptions").

§The risk of infection for 500 encounters is column 2 x [1-(1-column 3 x column 4)⁵⁰⁰].

|| High-risk groups with prevalences of HIV infection at the higher end of the range given include homosexual or bisexual men and intravenous drug users from major metropolitan areas, and hemophiliacs. Groups with prevalences at the lower end of the range include homosexual or bisexual men and intravenous drug users from other parts of the country, female prostitutes, heterosexuals from countries where heterosexual spread of HIV is common (including Haiti and central Africa), and recipients of multiple blood transfusions between 1983 and 1985 from areas with a high prevalence of HIV infection.

¶High-risk behavior consists of sexual intercourse or needle sharing with a member of one of the high-risk groups.

Adapted Hearst and Hulley, 1988

the behavior of pedestrians--people assume nontrivial risks of injury and death for trivial benefits in time saved--these kind of choices are made almost unconsciously by all of us every day.

However, as all of you know, people do not share needles or have sex on a random basis. Rather, there are groups of individuals who participate in these kinds of sexual activities. The critical issue is "how does the disease move from the IV drug using community and the gay community into the heterosexual community." Here the opportunities are fundamentally limited to only one. That is, an IV drug user or a bisexual man has sex with a heterosexual female. When that happens there is obviously a finite risk in his transmitting the disease to her. However, the sociology of the communities involved typically lead this to be the end of the infection chain. Thus, from the perspective of the epidemic, the disease ends with the female partner of a bisexual male because while he may have a dual life having sexual activity in a gay community, typically his only female partner is his wife and typically her only sexual partner is her husband. Thus, for the two of them AIDS is a tragedy, but as a public health event, it has a relatively limited impact, as she is not likely to transmit the disease to anyone else.

In the United States out of over 400,000 cases only about 250 cases of AIDS are attributable to one heterosexual getting the disease from another heterosexual, fewer than 25 per year. Thus, when a bisexual male transmits the disease to his female partner, the disease is unlikely to be transmitted by her into the heterosexual community. First, because of her lifestyle and second because of the extraordinary difficulty of transmitting AIDS from female to male (more later). When it happens, it becomes a headline in the newspaper, and/or is written up in the medical journals but still deep into the epidemic, it remains an extremely uncommon event.

The *New York Times* recently interviewed several experts on this point. Most agreed that there was little evidence that AIDS had broken out of the homosexual and IDU communities into the heterosexual population. Dr. Dennis Bregman, a former CDC statistician and epidemiologist currently at USC, said, "The disease is hard to transmit. Most cases among heterosexuals can be attributed to other risk factors. You look at it and say, where is the heterosexual epidemic?"

Dr. Harold Jaffe, deputy director of the CDC commented in the same article that "heterosexual transmission is more difficult than people expected...The virus spreads easily among intravenous drug users, crack addicts and their sexual partners, but apparently not outside those groups. Five or six years ago, people suggested that this will happen to the housewife in Cedar Rapids, but the statistics show that is not the case. The virus does not spread very rapidly by heterosexual transmission. That is what is saving the heterosexual population" (quoted in Kolata, 1995a).

Turning to Table 13 we can understand these comments. Note the tremendous variation in the risk of HIV infection under different circumstances. By far the most important cause of this variation is the risk status of the sexual partner. **Choosing a partner who is not in a high-risk group provides almost four orders of magnitude (5,000-fold) of protection compared with choosing a partner in the highest-risk category (male homosexual or intravenous drug user).** Condoms, in contrast, are estimated to provide only one order of magnitude of protection. The implications of this are clear. Choose partners carefully! The most important determinant of the risk of a sexual encounter is the likelihood that one's partner belongs to a high-risk group. And the most important issue is that the groups do not overlap very much.

Heterosexual Aids: How Good Are The Numbers

One of the more contentious issues concerning heterosexually transmitted AIDS concerns the numbers. An example of the problem comes from reports of the prevalence of HIV-antibodies among U.S. military recruits discovered to be seropositive (e.g., see Redfield, et al., 1985). Many men tell officials their infection is due to contact with prostitutes when it is not. Thus, at a time when eighty percent of male military patients claimed heterosexual acquisition of AIDS attributed to contact with prostitutes in German cities, an extensive study found that only 17 prostitutes in all of Germany were HIV-infected (Schultz et al., 1986). At the time no German male with AIDS had contracted it from sex with a female according to German government data. Lekatsas, et al. (1986) reported that 48% of men they interviewed, who initially claimed that prostitution was their route to infection, acknowledged homosexuality or IDU in subsequent interviews. New York City Health Department officials found that 83% of HIV-seropositive military recruits calling their AIDS-crisis hot line acknowledge sex with other men (42%) or IDU (53%) (Stonebruner, et al., 1986; Smith, 1987).

According to the New York City AIDS Surveillance Report, in September of 1991, (at a time when there were over 35,000 cases of AIDS in NYC) there were only 12 in men with AIDS who reported having sex with women at risk (0.04%). At the same time, the national statistics indicated that 5% of cases were transmitted to men heterosexually. In following the AIDS Surveillance Updates for New York City from the beginning of the AIDS epidemic, in 1993 the number of heterosexually acquired AIDS cases in men increased rather dramatically. I wrote to the New York Health Department as well as visited them, to try to understand what had happened as it seemed that either a serious "new" epidemic was in progress (as was reported extensively in

the lay press) or there was a new way of reporting the data. I quote from a letter from Dr. Pauline Thomas, epidemiologist of this unit.

“Previously, in men, cases reported as heterosexually infected have been highly likely to turn out to have another risk if investigated by the Health Department. As a result, men were not categorized as “infected through heterosexual exposure” until completely investigated. In 1993 our policy changed. Men claiming (or reported with) heterosexual transmission are placed in that category. As a result, numbers in that category (males infected heterosexually) greatly increased--although they remain a very small portion of all AIDS cases in men in New York City.”

The picture in women is different. Of the 50,000 women with AIDS, IDU account for about half; transfusions for about 10 percent and heterosexual contact about 25 percent, the vast majority of these women were infected by heterosexual contact with male IDUs.

Using findings from the HIV Survey in Childbearing Women an estimated 7,000 HIV-infected women delivered infants in the US in 1993, the last year that statistical information is available (*MMWR* 44:5). From 1989 through 1993 the annual prevalence of HIV infection among childbearing women has remained stable. The AIDS epidemic among women disproportionately affects racial/ethnic minorities (more later).

There are several reasons why women are more at risk of acquiring AIDS by heterosexual intercourse than are men: male to female transmission of HIV by vaginal intercourse is more efficient than female to male, and women are exposed to at least three types of commonly HIV-infected male transmitters; 1) bisexual men, 2) hemophiliacs, and 3) male IDUs (who are three times as common as female IDU. Men are exposed by heterosexual intercourse to only one commonly infected female transmitter, the IDU. During heterosexual intercourse women often experience receptive anal intercourse, with its known propensity to transmit HIV (Padian, et al., 1988) a subject I will return to, and during menstruation women might also acquire infection by blood-borne transmission (Padian, et al., 1990), although the evidence for this is marginal at best.

A risk factor that might be thought to increase the chances of men acquiring HIV by heterosexual transmission--exposure to prostitutes--has been shown to be primarily a function of whether the prostitute is an IDU. Prostitutes who are not IDU are rarely positive for HIV (Table 14). In a study by Padian, of 535 licensed prostitutes in Nevada's legal brothels, none were positive for HIV, while over 6 percent of imprisoned prostitutes in that state, all of whom were IDU, were HIV-positive (Padian, et al., 1987). A large study by Rosenberg and Weiner (1988) concluded that HIV infection in non-drug using prostitutes tends to be low or absent, implying that sexual activity alone does not place them at high risk.

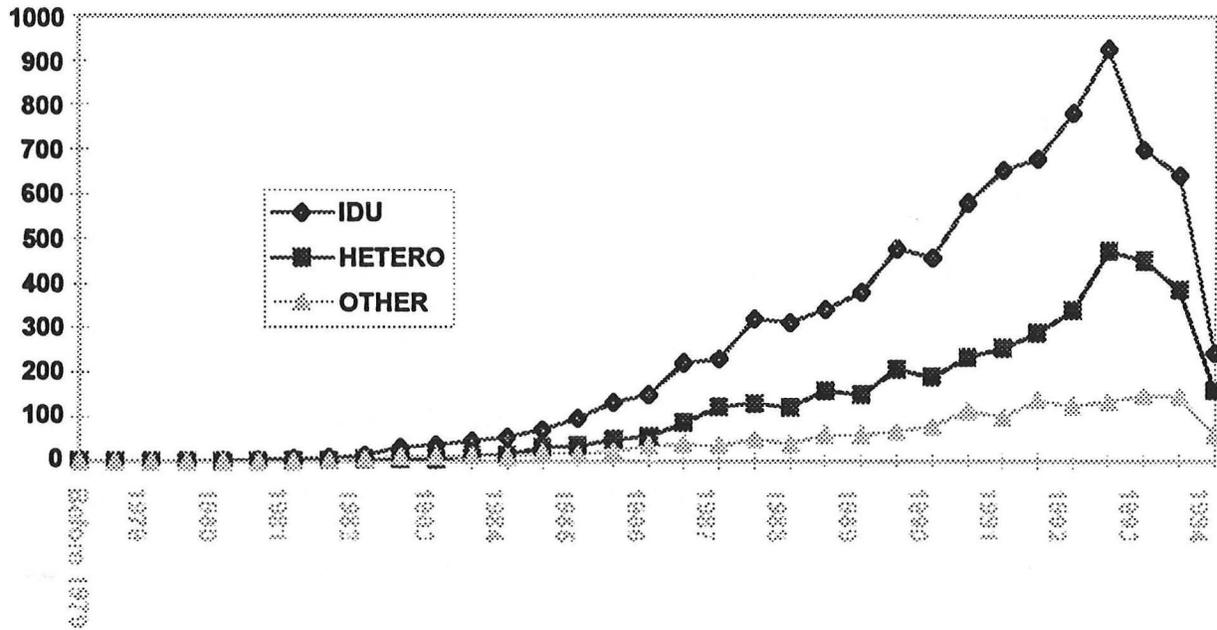
All this led the *New York Times* to state, in an article on heterosexual transmission of AIDS on May 1, 1990, that the "spread of AIDS by heterosexuals remains slow" (Hilts, 1990). Peter Plumley, a consulting actuary in Chicago, stated that the epidemic will never have a significant impact on non-drug-using heterosexuals: Even at its height it will strike only about one-tenth of 1 percent of the non-drug-using heterosexual population" (Plumley, 1990).

Table 14 Cross-sectional Studies of Prevalence of HIV Antibody in Female Prostitutes

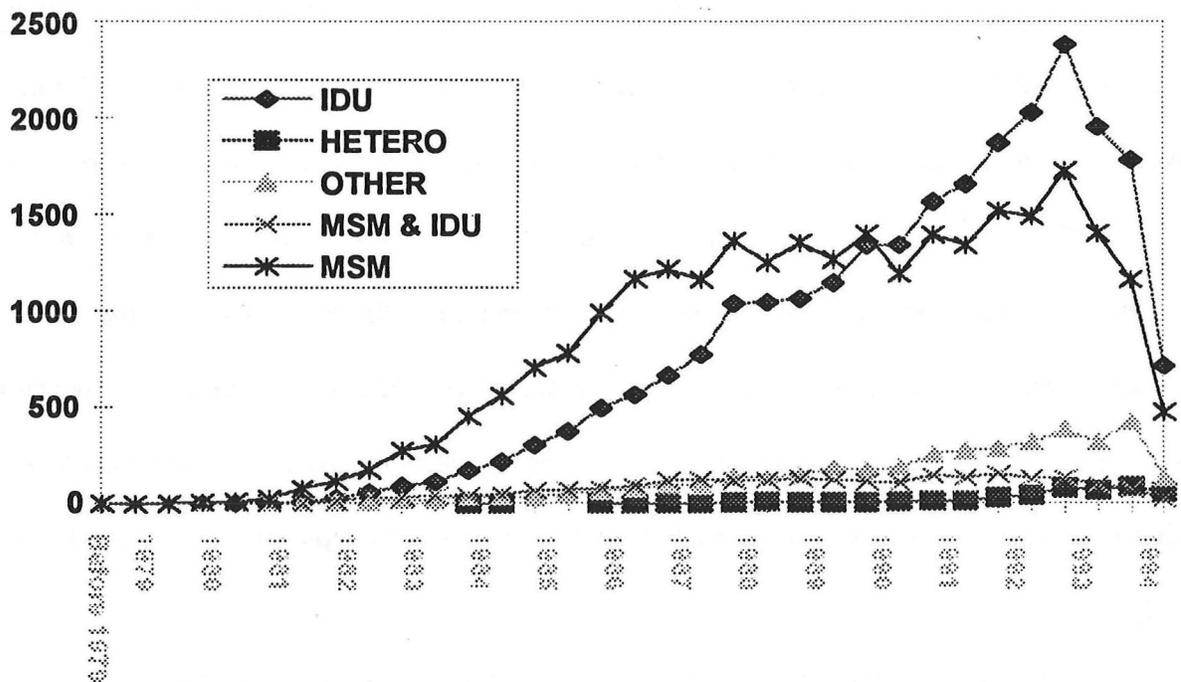
Date	Study Site	TOTAL		Intravenous Drug Users Users		Non-intravenous Drug Users	
		No. Subjects	Preva- lence (%)	No. Subjects	Preva- lence (%)	No. Subjects	Preva- lence (%)
US							
1987	brothels, Nevada	535	0				
	prison, Nevada	370	6.2				
1987	streets, NYC	78	13	12	50	64	7
1987	South Florida	90	41	63	46	27	30
Non-US							
1986	Licensed pros- titutes, West Germany	399	0	1	0	398	0
1985	STD clinic, London	50	0	3	0	47	0
1985	Rue Saint-Denis,	56	0	0	--	56	0
1987	Nairobi, Kenya	535	65				
1985	Athens, Greece	200	6	0	--	200	6
		400	0				
1987	Pordenone and Treviso, Italy	36	36	22	59	14	0

Modified from Rosenberg and Weiner, 1988

AIDS CASES AMONG WOMEN BY RISK - BY HALF YEAR OF DIAGNOSIS (NYC)



AIDS CASES AMONG MEN BY RISK - BY HALF YEAR OF DIAGNOSIS (NYC)



Heterosexual AIDS and Hemophilics

Because of exposure to contaminated coagulation factor, the prevalence of HIV infection among adult hemophilic men in the United States is reported to range from 75 to 90 percent. The risk of HIV transmission through long-term monogamous heterosexual contact can be estimated by studying the spouses of hemophilic subjects since these couples generally do not abuse intravenous drugs, usually maintain stable monogamous relationships, and are usually free of other risk factors. Kim, et al., (1988) gathered data on the risk of heterosexual transmission of HIV infection in the context of long-term monogamous relations according to the duration of HIV antibody seropositivity and of HIV antigenemia in HIV-infected hemophilic men, and their sexual habits.

Infection with HIV was studied in 14 sexually active spouses of infected hemophilic men who had been HIV antibody reactive for a mean of 46 ± 23 (SD) months. One half of the hemophilic men studied had overt HIV antigenemia for a mean duration of 27 ± 23 (SD) months; six of the men fulfilled clinical criteria for the diagnosis of AIDS. All couples were sexually active in a strictly monogamous fashion, in marriages of 13.5 ± 10.5 (SD) years with an average reported frequency of four sexual encounters per month. Plasma samples of the hemophilic husbands were retrospectively analyzed for HIV antibodies. Blood samples were obtained from female spouses at six months intervals. Comprehensive questionnaires regarding sexual habits and other risk factors were filled out by each couple. None of the couples used condoms before the study.

Antibodies to HIV developed in one of the 14 wives. At the time when this seroconversion was detected, her husband, in whom AIDS developed, had been reactive for HIV

antibody for 49 months, and showed positive findings for HIV antigen for 26 months. The infected female had a 14-year history of multiple sclerosis, and had been treated with immunosuppressants intermittently. HIV antibodies did not develop in any of the 13 other women. No changes in functional lymphocyte subsets were seen in any of the uninfected female partners of the infected hemophilic patients whether AIDS developed in their husbands or they remained clinically asymptomatic.

Kim, et al., conclude that, "the frequency of transmission of HIV in the setting of unprotected long-term monogamous heterosexual relationships with infected hemophilic men is relatively low" (Kim, et al., 1988). Several studies of a similar type have confirmed and extended this conclusion.

In New York City, where all cases of heterosexually acquired AIDS are classified by the risk status of the HIV positive person, only 8 of 71,959 cases of AIDS are attributable to sex with a person with hemophilia: 0/57,838 men and 8/14,121 women. These statistics emphasize that the transmission of HIV-1 infection among heterosexuals is extremely low.

Rectal Intercourse

HIV transmission may have more to do with sexual practice than sexual orientation. Homosexual men are generally singled out as being at high risk. Indeed they are, but not because of their homosexuality per se but because they engage in rectal intercourse. Heterosexuals who engage in rectal intercourse are at the same high risk (Lorian, 1988). Rectal intercourse or anal sex is a more common sexual practice in the heterosexual community than is generally believed. In the Dallas County Household HIV Survey conducted in May, 1990, 11% of women reported engaging in rectal intercourse at least once in the past twelve months and 21% in the last 13 years (Dallas AIDS Survey, 1991). Many studies of women in various parts of the western world put the number of at least single episodes in adult life between 23% and 33%. MacDonald reported that almost 19% of American College women engaged in rectal intercourse (MacDonald et al., 1990). For women with more than 10 lifetime partners the frequency of rectal intercourse is even higher.

Kinsey Institute staff members, Reinisch, *et al.* (1988) estimated that 39% of American women have engaged in rectal intercourse at least once. A conservative figure of *at least 10%* seems an appropriate and cautious *lower* limit for the number of sexually active American women who engage in rectal intercourse with some regularity. A higher value may well be more accurate (Brody, 1995; Voeller, 1991).

Table 15. Dallas HIV Survey

Since January 1978, how often did a man put his penis in your anus or rectum when you had sex?

	<i>% of population</i>	<i>Dallas County Estimate</i>
Never	79%	387,400
Sometimes	19%	89,500
Usually	1.2%	6,100
Every time	0.2%	500

In the past 12 months, how often did a man put his penis in your anus or rectum when you had sex?

	<i>% of population</i>	<i>Dallas County Estimate</i>
Never	88%	424,700
Sometimes	11%	54,100
Usually	*%	2,600
Every time	*%	2,100

*Less than 1%

From Dallas Country HIV House Survey, 1991

There is abundant sociologic data to indicate that within their heterosexual relationships bisexual males engage in rectal intercourse with their spouses approximately two-three fold more than the exclusively heterosexual population (Padian, et al., 1987; de Lima e Costa, 1990). A survey of 5,000 households in rural Brazil found that over 40% of those interviewed considered rectal intercourse a normal part of sexuality as did 50% of urban citizens of Rio de Janeiro (Leal de Santa Inez, 1983).

There is abundant evidence to suggest that the majority of women in the Western Developed World who get AIDS other than from IDU are infected during rectal intercourse. In a

British study 46% of women who engaged in rectal intercourse with an HIV infected man became HIV positive. These authors calculated that the transmission of the virus from men to women increased by a factor of 5.1 comparing rectal to vaginal intercourse. There are several other more recent studies in agreement with this number (Padian, et al., 1991; CDC, 1993; de Vincenzi, et al., 1994). The de Vincenzi study, which was recently published in the *New England Journal of Medicine*, showed a cumulative incidence of seroconversion among women having unprotected anal sex with an HIV infected man to be 27.8%. It is difficult to understand why this striking point has not been made more strongly in both the lay press as well as in the scientific literature. Indeed, in a letter to the editor of *Nature* published two years ago Per-Erik Åsard of Sweden stated that “this information is especially important for women because they are the main victims”.

There are good reasons that explain the transmission rate of any virus through the rectal mucosa. The colonic and rectal mucosa has a barrier function that normally prevents overwhelming infection by infective and toxic materials contained within the luminal contents. Exposure of rat colonic mucosa for 2-3 hours to human semen causes extensive damage to the rat mucosa as shown by histology, inhibition of fluid absorption and an increase in permeability to the normally impenetrable high molecular weight probe polyethylene glycol 4,000 (Mendizabal and Naftalin, 1992a). Human semen contains at least two components in sufficiently high concentration to cause breakdown of the basement membrane that supports the colonic epithelial cell layer: collagenase a component of seminal plasma, which hydrolyzes the collagen present within the basement membrane, and spermine. Spermine reaches a concentration of 5-15mM in human semen. Spermine permeates through the colonic mucosa and neutralizes aminoglycans within the intestinal matrix--this triggers the activation of endogenous collagenase which leads to

Rectal Intercourse and HBV Infection in Women

Both men who have sex with men and IDU are generally regarded as the groups at highest risk for acquiring hepatitis B virus (HBV) infection in developed countries. However, heterosexual transmission of HBV is well documented and is being reported with increasing frequency. Currently, heterosexual transmission of HBV infection accounts for over 25% of reported cases of hepatitis B in the United States.

The hepatitis B surface antigen has been identified in semen and saliva. The risk of different sexual practices among men who have sex with men has been evaluated, however, until recently there has been little information regarding sexual risk factors for HBV infection in women.

Rosenblum et al. (1992) surveyed over 1,300 female prostitutes 18 years of age or older in STD clinics. They divided them into IDU and those denying IDU. They attempted to understand what sexual practices were associated with HBV infection which was present in 56% of these prostitutes. Seventy-four percent of the IDU were HBV positive; 38% with no history of IDU were HBV positive. Tables 16 and 17 summarize these findings.

Table 16. Factors Associated With Hepatitis B Virus (HBV) Infection Among 646 US Female Prostitutes Who Report Never Injecting Drugs

Risk Factor	No. HBV Seropositive/No. Tested (%)	P
No. of lifetime sexual partners		
1-99	21/82 (26)	...
100-999	43/143 (30)	...
1000+	164/419 (39)	.006

Penile-anal Intercourse		
0	182/540 (34)	...
1-50	31/77 (40)	...
<hr/>		
≥50	15/26 (58)	.03
<hr/>		

Table 17. Risk Factors for Hepatitis B Virus Infection in 646 US Female Prostitutes Who Report Never Injecting Drugs: Results of Logistic Regression

Risk Factor	Odds Ratio
Human immunodeficiency virus seromarker	8.2
Penile-anal intercourse	3.1
Syphilis seromarker	2.7

This study provides evidence that having rectal intercourse and genital ulcer disease are the major risk factors of HBV infection in women. These findings are consistent with results of other studies that concluded that having receptive anal intercourse was a risk factor for HBV infection among men who have sex with men.

Rectal Intercourse and AIDS: A Historical Perspective

The first clinical descriptions of AIDS were published in 1981 (Friedman-Kien, et al., 1981; Gottlieb, et al., 1981). Almost concurrently, Drew and his colleagues reported that cytomegalovirus (CMV), known to exist in high titer in semen (Lang, et al., 1974), was sexually transmitted among homosexual men (Drew, 1982; Katznelson & Drew, 1984; Mintz, et al., 1983). Katznelson and Drew (1984) concluded "...only receptive anal intercourse correlated either with the initial presence of antibody to CMV, or with seroconversion to CMV during the course of the study...these data suggest that exposure of the rectal mucosa to CMV-infected semen may constitute a major mode of infection with CMV in homosexual men". This conclusion has been confirmed by others (Collier, et al., 1987).

The emphasis of Katznelson and Drew on the unidirectional transmission of semen-borne CMV to the "receptive" partner during rectal intercourse brought attention to the role this practice would play in the spread of AIDS among homosexual men. Indeed, almost all of the epidemiological studies of AIDS strikingly demonstrate that among homosexuals, receptive anal intercourse is quite distinctly the highest risk sexual practice for contracting disease (Boyko, et al, 1986; Darrow, et al., 1987; Kingsley, et al., 1987; Osmond, et al., 1988; Polk, et al., 1987; Winkelstein, et al., 1987). Most authorities place the risk of transmission by an HIV carrier to the receptive partner in unshielded anal intercourse at 2% (Philipson and Posner, 1993).

Perhaps because many physicians are unaware of the extent of heterosexual rectal intercourse, some AIDS authorities initially discounted the significance of receptive anal intercourse in heterosexual AIDS (Guinan and Hardy, 1987). Peterman and Curran, for example,

stated that, "nearly all infected heterosexuals...have no history of receptive anal intercourse" (1986, p. 2222).

The first major analysis of heterosexual AIDS in the United States was by Padian and her associates who studied women whose sexual partners were HIV-infected males. **They found that women who engaged in both vaginal and rectal intercourse placed themselves at triple the risk of HIV infection experienced by women who limited coitus to vaginal intercourse** (Padian, et al., 1987). Similar results were subsequently reported by Sion and colleagues in Brazil, where 75 female partners of HIV-infected bisexual men were studied. Eighteen of 33 women (54.5%) who engaged in rectal as well as vaginal intercourse were infected; 8 of 42 women (19%) who indicated they engaged only in vaginal intercourse were infected (odds ratio 5.1), (Sion, et al., 1988).

In the same year (1988) in an European study, 29 of 104 female partners of HIV-infected men became infected while under observation. Of these infected women, 58.6% had engaged in rectal intercourse; 25.2% did not acknowledge doing so (De Vincenzi, 1988). The group expanded their study to 65 European couples from six countries and determined the risk of transmission of AIDS for heterosexual rectal intercourse was 4.8 (De Vincenzi and Ancelle-Park, 1989). In Italy, the risk was reported to 2.5 for 80 women acknowledging heterosexual rectal intercourse, compared with 288 women engaging in vaginal, but not rectal, sex (D'Arminio-Monforte, et al., 1989). These findings are remarkably consistent: 3.0 (US), 5.1 (Brazil), 4.8 (Europe), 2.5, (Italy); average=3.9.

Genital Ulcer Disease and Receptive Anal Intercourse are the Crucial Risk Factors For the Transmission of AIDS Among Homosexuals

Among homosexual men in the United States, acquisition of AIDS has been primarily associated with multiple sexual partners and with receptive anal intercourse, but the actual mechanisms of sexual transmission have not been defined. As discussed above, studies in Africa that evaluated highly sexually active populations of heterosexual men and women demonstrated an association between HIV infection and genital ulcer disease. Genital ulceration might enhance the transmission of HIV by providing a more accessible portal of entry on contact with genital secretions infected with HIV. In addition, the inflammatory response associated with genital ulcerations may increase the number of activated T lymphocytes at the mucocutaneous entry site.

Although it is logical, an association between genital ulcer disease and HIV infection is hard to evaluate without detailed quantitative descriptions of confounding variables such as past sexual practices, sexual activity, and sexually transmitted diseases. Additionally, evidence showing that genital ulcer disease antedates HIV infection is needed to strengthen the argument that the former predisposes to acquisition of the latter. Between 1983 and 1986, Stramm, et al. (1988) enrolled 200 homosexual men into a study evaluating the microbial causes of acute proctitis. All patients underwent extensive microbiologic and serologic studies and provided detailed descriptions of past sexual practices. Using this population, they assessed the association of HIV infection with historical and serologic evidence of the two most common causes of genital ulceration among homosexual men in the United States, herpes simplex virus (HSV) infection and syphilis. They also retrospectively evaluated these associations among 111 homosexual men who presented voluntarily for counseling and testing for HIV antibody. They found a markedly

increased risk of HIV infection among men with historical and serologic evidence of these two infections. They concluded that the genital ulcer disease antedated the acquisition of HIV infections. They suggested that measures directed at the control of these diseases may reduce the transmission of HIV among homosexual men.

Table 18. Comparison of HIV Seropositive and Seronegative Men with Proctitis

Characteristic	HIV Status		P†
	Seropositive (N=108)	Seronegative (N=92)	
Median age, years	28	25	.006‡
Unmarried, %	98	99	NS
Sexual activity, years			
Median	12	10	NS
No. of sexual partners in month before study			
Median	2	2	NS
Range	0 to > 72	0 to > 100	
Syphilis	35	12	.0003§

*HIV indicates human immunodeficiency virus

†NS indicates not significant

‡Student's *t* test

§Fisher's exact test

Modified from Stramm, et al., 1988

Gential Ulcer Disease and Heterosexual AIDS

Syphilis and chancroid, the two “classical” genital ulcer diseases are clearly associated with both the homosexual and the heterosexual transmission of AIDS. Another disease, genital herpes, is also capable of producing genital ulcers--and such lesions are also implicated in the heterosexual transmission of AIDS. There is a large body of correlative data suggesting that serologic evidence of prior herpes simplex virus infection is associated with an increased risk of AIDS among male homosexuals.

Unlike patients with syphilis and chancroid, patients who have genital herpes are often unaware of their infection. Some patients, however, have ulcers as the major feature of genital herpes. When they do, it can be a conduit for the transmission of HIV-1. Quinn, et al., (1988) surveyed 4,000 patients attending an STD clinic and found that 6.3% of males and 3.0% of women were HIV-1 positive even though they failed to report traditional risk factors for HIV-1 infection. They found that syphilis was positively correlated with HIV-1 seropositivity in men, but not in women. Hook, et al., (1994) followed up on this group and studied genital ulcer disease in the population due to herpes. Although only 2.3% of 546 patients had a history of genital herpes 72% were HSV-1 positive and 56.6% were HSV-2 positive. Among heterosexual men 62.7% of those infected with HIV-1 has antibodies to herpes viruses. **They concluded that genital herpes contributes to increased risk of HIV-1 infection among heterosexuals.** They were particularly impressed with the degree of genital ulceration in their patient population. (An inner city group in Baltimore, MD). Since this non-drug using population of inner city, nonwhite, lower socioeconomic group patients in which STDs are common have sexual encounters with

IDU in the same area, they cautioned that they could serve as an important “bridge” for further transmission of HIV-1 into the heterosexual non-drug using population (Hook, et al., 1992).

Table 19. Association of HSV Infection and Syphilis With HIV Seropositivity Using Logistic Regression to Adjust for Indexes of Sexual Activity*

Predictive Factor	Odds Ratio	P
History of syphilis	3.0	.009
History of genital or anorectal HSV	2.1	.07
Any history of HSV (genital, anal, oral)	2.3	.01
HSV-1 antibody	1.6	.18
HSV-2 antibody	3.3	.0003
Serologic finding of syphilis	8.4	.03

*HSV indicates herpes simplex virus; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; and HATTS, hemagglutination treponemal test for syphilis.

†Controlling for number of sexual partners (lifetime and 6 and 1 mo before study), years of sexual activity, and age.

‡Controlling for number of sexual partners during 2 and 12 mo before study.

Modified from Stramm, et al., 1988.

Crack Cocaine and Heterosexual AIDS

Crack cocaine, an addictive, smokable form of cocaine, gained widespread use in many urban neighborhoods in the US in the mid-1980s, particularly among poor young adults who were members of minority groups. A recent national household survey of drug use found that 1 million Americans, including 1% of those between 18 and 25 had used crack during the previous years (NIDA, DHHS publication no. 92-1887, 1991). Unlike IDU, which is used predominantly by men, the use of crack cocaine is widespread among both men and women. Crack smoking women often exchange sex for money or drugs.

Increasing evidence suggests that the widespread use of crack cocaine has increased the spread of sexually transmitted diseases because of the high-risk sexual practices among crack users. Edlin, et al. (1994) recently did a study of nearly 2,000 young crack smokers. HIV seroprevalence was astonishing especially in women (see Table 20).

Table 20. HIV Seroprevalence among the study participants according to City of Recruitment (% HIV Positive)

City	Women		Men	
	Crack Smokers N=560	Non-Smokers N=406	Crack Smokers N=577	Non-Smokers N=424
NYC	29.6%	9.3%	15.4%	12.7%
Miami	23.0%	6.6%	17.8%	7.4%

As mentioned above, genital ulcer disease is a major risk factor in the transmission of AIDS. Many believe that this the major reason that in Subsaharan Africa AIDS is so rampant in the heterosexual population. After many years of reduction in the number of syphilis and chancroid cases in the United States, the numbers started increasing particularly among homosexuals in the '70's. A major public health effort brought this under control by the mid 1980s. Today, however, genital ulcer disease is rampant among crack cocaine users primarily because these people do not seek medical care and often sell their bodies to support their habits. This major problem needs urgent attention as it is very likely the avenue by which AIDS is circulation among this group of heterosexuals.

Though it has not been definitively proven that controlling STDs can prevent HIV infections, a convincing case can be made that for much of the world, this strategy is currently the most powerful tool available. "In most countries, STD control has been a failure or has not been attempted at all," (Laga, quoted in Cohen, 1993).

The link between STDs and HIV infection seems clear. In a Nairobi study, female to male transmission of HIV was five times more likely when the women had a genital ulcer. In Africa there are "staggering" numbers of STDs in commercial sex workers (Laga, quoted in Cohen, 1993). More than 35% of commercial sex workers in the Ivory Coast and Kenya have gonorrhea, more than 20% have syphilis, and more than 90% are infected with HIV. STDs increase the risk of HIV infection by inducing inflammation which means more white blood cells are present, and white blood cells harbor HIV (Laga, quoted in Cohen, 1993).

Homosexual and Heterosexual Rectal Intercourse: Populations at Risk

The question to be addressed in this section is which is the largest population at risk for AIDS in the United States? Since the most important risk factors are genital ulcer disease and receptive anal intercourse everyone with GUD and/or practices rectal intercourse needs to be addressed. At a conservative minimum, 10% of the female population of the United States engages in rectal intercourse. Based on the most recent population figures there are approximately 90 million American females between the ages of 15-64. If 10% engage in rectal intercourse, roughly 9 million women are at risk for developing AIDS and should be a primary target of any educational efforts from our public health institutions.

How many males are at risk? There are approximately 80 million American males between the ages of 15 and 64. The most conservative analysis would indicate that 5% of American males have substantial homosexual experience although some studies have suggested as many as 10%. If we use 7.5% as the number, 6 million American males engage in substantial homosexual activity. However, not all male homosexuals engage in rectal intercourse and an even smaller number engage in receptive anal intercourse which is the key risk factor. Most studies on a national basis suggest that less than 50% of American homosexuals engage in rectal intercourse of the receptive kind. This would reduce the 6 million figure to 3 million or one-third the number of women at risk for AIDS.

Table 21. Insertive *Versus* Receptive Anal Coitus Among San Francisco Homosexual Men⁺

Variable	% White males	% Black males
Performing anal intercourse	(n = 575)	(n = 111)
Never	22	10
Once or a few times	16	11
More than a few times	40	37
Once a week or more	22	42
Receiving anal intercourse	(n = 574)	(n = 111)
Never	33	22
Once or a few times	18	20
More than a few times	30	32
Once a week or more	19	26
Favorite sexual activity	(n = 552)	(n = 108)
Performing anal intercourse	26	44
Receiving anal intercourse	5	11

⁺Adapted from Bell and Winberg (1978)

Why is it then that women are effectively cul-de-sacs for AIDS whereas males continue to propagate the disease? Here again, we need to turn to the sociology of the groups involved as well as the scientific data we have on infectivity. The major non IDU method of transmitting AIDS is through infected semen. Thus, an infected male (whether he obtained the disease from an blood transfusion, IDU, or from receptive anal intercourse) can transmit the disease through infected semen which I have pointed out above has materials within it that degrade colonic mucosa and effectively introduce HIV-1 directly into the bloodstream. Women, on the other hand, who have AIDS primarily transmit the disease through vaginal intercourse an extremely

poor way of transmitting disease. The number of males who get AIDS from females in the United States from vaginal intercourse is exceedingly small (it is surely less than 500, and could be less than 100). Additionally, the women who get AIDS in the United States are often the partners of bisexual men whose only sexual partner is their infected husband. The exception to this, as I've pointed out, is among crack/cocaine users where women with AIDS and genital ulcer disease transmit the disease with some frequency to males during vaginal intercourse particularly if the male also has genital ulcer disease.

These arguments are made to attempt to explain three issues: 1) Why 95% of the people with AIDS in the United States are males. 2) Why western females tend to be terminators in infectivity chains. 3) Why homosexual and bisexual males engaging in both receptive and insertive anal intercourse are chain initiators and propagators. From this understanding we can approach our educational efforts which it follows should be directed toward receptive anal intercourse and the treatment of genital ulcer disease.

POPULATION RISKS

US Population	260,000,000
Females	135,000,000
Females 15-64	90,000,000
10% Rectal Intercourse	9,000,000 at risk
Males	125,000,000
Males 15-64	80,000,000
7.5% Homosexual	6,000,000
50% Anal Receptive	3,000,000 at risk

Limited Success of Most AIDS Prevention Programs Among Heterosexuals

In a national survey of AIDS related risk factors among the heterosexual population, the National AIDS Behavioral Survey obtained data from 10,630 respondents. Between 15 and 31 percent of heterosexuals and 20 and 41 percent in cities with a high prevalence of AIDS reported an HIV risk factor. Condom use was relatively low. Only 17 percent of those with multiple sexual partners and 12.6 percent of those with risky sexual partners, and 10.8 percent of untested transfusion recipients used condoms all the time. They concluded that new public health strategies are needed for these specific risk groups (Catania, et al., 1992).

Table 21. Condom use during vaginal intercourse among sexually active heterosexual adults within the three largest risk groups (high-risk cities sample).

Risk Group	<i>n</i> *	Condom use	Percent
Multiple partners†	803	None	37.8
		Low	28.1
		Moderate	17.1
		High	17.0
Risky partner‡	229	None	69.9
		Low	13.7
		Moderate	3.9
		High	12.6
Transfusion§	90	None	74.5
		Low	6.2
		Moderate	8.5
		High	10.8

*Weighted *n*. †Multiple partners include the following risk factors, multiple partners only, multiple partners and a risky partner, multiple partners and transfusion recipient, and the combination of these three factors. ‡Risky partner only, risky partner and transfusion recipient. §Transfusion recipient only, Catania, et al., 1992.

The number of condoms sold in the U.S. is around 500 million or 5 for every sexually active male. At two sexual encounters a week, if everyone used condoms, these 500 million would be used up well before February 1 of each year.

Des Jarlais, et al., in a recent "Sounding Board" in the *New England of Medicine* stated, "We do not recommend emphasizing the universality of HIV risk. Arousing fear is, at best, an imprecise method of changing behavior and attitudes" (Des Jarlais, et al., 1994).

Des Jarlais, et al., went on to argue that given the limited resources for HIV prevention, it is impossible to implement intensive programs of behavioral change aimed at all the areas and groups with low HIV seroprevalence. "In such environments, the primary public health objective should be to avert the extremely rapid transmission of HIV that has occurred among men who have sex with men and among IDU" (Des Jarlais, et al., 1994).

Recommendations concerning the use of condoms and targeted interventions for high risk groups in terms of genital ulcer disease are made more in terms of what should be done rather than what is known to truly work. Despite repeated pronouncements about the benefits of HIV prevention in the promotion of safer sex, "there are few prospective data demonstrating the effectiveness of condoms in reducing the transmission of HIV" (Johnson, 1991). In particular, the European Study Group which analyzed a very large cohort of people discordant for HIV at the beginning of the study demonstrated that even among repeatedly counseled couples, known to be exposed to HIV, nearly half continued to have unprotected intercourse. Among the minority who did use condoms consistently, the study provided evidence that consistently appropriately used condoms do reduce the rate of HIV transmission. However, the study raises the question of why some people adopt risk reduction strategies and others do not. We do not yet have a clear idea of

how counseling about risk reductions varies among different centers and what components of such counseling are most effective in promoting a sustained change in behavior (DeVincenzi, et al., 1994).

In an editorial in the same issue of the *NEJM*, Anne Johnson wrote "the difficulties of compliance with condom use even in a cohort of research subjects should make us pause and think about crusades for the supremacy of the condom in preventing the transmission of HIV". As mentioned earlier, selection of sexual partner is three or four orders of magnitude more effective than using condoms in reducing risk. In a letter to the editor published a month later, Nancy Padian and her colleagues at the University of California, San Francisco reported on their studies of patients discordant for HIV infection (this study has not yet been published in its entirety). She wrote that the major distinction in their counseling has been on explaining to the partners the risk of rectal intercourse which was at 39% frequency when their couples entered the study and 8% after they had been followed for several years ($P < .0001$). As in her studies described elsewhere, she argues that the fundamental problem is counseling people concerning anal intercourse.

Condom use in general has been a difficult sell to the American public. Most people argue that condoms reduce sexual pleasure. There are many studies that document that even when they are distributed free on college campuses, many students still engage in unsafe sex. Condoms are more popular in other countries, notably Japan, though in part it is because Japan has banned oral contraceptives, and have thus increased the contraceptive value of condoms (Philipson and Posner, 1993).

Conclusions

There are extraordinarily complex factors involved in the heterosexual transmission of AIDS. Fifteen years into the epidemic, in the western developed world, over 93% of the people that are HIV positive or who have AIDS are gay and bisexual men and or IDU. While it is possible that other factors that we still do not understand are involved in the transmission of the virus in these populations, the virus is most likely transmitted either directly by needles and drug products or through rectal intercourse almost always of the receptive type. This seems to be a reasonable conclusion from the extraordinary literature that exists on this subject. Most authorities now see the epidemic as expanding, moving on a slow timescale, largely centered in urban centers in poor communities and in socially marginalized groups (Anderson, 1993). Des Jarlais, whom I quoted above, argues that efforts to stamp out the epidemic should have a tighter focus saying, "the epidemic is settling into spacially and socially isolated groups." There is some fear that the AIDS prevention message will become a drug abuse prevention message.

Table 22.

<u>CIRCUMSTANCE</u>	<u>PROBLEM</u>	<u>APPROACH</u>
IV Drugs	Contaminated Needles	Education and Free Needles
Receptive Anal Intercourse	Virus → Rectal Mucosa	Education and Condoms
Crack Cocaine Users with STD	Genital Ulcer Disease	Education and STD Clinics and Contact Notification

Risk Reduction Strategies

Strategy	Log Reduction in HIV Risk	Capability of Individual to Execute	Possibility for Public Program
Careful selection of low risk partner or HIV negative partner	3 or more	Useful for long term committed relationships; requires that prospective sex partners have a meaningful discussion; Difficult in many settings; not a useful approach for persons with multiple partners	Since most sex and drug behaviors are hidden, programs using this as a strategy are difficult to implement; should be a component; useful for the vast majority of persons already at low risk
STD Control	1	NA	Useful for treatable STDs (syphilis, gc, chlamydia, chancroid); not useful for HPV or herpes
Condoms	1	Allows men to have control over risk; more difficult for women	Easy, sellable message; easy to implement; technology inexpensive
Cessation of receptive anal intercourse	1	Can be incorporated into behaviors of most persons	Fairly easy to target programs to men; difficult to identify women with this behavior

Adapted from Haley (personal communication)

We need to focus on the problems: contaminated needles, receptive anal intercourse (both homosexual and heterosexual) and the treatment of genital ulcer disease. In education, we should not focus on the bulk of the population who are at extremely low risk but rather on selected groups. These recommendations are free of political bias and make sense.

The view that much of the AIDS prevention program has been largely misdirected is now appreciated by more and more people. Although AIDS spread quickly among intravenous drug users and homosexuals, the social circles these groups travel in are rigidly circumscribed and most now believe it will not spread widely in the heterosexual population. "Rather than pretend that AIDS affects everyone, we would be better advised to concentrate our efforts on those most at risk" (Kolata, 1995a). Rosenberg, et al. (1994) have emphasized that the age of onset of HIV infection has declined substantially over the past decade and that our major educational efforts need to be redirected toward younger and younger people.

Among the seven percent of Americans who may have acquired AIDS heterosexually, the overwhelming majority are women. Relatively few American men have acquired this disease heterosexually. Even if all the cases currently ascribed to heterosexual risk were correctly categorized there are still five times as many American men killed by lightning each year. While the impact on each individual is profound, the impact of female --> male transmission on society remains modest. With women, however, the numbers are more troublesome and while they represent a public health concern, it is not likely to become a public health catastrophe. In women our efforts should be primarily educational at the level of protection during rectal intercourse. Our educational efforts should be re-directed not toward the 95% of the sexually active population but primarily focused on women who engage in rectal intercourse. These

women need to be strongly urged to use protection in this circumstance. Finally, in the inner city, especially among crack cocaine users, a major effort is needed to treat genital ulcer disease which is highly correlated with the heterosexual spread of AIDS in these populations. With that exception, by and large, other means of transmission at least in the Western Developed World are modest at best and well within the risks that we accept in every day life.

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