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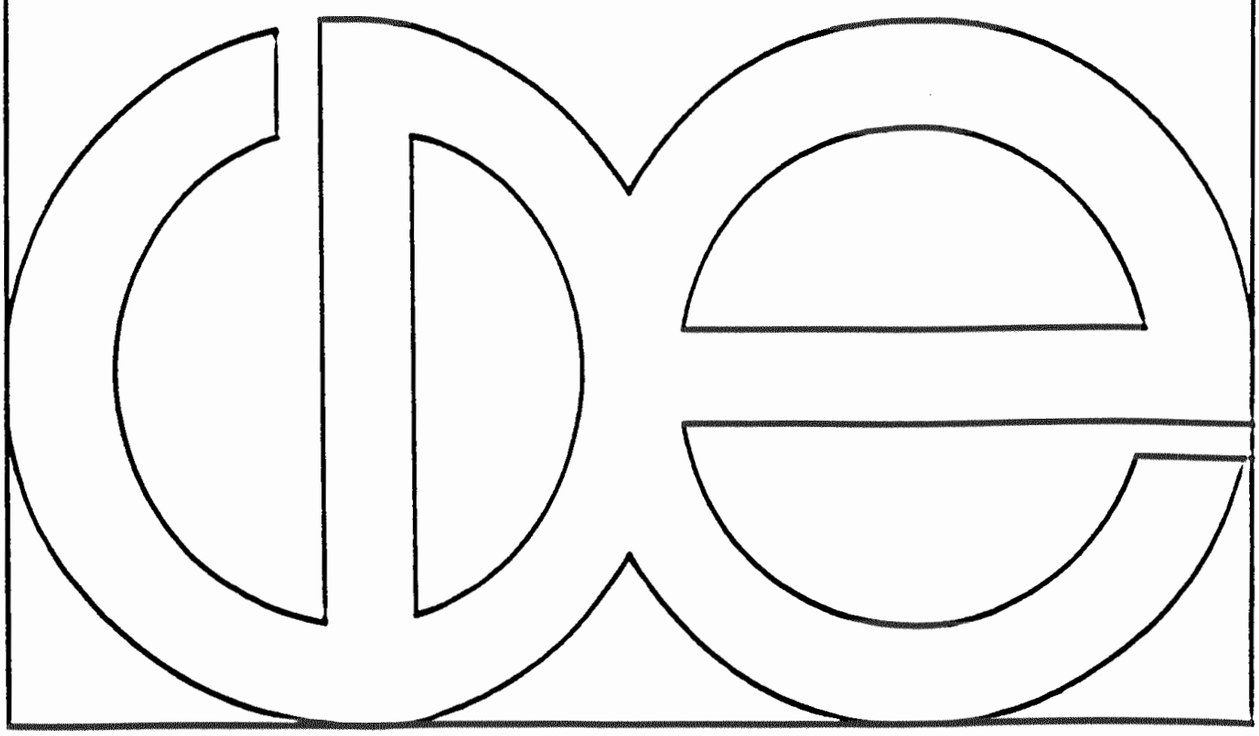

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PATTERNS IN SEXUAL BEHAVIOR AND THE SPREAD

Acquired Immune Deficiency Syndrome - AIDS - is the result of exposure to the Human Immunodeficiency Virus, or HIV. The fundamental question is the extent to which this virus will spread within the American population. In order to answer this question, we need four pieces of information.

1. How many people are currently infected? What is the prevalence of the virus in the American population?
2. How is the infection spread? What behaviors transmit the virus?
3. What is the frequency in the population of these behaviors?
4. What are the characteristics of the social networks in which people who engage in these behaviors are involved?

We will consider each of these questions in turn, and share with you the relevant, recent data we have been able to locate.

I. Prevalence

With regard to the first question, we do not know how many persons in the American population are infected. There have been numerous studies of small samples of special populations, including clients of STD clinics, prostitutes, and men and women entering correctional facilities. These studies report widely varying estimates.

The largest population which has been studied is military personnel on active duty. Between January 1986 and April 1988, the Department of Defense screened 1,752,191 persons. The presence of the HIV-antibody was confirmed (by Western Blot test) in 2,232 persons. This yields a prevalence of 1.3 persons per thousand (MMWR 37(30): 461-463). Personnel at the Centers for Disease Control in Atlanta believe that this is an underestimate of the seroprevalence of the virus in the American population. Both gay men and intravenous drug users are

underrepresented in the military, primarily due to self-selection; such persons are unlikely to attempt to enlist. Also, any recruit who tests positive for the presence of the HIV-antibody is denied enlistment into the military. So the active duty population contains proportionately fewer persons from the two largest risk groups.

Given this limited information about the prevalence of HIV infection, inferences about the risk of infection and the likely spread of the virus have been made from the characteristics of those persons who have been diagnosed as having Acquired Immune Deficiency Syndrome. As of March 31, 1992, 218,301 cases of AIDS have been reported to the Centers for Disease Control. Of those cases, 46,611 were reported in the preceding twelve months, between April 1, 1991 and March 31, 1992 (CDC, April 1992). That represents 21.4 percent of the cases reported since the CDC began keeping records in 1981. The current annual rate of new cases is 18 per 100,000 persons.

Looking at all cases of AIDS reported between 1981 and the fall of 1991, the classification of persons by risk group is as follows:

[Figure 1]

As seen in Figure 1, 58 percent of the cases involve homosexual or bisexual males. An additional 6 percent involve heterosexuals. All of these cases are assumed to have occurred through sexual transmission. Twenty-nine percent of the cases involve IV drug users; many of these men and women are sexually active, so an unknown proportion of them may have become infected via sexual transmission.

There are two problems with using these data to make inferences about the risk of infection. First, it is estimated that at least 10 percent of the cases of AIDS which occur in the United States are not reported (MMWR 37(14): 223-226). We do not know whether unreported cases have the same characteristics as reported cases. It has been suggested, for example, that

cases of AIDS among women are less likely to be diagnosed than cases among men. Second, reported cases of AIDS do not accurately reflect current levels of HIV infection in the United States. People being diagnosed with AIDS this year were infected from two to seven years ago. The characteristics of those who are infected may have changed in the past few years. Thus, data about cases diagnosed this year may overestimate the rate of transmission by sexual contact involving two men and underestimate the rate of transmission by sexual contact involving a man and a woman.

The problems notwithstanding, the data indicate that sexual contact accounts for at least two-thirds of the cases of AIDS which are reported to the CDC. Clearly, if we are to understand patterns in the transmission of the virus, we need to understand patterns in sexual behavior.

II. Sexual Behavior and HIV Infection

The human immunodeficiency virus is transmitted by the entry of infected body fluids into the blood stream of an uninfected person. It appears that direct contact between blood, semen or other fluids containing the virus and the blood cells of an uninfected person are necessary for transmission to occur.

Any sexual behavior that involves contact with mucous membranes and exchange of body fluids may permit HIV transmission. However, it is impossible to directly evaluate the likelihood of transmission by specific sexual practices. As a result, we must rely on reports by individuals of their sexual activities, and on inferences about patterns in sexual behavior in the population at large. Furthermore, most sexually active people engage in more than one activity, making it difficult to isolate the risk of a specific sexual behavior.

A. Male-Male Sexual Contacts

In order to make intelligent predictions about the spread of the human immunodeficiency virus within the gay/bisexual community, we need three pieces of information: 1) the size of that

population, 2) the frequency of risky sexual behaviors, and 3) the incidence of sexual contacts per unit time.

With regard to the size of the gay/bisexual population, data are available from three studies of large, apparently representative samples. In 1970, the National Opinion Research Center carried out a survey for the Kinsey Institute. NORC used a multistage area probability sample of blocks; within the selected blocks, interviewers were to complete interviews with specified types of respondents (men 21 -29, men 30 and over, unemployed women and employed women). A careful comparison of sample characteristics with 1970 census data indicates considerable agreement (Fay, et al., 1989). Respondents completed a self-administered questionnaire which asked about their sexual behavior. Specifically, each person was asked whether they had had "a sexual experience with someone of the same sex, when either you or your partner came to a sexual climax?" If the respondent had had such an experience, s/he was asked how old s/he was the first and last times, and how often such contact occurred. The results are displayed in Table 1.

[Table 1]

Due to the nature of the questions and sample, the authors describe these figures as minimum estimates. The data indicate that a minimum of 20.3 percent of adult men had sexual contact to orgasm with another man at some time in their adult lives. Of the 1450 male respondents, 1.4 percent reported adult (age 20+) homosexual contacts whose frequency was characterized as "fairly often." An additional 1.9 percent had such experiences whose frequency was described as "occasionally."

The data reported by Fay and his colleagues is of particular interest because it assesses sexual orientation with a behavioral measure. Most studies of sexual orientation ask the respondent to categorize him/herself as heterosexual, homosexual or bisexual. Some gay, lesbian,

or bisexual respondents may be unwilling to answer such a question honestly, resulting in an underestimate of the size of that population. Such a measure was used by Trocki in a survey of a probability sample of households from one county in the San Francisco Bay area. These data were collected in late 1988 and early 1989. Questions about sexual orientation and behavior were included in a self-administered questionnaire. Among the men, 97 percent classified themselves as heterosexual, 2 percent as bisexual and 1 percent as homosexual.

The 1989 General Social Survey conducted by NORC asked a probability sample of the adult population of the United States four questions about sexual behavior. 98.4 percent of the sexually active adults reported that they were exclusively heterosexual in the year preceding the survey (Smith 1991).

Taken together, these results suggest that two to 3 percent of the males in the United States engage in sex with other males in any given year, and that up to 20 percent will have at least one sexual contact with another male sometime during their lifetimes.

In sexual contacts involving two men, the main route of transmission of HIV is assumed to be anal intercourse. Transmission is most likely when the infected man plays the active or insertor role. The mucosa lining the rectum is delicate and tears easily during anal intercourse. This would allow semen containing the virus to enter the bloodstream of the receptive partner. Data from a study of a random sample of 785 gay men in San Francisco indicate the relative risk of infection associated with anal sex. Men who engaged in receptive anal intercourse were 7.9 times more likely to be seropositive than men who did not engage in this behavior (Darrow et al. 1987).

Thus, we need to know the frequency with which men engage in anal intercourse with other men. There is little data available concerning the frequency with which adults engage in specific sexual behaviors. A useful concept in this context is that of sexual scripts or scenarios

(Gagnon and Simon 1973; DeLamater 1987). Couples who engage in sexual intimacy with some frequency typically develop a pattern in their sexual interactions, and follow this pattern each time they have sex. Thus, they engage in some sexual activities each time they are together, and rarely or never engage in other behaviors. Relevant data are reported by Blumstein and Schwartz (1983), based on their study of couples. They obtained questionnaire data from volunteer samples of gay and lesbian couples, and from heterosexual cohabiting and married couples. Virtually all of the respondents were from the Seattle, San Francisco and New York City areas. Both members of 957 gay couples completed a 38 page questionnaire; among these couples, the frequency of anal intercourse was as follows:

Rarely or never	30 %
Regularly, alternating receptor role	27 %
Regularly, one is always receptor	43 %

Although oral-genital contact has received less attention, it is likely that it can transmit HIV infection. Since oral-genital sexual behavior transmits other infectious diseases, such as syphilis, it seems likely that this behavior transmits HIV infection as well. Again, transmission would be more likely when an infected man plays the active or insertor role. A study of gay and bisexual men at a community health center found that the rate of seroconversion among men engaging in receptive orogenital contact at least once a month was 6.33, compared to men who never engaged in this behavior. The rate of seroconversion was 4.57 among men who engaged in this behavior less than once a month, compared to men who never engaged in the behavior (McCusker 1988).

Two recent studies report the frequency with which gay men engage in unprotected anal and oral intercourse (Kelly 1990; Hays 1990). These data are displayed in Table 2.

[Table 2]

These results indicate that unprotected receptive anal intercourse occurs fairly frequently, as does unprotected receptive oral intercourse.

The risk of infection is greater for those men who have sexual contact with a large number of male partners. The best evidence for this relationship comes from a study conducted by Winkelstein and his colleagues (1987). They selected a multistage probability sample of men from the San Francisco Bay area. The sample was selected from census tracts with the highest incidence of AIDS. They interviewed 1,034 men ages 25 to 54 and obtained a blood sample from each man. The initial data were collected between June of 1984 and January of 1985. The rates of seropositivity were as follows. Among heterosexual men, none tested positively for HIV antibodies. Among gay and bisexual men who reported no partners in the preceding two years, the rate of seropositivity was 18 percent. Among gay and bisexual men who reported 50 or more sexual partners in the preceding two years, the rate of seropositivity was 70 percent. A more recent study of gay and bisexual men in New York City compared men who were seropositive and men who were not. Seropositive men reported a significantly larger number of male sexual partners during their lifetime than men who were not seropositive (Meyer-Bahlburg et al. 1991).

Finally, we need data about the number of persons with whom gay and bisexual men have sexual contact per unit time. Blumstein and Schwartz (1983) asked each of their respondents whether they had had any sexual contacts outside their established relationship. The data for gay men are reported in Table 3.

[Table 3]

As you can see, 82 percent of these men reported at least one sexual contact other than their partner; 43 percent report more than 20 other partners. The incidence of nonmonogamous sex appears to be quite high. At the same time, we have to be cautious in making generalizations

from these data, since they reflect contacts since the beginning of the current relationship; the time period covered by these reports ranges from a few weeks to many years.

Winkelstein has reported data on number of sexual partners among gay, bisexual and heterosexual men from his study in San Francisco. Each man was asked how many sexual partners he had in the period January through June of 1984. Thus, in these data the time period is constant, covering six months. The men were interviewed within six months of June 1984, so their reports should be reliable. The results are displayed in Table 4.

[Table 4]

At this point, we want to focus on the first two columns of the table. First, note that only small percentages of the gay and bisexual men report having no male partners during the six-month period. Second, the distributions of number of male partners reported by gay and bisexual men are very similar. Third, you can see that about 40 percent of each group reports having 5 or more partners during the six-month period.

In conclusion, these data suggest that the potential for transmitting HIV sexually within the gay community is high. There is a high frequency both of anal intercourse, and of casual sexual contacts.

B. Male-Female Sexual Contacts

A much smaller percentage of AIDS cases involves heterosexual transmission. Heterosexual transmission accounts for 6 percent of the cases portrayed in Figure 1. One-half of these cases are women who are sexual partners of male IV drug users. The relative size of this group is increasing steadily. An analysis of cases of AIDS among women from 1981 to 1986 reported that women infected via heterosexual contact increased from 12 percent of the total in 1982 to 26 percent of the total number of cases among women in 1986 (Guinan and Hardy 1987). In the year from April 1, 1991 to March 31, 1992, women infected via heterosexual

contact accounted for 37 percent of the total number of cases among women.

A study of the female partners of men infected with the virus suggests that the likelihood of male to female transmission is highly variable. The data indicate that transmission occurred in some cases after only a few sexual contacts, and did not occur in other cases despite hundreds of contacts (Allen and Curran 1988). In another study of 78 female sex partners of HIV positive men, two of the women became seropositive after only one act of unprotected intercourse (Johnson 1989).

It is often assumed that these women become infected as a result of vaginal intercourse. It is not clear how readily the virus can be transmitted from an infected man to an uninfected woman via this route. In anal intercourse, tears in the mucous lining the rectum are the likely route by which the virus reaches the bloodstream. Such tears should be much less likely in vaginal tissue, both because the tissue is more elastic and because of the lubrication which often accompanies intercourse.

It is possible that anal intercourse is a primary route of transmission among heterosexuals. Several studies of nonrandom samples report substantial frequencies of this behavior. These results are displayed in Table 5.

[Table 5]

According to these data, nine percent of the women surveyed had engaged in anal intercourse recently, 25 percent had engaged in it in their current relationship, and 40 percent of white woman had engaged in it at least once in their lives. Two studies report that women who engage in anal intercourse are at greater risk of HIV infection. In one of these, Padian and her colleagues (1987) studied 97 female partners of infected men. Twenty-three percent of the women were infected; women who had engaged in anal intercourse were 2.3 times more likely to become infected than women who did not engage in this behavior.

The human immunodeficiency virus can also be passed from an infected woman to an uninfected man. The virus has been identified in the vaginal secretions of infected women. Cases of AIDS involving female-to-male transmission comprise about 3 percent of the total number of reported cases among men. It appears that female-to-male transmission is much less likely than male-to-female transmission. In a survey of the heterosexual partners of HIV infected persons, the risk of male-to-female transmission was 17.5 times greater than the risk of female-to-male transmission. Only one case of the latter was observed, and this couple reported penile and vaginal bleeding during intercourse (Padian et al. 1991).

In the past four years, several studies have been published which include data on number of sexual partners reported by adults. These results are summarized in Table 6.

[Table 6]

The top panel displays the total number of partners reported by men and by women in the 12 months preceding the survey. The data published in MMWR are from the national sample surveyed by NORC. The data reported by Trocki are from a probability sample of adults from a single county in the San Francisco Bay area. In these two samples, the vast majority of men and women report either zero or one sexual partner in the preceding year. In both samples, only 9 percent of the women and sixteen percent of the men report more than one partner. By comparison, in Winkelstein's study of men in the San Francisco area, 71 percent of the gay men and 65 percent of the bisexual men reported two or more partners in the preceding six months.

The bottom panel of Table 6 displays the results of two studies which obtained reports from women of the number of male sexual partners. DeBuono (1990) asked women about the number of partners in the preceding 12 months; 60 percent of the respondents reported no partners or one partner. Pratt (1990) asked women how many male partners they had ever had; one-third of the respondents report having four or more partners.

These results suggest that relatively few heterosexual men and women are at risk of HIV infection as a result of having multiple sexual partners per unit time.

III. Social Networks and HIV Infection

Within the past few years, the proportion of cases of AIDS involving heterosexual transmission has been growing. How far will the virus spread?

Some concepts which are very useful in thinking about this question are found in the rapidly developing sociological literature on social networks. Interactions between two people create a bond or tie between them. All of the contacts between members of a group or population constitute a social network. Figure 2 displays two very simple networks.

[Figure 2]

Sociologists distinguish between two types of networks, those which are loosely knit and those which are dense. In a loosely knit network, members are as likely to interact with nonmembers as they are to interact with other members of the group or population. In a dense network, on the other hand, members are much more likely to interact with other members than with nonmembers. The network on the left side of Figure 2 is loosely knit, whereas the network on the right side is dense.

If the networks formed by the sexual contacts in those groups where HIV infection is prevalent are loosely knit, then the virus will spread into currently uninfected groups. In general, the more loosely knit the network, the faster the spread will occur. This is the reason why there is great concern about so-called "casual sex" - sexual contacts with strangers. On the other hand, if the networks of gay and bisexual men and IV drug users are dense, and they have few or no sexual contacts with nonmembers, AIDS may be epidemic within these groups and yet have relatively little impact on other groups. So far, the geographic areas of high concentration of reported cases of AIDS are those with large populations of gay and bisexual men and IV drug

users. This suggests that the networks in which these people are embedded are relatively dense.

Thus we need data about the nature of the networks formed by sexual interactions. Of particular concern is the number of men who have sexual contacts with both men and women. These men are potentially the principal route of transmission of the virus into the heterosexual population. Only limited information is available. A recent study of a purposive sample provides some relevant data. Borgotta and his colleagues (1987) drew a sample from selected census tracts in Seattle, Washington. The tracts selected were those with a high percentage of single persons. Computer-assisted telephone interviews were conducted with 386 respondents. Each participant was asked to report the gender of his/her sexual partners for the past five years. The results are displayed in Table 7.

[Table 7]

The results indicate that the vast majority, about 90 percent of both men and women, engage in sexual activity exclusively with members of one gender. About 10 percent report partners of both genders.

We also need to know how many male and female partners a bisexual male has. Winkelstein's study of men living in the San Francisco area provides virtually the only relevant data, which are presented in Table 4.

[Table 4]

Looking at the two columns in the middle of the table, we see that two-thirds of the bisexual men had no female partners in the six-month period. Of the remainder, 15 percent had one female partner and 17 percent reported two or more partners in the preceding six months.

On a related topic, we have no idea how many males have sexual contacts with male or female prostitutes. Data from observational studies of massage parlors and from reports of arrests for prostitution-related offenses suggest that the customers are often white, middle-class

males. These men could provide a route for transmission of the virus into the heterosexual population. We have almost no information about the number of escorts, male or female, nor about their sexual contacts. A recent study of 211 male street prostitutes in New Orleans presents relevant results (Morse et al. 1991). The findings suggest that these prostitutes do serve as a route for HIV infection into populations with currently low rates of infection. They do so both through contacts with non-customer sexual partners and through contacts with customers and thus to spouses and sexual partners of these people.

Summary

We began with four questions. Let us summarize the answers based on the literature we have reviewed.

1. How many people are currently infected? The data suggest that at least one person out of every 1,000 adults in the United States is infected with the human immunodeficiency virus.

2. How is the infection spread? The data on diagnosed cases of AIDS indicates that at least 64 percent of the cases reported to the Centers for Disease Control involve sexual transmission. In order to respond effectively to HIV infection we must focus on sexual behavior.

3. What is the frequency of the sexual behaviors which are capable of transmitting the virus? With regard to male-male contacts, the results suggest that 2-3 percent of the adult males in the United States have sexual contact with another male in a given year. Seventy percent of the gay couples in one survey reported receptive anal intercourse. Finally, data collected in the mid-1980s indicate that most gay and bisexual men had multiple partners within the preceding six months.

In male-female contacts, the route of transmission may be vaginal, oral or anal intercourse. Limited data suggest that these behaviors are very common, and that large majorities

of both men and women have multiple partners in a given year. The data suggest that rapid spread of the virus in the heterosexual population is a serious possibility.

4. What type of social networks are formed by these sexual contacts? Most diagnosed cases of AIDS are concentrated geographically, which suggests that the social networks of gay men and IV drug users are fairly dense. This may limit the spread of the virus into the larger population. On the other hand, the data suggest that one-third of the bisexual men have female partners; if these contacts cross group boundaries, the virus may be spreading rapidly into the population at large.

The evidence leads us to conclude that there is some risk of HIV infection for every sexually-active person. Since there is no vaccine which can eliminate the risk, the best we can do is to educate everyone about this risk. We should urge youth, single people of all ages, and other sexually active populations to use condoms, avoid anal intercourse, and to avoid sexual activity with strangers.

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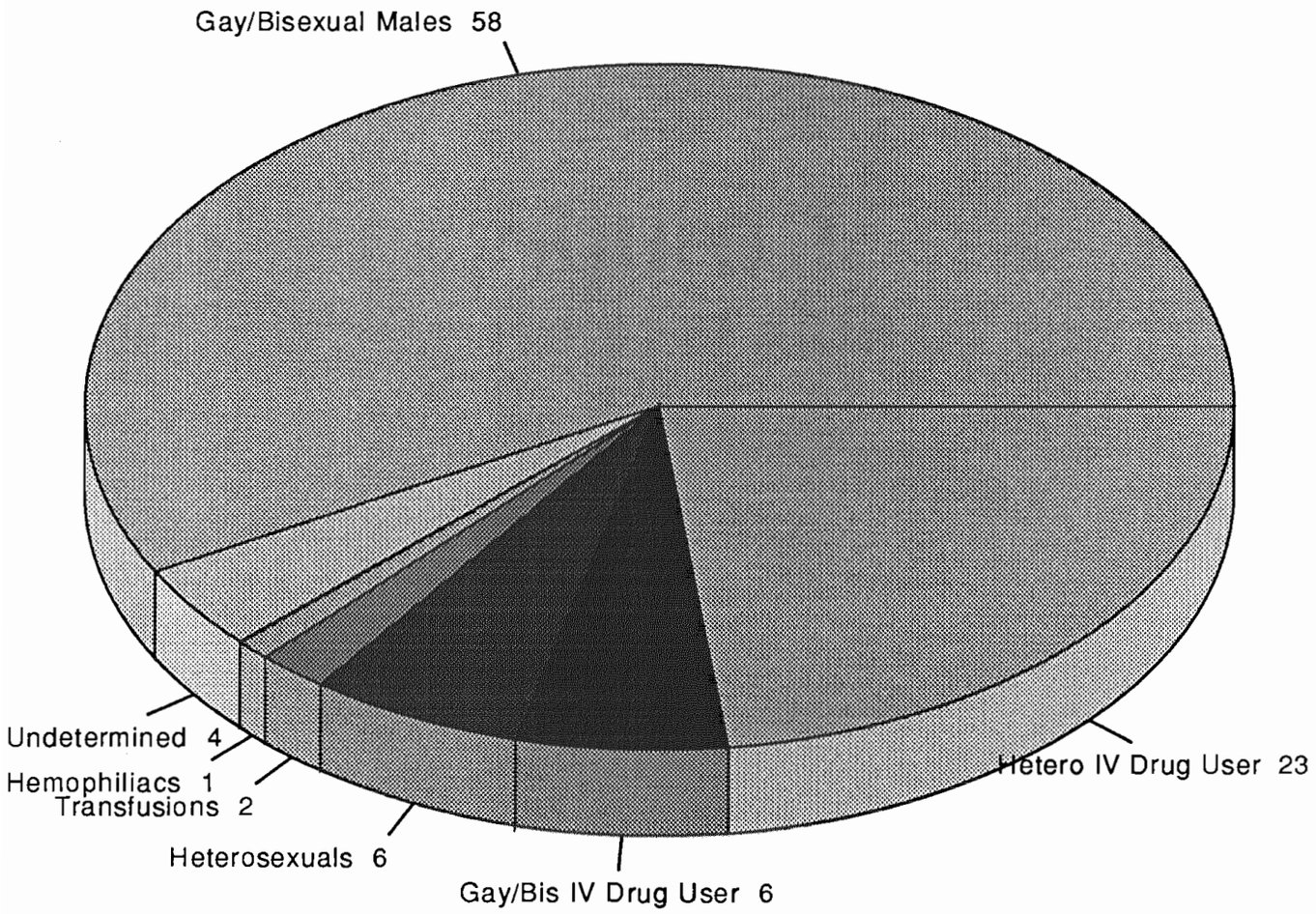
Figure 1

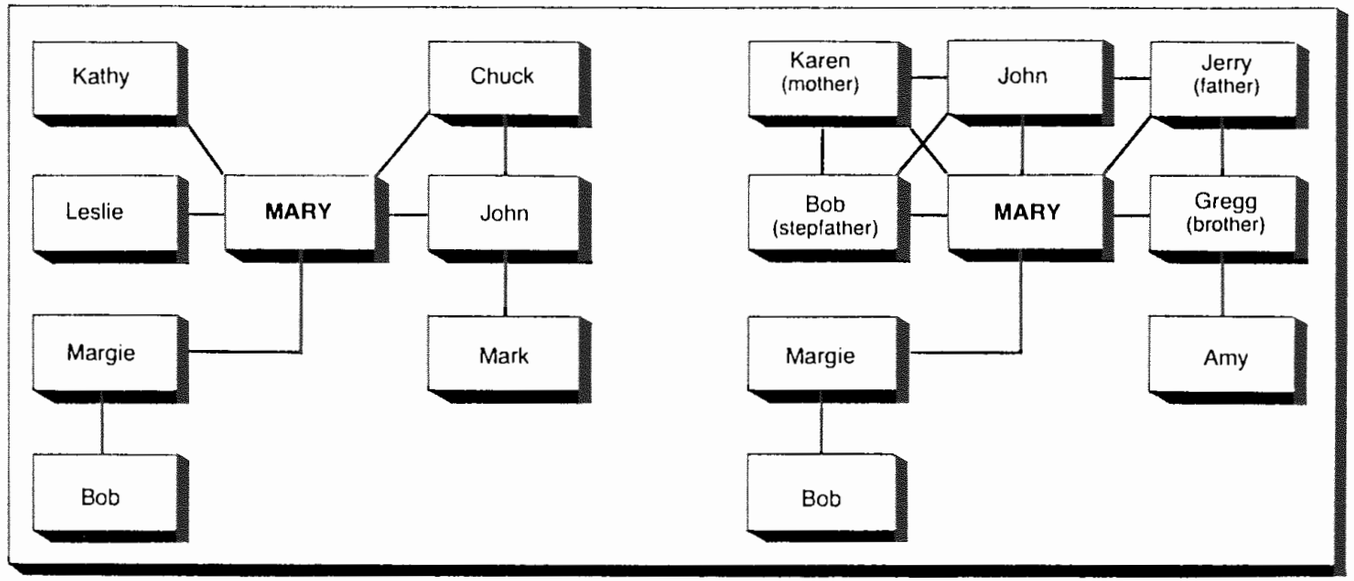
Adult/Adolescent Cases of AIDS by Risk Group



Source: Centers for Disease Control

Figure 2

The Density of Social Networks



Source: Michener, DeLamater and Schwartz, 1990

Table 1

Male Homosexual Experience by Age of Last Contact and Frequency of Contact

Data Collected in 1970
N=1450

Age at Last Contact	Frequency of Contact					
	Once	Twice	Rare	Occas.	Fairly Often	Total
<15	2.9%	1.2%	1.4%	2.2%	0.6%	8.4%
15-19	0.9	0.8	1.2	1.3	0.9	5.2
20+	0.8	0.9	1.8	1.9	1.4	6.7
Total	4.6	2.9	4.4	5.5	2.9	20.3

Source: Fay et al. (1989), Table 2G

Table 2

Percentage of Homosexual Men Reporting Unprotected Anal and Oral Intercourse

Source	N	Time Period	Unprotected Anal Intercourse		Unprotected Oral Intercourse	
			Insertive	Receptive	Insertive	Receptive
Kelly (1990)	352	2 months	25.0%	23.0%	35.0%[a]	29.0%[a]
Hays (1990)	99	6 months	34.0	32.0	24.0[b] 83.0[c]	19.0[b] 82.0[c]

[a] Fluid exchanged
[b] With ejaculation
[c] Without ejaculation

Table 3

Number of Sexual Partners Outside Relationship Reported by Homosexual Men

Volunteer Sample
N=1914

Number of Partners	Percent Reporting
None	17.0%[a]
1	7.0[b]
2-5	20.0
6-20	30.0
20+	43.0
	100%

[a] Percent of total sample
[b] Percentages of respondents reporting outside contact

Source: Blumstein & Schwartz (1983)

TABLE 4

Numbers and Percentages of Male and Female Sexual Partners of Homosexual, Bisexual, and Heterosexual Men in an Area of San Francisco, January to June 1984*

	Homosexual Men (N=641)	Bisexual Men (N=173)		Heterosexual Men (N=212)
No. of Partners	No. (%) of Male Partners	No. (%) of Male Partners	No. (%) of Female Partners	No. (%) of Female Partners
0	46 (7.2)	24 (13.9)	117 (67.6)	12 (5.7)
1	137 (21.4)	36 (20.8)	27 (15.6)	99 (46.7)
2-4	182 (28.4)	44 (25.4)	23 (13.3)	75 (35.4)
5-9	104 (16.2)	32 (18.5)	2 (1.2)	20 (9.4)
≥10	172 (26.8)	37 (21.4)	4 (2.3)	6 (2.8)

*Six subjects were not included because of missing data.

Source: Winkelstein, et al. 1987.

Table 5

Percentage of Heterosexual Women Reporting Anal Intercourse and Fellatio

Source	N	Time Period	Anal Intercourse	Fellatio
Wyatt (1988a,b)	122 White 64 Black	Ever Ever	43.0% 21.0	93.0% 65.0
Blumstein & Schwartz (1983)	129	During Relationship	25.0	
DeBuono[a] (1990)	132	Currently	9.1	86.3

[a] 1989 sample

Table 6

Number of Sexual Partners Reported by Adults

Source	N	Gender	Time Period
MMWR (1988)	638 843	Men Women	12 months
Trocki (1992)	370 429	Men Women	12 months
DeBuono (1990)	132	Women	12 months
Pratt (1990)	7394+	Women	Ever

Number of Partners (Male and Female)

0	1	2	3+
14.6%	61.3%	5.6%	12.0%
26.7	58.2	5.2	3.9
19.0	65.0	8.0	8.0
28.0	63.0	7.0	2.0

Number of Male Partners

0	1	2	3+
17.4	43.9	17.4	21.2

0	1	2-3	4+
11.9	29.2	22.9	36.1

TABLE 7

Gender of Sexual Partners in Past Five Years

(Purposive sample, Seattle, WA: N=386)

	Gender of Partners				
	Only Opp. Gender 1	2	50/50 3	4	Only Same Gender 5
MALE	66.5	4.3	1.6	4.8	22.9
FEMALE	84.6	6.9	1.7	2.3	4.6

Source: Borgotta, et al. 1987

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