AIDS and Behavioral Change to Reduce Risk: A Review

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Abstract: Published reports describing behavioral changes in response to the threat of AIDS (acquired immunodeficiency syndrome) are reviewed. These studies demonstrate rapid, profound, but expectably incomplete alterations in the behavior of both homosexual/bisexual males and intravenous drug users. This is true in the highest risk metropolitan areas such as New York City and in areas with lower AIDS incidence. Risk reduction is occurring more frequently through the modification of sexual or drug-use behavior than through its elimination. In contrast to aggregate data, longitudinal descriptions of individual behavior demonstrate considerable instability or recidivism. Behavioral change in the potentially vulnerable heterosexual adolescent and young adult populations is less common, as is risk reduction among urban minorities. Reports of AIDS-related knowledge and attitudes generally parallel the pattern of behavioral changes. Nonetheless, few studies investigate the relationship of knowledge and attitudes to risk reduction. Future studies should provide much-needed information about the determinants as well as the magnitude of behavioral changes required to reduce the further spread of AIDS. (*Am J Public Health* 1988; 78(4):394–410.)

Introduction

Since the first cases of acquired immunodeficiency syndrome (AIDS) were identified in 1981,[1,2] biological and epidemiological knowledge concerning the epidemic and the etiology of the syndrome has proliferated rapidly. In particular, the identification of the human immunodeficiency virus (HIV) in 1984 and the development of sensitive and specific anti-HIV antibody tests by 1985 permitted vigorous investigation of transmission and natural history issues.[3] However, the prospect for either a vaccine or a definitive treatment for those already infected remains remote,[4,5] and attention must therefore focus on the only available measure: alteration of those human behaviors essential to transmission of HIV. This was recognized early by gay community groups who issued recommendations for increased care in the selection, and decreased numbers, of sexual partners.[6,7] As additional and more accurate information regarding transmission has become available, the need for behavioral risk reduction has become better specified and more widely discussed. Recommendations have been issued by the Centers for Disease Control (CDC),[8] voluntary organizations such as the American Red Cross, and community groups serving both the gay community and those who use intravenous (IV) drugs.[9]

Briefly, HIV transmission is noted to occur through three mechanisms[10]: both heterosexual and homosexual activity (although the special role of anal intercourse is recognized[11]); direct contact with infectious blood, occurring with the administration of blood products prior to 1985, with intravenous drug use, and by accident; and perinatal transmission from infected mothers to their infants, which may occur either in utero, at birth, or during lactation. Prevention of HIV transmission requires either abstinence from or modification of relevant behaviors. In particular, celibacy and the avoidance of IV drug use would be sufficient to virtually halt the spread of HIV—but widespread compliance with such extreme measures is clearly unlikely,[12,13] necessitating control strategies which involve modification rather than elimination of risk-related behaviors. Thus, "safer sex" guidelines have been developed which urge homosexuals and heterosexuals potentially at risk for transmission of HIV to avoid the exchange of bodily fluids, particularly semen, during sexual activities.[14] The consistent and careful use of well-designed condoms and perhaps a spermicide containing nonoxynol-9 is recommended.[15] For those using intravenous drugs, the sharing of needles and other drug paraphernalia needs to be eliminated, and/or methods for the sterilization of such supplies must be carefully and consistently applied. There are also those who recommend selection of sexual partners based on concordant HIV serologic status[16] (at this point, no data are available concerning this approach, and it remains primarily an intensely debated policy alternative). The discussion which follows will examine selected published evidence concerning the elimination or modification of AIDS-related risk behaviors. Before doing so, however, some attention must be paid to special features of the AIDS threat.

Despite the specific behavioral imperatives posed by AIDS and the more general public health enthusiasm for individual behavioral risk-reduction,[17] idiosyncratic features of HIV infection and AIDS require careful consideration. These features arise from the unique biological characteristics of the retroviruses,[18] from the epidemiologic aspects of the epidemic, and from the enveloping social context. Unlike the preponderance of sexually transmitted diseases, HIV infection and its sequellae are currently incurable, so that persons at risk of infection, or already infected, are asked to undertake lifelong changes in their behavior. In addition, there is little incentive to offer those already seropositive, a circumstance which contrasts sharply with most other risk-reduction recommendations (e.g., in the case of cigarette smoking, those who successfully stop can expect improved respiratory function and reduced risk of heart disease within a comparatively brief period of time).[19,20]

Furthermore, the mechanisms of transmission for HIV call attention to sexual, reproductive, and addictive behaviors, comparatively sensitive and problematic areas for intervention. The development of a public consensus regarding appropriate policies in these areas is elusive, in part due to considerable heterogeneity in underlying social values. Intense debate is common, while coherent intervention/prevention programs are not. Furthermore, these are domains often viewed as more appropriate for private decision-making than for the imposition of public policies. Taken together, these factors suggest that development of AIDS interventions may lag well behind the more biomedical/technological disciplines.

Also, we must obtain and take into account various perspectives of the epidemic from inside the communities at

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risk. Those who are urged to modify their behavior experience the psychosocial burdens of threat, uncertainty, and stigmatization.

- First, the nature and complexity of the threat presented by AIDS is extreme. Not only is survival beyond three years unlikely, but those with the syndrome face the potential burdens of disfigurement from wasting or obvious lesions, disability, dependence, and dementia. Furthermore, this sense of threat extends to one's most intimate relationships; whether or not an infected individual becomes ill him/herself, lovers and children may sicken and die.
- Second, extreme uncertainty characterizes the entire process from exposure through infection to diagnosis, arising from our current lack of clarity concerning the precise circumstances under which infection occurs and progresses. Those at risk often know their potential exposure extends back as long as a decade, so that even comparatively remote behaviors may have resulted in infection. Yet infection is by no means certain even in those who engaged in the highest risk behaviors; the intensity of these behaviors, the seroprevalence of HIV in specific population subgroups, and individual characteristics still largely unspecified may all affect the probability of infection. Even the potentially lethal consequences of infection and their time course remain probabilistic events—increasingly describable in aggregate terms but doing little to reduce an individual's sense of uncertainty. Not surprisingly, available evidence suggests that this uncertainty can result in marked psychological distress.[21]
- Finally, as currently available surveys of both the general public and health care providers suggest, AIDS is a highly stigmatized condition.[22,23] Potential consequences range from disrupted personal or familial relationships through loss of income or insurance benefits to the denial of health care by some providers.

Given these unique features of HIV infection, AIDS, and the social context in which they are occurring, it is unlikely that simple extrapolation from behavioral responses to other chronic or infectious diseases will prove to be helpful, highlighting the importance of accumulated data concerning behaviors specific to AIDS. The review of published reports which follows encompasses two broad issues: behavioral risk reduction, and knowledge/attitudes regarding AIDS. Implications of this review for future practice and research will also be discussed. Our review is not necessarily complete, and is restricted to papers published by mid-1987. The time period in which each investigation was conducted is noted in the accompanying tables.

Behavioral Risk Reduction

This section documents both the extent of behavioral risk reduction and what is known regarding its determinants. Studies reviewed are summarized in more detail in Table 1. Most research to date has been conducted in the male homosexual/bisexual community.

Behavioral Change in Homosexual/Bisexual Men

Findings from these studies will be organized by location. Although rather dissimilar studies are audited, we emphasize a comparative description of three aspects of sexual behavior consistently linked to risk-reduction recommendations: number of sexual partners; frequency of anal intercourse; and use of condoms and/or spermicides.

SAN FRANCISCO

In San Francisco, three separate cohorts are being followed. The San Francisco Men's Health Study provides data on a mixed group of homosexual/bisexual and heterosexual single men recruited by multistage stratified cluster sampling conducted within the 19 census tracks which had experienced the highest cumulative incidence of AIDS through December 1983. The participation rate was 59 per cent. Data from biannual assessments (January 1984 through June 1986)[24] reveal major declines in the prevalence of receptive anal intercourse among seronegative participants, and in the frequency of insertive anal intercourse among seropositives. The prevalence of sexual activity with 10 or more partners during a six-month interval, and insertive and/or receptive anal/genital contact with two or more partners, had declined by at least 60 per cent. No data are provided concerning use of condoms or spermicides. At recruitment, 48.6 per cent of the cohort was seropositive; following the second examination the seroprevalence rate had stabilized at 49.3 per cent, providing evidence of the relation between changes in reports of risk-related behavior and protection from infection with HIV.

In another cohort study, homosexual men were initially recruited in 1983 from four sources: bathhouses; gay bars; advertising for volunteers who had used neither bars nor bathhouses for two months prior to recruitment; and stable "couples" who had taken part in previous investigations. Of those invited to participate, 42 per cent completed and returned the questionnaire (N=655). This recruitment method meant that study participants were more sexually active than those in population-based samples.

Changes in sexual behavior were assessed by asking these men to recall their sexual activity one year earlier, and to concurrently describe their behavior in the autumn of 1983. In their first report, McKusick, Horstman, and Coates[25] indicate that while 35 per cent of the respondents reported a mutually monogamous relationship initially, 41 per cent did so one year later. Receptive anal intercourse without a condom became less common outside of non-monogamous relationships and among those not in relationships. Condom use during receptive anal intercourse increased, yet was reported by only 3.6 per cent to 8.1 per cent of respondents. Although no data are provided, the authors suggest that "selected attitudinal and knowledge items" were related to the number of sexual partners. Men who reported using "hot anonymous" sex to relieve tension or who believed sexual freedom was integral to a gay lifestyle were apparently more likely to have at least three sex partners/month. On the other hand, those who had a "visual image" of AIDS deterioration were more likely to have fewer partners.

A subsequent report from this research group documented changes in behavior observed during a six-month interval following initial assessment:[26] the average number of partners decreased by 13.5 per cent; the 288 respondents who had been in non-monogamous relationships reported that their frequency of anal intercourse without a condom decreased by 46.2 per cent and the average number of their sexual partners per month by 20.4 per cent. Several other measures of sexual behavior show changes in the direction of reduced risk-related activities: a 28.6 per cent decline in number of anonymous sexual partners, a 50 per cent decline in oral-anal contact, a 27.3 per cent decline in proportion swallowing semen, and, even more dramatically, a 60 per cent decline in average number of visits to a sex club or

TABLE 1—Published Studies of AIDS-Related Behavioral Risk Reduction

	Sample		Study			Results		
Author	Description	Sociodemographics	Design	Sampling	Assessment	Behavioral Change	Validation of Change	Determinants of Change
Winkelstein et al.[24]	San Francisco: 641 homosexual 171 bisexual men	25–54 years old 43.3% exec, prof 89.8% 2 yr college	Longitudinal: 1984–86	Area-specific probability sampling (59% participation)	Structured Interview & biomed evaluation 4 biannual assessments	Prevalence of ≥10 sex partners/6 mos declined 60% or more among seronegatives: RAI* 14% at entry 5.9% at Time 2 4.9% at Time 3 5.8% at Time 4 among seropositives: IAI† 39.6% at entry 25.6% at Time 2 16.8% at Time 3 13.8% at Time 4 condom use not reported	HIV seroprevalence 48.6% at entry 49.6% at Time 2 then stable	Not reported
McKusick et al.[25]	San Francisco: 655 homosexual men	Specific to each subsample $\bar{x}$ age 30.5–33 61%–81% prof or white collar 86%–94% White 5%–44% in committed monog relat	Cross-sectional survey (1983) with retrosp comparison to 1 yr earlier	4 sources: bathhouses (N = 151) bars (N = 134) no bathhouse/bar (N = 181) couples (N = 186) 42% particip	Self-admin quex	Monogamy 35% 1 yr earlier 41% 1983 RAI without condom ≥1 times/mo among monogamous men (N = 159) 60.0% 1 yr earlier 59.1% 1983 RAI without condom ≥1 times/mo among men in nonmonog relat outside the relat 40.0% 1 yr earlier 30.2% in 1983	Not reported	Assoc with more partners: use of sex to relieve tension, perceiving sexual freedom as gay lifestyle, assoc with fewer partners: recall seeing victim with advanced AIDS
McKusick et al.[26]	San Francisco: homosexual men 655 (x-sect), 454 (longit)	Not reported	Retrosp: 1982; longitudinal 1983–1984	As above	Self-admin quex	$\bar{x}$ # sex partners/mo 3.7 in 1982 3.2 in 1983 among 288 in non-monog relat: AI‡ without condom/mo 1.9 in 1982 1.3 in 1983 0.7 in 1984 among 255 in primary relat: AI without condom/mo 3.3 in 1982 2.5 in 1983 2.3 in 1984 condom use in primary relationships not increased	Not reported	(criterion p = .10) *Maintaining* 0–2 partners/mo: first homosex experience ≥18 years ago *Reducing* # partners/mo: visual image of AIDS deterioration younger (age ≤40) first homosex experience ≤26 years ago
Stall et al.[27]	San Francisco: 464 homosexual non-monog men (subsample of McKusick cohort)	Not reported	Cross-sectional survey (1985) retrosp analysis (1984)	As above	Self-admin quex	Multi-item risk index among "no risk" 1984 (N = 100): 46% "no risk" 1985 54% "more risk" 1985 among "high risk" 1984 (N = 211): 45% "less risk" 1985 55% "high risk" 1985	Not reported	Increased risk assoc with: alcohol, drug use during sex; number of substances used; frequency of alcohol use

CDC[28]	San Francisco: homosexual men 500(x-sect), 301 (longit)	Not reported	Longitudinal 1984–85	Weighted random probability sampling (81.4% participation)	Telephone interview	>1 sex part past 30 days: 49% 1984 36% 1985 AI without condom with non-primary partner past 30 days 18% 1984 12% 1985	Not reported	Not reported
Martin[29]	New York City: 745 homosexual men	$\bar{x}$ age = 35.7 $\bar{x}$ yrs educ = 16.3 87% White 37% had current "lovers"	Cross-sectional survey (1985) retrosp comparison to "pre-AIDS"	Convenience	Interviewer admin quex	"Extra-domestic" sex: median # sex partners/year: pre-AIDS = 36 1985 = 8 "domestic" sex: median # sex partners/year: pre-AIDS = 5 1985 = 3 IAI and RAI median freq "declined by over 75%" pre-AIDS to 1985 condom use during: IAI 10% pre-AIDS 20% 1985 RAI 2% pre-AIDS 19% 1985	Not reported	Not Reported
Martin[30]	New York City: 745 homosexual men	Same as above	Same as above	Same as above	Same as above	Multi-item risk index multiple partners & higher risk activity 81% pre-AIDS 60% 1985 multiple partners & lower risk activity 9% pre-AIDS 23% 1985 monog & higher risk activity 6% pre-AIDS 8% 1985 monog & lower risk activity 2% pre-AIDS 7% 1985 celibate 2.5% pre-AIDS 3.5% 1985	Not reported	Not reported
Emmons et al.[31]	Chicago: 978 homosexual/ bisexual men	$\bar{x}$ age = 34.6 $\bar{x}$ educ = 16 yrs primary relat = 49.5%	Cross-sectional 1984–1985	Convenience	Self-admin quex	76.5% attempt to reduce part # 12.9% avoid RAI 20.2% practicing RAI avoid semen contact by condoms, withdrawal	Not reported	Health Belief Model assessed in relation to 5 outcomes: knowledge consistently important and perceived efficacy, perceived risk, belief in biomedical technology, social norms, all occasionally import
Joseph et al.[32]	Chicago: 637 homosexual/ bisexual men	$\bar{x}$ age = 35.2 $\bar{x}$ educ = 16.3 yrs 92% White	Longitudinal: 6 mos 1984–85	Convenience	Self-admin quex	$\bar{x}$ # sexual part/mo decreased 1.74 monogamy 17.6% at baseline 24.6% 6 mo later RAI 54.1% at baseline 48.6% 6 mo later condom use during RAI 16.5% at baseline 26.7% 6 mo later	Not reported	Health Belief Model assessed in relation to 7 outcomes: knowledge not predictive of longitudinal change social norms only consistent predictor of change

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TABLE 1—Continued

Author	Sample: Description	Sample: Sociodemographics	Study: Design	Study: Sampling	Study: Assessment	Results: Behavioral Change	Results: Validation of Change	Results: Determinants of Change
Golubjatnikov et al.[33]	Madison, WI: 488 homosexual men	Not reported	Surveillance 1982–83	Convenience: STD clinic patients	Not reported	$\bar{x}$ # sex part past mo: 6.8 1982 3.2 1983	Not reported	Not reported
Burton et al.[34]	UK, Central London: 326 homosexual men	Not reported	Survey 1986	Convenience from pubs and clubs	Interview	Decreased # sexual part/mo in comparison to previous year: 48% condom use during AI: 49% condom use during AI among those with multiple sex partners: 59%	Not reported	95% report receiving safe sex information 75% "welcomed and followed" safer sex guidelines
Carne et al.[35]	UK, Middlesex: 100 homosexual men	Not reported	Longitudinal "at least one year" 1984/1985–86	Convenience	MD or RN-admin quex	Median # sex part/mo: 3 in 1984/1985 1 in 1986 IAI with ≥2 part/mo: 27% in 1984/1985 8% in 1986 RAI with ≥2 part/mo: 41% in 1984/1985 16% in 1986	Not reported	Not reported
Anderson et al.[36]	UK, Paddington all population groups	Not reported	Intervention: UK public media campaign (1986) evaluation: frequency of requests for HIV serologic testing pre/post no controls	Population-based surveillance	Change in frequency of requests for HIV serologic testing	Increase in frequency of test requests in media campaign week: 191% among homosexual men 138% all others	Not reported	Intervention campaign
Friedman[40]	New York City: 59 clients in methadone maintenance programs	Not reported	Cross-sectional survey 1984	Convenience	Interview	Behavioral change to reduce AIDS risk: 59% increased use of clean/new needles: 31% reduced needle-sharing: 29%	Not reported	Not reported
DesJarlis[41]	New York City: 22 IV needle sellers on streets	Not reported	Street ethnography 1985	Convenience	Interview	18/22 report new needle sales increased; 4/18 cite AIDS as cause of demand for new needles 10/21 report selling old needles as new	Not reported	Not reported
Chaisson[43]	San Francisco: 152 IVDU (1985) 172 IVDU (1987) volunteers from drug treatment center	Not reported but "similar" in 1985, 1987	Intervention 1986: community health outreach to IVDUs, distribution of 5.25% sodium hypochlorite invails; media campaign evaluation pre (1985) post (1987) no controls	Convenience	Not reported	Needle-sharing 71% in 1985 71% in 1987 use of bleach solution to clean needles, if sharing 6% in 1985 47% in 1987	Not reported	Not reported

Marks & Parry[44]	UK, Liverpool IVDUs	Not reported	Intervention: program for needle/syringe exchange of sterile equipment for used (Nov 1986–Jan 1987) evaluation: utilization of program no pre/post no controls	Not applicable	Utilization of needle/syringe exchange	3,237 needles/syringes distributed in 3 mos; 2,949 returned and exchanged 1.75 registered IVDUs to 1.0 unregistered	Not reported	Not reported
Agle et al.[50]	Multi-center, USA: hemophiliacs N = 116 spouses N = 40 parents N = 94	$\bar{x}$ age pts. = 29	Cross-sectional survey 1983–1984	Consecutive unselected patients at treatment centers	Self-admin quex	Decreased frequency of intercourse due to AIDS 10.8% spouses 8.1% hemophiliacs	Not reported	Not reported
Winkelstein et al.[51]	San Francisco: 123 heterosexual men	25–54 years old	Longitudinal: 1984–1986	Area-specific probability sampling	Structured interview + biomed evaluation 4 biannual assessments	Mean # female sex part/6 mo 2.81 at entry 1.81 at Time 4 condom use not reported	Not reported	Not reported
Padian et al.[52]	San Francisco 97 heterosexual female partners of men infected with HIV	age 19–65 yrs 92% White 57% part of bisexual men	Longitudinal, recruitment began 1985	Special recruitment	Interview and biomed assessment	Evidence of change to "safer sex" practices among 1/3 of seronegative women	Prevalent serologic data only	Not reported
Strunin & Hingson[53]	Massachusetts: 829 adolescents 16–19 yrs old	Not reported	Cross-sectional survey 1986	Random digit dialing (86% participation)	Telephone interview, anonymous	Risk behavior prevalence 1% IVDUs 55% report sexual intercourse of whom 98% heterosex, 0.7% homosexual male, 0.5% bisexual change in sexual behavior due to AIDS: 15%, of these: 10% use condoms 10% celibate 35% more selective partners 25% "careful:" change in IVDU behavior 1/3 (N = 3) stopped needle use 1/3 (N = 3) stopped IVDU 1/9 (N = 1) using clean needles 2/9 (N = 2) use less drugs/no longer use "AIDS drugs"	Not reported	Not reported
Simkins & Kushner[55]	Kansas City: 212 college students, heterosexual & homosexual	$\bar{x}$ age = 22 yrs 42% male 84% single 77.4% heterosex 50% with current sex partner	Cross-sectional 1985 survey, comparison to similar 1984 survey in same pop	Convenience; psychology classes + special recruitment of homosexual men and women	Self-admin quex	AIDS does *not* influence sexual behavior = 68.4%	Not reported	Correlation between sexual activity and AIDS concern = −.049 (not signif)
DesJarlais et al.[56]	New York City: 67 jailed female prostitutes	Not reported	Cross-sectional 1986	Convenience, and key informants	Not reported, key informants interviewed	92% required customers to use condoms	Not reported	Key informants indicate use of condoms began in 1970s in response to concerns re: herpes, STDs

‡AI = anal intercourse
†IAI = insertive anal intercourse
*RAI = receptive anal intercourse

TABLE 2—Published Studies of Knowledge and Attitudes Relevant to AIDS

	Sample		Study			Results			
Author	Description	Sociodemographics	Design	Sampling Method	Assessment Method	Knowledge of Transmission	Knowledge of Prevention	Perception of Risk	Other
McKusick et al.[26]	San Francisco: homosexual/ bisexual 655 (x-sect) 454 (longit)	Not reported	Retrospect: 1982 longitudinal 1983–1984	4 sources: bathhouses (N = 151) bars (N = 134) no bathhouse/bar (N = 181) couples (N = 186) 42% particip	Self-admin quex	Agreement with risk reduction guidelines: high = 52.6%		Friend with AIDS: 17.9% Visual image of AIDS: 64.9%	
Joseph et al.[32]	Chicago: 637 homosexual/ bisexual men	$\bar{x}$ age = 35.2 $\bar{x}$ educ = 16.3 yrs 92% White	Longitudinal 6 mos 1984–1985	Convenience	Self-admin quex	Combined knowledge $\bar{x}$ score: 71.4% Belief in vaccine or cure $\bar{x}$ score: 40.0%		Perceived AIDS risk $\bar{x}$ score: 44.4%	Social norms supportive of safer sex $\bar{x}$ score: 64.0% (strongest predictor of longitudinal risk reduction)
Valdiserri et al.[61]	Pittsburgh: 464 homosexual/ bisexual men	$\bar{x}$ age = 33 66% college grad	Intervention: one 60 min group of 5–10 participants; knowledge focus Evaluation: pre/post no controls	Prerequisite for HIV test disclosure (32% participation)	Self-admin quex pre and 1–2 weeks post	Transmission of HIV: 86% × correct pre 94% × correct post	Not reported (see attitude results)	Perceived vulnerability 67% pre 72% post	Attitude change: number part/anomy partners 71% pre 72% post endorse condom use 65% pre 73% post discuss AIDS prevt with partners 48% pre 56% post
Williams[63]	Detroit: 62 homosexual men	All Black	Survey 1985	Convenience	Administered quex	Transmission via blood and semen: 13% correct	Not reported	Worry about AIDS infection: 37% not worried 19% very worried	
Friedman et al.[40]	New York City: 59 clients in methadone maintenance program	Not reported	Survey 1984	Convenience	Interview	93% knew IVDU can transmit 88% knew ≥2 modes of transmission	Not reported	Not reported	Not reported
	146 methadone maintenance clients & 115 incarcerated drug users	Not reported	Not reported	Not reported	Interview	97% knew IV needle use can transmit >50% believed shared utensils can transmit	Not reported	Not reported	Not reported
Ginzburg et al.[45]	New Jersey: 175 IVDUs in drug treatment program	57% men 58 White 34% Black median age = 32 yrs 60% HS grad or equivalent	Survey 1984	Not reported	Administered quex	95% knew IVDUs high risk group 95% knew transmission in IVDUs due to needle-sharing	Not reported	Not reported	Not reported
	577 IVDUs entering drug treatment programs	70% men 50% White 30% Black median age = 32.5 yrs	Survey 1985	Not reported, but "representative" of all admissions re: age, gender, race, and ethnicity	Administered quex	"Continued awareness" of transmission (NFS)* 57% knew infants of IVDUs or partners at risk	29.3% knew dilute bleach would inactive HIV	Not reported	Source of information: 78% TV 57% radio 15.3% field worker

Williams[63]	Detroit: 98 methadone maintenance clients	Not reported	Survey 1985	Convenience	Administered quex	62% knew IVDUs high risk group	67% knew avoidance of IV drugs would prevent infection 68% knew not sharing needles would prevent infection	Concern/worry about getting AIDS: 57% unconcerned 11.2% very worried	Sources of >50% unaware of source for AIDS information
Price et al.[64]	Ohio: 250 high school students	47.2% men age 16–19 years	Survey 1984	Convenience	Classroom quex	In best informed students, only 47% correct responses (NFS)	Not reported	Worry about getting AIDS: 73% not worried	Most information from mass media
DiClemente et al.[65]	San Francisco: 1326 high school students	age 14–18 years "all major ethnic groups represented"	Survey 1985	Inclusive: all students at selected high schools (99% participation)	Self-administered classroom quex	92% knew sex could transmit	60% knew condoms could help prevent infection	79% "afraid" 74% "worried"	88% believe school curriculum on AIDS important
Strunin and Hingson[53]	Massachusetts: 829 adolescents	Not reported	Survey 1986	Random digit dialing	Anonymous telephone interview	91% knew heterosexuals at risk 71% knew HIV in vaginal secretions	Not reported	54% not worried at all about getting AIDS 61% thought not at all likely to get AIDS in their lifetime	97% believe AIDS information should be available at school
Simkins and Kushner[55]	Kansas City: 212 college students	47.2% male 77.4% heterosexual 10.8% homosexual 3.3% bisexual 6.1% celibate	Survey 1986	Convenience	Classroom quex	Not reported	Not reported	Concern equal re: AIDS and herpes risk 71% no concern about getting AIDS from present partner	Homophobia scale significantly correlated with AIDS concern; males more homophobic than females
Sherr et al.[66]	UK: London: higher risk = STD clinid pts N = 156 pre 105 post #1 145 post #2 lower risk = law students or general practice pts N = 83 pre 75 post #1 134 post #2	Not reported	Intervention: 2 public media campaigns Evaluation: pre/post no controls	Convenience	Not reported	"Information levels were significantly raised by the first ($p = .03$) and second ($p < .001$) campaigns" (NFS)		Not reported	
Hastings et al.[67]	UK: Glasgow & Edinburgh 84 general population	Age 20–50 50% male	Focus group discussion of AIDS and proposed health education brochure 1986	Selected to be representative of population	Group discussion, qualitative data only	Knowledge "generally superficial and vague" (NFS) generally seen as transmitted through sex or blood most believed social contact could transmit		Not reported	Attitudes toward high-risk individuals "profoundly negative" (NFS)

*NFS = not further specified

bathhouse for sex. Among those in a primary relationship, there was a significant decrease in average number of sexual encounters/month, from 9.7 to 8.5.

In addition to these aggregate data, of those who initially had two partners per month or less, 70 per cent maintained this level of sexual activity, while among those who had three or more partners initially 41 per cent reduced their number of sexual partners to less than three.

Somewhat contradictory findings regarding the predictors of two behavioral patterns were reported. Those who initially had 0–2 partners/month were more likely to maintain this lower risk level if they had become homosexually active at least 18 years ago. On the other hand, those who successfully reduced their number of sexual partners during the follow-up period were more likely to have become sexually active in the past 26 years, to be 40 years old or less, and to have a visual image of AIDS deterioration. Relationship status, agreement with AIDS risk-reduction guidelines, and knowing a friend who has AIDS or has died from it were not related to either positive behavioral outcome.

A later report of sexual behavior in the same cohort[27] which employed a summary risk measure was confined to the 463 individuals not in a monogomous primary relationship at the time of the second assessment (1985), a selected subsample for whom behavioral risk reduction may be most salient. Sexual behavior was scored as "completely safe" (e.g., massage), "probably safe" (e.g., anal intercourse with condoms), "probably risky" (e.g., ingesting semen during oral-genital sex), or "risky" (e.g., anal intercourse without a condom): 25.3 per cent of the men were at no risk; 36.9 per cent at medium risk; and 37.8 per cent at high risk. The same score was then calculated at the prior assessment one year earlier. Cross-sectional analyses of 1985 data demonstrated that both alcohol and drug use of all kinds were significantly associated with an increased level of risk.

Retrospective analyses compared those originally at no risk with those originally at high risk. During the subsequent year, 54 per cent of those originally at no risk engaged in behaviors which placed them at greater risk, while 45 per cent of those originally at high risk were subsequently engaging in safer behavior. Those who increased their risk were more likely to subsequently report use of drugs and alcohol during sex. Since it was substance use during the second observational period which was correlated with change in the preceding year, this analysis leaves unexamined the issue of causality. The direction and magnitude of the relationship between substance use and unsafe sexuality, as well as their relationship to other potentially causal variables (such as personality predispositions), require further exploration.

A third study conducted in San Francisco randomly sampled telephone numbers listed with only a male name.[28] Men who identified themselves as "gay or bisexual" were eligible for interview and, of these, 81.4 per cent participated. Telephone interviews were conducted with 500 men identified in this fashion in 1984, and nine months later a random subsample of 301 was re-interviewed (93.2 per cent participated). The number of respondents reporting sex with more than one partner in the past month declined by 27 per cent, while the proportion reporting celibacy, monogamy, or no sex leading to exchange of semen outside a "primary relationship" rose from 69 per cent to 81 per cent, and anal intercourse without a condom, conducted outside a primary relationship, decreased from 17 per cent to only 7 per cent.

NEW YORK CITY

Martin has reported on sexual behavior in a well-educated convenience sample of 745 self-identified gay men aged 20–65.[29] An interview format was used which allows comparisons between recent behavior during an entire year and that recalled for a year prior to hearing about AIDS. For those men who reported sexual activity at locations other than home, the median number of sexual partners per year declined from 36 pre-AIDS to eight post-AIDS. All but one of the men in the cohort reported sexual activity at home; the median number of sexual partners in this location declined from five to three during the same interval. The number of reported receptive anal sex episodes declined by 75 per cent; use of condoms by the respondent's partner during episodes of receptive anal intercourse increased from 2 per cent to 19 per cent of the episodes.

In another report,[30] Martin combined these data to describe seven distinct risk categories. The most extreme typology was limited to men who had multiple partners (whether at home or elsewhere) and had engaged in high-risk acts. Between the time periods being compared, there was a 26 per cent reduction in the prevalence of this behavioral pattern, while all other patterns became more common. The least change was observed in those choosing to remain celibate (+1 per cent). Restricting sexual activity to lower risk behavior and eliminating sex outside the home were the most frequently changed aspects of behavior. In summary, 40 per cent of the sample decreased their level of risk between the two time periods, 49 per cent did not change, and 8.3 per cent increased their risk. This approach understates changes in behavior since a man who decreased the number of his sexual partners from 20 to two remains classified as having multiple sexual partners in spite of marked change.

OTHER US STUDIES

A cohort of approximately 1,000 homosexual/bisexual men living in Chicago, a less heavily affected area, are participants in an HIV natural history study and receive biannual medical and laboratory examinations, as well as providing extensive behavioral and psychosocial data in a concurrent study. This group of recruited volunteers closely resembles the men being studied both in San Francisco and in New York City. Cross-sectional analyses were confined to the 909 men not diagnosed with AIDS, not being paid for sex, and for whom data were missing on no more than three variables;[31] in 1984–85, 80.5 per cent reported making at least some behavior changes because of AIDS, and 76.5 per cent had specifically attempted to reduce their number of sexual partners. Of the 486 men continuing to engage in receptive anal intercourse 20.2 per cent were modifying this behavior by asking their partners to use a condom or to withdraw prior to ejaculation.

Multivariate analyses described the comparative contribution of components of the Health Belief Model (HBM) to five self-reported changes: any behavioral change because of AIDS; attempts to reduce the number of sexual partners; avoidance of anonymous sexual partners; avoidance of receptive anal sex; and modification of receptive anal sex. Knowledge regarding AIDS, and the perceived value of behavioral change in reducing one's risk of AIDS, were both consistently related to various measures of risk reduction. In addition, supportive peer norms, reliance on biomedical technology to prevent/cure AIDS, difficulties with sexual impulse control, and perceived risk of AIDS were all related to at least one of the outcome measures; however, the effects

of perceived risk were inconsistent. The cross-sectional nature of these analyses leads to cautions concerning presumed causality.

Subsequent longitudinal analyses by Joseph and others describe changes in the 637 men from the cohort for whom data were available both at entry into the study and six months later.[32] Sociodemographic characteristics remained largely unchanged in this subsample. There were reductions in the mean number of sexual partners per month, in the number of receptive anal exposures, in the number of anonymous partners, and in the number of total oral and/or anal exposures. By the second assessment, 51.4 per cent of the cohort was no longer engaging in receptive anal intercourse, and among those doing so there was an increase of 61.8 per cent in the use of condoms or withdrawal to prevent exposure to semen.

The HBM was again examined for its relationship to longitudinal change after taking account of baseline behavior—an important step because one of the strongest predictors of future behavior is past behavior. Generally diminished associations were observed: for example, knowledge was unrelated to any of the seven behavioral outcomes examined in the longitudinal analysis. Supportive social norms provided the only exception to this general trend of diminished effects in longitudinal analyses, being consistently and positively related to a range of risk-reduction behaviors. The authors concluded that, to some extent, there may be differences between factors that predict the initiation of behavior and those which predict its subsequent maintenance and/or incremental improvement.

A brief report from Wisconsin documents changes in number of sexual partners among 488 homosexual men seen at a clinic for the treatment of sexually transmitted diseases or screened for such conditions in gay bars.[33] Approximately twice as many men reported a single sexual partner and an increase in celibacy was observed when during the same six-month period in 1983 was compared with a year earlier. There was also a "sharp decline" in the proportion of men reporting 10 or more sexual partners.

STUDIES IN THE UNITED KINGDOM

A survey was undertaken in central London of 326 gay men in pubs and clubs in order to assess the affects of the AIDS epidemic and of "safer sex" publicity on behavior.[34] Of those interviewed, 95 per cent had received information on "safer sex," and 77 per cent said that AIDS had changed their sex life. Although 53 per cent of the men were continuing to engage in anal intercourse, 45 per cent of these were using condoms (59 per cent of those with multiple sexual partners), and 48 per cent of the respondents reported fewer sexual partners this year than in the previous year.

Carne, *et al,*[35] documented changes in sexual behavior among the first 100 members of a larger cohort of homosexual/bisexual men originally recruited in late 1982 in London. Between 1984–85 and 1986, median number of sexual partners/month declined from three to one; there was a 70 per cent decline in prevalence of anal intercourse with two or more partners in a typical month; and there was approximately a doubling of condom usage among those reporting receptive and insertive anal sex.

In the UK, mass media publicity campaigns are reported to have resulted in a 191 per cent increase in the number of homosexual/bisexual men seeking AIDS testing, a 73 per cent increase by those using intravenous drugs, and a 57 per cent increase among those who described themselves as prostitutes.[36]

Behavioral Change in Intravenous Drug Users

Intravenous drugs users (IVDUs) are the second largest AIDS risk group.[37] Prevention of transmission among IVDUs requires that they either abstain from drug use or modify their drug use behavior. Effective safety precautions consist of not sharing needles and syringes, or adequately sterilizing them between use (it has been demonstrated that a 10 per cent solution of household bleach and water is sufficient to inactivate HIV).[38] Infected intravenous drug users also may transmit infection to their heterosexual partners and children. Routine "safer sex" practices including condom and spermicide use are recommended for this population.

Unlike the gay community, which is relatively organized and generally characterized by educational and socioeconomic advantage, more IVDUs are members of minority communities and their average level of education is lower.[39] Language and literacy problems are well recognized, and communication in this subculture is generally oral rather than written. Furthermore, both the majority culture and the IVDU subculture tend to hold negative stereotypes of one another. There is a general impression that IVDUs are incapable of (or disinterested in) changing their behavior, while IVDUs view public health authorities with suspicion and distrust. In this context, it is particularly important to base interventions upon empirical findings.

Data from New York City provided by Friedman and others suggest that, as early as 1984, there were already AIDS-related behavioral changes among some groups of IVDUs[40] Interviews were conducted with 59 patients in Manhattan methadone maintenance treatment programs; the majority (59 per cent) reported behavioral changes to avoid AIDS: increased use of clean needles and/or the cleaning of their needles (31 per cent), and reduced needle-sharing (29 per cent); 51 per cent reported that their friends had also changed their behavior. Level of education (although not further described) was reportedly unrelated to extent of behavioral change.

Friedman also describes work by Selwyn and others conducted in New York City among 145 methadone maintenance patients and 115 incarcerated drug users. They found that over 60 per cent of their respondents reported making one of the following changes in order to avoid AIDS: no longer sharing needles although continuing IV drug use; decreased needle sharing; stopping IV drug use completely; or attempting to sterilize their needles. He also found that 48 per cent had decreased their number of sex partners, were using condoms, or were taking other "hygienic" measures in order to practice safer sex.

This report also provides brief ethnographic data suggesting that the illicit market in New York City for sterile needles has increased considerably, and that drug dealers have begun distributing "free" sterile needles or syringes since the beginning of the AIDS epidemic. Unfortunately, Friedman also reports that some are fraudulently selling used needles as new.

Des Jarlais, *et al,*[41] interviewed IVDUs who are not in any form of drug abuse or health care treatment—respondents potentially more representative of those at greatest risk. Interviews were conducted through an ethnographic storefront center and the Street Research Unit.[42] As early as fall 1983 intensive interviews with 18 IVDUs at the storefront suggested an increased demand for new needles as a result of

AIDS. During the spring of 1985, brief street interviews were held with 22 needle sellers, 18 of whom reported that new needle sales had increased over the last year. However, only four of these specifically mentioned AIDS as a reason for the increased demand. It should be added that 10 of these sellers reported that they had sold used needles as new at some time, and seven stated that they had resealed used needles in order to do so.

In San Francisco, in July 1986, public service agencies began training community health outreach workers to IVDUs not in treatment regarding AIDS and appropriate behavioral risk reduction.[43] More than 15,000 vials of a 2.5 per cent bleach solution were distributed to addicts, accompanied by instructions on their use for sterilization of drug equipment. Posters and billboards were used also to promote the use of bleach in the prevention of HIV transmission. In 1985, only 6 per cent of those who shared needles reported that they usually or always sterilized them with bleach; in the 1987 sample, this figure had risen to 47 per cent. The proportion reporting that they never used bleach fell from 76 per cent to 36 per cent in the same two groups. Interestingly, a consistent 23 per cent reported that they usually or always sterilized their equipment with alcohol. During the same period the prevalence of HIV antibodies among IVDUs in treatment increased from 10 per cent to 15 per cent, suggesting that other measures, particularly the provision of sterile hypodermic needles, need to be undertaken in these populations.

A report of exactly such a program is available from Liverpool where, since 1986, the municipal drug dependency clinic has been providing drug users with sterile needles and syringes in exchange for previously used ones.[44] In the initial months of the program, 3,237 syringes and needles had been issued and 2,949 had been returned. The ratio of those in treatment to those not in treatment using the facility is 1.75 to 1. Those who attend are encouraged to use condoms, which are supplied free on an experimental basis by a manufacturer (no data are available concerning the utilization of these condoms).

These quantitative assessments of risk reduction among IVDUs are supported by a more qualitative description derived from a study by Ginzberg, *et al.*[45] They also noted an increased demand for sterile syringes, both in New York City and in northern New Jersey.

Risk Reduction Behavior in Other Groups

In this portion of the review, we will discuss studies of behavioral risk reduction in heterosexuals who are not IVDUs.[46,47]

Sexual transmission of HIV from hemophiliacs to their sexual partners and children is well documented,[48] and the National Hemophilia Foundation has acted to provide information and guidelines for behavioral risk reduction.[49] However, the limited number of published reports focus on psychosocial or psychological consequences of being at risk, rather than on behavior. Minimal data are provided by Agle and others who conducted a multicenter study of 116 hemophiliacs, their parents, and their partners.[50] The report primarily documents affective or attitudinal changes, and the differences between the three groups studied. Nonetheless, there was evidence of a decreased willingness to receive factor concentrate because of AIDS, and both hemophiliacs and their partners reported decreased sexual desire and frequency of sexual behavior because of their concerns about AIDS. Obviously, decreased frequency of intercourse is not an appropriate method for behavioral risk reduction; no data are provided concerning condom or spermicide usage.

Using the same methods for recruitment and study as were applied to homosexual/bisexual men,[24] the San Francisco Men's Health Study documented the behavior of 123 single heterosexual men.[51] Heterosexual participants had fewer sexual partners than homosexual/bisexual men living in the same area, and had also substantially reduced their number of sexual partners.

In a later report from San Francisco, Padian and others describe the serologic status and behavior of 97 female partners of 93 men known to be infected with HIV or diagnosed as having AIDS or ARC.[52] Women who used intravenous drugs or who had recently received blood transfusions were eliminated from all analyses. Most of those recruited were the partners of bisexual men (57 per cent), while others were the partners of hemophiliacs (19.6 per cent), of intravenous drug users (12.4 per cent), or of those who had received transfusions or who were both bisexual and IVDUs. This report is primarily concerned with the natural history of HIV transmission and infection in this group of women. Although precise figures are not provided, the authors state that one-third of the seronegative women and all seropositive women reported changing to safer sexual practices (in particular, condom use) after hearing about AIDS. This provides some evidence of behavioral risk reduction occurring among heterosexual women at greatest risk for infection with HIV.

Several reports have documented risk-related behaviors and changes in such behaviors among adolescents and young adults. In one investigation, 963 Massachusetts teenagers were contacted by random-digit dialing;[53] 829 (86 per cent) agreed to participate in the survey. Knowledge concerning AIDS was incomplete at best. In this sample, there were few IVDU and male homosexual contacts. Among sexually active respondents, only 15 per cent indicated changes in their sexual behavior because of concern about AIDS: 35 per cent said they were more selective in their choice of partners, and another 25 per cent that they were "careful". Only 10 per cent reported using condoms, with another 10 per cent stating that they now abstained from sex.

Research work conducted in Kansas City among volunteers from psychology classes, from the gay and lesbian student service, and from gay bars provides limited behavioral data. These similar studies appeared in 1984[54] and 1986,[55] and the sociodemographic characteristics of participants are virtually identical. There were a few more men than women; approximately three-fourths were single; three-fourths were heterosexual (the remainder being identified as homosexual, bisexual, or celibate); slightly over half currently had sexual partners; and the average age was approximately 22. There was little change in behavior noted between the two surveys, with only one-fourth stating that fears regarding AIDS had affected their sexual behavior (an equal proportion reported that herpes had had the same effect).

It is generally recognized that heterosexual contact with prostitutes may constitute an especially risky behavior, both because of the large number of sexual partners inherent in prostitution, and because IVDU is common in this group. It then becomes particularly important to document preventive behaviors in prostitutes and their clients. Des Jarlais and others[56] present data from 67 jailed "street" prostitutes, among whom 92 per cent reported that they "usually required" clients to use condoms. Additionally, oral-genital sex was the predominant sexual activity, further reducing the

likelihood of HIV transmission. However, key informants reported that these behaviors were adopted in the early 1970s in response to general concerns about sexually transmitted diseases rather than as a consequence of the AIDS threat.

Studies of AIDS Knowledge and Attitudes

Although it is obvious that the prevention of HIV transmission is dependent upon the alteration of behavior, most would agree that appropriate knowledge and attitudes are prerequisites for such change.[57,58] Although a wide variety of specific topics are documented in various reports, this review will concentrate on three central questions: how adequate is knowledge regarding the mechanism of HIV transmission? how adequate is knowledge regarding preventive methods, especially those particularly relevant to the sample being studied? to what extent is there a sense of personal vulnerability or risk which would make the available knowledge concerning transmission and prevention salient? In addition, we are concerned with the prevalence of misinformation or inaccuracies in preventive knowledge. This is important because it may be that, while individuals can correctly identify several mechanisms for transmission, this is only because they affirm that *all* modes of transmission are possible. Such a response set would suggest a generalized sense of hazard due to HIV, rather than an appropriate focus on specific mechanisms of transmission and their prevention.

Studies of Homosexual/Bisexual Men

McKusick and others assessed variables which could be construed as broadly describing both knowledge and perceived risk.[26] Of the 424 sample participants, 52.6 per cent expressed a "high" level of agreement with the guidelines for behavioral risk reduction. Seemingly, this would require both an adequate level of knowledge about, and appropriate attitudes toward, the guidelines. Although only 17.6 per cent reported having a friend with AIDS, 64.9 per cent had a visual image of AIDS deterioration—a factor which was related to behavioral risk reduction. These results provide evidence that, comparatively early in the epidemic, knowledge was far from complete and that the salience of the epidemic also seemed to be subject to individual variability. Insofar as metropolitan areas such as San Francisco experienced manifestations of the epidemic in an earlier or more extreme form, this suggests that provision of adequate information and communication about risk may be early needs.

As part of their efforts to determine the magnitude and determinants of behavioral risk reduction in Chicago, Joseph and others[31,32] constructed indices to assess the levels of AIDS knowledge and perceived risk. Knowledge, which appeared to be more important in predicting initial or accumulated behavioral risk reduction rather than its maintenance or incremental improvement, was assessed using a multi-item index that summed seven items dealing with the etiologic agent for AIDS, mechanisms of transmission, and public health behavioral recommendations. Because both transmission and prevention issues were combined in this index, it is not possible to describe separately the prevalence of particular types of knowledge. However, the global knowledge mean score was 71.4 per cent. Perceived risk of AIDS was not related in any straightforward fashion to either cross-sectional or longitudinal findings. In a separate report, this group suggests that the relatively facile notion that a sense of risk will improve compliance to behavioral recommendations requires more careful examination.[59] Nonetheless, they note that the mean score on a perceived risk index was 44.4 per cent, or less than "some" or an "average" chance of getting AIDS. Approximately 40 per cent of this cohort was already seropositive at the time of recruitment,[60] so there appears to be an optimistic bias regarding personal risk of AIDS. On the other hand, when men in the cohort were given the opportunity to affirm their belief that biomedical technology will provide a vaccine or cure in the near future, the mean score for this index was only 40 per cent; this suggests that although the sense of risk may be optimistically understated, it is not because respondents assume they will be rescued by technological innovations. Men were, however, fairly certain that behavioral changes are effective in reducing the risk of AIDS; this index had the highest overall mean score (82 per cent). Similarly, men reported sexual norms in their peer culture as generally supportive of adherence to behavioral risk reduction guidelines (mean score=64 per cent). Taken together, these results imply that, even in a lower-risk area, knowledge and attitudes are generally supportive of behavioral risk reduction. On the other hand, the uniquely advantaged nature of this cohort needs to be kept in mind, and it is clear that considerable variability remains even in this group of highly motivated and well educated men.

A study more directly concerned with attitudes in homosexual and bisexual men is reported in a Pittsburgh-based investigation by Valdiserri and others.[61] A cohort of 1,700 men enrolled in a natural history study of HIV infection was invited to participate in an educational session as part of the process of learning their HIV serologic status; 464 (32 per cent) agreed to do so. Serologic status did not distinguish participants and non-participants.

Prior to the intervention, knowledge was high concerning transmission of AIDS, AIDS risk groups, HIV natural history, manifestations of HIV infection, and the meaning of HIV antibody testing; men were somewhat less well informed regarding local AIDS prevalence. The majority of respondents also endorsed attitudes supportive of AIDS risk reduction, although a sizable minority did not. Strongest agreement (71 per cent among participants) concerned statements endorsing decreases in number of sexual partners, while items describing discussion of AIDS prevention with sexual partners received the lowest scores (53 per cent among those participating).

Given the relatively high initial scores, knowledge scores were predictably unchanged at the post-intervention assessment, but altered attitudes were observed in five of the six domains assessed. No changes were seen in any of the eight statements that assessed attitudes regarding number and type of sexual partners. No analysis of the relationship of attitudinal change to sexual practices was reported; however, both among those who participated in the intervention and those who declined to do so, nearly two-thirds indicated unprotected receptive anal intercourse with more than one partner in the preceding six months. Given the remarkably complete knowledge regarding AIDS in this cohort, this suggests that it is not information but, rather, attitudes or other factors which need to be targeted in future intervention activities.

The special needs of the minority (especially black) homosexual/bisexual male population are becoming increasingly recognized.[62] In this regard, a series of 62 interviews conducted by a Black community group in Detroit is of special relevance.[63] No sociodemographic data are provided, but the purpose of the study was to assess needs in the Black community where many homosexuals remain "closeted" and therefore difficult to reach even in surveys of the

homosexual community. While 58 per cent of the respondents were able to correctly identify IVDUs as being at risk for AIDS, only 13 per cent knew that semen and blood were primary routes for transmission of HIV. No information is given about the proportion of the sample who knew that HIV could be transmitted in homosexual male intercourse, although 37 per cent identified Haitians as a high-risk group. The preventive methods mentioned most often were monogamy and frequent medical checkups (no data provided). Almost three-fourths either felt that information in the Black homosexual community regarding AIDS was inadequate or were unsure about the availability of such information. The local organization providing AIDS-related preventive and service efforts was seen as a source of information by fewer than 7 per cent of the sample. Only 19 per cent of the participants were very worried that they might get AIDS, while 37 per cent reported that they were not worried (the remaining 44 per cent were somewhere intermediate between these extremes).

Knowledge and Attitudes in IV Drug Users

Friedman documented level of knowledge concerning AIDS as well as relevant behaviors in 59 Manhattan methodone maintenance patients.[40] All knew of AIDS, 93 per cent knew that IVDU was a mechanism for transmission, and 61 per cent were able to correctly identify at least one symptom of AIDS. Friedman also reports work by Selwyn and others in their sample of 146 methadone maintenance patients and 115 incarcerated drug users in New York City. During 1985, 97 per cent of these participants knew that you can get AIDS from sharing needles, although inaccurate information was also comparatively widespread (e.g., a majority of a sample believed that you could acquire AIDS from sharing a drinking cup). Knowledge of preventive methods was not specifically discussed, but the behavioral changes observed suggest that the participants are familiar with the need to eliminate needle-sharing and/or to clean needles when they are shared.

Ginzburg and others presented results of a knowledge assessment survey among IVDUs in both 1984 and 1985.[45] During 1984, more than 1,000 IVDUs from 10 drug treatment programs in New Jersey were invited to participate in a study designed to determine seroprevalence of HIV infection and level of knowledge in the surveyed communities. The authors report that less than 5 per cent of those approached refused to cooperate. Level of knowledge was unrelated to variability in community AIDS prevalence. Almost all participants were aware that IVDU increased the risk of infection with HIV and that this was due specifically to the practice of needle-sharing, with 93 per cent correctly identifying means of avoiding AIDS (the exact content of this question is not further specified).

A similar survey was undertaken a year later among those entering treatment; 89.1 per cent correctly identified IVDUs as a risk group and 87 per cent knew that the virus is spread by sharing needles. While only 29.3 per cent correctly identified the use of a 10 per cent solution of bleach as a method for sterilizing needles and reducing risk of transmission, 81.8 per cent correctly reported that never sharing needles or syringes would lower the risk of AIDS.

In this same group, approximately one-third did not recognize the potential for transmission of HIV from the intravenous drug user to his or her heterosexual partner. Perhaps more worrisome is that 43 per cent failed to recognize that infants born to women who use IV drugs (or whose partners do) are at risk for AIDS. There was considerable misinformation in this group as well: 16.3 per cent of those surveyed believed that living in a home or working with someone who has AIDS is sufficient to transmit the illness, and 15 per cent felt that wiping off a needle before use was sufficient to reduce the risk of AIDS. Furthermore, just over one-third thought that those who were infected with the AIDS virus would be visibly ill—an especially problematic notion because it would suggest that needle sterilization techniques might be directed only at drug partners who were not well. The authors point out that the concept of a carrier state may be a particularly difficult one for a group where physical appearance alone is often sufficient to permit recognition of those with hepatitis, a situation quite different from that of AIDS.

Information from Detroit methadone maintenance programs is supplied by Williams.[63] All respondents were Black as the particular focus of this group was the development of materials and programs appropriate for use in the Black population at risk for AIDS. Knowledge regarding AIDS and the transmission of HIV among homosexual men was at least adequate, yet only 62 per cent described IVDUs as a high-risk group. Blood and semen were correctly identified as the principle mechanisms for transmission, but 57 per cent were not concerned that they might get AIDS, and only 11.2 per cent were "very worried" about developing AIDS. Avoidance of IVDU was identified as an effective preventive by 67 per cent of those surveyed, and no longer sharing needles by 67 per cent. No data were available concerning use of a dilute bleach solution for inactivation of HIV. More than half were unaware of where they might call to receive more information, and 93.8 per cent believed such information should be available from drug treatment centers. Taken together, these facts suggest that perceived vulnerability and preventive knowledge were far from complete in this population, and that there was considerable potential for further intervention.

Knowledge and Attitudes in Other Groups

Using a brief self-administered questionnaire, Price and others investigated level of AIDS knowledge in a sample of 250 Ohio adolescents.[64] Although between half and three-fourths of these high school junior and senior students knew about certain characteristics of AIDS (immune suppressive syndrome, new disease, no cure), they were not able to correctly identify all risk groups, nor did they understand transmission. Overall, students who performed best nonetheless answered only 47 per cent of the questions correctly. Sources of information used by the students demonstrated that those using magazines were the best informed, with television and newspapers ranking second and third, respectively. Perceived vulnerability was assessed by asking students if they were worried about getting AIDS. Only 27 per cent indicated that this was the case, and fewer males than females were "personally worried" about contracting AIDS.

In San Francisco, DiClemente and others[65] evaluated knowledge, beliefs regarding personal vulnerability, and perceived need for AIDS instruction in high schools. General characteristics of the syndrome were correctly identified by the majority of students. While 92.4 per cent recognized "having sex with someone" and 81.1 per cent identified "sharing a needle with a drug user" as modes of transmission, almost one-fourth either believed that shaking hands with someone could give you AIDS or were unsure on this point. Only 60.0 per cent of the students knew that using a condom during sex could help prevent AIDS, and three-

fourths thought a new vaccine might have been recently developed for the treatment of AIDS.

On the other hand, these students appeared (perhaps because they reside in San Francisco) to be concerned about AIDS; 78.7 per cent reported that they were afraid of getting AIDS, and 41.8 per cent believed that their chances of getting AIDS were increased by living in the San Francisco area. Conversely, when students were asked if they felt they were less likely than most people to get AIDS, 52.5 per cent students agreed, and 61.5 per cent believed they were "not the kind of person" who is likely to get AIDS. It is difficult to know if these statements reflect an accurate assessment of their sexual and drug behaviors or an over-optimistic bias.

Strunin and Hingson's[53] survey in Massachusetts indicated that 96 per cent of adolescents had heard of AIDS and almost 50 per cent had discussed the subject with their parents or other adult family members; nonetheless, considerable confusion remained regarding the transmission of AIDS and, more particularly, regarding the meaning of "bodily fluids." Although only 4 per cent of the respondents knew someone who was or had been ill with AIDS, 11 per cent of these believed those with AIDS were contagious and had therefore seen the person less. Similarly, 23.2 per cent believed that someone with AIDS should not be allowed to attend school because of the potential for transmission. With regard to perceptions of risk, 54 per cent of the respondents were not at all worried that they might contract AIDS, and 61 per cent did not think it at all likely that they would get AIDS in their lifetime.

In a study of 212 college-age young adults in Kansas City,[55] Simkins and Kushner found that 71 per cent of the respondents indicated they were not concerned about contracting AIDS from their present sexual partner, and 41 per cent had no concerns regarding any future partners. As might be expected, there was more concern expressed by the small number of homosexual respondents, and men were more concerned about their partners infecting them with AIDS than were women. A homophobia scale was administered and found to correlate at a relatively low level with concerns regarding transmission of AIDS from either present ($r=.18$) or future partners ($r=.22$). Only one-fourth of respondents indicated that AIDS was of concern to them and that this had influenced changes in their sexual behavior. Despite the marked difference in lethality of the two conditions, students were equally concerned about herpes and AIDS; this may reflect the comparative prevalence of the two conditions in college-age populations rather than erroneous risk perceptions.

Reports from the United Kingdom provide evaluations of public information campaigns about AIDS. Sherr and others present data from both higher-risk individuals (patients at a clinic for sexually transmitted disease) and lower-risk individuals (law students and patients at a general practice office).[66] These groups were surveyed before any public information campaign; after an initial series of advertisements; and after a second series. Following the first advertisement, 41.9 per cent of the respondents indicated that they had read it, while 24.1 per cent reported reading the second. No details are provided, but the authors state that "information levels" were increased after both advertisement campaigns. They note, however, that although knowledge was increased, misconceptions were not corrected (i.e., error scores remain constant), and anxiety was not lowered by either program.

In Scotland, focus group qualitative research methods were used to assess knowledge and attitudes toward AIDS as part of the development of a public information leaflet.[67] Participants correctly saw AIDS as a sexually transmitted disease that could also be transmitted through blood contact. However, most believed that social contact was also sufficient for transmission, either through sharing facilities (such as a common cup) or through social interaction (shaking hands). Although respondents were able to correctly identify homosexual men and IVDUs as groups at higher risk, these groups were seen as being different from "ordinary" people, and affective responses to them were "profoundly negative." These negative feelings were generalized to the condition of AIDS, which was seen both as shameful and only affecting those with idiosyncratic behaviors.

Discussion

It is evident from the literature reviewed that changes in human behavior are occurring because of the threat of AIDS. Indeed, in some populations of homosexual/bisexual men, this may be the most rapid and profound response to a health threat which has ever been documented. The most complete data illustrating this point are available in San Francisco, where three separate cohorts are being studied and behavioral information is available from 1982 through 1986. Although cautions must be expressed about the comparability of these descriptions, an overall picture nonetheless emerges concerning the crucial transmission behavior of unprotected anal intercourse. In 1982, somewhere between 40 per cent and 60 per cent of San Francisco homosexual men appear to have been exposing themselves to HIV in this fashion.[24] By 1983, the prevalence of this behavior had declined to 30.2 per cent among those who were non-monogamous, while 59.1 per cent of monogamous men continued the behavior. A second study documented an 18 per cent prevalence of unprotected anal intercourse with non-primary partners, with a decrease to 12 per cent by 1985.[28] Also in 1985, receptive anal intercourse among the still vulnerable seronegatives was reported by 14 per cent of another cohort, but this figure had declined to 5.8 per cent by 1986.[24] In a parallel fashion, insertive anal intercourse prevalence dropped from 39.6 per cent in 1985 to 13.8 per cent in 1986 (these data do not take into account condom usage, so that effective transmission of HIV is presumably even less common). Taken together, these data suggest what may be a 90 per cent reduction in a powerfully reinforcing, common, and habitual behavior during a four-year period.

Available evidence also suggests that IVDUs are changing their behaviors. In sharp contrast to common stereotypes, a variety of behavioral changes were reported by 59 per cent of methadone maintenance patients as early as 1984 in New York City.[40] Furthermore, novel behaviors such as use of bleach solutions to disinfect needles and syringes increased eight-fold during two years and were reported by almost half of those interviewed in 1987.[43] It is among potentially vulnerable adolescent and young adult heterosexuals that little change is yet documented. Available data are limited, but suggest urban Black and Hispanic populations are also experiencing less behavioral change.

It is also apparent that there are preferred strategies being employed for risk reduction. As suggested in the introduction to this review, those at risk can either eliminate or modify behaviors that promote transmission of HIV; this is equally true for sexual and for drug-use behaviors. It is hardly surprising to note that celibacy is not the preferred strategy of homosexual/bisexual men for dealing with the risk

of AIDS. Instead, they appear to be differentially reducing their number of sexual contacts outside of a primary relationship and/or to be eliminating or modifying anal intercourse by use of condoms. Similarly, IVDUs are purchasing new needles or syringes, and learning to sterilize their equipment when sharing it. Apart from the scientific merit of accurately describing these preferences, we suggest that they might also inform the development of intervention programs. Although it may be attractive to counsel abstinence, information and support need to be provided to the much larger group of individuals who are choosing to modify their behavior. This immediately creates the difficulties in developing a social consensus which were discussed earlier. There are those for whom such programs provide tacit approval of behaviors which they view as at least illicit if not immoral. Nonetheless, we must consider the public health and social consequences of a failure to recognize how behavior change is most likely to occur.

On the other hand, the idiosyncratic nature of this infectious syndrome creates special problems. Unlike chronic diseases in which accumulated exposure produces deleterious health effects, in the case of AIDS we are concerned with avoiding probabilistic exposure to a retrovirus. Both the seroprevalence of this virus in a subgroup and the behaviors which they share will influence the likelihood of transmission. This virological reality creates special problems. For example, in a subgroup where HIV infection is comparatively uncommon, advice to limit frequency of exposure (e.g., by reducing the number of sexual or needle-sharing contacts) may have some value since it effectively reduces likelihood of contact with an infected person. However, as seroprevalence rises, this strategy becomes less likely to succeed. Indeed, even the suggestion that risky activities are permissible within the confines of a mutually monogamous relationship is patently hazardous unless serostatus is absolutely concordant and behavior is absolutely monogamous (and even this strategy ignores technological and human fallibility as well as the possibility of infection with other agents). Concern must then be expressed about the apparent distinction among homosexual/bisexual men between what is permitted within a primary relationship and what is allowed outside such a relationship. It would seem imperative that the simple but emphatic educational message emphasize preventing exposure to potentially infectious blood and semen. Thus, safer sex is not conditional on partner choice but requires altering behaviors with all partners. This is of even greater concern for heterosexuals, where behavioral responses such as "being careful" in partner choice are distressingly common.

Control of HIV transmission also requires that changes in behavior be applied consistently. There is ample evidence in these studies of recidivism (i.e., instability in behavioral risk reduction). Although a common phenomenon with any health behavior, it is potentially lethal in the case of AIDS. This may argue against attempts to eliminate rather than to modify transmission-relevant behaviors; if the probable outcome of such extreme change is subsequent readoption of high-risk behaviors, there is little to be gained by such a strategy. We recognize that positive health behaviors are often adopted incrementally, and with inevitable periods of "backsliding". Tragically, in the case of AIDS, these expectable patterns have potentially lethal consequences. At a minimum, it would seem necessary to strengthen and clarify behavioral recommendations so that the message of "risk reduction for a lifetime" takes center stage. This also suggests that community service programs need to anticipate the need for reinforcing and maintaining behavior change as well as for initiating it.

The discussion has, to this point, been primarily concerned with reducing an individual's risk of infection with HIV; however, the public health concern is inevitably somewhat different. Here, the question is not how an individual might avoid risk but how a population might avoid further transmission of an infectious agent. This draws attention to the problems created by even a small group of individuals who maintain behaviors capable of transmitting HIV. While behavioral risk reduction has been widespread, it is certainly not complete. Even the simplest transmission models suggest that a small group of particularly active individuals may be sufficient to prolong and/or extend this epidemic. Having said this, the immediate question becomes why most individuals successfully change their behaviors while some others do not. Unfortunately, distressingly little attention has been paid to this central issue. Further studies simply documenting the magnitude of behavioral change are of little value in most populations. What is required are vigorous attempts to better understand the determinants of AIDS-relevant behavioral change. Such observational studies are an essential prerequisite for the development of potentially successful intervention programs. Until we can describe and address the impediments to behavioral change, discussion of such extreme policies as quarantine or isolation of those infected will continue. To call for quarantine is, in essence, to announce that we have given up in our attempts to facilitate behavior change. Evidence reviewed here suggests this is certainly not necessary, but virtually no attention has been paid to the key issue of understanding behavioral risk reduction. The effort to recruit and assess those at risk for AIDS has been enormous; future work *must* capitalize on this investment by adequately investigating the determinants of behavior.

Finally, this review highlights the need to diversify research activity by including investigations of minority populations and young adults. The special needs of these groups are now being recognized, but carefully developed and rigorously analyzed behavioral studies are imperative. At a minimum, it is naive to assume that studies in population subgroups can simply be extrapolated to others; for example, the determinants of condom use among homosexual males, intravenous drug users, and inner city adolescents may be quite dissimilar.

This report has also reviewed studies of AIDS-relevant knowledge and behavior which, taken together, suggest at least an ecological correlation between level of knowledge and extent of behavior change in various groups. It would seem that homosexual/bisexual men are the best informed and the most likely to change their behavior, while the opposite is true of late adolescent and young adult heterosexuals. Nonetheless, there is little actual evidence that an individual's knowledge and attitudes toward AIDS significantly shape his or her behavior. It may well be that there is some "threshhold" effect and that, beyond a certain level, further increments in knowledge or improved attitudes no longer influence behaviors. On the other hand, it is also possible that this ecological association is an indirect one and that some third factor, such as comparative social advantage, provides the major link between positive knowledge/attitudes and behavioral risk reduction. In any event, these uncertainties only serve to highlight the need for further studies of the determinants of behavioral risk reduction.

In conclusion, we wish to reemphasize the multifaceted

and complex nature of the problem presented by the AIDS epidemic. There is an urgent requirement for interdisciplinary investigations which attend to behavioral as well as biomedical issues. After six years of experience with this epidemic, we still know far too little about behavioral and human responses to it.

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The Global AIDS Situation: WHO Update, January 1988

The numbers of reported cases of AIDS and countries reporting AIDS have continued to increase dramatically. As of January 1, 1988, 73,747 AIDS cases have been officially reported to the World Health Organization (WHO) from 129 countries. However, the total number of AIDS cases to date is estimated to be approximately 150,000.

- WHO estimates that between 5 and 10 million persons may be currently infected with human immunodeficiency virus (HIV), the virus which causes AIDS. By 1991, WHO estimates that at least one million new cases of AIDS could develop in people already infected with HIV.
- AIDS has been reported from every part of the world. The largest number of cases, 48,139, have been reported in the United States, where the disease was first recognized in 1981. In 41 other countries in the Americas, a total of 7,215 cases have been reported. In the Americas, Europe and Australia, most AIDS cases occur among young, 20–49 year-old homosexual or bisexual men and intravenous drug users. However, the estimate of the proportion of cases of AIDS acquired through heterosexual contact has increased from 1% to approximately 4%.
- In Europe, where 27 countries have reported 8,839 AIDS cases, most countries are now considered to be facing an epidemic. WHO estimates that 500,000 to one million persons in Europe are infected with the AIDS virus. Highest per capita cases of AIDS are found in Switzerland, Denmark, France and Belgium. WHO estimates 25,000 new cases of AIDS in Europe by the end of 1988.
- In Africa, the number of countries reporting AIDS to WHO has increased substantially in the past year. As of January 1, 37 African nations had reported 8,652 cases of AIDS. Major factors of HIV spread in Africa are heterosexual transmission, transfusions with unscreened blood, use of unsterilized needles or syringes, and mother-to-child transmission. The latter is a significant source of infection, especially in areas where 5–10% of pregnant women have been recorded as HIV seropositive.
- In Asia, 19 countries have reported 224 cases of AIDS. Many of those cases are linked to persons who have been in areas where AIDS is more prevalent. Oceania (including Australia and New Zealand) has reported 742 cases.
- The WHO Special Program on AIDS (SPA) was established on February 1, 1987 as the headquarters of the global fight against AIDS. As of January 1, 1988, SPA received requests for collaboration from 132 countries. Initial support of national AIDS programs has been carried out in 109 countries with more scheduled. In concert with SPA, 70 countries have completed short-term (6–12 month) plans; 26 countries have completed medium-term (3–5 year) plans; national AIDS committees have been established in more than 150 countries.

The global AIDS strategy of the Special Program on AIDS has been endorsed by the World Health Assembly (May 1987), at the United Nations General Assembly (October 1987), the Economic and Social Council of the United Nations (July 1987), and the Venice Summit (June 1987). The address of the World Health Organization is 1211 Geneva 27 Switzerland.