Barbara Snell Dohrenwend Memorial Lecture

The Impact of AIDS on a Gay Community: Changes in Sexual Behavior, Substance Use, and Mental Health[1]

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This report describes progress made to date on a study of the impact of the AIDS epidemic on the gay community of New York City. Using a model of the life stress process described by Barbara Dohrenwend and her colleagues, the AIDS epidemic was conceptualized as a community stressor resulting in two key stress-inducing events: death of loved ones due to AIDS and potential illness and death of oneself due to infection with human immunodeficiency virus (HIV). It was hypothesized that these stressors would be significantly related to three domains of health outcomes: sexual behavior, drug and alcohol use, and psychological distress. Descriptive trends over time are provided for both the health outcome variables and the stressor varia-

bles. Cross-sectional analyses for 3 years of data provide evidence in support of the main hypothesis. The implications of these findings are discussed from the standpoints of methodology, public health, and the psychology of stress processes in community settings.

We use as a point of departure a general model of the life stress process which Barbara Dohrenwend and her collegues (B. S. Dohrenwend, 1978; B. S. Dohrenwend & Dohrenwend, 1981a) developed and articulated during the course of a decade of research. This model, shown in Figure 1, has received wide attention and was adopted as a heuristic guide by the Institute of Medicine panel on Stress and Life Events in 1981 (Elliot & Eisdorfer, 1982). Although this scheme is an oversimplification of a highly complex process of interrelationships and feedback loops, there are certain attributes of the model that were very useful in conceptualizing and organizing a study of the impact of the AIDS epidemic on the gay community of New York City.

First, the model explicitly provides for the measurement of the objective occurrence of life stressors, independent of individuals' reactions to those events (B. S. Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984). Second, the model indicates that the influence of prior or extant environmental and personal factors on the occurrence of events must be considered and estimated (Brown & Harris, 1978, pp. 73-74; B. P. Dohrenwend, Link, Kern, Shrout, & Markowitz, 1988). Third, the model emphasizes the central role of mediating factors in determining the impact of life stressors (B. S. Dohrenwend & Dohrenwend, 1981b). Specifically, factors in the ongoing social situation, such as social supports or social burdens, and intrapersonal factors, such as self-esteem and mastery, play a critical role in the influence that stressors ultimately have on individual health. And fourth, the model includes not only decrements in health but also personal growth or health enhancement as possible consequences of life stressors (B. P. Dohrenwend et al., 1982). Thus, the model can be fruitfully applied to adaptive as well as maladaptive human responses to environmental demands. Using this model as an organizing framework, we designed a longitudinal study of the impact of the AIDS epidemic on nonill but at-risk gay men. A major goal of the project has been to compare and evaluate specific components of the model, to determine the explanatory power of each with regard to health outcomes.

The three primary health outcomes of interest were sexual behavior, drug and alcohol use, and mental health. We expected to see an impact of the AIDS epidemic on substance-use patterns and sexual activity because these were the types of behaviors most intensively focused upon in risk-reduction literature aimed at controlling the epidemic (e.g., Bay Area Physicians for Human Rights, 1982; Berkowitz & Callen, 1983; Gay Men's Health Crisis Newsletter, 1982). Substance use and sexual activity were also behaviors that
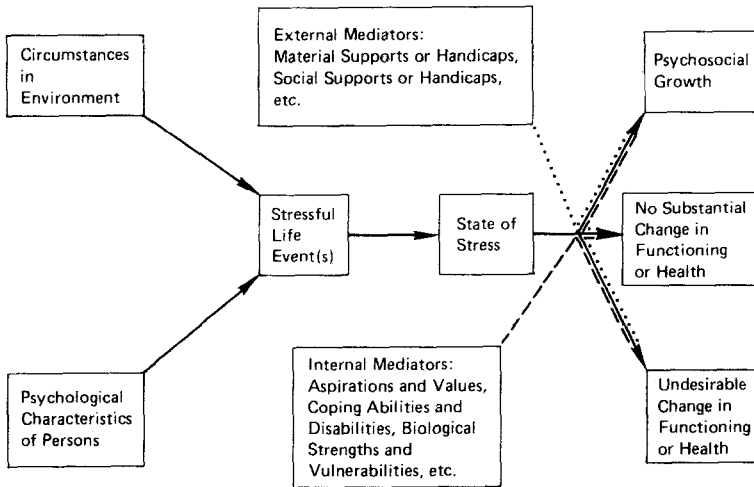
Fig. 1. Model of life stress process. Adapted from B. S. Dohrenwend, 1978, *American Journal of Community Psychology, 6,* pp. 1-14.

had been occurring at very high rates in particular segments of the gay community prior to the onset of the epidemic. Thus, there was room to observe a great deal of change, particularly in the direction of reductions in these behaviors.

The hypothesis that the AIDS epidemic would result in a major impact on mental health, however, was based on theoretical and empirical developments. We drew on findings derived from research on the nature and effects of stressful life events (B. S. Dohrenwend & Dohrenwend, 1974, 1978), human responses to natural and man-made disasters (B. P. Dohrenwend et al., 1979; Erikson, 1976), the effects of social disorganization on mental health, (Leighton, 1955), and the central role of threat appraisal in stress responses (Lazarus, 1966). Drawing parallels between stressors studied from these perspectives and the AIDS epidemic, we reasoned that as the AIDS epidemic grew it would generate stressors capable of increasing the rate of mental disorders and psychological distress in those communities at high risk for the disease. In addition, since stressors capable of evoking mental distress might also be those same forces that influence other health-related outcomes, such as sexual behavior and substance use, findings from such a study could have both theoretical and practical implications.

It is important to note that the psychological stress of the AIDS epidemic is not, nor was it ever, equivalent for all gay men. Just as there is a definable risk gradient for AIDS illness within the gay community, which is best modeled by levels of receptive anal intercourse activity (Chmiel et al., 1987; Kingsley et al., 1987; Martin, Garcia, & Beatrice, 1989; Mayer et al., 1986;

Moss et al., 1987; Stevens et al., 1986; Winkelstein, Lyman, & Padian, 1987), so is there systematic variation in the extent to which the AIDS epidemic is a stressor for the population of gay men. For some, the epidemic has destroyed their personal and social lives. For others, the epidemic has left them relatively unaffected. In order to operationalize and measure variation in the experience of AIDS-related stressors we focused on (a) bereavement of a lover and/or close friends due to AIDS (Martin, 1988a; Martin & Dean, 1989), and (b) the personal threat of developing AIDS which is brought about by knowledge of a positive HIV antibody test. (A positive HIV antibody test is generally accepted as evidence of infection with the virus that causes AIDS, and is considered by many to invariably result in morbidity and death [Institute of Medicine, 1988, pp. 35-36].)

Although the ultimate goal of this research program is to evaluate fully specified, interactive, longitudinal models of the processes leading from the experience of these stressors to various health outcomes, our first step has been more modest. That is, we have sought to establish the extent to which AIDS-related stressors impinge directly on mental health, sexual behavior, and substance-use patterns within the gay population. The purpose of this paper is to describe the progress we have made toward this end.

METHOD

Study Participant Selection

Since no sampling frame exists for enumerating gay and bisexual men we could neither draw a random sample of the community nor evaluate the sample for representativeness once it was drawn. Recognizing this limitation our goal was to generate a sample reflecting the diversity of the gay male population and avoid a narrow sample of convenience. Prespecified inclusion criteria were (a) New York City residency, (b) over 19 years of age, and (c) be a homosexual or bisexual male, defined as such by personal self-assessment. The only exclusion criterion was a diagnosis of AIDS.

The sample was recruited in early 1985 in multiple steps (Martin & Dean, 1985, in press). First, a two-stage random probability sample was drawn of all members of gay organizations in New York City. Stratifying the 110 organizations by size (small: up to 50; medium: 51–100; and large: 100 or more), and by type (social, religious, athletic, cultural, political), half of the groups in each stratum were randomly selected to approach for assistance in subject recruitment. Due to the difficulty in recruiting black and Hispanic gay men into research programs, 100% of all groups whose membership consisted primarily of men of color were approached for assistance. In response to

this personal solicitation, 92% of the organizations we approached agreed to participate.

Having located organizations willing to participate, the head of each group was instructed to randomly select five group members to whom invitational materials would be mailed. These materials were compiled by the research team but were sent out by the group leader so that an individual's identity would not be revealed unless that person decided to enroll in the study. The response rate for this organization subsample was 76%; 131 respondents were obtained from this source.

We recruited additional respondents in less systematic ways through four other channels: (a) Face-to-face recruitment at the 1985 Gay Pride Festival (n = 72); (b) nurse-practitioner recruitment at a public health clinic serving young, low income, primarily heterosexual, individuals (n = 15); (c) enrollment of unsolicited volunteers who heard about our study and contacted us in order to participate (n = 41); and (d) referrals into the study through 23 pilot subjects who agreed to test the "snowball" recruitment procedures, as described below.

A total of 291 respondents were recruited directly by the research team from the above five sources. At the conclusion of the interview with each of these participants, interviewers requested respondents' cooperation in recruiting friends into the study. Each man was given recruitment materials to mail to three friends. Respondents were asked to avoid "prescreening" those friends selected for recruitment so that each individual could choose to enroll or decline enrollment on his own. This method of recruitment, through personal referrals, allowed us to penetrate gay social networks in New York City up to five generations removed from the original individuals recruited directly by us, the researchers, from the five original recruitment sources.

The final sample compiled in 1985 consisted of 746 men, 39% recruited directly though diverse community channels, and the remaining 61% recruited through snowball procedures. The data presented in this paper are based on the 624 members of the panel who have completed three annual interviews in 1985, 1986, and 1987. This represents a reinterview rate of 84% after 3 years. Adjusting for the 18 men who died during this study period, the overall response rate is 86%. A number of demographic characteristics of the panel are shown in Table I. As of 1987, the cohort consisted primarily of well-educated men, averaging 38 years of age, with median annual incomes of $30,000 to $35,000 for 1986. Despite intensive recruitment efforts, only 10% of the cohort was black or Hispanic. Forty-two percent qualified for the operational definition of being coupled with a lover: (a) The respondent said he had a lover; (b) the lover viewed the respondent as his lover (reciprocity); (c) the couple's friends viewed the pair as a couple (public recognition); and (d) the relationship had been extant for 6 months or more (duration).

Table I. Panel Sample Demographic Character-
istics, 1987 ($N = 624$)

Demographic variable	Sample value
Age[a]	38.0 (8.7)
Years education[a]	16.5 (1.7)
Median income	$30–35K
Black or Hispanic race	10.9%
Formal religious affiliation	51.0%
Living alone	50.7%
Coupled with a lover[b]	43.1%
Father	6.2%
U.S. Veteran	13.3%

[a]Mean (SD).
[b]A respondent qualified as having a lover if (a)
he said he had a lover, (b) his lover viewed him
as his lover (reciprocity), (c) friends viewed the
two as a couple (public recognition), (d) the rela-
tionship was extant for 6 months or more (du-
ration).

HIV Antibody Status

In addition to annual psychosocial data collected in face-to-face inter-
views, 45% (282) of the panel sample have also had blood samples assessed
for HIV antibody, and a variety of hematological characteristics, on an an-
nual basis. The fact that the blood study subsample was recruited from wi-
thin the larger community sample allowed us to evaluate sample biases that
may be operating in our own seroepidemiological study of HIV infection
rates among gay men. To date, no significant differences on demographic
variables have been found between the subsample of men enrolled in the blood
study and those who declined enrollment. In addition no differences on sex-
ual behavior variables known to increase the risk of HIV infection and AIDS
(i.e., frequency of receptive anal intercourse and the number of different
sexual partners) have been found between these two groups.

It should be noted that our recruitment efforts have generated a study
group of gay men that is different from most other study groups (e.g., Joseph
et al., 1987; McKusick, Horstman, & Coates, 1985). Many findings published
to date on gay men and AIDS are based on patients drawn either from sexu-
ally transmitted disease clinics (e.g., Darrow et al., 1987; Mayer et al., 1986)
or private physician practices (e.g., Goedert et al., 1984). Some of the most
widely quoted epidemiologic findings are based on samples drawn from co-
horts of gay men assembled in the latter half of the 1970s for the develop-
ment of the Hepatitis B vaccine and subsequent efficacy trials (Stevens et
al., 1986). Thus, most conclusions to date have been based on samples con-
sisting primarily of either highly visible, easily recruited, sexually active

homosexuals and/or homosexuals experiencing a health problem at the time of study enrollment. Rarely are efforts made to either recruit additional subjects or adjust the sample in ways that emphasize healthy gay men or gay men who are more difficult to identify or contact.

Although these skews may not seriously affect internal comparisons (and indeed the large cohort samples have been extremely valuable in dating the introduction of HIV into the population), they may distort estimates of population characteristics on which the magnitude of the AIDS problem are based. One example of this problem is with regard to estimating HIV prevalence. While seroprevalence estimates by Jaffe and colleagues (Darrow et al., 1987) indicate that about 70% of San Francisco gay men have antibody to HIV, and estimates by Stevens et al. (1986) put the seroprevalence rate in New York City at about 55 to 60% in 1986, our estimate of HIV seroprevalence among New York City gay men is 37% as of late 1986.[3] It is likely that this large discrepancy is due to the nature of the samples. Since the recruitment efforts in the present study were aimed at a more diverse cross-section of the gay community compared to other samples published, it may be that epidemiologic research to date has overestimated the prevalence of HIV infection within the larger homosexual population.

Data Collection Procedures

The interview schedule was developed over a 1-year period by combining extant measures where possible with newly created measures as needed. Domains of interest inquired into each year included demographic characteristics of the respondent and his lover (if he had one), relationship satisfaction, domestic and extradomestic sexual behavior, psychological distress, drug and alcohol use, AIDS-related fears, HIV antibody testing attitudes and experiences, methods of coping with the AIDS epidemic, knowledge and beliefs about AIDS, social network structure and function, availability and adequacy of social support, AIDS-related losses and illness in the social network, bereavement reactions, professional service use, physical health and illness, and a number of personality characteristics (social desirability [Marlowe & Crowne, 1961], personal hardiness [Kobasa, 1979], health locus of control [Wallston et al., 1978], sensation seeking [Zuckerman, 1979], and masculinity-femininity-androgyny [Bem, 1974]). Open-ended questions with tape-recorded responses were provided by respondents at prespecified

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[3]A total of 397 men were originally tested in early 1986, of whom 146 were HIV antibody positive. The rate of 37% remains constant when we restrict our calculation to the 282 men who were part of the panel sample as of late 1987.

points in the interview session. The majority of measures focus on the year prior to the interview as the time frame of interest.

Interviews lasted from 2 to 4 hours and were of consistent length each year. They were typically conducted in private in respondents' homes. The interviewing team consisted of both gay and nongay individuals and included 12 to 14 people per year, one third of whom were women. Written informed consent was obtained at each interview, in accordance with institutional and government guidelines.

RESULTS

Trends in Sexual Behavior, Substance Use, and Psychological Distress

The assessment of the impact of AIDS stressors on health outcomes is complicated by the fact that ongoing changes in sexual behavior, drug use, and mental health are taking place in the gay male population of New York City. Describing the extent and nature of these changes for the sample as a whole is important for both substantive and methodological reasons. The first half of this analysis provides descriptive data on trends over time in this cohort of gay men.

Sexual Behavior, 1981–1987

In the baseline interview conducted in 1985 we inquired about sexual activity not only in the year prior to the interview but also in the year prior to when the respondent first heard about AIDS. For most of the sample this date was easily recalled: July 1981. Test–retest studies conducted during the pilot work indicated that the reliability of these retrospective reports was adequate for use as a benchmark, or "pre-AIDS" reference point, against which to compare data derived from subsequent time periods (see Martin, 1986, 1987, for details of this procedure). Thus, the following descriptive trends in sexual behavior represent activity levels for yearly periods corresponding roughly to 1981, 1985, 1986, and 1987. Table II shows trends in sexual partner patterns from 1981 to 1987. For the pre-AIDS year (1981) less than 3% of the cohort were celibate (i.e., no sexual contact with another man). This proportion increased to approximately 7% in 1987, with statistically significant increases occurring from 1985 to 1986, and 1986 to 1987. More pronounced changes can be seen in the adoption of monogamy: in 1981 approximately 8% of the sample reported sexual contact with a single partner,

Table II. Percentage of Panel Sample ($N = 624$)
Reporting No Partners, One Partner, and Two or
More Partners During Four Years[a]

Partners	Year			
	1981	1985	1986	1987
None	2.7	3.0	5.0[b]	6.9[b]
One	8.1	14.0[c]	16.2	18.6
Two or more	90.2	83.0	78.8	74.5

[a] T tests for proportions comparing matched samples were used to test differences between each yearly value and the value for the prior year: 1985 vs. 1981, 1986 vs. 1985, 1987 vs. 1986.
[b] $p < .05$.
[c] $p < .001$.

whereas in 1987 almost 19% had sex with a single partner. The statistically significant increase in monogamy occurred between 1981 and 1985, with more gradual subsequent increases in 1986 and 1987. While the rates of celibacy and monogamy have certainly increased, Table II also indicates that the majority of gay men reported multiple partners in 1981 (90%) as well as 1987 (75%).

In order to assess sexual contact with anonymous partners, the frequency of use of extradomestic locations for sex (i.e., bathhouses, back room bars and sex clubs, public places, and outdoors) were examined. While the frequency of use of all types of locations declined over time, the largest decrease occurred in the use of bathhouses: 50% of the sample attended a bathhouse for sex at least once in 1981 whereas 8% did so in 1987 ($p < .0001$).

Although sexual partner patterns are informative, the key aspect of sexual behavior relevant to disease transmission involves specific sexual acts. The frequency of engaging in specific sex acts as well as the percentage of the sample abstaining from each act are informative.

The top half of Figure 2 shows the average number of episodes in which each of 9 types of sexual activities were engaged in during each of the four yearly periods. The reductions in mean frequency from 1981 to 1985 are all statistically significant (Martin, 1987). Using matched-pair t tests to compare 1985 mean levels with 1987 mean levels, we found statistically significant declines in all nine types of sexual acts ($p < .001$). It is clear, however, that the magnitude of the declines is growing progressively smaller each year, as an asymptote in each distribution is reached. Such an asymptote is not so clearly defined in the distributions of abstainers shown in the lower half of Figure 2. The yearly increases in abstinence are statistically significant for each type of act ($p < .001$), and there does not yet appear to be a leveling off.
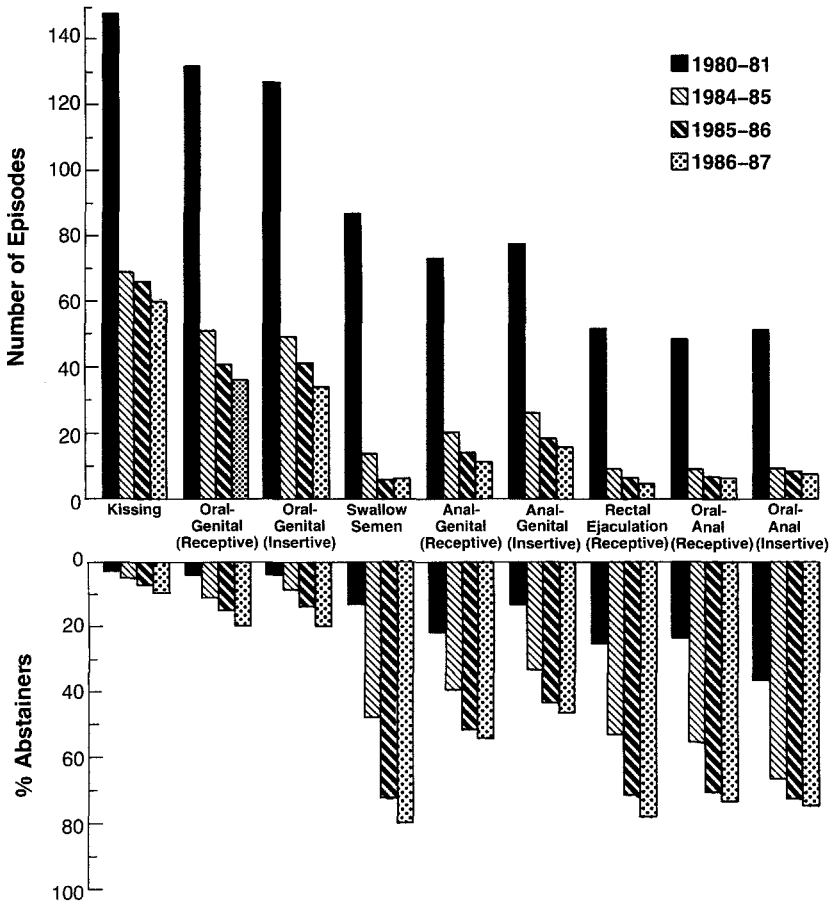
Fig. 2. Mean frequency of engaging and percentage abstaining from specific sexual activities in the panel sample ($N = 624$) during 4 years.

Two important points should be noted in Figure 2. First, as of 1987, over 50% of the sample had abstained for at least 1 year from receptive anal intercourse, whereas over 80% had abstained for at least 1 year from receiving a partner's ejaculate, either orally or rectally. Second, it is also clear that oral–genital sex is a highly preserved activity for gay men. Although abstinence from oral sex has increased over time, as of 1987 approximately 85% of the sample engaged in insertive or receptive oral sex at least once in the year. This finding demonstrates that, as a group, gay men discriminate sharply between sexual acts that carry a low risk of HIV infection (i.e., oral sex) from sexual acts that carry a high risk of HIV infection (i.e., anal intercourse). In addition, the differential changes demonstrated here indicate that investi-
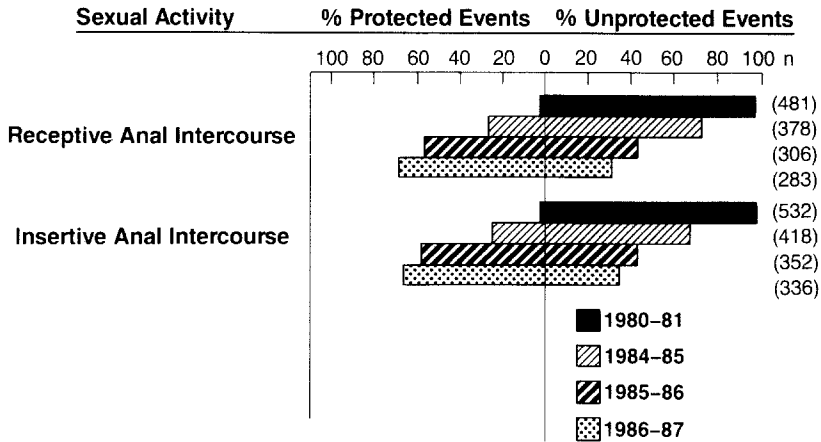
Fig. 3. Proportion of condom protected and unprotected anal intercourse episodes during 4 years.

gations in this field must employ highly specific measures of sexual behavior. Global measures tapping sexual risk taking (see, for example, Martin, 1986; and Stall, McKusick, Wiley, Coates, & Ostrow, 1986) should be avoided in light of the distinct variability across types of sex acts shown in Figure 2.

Turning now to the question of risk taking during sex, we examined condom use during anal intercourse. Looking first at the percentage of the sample who engaged in receptive anal intercourse who reported "always" using a condom during this activity, we found an increase from 2% (9/490) in 1981 to 62% (176/283) in 1987 ($p < .0001$). A similar increase was also found in the frequency of consistent use of a condom during insertive anal intercourse: 2% (10/541) in 1981 compared with 58% (193/336) in 1987 ($p < .0001$).

Shifting the unit of analysis to the total number of anal intercourse episodes reported by the cohort in each yearly period, Figure 3 illustrates the percentage of condom-protected episodes (both insertive and receptive) occurring each year. It can be seen that protected episodes increased from less than 1% in 1981 to approximately 70% in 1987 ($p < .0001$).

In order to determine the number of men in the sample conforming to public health risk reduction recommendations which call for either abstinence from anal intercourse or consistent condom use during intercourse we combined the data on abstainers with the data on consistent condom use. These results are shown in Table III. It can be seen that as of 1987, 82.9% of the sample had avoided unprotected receptive anal intercourse either by abstinence or consistent condom use for at least 1 year; 77.1% had avoided unprotected insertive anal intercourse for that same time period.

Table III. Percentage of Panel Sample ($N = 624$) Who Either Abstained From Anal Intercourse or Who Always Used a Condom With Anal Intercourse During Four Years[a]

Type of anal intercourse	Year			
	1981	1985	1986	1987
Receptive	22.9	49.0[b]	73.9[b]	82.9[b]
Insertive	14.9	43.4[b]	70.2[b]	77.1[b]

[a] T tests for proportions comparing matched samples were used to test differences between each yearly value and the value for the prior year: 1985 vs. 1981, 1986 vs. 1985, 1987 vs. 1986.
[b] $p < .001$.

These changes have clearly resulted in a public health payoff in terms of reduced rates of new HIV infections. Evidence linking behavior change with lowered incidence of infection was generated in two ways. Direct support for this conclusion comes from the observation that among the group of men who stopped engaging in receptive anal intercourse as of 1985, 22% (15/69) were HIV antibody positive. In contrast, among the group who did not stop engaging in receptive anal intercourse as of 1985, 48% (86/181) were HIV antibody positive. This represents a relative odds of 3.2, indicating that those who did not stop engaging in receptive anal intercourse were over three time more likely to be HIV positive in 1985 compared with those who did stop, $\chi^2(1) = 12.73$, $p < .001$. This protective effect of behavior change is even stronger among the 135 men who were most sexually active in the pre-AIDS year (i.e., 15 or more different sexual partners). Among those who stopped engaging in receptive anal intercourse 26% (9/34) were HIV positive. Among those who did not stop, 64% (64/101) were HIV positive (odds ratio = 5.0, $\chi^2[1] = 13.7$, $p < .001$).

The second type of evidence (which is indirect) indicating a public health payoff associated with behavior change is that in this cohort, we observed four incident seroconversions (indicative of new HIV infections among susceptible seronegative men) during a 6-month interval in 1986. This represents a half-year incidence rate of 1.6% (4/251) or 3.2% for the year. During the subsequent 12 months, we observed two incident seroconversions, representing an annual incidence rate of 0.8% (2/242), as of mid-1987. Thus, HIV infection rates have declined from over 10% per year in the early 1980s (Stevens et al., 1986), to 3% in 1986, to less than 1% in 1987.

From these figures it is quite clear that the epidemic of HIV infection in the gay community in New York City is beginning to come to a halt. Although there is not a 100% compliance with infection control guidelines in sexual behavior among gay men, the changes that have occurred have lead

to a reduction in new infections to a level of 1% per year. It is crucial to note, however, that while the epidemic of new HIV infections among gay men is slowing, the incidence of new cases of AIDS illnesses continues to rise. Given a period of latency from the point of infection to significant clinical illness of 10 years or more (and the estimate continues to increase [see numerous abstracts from the IV International Conference on AIDS, Stockholm, Sweden, June 1988]), it is very likely that we will continue to see growing rates of new AIDS cases in the gay community for some time. With the continued lack of effective treatments for AIDS illnesses, the threat of this disease continues to loom for large numbers of gay men. In addition to fear of the disease itself, the social and emotional burden of helping those sick with AIDS through, what for most is, a consistent decline to death, takes a significant toll on those who survive this epidemic. Thus, it is appropriate to turn now to psychological aspects of this cohort, and examine patterns of alcohol use, drug use, and emotional distress.

Trends in Substance Use

Alcohol Abuse and Dependence, 1986-1987. Focusing on maladaptive behaviors that may be more prevalent among males, particularly when viewed as an expression of psychological distress (B. P. Dohrenwend & Dohrenwend, 1969, 1974), we attempted to measure diagnosable alcohol abuse and dependence disorders, using DSM-III (American Psychiatric Association, 1980) criteria. The Diagnostic Interview Schedule (DIS: Robins, Helzer, Croughan, & Ratcliff, 1981) section on alcoholism was included in the 1986 and 1987 versions of the interview. (See Martin & Hasin, in press, for a detailed description of the method.) Using the standard algorithm developed by the St. Louis team, the prevalence of alcohol abuse and dependence disorders were calculated for this sample. Annual rates reported here are based on the date of the occurrence of the most recent symptom of abuse and/or dependence. The marginal values shown in Table IV indicate that 12% of the sample met criteria for a DIS-DSM-III diagnosis of alcohol abuse or dependence in 1986. This figure dropped to less than 9% in 1987. The 2-year dynamics of the alcoholism diagnosis are also of interest. First, the figures in Table IV suggest an annual incidence rate of 3.6% of new cases of DIS-DSM-III alcohol abuse or dependence among gay men. Second, approximately half of the 75 respondents who met criteria in 1986 failed to meet criteria in 1987. This finding suggests the occurrence of either (a) a remarkably high rate of remission among gay male alcoholics or (b) a problem in measurement whereby diagnostic criteria are too easily met. These data are currently under intensive study prior to conducting statistical significance tests. Although these data must be interpreted cautiously, it is clear that the types of problems associated with diagnosable alcoholism that are included in the DIS assess-

Table IV. Prevalence and Incidence of DIS-DSM-III Alcohol Abuse and Dependency Among Panel Sample Members ($N = 624$) During Two Years

Alcoholsim dx. status, 1986	Alcoholism dx. status, 1987					
	Absent		Present		Total	
	n	%	n	%	n	%
Absent	529	84.8	20	3.2	549	88.0
Present	39	6.2	36	5.8	75	12.0
Total	568	91.0	56	9.0	624	100.0

ment instrument are not increasing in this sample. In fact, they appear to be decreasing.

Recreational Drug Use, 1981–1987. Another aspect of psychological distress may be reflected in the use of illicit drugs. Although injecting drugs is a primary risk factor for AIDS and HIV infection, only 9% of the sample had a history of injecting. More important, less than 1% reported ever sharing injection equipment. Thus, the primary interest has been in the use of noninjected drugs including marijuana, barbiturates, amphetamines, cocaine, opiates, hallucinogens, and inhaled nitrites. As with the measures of sexual behavior, the baseline interview in 1985 included a retrospective section on drug use behavior focused on the year prior to the AIDS epidemic. Thus, a benchmark, pre-AIDS year (1981), is available for comparison with 1985, 1986, and 1987. The trends in recreational drug use over these four yearly periods are shown in Figure 4. The top half of Figure 4 reflects the average number of days of drug use for each drug type, as well as for all drugs combined, for each of the 4 years. Statistically significant declines ($p < .0001$) were found for all drugs, from 1981 to 1985, except cocaine ($p < .07$) and opiates ($p < .10$). The lack of difference in cocaine use is due to the small decrease in use over time, while the lack of difference in opiate use is due to the rareness of use of opiates at all time periods in this sample. Comparing average use in 1981 with average use in 1987, Figure 4 shows a decline of over 80% in the use of inhaled nitrites, barbiturates, amphetamines, and hallucinogens. Marijuana use declined by 60% while cocaine use declined by 47% over the 6-year period. The lower half of Figure 4 indicates that many gay men abstain entirely from the use of specific drugs. Focusing on the summary measure, we found more than a doubling in the percentage of the sample that abstained from all drug use; 16% in 1981 compared with 39% in 1987.

Trends in Psychological Distress, 1985–1987

We borrowed a number of subscales from the Psychiatric Epidemiology Research Instrument (PERI: B. P. Dohrenwend, Shrout, Egri, & Men-
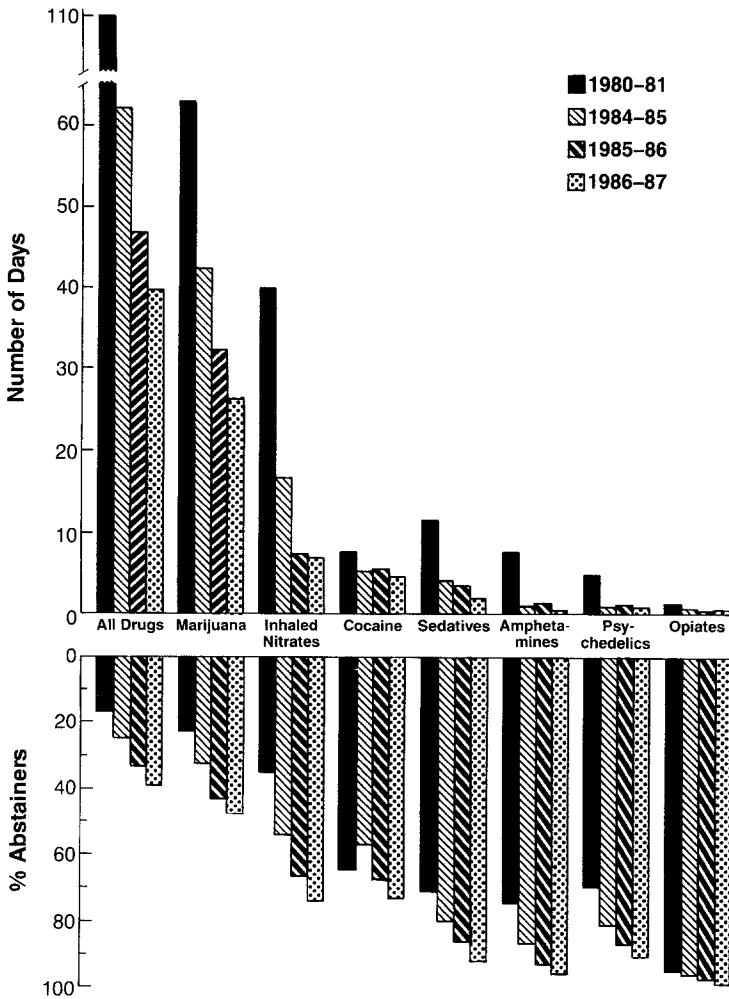
Fig. 4. Mean number of days of use and percentage of abstainers in the panel sample (N = 624) for 4 years.

delsohn, 1980) in order to measure various types of psychological distress symptoms. These included demoralization, sleep problems, guilt, and suicidal ideation. We also created a new measure of distress in an attempt to measure Post Traumatic Stress Response (PTSD: American Psychiatric Association, 1980) reactions to the AIDS epidemic. We modified items in the Impact of Event Scale (Horowitz, Wilner, & Alvarez, 1979), rewording them so as to be directly related to intrusive and avoidant thoughts and emotions about AIDS. Three additional items were added which contributed to

Table V. Mean Levels of Psychological Distress For the Panel Sample (N = 624) During Three Years[a]

Psychological distress measure	Year					
	1985		1986		1987	
	M	SD	M	SD	M	SD
Demoralization	35.2	14.3	32.9[e]	13.6	31.8[e]	13.8
Sleep problems	4.2	2.6	4.1	2.5	3.9[c]	2.8
Guilt	4.8	3.0	4.4[e]	2.8	4.2[d]	2.8
Suicidal ideation	0.45	0.74	0.36[d]	0.66	0.37	0.67
PTSD	18.2	9.6	18.5	9.3	18.9[b]	9.5

[a] T tests for means comparing matched samples were used to test differences between each yearly value and the value for the prior year: 1986 vs. 1985, 1987 vs. 1986.
[b] Increase from 1985 to 1987 is significant, $p < .01$.
[c] $p < .05$.
[d] $p < .01$.
[e] $p < .001$.

the internal consistency reliability of the scale (alpha = .87). Although construct validation work remains to be done, the measure is quite sensitive to particular aspects of AIDS-related stressors and, as suggested by the findings presented here, it appears to be distinct from the measure of demoralization.

Using the PERI measures and the PTSD measure, psychological distress was assessed for 1985, 1986, and 1987. Table V shows mean levels of distress for the panel sample over a 3-year period. The trends shown in Table V for demoralization, sleep problems, guilt, and suicidal ideation indicate successive decreases in symptoms from 1985 to 1987. Statistically significant declines from 1985 to 1986, and again from 1986 to 1987, are shown for demoralization and guilt. Sleep problems declined significantly from 1986 to 1987, while suicidal ideation declined significantly from 1985 to 1986. In contrast to this pattern, stress response symptoms contained in the PTSD measure have increased on an annual basis. Although the changes from 1985 to 1986, and 1986 to 1987, are not statistically significant, the increase from 1985 to 1987 is significant ($p < .01$).

These results warrant further investigation as well as additional time points (which we are currently gathering). It is not clear at this time why depressive symptomatology of the kind tapped by the four PERI scales would be decreasing. However, the increases in PTSD-like symptoms may reflect the fact that progressively more gay men are experiencing AIDS-related stressors as the epidemic continues. We turn now to evidence that supports this proposition, and examine the relationships between AIDS-related stressors and health outcomes associated with psychological distress, drug use, and risk taking during sexual behavior.

AIDS-Related Stressors and Health Outcomes

The following analyses represent an initial look at the longitudinal data on the associations between AIDS-related stressors (bereavement and knowledge of a positive HIV status) and sexual behavior, drug use, and psychological distress. Given the rapid changes that have characterized all aspects of the AIDS epidemic (scientific, medical, social, and political), we have approached the question cautiously and we have not attempted to model *changes* over time. Rather, using ordinary least squares regression models within each wave of data, the aim of these analyses was to determine the extent to which key associations between stressors and outcomes remained stable over time. Using results obtained from these cross-sectional analyses, we are in a better position to specify and test longitudinal models of the life stress process.

Before examining the relationships of bereavement and knowledge of being HIV positive on health outcomes, we first studied the variation in health outcomes associated with four specific demographic variables. Simultaneous regression equations were tested for 1985, 1986, and 1987, in which scores on the measures of PTSD, demoralization, drug use,[4] unprotected receptive anal intercourse (RAI), and unprotected insertive anal intercourse (IAI), were each regressed on race, age, years education, and partner status. The results of these cross-sectional regression models are summarized in Table VI.

Examining the first column in Table VI it can be seen that consistent effects associated with race were found only for PTSD symptoms. White respondents consistently reported more frequent and/or intense symptoms compared with black and Hispanic respondents. It can be seen in the second column of Table VI that PTSD symptoms and drug use are related to age. For both of these variables the association is inverse, such that PTSD symptoms and drug use decrease as age increases.

The third column of Table VI represents education. It can be seen that demoralization is the only variable consistently associated with years of education. This inverse association replicates prior work by the authors of the scale, showing consistently lower demoralization scores among the more highly educated (B. P. Dohrenwend et al., 1980).

The fourth column in Table VI represents partner status in which single men are compared with partnered men. The results are complex and intriguing. Considering PTSD symptoms first, there appears to be fluctuation over time in the mean scores of partnered versus single men. However, since

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[4]The summary drug use measure includes the frequency of use of illicit barbiturates, amphetamines, cocaine, and hallucinogens. We did not include marijuana or inhaled nitrites in this summary measure because each of these drugs has a distinct pattern of use and has been analyzed separately in previous research reports. See Martin (1988a).

Table VI. Unstandardized Regression Coefficients (SE) Derived From Predicting Five Health Outcomes From Four Demographic Variables For Three Years ($N = 624$)[a]

Health outcome	Race[b]		Age[c]		Education[c]		Partnered[d]	
Posttraumatic stress								
1985	-3.30^g	(1.24)	-0.12^g	(0.04)	-0.21	(0.21)	-0.64	(0.79)
1986	-2.33^f	(1.21)	-0.14^g	(0.04)	-0.23	(0.21)	-1.55^f	(0.76)
1987	-3.41^g	(1.23)	-0.15^g	(0.04)	-0.56^f	(0.23)	1.60^f	(0.77)
Demoralization								
1985	-1.45	(1.86)	-0.09	(0.07)	-0.86^g	(0.32)	-3.17^g	(1.18)
1986	-0.96	(1.76)	-0.01	(0.06)	-1.42^h	(0.31)	-2.88^g	(1.10)
1987	-1.75	(1.82)	-0.10	(0.06)	-1.09^g	(0.33)	-1.97^e	(1.14)
Unprotected RAI								
1985	0.03	(0.21)	-0.02^f	(0.01)	-0.06^e	(0.04)	0.76^h	(0.13)
1986	0.14	(0.17)	-0.01	(0.01)	-0.03	(0.03)	0.64^h	(0.11)
1987	0.13	(0.15)	-0.01	(0.01)	-0.02	(0.03)	0.52^h	(0.09)
Unprotected IAI								
1985	0.22	(0.21)	0.01	(0.01)	-0.02	(0.04)	0.99^h	(0.13)
1986	0.32	(0.19)	0.01	(0.01)	-0.06	(0.03)	0.85^h	(0.12)
1987	0.19	(0.16)	0.01	(0.03)	-0.02	(0.03)	0.64^h	(0.10)
Drug use								
1985	-0.27	(0.27)	-0.04^h	(0.01)	0.02	(0.05)	-0.05	(0.17)
1986	-0.18	(0.26)	-0.03^h	(0.01)	-0.01	(0.05)	-0.06	(0.16)
1987	-0.01	(0.24)	-0.02^g	(0.01)	-0.04	(0.04)	-0.16	(0.15)

[a] The F test for each demographic variable was conducted after adjusting for the three other demographic variables ($df = 1$, 618).
[b] Black or Hispanic race = 1; white = 0.
[c] Continuous variable.
[d] Partnered with a lover = 1; single = 0.
[e] $p < .10$.
[f] $p < .05$.
[g] $p < .01$.
[h] $p < .001$.

the effect sizes are small, it would be unwise to interpret these differences. A more consistent picture emerges with respect to demoralization. In each of the 3 years, partnered men have lower demoralization scores compared with single men. This effect, however, appears to be waning with time. It should be noted that this analysis does not take into account the incident couplings and breakups that occurred each year in the cohort (Martin, 1988b). Given the highly stressful nature of breakups, future work on the partner status–demoralization relationship over time will have to take these events into account.

The clearest and strongest associations shown in Table VI involve the relationship between partner status and unprotected (insertive and receptive) anal intercourse or sexual risk taking. In each cross-section these results indicate that men who are in a primary relationship report significantly higher mean frequencies of unprotected intercourse compared with men who are single. This finding is important from a public health standpoint as well as a psychological standpoint: choices about risk seem to be clearly linked to the partner with whom one takes the risk.

Having established that demographic factors are important correlates of particular health outcomes, we turn now to examine the associations between AIDS-related stressors and those five health outcomes.

AIDS-Related Bereavement

The death of a lover or a close friend due to AIDS is becoming increasingly common among gay men. In 1981 the annual incidence of AIDS-related bereavement was less than 2%. By 1985 the noncumulative annual incidence had reached 18%. That figure continued to increase to 23% in 1987. These rates do not reflect the fact that of those who are bereaved, over one third have lost two or more close individuals within the same year. Some men have reported as many as six close losses in 1 year (Martin, 1988a) whereas others have been chronically bereaved of close loved ones for 3 or more consecutive years of the epidemic (Dean, Hall, & Martin, 1988). In addition, AIDS-related bereavement is not a random event in the gay population but is disproportionately concentrated among those aged 35 to 45, who are HIV antibody positive, and who have experienced one or more clinically significant signs of AIDS-related illness (Martin & Dean, 1989).

Knowledge of a Positive HIV Antibody Status

The second major AIDS-related stressor which is increasing in this cohort is knowledge of being HIV antibody positive. Such knowledge can be highly stressful because infection with HIV has serious health implications,

Table VII. Unstandardized Regression Coefficients (*SE*) Derived From Predicting Five Health Outcomes From Bereavement and Knowledge of Being HIV Antibody Positive for Three Yearly Periods (*N* = 624)[a]

Health outcome	Bereavement		Informed HIV antibody positive	
	b	SE	b	SE
Posttraumatic stress				
1985	6.00[e]	(0.76)	2.94	(2.54)
1986	1.83[e]	(0.54)	4.78[d]	(1.52)
1987	2.89[e]	(0.56)	3.42[d]	(1.28)
Demoralization				
1985	5.51[e]	(1.18)	1.67	(3.92)
1986	0.37	(0.80)	2.11	(2.23)
1987	2.01[d]	(0.84)	2.07	(1.93)
Drug use				
1985	0.53[d]	(0.17)	0.94	(0.58)
1986	0.23[c]	(0.11)	1.16[e]	(0.33)
1987	0.20[b]	(0.11)	0.93[e]	(0.36)
Unprotected RAI				
1985	−0.10	(0.13)	0.49	(0.44)
1986	0.19[c]	(0.08)	0.16	(0.22)
1987	0.04	(0.07)	0.23	(0.16)
Unprotected IAI				
1985	−0.13	(0.14)	0.14	(0.45)
1986	0.19[c]	(0.09)	0.01	(0.24)
1987	−0.14	(0.07)	−0.02	(0.17)

[a]The *F* tests for bereavement were conducted after adjusting for race, age, education, lover status, and knowledge of being HIV antibody positive. The *F* tests for knowledge of being HIV positive were conducted after adjusting for race, age, education, lover status, and bereavement; (*df* = 1, 617).
[b]*p* < .10.
[c]*p* < .05.
[d]*p* < .01.
[e]*p* < .001.

not the least of which is a high likelihood of developing AIDS. A positive HIV antibody status is also believed to indicate infectiousness to others even in the absence of clinical symptoms of AIDS. In this cohort, 2% (*n* = 13) knew of their positive HIV status as of 1985, 6% (*n* = 38) knew as of 1986, and 9% (*n* = 55) knew as of 1987.

In order to evaluate the direct relationships between each of the AIDS-related stressors and the five health outcomes, the regression models used to test demographic effects were extended to include two additional predictors: (a) whether or not the respondent knew he was HIV antibody positive, and (b) the number of AIDS-related bereavements experienced by each respondent in the year prior to the interview. The results for each type of stressor are summarized in Table VII.

Looking first at the column summarizing bereavement results, it can be seen that there is a direct relationship between the frequency of losing someone close due to AIDS and symptoms of PTSD, demoralization, and illicit drug use. The demoralization effect disappears in 1986 but reappears in 1987 and is most likely the result of random error fluctuations. This irregularity is being studied. The link between illicit drug use and bereavement, which we reported previously (Martin, 1988a), appears to be growing weaker with time. In contrast to the indicators of psychological distress, the indicators of sexual risk taking (i.e., unprotected anal intercourse) do not appear to be consistently related to the frequency of experiencing bereavement.

The second column of Table VII summarizes the cross-sectional associations between the five health outcomes and knowledge of a positive HIV status. These results indicate that there was no relationship between knowledge of a positive HIV status and any of the five health outcomes, for the small group who knew their status, in 1985. However, in 1986 and 1987 those who knew their positive HIV status had significantly elevated mean levels of PTSD symptoms and significantly elevated drug use scores compared with those who did not know their HIV status, positive or negative. No differences associated with knowing one's positive HIV status were found for demoralization or frequency of unprotected anal intercourse (either insertive or receptive).

SUMMARY AND DISCUSSION

The descriptive data presented in the first half of this paper indicate that as a group gay men in this sample have undergone major changes in the course of the AIDS epidemic. Sexual activity has decreased dramatically while efforts aimed at reducing the risk of all types of disease transmission during sex have been incorporated into most gay men's sexual habits. Illicit drug use has become much less prevalent, and as of 1987 was largely limited to marijuana use. The rate of alcohol abuse and dependence appears to have declined, at the same time that depressive symptomatology involving demoralization, sleep problems, guilt, and suicidal ideation have also decreased. These trends suggest that, overall, the mental and physical health of the gay community of New York City may actually be improving as the AIDS epidemic progresses. Of course, such a conclusion applies only to those who are surviving the epidemic. Yet even among these survivors, there are important mental and physical health outcomes that are clearly tied to AIDS-related stressors and sociodemographic factors.

The one type of psychological distress that has increased from 1985 to 1987 for the sample as a whole has been PTSD-like symptoms associated

with intrusive and avoidant thoughts and emotions about AIDS. This is also the particular type of psychological distress that appears to be most reactive to the AIDS-related stressors of bereavement and knowledge of a positive HIV antibody status. Since the occurrence of both of these stressors is increasing each year in this cohort, this may explain the differential increase in PTSD-like symptoms compared with decreases in depressive symptoms. Clearly, further work is required to disentangle these trends.

Considering the issue of either taking risk for oneself, or imposing a risk on one's partner, the lack of association between unprotected anal intercourse and knowledge of a positive HIV status was surprising. While it is premature to conclude that such knowledge has no effect on risk taking during sexual behavior, the present negative results certainly call into question the idea that HIV testing is a useful or efficacious public health intervention as a means of changing risky behavior among gay men. Indeed, more refined analyses of our own data to date indicate that knowledge of a positive HIV status may lead to increased tendency to engage in unprotected receptive anal intercourse (i.e., increased risk taking for oneself [Martin, 1988c]). In light of the extreme changes that have already occurred in sexual behavior patterns, the public health gains associated with HIV testing for the gay population as a whole may be quite small.

The one variable found to be a strong and consistent predictor of unprotected anal intercourse, in both receptive and insertive modes, was partner status. Gay men involved in a primary relationship engaged in higher risk sexual behavior more frequently than gay men who were single. Further work is needed to determine the elements of the primary relationship that may account for this differential. What is clear, however, is that unlike the early years of the epidemic, the more recent years are characterized by risk taking with known, intimate, primary partners, rather than anonymous partners contacted in extradomestic locations.

In conclusion, the results presented here indicate that AIDS-related bereavement and knowledge of a positive HIV status are directly related to increased psychological distress, particularly PTSD-like symptoms and illicit drug use. These stressors, however, do not appear to predict levels of risk-taking behavior during sex. The findings are consistent with prior work demonstrating that stressors and psychological distress are indeed significantly and directly related, but there are limitations with respect to the health outcomes we might expect to be directly influenced by stressors. Thus, it is also clear from these findings that there is a great deal more to learn about the pathways leading from the experience of stressors to various health outcomes.

The emphasis on mediating factors so central to the model of stress processes outlined by Barbara Dohrenwend, with which we began, is very well conceived. Our future work must focus on situational and personal

characteristics that either sharpen or reduce the associations we have demonstrated between demographic factors, AIDS-related stressors, and deleterious health outcomes. Such a direction will not only lead us to theoretical advances in our understanding of the costs of adaptation to severe life stressors but also point the way toward effective interventions, prevention efforts, and therapeutic efforts.

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