

Effects of HIV Antibody Test Knowledge on Subsequent Sexual Behaviors in a Cohort of Homosexually Active Men

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Abstract: This study assesses the effects of HIV (human immunodeficiency virus) antibody testing on subsequent (one year) sexual behavior among 270 homosexual men at a Boston community health center, 21 per cent of whom were unaware of their test result. Except for the number of steady partners, the levels of all sexual activities of all groups of study participants declined over time. No effects of test awareness of antibody status were found on protective behavior for receptive anogenital contact. Elimination of unprotected

insertive anogenital contact (by elimination of the practice or by condom use) was reported somewhat more often among seropositive men who became aware of their test result. Increased negative emotional reactions were reported by HIV seropositive men who were aware of their test result. These results suggest some behavioral impact of HIV antibody test knowledge in this cohort, but may not be generalizable to other populations. (*Am J Public Health* 1988; 78:462-467.)

Introduction

Screening for antibodies to the human immunodeficiency virus (HIV) has been advocated as part of public health programs for the surveillance and control of the acquired immunodeficiency syndrome (AIDS) and HIV infection.¹ Members of high-risk groups in particular have been encouraged to be screened in order to prevent further transmission of HIV. This issue has been extremely controversial, particularly among members of the gay community, public health professionals, and politicians. Concerns have been raised about the confidentiality of test results, and possible discrimination against individuals found to be HIV seropositive. Some have argued that risk-reducing behaviors can result from properly designed educational programs, of which screening is not a necessary component.² Finally, concerns have been raised regarding the reliability and validity of the antibody tests currently available. However, false positive results are more of a problem in screening a low-risk than a high-risk population and can be dealt with by using appropriate confirmatory tests. Biologically valid false negative results may be noted, however, since weeks to months may elapse between exposure and the detection of elevated antibody titres.^{3,4} Rare individuals may be infected with HIV without making antibodies for long periods of time, as determined by viral cultures of white blood cells.^{5,6}

This study investigates the effects of HIV antibody screening in a cohort of initially asymptomatic homosexually active male clients of a Boston community health center. The men, enrolled in a longitudinal study of the natural history of HIV infection,^{7,8} have had the option of remaining unaware of their antibody test results. The objectives of this study are to identify factors associated with the decision to be informed of HIV antibody test results, and to investigate sexual behavior subsequent to antibody testing, comparing behavior between HIV seronegative and seropositive men and between those who are aware and unaware of their test result.

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Methods

Study recruitment began in January 1985, and included mailings to health center clients and information on the study placed in the waiting area. Eligibility criteria for study participation included: being a health center client, regular homosexual activity (more than one homosexual contact per month), and absence of symptoms suggestive of HIV infection. Participation in the study followed written informed consent and included completion of a self-administered questionnaire, a physical examination, and HIV antibody testing. Regardless of whether the men subsequently decided to receive their HIV antibody test result, the meaning of the HIV antibody test and HIV risk reduction measures were discussed with them. Those who chose to know their test result returned to the health center, usually within three months, to receive their result and to be counseled. Men who originally decided not to receive their result had the option to change their mind and to receive their result at any point in the follow-up period. Results from the one-year follow-up visit are presented for those 270 men who had completed this visit by June 1987. The cohort is largely White (97 per cent), college educated (64 per cent); and 74 per cent are between 20 and 34 years of age.

Laboratory Methods

Antibody to HIV was determined with the enzyme-linked immunosorbent assay (ELISA) or fluorescent antibody (FA) techniques.⁹ Sera reactive three-fold or greater over known negative controls were considered positive. Specimens positive by ELISA or FA were confirmed by Western blot,⁵ and reported as positive when both tests gave positive results.^{10,11}

Measurement of Behaviors

At the initial visit, subjects completed a written questionnaire in which they reported their sexual behavior and provided information on specific practices during the previous six-month period. At the six-month and one-year follow-up visit, information was collected on the same set of practices for the preceding six-month period. Several of these measures have been determined to have adequate test-retest reliability.¹²

Measurement of Knowledge and Perceptions about AIDS

At the initial visit, subjects were asked about their knowledge of high-risk behaviors for HIV transmission, and about the number of ways that they had sought out information on AIDS. A measure of the individual's perceived effort

to change his sexual behavior was derived from responses to two Likert-scaled items. Perceptions about AIDS were measured by Likert-scaled items and scales, and included measures of perceived severity of AIDS, susceptibility to AIDS, efficacy of medical treatment of AIDS, benefits of behavior change in risk-reduction, optimism regarding the prognosis for a positive HIV antibody test result, beliefs of their social network regarding behavior change, and general health promotion behavior (details on the construction of these scales are available from the authors, upon request). In addition, information was gathered on whether a friend or lover was known to have AIDS, AIDS-related complex, or HIV infection. Subjects were also asked at the six-month and one-year visits about emotional reactions (anger, depression, fear, happiness, encouragement) that they might have experienced since their initial visit and which they perceived as effects of their participation in the study.

Statistical Methods

Factors associated with whether subjects received their HIV test results were investigated using cross-classification and chi-square statistics, as well as with multiple logistic regression analysis.¹³ Subjects were divided into the four groups resulting from cross-classification of their antibody status and knowledge of test results for comparisons of the levels of several specific behaviors at the three visits. Subjects whose antibody status or knowledge of test result had changed over the course of the observation period were excluded from this analysis. Profile analysis and linear least-squares regression techniques were used to investigate associations between the explanatory variables and changes in levels of specific behaviors.¹⁴ The sexual behavior variables were coded as the midpoints of the interval of the response category, and transformed to a logarithmic scale to reduce skewness. Where appropriate, geometric means (the anti-log of the mean in the logarithmic scale) are reported. Specific behaviors investigated in this way for the prior six-month period included: the number of steady homosexual partners, the number of casual homosexual partners, the frequency of insertive anogenital contact in which the subject did not use a condom, and the frequency of anal exposure to ejaculate.

The main interest in this investigation was in change from unprotected anogenital contact either to protected contact or to elimination of the practice, since this has been the practice most highly associated with HIV transmission.⁸⁻¹⁰ Therefore, a second analysis of behavior change used categorical measures of unprotected contact (none or any) and excluded men who reported no unprotected contact of this type initially. Anogenital contact was considered protected when the insertive partner(s) always used a condom. However, as a question on the partner's condom use during anogenital contact (subject receptive) was not asked until the 12-month questionnaire, we substituted information on the subject's anal exposure to ejaculate for assessment of protection during receptive anogenital contact at the initial visit. The cross-classification and logistic regression techniques described above were also used for this analysis.

Results

Of the 270 men who completed their one-year follow-up visit, 200 men (74 per cent) chose to receive their initial test result before the six-month follow-up visit, almost all of these within three months of the initial visit. Sixty-seven men (25

per cent) were HIV antibody seropositive, and disclosure was not associated with HIV antibody status: 151 (74 per cent) seronegative and 49 (73 per cent) seropositive men chose to receive their result. By the time of the one-year visit, 11 initially seronegative, unaware men had decided to receive their result, one of whom had seroconverted by the six-month visit. One additional seroconversion occurred in a man who chose to remain unaware of his antibody status throughout the 12-month period. Thus, at the time of the one-year follow-up visit, 69 men (26 per cent) were seropositive, and 161 (80 per cent) of 201 seronegative men and 50 (72 per cent) of 69 seropositive men were aware of their antibody status.

Determinants of Test Disclosure

None of the sexual behavior variables in this study were associated with the decision to know one's results. Multiple logistic regression modeling of test disclosure (Table 1) revealed that men who elected to receive their test results reported lower perceived severity of AIDS, greater perceived benefit of behavior change, and greater effort to change their sexual behavior.

Changes in Level of Sexual Activity

Several behaviors including number of casual homosexual partners and number of anogenital partners (insertive and receptive) showed substantial declines over the time period, but no effects of antibody status or test knowledge were observed. The only behavior to show no marked change over time was the number of steady homosexual partners.

Figure 1 presents the geometric mean frequency per month for insertive anogenital contact without a condom in the four groups defined by antibody status and result knowledge at the three visits. The decline in the level of this practice

TABLE 1—Logistic Regression Model of Decision to be Informed of HIV Antibody Test Results before the 12-Month Visit*

Variable ^b	Coefficient	SE	Odds Ratio	95% Confidence Interval	
				Lower Limits	Upper Limits
Demographic					
Age	0.02	0.03	1.02	0.96	1.07
Education	-0.11	0.08	0.89	0.76	1.05
Behaviors					
Lifetime partners (log2)	-0.13	0.11	0.88	0.72	1.08
6-mo anogenital partners:					
Subject receptive (log2)	0.04	0.07	1.04	0.90	1.20
Subject insertive (log2)	-0.01	0.07	0.99	0.86	1.15
6-mo marijuana use (0,1)	-0.48	0.36	0.62	0.31	1.25
6-mo "popper" use (0,1)	0.36	0.36	1.44	0.72	2.89
6-mo alcohol use (log2)	-0.09	0.06	0.92	0.82	1.03
Attitudes					
Behavioral effort	0.22	0.11	1.25	1.00	1.55
Susceptibility	0.24	0.17	1.27	0.91	1.76
Severity	-0.28	0.13	0.75	0.58	0.97
Benefit of behavior change	0.29	0.17	1.34	0.97	1.86
Medical efficacy	0.08	0.07	1.09	0.95	1.25
Prognosis optimism	0.03	0.16	1.03	0.75	1.41
Network beliefs	-0.02	0.10	0.98	0.81	1.19
Health promotion	0.08	0.09	1.09	0.91	1.29
Miscellaneous					
Informational activities	-0.29	0.20	0.75	0.50	1.12
Friend with AIDS/ARC/HIV (0,1)	0.08	0.35	1.08	0.55	2.13
Lover with AIDS/ARC/HIV (0,1)	0.79	0.82	2.21	0.44	11.01
Constant	-0.40				

*Hosmer-Lemeshow test for goodness-of-fit: chi square = 8.26, d.f. = 8, p = 0.41.
^bIndependent variables measured on interval scale unless otherwise indicated.

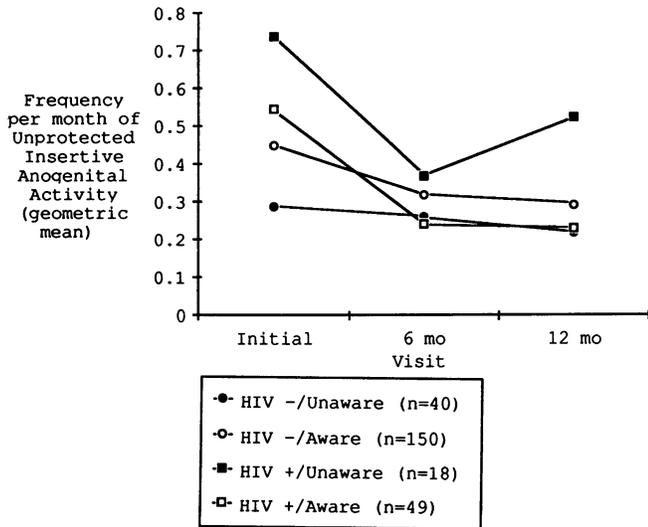


FIGURE 1—Frequency of Unprotected Insertive Anogenital Activity during Previous Six Months, by Visit, HIV Antibody Status, and Awareness of Test Result.

from the initial to the six-month visit was greater among seropositive than seronegative men, but knowledge of result appeared not to influence this change. Furthermore, the change from six to 12 months appeared to be insubstantial. Profile analysis confirmed these observations. (Results are available from the authors, upon request.) The apparent increase from six to 12 months in this practice among the seropositive unaware men was not statistically significant nor continued over time. Figure 2 shows the results of an analysis conducted on the 151 men who had completed all visits through 24 months without any change in either antibody status or result knowledge during this period.

Results for frequency of anal exposure to ejaculate were similar to those for insertive anogenital contact without condom (Figure 3). The seropositives had higher levels of this practice than seronegatives at all visits. All groups showed a decline from initial to six months and to no change from six

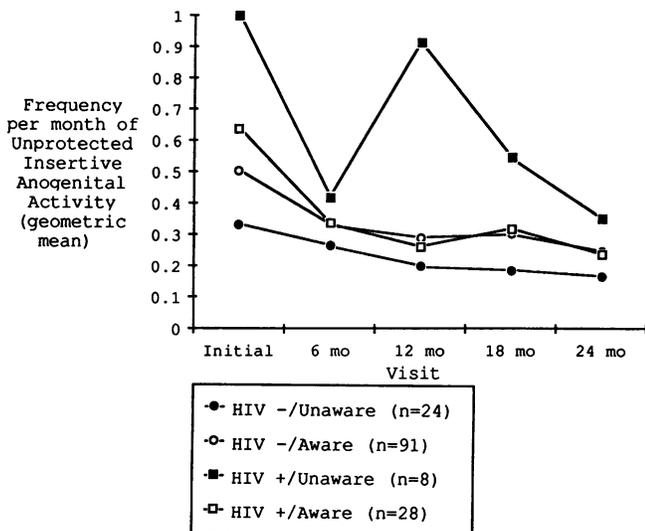


FIGURE 2—Frequency of Unprotective Insertive Anogenital Activity during Previous Six Months, by Visit, HIV Antibody Status, and Awareness of Test Result.

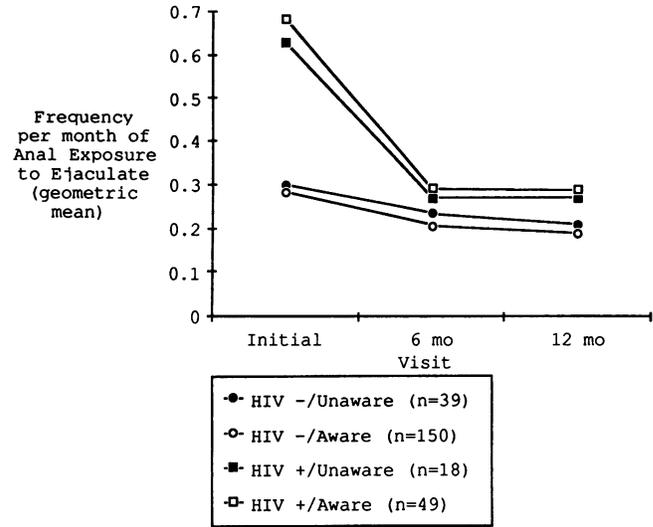


FIGURE 3—Frequency of Anal Exposure to Ejaculate during Previous Six Months, by Visit, HIV Antibody Status, and Awareness of Test Result.

to 12 months. The levels and declines were not affected by knowledge of antibody status.

In order to control for the variables which were previously found to be associated with test disclosure and which might be confounding these results, we conducted multiple linear regression analyses on these behavior variables. The dependent variables were the means of the six- and the 12-month behavior levels. The independent variables considered in addition to antibody status, test awareness, their interaction, and initial level of the practice, included the same variables from the initial visit used in the model presented in Table 1, with the exception of the numbers of partners for anogenital contact. Both of these analyses found that prior sexual practices were the strongest predictors of subsequent practices. Once the initial level of behavior and the attitude and belief measures were considered, antibody status was no longer an important predictor of frequency of anal exposure to ejaculate. For insertive anogenital contact, however, antibody status, result knowledge and their interaction were weakly associated with this behavior even when initial levels of attitudes and behaviors were controlled (Table 2). In particular, seropositives who knew their status declined more and seropositives who did not know declined less than the others.

Changes in Unprotected Anogenital Activity

To investigate the change from unprotected to protected anogenital contact or to elimination of these practices, we stratified by protection during anogenital contact. At the initial visit, 104 men (39 per cent) reported either no insertive contact or consistent use of a condom for this practice. One hundred thirty-nine men (51 per cent) reported either no receptive contact or no anal exposure to ejaculate during receptive contact. At the one-year follow-up visit, 79 per cent of each of these groups continued to report no unprotected anogenital contact, while 21 per cent reported some unprotected contact. No effect of test awareness was detected, but the numbers were too small for precise estimates. Subsequent analyses are restricted to men who reported some unprotected anogenital contact at the initial visit. Table 3 shows the percentage who reported continued unprotected

TABLE 2—Linear Regression Model Predicting Average Frequency of Unprotected Insertive Anogenital Activity at Six and 12 Months (log 2)

Independent Variables*	Coefficient	Standard Error	Standard Regression Coefficient
HIV Antibody			
Result (at 6 months)	0.22	0.37	0.06
Knowledge (at 6 months)	0.10	0.23	0.03
Interaction of result and knowledge	-0.80	0.41	-0.21
Demographics			
Age	0.002	0.01	0.01
Education	-0.04	0.04	-0.05
Behaviors			
Unprotected insertive anogenital contact (log2)	0.48	0.04	0.58
Lifetime partners (log2)	-0.01	0.05	-0.01
6-mo marijuana use (0,1)	-0.05	0.18	-0.02
6-mo "popper" use (0,1)	0.09	0.18	0.03
6-mo-alcohol use (log2)	0.02	0.03	0.04
Attitudes			
Behavioral effort	-0.15	0.06	-0.15
Susceptibility	-0.07	0.08	-0.05
Severity	0.02	0.06	0.02
Benefit of behavior change	0.09	0.09	0.05
Medical efficacy	-0.04	0.04	-0.07
Prognosis optimism	0.08	0.08	0.05
Network beliefs	0.08	0.05	0.08
Health promotion	0.03	0.04	0.03
Miscellaneous			
Informational activities	-0.14	0.11	-0.07
Friend with AIDS/ARC/HIV (0,1)	-0.07	0.17	-0.02
Lover with AIDS/ARC/HIV (0,1)	0.20	0.35	0.03
Intercept	0.06		
Analysis of Variance			
	d.f.	Mean square	F ratio
Regression	21	11.90	7.97
Residual	244	1.49	
Multiple R-Square	0.41		

*Unless otherwise stated, all independent variables were measured at initial visit, and an interval scale was used.

insertive or receptive anogenital contact at one year, by antibody status and test awareness at the previous (six-month) visit. Fifty-three per cent of those initially reporting unprotected insertive anogenital contact continued this to 12 months. An interaction was noted between antibody status and test awareness. Men who became aware of a positive result were less likely to continue insertive contact without a condom than were seropositive men unaware of their result (33 per cent versus 80 per cent). Among seronegative men, however, those aware of their result were somewhat more likely to continue this practice (57 per cent versus 48 per cent). Aware seropositive men were less likely than aware seronegative men to continue unprotected insertive anogenital contact (OR = 0.37, 95% CI 0.15, 0.88). Multiple logistic regression analysis, controlling for the potentially confounding variables previously identified, revealed adjusted odds ratios for the association between test awareness and protected insertive anogenital contact which were only slightly lower than the crude estimates in both antibody status groups.

The results on receptive anogenital contact show little effect of test awareness or antibody status, although there was a trend for seropositive men aware of their result to continue this behavior more than unaware seropositives, and

more than aware seronegative men (OR = 1.61, 95% CI 0.65, 4.00).

It should be noted that these estimates disregard the number of partners involved in the sexual practices. Approximately half of the men who reported unprotected anogenital contact at 12 months reported only one partner for this practice.

Emotional Reactions

Among seropositives, men who were aware of their HIV antibody status reported depression (94 per cent) and anger (49 per cent) as a result of study participation much more frequently at their six-month visit than those who were unaware (65 per cent and 0 per cent), while happiness was reported significantly less frequently (24 per cent and 65 per cent). Among seronegatives, men who were aware of their HIV antibody status reported happiness significantly more often than men who were unaware (75 per cent versus 50 per cent).

Discussion

Homosexually active men in this Boston-based study have reported progressive decreases in sexual practices that put them at increased risk for acquiring or transmitting HIV, as has been noted in other locations.¹⁵⁻¹⁹ The main findings of the current study regarding the association of HIV antibody test knowledge and subsequent behavior are:

- Reductions in multiple high-risk sexual behaviors are taking place in the cohort;
- Seropositive subjects have changed their behavior more than seronegative subjects, partly because they had higher initial levels of most behaviors and therefore had greater room for change. Nevertheless, seropositive men still have higher levels of certain behaviors, particularly receptive anogenital contact;
- Awareness of test results is not associated with reduction of unprotected receptive anogenital contact, either in seropositive or seronegative men;
- Individuals who learned of a positive antibody result were more likely to eliminate unprotected insertive anogenital contact than either unaware seropositive men, or men who learned of a negative antibody result.

In this observational study, subjects chose whether or not to be informed of their HIV antibody test results. It is possible that men who were already predisposed to risk-reducing behavior were also more likely to choose to know their test result. Our finding that men who chose disclosure reported more effort to change certain sexual behaviors prior to HIV antibody testing would support this hypothesis. Nevertheless, when we controlled in the analysis for this initial effort to change behavior and other variables which we had identified as being associated with test disclosure, the association between result awareness and subsequent reduction in unprotected insertive anogenital contact among seropositive men persisted. In contrast, discontinuation of unprotected anogenital receptive contact was reported slightly more often by men who became aware of a negative test result than by those who became aware of a positive result.

These behavioral changes are those which might be expected to reduce HIV transmission, which is believed to be mainly (if not entirely) from the insertive to the receptive partner.²⁰ A "disinhibition" effect which has been noted in one other study,²¹ in which men who become aware of a negative test result either do not change or even increase their risk behavior, was not found in this study. An important piece

TABLE 3—Unprotected Anogenital Contact at 12 Months by HIV Antibody Status and Knowledge of Antibody Test Result among Men with Some Initial Unprotected Contact: Crude and Adjusted Odds Ratios (95% Confidence Intervals)

HIV Antibody Status	Result Knowledge	Unprotected Insertive Contact		Crude OR (95% CI)	Adjusted OR (95% CI)
		No	Yes		
-	no	11	10	1.00	1.00
	yes	40	54	1.49 (0.52, 4.35)	1.20 (0.62, 33.3)
+	no	3	12	1.00	1.00
	yes	24	12	0.13 (0.02, 0.62)	0.10 (0.02, 0.52)
Unprotected Receptive Contact					
		No	Yes		
-	no	9	6	1.00	1.00
	yes	41	27	0.99 (0.28, 3.85)	1.10 (0.34, 3.57)
+	no	8	4	1.00	1.00
	yes	17	18	2.13 (0.45, 11.1)	2.08 (0.77, 5.67)

of information which we were not able to gather is the HIV antibody status of the sexual partner(s) of study subjects. Unprotected contact with an individual of similar serological status in a mutually monogamous relationship could possibly result in minimal, if any, HIV transmission, although it is unknown how recurrent intimate exposure to HIV and other immunosuppressive viruses might affect health status.

The greater perceived severity of AIDS among those who chose not to get their result may be an indication of the fear and anxiety engendered by the disease. Lyter and coworkers found that concern about the psychological impact of learning about a positive test result was an important reason for declining to be informed of antibody test results.²² This finding may be also related to that of Fox, *et al*,²¹ who found that men who chose not to get their result had greater depression prior to testing.

Results of this study may have limited generalizability. The cohort studied is not typical of homosexual men with regard to sociodemographic variables. Moreover, the decision to enroll in the longitudinal study and the process of participation itself may have strong effects on subsequent behavior. Men who choose to remain unaware of their test result in a research setting may differ from those who choose not to be tested in other settings. A recent Dutch study reports that homosexual men who chose not to be tested tended to practice fewer risky behaviors.²³ Because of the limited ability to generalize from this study, either to other groups of homosexual men or to individuals with other high-risk behaviors, further studies need to examine the behavioral effects of HIV antibody screening programs in other settings. For example, HIV testing could possibly be a useful adjunct to educational programs targeted to groups that do not already identify themselves as "high-risk".

The results of our study do not support the use of HIV antibody testing by itself as an informational aid to risk reduction. Our results on adverse emotional effects of learning of a positive HIV antibody test result support the recommendation that testing should be accompanied by counseling, both before testing and at the time that the results are given. Additional follow-up and counseling of seropositive individuals may also be needed, to deal with the depression and other problems that they may experience.

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