AIDS Prevalence and Barrier Contraceptive Use in A Cohort of Gay Men

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Abstract: This paper evaluates the potential determinants of AIDS prevalence and barrier contraceptive use among gay men. Gay men 18-65 years of age participated in this longitudinal cohort (1987-1991). The initial and follow-up visit data were collected from four cities (Seattle, WA; Denver, CO; Dallas, TX; and Long Beach, CA). Respondents were matched using their anonymous identification numbers and the city codes. Baseline characteristics were evaluated as potential determinants of AIDS prevalence associated with outcome variables. Of 3,908 men included in the study, 27% were at high risk, 32% at moderate risk and 38% at low risk of being exposed to HIV. Number of sexual partners, drug use and high risk sex behavior predicted the AIDS prevalence. Condom use patterns decreased with age and increased with the number of sexual partners. High-risk sexual activities, gay/bisexual partners and alcohol-drug use were significant predictors of condom use. Number of sexual partners and high-risk sexual practices were determinants of AIDS risk and condom use. Consistent use of barrier contraceptive methods and counseling may reduce the AIDS transmission rate.

1. Introduction

In the United States and around the world, reducing the prevalence of HIV/AIDS epidemic has been a pressing societal concern for researchers and the medical community in general Thus far, over a million people have been infected with HIV, and over half a million people have been diagnosed with AIDS and the CDC has estimated nearly 62% have died with HIV-related illness (CDC 1997b). The toll of this epidemic among injection drug users (IDUs) and heterosexuals has increased dramatically during the last decade. HIV - related illness and death have had a large impact on men who have sex with men (MSM). According to CDC, in 1997 alone, 21,260 AIDS cases were reported among MSM, compared with 14, 698 among IDUs and 8,112 among men and women who acquired human immunodeficiency virus (HIV) heterosexually. More than 13,000 young adults in the United States were reported to be infected with HIV (CDC 1997b). Although this number may underestimate the total cases, the data we have analyzed do reveal several at-risk groups among young adults. Among the most recent reports of HIV infections, 31% of the infections are accounted for men who have sex with men (MSM). The spread of HIV/AIDS among these population is mainly due to a combination of unsafe sexual and drug practices, inadequate prevention and support services.

AIDS incidence among African-American and Hispanic MSM have continued to increase until the beginning of 1997 when the new anti-retroviral therapy and other new treatments have emerged into the market and have considerable impact on the trends in these populations. Recent studies at CDC on HIV prevalence and risk behaviors suggest that young gay and bisexual men continue to place themselves at considerable risk for infection with HIV and other Sexually transmitted Diseases (STD).

There were a number of cases reported by CDC among gay men diagnosed with Pneumocystis carnii pneumonia (PCP) and Kaposi's Sarcoma (KS), the opportunistic infections as the leading cause of death. These reports provided the first intimations of an epidemic that would infect very large numbers of gay men unless the proper prevention measures have been taken. It has been reported that non-heterosexual transmission accounts for 30% of all HIV-related illness worldwide. The HIV epidemic has manifested

itself in all race/ethnic groups and the spread of new infections, especially in the gay community has shown significant decrease in the wake of introducing the new treatment regimes. During 1994, CDC has reported 34, 974 cases of acquired immunodeficiency syndrome (AIDS) among men whose only HIV exposure was sexual contact with other men. Male to male sexual contact continues to represent the frequently reported mode of HIV transmission among persons with AIDS.

Rosenberg (1995) claimed that 18% of the persons who are infected with HIV are under reported in the AIDS registry. Thus, after adjusting for these cases, the total number of cases among MSMs could increase. Levine et. al (1997) stated that the exact number of gay men who have been (or will be) infected with HIV and who will have HIV-related illness may never be accurately estimated. Several studies have indicated that HIV epidemics may share similar psychological consequences like any other natural disasters (Erikson, 1976). They could ruin the sociocultural fabric of a community and contribute to emotional reactions which typically appear in the form of collective or individual traumas.

Abstinence remains the most effective strategy for preventing the transmission of HIV and other STDs. However, the U. S. Public Health Service has recommended that consistent and correct use of male condoms can prevent the disease transmission considerably . Although condom use is increasing among the gay men, it remains particularly low among certain subgroups of the population. Refusal by partners to wear a condom and compliance with partner passivity in sexual situations could also be the reasons for decrease in consistent condom use.

2. Methods

2.1 Study Design and Procedures

This was a prospective follow-up study of gay men. The initial and follow-up visit data were collected from four cities (Seattle, WA; Denver, CO; Dallas, TX; and Long Beach, CA). Gay men 18-65 years of age participated in this longitudinal cohort (1987-1991). Respondents were matched using their anonymous identification numbers and the city codes. At the initial visit, each participant was interviewed more extensively and were required to complete the questionnaire.

2.2 Data Analysis

This is a cross-sectional study. The potential determinants of AIDS prevalence and consistency of condom use evaluated in this analysis included a set of important baseline characteristics of the study participants. These included age, race, marital status, lifetime number of sexual partners, alcohol/drug use, risky sexual behavior , previous condom use, age at their first drug use, smoking status, needle exchange with sexual partners and the type of sexual partners (gay/bisexual, IV-drug users, male prostitutes and female prostitutes).

2.3 Estimation Procedure

Generalized linear models were used to model the AIDS prevalence and condom use as a binary outcome. The regression coefficient estimates were used to compute the odds ratio of AIDS prevalence and condom use and its 95% confidence intervals. Generalized linear models allow the mean of a population to depend on a linear predictor through a nonlinear link function and allow the response probability distribution to be any member of an exponential family of distributions, Nelder and Wedderburn (1972).

The procedure uses a ridge-stabilized Newton-Raphson algorithm to maximize the log likelihood function with respect to the regression parameters with the logit link function.

$$\beta_{k+1} = \beta_k - H^{-1}S$$

where H is the Hessian matrix and S is the first derivative vector of the log likelihood function. Using the iterative procedure we obtain the parameter vector β_k .

$$S_j = [\partial L/\partial \beta_j]$$

and

$$H = [\partial^2 L/\partial \beta_i \partial \beta_j]$$

For logistic regression the link function will be

$$\eta_i = \log(\mu_i/(1-\mu_i)) = g(\mu_i)$$

The gradient vector and Hessian matrix for the regression parameters are,

$$S = \sum_i \frac{w_i(y_i-\mu_i)x_i}{v(\mu_i)g^{-1}(\mu_i)\varphi}$$

$$H = -X W_0 X ,$$

where X is the design matrix and V is the variance function, Nelder and Wedderburn (1972).

3. Results

A total of 4,244 men participated at the initial visit. Information used in this analysis pertains to only 3,908 men who had received a pretest at the initial visit. The group consists of predominantly young adults (median age: 31 years), White (88%), Black (3%), Hispanic (7%), and other (2%)
(Table 1). Of these, 27% were at high risk, 32% at moderate risk and 38% at low risk of sexual activities. These subjects have been tested routinely prior to the visit and 59% provided the most recent AIDS test results, which, 19% tested positive and 81% tested negative. Based on the distribution of condom use in the past 90 days, participants were classified into two groups: consistent condom user as insertive or receptive partner (condoms were used on 100% of sexual occasions) and inconsistent condom user (condoms were used on <100% of sexual occasions). Most participants had experience using condoms, although only 38% used them consistently, while 62% used condoms occasionally or never.

In the study, 74% of the participants had experienced using drugs in the past 3 months and only 0.8% have shared a needle to inject drugs or other substances into their body. In the last five years, 74% of the participants had only male partners and 26% had both the male and female partners occasionally. Among the partners in the last 90 days, 62% had gay/bisexual partners, 2.3% had IV-drug users, 3.2% had encounters with male prostitutes, 0.5% had female prostitutes.

Logistic regression models were generated to evaluate the determinants of baseline prevalence of AIDS cases and to estimate the consistency of condom use. The regression coefficient estimates were used to compute the odds ratios and its 95% confidence intervals. Looking at the AIDS prevalence first, Consistent condom use in the past 90 days reduced the risk of AIDS and the number of sexual partners was significantly associated with AIDS rate (OR=3.9, CI= 2.0 – 7.6 for single partners; OR=2.8, CI=1.5 - 5.2 for 2 - 5 partners; OR 5.2, CI=2.8 - 9.8 for more than 5 partners).
Men between ages 21 and 40 years had high AIDS prevalence rate. Drug use (OR=1.6, CI=1.0 - 2.5) and those who were at high-risk of being exposed to the AIDS-virus (OR=3.0, CI=1.6 - 5.4) and smokers were statistically significant predictors of AIDS. Age at first drug use (OR=0.6, CI=0.6 - 1.0) was associated with a decreasing risk and among the type of sexual partners, IV drug user has an increasing risk (OR=2.0, CI=0.9 - 4.3), gay/bi-sexual partner in the past 90 days (OR=0.6, CI=0.5 - 0.8) was associated with decreased risk of AIDS.

Consistent condom use decreased with older age and mildly increased with larger number of sexual partners. High-risk sexual activities (OR=1.7, CI=1.1-2.6), gay/bisexual partners (OR=2.0, CI=1.8-2.3) and alcohol-drug use (OR=1.4, CI=1.3-1.7) were significant predictors of consistent condom use. Regular or occasional smokers have decreased condom use.

4. Discussion

This study examined the determinants of AIDS prevalence and consistent condom use of gay men between 18-65 years of old. Young people represent one half of all new infections in United States, and the majority are infected sexually. The results from the analysis looking at different risk factors are important in educating young people to practice safe sex and also reduce their risk and the spread of HIV/AIDS.

Among men who have sex with men (MSM), the trends in other sexually transmitted diseases including Gonorrhea may reflect changes in sexual behaviors that could also influence the risk of HIV infection. There were studies done earlier by CDC looking at these aspects and the data collected from the Gonococcal Isolate Surveillance Project (GISP) were used to assess trends in Gonococcal Infection (GC) among MSM (CDC 1997).

An increase in high-risk encounters among MSM could very well explain the increase in GC cases and could enhance HIV transmission. STD clinics and other facilities that serve substantial numbers of MSM are encouraged to collect and analyze data to follow trends in STDs and sexual behaviors that may increase the risk for transmission of HIV infection among MSM. The relation between GC and the spread of HIV , Cohen et. al (1997) and Deschamps et. al (1996) necessitate specific attention to GC control, including routine screening for GC and other sexually transmitted diseases among MSM by the public and private providers and immediate treatment to prevent subsequent infection.

An annual survey conducted by the volunteers in The Stop AIDS project from 1994 through 1997, in which MSM were approached in various neighborhoods, bars and clubs, etc., collected demographic and sexual information (CDC, 1997). In the survey, unprotected anal intercourse was defined as insertive or receptive anal sex during the previous 6 months without always using condoms. The annual incidence from 1994 through 1997 was calculated as cases per 100,000 adult men aged greater than or equal to 15 years. They also reported that increases in unsafe sexual behavior have occurred among MSM in San Francisco, resulting in high risk for HIV infection and transmission. According to CDC estimates, after adjusting for reporting delays from the state and local health departments, 501,310 AIDS cases were reported in the U.S. by October 31, 1995 and close to twice the number or more of HIV cases have been estimated by CDC to be infected by HIV by the end of 1989. Rosenberg (1995) estimated that the total number of persons ever infected with HIV was between 870, 000 to 1,200,000 by the end of 1993. Levine et. al (1997) reported that based on such statistics that there are between 400,000 and 600,000 persons living with HIV, but not diagnosed with AIDS. They also reported that among these AIDS cases, about 51% were MSM cases.

This study has several strengths in addition to the large sample size. It is a cohort study with the information collected during each visit which occurs monthly. The study protocol included most of the components pertaining to the gay men and their sexual life style. Findings from these data are useful in recommending the tools for safe sex and also in designing and implementing preventive measures from spreading this epidemic.

Based on the recommendation of the U. S. Public Health Service, consistent and correct use of male condoms can prevent the disease transmission considerably (CDC 1993) and there is a pressing need for educating and implementing the public about the effectiveness of consistent condom use in preventing sexually transmitted diseases. In this study, consistent condom user as an insertive or receptive partner, demonstrated that only 38% used condom consistently, while 62% used condoms occasionally or never. The contraceptive effectiveness of the male condom has been assessed in several studies. Evaluating the determinants of condom use at baseline, we note the participants who are exposed to AIDS virus engaging in high risk sexual activities are more likely to use condoms (OR=1.7, CI=1.1-2.6) which is statistically significant ($p<0.01$). There is an increased condom use among gay and bisexual partners ($p<0.001$) and alcohol users ($p<0.001$) at the baseline.

Skills-provision training increases condom use for insertive anal intercourse and is important in teaching basic skills for condom use and proper choice of lubricants (Valdiserri et al,1989). Condom use is a relatively complex behavior that involves personality types. These personalities include, men who have assertive communication styles and dominant partner may be more successful in changing condom-use behavior with partners and psychological adjustment that may be facilitated by reinforced skills-provision training. Also, learning how to negotiate safer sex skills is especially important for men who continue to have sex with occasional and one-time partners. Counseling and skills-provision training assists men who have sex with men to discontinue or decrease anal intercourse and increase condom use. These findings suggest the need for HIV

prevention counseling and skills-provision training in programs providing HIV-prevention intervention for men who have sex with men.

The findings in this study are subject to at least some limitations. First, the data we analyzed may not be a true representative of the general MSM community in all of United states and the questionnaire did not inquire specifically about the condom use with persons whose HIV serostatus was unknown. However, the population surveyed was relatively large and reported risk behaviors were consistent across all age and racial/ethnic groups. The data described in this article, suggest that increases in unsafe sexual behavior have occurred among MSM resulting in increased risk for HIV infection and transmission. Geographic differences in rates of AIDS attributed to male-to-male sexual contact may reflect variations in the prevalence. The initial and follow-up visit data were collected from four cities (Seattle, WA; Denver, CO; Dallas, TX; and Long Beach, CA). The variation in these four sites could impact the overall prevalence and also the risk factors associated.

5. Acknowledgments

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Table 1: Baseline Characteristics of Study Participants (N=3908)

Characteristic, statistic	N(%)
Age, Mean (median)	32(31)
Race, count (%)	
White	3433(88)
Black	124(3)
Hispanic	254(7)
Other	97(3)
Marital Status	
Single	3802(97)
Married	106(3)
Lifetime Number of sexual Partners, Mean (median)	18(5)

Table 3: Predictors of consistent condom use

	OR*	95%CI*	P-Value**
Age at initial visit			
50+	0.6	0.4 - 1.1	
41-50	0.7	0.4 - 1.0	
31-40	0.9	0.6 - 1.3	
21-30	1.0	0.7 - 1.4	
≤20	1.0	Ref	0.0166
Number of sex partners			
20+	1.2	0.9 - 1.6	
6-20	1.2	0.9 - 1.5	
2-5	1.0	0.8 - 1.2	
1	1.0	0.7 - 1.2	
0	1.0	Ref	0.0732
Risk level of exposure to HIV			
High	1.7	1.1 - 2.6	
Moderate	1.6	1.0 - 2.4	
Low	1.5	1.0 - 2.3	
None	1.0	Ref	0.0761
Alcohol/Drug use			
Yes	1.4	1.3 - 1.7	
No	1.0	Ref	0.0001
Type of sex partner Gay/Bi			
Yes	2.0	1.8 - 2.3	
No	1.0	Ref	0.0001
IV drug user			
Yes	0.6	0.4 - 1.0	
No	1.0	Ref	0.0606

*Relative prevalence odds and 95% confidence intervals of the OR from a generalized logistic model.
**P-value for a likelihood ratio test of the null hypothesis of no association between the risk factors and AIDS prevalence.

Table 2: Predictors of AIDS prevalence

	OR*	95%CI*	P-Value**
Age at initial visit			
50+	2.2	0.5 - 9.2	
41-50	2.7	0.7 - 9.9	
31-40	4.6	1.3 - 16.2	
21-30	4.1	1.2 - 14.1	
≤20	1.0	Ref	0.0032
Race			
White	0.7	0.5 - 1.0	
Black	1.1	0.5 - 2.1	
Hispanic, Other	1.0	Ref	0.1098
Number of sex partners			
20+	6.7	3.5 - 12.6	
6-20	5.2	2.8 - 9.8	
2-5	2.8	1.5 - 5.2	
1	3.9	2.0 - 7.6	
0	1.0	Ref	0.0001
Risk level of exposure to HIV			
High	3.0	1.6 - 5.4	
Moderate	0.6	0.3 - 1.0	
Low	0.3	0.2 - 0.6	
None	1.0	Ref	0.0001
Age at first drug use			
≤15	0.6	0.4 - 1.0	
16-19	0.6	0.4 - 1.0	
20-26	0.9	0.6 - 1.5	
26+	1.0	Ref	0.0452
Shared Needle with Partner			
Yes	0.4	0.1 - 1.4	
No	1.0	Ref	0.1318
Alcohol/Drug use			
Yes	0.9	0.7 - 1.2	
No	1.0	Ref	0.6204
Type of sex partner Gay/Bi			
Yes	0.6	0.5 - 0.8	
No	1.0	Ref	0.0001
IV drug user			
Yes	2.0	0.9 - 4.3	
No	1.0	Ref	0.0865

*Relative prevalence odds and 95% confidence intervals of the OR from a generalized logistic model.
**P-value for a likelihood ratio test of the null hypothesis of no association between the risk factors and AIDS prevalence.