Implications for HIV Prevention Programs From a Serobehavioural Survey of Men Who Have Sex With Men in Vancouver, British Columbia: The ManCount Study

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ABSTRACT

Background: We examined HIV prevalence, awareness of HIV serostatus and HIV risk behaviour among a sample of men who have sex with men (MSM) in Vancouver.

Methods: MSM ≥18 years were recruited from August 2008 to February 2009 through community venues. Participants completed a questionnaire and provided a dried blood spot (DBS) for HIV and other STI testing. We performed descriptive statistics and bivariate analyses of key explanatory variables.

Results: A total of 1,169 participants completed questionnaires; of these, 1,138 (97.3%) provided DBS specimens suitable for testing. The median age was 33 years (IQR 26-44). A total of 206 (18%) were HIV-positive by DBS, of whom 86% were aware they were positive. HIV seropositivity increased from 7.1% in those <30 years of age to 19% in those 30-44 years and 34% among those ≥45 years ($p<0.001$ for test of trend). Of the 933 who self-reported as HIV-negative or unknown, 28 (3.0%) tested HIV-positive. Among those not tested for HIV in the previous 2 years, the reasons for not testing differed between participants with undiagnosed HIV infection and those who were HIV-negative. A total of 62% of study participants who self-reported as HIV-negative reported using a condom the last time they had anal sex. The use of risk-reduction measures was reported by 91.1% of all study participants (72% if excluding consistent condom use).

Conclusion: The majority of MSM in Vancouver have adopted behaviours that reduce their HIV-related risk. However, prevention programs must continue to promote condom use, increase HIV testing, and better inform MSM of the value and limitations of other risk-reduction strategies.

Key words: HIV; homosexuality; bisexuality; sexual behaviour

La traduction du résumé se trouve à la fin de l'article.

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Gay, bisexual and other men who have sex with men (MSM) remain the population most heavily affected by HIV in Canada and British Columbia (BC).[1,2] MSM are thought to comprise 45% or more of the estimated 9,300-13,500 individuals infected with HIV in BC.[3,4] The number of new diagnoses of HIV among MSM in BC has remained largely unchanged since 2003, with approximately 150-180 new diagnoses each year.[4]

We conducted an analysis from an HIV serobehavioural survey of MSM who attend community venues that cater to gay, bisexual and other MSM in Vancouver in order to determine the current state of HIV knowledge and HIV risk and preventive behaviours among this population.

METHODS

The Public Health Agency of Canada (PHAC) has developed a national enhanced surveillance system for HIV among MSM called M-Track. In Vancouver, M-track was called "The ManCount Survey" and was jointly designed and implemented by PHAC and local partner organizations. The study protocol was approved by the Research Ethics Boards of the University of British Columbia and Health Canada.

Participants were recruited from August 1, 2008 to February 28, 2009 through venues that cater to gay, bisexual and other MSM. We used a time-space sampling recruitment methodology based on a two-stage sampling plan. This entailed the construction of a sampling frame of potential recruitment events at participating venues followed by developing a standardized process for sampling these events and venues.

Men ≥18 years of age who reported ever having had sex with other men were offered enrolment in the study. Participants were excluded if they had previously completed the survey or were

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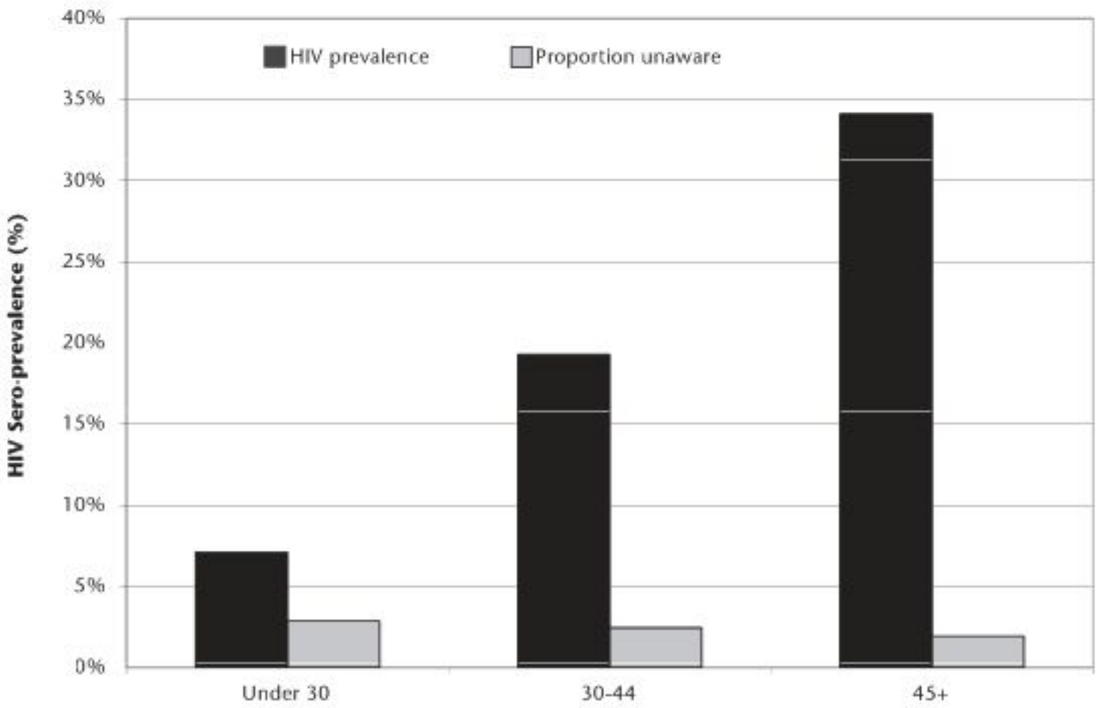
Figure 1. HIV prevalence and proportion unaware of HIV-positive serostatus by age among 1,132 ManCount Study participants who provided a usable dried blood specimen



Age (years)	Under 30 N (%)	30-44 N (%)	45+ N (%)	P-value
Aware	16 (3.8)	74 (16)	83 (32)	<0.001†
Unaware	12 (2.8)	11 (2.4)	5 (1.9)	1.00‡
Total *	30 (7.1) /422	87 (19) /451	88 (34) /259	<0.001§

* Totals include two positive individuals under 30 and two between 30 and 44 years of age who failed to self-report their HIV serostatus.
† p-value for Fisher's exact test to examine the association between age group and knowledge of HIV seropositivity among those with a positive HIV test.
‡ p-value for Fisher's exact test to examine the association between age group and lack of knowledge of HIV seropositivity among all study participants.
§ p-value for test of trend of HIV prevalence across age groups.

unable to complete the questionnaire in English. After providing informed consent, participants completed an anonymous self-administered questionnaire and provided an anonymous dried blood spot (DBS) sample. HIV testing was performed on the DBS using the Bio-Rad GS rLAV HIV-1 EIA assay. Confirmatory testing was performed using the Bio-Rad Genetic Systems™ HIV-1 Western Blot assay.

The questions included a core set, proposed by PHAC, for inclusion in all M-Track surveys, as well as questions that were developed locally. Unless otherwise stated, percentages are expressed from the total of respondents who answered a particular question or set of questions. We examined trends in HIV seropositivity and differences in the awareness of HIV seropositivity across age categories using the Cochran-Armitage test of trend and Fisher's exact test, respectively. We compared the responses to key variables with participants classified on the basis of their HIV serostatus by DBS and by self-report using Chi-square and Fisher's exact tests.

RESULTS

A total of 2,805 individuals were approached for study participation and 1,169 (41.7%) were enrolled. Of these, 1,138 (97.3%) provided DBS samples which were suitable for testing. Participants were recruited from bars (54%), followed by community events (25%), businesses (12%), community associations (4.9%), and bathhouses (4.2%). Most participants (76%) reported European/North American ethnicity; 6.6% Asian; 4.0% Aboriginal; and 14% other.

Table 1. Factors Associated With Self-reported Unprotected Anal Intercourse With a Known HIV-positive or Unknown Serostatus Partner in the Previous Six Months by ManCount Study Participants Who Self-reported as Being HIV-negative or Unknown

	Report Risky Sex* N (%)	No Risky Sex N (%)	P-value
Total*	141 (18)	650 (82)	–
Median age (interquartile range)	31 (25-39)	32 (26-42)	0.202
Sexual orientation			
Gay/ homosexual	119 (85)	514 (80)	0.459†
Bisexual	15 (11)	78 (12)	
Straight/ heterosexual	0 (0)	15 (2.5)	
Other	6 (4.3)	39 (6.0)	
Ethnicity			
North American	60 (42)	341 (53)	0.030†
Aboriginal	6 (4.3)	18 (2.8)	
Asian	5 (3.5)	47 (7.2)	
European	42 (30)	156 (24)	
Other	28 (20)	87 (13)	
Some post-secondary education	111 (79)	537 (83)	0.314
Personal income >$40,000 per year	68 (50.0)	315 (49.3)	0.881
Ever tested for HIV	133 (94.3)	566 (87.9)	0.086
Tested for HIV in last year	83 (64.8)	300 (52.8)	0.013
Recruitment site			
Bar	75 (53.2)	373 (57.4)	0.005
Bathhouse	12 (8.5)	21 (3.2)	
Event	33 (23.4)	163 (25.1)	
Association	11 (7.8)	23 (3.5)	
Business	10 (7.1)	70 (10.8)	
Report unlikely or very unlikely to acquire HIV infection	78 (66.7)	484 (89.1)	<0.001
Unaware of HIV infection (HIV-positive on DBS)	6 (4.3)	13 (2.0)	0.133

* Risky sex is defined as self-reported unprotected anal intercourse with a known HIV-positive or unknown serostatus partner.
† Fisher's exact test result.
Note: Totals reflect those who responded to the question asking whether they were HIV-positive and the variable reported in each row. As such, the denominators vary somewhat for each variable.

The median age was 33 years (inter-quartile range [IQR]: 26-44) and 79% had completed some post-secondary education. A total of 81% identified as being gay or homosexual; 11% bisexual; 3.0% two-spirited; 2.3% queer; and 1.8% straight.

Overall, 206/1,138 (18%; 95% CI 16-20) were HIV-positive by DBS. Of these, 202 self-reported their HIV status and 86% were aware they were positive. HIV seropositivity increased with age from 7.1% for men <30 years of age to 19% for those 30-44 years, and 34% for those ≥45 years (p<0.001 for test of trend) (Figure 1). However, the proportion of HIV-positive men aware of their serostatus in each age group varied greatly, from 53% (16/30) among those aged <30 to 85% (74/87) among those aged 30-44 years, and 94.3% (93/98) among those aged ≥45 years (p<0.001).

Among HIV-positive individuals who were aware of their serostatus, the median year of diagnosis was 1997 (IQR: 1989-2003). Approximately 70% reported taking anti-HIV medication in the previous six months (an additional 8.7% reported having used these medications in the past).

Of the participants who provided a DBS, 933 (82%) self-reported their status as HIV-negative/unknown. Of these, 28 (3.0%) tested HIV-positive by DBS, which represented 14% of the positive tests. Among participants who self-reported as HIV-negative or unknown, 86% reported ever having been tested for HIV. Among those aged <30 years, 77% reported ever testing versus 89% for those aged 30-44 years, and 85% for those aged ≥45 years. Of the 882 men who were HIV-negative/unknown by self-report, 601 (68%) reported testing in the previous two years. Twenty (71%) of 28 individuals

Table 2. Reasons for Not Testing in the Previous 2 Years for 281 Self-reported Serostatus HIV-negative or Unknown Stratified by DBS HIV Test Result

Reasons for Not HIV Testing	DBS HIV-negative (%) N=269	DBS HIV-positive (%) N=12	P-value (Fisher's Exact test)
I am at low risk for HIV infection	84 (31)	3 (25)	0.760
I want to be tested, I just haven't done it yet*	46 (17)	4 (33)	0.236
I always have safer sex	45 (17)	2 (17)	1.00
I think I am HIV-negative	38 (14)	1 (8.3)	1.00
I did not have sex with an infected person	29 (11)	1 (8.3)	1.00
Other reason	27 (10)	1 (8.3)	1.00
I do not want to know*	17 (6.3)	4 (33)	**0.008**
I never thought about it	16 (6.0)	3 (25)	**0.039**
I am healthy so I don't need to be tested	15 (5.6)	3 (25)	**0.034**
I am afraid of needles	15 (5.6)	3 (25)	**0.034**
I could not deal with knowing I was infected*	10 (3.7)	4 (33)	**0.002**
It could affect my relationships*	8 (3.0)	5 (42)	**<0.001**
I don't have a doctor	9 (3.4)	3 (25)	**0.011**
I do not know where to get the test	9 (3.4)	1 (8.3)	0.358
I am afraid of having my name reported	8 (3.0)	2 (17)	0.062
I am worried about the impact on my sex life	7 (2.6)	3 (25)	**0.006**
I am worried about being discriminated against	7 (2.6)	2 (17)	0.051
It could affect my career or insurance	6 (2.2)	1 (8.3)	0.266
I think I am HIV-positive*	3 (1.1)	4 (33)	**<0.001**
I don't think I can get HIV	5 (1.9)	1 (8.3)	0.232
If I tested positive, nothing can be done	4 (1.5)	2 (17)	**0.023**
I couldn't get an appointment for HIV testing when I wanted one	3 (1.1)	2 (17)	**0.016**
Doesn't matter if I'm infected because of my age	2 (0.7)	2 (17)	**0.010**
I don't think the test is always right	1 (0.4)	2 (17)	**0.005**

* Most common responses for undiagnosed HIV infection group.

Table 3. HIV Prevention Strategies Reported by Self-reported HIV Status and by DBS Result

Variable	HIV Pos (Self-report) n/N (%)	HIV-negative/Unknown Serostatus (Self-report) HIV Neg (DBS) N (%)	HIV Pos (DBS) N (%)	p-value†
Any HIV prevention measure	149/173 (86)	772/836 (92.3)	22/26 (85)	0.142
Always have anal sex with condoms	N.A.	555/ 812 (68)	13/24 (54)	0.182
Ask sex partner's HIV serostatus	105/167 (63)	474/750 (63)	14/24 (58)	0.670
Have sex other than anal sex	95/163 (58)	N.A.	N.A.	–
No ejaculation inside partner†	76/160 (48)	319/737 (43)	9/23 (39)	0.832
Serosorting‡	81/161 (50)	263/752 (35)	9/23 (39)	0.664
Strategic positioning§	59/162 (36)	250/738 (34)	11/26 (42)	0.403
Have unprotected sex only when viral load is low or on HIV medication	41/155 (26)	48/719 (6.7)	3/23 (13)	0.206

* Bivariate comparison of those who are DBS-positive and -negative among only those who are HIV-negative or unknown by self-report.
† Refers to HIV-positive insertive not ejaculating in sex partner, or HIV-negative or unknown status receptive not allowing sex partner to ejaculate inside them.
‡ Refers to not using condoms with a sex partner of concordant serostatus; i.e., with a known HIV-positive sex partner if HIV-positive, or with a known HIV-negative sex partner if HIV-negative or unknown HIV serostatus.
§ Refers to only practicing insertive anal sex if one is HIV-negative and only receptive anal sex if one is HIV-positive.
N.A. – Not asked for individuals self-reporting this HIV serostatus.

with undiagnosed HIV infection reported ever having tested for HIV, of whom 14 (50% of the 28) had tested in the previous two years. As unprotected anal intercourse (UAI) is the most likely route of HIV transmission in these men, we compared the 18% of self-reported HIV-negative/unknown serostatus participants who reported UAI with an HIV-positive or unknown serostatus partner in the previous six months with the 72% who did not report this behaviour (Table 1). While the prevalence of undiagnosed HIV infection was higher in the latter group, the difference was not statistically significant (4.3% vs. 2.0%; p=0.133)

Of the 281 participants who had not tested in the previous two years, the most common reasons for not testing were a low perceived risk for HIV infection (31%); wanting to test but not having done it yet (18%); always practicing safer sex (17%); and a belief they were HIV-negative (14%) (Table 2). The reported reasons for not testing differed between those who were HIV-negative by DBS and those with undiagnosed infection (Table 2). More of those with undiagnosed HIV infection reported concern about the impact on their relationships (42% vs. 3.0%; p<0.001); a suspicion that they were already HIV-infected (33% vs. 1.1%; p<0.001); and not wanting to know (33% vs. 6.3%; p=0.008). Not having gotten around to getting tested was also a commonly reported reason, but did not differ significantly between the groups (33% vs. 17%; p=0.236).

The most commonly reported methods of HIV prevention for men who self-reported as HIV-negative/unknown and were HIV-negative on DBS testing were: always having anal sex with condoms (68%); asking their partner's HIV status before sex (63%); not having their partner ejaculate inside them (43%); only having unprotected sex with men known to be HIV-negative (35%); and having insertive anal intercourse only (34%) (Table 3). We found no differences in reported HIV-prevention measures used by participants who self-reported as HIV-negative/unknown and were DBS-negative compared to those with undiagnosed HIV infection.

The use of risk-reduction measures was reported by 91% of study participants (72% if reporting always having anal sex with condoms was excluded). When stratified on the basis of serostatus, 86%

of self-reported HIV-positive and 92.1% of self-reported HIV-negative/unknown serostatus participants reported using at least one measure to prevent HIV transmission or acquisition.

A total of 78% of participants reported having anal sex in the previous six months and of these, 59% reported using a condom the last time they had anal sex. Significantly more self-reported HIV-negative men reported using condoms the last time they had anal sex than self-reported HIV-positive men (62% vs. 41%; $p<0.001$). Overall, 85% of self-reported HIV-negative men thought it was unlikely or very unlikely that they would acquire HIV during their lifetime. Among those with an undiagnosed HIV infection, 10 (50%) of 20 participants thought that they were very unlikely or unlikely to acquire HIV during their lifetime.

For men who were HIV-positive by self-report and DBS, the most commonly reported prevention methods were: asking sex partners' serostatus (63%) and having sex other than anal sex (58%) (Table 2). Overall, 37% of HIV-positive men reported having UAI with a partner who was HIV-negative/unknown serostatus in the previous 6 months.

DISCUSSION

HIV prevalence was 18% overall and increased substantially with age in this sample of MSM in Vancouver, approaching 1 in 3 for men aged ≥45 years. Undiagnosed HIV infection accounted for a small, but potentially important proportion of HIV-positive individuals in this population. However, it appears that HIV prevention is a priority for most MSM in this sample, as >90% of participants reported using at least one HIV risk-reduction measure. The most commonly reported measure by men who self-reported as HIV-negative/unknown was always using condoms when having anal sex, reported by 68% of respondents. This observation contrasts somewhat with commonly-held views that HIV infection is not a concern for MSM and that condom use has fallen into disfavour.[5]

These findings have implications for HIV-prevention programs for MSM in Vancouver. A significant minority of MSM in this survey (36% of HIV-positive men and 18% of HIV-negative men) reported engaging in UAI with a serodiscordant or unknown serostatus partner. When combined with the high HIV prevalence in this sample, this implies a high level of risk for this minority, although this risk may be mitigated somewhat by the high levels of HIV treatment reported by the HIV-positive participants.[6] Indeed, the high HIV prevalence, in part, reflects the success of antiretroviral therapy in keeping HIV-infected MSM alive, healthy and available for inclusion in this study. The HIV prevalence we found is comparable to recent seroprevalence surveys conducted in Seattle,[7] and other M-Track surveys in Toronto, Ottawa,[8] Montreal[9] and Victoria.[10]

Second, while close to 70% of HIV-negative men reported always using condoms as a method of preventing HIV acquisition, when asked specifically about condom use the last time they had anal sex, this number fell to 58%. All-partner condom use is a rather crude indicator of sexual risk-behaviour as MSM may vary their condom use depending on whether they are having sex with a regular or casual partner and whether they know the serostatus of their partner. Nevertheless, continued promotion of condom use and provision of condoms remain fundamental components of HIV prevention among MSM that should not be neglected.

It also appears that there is opportunity to further promote HIV testing, especially among MSM <30 years of age, where 25% of participants reported never having tested for HIV. Knowing that one is HIV-infected has been shown to increase safer sexual behaviour among MSM.[11] As 71% of men with undiagnosed infection had tested previously (with 43% having tested in the previous 2 years), promoting more frequent HIV testing for MSM could also reduce the number of undiagnosed HIV infections.

Additionally, facilitating the discussion of HIV serostatus among MSM would likely improve HIV prevention efforts. Approximately 64% of participants reported asking the HIV serostatus of sex partners. This likely facilitates discussion of condom use or other prevention methods and should be actively promoted. As well, ensuring that disclosure is frank and not implied, based on subsequent sexual behaviours, should also be encouraged.[12,13] Additionally, accurate disclosure of HIV serostatus is only possible if men are truly aware of their serostatus. In our study, 3% of men who self-reported as HIV-negative were, in fact, HIV-infected. Hence it is also important to provide MSM with accurate information regarding the effectiveness of other means of HIV risk-reduction employed here, including serosorting, strategic positioning and HIV treatment. While none of these methods are as effective as 100% condom use, they may contribute to some reductions in HIV transmission at the community level.[14]

This study has several limitations. First, it is cross-sectional in nature, so one cannot determine the directions of the associations we have observed. Second, as we recruited individuals through venues that cater to gay, bisexual and other MSM, it is only generalizable to those MSM who frequent these venues. Last, our study is also likely to be over-represented with individuals who attend these venues frequently, since they would have a greater probability of being recruited into our study.

In summary, our study found that 18% of men surveyed in venues or events that cater to gay, bisexual and other MSM were HIV-infected. This high prevalence requires that prevention programs do more to promote primary HIV prevention through a number of different measures, and support secondary HIV prevention through better identification of undiagnosed HIV and ensuring effective treatment for those already infected.

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RÉSUMÉ

Contexte : Nous avons examiné la prévalence du VIH, la connaissance de l'état sérologique VIH et les comportements présentant un risque de contracter le VIH au sein d'un échantillon d'hommes ayant des relations sexuelles avec des hommes (HRSH) à Vancouver.

Méthode : Des HRSH ≥18 ans ont été recrutés entre août 2008 et février 2009 dans des lieux communautaires. Les participants ont rempli un questionnaire et fourni une goutte de sang séché (GSS) pour le dépistage du VIH et d'autres ITS. Nous avons effectué des analyses statistiques descriptives et des analyses bivariées de variables explicatives clés.

Résultats : En tout, 1 169 participants ont rempli des questionnaires; de ce nombre, 1 138 (97,3 %) ont fourni une GSS analysable. L'âge médian des répondants était de 33 ans (écart interquartile 26-44). Deux cent six répondants (18 %) étaient séropositifs pour le VIH selon la GSS, dont 86 % qui connaissaient leur statut. La séropositivité augmentait avec l'âge, passant de 7,1 % chez les moins de 30 ans à 19 % chez les 30 à 44 ans et à 34 % chez les 45 ans et plus ($p<0,001$ pour le test de tendance). Sur les 933 répondants ayant déclaré avoir un statut séronégatif ou ignorant leur statut, 28 (3 %) étaient séropositifs au dépistage. Les répondants n'ayant subi aucun dépistage pour le VIH au cours des deux années précédentes ont donné des explications différentes selon qu'ils avaient une infection à VIH non diagnostiquée ou qu'ils étaient séronégatifs. En tout, 62 % des répondants s'étant dits séronégatifs pour le VIH ont dit avoir porté un condom lors de leur dernière relation sexuelle anale. L'utilisation de mesures de réduction du risque a été déclarée par 91,1 % des répondants (72 % si l'on exclut le port systématique du condom).

Conclusion : La majorité des HRSH de Vancouver ont adopté des comportements qui réduisent leur risque lié au VIH. Néanmoins, les programmes de prévention doivent continuer à promouvoir le port du condom, accroître le dépistage du VIH et mieux informer les HRSH de l'utilité et des limites d'autres stratégies de réduction du risque.

Mots clés : VIH; homosexualité; bisexualité; comportement sexuel