Nonnegligible Increasing Temporal Trends in Unprotected Anal Intercourse Among Men Who Have Sexual Relations With Other Men in Montreal

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Objective: To determine temporal trends in unprotected anal intercourse (UAI) among men who have sex with men (MSM) participating in the Omega Cohort Study, 1997 through 2003.

Methods: The Omega Cohort Study was a longitudinal study of HIV-negative MSM aged 16 years or older and living in Montreal. Participants completed self-administered questionnaires and interviews every 6 months. Trend analysis using the generalized estimating equation was done for length of cohort membership (visits) and by calendar time for all visits per type of sexual partner. Odds ratios (ORs) were calculated to measure the odds of increasing UAI per 6-month period.

Results: Among subjects who were followed for at least 4 years, UAI increased with regular seroconcordant partners (OR = 1.06, 95% confidence interval [CI]: 1.04 to 1.09) and any type of partner (OR = 1.05, 95% CI: 1.03 to 1.07). There was a nonnegligible increase in UAI with casual partners (OR = 1.05, 95% CI: 1.01 to 1.09). For the analysis by calendar time, there were increases in UAI between regular seroconcordant partners (OR = 1.04, 95% CI: 1.02 to 1.05) and any type of partner (OR = 1.03, 95% CI: 1.02 to 1.04). There were nonnegligible increases in UAI with casual partners (OR = 1.03, 95% CI: 1.00 to 1.05) and with any type of partner except a regular seroconcordant partner from 15.7% to 18.8% (OR = 1.02, 95% CI: 1.00 to 1.04).

Conclusions: There was a nonnegligible and consistent increase in UAI among Omega Cohort Study participants between 1997 and 2003. Continuous trend analysis is important because it allows us to follow UAI closely and to implement intervention strategies that may help to stop or reduce the present trend.

Key Words: unprotected anal intercourse, epidemiology, men who have sex with men, sexual behavior, HIV

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During the early 1980s, AIDS had a highly negative impact on North American and other occidental gay communities because there was a paucity of information on risk factors or causes of AIDS.[1] On discovering how the virus can be transmitted, a period of health promotion, education, and social and political activism commenced in gay and/or bisexual communities, with the aim of reducing the incidence of HIV.[1] In Canada and the United States, the incidence of HIV peaked in the early 1990s, and there then followed a period of declining rates.[2,3] The early declining HIV incidence among men who have sex with men (MSM) has been attributed to changes in sexual practices, particularly unprotected anal intercourse (UAI). After 2 decades into the epidemic, however, there are indications of a resurgence in the incidence of HIV among MSM.[3–5]

In its June 3, 2000 editorial, the *British Medical Journal* heralded a growing trend in UAI among MSM in the United Kingdom, Australia, and the United States.[6] Surveillance and public health reports at that time also showed an increasing frequency of UAI among MSM, because rates of sexually transmitted infections (STIs), particularly rectal gonorrhea, were increasing (STIs act as proxy indicators of UAI).[7–9] Various epidemiologic reports suggest that the incidence of HIV is increasing after a period of stable rates.[4,5] In the province of Ontario, the incidence of HIV among repeat testers increased from 0.87 per 100 person-years (PY) in 1996 to 2.07 per 100 PY in 1999.[4] A sustained increase in HIV-1 seroconversion was noted among MSM in Vancouver.[5]

Several studies have already shown an increase in UAI among MSM.[8,10–14] Data analysis from a series of

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TABLE 1. Selected Baseline Characteristics for Analysis by Calendar Time (n = 1587) and by Visit Number (n = 579)

Variable	Frequency* Calendar Time Analysis	%†	Frequency*† Visit Number Analysis	%‡
Age (y)				
<30	743	46.9	222	38.3
≥30	843	53.1	357	61.7
Education				
High school or less	464	29.6	130	22.6
College or more	1106	70.4	446	77.4
Place of birth				
Quebec	888	56.0	330	57.0
Other provinces	150	9.4	52	9.0
Foreign countries	204	12.9	61	10.5
Not stated	344	21.7	136	23.5
Annual income ($)§				
<20000	743	48.6	244	43.0
≥20000	787	51.4	324	57.0
HIV test history‖				
1 time	359	29.9	127	28.2
2 times	256	21.3	94	20.9
3 times	187	15.6	68	15.1
≥3 times	398	33.2	161	35.8
Regular partners during past 6 months¶				
0	268	17.0	95	16.5
1	633	40.2	230	40.0
2–5	591	37.6	216	37.6
≥6	81	5.2	34	5.9
Casual partners during past 6 months¶				
0	366	23.3	126	22.0
1	170	10.8	60	10.5
2–5	434	27.7	161	28.1
6–19	365	23.3	128	22.3
≥20	233	14.9	98	17.1
Lifetime regular partners				
0	43	2.7	12	2.1
1–5	852	54.0	293	50.8
≥6	684	43.3	272	47.1
Lifetime casual partners				
0	70	4.4	25	4.3
1–49	908	57.5	291	50.5
≥50	602	38.1	261	45.2
Ever had sex with women				
No	832	44.5	270	46.9
Yes	1037	55.5	306	53.1

*Some categories may not add up to 1587 because of missing values.
*†Some categories may not add up to 579 because of missing values.
†Percentages may not add up to 100 because of rounding.
‡Percentages may not add up to 100 because of rounding.
§Canadian dollars.
‖HIV testing history at baseline.
¶Number of partners in the past 6 months before baseline.

cross-sectional studies among MSM in London showed an increase in UAI from 30% in 1996 to 42% in 2000 ($P < 0.001$). This increase was associated with younger MSM.[11] Because these studies have been largely cross-sectional, it is impossible to impart causality to this behavior; UAI could have been increasing among regular seronegative partners, as is expected in a long-term stable relationship. Many studies do not differentiate between UAI with regular partners and casual partners. Although there has not been a statistically significant increase in the HIV incidence among Omega Cohort Study participants,[15] it is important to know whether subjects truly increased their high-risk sexual behavior, because this can be used to assist public health units to devise specific risk reduction strategies.

Thus, the objective of the present study was to describe the temporal trend in UAI from 1997 to 2003 among MSM enrolled in the Omega Cohort Study, being critically aware of the different affective and/or sexual relationships and serostatus that influence behavior.

METHODS

The Omega Cohort Study was a longitudinal study aimed to determine the incidence and risk factors associated with HIV among MSM in Montreal, Canada. Detailed methods of this cohort study have been previously described elsewhere.[16] Briefly, recruitment commenced in October 1996 and ended in December 2002, but data collection continued until July 2003. Self-identified MSM aged 16 years or older could participate, although the objective was to have an equal distribution of MSM younger than and older than 30 years of age. Recruitment was done through the use of posters, the Internet, the gay print media, and distribution of information cards during the annual gay pride week.

Data Collection

A mixed approach of interview and self-administered questionnaires was used. Face-to face interviews were used for collecting psychosocial data, whereas self-administered questionnaires were used for more sensitive behavioral variables. At each scheduled 6-month visit, a research nurse provided pretest counseling using a standard approach and drew a blood sample for HIV serology testing. At the second appointment 1 month later, the laboratory results were shared with the participants in the context of posttest counseling. Persons seropositive at the first visit or at a subsequent follow-up visit were excluded from the study and referred to the appropriate health services for clinical follow-up.

For temporal trend analysis, UAI was the dependent variable and was defined as "penetrative anal sex without a condom at least once during the past 6 months." In this cohort of HIV-negative men, a serodiscordant partner is someone who is seropositive or of unknown serostatus. A casual partner is someone with whom the participant had sex only once and did not intend to see again. If a subsequent encounter did occur, it was purely by chance. A regular partner is someone with whom the participant had sex at least twice or someone he intended to see again. In contrast to studies that have grouped all UAI as homogeneous risk behavior, we have differentiated UAI by partnership and serostatus in 6 categories: casual partners of unknown serostatus, regular partners known to be seronegative (seroconcordant), regular partners of unknown serostatus, regular seropositive partners, all types of partners except seronegative partners, and any type of sexual partner. We have included the category "any type of sexual partner" so as to compare our study with earlier studies that did not differentiate risk behavior by partnership or serostatus.

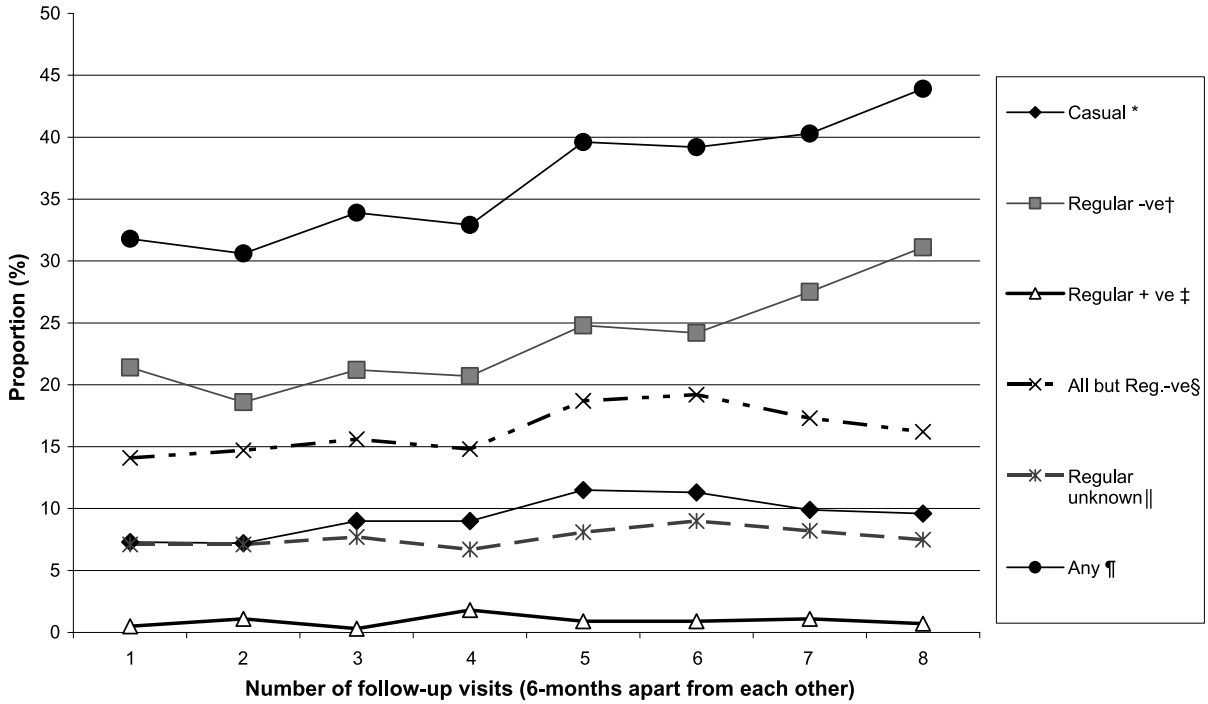

FIGURE 1. Proportion of men having UAI, by partnership and serostatus of sexual partners (n = 579). *Casual partner: someone with whom the participant had UAI only once (one-night stand) and did not intend to see again. †Regular negative partner: A seroconcordant person (HIV seronegative) with whom the participant had UAI at least twice, or someone he intended to see again. ‡Regular positive partner: An HIV seropositive person with whom the participant had UAI at least twice, or someone he intended to see again. §All but regular partner–Any person with whom the participant had UAI except his regular HIV negative (seroconcordant) partner. ‖Regular unknown: a regular partner of unknown serostatus with whom the participant had UAI at least twice, or someone he intended to see again. ¶Any partner with whom the participant had UAI regardless of serostatus or partnership.

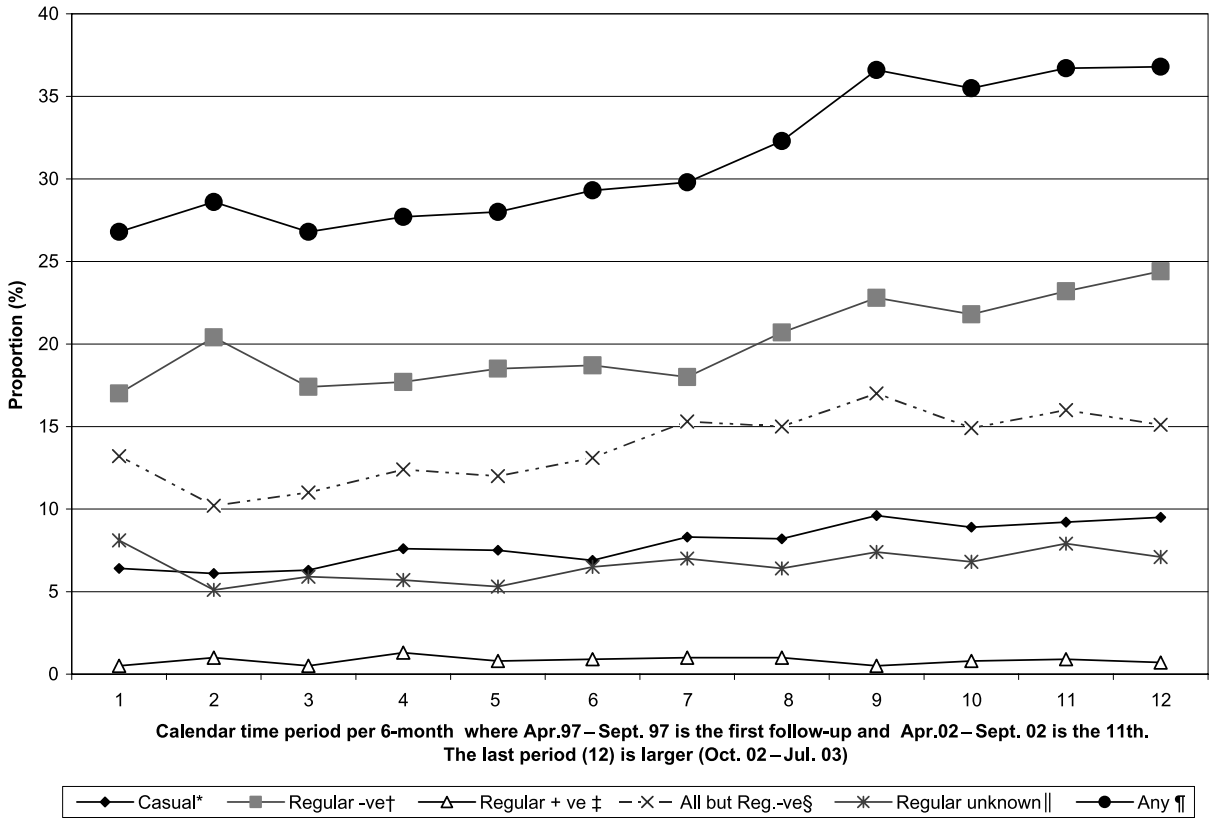

FIGURE 2. Proportion of men having UAI, from April 1997 to July 2003, by partnership and serostatus (n varied between 352 and 800 per serostatus per calendar period. *Casual partner: someone with whom the participant had UAI only once (one-night stand) and did not intend to see again. †Regular negative partner: A seroconcordant person (HIV seronegative) with whom the participant had UAI at least twice, or someone he intended to see again. ‡Regular positive partner: An HIV seropositive person with whom the participant had UAI at least twice, or someone he intended to see again. §All but regular partner–Any person with whom the participant had UAI except his regular HIV negative (seroconcordant) partner. ‖Regular unknown: a regular partner of unknown serostatus with whom the participant had UAI at least twice, or someone he intended to see again. ¶Any partner with whom the participant had UAI regardless of serostatus or partnership.

Trend Analysis

Subjects included in the calendar time category may not necessarily be the same subjects at each follow-up period because of attrition and continuous recruitment throughout the study. We analyzed data for 1587 subjects with at least 2 follow-up visits (cohort comprised 1890 subjects). Calendar time was based on the Julian calendar, ran from April 1997 (first postbaseline visit) to July 2003, and was divided into 6-month periods. We used data from the first follow-up visit to focus on recent as opposed to lifetime behaviors. We considered variations in sexual behavior attributable to the individual aging process (age effects) by creating interaction terms for age at the midpoint of the first follow-up visit and calendar time and population-wide changes over time (period effects), seen as the interaction between time of recruitment and calendar time, as was suggested by Jacobs et al.[17] We tested the cohort effect of age first. If an age-cohort effect was found, we created 7 age subcategories (24 years of age or younger, 25–29 years, 30–34 years, 35–39 years, 40–44 years, 45–49 years, and 50 years and older) to test for trends on those subcategories.

For trend analysis by visit number (based on individual level data), we used data from the first to the eighth follow-up questionnaire. Trend analysis by visit number included only individuals who had complete data for 8 follow-up visits (n = 579).

Data for insertive and receptive anal sex for the same individual were combined, because we observed a similar trend in UAI for insertive and receptive anal sex. The generalized estimating equations method (GEE) was used in analyzing trends because it takes into account correlations between repeated measures on the same individual.[18] Calendar time, modeled as a continuous variable, and odds ratio (OR), modeled as a measure of the odds of increasing UAI per 6-month period, were adjusted for actual age (because participants were allowed to grow older in the models) and time of recruitment. Trend analyses were done with SAS software, version 8.2 (SAS Institute, Cary, NC).

RESULTS

General characteristics of participants who were enrolled in the study are shown in Table 1. Individuals in

both categories were more likely to be college educated and to have been born in the province of Quebec. Participants had similar sexual and HIV testing history; however, those in the visit analysis had a marginally higher income and were more likely to be 30 years or older than those in the calendar time analysis.

Trend Analysis by Visit Number

Figure 1 depicts the trend in UAI by partnership and/or serostatus for the analysis by visit (n = 579). There were important increases in UAI with seroconcordant partners, from 21.3% at the first follow-up to 31.1% at the last visit (OR = 1.06, 95% confidence interval [CI]: 1.04 to 1.09; $P < 0.0001$), and with any type of partner (from 31.8% to 43.9%; OR = 1.05, 95% CI 1.03 to 1.07; $P < 0.0001$). There was also a nonnegligible increase in UAI with casual partners (from 7.3% to 9.6%; OR = 1.05, 95% CI: 1.01 to 1.09; $P = 0.01$). There were no significant differences when the data were analyzed separately by age: less than 30 years and 30 years or older (data not shown).

Trend Analysis by Calendar Study Time

Figure 2 portrays the sexual behavior of all participants for the analysis by calendar period. The number of participants per calendar period increased from 352 to more than 800 in the first 6 periods and then remained stable thereafter. There were important statistically significant increases in UAI between April 1997 and July 2003 with seroconcordant partners from 21.4% to 28.9% (OR = 1.04, 95% CI: 1.02 to 1.05; $P < 0.0001$) and with any type of partner from 34.1% to 43.9% (OR 1.03, 95% CI: 1.02 to 1.04; $P < 0.0001$). There were also nonnegligible increases in UAI with casual partners from 8.2% to 12.2% (OR = 1.03, 95% CI: 1.00 to 1.05; $P = 0.01$) and with any type of partner except a seroconcordant partner from 15.7% to 18.8% (OR = 1.02, 95% CI: 1.00 to 1.04; $P = 0.02$). Although we present the combined analysis of receptive and insertive UAI, we did find some age effects in subanalyses (as seen as the interaction between age at the first follow-up visit and calendar time) for insertive UAI. Further subanalyses showed that age groups 24 years or younger and 35 through 39 years had higher rates of insertive UAI (data not shown). Conversely, it seems that the trend in UAI with casual partners was driven by receptive UAI within the 24 years and younger group, but the 35 through 39 years and 45 through 49 years categories showed a reduction in receptive UAI. These were small variations, however, and we felt comfortable in combining receptive and insertive UAI in the main analyses.

DISCUSSION

There was a nonnegligible and consistent temporal increase in the proportion of Omega Cohort Study participants who practiced UAI from 1997 to 2003. Although this increase in UAI was not homogeneous with all groups of subjects as defined by partnership and serostatus, there were important statistically significant increases with seroconcordant partners and with any type of partner group. We also found some increase in UAI with casual partners. Although increases shown were small, it raises concern, because there was a small increase in the incidence of HIV in Montreal over time, albeit not statistically significant.[15] Further, populations that had previously seen an increase in UAI[12,19] and STIs[7–9] have not witnessed any decrease in HIV incidence, and some have seen an increase in HIV incidence.[4,5,20,21] This observed trend could herald an increase in the incidence of HIV in Montreal.

An increase in UAI with casual partners and serodiscordant partners among HIV-negative MSM is not isolated to the Omega Cohort Study. In London, UAI also increased among serodiscordant or unknown status partners between 1996 and 2000, and this increase continued to 2002.[11,22] In another study among gay men attending London gyms between 1998 and 2001, UAI increased for concordant and discordant casual partners except for concordant seronegative partners.[23] Unlike that study, we defined a casual relationship as serodiscordant; however, the overall increase in UAI with casual partners is similar to our results. In San Francisco, UAI among serodiscordant MSM increased between the period from 1999 to 2000.[17] When the analysis is restricted to seronegative partners, the results of that study are similar to ours.

MSM in the Omega Cohort Study also increased their frequency of UAI with their seroconcordant partners. This result is in contrast to a London study in which UAI did not increase with a main partner who was seronegative. Like that study, however, we did not see an increase in UAI with seropositive partners.[23] Also, using the comprehensive category of "any type of partner," our study showed an increase in UAI among cohort participants.

We believe that the low but consistent increase in UAI in the Omega Cohort Study may differ from the situation in other cities because of the harm reduction policies enacted by Montreal Public Health Department in the early years of the epidemic. Unlike other cities, where the public health response to HIV was to close gay saunas, Montreal's approach was participatory and involved gay community organizations that focused on educating gay men and promoting and distributing condoms in venues identified to attract MSM. With changing times, however, these organizations may need to change their outreach strategy to reach more vulnerable groups, such as migrants to the city and younger men.

Several reasons have been given for recent increases in UAI among MSM, most notably because of advances in antiretroviral therapy.[23,24] This conclusion comes from studies that have mostly studied HIV-negative MSM, with the premise that receiving HAART or having an undetectable viral load protects against being infected by HIV. A meta-analysis showed that having these beliefs increase one's risk of engaging in UAI[25]; however, an earlier analysis of the Omega Cohort Study's data showed that most participants do not hold such beliefs.[26] Studies have noted increased risk behavior because of "party-drug" use at circuit "rave" parties,[27] increasing Internet use for seeking sex,[28] and use of nitrite inhalants, all of which are not foreign to Omega Cohort Study participants.

Importance of Trend Analyses

Trend analysis by visit is important because it allows us to follow the same people over time to witness the evolution of sexual behavior as the cohort matures and individuals grow

older. As such, time of recruitment (which was spread over 2.5 years) and age were potential confounders and were controlled for in this analysis. This analysis is powerful, because it is expected that participants would decrease their risk because they were counseled at each visit; nevertheless, UAI increased. Trend analysis by calendar time is also important because it is a sensitive measure of recent changes in sexual behavior, characteristics of the people who were recruited at different points, and characteristics of those who were lost to the study. If more people with higher sexual risk profiles were recruited later, it would have been expected that the proportion of UAI would increase. On controlling for age and time of recruitment, significant increasing trends remained.

LIMITATIONS

This important study showed the evolution of UAI in the Omega Cohort. The relatively long follow-up time strengthens the study because it provided sufficient time to observe general ecologic changes (age, period, and cohort) and real, as opposed to spurious, fluctuation in UAI. Although the study recruited a diversity of MSM from different settings, participants constituted a convenience sample of MSM who have some degree of comfort with their sexuality, because the questionnaire involved an extensive face-to-face interview and post-HIV test counseling. Some MSM, especially from certain communities, may not have participated out of fear of their sexuality being disclosed. Also, there is a chance that men may have misrepresented their real sexual behavior, thus introducing a misclassification bias. Also, although a 6-month period is a relatively short time to recall a sexual behavior, there is always the possibility that some men may not recall certain behavior, especially if they consider it to be an undesirable behavior.

CONCLUSION

There was a general increase in UAI among Omega Cohort Study participants, but this level was not appreciably high. It is also an indication that most men continue to practice safe sex most of the time, and they should be encouraged to continue doing so. Continuous trend analysis is important because it allows us to follow UAI closely, which may be a forebearer of an impending rise in the incidence of HIV.

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