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Voluntary HIV Testing Among Inmates: Sociodemographic, Behavioral Risk, and Attitudinal Correlates

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Summary: We sought to determine the prevalence and correlates of self-reported HIV testing among inmates in correctional centers in Ontario, Canada. A cross-sectional survey was conducted with a stratified random sample of 597 male and female adult inmates. The participation rate was 89%. Descriptive statistics and multiple logistic regression were used to analyze HIV testing. Fifty-eight percent had ever been tested, and 21% had voluntarily tested while incarcerated in the past year. Having ever been tested was more common among those at risk for HIV through injection drug use (IDU) or sexual behavior. Testing while incarcerated in the past year was independently associated with being single (OR = 2.6), frequent IDU (OR = 4.0), not having casual sex partners prior to incarceration (OR = 0.53), a history of hepatitis (OR = 2.4), previous HIV testing (OR = 3.7), a close relationship with an HIV-positive person in the outside community (OR = 1.7), knowing an HIV-positive person inside (OR = 2.7), a perceived chance of being infected during incarceration (OR = 2.2), and support of mandatory testing (OR = 2.0). The predominant motivations for testing while incarcerated were IDU or fears of infection inside, possibly through contact with blood, during fights, or even by casual contact. Voluntary HIV testing in prison should be encouraged, and inmates should receive appropriate counseling and information to allow realistic assessment of risk. **Key Words:** HIV testing—Prisoners—Risk behavior—Canada.

Correctional facilities in Canada are known to house significant numbers of people at risk for HIV, particularly injection drug users (1–5). The proportion of inmates reporting a history of injection drug use (IDU) ranges from 28% to 50% (1–3). Estimates of HIV prevalence range from 0% to 7.7%, with most studies reporting rates between 1% and 3%; these rates are 6 to 10 times higher than in the general population (1,2,6–11). Inmates with a known history of IDU are found to have an elevated prevalence of HIV (2,3,6,7,9–11).

Voluntary HIV counseling and testing (VCT) is an important public health strategy to prevent HIV transmission and facilitate treatment (12–14). In addition to testing services available to the general population, targeted VCT programs are recommended for those at higher risk, such as injection drug users and inmates (14–16). In Ontario, Canada, HIV tests are available outside correctional facilities at no cost to the patient through a physician or anonymous testing center. Nominal VCT is also available to inmates in correctional facilities through the facility's health care unit. Testing is offered to all who request testing, exhibit symptoms, or

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are perceived to be at risk based on medical histories obtained on admission.

Utilization of VCT services in correctional facilities has not been extensively studied in Canada. There is anecdotal evidence that some inmates are reluctant to test (16). In the United States, uptake of VCT offered to inmates ranged from 39% to 71% (17–21) and increased between 1992 and 1998 (22). Reasons for refusing VCT among inmates in Maryland were perceived low risk, fear of testing HIV-seropositive, and lack of interest (17). In Australia, between 37% and 92% of inmates accepted VCT on reception into prison (23). These studies have improved our understanding of the extent of utilization of VCT services in correctional facilities and the characteristics of those undergoing testing, and a few have examined correlates of testing (17,18). More in-depth information on the correlates of HIV testing in correctional facilities would be helpful for the evaluation, design, and targeting of VCT services for this high-risk population.

The objectives of this analysis were to measure the extent of HIV testing among inmates, to better understand who was more likely to undergo HIV testing, to describe reasons for not testing, and to determine the correlates of recent testing while incarcerated.

METHODS

Between August 1996 and March 1997, we conducted face-to-face interviews with a stratified random sample of adult men and women incarcerated in six provincial correctional centers in Ontario, Canada. Provincial correctional centers house inmates serving a sentence less than 2 years in length. Inmates with longer sentences are housed in federal prisons. The six centers included the only facility for women (which contained both minimum and medium security units) and five facilities for men (which included two minimum, two medium, and one maximum security units). Participation was voluntary and confidential. No incentives were offered for participation. All data were self-reported, because it was believed that linkage with correctional records might jeopardize the confidentiality of participants and their willingness to participate. The project received ethical approval from the University of Toronto's Human Subjects Review Committee and the Advisory Committee on Research and Evaluation of the Ontario Ministry of the Solicitor General and Correctional Services.

For each correctional center, a list of potential participants was generated from the inmate list using random number tables. Interviewers approached potential participants in random order at their living units. Interested inmates were escorted to a private interview room and given full details of the study. Participants provided written informed consent. During the interview, the door remained closed and unlocked, and no correctional staff members were present. Interviews lasted an average of 1 hour 10 minutes. To protect the confidentiality of the participants, the survey instrument did not contain personal identifiers.

Data analysis was done using SAS (version 8, SAS Institute, Cary, NC, U.S.A.). A $P \leq 0.05$ level was used to determine statistical significance. Key variables for this analysis were previous HIV testing history (i.e., ever tested, number of times, whether tested in the outside community or in correctional facilities) and specifics of the most recent HIV test (i.e., date, location, reason for testing, result). Inmates who had not tested were given a list of reasons and asked to what extent each applied to them using a four-point Likert scale. Rates of ever testing were examined according to HIV risk factors and analyzed using multiple logistic regression. Measures of risk factors included sexual, IDU, and tattoo histories.

Further analysis focused on correlates of undergoing HIV testing while incarcerated in the past year. Independent variables examined were previous HIV testing (i.e., ever undergone testing other than while incarcerated in the past year), sociodemographic characteristics (i.e., gender, age, marital status, children, race, income, education), sexual risk (i.e., orientation, number of sexual partners in lifetime, worked in the sex trade, ever had sex partners who were injectors, bisexual, HIV-positive, sexual risk behavior in the outside community in the year prior to incarceration and while incarcerated in the past year), IDU risk (i.e., IDU ever and ever while incarcerated, IDU in the outside community in the year prior to incarceration and while incarcerated in the past year, ever shared needles with an HIV-positive person), and medical history (i.e., receipt of a blood product prior to 1985, ever diagnosed with a sexually transmitted disease or hepatitis). Knowledge of HIV was based on a series of 22 true/false questions; the effects of summed correct responses for all questions and for subcategories of knowledge were analyzed. Self-perceived risk was measured with the question "What do you think are your chances of becoming infected with HIV/AIDS?" using a five-point scale ranging from "almost certain I will not get infected" to "almost certain I will get infected"; those who were already infected were not included in the analysis of perceived risk. Categories of self-perceived risk were collapsed into two levels (none or extremely small chance vs. some chance or greater) because of small frequencies in some categories and because there were similar odds of HIV testing in categories that were combined. Participants were also asked if they knew a person with HIV/AIDS in the outside community or "on the inside." Finally, we examined the effects of attitudes toward alternative policies of disclosure of HIV status, segregation of HIV-positive inmates, and mandatory HIV testing (such policies are not in place in Canada). For example, attitudes toward mandatory HIV testing were captured with four statements: "All (inmates/ medical staff/ correctional officers/ administrative staff) should be tested with HIV, even if they don't want to be tested." Participants were asked to what extent they agreed using a four-point Likert scale; the average response was analyzed (additional details on the questionnaire and measures are available from the authors).

Preliminary bivariate analysis (e.g., Pearson χ^2 tests, t tests) was used to examine associations with HIV testing while incarcerated in the past year. Statistically significant variables were selected for modeling. Two-way interaction terms between all significant variables were examined as well as those with sociodemographic variables. The final model was selected based on the statistical significance of terms in the model, the size of the associations, the need for adjustment of covariates, and the goodness of fit of the model according to the Hosmer and Lemeshow test (24).

RESULTS

A total of 597 inmates (439 men and 158 women) were interviewed. The participation rate was 89%. Participants did not differ significantly from nonparticipants in terms of age, gender, facility, or security level. There was considerable difference in sociodemographic and

TABLE 1. *Characteristics of inmates surveyed in correctional centres in Ontario, Canada*

	Total (N = 597)	Males (n = 439)	Females (n = 158)	*P* value
Age				0.005
18–29 years	45%	49%	34%	
30–39 years	35%	32%	43%	
40 or older	20%	19%	24%	
Education				0.82
Less than secondary school	60%	60%	62%	
Secondary school	22%	22%	22%	
More than secondary school	18%	18%	16%	
Racial group				0.07
White	71%	73%	66%	
Aboriginal	13%	13%	11%	
Black	12%	10%	17%	
Other	5%	4%	6%	
Marital status				0.0003
Never married	51%	55%	40%	
Married or common-law	30%	29%	32%	
Divorced, separated, or widowed	19%	16%	28%	
First incarceration	26%	21%	41%	<0.0001
Median number of times jailed/detained in lifetime (range)	4.0 (1–200)	5.0 (1–175)	3.0 (1–200)	<0.0001[a]
Median number of years served in lifetime (range)	1.5 (0.04–28)	2.0 (0.08–28)	0.58 (0.04–14)	<0.0001[a]
Median number of months served for current sentence (range)	4.5 (0.43–39)	5.0 (0.43–39)	3.0 (0.43–26)	<0.0001[a]

P values for gender comparisons estimated using Pearson χ^2 tests.
[a] Wilcoxon rank sum test.

criminal history characteristics of male and female inmates (Table 1). More women than men were aged 30 years or older (67% vs. 51%); were black (17% vs. 10%); or were divorced, separated, or widowed (28% vs. 16%). Men tended to have never married compared with women (55% vs. 40%) and had more extensive criminal histories. At the time of their interview, inmates had served a median of 4.5 months for their current sentence (men = 5 months; women = 3 months; $P < 0.0001$, Wilcoxon rank sum test).

A substantial proportion of inmates reported HIV risk factors (Table 2). Similar proportions of men and

TABLE 2. *Risk factors for HIV infection among inmates, by gender*

	Males, % (n)	Females, % (n)	*P* value
Total number of sex partners in lifetime			
1–5	16 (72)	33 (50)	<0.0001
6–10	19 (85)	22 (33)	
11–20	24 (106)	9 (13)	
21–50	22 (98)	13 (20)	
>50	17 (75)	24 (36)	
Ever received payment for sex	1 (5)	26 (41)	<0.0001
No	99 (427)	74 (114)	
Male ever had sex with a male	9 (41)	NA	NA
No	91 (393)		
Ever had sex while incarcerated	9 (41)	11 (18)	0.46
No	91 (393)	89 (140)	
Ever injected drugs	30 (133)	37 (56)	0.23
No	70 (304)	64 (101)	
Ever injected drugs while incarcerated	9 (39)	5 (8)	0.13
No	91 (398)	95 (149)	
Ever tattooed while incarcerated	21 (91)	6 (9)	<0.0001
No	79 (348)	94 (149)	

P values comparing risk factors between males and females were estimated using Pearson chi-square tests. NA, not applicable.

women reported ever injecting drugs (30% and 37%) or ever injecting while incarcerated (9% and 5%). Ever being paid for sex was more common among women (26%) than men (1%) ($P < 0.0001$, χ^2 test), and ever being tattooed while incarcerated was more common among men (21%) than women (6%) ($P < 0.0001$, χ^2 test).

Ever Testing for HIV

Fifty-eight percent (343/595) of inmates had ever tested for HIV, 5% (31/595) were unsure, and 37% (221/595) had never tested. Among the 343 tested, 44% had only tested in the outside community, 25% had only tested while incarcerated, and 31% had tested both outside and inside correctional facilities. The median number of times tested was 2 (range: 1–50). Of those tested, 3.6% (12/325) reported receiving an HIV-positive result (95% CI: 1.6%–5.6%).

Ever undergoing testing was more prevalent among those at risk, although not all differences were statistically significant (Table 3). Ever testing was independently associated with younger age (OR = 3.3 and 3.2 for ages 18–29 years and 30–39 years compared with 40 years of age and older, respectively), female gender (OR = 2.4), having had over 50 sexual partners in one's lifetime (OR = 3.4 compared with 1–5 partners), IDU ever (OR = 2.7), IDU ever while incarcerated (OR = 11), and ever being tattooed while incarcerated (OR = 2.0).

Among inmates who had never tested (n = 221), 70% mostly or definitely agreed that their reason was "I don't think I am at risk." Many also agreed they never tested because "I am careful about what I do" (63%), "I never really thought about being tested for HIV" (60%), and "I feel healthy" (46%). Other reasons for never testing (e.g., not being able to cope with an HIV-positive result or fear of stigma and discrimination) were reported by less than 13%.

HIV Testing While Incarcerated

Analysis of HIV testing while incarcerated excluded inmates who were unsure whether they had undergone HIV testing ever (n = 31) or in correctional facilities (n = 8). Of the remaining 554 inmates with nonmissing data, 33% (185) had ever tested while incarcerated. Among these 185, 55% had tested once, 20% had tested twice, and 25% had tested three or more times. Of those who tested at least 1 month ago, 91% (157/173) had

TABLE 3. *Adjusted odds ratios for ever testing for HIV among inmates*

	n	Tested	$OR_{adjusted}$[b]	95% CI	*P* value
Age					
18–29	254	61%	3.3	(1.9, 5.7)	<0.0001
30–39	199	70%	3.2	(1.8, 5.7)	<0.0001
40 or older	111	43%	referent		
Gender					
Male	409	58%	0.42	(0.26, 0.71)	0.001
Female	155	69%	referent		
Number of sex partners in lifetime					
1–5	113	45%	referent		
6–10	114	53%	1.0	(0.57, 1.8)	0.96
11–20	114	60%	1.3	(0.72, 2.4)	0.37
21–50	111	68%	1.7	(0.90, 3.1)	0.11
Over 50	106	79%	3.4	(1.6, 7.0)	0.001
Ever received payment for sex	44	91%	1.1	(0.33, 3.9)	0.85
No	511	58%	referent		
Ever had sex while incarcerated	59	83%	1.4	(0.64, 4.5)	0.38
No	505	58%	referent		
IDU ever	185	83%	2.7	(1.7, 4.5)	<0.0001
No	377	50%	referent		
IDU ever while incarcerated	47	98%	11	(1.4, 86)	0.02
No	514	57%	referent		
Ever tattooed while incarcerated	97	78%	2.0	(1.1, 3.7)	0.03
No	467	57%	referent		

Analysis excludes inmates who were unsure if they had ever been tested (n = 31), declined to respond to the question on HIV testing (n = 1) or had missing data.

[b] Adjusted for all variables shown using multiple logistic regression model (n = 549, Hosmer-Lemeshow goodness-of-fit test $P = 0.70$).

CI, confidence interval.

received the result, and of those, 4.5% (7/157, 95% CI: 1.3%–7.7%) reported an HIV-positive result.

A total of 145 inmates had tested in the outside community but never while incarcerated. Predominant reasons for not testing "inside" were "I am careful about what I do" (62%), "I don't think I am at risk" (50%), and "because I feel healthy" (39%). Some inmates reported not testing because of concerns about receiving an HIV-positive diagnosis in the correctional setting: "There is no confidentiality among prison staff" (24%), "I fear the reaction of other inmates" (18%), and "Prison is hard enough" (18%).

Of all inmates, 21% (117/556) underwent HIV testing while incarcerated in the past year. Reasons given included wanting to know one's status (28%), sexual risk behavior (17%), IDU (16%), a follow-up test to a previous test (12%), being in an accident or a fight (8%), being a "regular tester" (7%), being tested as part of a medical checkup (5%), and illness (4%).

Characteristics independently associated with undergoing HIV testing while incarcerated in the past year are shown in Table 4. Testing was more common among inmates who were single/never married (OR = 2.6), those without casual partners (OR = 1.9), those who injected drugs twice a week or more often (OR = 4.0) outside in the year prior to incarceration, those reporting a diagnosis of hepatitis (OR = 2.4), and those who agreed or strongly agreed with mandatory testing (OR = 2.0). There were marginally significant ($P = 0.06$) trends for recent testers to have a close relationship with a person (i.e., partner, family, close friend) who had HIV/AIDS in the outside community (OR = 1.7) and to

TABLE 4. *Adjusted odds ratios for testing for HIV while incarcerated in the past year among inmates*

	n	Tested	OR_{adj}[a]	95% CI	*P* value
Single marital status	284	28%	2.6	(1.5, 4.6)	0.0004
No	270	15%	referent		
Had casual partners in outside community in year prior to incarceration	183	16%	0.53	(0.30, 0.96)	0.03
No	372	24%	referent		
IDU twice a week or more often in outside community in year before incarceration	61	52%	4.0	(1.9, 8.2)	0.0002
No	535	17%	referent		
Ever diagnosed with hepatitis	101	36%	2.4	(1.2, 4.8)	0.01
No	496	18%	referent		
Previously tested for HIV[b]					
Yes (age 18–29)	144	34%	3.7	(1.6, 8.5)	0.002
No (age 18–29)	108	8%	referent		
Yes (30–39)	122	26%	0.53	(0.22, 1.3)	0.15
No (age 30–39)	72	18%	referent		
Yes (age 40 or older)	40	17%	1.0	(0.26, 4.0)	0.98
No (age 40 or older)	70	10%	referent		
Close relationship to a person with HIV/AIDS in outside community	121	36%	1.7	(0.98, 3.0)	0.06
No	435	17%	referent		
Perceived chance of becoming infected with HIV/AIDS while incarcerated					
Some chance or greater	44	38%	2.2	(0.98, 4.9)	0.06
None or very small chance	538	19%	referent		
Know someone with HIV/AIDS "inside prison"[c]					
Yes (age 18–29)	106	39%	2.7	(1.3, 5.7)	0.007
No (age 18–29)	164	12%	referent		
Yes (age 30–39)	84	37%	2.9	(1.3, 6.6)	0.01
No (age 30–39)	123	14%	referent		
Yes (age 40 or older)	44	7%	0.23	(0.05, 1.1)	0.06
No (age 40 or older)	76	16%	referent		
Agree or strongly agree with mandatory testing of inmates, medical staff, correctional officers, and administrative staff	306	26%	2.0	(1.2, 3.3)	0.008
No	288	16%	referent		

Analysis excludes inmates who were unsure if they had ever been tested (n = 31), unsure if they were tested in correctional facilities (n = 8), declined to respond to the question on HIV testing (n = 1), or had missing data.

[a] Adjusted for all variables shown and gender using multiple logistic regression (n = 537, Hosmer-Lemeshow goodness-of-fit test. $P = 0.24$).

[b] Interaction P value = 0.006.

[c] Interaction P value = 0.01.

have perceived themselves at risk for HIV infection while incarcerated (OR = 2.2).

Two correlates of HIV testing depended on age (Table 4). Among inmates aged 18 to 29 years, those who had previously tested were 3.7 times more likely to have also tested while incarcerated in the past year; previous testing had no effect among people who were 30 years of age or older. Knowing someone with HIV/AIDS "inside prison" was associated with testing among inmates under the age of 40 years but was associated with not testing among those aged 40 years or older.

Further analysis was conducted to understand the association between recent testing while incarcerated and perceived risk of infection, knowing someone with HIV/AIDS, and support of mandatory testing in correctional facilities. Those who believed they could be infected were more likely to report IDU while incarcerated in the past year than those who did not think they were at risk (9.3% vs. 2.8%; $P = 0.04$, Fisher exact test). They were also more likely to avoid blood or fights inside to prevent infection (32% vs. 18%; $P = 0.02$, χ^2 test).

Inmates who said they knew someone with HIV/AIDS "on the inside" reported more risk behavior while incarcerated in the past year compared with those who did not know someone (IDU: 5.2% vs. 2.2%; $P = 0.06$, Fisher exact test; oral sex or intercourse: 6.9% vs. 0.8%; $P < 0.0001$, Fisher exact test).

There was a positive association between having been tested and support of mandatory testing in correctional facilities. Support was measured with four statements regarding testing of all inmates, medical staff, correctional officers, or administrative staff. There was high intercorrelation between these four statements, and their association with having been tested was consistent whether each statement was analyzed alone or all four were combined (data not shown). More of those who supported mandatory testing had tested only in correctional facilities (20% vs. 10%; $P = 0.0006$, χ^2 test). They also tended to avoid casual contact with others to prevent HIV infection while incarcerated (32% vs. 16%; $P < 0.0001$ χ^2 test). This included behaviors such as washing hands; not sitting on toilet seats; not sharing cigarettes or eating utensils; and avoiding people who were HIV-positive, homosexual, or used drugs. Finally, they scored lower on knowledge questions about HIV transmission through casual contact (median: 5 of 6 answers correct vs. 6 of 6 answers correct; $P < 0.0001$ Wilcoxon rank sum test).

DISCUSSION

Rates of ever testing for HIV among inmates in this survey were considerably higher than the rate of 35% reported among the general Canadian population (25). This is likely a reflection of the risk profile of inmates, many of whom had multiple sex partners, engaged in IDU, or were tattooed while incarcerated. Consistent with previous research in other populations in Canada (25), elsewhere (26,27), and among inmates (28–30), inmates who reported risk factors had higher rates of testing. Although this finding is encouraging, it is a concern that some at risk had not been tested.

Recent voluntary HIV testing in correctional facilities was associated with frequent IDU outside prior to incarceration. Millson and colleagues (31) also found that frequent IDU led to recent HIV testing among injectors recruited in the outside community in Ontario. Higher rates of testing among injectors were observed in Scottish prisons (28) and among Maryland prison entrants (17) but not among female inmates in North Carolina (18). In our study, testing while incarcerated was not associated with recent high-risk sexual activity, although a minority said their reason for testing was sexual behavior and those who had a close relationship with someone with HIV/AIDS outside were more likely to test. We do not know whether this latter association is a result of risk behavior with HIV-positive people or of increased awareness of HIV, because few inmates reported sharing needles or having sex with HIV-positive people.

Among young inmates, a history of previous HIV testing was associated with testing while incarcerated. This suggests ongoing risk behavior among repeat testers because they tend to be at higher risk (21,32,33). For some, recent testing inside was a follow-up for a prior test event as is typically counseled (15).

A perception of greater personal risk and knowing a person with HIV/AIDS inside were correlated with recent testing. Direct associations between testing and risk behavior while incarcerated were not significant, but power was low, because few inmates reported IDU or sex inside. Those who thought they were at risk or knew a person with HIV/AIDS inside were more likely to have injected, had sex, or have avoided blood and bodily fluids or fights to prevent infection while incarcerated, however.

Mandatory testing of inmates is not in place or recommended in Canada (16). Yet, we found that recent testers in correctional facilities were more supportive of the idea of mandatory testing. We are not aware of previous research that has examined this issue but propose that support of mandatory testing may be more common among those who do not anticipate a positive result or have fears of HIV transmission through casual contact while incarcerated.

The results suggest two dominant motivators for testing among inmates. One group of testers appears to be motivated by behavior that places them at risk for HIV, namely, IDU in the outside community and possibly risk behavior while incarcerated. Another group of testers appears to be motivated by fears of infection inside correctional facilities, possibly through contact with blood, during fights, or even through casual contact. Close proximity to strangers in the correctional setting may lead to anxiety and fear of infection, however irrational those fears may be.

We believe the random sample of 597 inmates in this investigation was generalizable to the inmate population in Ontario correctional centers in 1996 through 1997. The centers included in the study represented 78% of male and 100% of female annual admissions in Ontario (5), and 89% of inmates asked agreed to participate in the survey. The sociodemographic characteristics of participants were typical of inmates in the provincial system, with the exception of women, who were overrepresented as a result of the sampling method (26% in our sample compared with 6% in provincial system).

There are some limitations to this investigation. All information was self-reported. There is excellent agreement between self-reported HIV status and results from saliva testing among inmates (30), suggesting that self-reported HIV testing is valid in this population. Nevertheless, there may have been underreporting of undesirable, illegal, and/or stigmatizing behavior such as drug use and sexual behavior while incarcerated. Inmates were assured of confidentiality and informed that it would be better not to participate or to refuse to respond to a question if they were uncomfortable in providing honest answers. Rates of drug use reported by inmates in our survey were consistent with those from the random drug testing program in federal prisons (34). Nevertheless, we believe that there was some underreporting of these behaviors. Underreporting would result in an underestimation of the association between risk behavior and undergoing HIV testing and in reduced power to detect differences.

Secondly, the time frames used for various measures may have affected their accuracy. Behavior remembered over a lifetime would be subject to recall error, particularly for events that occurred some time ago. Also, time frames used to capture recent behavior were not consistent for all inmates. The time frame for recent behavior in the outside community was "outside in the year preceding this term of incarceration." Many inmates have extensive criminal histories. Some may not have been outside for a full year prior to their incarceration. For recent behavior in correctional facilities, the time frame was "in the past year while incarcerated"; however, most had served less than this amount at the time of their interview. This was unavoidable, because the study was conducted in provincial correctional centers, where sentences are less than 2 years, and most are considerably shorter. These inconsistencies may have lead to underestimation of rates and reduced power to detect correlates of HIV testing.

Several recommendations can be made based on our findings. Confidential VCT in correctional facilities should be continued and encouraged. For some inmates, correctional facilities may be the only location in which they undergo testing. Although anonymous testing has been recommended in correctional facilities (16,35), to date, it is not available. We support the provision of anonymous testing in addition to the existing nominal testing, because many inmates in our survey avoided testing because of concerns about confidentiality and discrimination. Inmates may be more comfortable in using testing services offered by outside agencies (16). This could also allow access to a result on release, which would provide continuity of care in the community and ensure the provision of results to inmates serving short sentences or testing close to the end of their sentence. Efforts should be made to increase testing among male inmates and those at risk because of sexual behavior and to address perceptions of risk. Finally, those who seek testing inside because of fears of infection through casual contact should receive appropriate counseling and information to allay their fears.

VCT is one of the most effective public health strategies currently available to deal with HIV/AIDS. When done well, it provides education, raises awareness, dispels myths, reduces levels of HIV discrimination, and detects those in need of HIV care and treatment (12–14). Our results provide evidence that VCT serves an important function in the Ontario correctional system. The implementation of the above recommendations would further strengthen this useful tool.

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REFERENCES

1. Dufour A, Alary M, Poulin C, et al. Prevalence and risk behaviors for HIV infection among inmates of a provincial prison in Quebec City. *AIDS* 1996;10:1009–15.
2. Ford P, Pearson M, Sankar-Mistry P, et al. HIV, hepatitis C and risk behavior in a Canadian medium-security federal prison. *Q J Med* 2000;93:113–9.
3. Hankins C, Gendron S, Handley M, et al. HIV infection among women in prison: an assessment of risk factors using a nonnominal methodology. *Am J Public Health* 1994;84:1637–40.
4. Millson P, Myers T, Rankin J, et al. Prevalence of HIV and associated risk behaviors in injection drug users in Toronto. *Can J Public Health* 1995;86:176–80.
5. Ministry of Correctional Services. Annual report 1992. Toronto: Ministry of Correctional Services, 1992.
6. Calzavara L, Major C, Myers T, et al. Reducing volunteer bias: using left-over specimens to estimate rates of HIV infection among inmates in Ontario, Canada. *AIDS* 1995;9:631–7.
7. Calzavara L, Major C, Myers T, et al. The prevalence of HIV-1 infection among inmates in Ontario, Canada. *Can J Public Health* 1995;86:335–9.
8. Ford P, White C, Kaufmann K, et al. Voluntary anonymous linked study of the prevalence of HIV infection and hepatitis C among inmates in a Canadian federal penitentiary for women. *CMAJ* 1995;153:1605–9.
9. Hankins C, Gendron S, Handley M, et al. HIV-1 infection among incarcerated men—Quebec. *Can Commun Dis Rep* 1991;17: 233–5.
10. Hankins C, Gendron S, Richard C, et al. HIV-1 infection in a medium security prison for women—Quebec. *Can Commun Dis Rep* 1989;15:168–70.
11. Rothon D, Mathias R, Schecter M. Prevalence of HIV infection in provincial prisons in British Columbia. *CMAJ* 1994;151:781–7.
12. Higgins DL, Galavotti KO, O'Reilly KR, et al. Evidence for the effects of HIV antibody counseling and testing on risk behaviors. *JAMA* 1991;266:2419–29.
13. Phillips KA, Coates TJ. HIV counseling and testing: research and policy issues. *AIDS Care* 1995;7:115–24.
14. Joint United Nations Program on HIV/AIDS (UNAIDS). Report on the global HIV/AIDS epidemic, July 2002. Geneva, Switzerland: UNAIDS, 2002.
15. Canadian Medical Association. Counseling guidelines for HIV testing. Ottawa: Canadian Medical Association, 1995.
16. Jurgens R. HIV testing and confidentiality: final report. Canadian HIV/AIDS Legal Network & Canadian AIDS Society, 2001.
17. Behrendt C, Kendig N, Dambita C, et al. Voluntary counseling and testing for human immunodeficiency virus (HIV) in a prison population with a high prevalence of HIV. *Am J Epidemiol* 1994;139: 918–26.
18. Cotten-Oldenburg N, Jordan B, Martin S, et al. Voluntary HIV testing in prison: do women inmates at high risk for HIV accept HIV testing? *AIDS Educ Prev* 1999;11:28–37.
19. Hoxie N, Vergeront J, Frisby H, et al. HIV seroprevalence and acceptance of voluntary HIV testing among newly incarcerated male prison inmates in Wisconsin. *Am J Public Health* 1990;80: 1129–31.
20. Kassira E, Bauserman R, Tomoyasu N, et al. HIV and AIDS surveillance among inmates in Maryland prisons. *J Urban Health* 2001;78:256–63.
21. McCusker J, Willis G, McDonald M, et al. Community-wide HIV counseling and testing in central Massachusetts: who is retested and does their behavior change? *J Community Health* 1996;21: 11–22.
22. Sabin K, Frey R, Horsley R, et al. Characteristics and trends of newly identified HIV infections among incarcerated populations: CDC HIV Voluntary Counseling, Testing and Referral System, 1992–1998. *J Urban Health* 2001;78:241–55.
23. McDonald A, Ryan J, Brown P, et al. HIV prevalence at reception into Australian prisons, 1991–1997. *Med J Aust* 1999;171:18–21.
24. Hosmer D, Lemeshow S. *Applied logistic regression*. New York: John Wiley & Sons, 1989.
25. Houston SM, Archibald CP, Strike CP, et al. Factors associated with HIV testing among Canadians: results of a population-based survey. *Int J STD AIDS* 1998;9:341–6.
26. Shuter J, Alpert PL, DeShaw MG, et al. Rates of and factors associated with self-reported prior HIV testing among adult medical patients in an inner city emergency department in the Bronx, New York City. *J Acquir Immune Defic Syndr Hum Retrovirol* 1997;14:61–6.
27. Solomon L, Moore J, Gleghorn A, et al. HIV testing behaviors in a population of inner-city women at high risk for HIV infection. *J Acquir Immune Defic Syndr Hum Retrovirol* 1996;13:267–72.
28. Gore S, Bird A, Burns S, et al. Anonymous HIV surveillance with risk-factor elicitation: at Perth (for men) and Cornton Vale (for women) Prisons in Scotland. *Int J STD AIDS* 1997;8:166–75.
29. Malliori M, Sypsa V, Psichogiou M, et al. A survey of bloodborne viruses and associated risk behaviors in Greek prisons. *Addiction* 1998;93:243–51.
30. Rotily M, Weilandt C, Bird S, et al. Surveillance of HIV infection and related risk behavior in European prisons. *Eur J Public Health* 2001;11:243–50.
31. Millson P, Myers T, Calzavara L, et al. HIV testing behavior amongst injection drug users (IDU) in Ontario [abstract 363P]. Presented at the 11th Annual Canadian Conference on HIV/AIDS Research, Winnipeg, Manitoba, April 2002.
32. McFarland W, Fischer-Ponce L, Katz MH. Repeat negative human immunodeficiency virus (HIV) testing in San Francisco: magnitude and characteristics. *Am J Epidemiol* 1995;142:719–23.
33. Norton J, Elford J, Sherr L, et al. Repeat HIV testers at a London same-day testing clinic. *AIDS* 1997;11:773–81.
34. Kendall P, Pearce M. Drug testing in Canadian jails: to what end? *CMAJ* 2000;91:26–8.
35. Expert Committee on AIDS And Prisons (ECAP). HIV/AIDS in prisons: final report of the Expert Committee on AIDS and Prisons. Ottawa: Correctional Services of Canada, 1994.