

Falling through the cracks? Characteristics of undiagnosed HIV infections and implications for HIV testing for injection drug users and street-based sex workers

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Background

More than half of new transmissions originate from individuals with undiagnosed HIV infection [1]. In Canada, an estimated 1 in 4 HIV infections are undiagnosed [2]. Characterizing this hidden population could inform HIV testing strategies to better target the undiagnosed.

Observational cohorts offer a unique opportunity to identify and study the undiagnosed population. Self-reported health status is commonly requested from cohort study participants upon enrollment in a study. Those that report "Unknown" or "HIV negative" status but test positive on the confirmatory HIV test represent the previously undiagnosed group. In this study, we characterized individuals who were unaware of their HIV infection at the time of enrollment into observational cohorts of injection drug users (IDU) and street-based sex workers (SW) to identify possible factors that may lead to missed HIV diagnoses.

Methods

Baseline data from longitudinal cohorts were analysed. Injection drug users participating in the VIDUS [3] cohort during 1996-2005, and street-based sex workers participating in the MAKa [4] cohort during 2006-2007 were included in the study.

Groups were defined for comparison based on HIV status at the time of enrollment: Self-reported HIV status was confirmed by an HIV test to classify each new SW participant as HIV negative, diagnosed HIV positive or undiagnosed HIV positive at baseline (Table 1). Sufficient data were available for IDU to restrict comparisons to the HIV positive groups (Table 2). Groups were compared across socio-demographic, risk-behavior, violence and service-utilization variables. Chi-square and Fisher's exact tests were applied in bivariate comparisons. Statistically significant results were used to develop a multivariate model for injection drug users only, because data for sex workers were insufficient for the multivariate analysis.

Results

18% of HIV positive street-based sex workers were undiagnosed on enrollment in the study. The group with diagnosed HIV at baseline were more likely - with marginal significance - to inject cocaine; they were also significantly more likely to have had a Hepatitis C test and report poor health, but less likely to be subjected to physical violence (Table 1).

17% of HIV positive injection drug users were undiagnosed on enrollment in the study. Table 2 shows that diagnosed IDU were significantly more likely than undiagnosed to be female, Caucasian or Aboriginal, to have Hepatitis C, have ever had a mental illness, ever used a needle exchange, engage in binge injection, use a drug treatment facility, visit a counselor, and access a doctor, emergency room or hospital. In multivariate analyses, HIV diagnosis remained independently associated with lower odds of being male and was positively associated with Hepatitis C infection, binge injection and using needle exchange.

Discussion

Street-based sex workers and injection drug users with undiagnosed HIV infection were less likely to have recognized risk factors. For example, binge injecting and having Hepatitis C were more common among those with diagnosed HIV infection. This suggests that specific risk factors are more likely to trigger HIV testing. Therefore, those engaging in high-risk activities less often - yet who are still at significant risk for HIV infection - could be falling through the cracks and may be missing opportunities for HIV testing.

Results point to specific vulnerabilities affecting the undiagnosed. Male injection drug users and street-based sex workers who experienced physical violence were less likely to be diagnosed in this study. To identify specific vulnerabilities relevant today, more recent data would be required.

Current risk-based HIV testing strategies may need to be revised to better target the undiagnosed. Risk-based testing criteria for traditional targeted testing strategies should be reviewed to help reach vulnerable individuals who remain hidden to the testing program. While outreach testing remains essential, expanding routine voluntary HIV testing could improve the overall effectiveness of comprehensive testing programs.

Table 1: Factors Associated with HIV Diagnosis Status for Street-based Sex Workers

Variable (P6M = Past 6 Months)	A HIV Negative N=191		B Diagnosed HIV Positive N=50		C Undiagnosed HIV Positive N=11		p-value	
	%	N	%	N	%	N	3-Group Comparison A/B/C Chi-squared Test	2-Group Comparison B/C Fisher's Exact Test
	SOCIODEMOGRAPHIC VARIABLES							
First Nations, Inuit, Métis	39	75	32	16	36	4	0.638	1.000
Education	32	60	44	11	18	2	0.518	0.670
Homeless in P6M	49	93	21	10	46	5	0.003	0.131
Living outside of DTES	23	43	6	3	18	2	0.029	0.218
Self-reported health status fair to poor	37	70	53	26	9	1	0.015	0.008
INJECTION DRUG USE								
Injection drug use ever	75	141	96	45	82	9	0.006	0.159
Injected cocaine in P6M	29	56	48	24	18	2	0.025	0.097
Injected heroin in P6M	48	91	54	27	55	6	0.680	1.000
Injected crystal meth in P6M	14	26	10	5	27	3	0.314	0.148
SEX WORK								
Usually work outside DTES*	44	84	8	13	27	3	0.133	1.000
Used drugs with non-regular client in P6M	43	76	59	27	46	5	0.161	0.508
Had regular intimate sexual partner in P6M	46	86	38	18	60	6	0.348	0.291
SAFETY AND VIOLENCE								
Had bad date in past 6 months	24	42	18	9	27	3	0.651	0.677
Experienced physical assault in P6M	30	53	18	9	55	6	0.037	0.019
Moved because felt unsafe	24	44	14	7	9	1	0.218	1.000
Worked indoor ever	27	49	27	14	18	2	0.781	0.710
ACCESS AND UTILIZATION OF HEALTH SERVICES								
Sought care for health issues in P6M	21	38	35	17	45	5	0.034	0.731
Ever had Hepatitis C test	93	162	100	50	73	8	0.003	0.025
Accessed emergency in P6M	18	34	24	12	18	2	0.609	1.000
Accessed health clinic in P6M	28	53	28	14	18	2	0.782	0.711
No access due to poor treatment in P6M	16	31	12	6	18	2	0.738	0.671

Table 2: Factors Associated with HIV Diagnosis Status for Injection Drug Users

Variable (P6M = Past 6 Months)	Bivariate Analysis				Multivariate Model			
	Diagnosed HIV Positive (Total = 257)		Undiagnosed HIV Positive (Total = 53)		Unadjusted Odds Ratio (95% C.I.)	p-value	Adjusted Odds Ratio (95% C.I.)	p-value
	p-value <0.024							
	%	N	%	N				
Female gender (Male vs Female)	45	117	26	14	0.43 (0.22-0.84)	0.013	0.43 (0.21-0.86)	0.017
Ethnicity								
First Nations, Inuit, Métis	57	147	38	20	1.00			
Caucasian	36	92	40	21	0.60 (0.31-1.16)	0.128		
Other	7	18	23	12	0.20 (0.09-0.49)	<0.001		
Hepatitis C positive	33	76	10	5	4.60 (1.76-12.05)	0.002	4.53 (1.69-12.09)	0.003
Ever had mental illness	23	60	9	5	2.92 (1.11-7.67)	0.029		
Binge injection in P6M	59	150	38	20	2.33 (1.27-4.29)	0.006	2.24 (1.16-4.34)	0.016
Sex trade work ever	59	120	40	19	2.11 (1.10-4.02)	0.024		
Used drug treatment facility in P6M	38	97	19	10	2.55 (1.22-5.31)	0.013		
Accessed doctor in P6M	88	228	42	22	3.00 (1.48-6.09)	0.002		
Accessed emergency room in P6M	58	149	42	22	1.96 (1.08-3.58)	0.028		
Used needle exchange ever	98	254	91	48	6.61 (1.71-25.53)	0.006	6.90 (1.41-33.72)	0.017
Visited counselor in P6M	23	58	2	1	14.86 (2.01-109.9)	0.008		

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