Quantifying sexual mixing patterns among gay, bisexual, and other men who have sex with men in Canada: implications for modeling HIV/STI transmission

engage
Advancing gay and bisexual men's sexual health

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BACKGROUND

• In mathematical modeling, sexual mixing patterns refer to 'who has sex with whom
  o Describing individuals and their sex partners by attributes, e.g. perceived HIV serostatus, known as serosorting

• Sexual mixing patterns can also influence per-sex-act probability of HIV/STI transmission if partnership type has differential
  o condom use
  o number of sex acts
  o sexual positions

• Characterizing sexual mixing patterns is important for evaluating the population-level transmission impact of HIV/STI interventions

• Most HIV/STI transmission models to date assume proportionate mixing (i.e. no serosorting).

Objective: We quantified sexual mixing in a sample of gay, bisexual, and other men who have sex with men (gbMSM) in Canada using preliminary data from the Engage study

METHODS

Source/study population: Engage study (N=1360, Feb 2017-Feb 2018)
3-city cross-sectional study using respondent-driven sampling to recruit gbMSM (cis & transgender men)
• aged ≥16 years
• who report sex with another man in the past 6 months (P6M)

Setting: Toronto, Montreal and Vancouver

Data collection:
• Behaviours: Computer-assisted self-interviews in English or French
• HIV/STI status: Nurse-administered STI/HIV testing

Variables of interest:
• **Number of sex partners**: Self-reported anal or oral sex partners P6M
• **HIV status of respondents:** self-reported and classified by latest HIV test date and result
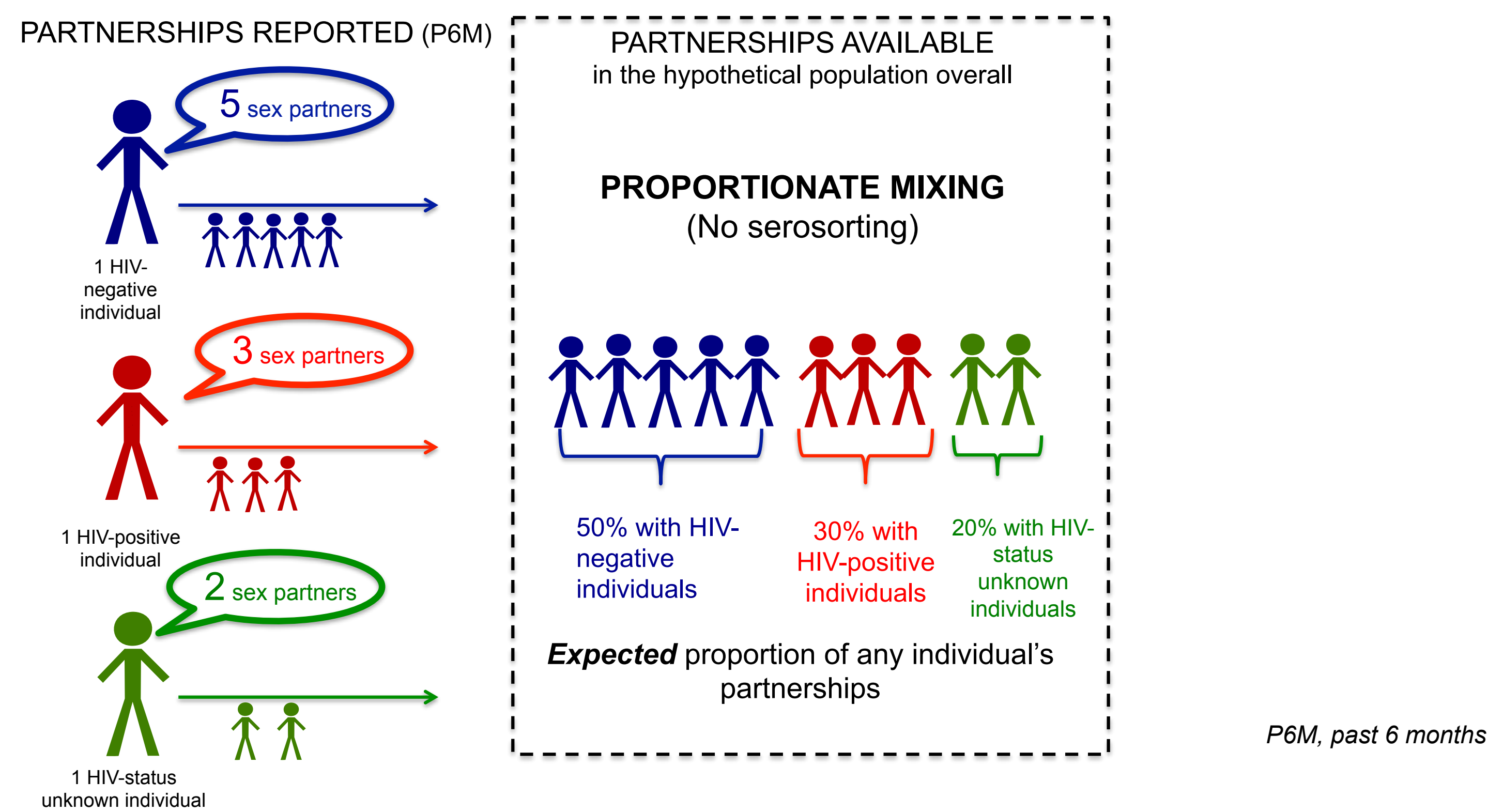• **HIV status of partners**: self-reported and perceived

Definitions: Based on answers to the following questions from the questionnaire,
• **Perceived HIV-positive:** "Of the men you had oral or anal sex with in the past 6 months: How many men were HIV positive?"
• **Perceived HIV-negative:** "Of the men you had oral or anal sex with in the past 6 months: How many men were HIV negative?"
• **Perceived HIV status unknown:** "Of the men you had oral or anal sex with in the past 6 months: How many were men whose HIV status you did not know (or were unsure about)?"

Analysis: Chi-square test: to compare <u>observed partnerships</u> by perceived HIV serostatus vs. <u>expected partnerships</u> under proportionate mixing
• p-value >0.10 suggests proportionate mixing pattern by HIV-serostatus

Fig 1. Expected HIV status of sexual partners if sexual mixing is proportionate (i.e. no preference based on HIV serostatus) in a hypothetical population

PARTNERSHIPS REPORTED (P6M)

PARTNERSHIPS AVAILABLE in the hypothetical population overall

PROPORTIONATE MIXING (No serosorting)

1 HIV-negative individual — 5 sex partners
1 HIV-positive individual — 3 sex partners
1 HIV-status unknown individual — 2 sex partners

50% with HIV-negative individuals
30% with HIV-positive individuals
20% with HIV-status unknown individuals

Expected proportion of any individual's partnerships

P6M, past 6 months

• Expected proportions: calculated based on HIV serostatus of the respondent only

• Observed proportions: calculated based on the reported number of partners by HIV serostatus of the
  o respondent
    and
  o partner (i.e. perceived partner status)

RESULTS

Table 1: Baseline characteristics of gbMSM in the Engage study (N=1360, Feb 2017-Feb 2018)*

	n (%) or median (IQR)	
Age (years)	33 (27-48)	
White race/ethnicity	979 (72.6)	
Sexual identity		
Gay	1093 (80.4)	
Bisexual	99 (7.3)	
Other	168 (12.4)	
City		
Montreal	907 (66.7)	
Toronto	210 (15.4)	
Vancouver	243 (17.9)	
Perceived HIV status		
Positive	252 (18.5)	
Negative (tested P6M)	579 (42.6)	
Unknown	529 (38.9)	
SEX BEHAVIOURS		
Overall	**# Anal sex partners P6M**	**# Sex partners (oral or anal) P6M**
	4 (2 -10)	5 (2-13)
By perceived HIV status		
Positive	4 (2-15)	6 (2-20)
Negative (tested P6M)	5 (2-12)	8 (4-16)
Unknown	2 (1-5)	3 (1-7)

Crude estimates, not adjusted for Respondent driven sampling (RDS). 51.2% of targeted sample enrolled as of Feb 2018.

IQR: interquartile range; P6M: past 6 months.

Table 1
• *Majority were white and identified as gay*
• *HIV prevalence was 18.5%; almost 40% did not know their HIV status while 43% tested negative*
• *Those with unknown HIV status reported fewer sex partners vs. those negative or living with HIV*

Fig 2. Observed proportions of HIV-positive partners by respondent's perceived HIV serostatus compared to expected with proportionate mixing
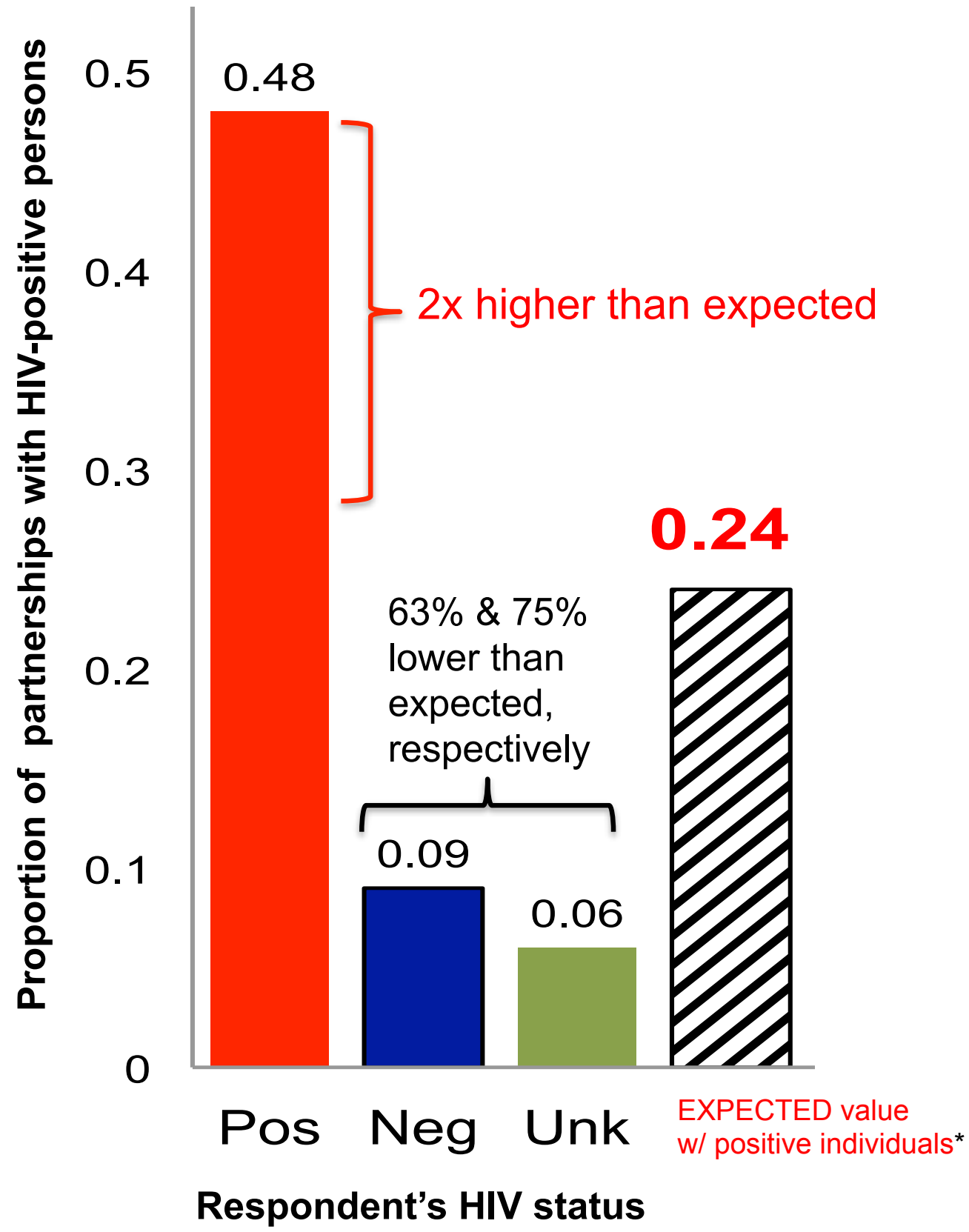

Fig 2
• *Observed proportions indicate preferential mixing by perceived serostatus vs. no preference:*
  o *Respondents with HIV 2x as likely to have HIV-positive partners*
  o *HIV-negative respondents 63% less likely & those with unknown status 75% less likely to have HIV-positive partners*

*Proportion expected if proportionate mixing by HIV-serostatus
Pos= HIV-positive, Neg=Negative, Unk= HIV unknown status*

Table 2. Proportions (95% confidence intervals) of sexual partnerships by perceived HIV serostatus expected with proportionate mixing vs observed

		Partner's HIV status		
		HIV-positive	**Negative**	**HIV status unknown**
	EXPECTED	0.24 (0.24, 0.25)	0.52 (0.52, 0.53)	0.23 (0.23, 0.24)
Respondent's HIV status	**HIV-positive**	0.48 (0.47, 0.50)	0.18 (0.17, 0.20)	0.34 (0.32,0.35)	p<0.0001
	Negative	0.09 (0.08, 0.10)	0.53 (0.52, 0.54)	0.38 (0.37, 0.39)	p<0.0001
	HIV status unknown	0.06 (0.05, 0.07)	0.46 (0.44, 0.48)	0.48 (0.46, 0.50)	p<0.0001

p-value for χ²

** Highlighted cells=seroconcordant partnerships (respondent and partner's perceived HIV serostatus the same)· p-value >0.10 suggests proportionate mixing pattern by HIV-serostatus

Table 2
• *Mixing was not proportionate: regardless of HIV serostatus of respondent (p<0.001 in all strata)*

CONCLUSIONS

• Mixing was preferential by perceived HIV serostatus
• Sexual mixing by serostatus can be empirically estimated and used in mathematical models
  o Better representation of underlying HIV/STI transmission dynamics and can influence the impact of HIV/STI interventions (**CAHR OS EPH3.07**)
• Above estimates do not account for probability of disclosure or differential responses by perceived serostatus → leading to a greater difference between observed vs. expected
• Future work includes analysing the final dataset; including probability of disclosure, partnership type and number of sex acts; and alternative survey questions to estimate sexual mixing

CAHR 2018 | CIHR IRSC | CANFAR | Santé et Services sociaux Québec | the CTN CIHR Canadian HIV Trials Network | le Réseau canadien pour les essais VIH des IRSC | ONTARIO HIV TREATMENT NETWORK | BRITISH COLUMBIA CENTRE for EXCELLENCE in HIV/AIDS | UBC | UNIVERSITY OF TORONTO | University of Victoria | Ryerson University | McGill | No conflicts to disclose

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