

# Incident Syphilis, Gonorrhoea, and Chlamydia Infection Among a Cohort of MSM

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## Background

- Implementing HIV treatment as prevention (TasP) may potentially influence risk behavior among key groups such as men who have sex with men (MSM).
- We measured the incidence and determinants of chlamydia (CT), gonorrhoea (GC) and syphilis infection within a prospective cohort of MSM in Vancouver, Canada where TasP has been policy since 2010.**

## Methods

**Study Protocol:** Data were drawn from the Momentum Health Study, a prospective bio-behavioural cohort of sexually-active MSM aged 16+ in Metro Vancouver recruited using RDS from 02/2012 - 02/2015. Every 6 months, participants self-completed a questionnaire on their demographics, sex, and substance use, and a nurse visit with HIV testing, venipuncture for syphilis serology, and optional urine and rectal and/or pharyngeal swabs for CT/GC testing. Follow-up data included in this analysis were truncated as of 08/2015.

**Outcomes:** Incident CT/GC infection and incident syphilis infection were the two outcomes for this analysis, determined using the test results from biological specimens collected and/or via participants' self-reported STI diagnoses in the 6 months prior to a follow-up visit.

**Predictors:** We considered demographics (age, sexual identity, race/ethnicity, relationship status), risk factors (recent number of male sex partners, any escort/sex work, group sex event participation), prevention practices (strategic positioning, sero-sorting, and viral load sorting), substance use (Ecstasy, GHB, crystal methamphetamine), and healthcare (any current family doctor, recent STI diagnosis). Participants were also asked if they were aware of the term "treatment as prevention" and to complete the 12-item Treatment Optimism scale (study  $\alpha=0.82$ , Van Den Ven et al. 2000). Example items include "A person with undetectable viral load cannot pass on the virus" and "HIV/AIDS is a less serious threat than it used to be because of new treatments"; level of (dis)agreement in rated on a 4-point likert scale.

**Statistical Analysis:** All analyses were stratified by HIV status. Incidence rates with 95% confidence intervals were calculated by dividing the number of cases reported over follow-up by the total number of person-years of follow-up of those infected with that/those STI(s). Descriptive statistics stratified by having any incident CT/GC versus never and any incident syphilis infection versus never were prepared. To identify predictors of an incident STI we used generalized estimating equations. Univariable results are shown with relative risks and the associated 95% confidence intervals.

## Results

- Of **575 MSM** (29.4% HIV-positive and 70.6% HIV-negative at enrollment) with a mean follow-up of **1.87 years/participant**, 134 (23.3%) had any incident STI.
- Table 1** shows the number and incidence rates of CT, GC, and syphilis.
- Any STI incidence did not differ by HIV status ( $p=0.85$ ), but compared with HIV-negative MSM, **HIV-positive MSM had a significantly higher syphilis incidence rate and significantly lower CT/GC incidence rate.**
- Table 2a and 2b** show descriptive statistics examining predictors of incident CT/GC infection and incident syphilis infection, stratified by HIV status.

**Table 1. STI incidence rates among MSM, stratified by HIV status**

	HIV-Negative MSM		HIV-Positive MSM		RR (95% CI) Ref: HIV-negative
	#	Incidence rate per 100 person-years (95% CI)	#	Incidence rate per 100 person-years (95% CI)	
Chlamydia	61	8.02 (6.16-10.44)	16	5.04 (3.16-8.04)	0.63 (0.37-1.08)
Gonorrhoea	56	7.36 (5.54-9.79)	13	4.10 (2.35-7.15)	0.56 (0.30-1.03)
Syphilis	14	1.84 (1.06-3.20)	23	7.25 (4.84-10.86)	<b>3.94 (1.98-7.81)</b>
Any CT/GC	117	15.39 (12.37-19.13)	29	9.14 (6.26-13.34)	<b>0.59 (0.38-0.92)</b>
Any STI	131	17.23 (13.98-21.23)	52	16.39 (12.41-21.63)	0.95 (0.67-1.35)

**Table 2a. Descriptive statistics and predictors of incident STIs among HIV-positive MSM (n=169)**

	HIV-positive MSM					
	Any Incident CT/GC (25 vs. 144)			Any Incident Syphilis (22 vs. 147)		
	Never median (Q1,Q3)	Any median (Q1,Q3)	RR (95% CI)	Never median (Q1,Q3)	Any median (Q1,Q3)	RR (95% CI)
Age	49 (42,54)	47 (32,50)	<b>0.96 (0.93-1.00)</b>	49 (41,54)	48 (43,54)	0.99 (0.96-1.02)
HAART Optimism	30 (27,34)	32 (31,35)	<b>1.09 (1.02-1.16)</b>	30 (27,34)	29 (27,32)	0.96 (0.90-1.03)
# Male Sex Partners, P6M	3 (1,10)	16 (6,32)	1.00 (1.00-1.01)	3 (1,10)	5 (2,15)	<b>1.00 (1.00-1.01)</b>
	n (%)	n (%)	RR (95% CI)	n (%)	n (%)	RR (95% CI)
Non-Gay Identity (ref: gay)	15 (10.4)	3 (12.0)	1.34 (0.40-4.52)	17 (11.6)	1 (4.6)	0.38 (0.05-2.75)
Non-White Race/Ethnicity (ref: White)	29 (20.1)	5 (20.0)	0.88 (0.34-2.26)	27 (18.4)	7 (31.8)	1.84 (0.79-4.30)
Current Regular Partner (ref: no)	56 (38.9)	10 (40.0)	1.08 (0.50-2.33)	59 (40.1)	9 (40.9)	1.03 (0.47-2.27)
Sex/Escort Work, P6M (ref: no)	8 (5.6)	4 (16.0)	2.18 (0.86-5.57)	8 (5.4)	5 (22.7)	<b>3.22 (1.40-7.41)</b>
Group Sex Event, P6M (ref: no)	30 (20.8)	13 (52.0)	<b>3.17 (1.50-6.72)</b>	33 (22.5)	7 (31.8)	1.47 (0.64-3.37)
Risky Anal Sex, P6M (ref: none)						
Condomless only with seroconcordant	28 (20.0)	6 (24.0)	3.43 (0.88-13.33)	25 (17.4)	7 (31.8)	1.77 (0.66-4.78)
Condomless with unknown/discordant	55 (39.3)	16 (64.0)	<b>4.70 (1.41-15.66)</b>	64 (44.4)	8 (36.4)	0.90 (0.35-2.34)
Strategic Positioning, P6M (ref: no)	38 (26.8)	9 (36.0)	1.68 (0.77-3.67)	41 (28.3)	4 (18.2)	0.65 (0.24-1.78)
Serosorting, P6M (ref: no)	58 (40.9)	13 (52.0)	1.26 (0.59-2.69)	64 (44.1)	9 (40.9)	0.90 (0.40-2.00)
Viral Load Sorting, P6M (ref: no)	43 (30.3)	14 (56.0)	<b>2.57 (1.21-5.45)</b>	51 (35.2)	8 (36.4)	1.12 (0.50-2.47)
Ecstasy, P6M (ref: no)	14 (9.7)	8 (32.0)	<b>3.06 (1.37-6.84)</b>	17 (11.6)	5 (22.7)	1.81 (0.70-4.67)
GHB, P6M (ref: no)	29 (20.1)	9 (36.0)	1.65 (0.73-3.72)	31 (21.1)	7 (31.8)	1.33 (0.56-3.18)
Crystal methamphetamine, P6M (ref: no)	45 (31.3)	10 (40.0)	1.30 (0.60-2.86)	46 (31.3)	11 (50.0)	1.80 (0.82-3.96)
Aware of TasP (ref: not aware)	123 (85.4)	22 (88.0)	1.27 (0.40-4.02)	128 (87.1)	17 (77.3)	0.54 (0.22-1.32)
Current Family Doctor (ref: no)	142 (98.6)	24 (96.0)	<b>0.19 (0.04-0.95)</b>	145 (98.6)	22 (100.)	--
Recent STI Diagnosis (ref: no)	8 (5.6)	5 (20.0)	<b>2.96 (1.29-6.80)</b>	9 (6.1)	0 (0.0)	--

**Table 2b. Descriptive statistics and predictors of incident STIs among HIV-negative MSM (n=410)**

	HIV-negative MSM					
	Any Incident CT/GC (86 vs. 324)			Any Incident Syphilis (13 vs. 397)		
	Never median (Q1,Q3)	Any median (Q1,Q3)	RR (95% CI)	Never median (Q1,Q3)	Any median (Q1,Q3)	RR (95% CI)
Age	33 (27,44)	28 (25,34)	<b>0.95 (0.93-0.98)</b>	32 (27,42)	34 (29,46)	1.02 (0.98-1.06)
HAART Optimism	26 (23,29)	26 (24,29)	1.04 (0.99-1.08)	26 (24,29)	29 (25,31)	1.10 (0.98-1.23)
# Male Sex Partners, P6M	2 (1,5)	8 (4,17)	<b>1.01 (1.00-1.01)</b>	3 (1,6)	15 (5,35)	<b>1.01 (1.00-1.02)</b>
	n (%)	n (%)	RR (95% CI)	n (%)	n (%)	RR (95% CI)
Non-Gay Identity (ref: gay)	60 (18.5)	10 (11.6)	0.60 (0.30-1.18)	70 (17.6)	1 (7.7)	0.33 (0.04-2.50)
Non-White Race/Ethnicity (ref: White)	81 (25.0)	27 (31.4)	1.16 (0.76-1.80)	103 (25.9)	5 (38.5)	1.64 (0.54-4.95)
Current Regular Partner (ref: no)	157 (48.5)	25 (29.1)	<b>0.46 (0.29-0.72)</b>	185 (46.6)	2 (15.4)	<b>0.21 (0.05-0.92)</b>
Sex/Escort Work, P6M (ref: no)	8 (2.5)	8 (9.3)	<b>2.80 (1.39-5.62)</b>	14 (3.5)	2 (15.4)	4.15 (0.95-18.14)
Group Sex Event, P6M (ref: no)	37 (11.4)	24 (27.9)	<b>2.72 (1.73-4.30)</b>	48 (12.1)	6 (46.2)	<b>4.97 (1.70-14.59)</b>
Risky Anal Sex, P6M (ref: none)						
Condomless only with seroconcordant	93 (29.0)	23 (27.4)	1.77 (0.98-3.19)	117 (29.9)	1 (9.1)	1.45 (0.09-22.99)
Condomless with unknown/discordant	77 (24.0)	43 (51.2)	<b>3.90 (2.29-6.65)</b>	103 (26.3)	9 (81.8)	<b>13.44 (1.71-105.5)</b>
Strategic Positioning, P6M (ref: no)	84 (26.4)	30 (34.9)	1.23 (0.81-1.87)	97 (24.9)	9 (69.2)	<b>5.78 (1.80-18.58)</b>
Serosorting, P6M (ref: no)	109 (34.3)	42 (48.8)	<b>1.68 (1.12-2.52)</b>	148 (38.0)	5 (38.5)	1.03 (0.34-3.11)
Viral Load Sorting, P6M (ref: no)	41 (12.9)	16 (18.6)	<b>1.91 (1.13-3.25)</b>	52 (13.3)	7 (53.9)	<b>6.92 (2.38-20.14)</b>
Ecstasy, P6M (ref: no)	70 (21.6)	26 (30.2)	1.40 (0.89-2.20)	94 (23.7)	5 (38.5)	1.76 (0.58-5.34)
GHB, P6M (ref: no)	29 (9.0)	13 (15.1)	1.77 (1.00-3.14)	36 (9.1)	5 (38.5)	<b>5.36 (1.80-16.01)</b>
Crystal methamphetamine, P6M (ref: no)	19 (5.9)	10 (11.6)	<b>2.43 (1.31-4.53)</b>	24 (6.1)	5 (38.5)	<b>8.52 (2.89-25.17)</b>
Aware of TasP (ref: not aware)	225 (69.4)	63 (73.3)	1.28 (0.81-2.03)	283 (71.3)	9 (69.2)	0.89 (0.28-2.85)
Current Family Doctor (ref: no)	204 (63.4)	43 (50.0)	0.67 (0.44-1.00)	244 (61.8)	6 (46.2)	0.59 (0.20-1.75)
Recent STI Diagnosis (ref: no)	6 (1.9)	16 (18.6)	<b>4.58 (2.93-7.15)</b>	20 (5.0)	4 (30.8)	<b>7.26 (2.34-22.59)</b>

## Conclusions

- STI incidence & re-infection was common**
- Although TasP awareness and HAART optimism were generally not associated with STI incidence, viral load sorting was a common predictor**
- This may be a concomitant effect of TasP scale-up, and may reduce some of its benefits without more focus on primary prevention of other STIs**

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