

## Sexually Transmitted Infections

### Population rates of HIV, gonorrhoea and syphilis diagnoses by sexual orientation in New Zealand

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## Abstract

**Introduction:** Globally, gay and bisexual men (GBM) are overrepresented in HIV, syphilis and gonorrhoea cases. However, surveillance systems rarely provide meaningful measures of inequity, such as population-specific rates, due to a lack of sexual orientation denominators. HIV, gonorrhoea and syphilis are legally notifiable diseases in New Zealand (NZ); we calculate rates by sexual orientation for the first time.

**Methods:** We analysed 2019 national surveillance data on HIV, syphilis and gonorrhoea notifications disaggregated by sexual orientation. Unique health records identified duplicate notifications and re-infections. Missing data were imputed from known cases. We used the NZ Health Survey 2014/15 to estimate population sizes by sexual orientation, measured in two ways (current sexual identity, sexual contact in the previous 12 months with men, women or both). We calculated notification rates per 100,000 for each sexual orientation subgroup and rate ratios.

**Results:** In 2019, GBM accounted for 76.3%, 65.7% and 39.4% of HIV, syphilis and gonorrhoea notifications respectively. Population rates per 100,000 for HIV were 158.3 (gay/bisexual men), 0.5 (heterosexuals); for syphilis were 1231.1 (gay/bisexual men), 5.0 (lesbian/bisexual women), 7.6 (heterosexuals); for gonorrhoea (imputed) were 6843.2 (gay/bisexual men), 225.1 (lesbian/bisexual women), 120.9 (heterosexuals). The rate ratios for GBM compared to heterosexuals were: 348.3 (HIV); 162.7 (syphilis); 56.6 (gonorrhoea). Inequities remained in sensitivity analysis (substituting sexual identity with sexual behaviour in the previous 12 months).

**Conclusion:** GBM in NZ experience profound inequities in HIV, syphilis and gonorrhoea. Rate ratios by sexual orientation provide useful “at-a-glance” measures of inequity in disease incidence.

**Key messages**

- Globally, gay and bisexual men (GBM) are more likely to acquire HIV, syphilis and gonorrhoea than heterosexual people.
- A useful measure of inequity would be population rates of disease incidence by sexual orientation and rate ratios, but these are rarely published in surveillance.
- GBM in New Zealand have HIV, syphilis and gonorrhoea rates that are 348.3 times, 162.7 times and 56.6 times respectively the rate in heterosexuals.
- Rate ratios by sexual orientation provide useful “at-a-glance” measures of inequity.

## INTRODUCTION

Globally, gay and bisexual men (GBM) are disproportionately affected by sexually transmitted infections (STI) such as HIV, syphilis and gonorrhoea.[1] Besides demographics, surveillance systems often include sexual risk behaviour to monitor trends in STI risk groups. However, unlike populations defined by demographics such as age, sex and ethnicity, populations defined by their sexual orientation characteristically lack denominator data necessary to calculate disease rates.

The absence of sexual orientation denominators has considerable implications. For example, surveillance data cannot easily be used to compare STI incidence between GBM and non-GBM, or GBM in two countries. The inability to assess differences in STI burden means it is difficult to guide national health policies and prioritise resources relative to needs, or to evaluate targeted STI interventions.

Currently, researchers estimate differences in STI incidence between risk groups in various ways. These include describing the proportion of cases attributable to GBM,[2] or expressing diagnoses among GBM as a rate per 100,000 adult males.[3] Although the latter approach allows rates to be compared across jurisdictions, it is the incorrect denominator, and gives no insight into the incidence difference between GBM and other populations. A possible alternative to estimating the denominator for sexual orientation groups is to multiply the estimated population by the proportion reporting same-sex contact in the last year [4] or last five years. [5] Applying the numerator (STI notifications by sexual orientation) to the sexual orientation denominator creates an appropriate population-specific rate; rate ratios then provide a more meaningful measure of inequity.

New Zealand's surveillance system provides an opportunity to examine the value of improved reporting. HIV, syphilis and gonorrhoea are legally notifiable. Every patient has a unique health record (National Health Index/NHI number). In 2014/15 the New Zealand Health Survey (NZHS) provided representative sexual orientation estimates.[6] The aim of our paper is therefore to generate STI rates by sexual orientation for all risk groups.

## METHODS

HIV notifications were provided by the AIDS Epidemiology Group (AEG), University of Otago. Syphilis and gonorrhoea notifications were provided by the Institute for Environmental Science and Research (ESR). Laboratories send reports of positive tests for HIV to AEG and for gonorrhoea to ESR, using a patient's NHI number.[7] For HIV, this triggers an enhanced surveillance questionnaire to diagnosing physicians, seeking additional information on 17 variables such as likely mode of transmission and country of acquisition. Clinicians also complete an enhanced questionnaire for gonorrhoea cases. For syphilis there is no laboratory notification, instead, clinicians notify via a similar online questionnaire or fax. For both STIs, enhanced surveillance data includes additional clinical data, treatment and risk factors about sexual behaviour (derived by combining a patient's gender with gender of recent sexual partner/s). These systems are reported elsewhere.[8,9] In this analysis, we define cases resulting from men and women having opposite-sex sexual behaviour as "heterosexual", cases due to men having sex with men as "gay/bisexual men", cases due to women having sex with women as "lesbian/bisexual women" and "other" if applicable. HIV cases were limited to New Zealand-acquired aged 16 and over. Syphilis and gonorrhoea cases were aged 18 and over. We used NHI data to remove duplicate notifications.

Denominator data are derived from the population estimates by sex of the national resident population aged 16-64 from Statistics New Zealand.[10] To estimate sexual orientation subpopulations, we applied data from the NZHS on current sexual identity (heterosexual, gay or lesbian, bisexual). We then conducted a sensitivity analysis by substituting sexual identity with sexual behaviour with men, women or both in the last 12 months, omitting people who had no sex. All estimates are of the non-missing responses (i.e. excluding "refused" and "don't know"). [6]

We report 2019 data on case numbers disaggregated by sexual orientation, the proportion of known cases attributable to each sexual orientation group and the notification rate per 100,000 population with 95% confidence intervals (95% CI). To quantify disparities, we calculate the rate ratio (RR), for gay/bisexual men and for lesbian/bisexual women, with the heterosexual rate as referent. Where there are large amounts of missing data, we impute the mode of transmission by reallocating missing cases based on the distribution of known cases.

## RESULTS

Table 1 shows the estimated population by current sexual identity and sexual behaviour in the last 12 months, the population disease rates and RRs.

Focussing first on the rates by sexual identity, 76.3% of HIV notifications were in gay/bisexual men (158.3/100,000), 9.2% in heterosexual men (0.5/100,000) and 9.2% in heterosexual women (0.5/100,000). The HIV RR for gay/bisexual men versus heterosexual men/women was 348.3 (Table 1).

Two-thirds of the syphilis notifications (65.7%) were in gay/bisexual men (1231.1/100,000), 20.8% in heterosexual men (9.3/100,000) and 13.1% in heterosexual women (5.9/100,000). Few (4.3%) had unknown modes of transmission. The syphilis RR for gay/bisexual men versus heterosexual men/women was 162.7 (Table 1).

Of the gonorrhoea cases, 2420/6363 (38%) had data on transmission mode (3,441 (62%) had no enhanced surveillance data and 504 (0.8%) cases stated unknown transmission). Of cases with a known transmission mode, most were in gay/bisexual men (39.4%), a quarter (25.8%) in heterosexual men, a third (32.7%) in heterosexual women and 2.1% in lesbian/bisexual women (Table 1). Reallocating the 3,945 missing data cases according to the distribution of known transmission mode cases, we imputed 2,507 cases in gay/bisexual men (6843/100,000), 1643 cases in heterosexual men (106.3/100,000), 2081 cases among heterosexual women (135.6/100,000) and 134 cases in lesbian/bisexual women (225.1/100,000). The imputed gonorrhoea RR for gay/bisexual men versus heterosexual men/women cases was 56.6 and for lesbian/bisexual women it was 1.9 (Table 1).

The proportion of gay/bisexual men aged 16-64 in New Zealand diagnosed with locally-acquired HIV was 0.2% (1 in 500 men) and with syphilis was 1.2% (1 in 81 men) (not reported in Table 1). Not accounting for repeat infections, the proportion of gay/bisexual men with gonorrhoea (actual) was 2.6% (1 in 38 men) and with gonorrhoea (imputed) was 6.8% (1 in 15 men).

In sensitivity analysis, the sexual behaviour-based sexual orientation denominators reduced for all risk groups, but most markedly for heterosexually active men and women. Consequently, the RRs



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3 narrowed between those reporting any same-sex behaviour in the last 12 months and those  
4 reporting exclusively opposite-sex behaviour (Table 1).  
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## 8 **DISCUSSION**

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11 Our first analysis of STI rates by sexual orientation in New Zealand reveals stark inequities.  
12 Compared to heterosexual men and women, GBM were 348.3 times as likely to be diagnosed with  
13 HIV, 162.7 times as likely to be diagnosed with syphilis, and 56.6 times as likely to be diagnosed with  
14 gonorrhoea. This confirms other measures such as the proportion of all cases attributed to GBM  
15 (76.3%, 65.7%, 39.4%), but the magnitude of inequity is simpler to interpret at a glance.  
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21 STI prevalence studies in New Zealand have shown GBM experience a high burden of infection but  
22 also test for HIV and STIs more than non-GBM. Testing frequency will have increased after HIV pre-  
23 exposure prophylaxis (PrEP) was funded in 2018, which requires 3-monthly STI screening for repeat  
24 prescriptions. New Zealand's estimated incidence of HIV among GBM is lower than described for  
25 New York and Switzerland, but the syphilis and gonorrhoea rates among GBM are considerably  
26 higher.[4,5] Resurgent syphilis and gonorrhoea epidemics globally and widening PrEP use since these  
27 other studies could partly explain these differences.[1]  
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35 Strengths of our analysis include legally notifiable data and NHI numbers that identify duplicate  
36 cases and re-infections, enhanced HIV and STI surveillance, and nationally representative estimates  
37 of sexual orientation. Our analysis extends previous work by including lesbian and bisexual  
38 women.[4,5] We also compared two sexual orientation denominators: current sexual identity and  
39 sexual behaviour in the last 12 months. Factors favouring the choice of sexual identity denominators  
40 include: they are more frequently collected than behavioural data in many countries; they align  
41 better with public health approaches to equity; they recognise minoritised communities, not just  
42 sexual contact. Alternatively, factors favouring sexual behaviour-based denominators include: they  
43 are a more accurate behavioural measure of STI risk; they are commonly used by WHO and CDC. Our  
44 analysis shows that different sexual orientation measures affect the estimated denominators and  
45 consequently the STI rates and rate ratios. Regardless of sexual orientation measure, inequities in  
46 STI incidence remain.  
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56 Limitations include the high proportion of missing data for gonorrhoea resulting in imputation. Gaps  
57 in the gonorrhoea notification system should be addressed so that policymakers can confidently act  
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3 on gonorrhoea data. Gonorrhoea notification may be more complete from sexual health services  
4 and these may bias towards GBM, similarly biasing our imputed estimates. Syphilis surveillance  
5 relies on clinician notification alone so these could be under-reported. The national population aged  
6 16-64 is commonly used for international comparisons but STI susceptibility is not limited to these  
7 ages. Notifications will underestimate actual incidence. We calculated national incidence estimates  
8 but GBM disproportionately concentrate in urban centres. GBM have heightened STI incidence but  
9 women experience significant sequelae, such as pelvic inflammatory disease.  
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## 17 **CONCLUSIONS**

18 Our analysis shows that HIV/STI rates by sexual orientation are a feasible and meaningful way to  
19 measure inequity. Future research should repeat our analysis disaggregating it by age, ethnicity and  
20 region, to understand inequities within GBM populations.  
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**CONTRIBUTORSHIP**

Peter Saxton: Conceptualisation, Methods, Writing-original draft, Statistical analysis.

Susan McAllister: Methods, Writing-review and editing.

Callum Thirkell: Data extraction, Methods, Writing-review and editing.

Adrian Ludlam: Conceptualisation, Writing-review and editing.

Jerram Bateman: Data extraction, Writing-review and editing.

Andrew Anglemyer: Data extraction, Methods, Writing-review and editing.

Patricia Priest: Writing-review and editing.

Gerard Sonder: Writing-review and editing.

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**COMPETING INTERESTS**

None declared.

**ETHICS STATEMENT**

This study involves human participants but an Ethics Committee(s) or Institutional Board(s) exempted this study: Data are legally notifiable infectious disease cases under Part 3A of the Health Act 1956 (updated January 2017).

**DATA ACCESS**

HIV notification data can be accessed by contacting the AIDS Epidemiology Group, Dunedin Medical School, University of Otago. Syphilis and gonorrhoea can be accessed by contacting the Institute of Environmental Science and Research, Wellington, New Zealand.

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**Table 1** HIV, syphilis, gonorrhoea rates by sexual orientation in New Zealand (NZ), 2019

Population denominator estimates by sexual orientation						
Denominator measure	Males			Females		
	%	n		%	n	
NZ Total population aged 16-64	100.0	1,592,830		100.0	1,608,600	
Sexual identity <sup>a</sup>						
Heterosexual	97.0	1,545,045		95.4	1,534,604	
Gay/bisexual or lesbian/bisexual	2.3	36,635		3.7	59,518	
Sexual behaviour in last 12 months <sup>b</sup>						
Opposite-sex only	76.1	1,212,144		68.3	1,098,674	
Same-sex or both sexes	2.1	33,449		2.7	43,432	

  

HIV, syphilis, gonorrhoea notifications						
Notifiable infection and transmission mode	n	% <sup>d</sup>	Rate by sexual identity		Rate by sexual behaviour in last 12 months	
			Annual diagnosis rate / 100,000 (95% CI)	Rate ratio (95% CI)	Annual diagnosis rate / 100,000 (95% CI)	Rate ratio
HIV <sup>c</sup>	76		2.4 (1.9-3.0)		2.4 (1.9-3.0)	
Heterosexual	14	18.4	0.5 (0.2-0.8)	Reference	0.6 (0.3-1.0)	Reference
Men	7	9.2	0.5 (0.2-0.9)	--	0.6 (0.2-1.2)	--
Women	7	9.2	0.5 (0.2-0.9)	--	0.6 (0.3-1.3)	--
Gay/bisexual men	58	76.3	158.3 (120.2-204.6)	348.3 (194.3-624.2)	173.4 (131.7-224.1)	286.2 (159.7-513.0)
Lesbian/bisexual women	0	0.0	0.0 (0.0-6.2)	--	0.0 (0.0-8.5)	--
Other	4	5.3	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>
Unknown mode	0	0.0	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>
Infectious syphilis <sup>e</sup>	718		22.4 (20.8-24.1)		22.4 (20.8-24.1)	
Heterosexual	233	33.9	7.6 (6.6-8.6)	Reference	10.1 (8.8-11.5)	Reference
Men	143	20.8	9.3 (7.8-10.9)	--	11.8 (9.9-13.9)	--
Women	90	13.1	5.9 (4.7-7.2)	--	8.2 (6.6-10.1)	--
Gay/bisexual men	451	65.7	1231.1 (1120.7-1349.3)	162.7 (139.0-190.5)	1348.3 (1227.5-1477.7)	133.7 (114.2-156.6)
Lesbian/bisexual women	3	0.4	5.0 (1.0-14.7)	0.7 (0.2-2.1)	6.9 (1.4-20.2)	0.9 (0.3-2.9)
Other	0	0.0	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>

Unknown mode	31	4.3	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>
Gonorrhoea <sup>e</sup>	6365		198.8 (194.0-203.8)		198.8 (194.0-203.8)	
Heterosexual	1416	58.5	46.0 (43.6-48.4)	Reference	61.3 (58.1-64.6)	Reference
Men	625	25.8	40.5 (37.3-43.8)	--	51.6 (47.6-55.8)	--
Women	791	32.7	51.5 (48.0-55.3)	--	72.0 (67.1-77.2)	--
Gay/bisexual men	953	39.4	2601.3 (2440.7-2769.5)	56.6 (52.1-61.4)	2849.1 (2673.4-3033.1)	46.5 (42.9-50.4)
Lesbian/bisexual women	51	2.1	85.7 (63.8-112.7)	1.9 (1.4-2.5)	117.4 (87.4-154.4)	1.9 (1.4-2.5)
Unknown mode	3945	62.0	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>	-- <sup>f</sup>
Gonorrhoea <sup>e</sup> (imputed)	6365		198.8 (194.0-203.8)		198.8 (194.0-203.8)	
Heterosexual	3724	58.5	120.9 (117.1-124.9)	Reference	161.2 (156.0-166.4)	Reference
Men	1643	25.8	106.3 (101.3-111.6)	--	135.5 (129.1-142.3)	--
Women	2081	32.7	135.6 (129.8-141.6)	--	189.4 (181.4-197.7)	--
Gay/bisexual men	2507	39.4	6843.2 (6586.7-7106.5)	56.6 (53.9-59.5)	7495.0 (7215.0-7782.4)	46.5 (44.3-48.9)
Lesbian/bisexual women	134	2.1	225.1 (188.7-266.6)	1.9 (1.6-2.2)	308.5 (258.6-365.3)	1.9 (1.6-2.3)

Notes: STI cases reported according to the following modes of transmission: heterosexual = men having sex with women, or women having sex with men; gay or bisexual men = men having sex with men (including bisexual men); lesbian or bisexual women = women having sex with women (including bisexual women). Sexual identity and sexual behaviour data sourced from [6]. NZ population data sourced from [10]. <sup>a</sup> Sexual identity "other": men=0.7%; women=0.9%; not reported. <sup>b</sup> No sexual contact with either sex in last 12 months: males=21.8%; females=30.0%; not reported. <sup>c</sup> Diagnoses of HIV acquired in New Zealand i.e excludes overseas acquired. <sup>d</sup> Denominator for transmission mode is of known cases. <sup>e</sup> Excludes paediatric cases. <sup>f</sup> Rates not possible with unknown populations.