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Injecting drug use among gay and bisexual men in New Zealand: Findings from national human immunodeficiency virus epidemiological and behavioural surveillance

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Abstract

Introduction and Aims. *Gay and bisexual men (GBM) who inject drugs are disproportionately affected by human immunodeficiency virus (HIV) because of dual transmission risks. New Zealand has a progressive history of harm reduction and was the first country to publicly fund needle exchange programs in 1988 for people who inject drugs (PWID). We combine national HIV epidemiological and bio-behavioural surveillance data to understand HIV risk among this subpopulation.* ***Design and Methods.*** *We examine trends in new HIV diagnoses 1996–2018 by mode of transmission, and compare HIV cases attributed to sex between men (MSM-only), MSM/injecting drug use (IDU) and IDU-only. IDU among GBM in a national HIV behavioural surveillance survey was also examined. We compare GBM by IDU status (never, 'recent', previous) and identified predictors of recent IDU.* ***Results.*** *Of 1653 locally-acquired HIV diagnoses 1996–2018, 77.4% were MSM-only, 1.5% MSM/IDU, 1.4% IDU-only and 14.2% heterosexual mode of transmission. On average, just one HIV diagnosis attributed to MSM/IDU and IDU, respectively, occurred per annum. MSM/IDU cases were more likely than MSM-only cases to be indigenous Māori ethnicity. Of 3163 GBM survey participants, 5.4% reported lifetime IDU and 1.2% were recent IDU. Among GBM, HIV positivity was 20% among recent IDU and 5.3% among never injectors. Predictors of recent IDU were: age under 30; more than 20 male partners; female partner; condomless intercourse; HIV positivity.* ***Discussion and Conclusion.*** *New Zealand has averted high endemic HIV rates seen among GBM and PWID in other countries and results have been sustained over 30 years.* [Saxton PJW, MCAllister SM, Noller GE, Newcombe DAL, Leafe KA. Injecting drug use among gay and bisexual men in New Zealand: Findings from national human immunodeficiency virus epidemiological and behavioural surveillance. *Drug Alcohol Rev* 2020]

Key words: homosexual, human immunodeficiency virus, injecting drug use, harm reduction, needle exchange.

Introduction

Gay and bisexual men (GBM) and people who inject drugs (PWID) are at significantly elevated risk of HIV infection [1,2]. Biological, behavioural, epidemiological, social and legal factors explain why this persists. Both populations encounter a high biological efficiency of human immunodeficiency virus (HIV) transmission through receptive anal intercourse or sharing unsterilised injecting equipment [3]. These groups typically exhibit contact networks that facilitate rapid clustering and diffusion of infection due to connectivity and mixing characteristics [1,4]. Because of these factors, both experience high ongoing prevalence of HIV infection that in turn propels incidence [5]. Both groups also face stigma, moral censure and often criminalisation, social and legal sanctions that inhibit access to and provision of effective prevention and treatment services [6,7].

These risk factors compound in individuals who are both GBM and PWID, resulting in extraordinarily high HIV prevalence [8–10]. This burden of HIV is sensitive to policy and program settings. HIV prevalence among PWID is higher in countries without

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needle exchange programs or harm reduction law reform, and is lower in jurisdictions with these public health responses [11,12].

New Zealand has an excellent record preventing HIV among PWID. Compared to other countries, HIV prevalence in PWID accessing needle exchange programs is low (0.2%), although higher (7.7%) among gay and bisexual men who report injecting drug use (GBM/PWID) [13,14]. New Zealand was an early adopter of drug harm reduction: in 1987, the country decriminalised the possession of needles and syringes and in 1988 became the first country in the world to establish a publicly funded needle exchange program [14,15]. An estimated 0.73% of New Zealanders engage in injecting drug use (IDU) [2] and a 1996 national study estimated IDU among GBM at 2.4% [16]. New Zealand adopted an Ottawa Charter health promotion agenda to control HIV in the late 1980s, and was the first to demonstrate a decline in AIDS cases [17].

These early successes contrast with a more sobering contemporary environment: HIV diagnoses have been rising among GBM [18]; the country has lagged behind in drug policy reform [19]; and disinvestment in research has created an evidence gap to inform contemporary responses [20]. These features mean New Zealand is a useful case study to consider the long-term impact of injecting drug use policy and programs on HIV risk among a key affected population such as GBM.

We examined data on GBM/PWID from the national HIV epidemiological surveillance and the national HIV behavioural surveillance programs to better understand HIV risk among GBM//PWID.

Methods

Terminology

In this article, we use the phrases 'GBM (gay and bisexual men) and "PWID" (people who inject drugs) to refer to individuals, and "MSM" (men having sex with men) and "IDU" (injecting drug use)' to refer to the likely mode of HIV transmission.

HIV epidemiological surveillance

Design. Since 1985 anonymous but coded information on individuals newly diagnosed with HIV in New Zealand has been supplied by laboratories performing confirmatory HIV antibody testing. Initially, this included sex, age and mode of transmission (heterosexual sex, male to male sex, injecting drug use, perinatal, blood transfusion, other). In 1996, this information was expanded to include fields such as ethnicity, district of usual residency and likely country of infection ('enhanced surveillance') [21]. From 2002, new HIV diagnoses identified through HIV viral load testing were included in surveillance reports. Viral load testing captures individuals who received their initial HIV-positive test overseas and viral load testing is also now increasingly used in New Zealand to confirm an HIV diagnosis. Since 2005 information on CD4 count at time of diagnosis—a proxy for likely stage of infection and late diagnosis—was also added to surveillance reports [21].

Analysis. This article focuses on patterns in domestic HIV transmission. We examine new HIV diagnoses since enhanced surveillance in 1996 where infection was thought to have occurred in New Zealand ('locally acquired HIV') rather than overseas. First, we describe trends over time 1996–2018 by plotting new annual diagnoses in the following likely mode of transmission categories: male-to-male sex with no injecting drug use risk factor ('MSM not IDU'); male-to-male sex with injecting drug use risk factors ('MSM/IDU'); injecting drug use but no MSM risk factor ('IDU not MSM'); heterosexual contact. Second, we compare the sex, age, ethnicity, place of residence and CD4 count of three groups: MSM/IDU vs. MSM not IDU; and MSM/IDU vs. IDU not MSM. The latter category is relevant as it is unclear whether MSM/IDU acquired HIV via homosexual sex or via IDU. Due to low cell sizes for several variables, we dichotomised age (<30, 30+), ethnicity (European, non-European), place of residence (Northern, Other New Zealand) and CD4 count at time of diagnosis (≤200, 201+). Chi-square or Fisher's exact tests of association were used to compare groups where appropriate. Statistical analyses of epidemiological data were conducted using Stata v.12.1 on non-missing data using an alpha of 0.05.

HIV behavioural surveillance

Design. We analysed data collected from the 2011 round of the community-based Gay Auckland Periodic Sex Survey (GAPSS) and web-based Gay Online Sex Survey. These comprise New Zealand's HIV behavioural surveillance system for GBM and have utilised repeat cross-sectional convenience sampling since 2002, as recommended by the Joint United Nations Programme on HIV and AIDS/World Health Organization Guidelines [22]. Detailed methods are reported elsewhere [23]. Ethics approval was received from the Northern X Regional Ethics Committee (NTX/05/12/164).

Data collection. GAPSS participants were recruited in Auckland, New Zealand by trained recruitment staff. Data collection occurred over 1 week in February 2011, beginning with a gay community fair day and subsequently from all gay bars and sex-on-site venues in that city. Eligibility criteria were being male, aged at least 16 years, having had sex with a man in the past 5 years, and had not already completed the survey that year. Questionnaires were voluntary, anonymous and self-completed on site. Secure return boxes ensured privacy. Following GAPSS, the same questionnaire was used for the Internet-based nationwide Gay Online Sex Survey over the next month that accessed participants through banners on New Zealand Internet dating sites. No monetary incentives were offered. Participants were only eligible if they had not participated in that year's survey round.

In addition to self-reported questions on HIV testing history, oral fluid specimens for HIV antibody testing were also collected as part of an embedded HIV epidemiological observational study to investigate actual and undiagnosed infection. Specimen provision was voluntary. Biological and behavioural data for each participant were linked by a unique non-identifying code. A detailed description of the methods is published elsewhere [24].

Questionnaire. The questionnaire contained core questions on the number and type of sexual relationships in the previous 6 months and condom use for those engaging in anal intercourse, the time since last HIV test and the result, and any sexually transmitted infections (STI) in the previous year. Socio-demographic items included age, residence, sexual identity and ethnicity. The latter allowed multiple responses that were categorised into a single variable according to the Statistics New Zealand prioritisation system (Māori, Pacific, Asian, other ethnicity prioritised above European).

Participants were asked 'have you ever injected drugs?' with the response options 'no', 'yes but not for at least 6 months' ('previous IDU') and 'yes in the last 6 months' ('recent IDU').

Data analysis. We report the overall prevalence of lifetime injecting and by time since last injecting. We identified three participant groups: GBM who have never injected, GBM who were recent IDU (injected in the 6 months prior to survey) and GBM who were previous IDU (injected more than 6 months prior to survey). We then conducted two analyses: (i) compared the socio-demographic and behavioural characteristics and HIV prevalence of GBM who have never injected to recent IDU and to previous IDU using χ^2 tests; and (ii) identified factors independently associated with recent IDU (versus non-recent or never IDU) using multivariate logistic regression analysis with dichotomised variables. Variables included in the latter were recruitment site, age, ethnicity, sexual identity, number of male partners in the previous 6 months, sex with women in the previous 6 months, HIV test status, condomless sex with casual partners in the previous 6 months and STI history. Data management and analyses were undertaken using Stata v.12.1 on non-missing data using an alpha of 0.05.

Results

HIV epidemiological surveillance

Figure 1 presents annual trends in new HIV diagnoses 1996–2018 for select modes of transmission (MSM, IDU, heterosexual) where the place of infection is believed to have been New Zealand. Of the 1653 new HIV diagnoses over this period, 1280 (77.4%) were MSM with no IDU risk factors, 25 (1.5%) were MSM with IDU risk factors, 23 (1.4%) were individuals whose main HIV risk factor was IDU (not MSM or heterosexual transmission), and 235 (14.2%) were individuals whose main risk factors were heterosexual transmission (n = 229) or heterosexual transmission and/or IDU (n = 6). A further 37 individuals (2.2%) had an 'other' risk factor and for 53 individuals (3.2%) the main risk factor was not known.

Over time, the annual number of new HIV diagnoses among PWID where infection had been acquired in New Zealand remained very low (Figure 1). This generally never rose above four annual HIV diagnoses which occurred twice in 23 years (in 2002, there were four reported among IDU/not MSM and in 2012, there were two among MSM/IDU and two among IDU/not MSM). In 2018, there were six MSM/IDU reported, the highest ever annual number. In those years, such cases represented 8.7%, 4.3% and 8.0%, respectively, of annual HIV diagnoses where HIV was locally-acquired. In contrast, the number of newly diagnosed HIV cases locally acquired where the main risk factor was male–male sex rose steadily over time, to a peak of 98 in 2016. Diagnoses of locally-acquired HIV where heterosexual transmission was the main risk factor averaged 10 per annum over this period (Figure 1).

The demographic profile and CD4 count at diagnosis of three of these risk-factor groups (MSM only, MSM/IDU, IDU only) are presented in Table 1. Individuals were mostly male (all of the MSM and MSM/IDU, 82.8% of the IDU group). Comparing the MSM/IDU risk-factor group to the MSM-only risk-

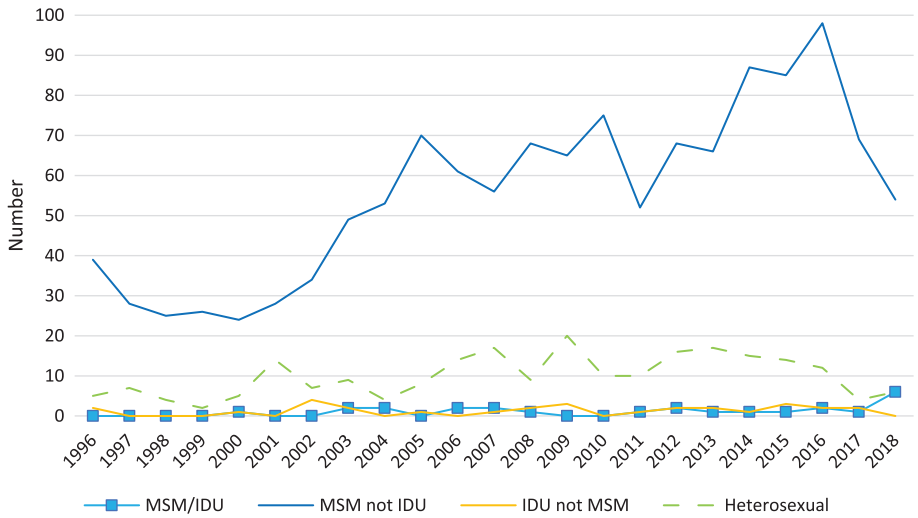

Figure 1. Trends in annual newly diagnosed HIV where infection occurred in New Zealand, by selected mode of transmission 1996–2018. Notes: 'MSM/IDU', men having sex with men with injecting drug use risk factor; 'MSM not IDU', men who have sex with men without injecting drug use risk factor; 'IDU not MSM', individuals with injecting drug use but not male to male sex risk factor. "Other" and 'unknown' modes of transmission not shown.

factor group, the former were more likely to identify as Māori (40.0% vs. 12.4%, $P < 0.001$). Comparing the MSM/IDU risk-factor group to the IDU-only risk-factor group, the former were more likely to be non-European ($P = 0.05$) and to live in the Northern region compared to elsewhere in New Zealand ($P = 0.01$).

HIV behavioural surveillance

Overall, 3163 GBM participated in behavioural surveillance in New Zealand in 2011. The majority were recruited online (60.3%), aged under 30 years (39.8%), of European ethnicity (72.8%) and identified as gay (74.1%) (Table 2). Few (5.1%) had been diagnosed HIV positive, but 8.2% had been diagnosed with another STI in the previous 12 months and 30% had engaged in any condomless anal intercourse with a casual partner in the previous 6 months. Around 1 in 12 participants (8.5%) reported more than 20 male sexual partners in the previous 6 months and 15.4% at least one female sexual partner (Table 2).

One in 20 participants (5.4%) had ever injected drugs; of those 172 participants, 37 (1.2% overall) were 'recent IDU' and 135 (4.3% overall) 'previous IDU'. Compared to GBM who had never injected drugs, recent IDU were more likely to be aged under 30 (59.5% vs. 39.7%, $P = 0.03$), diagnosed HIV positive (24.2% vs. 3.6%, $P < 0.001$), to have been diagnosed with another STI (24.3% vs. 7.9%, $P < 0.001$), to report at least one female partner (35.1% vs. 15.1%, $P = 0.001$) and more than 20 male partners in the last 6 months (35.1% vs. 7.9%, $P < 0.001$). Recent IDU were also more likely to report any condomless anal intercourse with casual partners (58.3% vs. 29.4%, $P < 0.001$) (Table 2).

Compared to GBM who had never injected drugs, previous IDU were more likely to have been recruited offline (52.6% vs. 39.0%, $P = 0.002$), have had less formal education (72.2% vs. 58.6%, $P = 0.002$), diagnosed HIV positive (14.0% vs. 3.6%, $P < 0.001$) and to report more than 20 male sexual partners in the past 6 months (15.3% vs. 7.9%, $P = 0.003$). In contrast to recent IDU, previous IDU were not more likely to be younger, report a recent female partner, a recent STI or recent engagement in condomless anal intercourse with casual partners. However, previous IDU were more likely than GBM who had never injected drugs to report recent HIV testing (50.9% vs. 46.9%, $P = 0.03$) (Table 2).

Among the subset of participants in the Auckland community-based survey (GAPSS), 80.4% (1049/1304) provided an oral fluid specimen for HIV antibody testing. There was no difference in the specimen provision rate by IDU history [24]. The prevalence of diagnosed and undiagnosed HIV among those who had never injected drugs was 4% and 1.3%, respectively. These prevalences were 20% and 0% among recent IDU ($P < 0.001$ vs. never injected drugs), and 18% and 3.3% among previous IDU ($P = 0.01$ vs. never injected drugs).

Table 3 describes the independent predictors of recent IDU in the sample. Being aged under 30 [adjusted odds ratio (AOR) 3.7, 95% confidence interval (CI) 1.67–8.31], having more than 20 recent

Table 1. *Characteristics of individuals with newly diagnosed HIV where infection occurred in New Zealand by mode of transmission: HIV epidemiological surveillance 1996–2018*

	Mode of transmission							
	MSM (A) n = 1280		MSM/IDU (B) n = 25		IDU (C) n = 29			
	n	%	n	%	n	%	χ^2 P-value (A vs. B)	χ^2 P-value (B vs. C)
Sex							—	—
Male	1280	*100.0*	25	*100.0*	24	*82.8*		
Female	0	*0.0*	0	*0.0*	5	*17.2*		
Age, years							0.20	0.28F
15–29	303	*23.7*	6	*24.0*	3	*10.3*		
30–39	387	*30.3*	12	*48.0*	13	*44.8*		
40–49	335	*26.2*	5	*20.0*	8	*27.6*		
50+	254	*19.9*	2	*8.0*	5	*17.2*		
Unknown	1							
Ethnicity							**<0.001**	**0.05**F
European	902	*70.7*	13	*52.0*	23	*79.3*		
Māori	158	*12.4*	10	*40.0*	5	*17.2*		
Other	215	*16.9*	2	*8.0*	1	*3.5*		
Unknown	5							
Region							0.53F	**0.01**F
Northern	741	*59.1*	16	*66.7*	8	*27.6*		
Midland	90	*7.2*	2	*8.3*	4	*13.8*		
Central	248	*19.8*	2	*8.3*	7	*24.1*		
Southern	174	*13.9*	4	*16.7*	9	*31.0*		
Overseas, unknown or NZ not specified	27		1		1			
CD4 count at diagnosis							0.75F	0.46F
< =200	168	*19.6*	3	*21.4*	7	*36.8*		
201–500	329	*38.4*	3	*21.4*	5	*26.3*		
> 500	359	*41.9*	8	*57.1*	7	*36.8*		
Unknown	424		11		10			

Note: Italics denote percentages. Bold denotes statistically significant result. F, Fisher's exact test; IDU, injecting drug use; MSM, men who have sex with men; MSM/IDU, men having sex with men who also have injecting drug use risk factors; NZ, New Zealand. Categories dichotomised first row versus the rest. Proportions exclude unknown.

male sexual partners (AOR 3.96, 95% CI 1.66–9.44), having had sex with a female partner in the previous 6 months (AOR 4.19, 95% CI 1.54–11.42), engaging in recent condomless anal intercourse with a casual male partner (AOR 2.95, 95% CI 1.28–6.82) and being HIV positive (AOR 5.65, 95% CI 2.09–15.28) were all independently associated with recent injecting drug use among GBM participants.

Discussion

Injecting drug use accounts for a very small fraction of HIV transmission in New Zealand. Since 1996 this has averaged approximately one HIV diagnosis per annum among individuals with dual potential modes of transmission (MSM/IDU) and a similar number among individuals whose main mode of transmission was IDU alone. These cases accounted for 1.5% and 1.4%, respectively, of all domestic HIV diagnoses and there were no observable trends over time. Individuals diagnosed with HIV since 1996 with dual MSM/IDU risk factors were more likely to be of indigenous Māori ethnicity compared to HIV diagnoses among MSM with no IDU risk factor, and were more likely to be of non-European ethnicity and to live in the north of New Zealand compared to individuals whose HIV risk factors were IDU but not MSM. One in 20 (5.4%) GBM reported having ever injected drugs and 1 in 83 (1.2%) reported recent injecting. Overall, recent IDU tended to report riskier sexual behaviours than other participants who had either previously or never injected drugs.

Strengths of our analysis include combining established national HIV epidemiological and HIV

Table 2. *Socio-demographic characteristics, HIV testing and sexual behaviour of gay and bisexual men who injected drugs: HIV behavioural surveillance in New Zealand 2011 (n = 3163)*

	All respondents		Never injected (A) *n* = 2991		Injected >6 months ago (B) *n* = 135		Injected <6 months (C) *n* = 37			
	n	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*P*-value (B vs. A)	χ^2 *P*-value (C vs. A)
Recruitment site									**0.002**	0.13
Offline	1257	*39.7*	1167	*39.0*	71	*52.6*	19	*51.4*		
Online	1906	*60.3*	1824	*61.0*	64	*47.4*	18	*48.7*		
Age									0.22	**0.03**
16–29	1248	*39.8*	1178	*39.7*	48	*36.4*	22	*59.5*		
30–44	1040	*33.2*	976	*32.9*	53	*40.2*	11	*29.7*		
45+	848	*27.0*	32.9	*27.4*	31	*23.5*	4	*10.8*		
Ethnicity									0.42	0.48
European	2277	*72.8*	2151	*72.8*	101	*75.9*	25	*67.6*		
Non-European	849	*27.2*	805	*27.2*	32	*24.1*	12	*32.4*		
Education									**0.002**	0.87
Less than tertiary degree	1846	*59.2*	1729	*58.6*	96	*72.2*	21	*60.0*		
Tertiary degree	1272	*40.8*	1221	*41.4*	37	*27.8*	14	*40.0*		
Sexual identity									0.89	0.88
Gay	2340	*74.1*	2213	*74.1*	100	*74.6*	27	*73.0*		
Bisexual or other	817	*25.9*	773	*25.9*	34	*25.4*	10	*27.0*		
Actual HIV status[a]									**<0.001**	**0.01**
Negative	957	*93.6*	897	*94.7*	48	*78.7*	12	*80.0*		
Known positive	52	*5.1*	38	*4.0*	11	*18.0*	3	*20.0*		
Undiagnosed positive	14	*1.4*	12	*1.3*	2	*3.3*	0	*0.0*		
HIV test status									**<0.001**	**<0.001**
HIV positive	131	*4.2*	105	*3.6*	18	*14.0*	8	*24.2*		
HIV negative or do not know	2987	*95.8*	2851	*94.5*	111	*86.1*	25	*75.8*		
HIV test history[b]									**0.03**	0.81
Last tested <12 months	1406	*47.0*	1336	*46.9*	59	*50.9*	11	*42.3*		
Tested >12 months ago	730	*24.4*	688	*24.2*	36	*31.0*	6	*23.1*		
Never tested	855	*28.6*	825	*29.0*	21	*18.1*	9	*34.6*		
STI diagnosed < 12 months									0.25	**<0.001**
Yes	255	*8.2*	232	*7.9*	14	*10.7*	9	*24.3*		
No	2856	*91.8*	2711	*92.1*	117	*89.3*	28	*75.7*		
Female partner < 6 months									0.57	**0.001**
Yes	483	*15.4*	448	*15.1*	22	*16.9*	13	*35.1*		
No	2654	*84.6*	2522	*84.9*	108	*83.1*	24	*64.9*		
No. male partners < 6 months									**0.003**	**<0.001**
Up to 20	2805	*91.5*	2670	*92.1*	111	*84.7*	24	*64.9*		
>20	262	*8.5*	92.1	*7.9*	20	*15.3*	13	*35.1*		
Any condomless intercourse with casual partner < 6 months									0.14	**<0.001**
Yes	921	*30.0*	853	*29.4*	47	*35.3*	21	*58.3*		
No	2150	*70.0*	2049	*70.6*	86	*64.7*	15	*41.7*		

Note: Italics denote percentages. Bold denotes statistically significant result. [a]Subsample of 1023 participants providing oral fluid specimens in Auckland community venues. [b]Of participants without confirmed HIV infection. HIV, human immunodeficiency virus; STI, sexually transmitted infection.

behavioural surveillance systems for greater explanatory power. The enhanced surveillance of HIV diagnoses produced high-quality data, separating locally from overseas-acquired infections and disaggregating data by mode of transmission. The broad sampling frame of the HIV behavioural surveillance program that recruited from community and internet venues generated a large and diverse sample of GBM. The voluntary, anonymous and self-reported participation will have minimised social desirability biases regarding homosexuality, sexual practices and IDU that are socially stigmatised. We had a large sample to help

Table 3. *Factors independently associated with recent injecting drug use (<6 months) among gay and bisexual men: HIV behavioural surveillance in New Zealand 2011 (n = 2865)*

Factor	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)	Adjusted *P*-value
Recruitment source			
Offline	1	1	
Online	0.62 (0.32–1.19)	0.57 (0.26–1.24)	0.16
Age group			
Under 30 years	**2.24 (1.16–4.34)**	**3.7 (1.67–8.31)**	**0.001**
30+ years	1	1	
Ethnic group			
NZ European	1	1	
Non-NZ European	1.29 (0.65–2.58)	1.1 (0.49–2.50)	0.82
Sexual identity			
Gay	1	1	
Bisexual or other	1.06 (0.51–2.20)	0.85 (0.29–2.48)	0.76
No. male partners < 6 months			
Up to 20	1	1	
20+	**6.05 (3.04–12.03)**	**3.96 (1.66–9.44)**	**0.001**
Sex with women < 6 months			
No	1	1	
Yes	**3.03 (1.53–6.0)**	**4.19 (1.54–11.42)**	**0.005**
Any condomless anal intercourse with casual male partner < 6 months			
No	1	1	
Yes	**3.32 (1.70–6.47)**	**2.95 (1.28–6.82)**	**0.01**
HIV test status			
Last tested HIV negative or never tested	1	1	
HIV positive	**7.71 (3.41–17.43)**	**5.65 (2.09–15.28)**	**0.001**
STI diagnosed < 12 months			
No	1	1	
Yes	**3.70 (1.72–7.92)**	1.61 (0.62–4.19)	0.33

Note: Italics denote percentages. Bold denotes statistically significant result. CI, confidence interval; HIV, human immunodeficiency virus; NZ, New Zealand; STI, sexually transmitted infection.

estimate rare behaviours such as IDU and its characteristics, and the inclusion of bio-sampling among a sub-sample enabled us to assess actual and undiagnosed HIV infection.

Notwithstanding, our behavioural surveillance findings are limited by the non-random and cross-sectional study design. Questions on injecting did not capture injecting frequency nor the types of drugs injected, injecting practices associated with sex such as 'slamming' (injecting methamphetamine or mephedrone) [25], nor whether equipment was shared. The anonymous survey means we are unable to identify repeat participation, however, there were no incentives to do so and participants were instructed not to complete the survey more than once that year. The epidemiological surveillance data are of diagnoses: HIV infection will predate the year of reporting for many cases; and diagnoses rely on testing access and engagement. CD4 count at the time of diagnosis was collected only from 2005 onwards. Our analysis utilised enhanced HIV surveillance from 1996 and omits HIV diagnoses among PWID from the early epidemic phase. Studies show that few individuals acquired HIV via IDU during that period in New Zealand [21]. The low number of individuals reporting IDU in the epidemiological and behavioural surveillance systems may have affected our ability to compare their characteristics to those not reporting IDU.

Compared to other New Zealand findings, our estimates of recent IDU (1.2%) are lower than found in a 1996 national survey of GBM (2.4%) [16], as well as a pre-exposure prophylaxis study of high-risk GBM (4.7%) [26]. However, it is higher than the 0.73% estimated IDU prevalence in the New Zealand population aged 15–64 [2]. This latter finding is consistent with other New Zealand research pointing to drug use overall being more common among GBM than non-GBM [27], and with national probability studies in other countries showing IDU specifically is more prevalent among GBM sub-populations. For example, in Australia, rates of 'ever' IDU were 6.2% among non-heterosexual participants compared to 1.3% among

heterosexuals [28], although in Britain no differences were found in lifetime IDU behaviour [29].

Comparing across GBM populations, the prevalence of IDU in New Zealand is lower than in Australia, where 4.8% of GBM recruited in community samples reported recent IDU [30] and 10.3% in an online cohort reported any lifetime IDU [31]. In a respondent-driven sampling study in Vancouver, 8.4% of gay-identified men reported IDU in the previous 6 months [32]. IDU in the past 12 months was reported by 1.9% of HIV negative and 5.2% of HIV positive GBM in the US National HIV Behavioral Surveillance survey [33]. In the UK, 1.8% of an online survey of GBM reported recent IDU and 2.9% lifetime IDU [34]. A European internet survey of GBM in 33 countries in 2010 found 5% report lifetime IDU [35], and a 2013–2014 survey of GBM in 13 European cities reported a similar lifetime injecting prevalence of 4.4% [36]. Our prevalence of IDU among GBM therefore sits in the lower to mid-range internationally.

GBM/PWID in New Zealand were more likely than non-injecting GBM to report risky sexual practices, consistent with research elsewhere [9,31,34,37]. Furthermore, HIV prevalence among GBM/PWID has been recorded as much higher than that among non-injecting GBM in many settings. In this New Zealand study, one in five GBM who were recent injectors were living with diagnosed HIV, although no undiagnosed infections were detected. In the 2014 Gay Men's Sex Survey in the UK, 54.8% of GBM who were recent IDU had tested HIV positive compared to 8% of non-PWID [34]. In Australia, 46.2% of GBM in a national online cohort who recently injected were HIV positive compared to 5% of non-injecting GBM [31].

Based on these data, we believe New Zealand's record surpasses the small number of countries, such as the UK and Australia, where timely and comprehensive interventions have prevented national epidemics of HIV among PWID [38]. Although rare, IDU in the general New Zealand population is in fact more common than in many countries [2]. It is therefore significant that IDU accounts for such a small fraction of new HIV diagnoses, as we have shown, and also that HIV prevalence among PWID [2] and GBM/PWID (presented here) is comparatively low by international standards. Repeated epidemiological studies in diverse sentinel populations support the findings presented here [13,39–41].

Pre-exposure prophylaxis is currently publicly funded for high-risk GBM in New Zealand, but eligibility criteria do not include IDU in the absence of condomless receptive anal intercourse or rectal bacterial STI [42]. Policy makers ought to consider expanding pre-exposure prophylaxis eligibility to GBM// PWID, given this group's high potential to acquire and transmit HIV. Effectively engaging GBM who inject drugs in sexual health services would also help manage their high STI burden, link them into testing and treatment for HCV and other blood-borne infections. The high co-occurrence of drug use and sexual risk-taking means that drug harm reduction programs and sexual health services should develop close relationships to ensure a joint approach.

We examined behavioural surveillance data alongside epidemiological data and findings generally reinforced each other. An exception was ethnicity: non-European GBM (including indigenous Māori) were not more likely to report recent or previous injecting in the behavioural surveillance survey, yet Māori were over-represented in HIV diagnoses among GBM who had injected drugs. This could point to injecting practices that were less safe among Māori GBM who do inject drugs, to poorer access to harm reduction services, and/or to services that are not culturally responsive to Māori GBM. Despite small numbers of Māori diagnosed with HIV as a result of dual GBM/PWID risk factors, this should be further investigated.

Future research should provide updated estimates of IDU, the type and frequency of drugs injected, and injecting harm reduction practices among GBM in New Zealand. The last comprehensive data on illicit drug use among GBM in this country was 2006 [27], and for PWID was 2013 [13], with 5.7% of that sample identifying as GBM. It is likely that patterns of drug use have changed since then, with the rise in methamphetamine use, steroids and other forms of sexualised drug use being examples.

Lastly, PWID and GBM belong to networks prone to outbreaks of HIV and other communicable infections [38]. The spike of six MSM/IDU HIV diagnoses in 2018 is a case in point. Services and novel interventions should continue to be resourced to protect against this vulnerability. The capacity for GBM/PWID to act as a bridging population to larger at-risk communities makes these investments a strategic priority for Governments.

Conclusions

New Zealand engineered an early, rational, harm reduction response to the threat of HIV among PWID and among GBM before the epidemic had a strong foothold. This averted the high endemic HIV rates among PWID seen elsewhere and the country has sustained these results for over 30 years. Individuals who are both GBM and who inject drugs have a high

risk of HIV acquisition and onward transmission in the absence of effective interventions, and supporting these remains a public health priority.

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Conflict of Interest

The authors have no conflicts of interest.

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