

# HIV prevalence among men who have sex with men in New Zealand 1985–2009: 25 years of public health monitoring

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**Summary:** Annual population-based estimates of the number of men who have sex with men (MSM) with diagnosed HIV infection (HIV prevalence pool), and the proportion of all MSM this represents (HIV prevalence), have been insufficiently described over the long term. We investigated the dynamic effects of ongoing HIV diagnoses, lower mortality due to treatment and growth in the MSM population over time on these two epidemic indicators using national HIV/AIDS surveillance data in New Zealand, 1985–2009. The diagnosed HIV prevalence pool rose 79% between 1989 and 1999, and 137% between 1999 and 2009. Estimates of diagnosed HIV prevalence as a proportion of MSM were 0.2% of MSM in 1985, and were between 1.5% and 5.0% of MSM by 2009. New Zealand continues to have a relatively low-prevalence HIV epidemic among MSM; however, the number of MSM living with diagnosed infection is growing rapidly 25 years after HIV testing was introduced.

**Keywords:** epidemiology, HIV, men who have sex with men, New Zealand, surveillance

## INTRODUCTION

New Zealand was one of the first countries in the world to report a decline in AIDS diagnoses in the 1990s due to an earlier drop in HIV infections.<sup>1</sup> However, in the 2000s, as in many developed countries,<sup>2–6</sup> New Zealand has witnessed an increase in the annual number of new HIV diagnoses among men who have sex with men (MSM).<sup>7</sup> The combination of new infections and improved survival from highly active antiretroviral therapy (HAART) will have a marked impact on the number of individuals living with diagnosed HIV infection over time. While MSM continue to experience the highest number of diagnosed HIV infections occurring in New Zealand,<sup>8</sup> repeat anonymous seroprevalence studies among sexual health clinic attendees have found actual HIV prevalence to be stable in MSM between 1996 (4.4%) and 2005 (4.4%).<sup>9,10</sup> Behavioural surveillance data also suggest that HIV prevalence remains below 5% of sampled MSM.<sup>11</sup> Nevertheless, there has been no systematic analysis of trends in population-based HIV prevalence among this group from the beginning of the epidemic to the present.

This paper uses routine HIV surveillance data to estimate the annual number of MSM living with diagnosed HIV in New Zealand between 1985 and 2009 (the annual HIV prevalence pool). Trends identified in the HIV prevalence pool will inform the provision of clinical care and HIV prevention. Secondly, the proportion of MSM with diagnosed HIV is calculated annually over this period (annual HIV prevalence). This

will estimate the burden of HIV infection among MSM, and how this has varied over time when both the numerator (HIV prevalence pool) and denominator (MSM population) values have been changing. The use of routine HIV surveillance systems to generate population-based data on the HIV prevalence pool and HIV prevalence among MSM has been reported for some jurisdictions previously;<sup>12–15</sup> however, this is the first to provide annual estimates of both of these indicators for a country over the first 25 years of monitoring the HIV epidemic.

## METHODS

### AIDS notifications and Western blot HIV antibody tests

New Zealand's AIDS and HIV surveillance system is described elsewhere.<sup>16</sup> In brief, there has been a legal requirement for the diagnosing clinician to notify AIDS using an anonymous code since 1983, and this information has been kept in a national data collection with the AIDS Epidemiology Group. Since 1985, while not notifiable by law, similarly coded information on individuals diagnosed with HIV through a confirmatory Western blot antibody test has been routinely collected through the small number of laboratories where this is performed. Information on the likely mode of transmission and basic demographic characteristics such as age and gender are requested for all reported HIV and AIDS diagnoses. From the beginning of 1996, a system of enhanced surveillance has requested further information on new HIV diagnoses such as ethnic group and likely country of infection, and since that

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date the AIDS Epidemiology Group have received detailed data on 98.6% of all cases.

In the 1980s and early 1990s, there were a number of positive Western blot antibody tests among men where a likely means of infection was not provided. We retrospectively checked all unknown male cases prior to 1996 to determine whether the mode of transmission had been reported with a later AIDS notification on the separate AIDS database. Previously unknown male HIV cases that were consequently identified as MSM transmission are included in this analysis. The results of this retrospective cross-check were also used to impute MSM mode of transmission for a proportion of the remaining unknown male HIV cases.

### HIV viral load testing

In 2001, it was recognized that there were some people receiving care in New Zealand who had not had an HIV antibody test recorded, in particular those who had been diagnosed overseas. Surveillance was therefore augmented using data from the four laboratories undertaking viral load testing, allowing a cross-check to ensure that all individuals living with diagnosed HIV infection in this country were included on the HIV database.<sup>17</sup> For those having viral load testing whose code is not on the HIV database, the clinician is contacted and asked to provide the same information as for antibody testing, as well as the place and timing of the original diagnosis.

### Mortality and losses to follow-up

Information on the survival of people notified with AIDS is regularly sought from clinicians, and further cross-checks are undertaken with coded death certificates. For this analysis, we have furthermore assumed that all MSM who have been notified with AIDS and are no longer followed up by their reporting clinicians have either died or have gone overseas. While less complete, as it is not actively sought, information on death or emigration is sometimes provided on individuals with diagnosed HIV infection. We have assumed that unless the AIDS Epidemiology Group have been informed that a person has died or gone overseas, all individuals reported to have been diagnosed with HIV are still living in New Zealand.

### Enumerating the annual MSM population

Using routine HIV surveillance data to generate HIV prevalence estimates as a proportion of those at risk requires an annual denominator for the population of MSM. Enumerating this population is fraught with conceptual, methodological and empirical difficulties.<sup>12,18-20</sup> A key issue is that the definition of the MSM population will determine the size of this denominator, and hence the HIV prevalence calculations. New Zealand<sup>21-23</sup> and international studies<sup>15,18,24-27</sup> have shown that the proportion of men reporting homosexual experience varies according to the type of sexual contact (e.g. any genital contact, any anal intercourse) and the period over which the experience is recalled (e.g. lifetime, last five years, last year). There is also evidence that in repeated national probability studies,<sup>24,26</sup> the proportion of men reporting same-sex contact has increased over time.

We therefore proposed three alternative estimates of MSM activity. Measure 'MSM constant rate' holds MSM as a constant 2% of the male population throughout 1985-2009, based on the only national probability estimate of any lifetime same-sex contact in New Zealand.<sup>21</sup> 'MSM slow increase' begins at 2% of the population in 1985 and gradually increases by 0.1% annually to reach 4.4% of the male population by 2009. 'MSM rapid increase' increases by 0.2% annually to reach 6.8% of the male population by 2009. These three estimates were then applied to the annual estimated population, mean year ended 31 December of men aged 15-59 provided by Statistics New Zealand.<sup>28</sup>

## RESULTS

Between 1985 and 2009 there were 1481 HIV diagnoses by Western blot antibody testing recorded nationally among MSM (this includes 34 MSM who were also reported to have possibly been infected through injecting drug use). The retrospective check of male cases with an unknown mode of transmission prior to 1996 found that 61 had information on mode of transmission provided with a later AIDS notification, 53 (87%) of which were MSM. It was therefore assumed that a further 155 (87% of the remaining 179 men with an unknown mode of transmission) were MSM.

An additional 300 MSM were identified through surveillance of viral load testing. Of these, for 81 MSM the year of their original HIV diagnosis in New Zealand was ascertained. For nine MSM who were originally diagnosed in New Zealand, the year this occurred could not be ascertained, and for 210 either originally diagnosed overseas or for whom the place was unknown, the year of entry was assumed to be the year of their first viral load test. For the latter 210 individuals, a spike of first viral load tests appears in 1999, and is assumed to be due to increased availability of such testing. Cases in this spike were smoothed at the average rate of viral load cases within this category post-1999 (which equalled 14 cases), beginning in 1999 backwards to 1996 and the residual 11 allocated to 1995.

Between 1983 and 2009, there were 720 diagnoses of AIDS among MSM. Where the year of AIDS diagnosis was missing ( $n = 13$ ), these were allocated to the year of notification. Follow-up of these found 527 deaths and 42 reports of 'gone overseas' or 'lost to follow-up'. For seven of the MSM who were diagnosed early in the epidemic a year of death was not reported; as the median survival post-AIDS diagnosis at that time was 18 months the year of death was taken to be the year following the AIDS diagnosis. The AIDS Epidemiology Group also were told that 29 MSM who had an HIV but not an AIDS diagnosis had gone overseas; these were allocated to the year of departure, when known, or to the date of viral load report. There were also 25 noted deaths among MSM with diagnosed HIV but not AIDS; where the year of death was not known ( $n = 4$ ) this was calculated as being four years after the year of Western blot or viral load report, being the mean survival time for the remaining 21 cases.

### Annual HIV prevalence pool among MSM

The annual number of new HIV reports recorded among MSM living in New Zealand between 1985 and 2009 is shown in Figure 1. This includes 1936 MSM diagnosed through

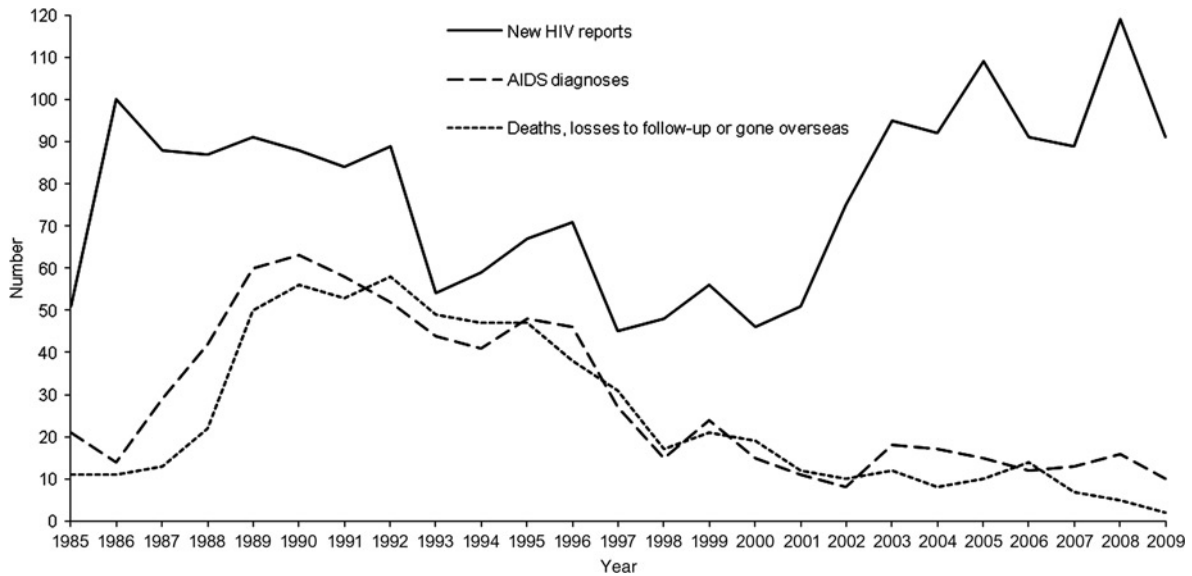


Figure 1 Annual new HIV reports, AIDS notifications and deaths, losses to follow-up or gone overseas among MSM in New Zealand 1985–2009

Western blot antibody testing, viral load testing or who were assumed to be MSM from the unknown male data. The annual number was relatively stable from 1986 to 1992, then declined to a low plateau until 2001, and subsequently increased again. Also shown in Figure 1 is that AIDS diagnoses peaked in 1990 and then steadily declined, and since 2000 have numbered fewer than 20 annually. The combined total of people known to have died, known to have gone overseas and lost to follow-up among MSM with diagnosed HIV or AIDS peaked in 1992 and then declined.

The annual HIV prevalence pool of MSM with diagnosed HIV – the difference between the cumulative number of HIV diagnoses and cumulative losses at a given point in time – is shown in Figure 2. These data suggest that this was 310 at the end of 1989, 554 at the end of 1999 and 1313 at the end of

2009; a growth of 79% between 1989 and 1999 and 137% between 1999 and 2009, respectively.

### Estimating diagnosed HIV prevalence among MSM

Figure 3a illustrates the three alternative estimates of MSM activity among men in New Zealand and Figure 3b enumerates these over time. Figure 4 presents the annual proportion of MSM living in New Zealand with diagnosed HIV over 25 years calculated from the estimates of the sizes of the MSM population. The beginning (1985) and endpoint (2009) diagnosed HIV prevalence estimates range from 0.22% to 5.04% for ‘MSM constant rate’, from 0.22% to 2.29% for ‘MSM slow increase’ and from 0.22% to 1.48% for ‘MSM rapid increase’.

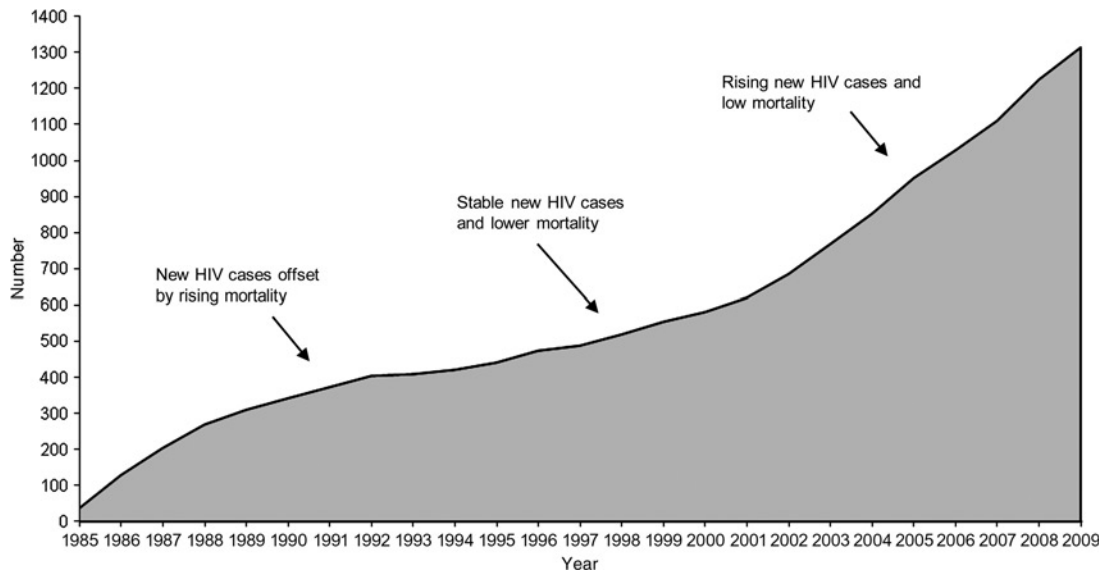


Figure 2 Estimated diagnosed HIV prevalence pool among MSM in New Zealand 1985–2009

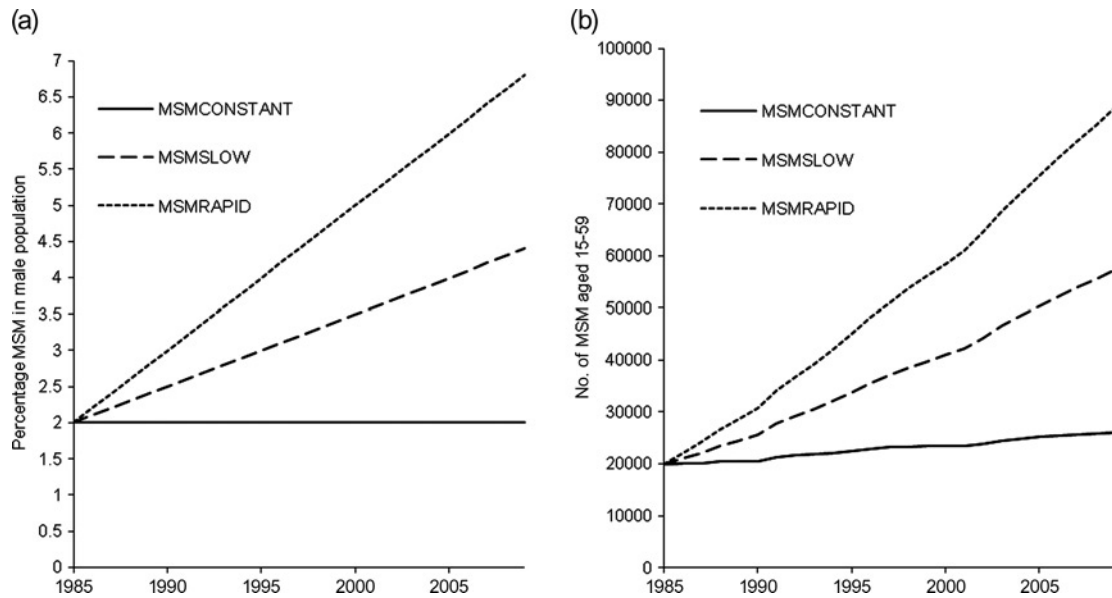


Figure 3 Estimating (a) the proportion; and (b) the number of MSM in New Zealand over time. MSMCONSTANT = constant MSM% in male population; MSMSLOW = slow increase in MSM% in male population; MSMRAPID = rapid increase in MSM% in male population

There was a general increase in diagnosed HIV prevalence estimates using all MSM population denominators, although estimates declined or stabilized in at least some years. Using 'MSM rapid increase', this occurred between 1990 and 2003. Using 'MSM slow', this occurred between 1990 and 1998. Using 'MSM constant', diagnosed HIV prevalence never declined, at most remaining steady for the years 1992 and 1993 (in which it remained at 1.87%).

## DISCUSSION

The estimated number of MSM living with diagnosed HIV in New Zealand over the first 25 years of monitoring has risen

most rapidly over the past 10 years. This is a result of an acceleration of the number of new diagnoses from 2002, and decreased deaths due to more effective treatment.

If the proportion of men in the population who had had sex with other men remained stable over this period, HIV prevalence as a proportion among this group would have increased. If however same-sex behaviour has become more common, then diagnosed HIV prevalence is shown to have been more stable or even to have periodically declined.

This analysis utilized routine surveillance to provide annual population-based estimates of diagnosed HIV prevalence that can help measure trends in the burden of infection among MSM in New Zealand, and adds to work that has recently been conducted in other jurisdictions.<sup>12-15,29,30</sup> We believe

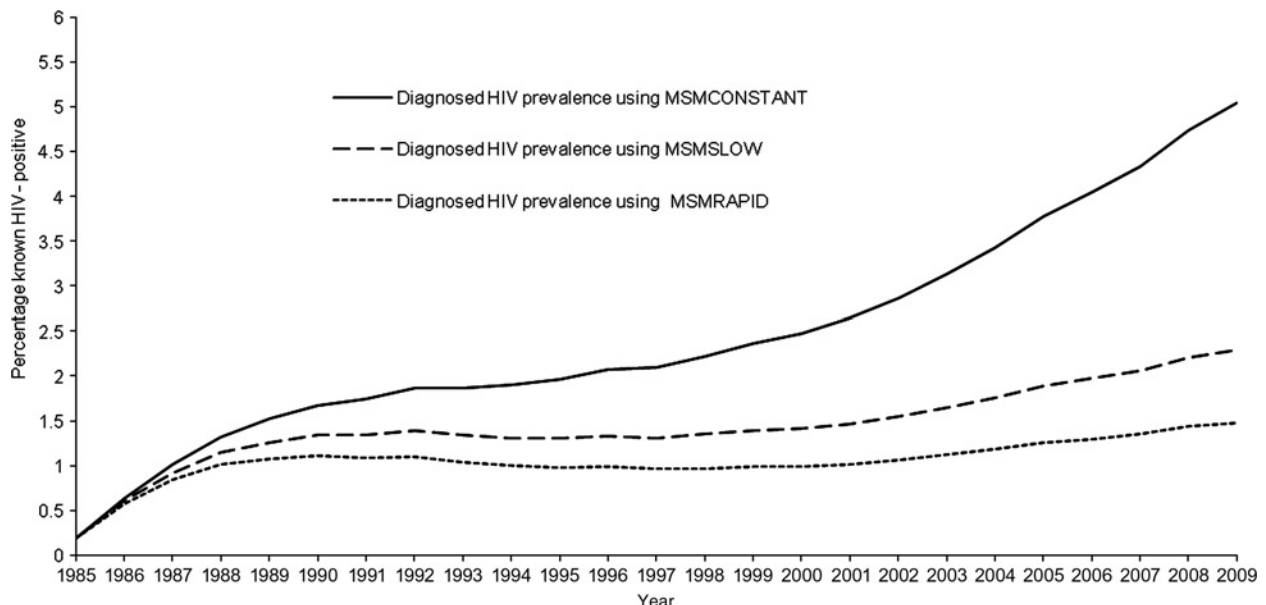


Figure 4 Estimated diagnosed HIV prevalence among MSM in New Zealand 1985-2009. MSMCONSTANT = constant MSM% in male population; MSMSLOW = slow increase in MSM% in male population; MSMRAPID = rapid increase in MSM% in male population

this to be the first to provide both annual HIV prevalence pool and annual HIV prevalence estimates for a country's MSM population over 25 years of the epidemic, and thus the opportunity to explore the dynamics of the epidemic among MSM over a long period where both the numerator and denominator values are changing.

This paper has also described features of New Zealand's HIV monitoring system a decade after the first review. This appears to be robust, being based on laboratory reporting of positive confirmatory antibody tests and surveillance of viral load tests.<sup>16,17</sup> Information is received on 98.6% of all reported diagnoses; few record the mode of transmission as unknown, and duplicate reporting is believed to be low.

The limitations of routine surveillance data need to be borne in mind. This is highlighted by the use of data in this analysis relating to some men with an unknown mode of transmission prior to 1996, and the smoothing of MSM cases identified through viral load testing for which there was no initial record of a Western blot antibody test. If these are neglected in prevalence pool calculations, or the date of entry into the national reporting system is incorrect, it will affect the estimated size of the diagnosed HIV prevalence pool among MSM (the numerator).

Losses of individuals with diagnosed HIV likewise create challenges to these analyses. If a substantial proportion of MSM have permanently emigrated from New Zealand post-HIV diagnosis but pre-AIDS diagnosis, this is unable to be fully captured and the calculations reported here will overstate the HIV prevalence pool. Similarly, not all deaths among diagnosed HIV-positive individuals living in New Zealand will be known to the AIDS Epidemiology Group in a timely way. Alternatively, temporary visitors to New Zealand infected with HIV who do not access care will not be counted in the system, offsetting this to some extent.

Surveillance data rely on patterns of HIV testing and thus the figures reported here will underestimate the actual number of MSM infected with HIV. Approximately 75% of MSM in New Zealand reported having tested for HIV at least once in their lifetime.<sup>11</sup> Under-diagnosis of HIV among MSM attending sexual health clinics appears to be low,<sup>9,10</sup> although this needs to be confirmed in community-based studies.

The estimates of the proportion of MSM with diagnosed HIV infection are sensitive to at least four assumptions about the definition or size of the MSM population denominator at any given point in time. First, in our analysis the 'MSM constant rate' denominator holds MSM at a constant 2% of the adult male population at each year, based on data relating to any lifetime same-sex contact from the only national probability study available for New Zealand – in 1991.<sup>21</sup> This is lower than the majority of rates published from other developed countries.<sup>15,24,26</sup> Second, definitions other than the lifetime rate of any homosexual contact could be used; for example recent estimates by the CDC pertaining to contact in the past year (2.6%), past five years (4%) or lifetime (7%).<sup>15</sup> Changing the percentage who were MSM would shift the 'MSM constant' HIV prevalence estimate up or down, but would not however transform the shape of the curve as it is modelled as a constant value over 25 years.

Third, the denominators 'MSM slow increase' and 'MSM rapid increase' model what could have been observed in New Zealand if there had been a slow or rapid increase, respectively, in the population rate of homosexual contact over time. These scenarios assume a steadily increasing rate of MSM sexual

activity from 1985 to 2009 as legal and social sanctions against homosexuality are gradually removed: namely the decriminalization of homosexual behaviour in 1986, human rights law reform in 1993 and a progressively more tolerant social environment.<sup>19</sup> This assumption is consistent with repeated probability surveys in other countries.<sup>24,26</sup> Any temporal increase in the population rate of homosexual behaviour is expected to reach an upper limit, commensurate with the actual yet unknown size of this minority. However, the magnitude and nature of change modelled here is necessarily arbitrary due to the lack of available data in New Zealand over the full 25 years.

Fourth, these are estimates of the proportion of diagnosed HIV infection among the MSM population as a whole. They do not examine how the pool of HIV infection and the rate of same-sex contact varies by demographic characteristics such as age group or ethnicity,<sup>12</sup> and furthermore how these experiences may have changed between 1985 and 2009.

The acceleration in the number of MSM living with diagnosed HIV infection has prevention implications. As the number of prevalent infections in a community is a key determinant of incident infections, then if the secondary transmission rate is stable, an expanding pool of MSM with HIV infection will lead to incrementally higher new annual infections, *ceteris paribus*. The relationship between prevalent and incident cases has been investigated in a small number of countries,<sup>31–35</sup> and trends in the HIV prevalence pool described herein will enable similar calculations regarding the annual transmission rate and the reproductive rate to be made for New Zealand MSM.

It is less clear as to what the findings regarding HIV prevalence as a proportion of all estimated MSM mean. Population-based HIV prevalence estimates for MSM can be used to compare the breadth of infection locally (i.e. between different risk groups) and internationally (i.e. between MSM in different jurisdictions) to identify needs and evaluate the success of control strategies. Sustained declines in HIV prevalence over the long term will signal whether overall control of the epidemic is being achieved for that group. Of concern is that while two of the three estimates suggested temporary declines for some of the first 25 years of surveillance, each of the three HIV prevalence estimates for MSM are now trending upwards. This indicates that growth in the number of diagnosed positive MSM is outpacing growth in the MSM population overall.

Further research such as the community HIV prevalence survey among MSM just completed will enhance data triangulation and provide an indication of underdiagnosis. A national random probability survey providing updated estimates for homosexual contact in New Zealand, and hence denominator values, would also improve the ability to accurately estimate the prevalence of HIV from HIV surveillance data.

## CONCLUSION

The number and proportion of MSM living with diagnosed HIV in New Zealand continues to climb 25 years after monitoring began, despite being a geographically remote country with a successful history of HIV prevention, a low prevalence of HIV and over 10 years of HAART usage. This will place increasing demands on aspects of clinical care and services targeted at HIV-positive MSM, and will create challenges for prevention into the future.

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