The first 30 years of HIV in New Zealand: Review of the epidemiology

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ABSTRACT

AIM: To summarise findings of the epidemiology of AIDS and HIV infection in New Zealand.

METHOD: Key results from reports of AIDS and diagnosed HIV infection are presented. Where appropriate, data on HIV diagnoses are reported for the period 2010–2014 to indicate the current pattern of diagnoses.

RESULTS: New Zealand has a well-described low prevalence epidemic of HIV infection, mostly concentrated in sub-populations of men who have sex with men (MSM), and heterosexual individuals from sub-Saharan Africa and South-East Asia. The former is largely due to transmission within New Zealand, whereas the latter mostly occurred overseas, although the difference has been less marked in recent years. The number of notified cases of AIDS peaked in the late 1980s, and dropped dramatically in the mid-1990s due to the introduction of effective antiretroviral treatments. Presently, most cases of AIDS are in people with previously undiagnosed HIV infection. In contrast, currently the annual number of diagnoses of HIV infection is higher than in the late 1990s, due to more occurring among MSM. Over the past 30 years, each sub-epidemic has demonstrated a distinct pattern, reflecting different determinants. HIV among people who inject drugs, sex workers, children and the general population has been restricted to very low levels.

CONCLUSIONS: Control of HIV in New Zealand is favourable compared to many countries, however challenges remain, especially in prevention among MSM, and more timely diagnosis for all, especially those heterosexually infected. National monitoring of the clinical outcomes of people diagnosed with HIV would provide an indication of the provision of effective care and allow international benchmarking.

What is now known as the acquired immune deficiency syndrome (AIDS) was first recognised as a clinical entity in 1981, and the first case diagnosed in New Zealand in 1983.[1,2] The human immunodeficiency virus (HIV) was identified as the causative agent in 1984,[3] and HIV antibody tests to detect infection became available in New Zealand in 1985.[4]

Understanding the patterns of the epidemic in the population is important to develop appropriate preventive control and treatment services.[5] To this end, AIDS was made a notifiable condition in 1983, however, HIV was not due to concerns this might discourage testing. Coded information on new diagnoses from the laboratories undertaking confirmatory testing for HIV antibodies has been available since this began.

Epidemiological surveillance of AIDS and HIV was initially undertaken by the Department of Health, and since 1989 by the AIDS Epidemiology Group (AEG) based at the University of Otago, Dunedin. The AEG's surveillance has been centered on case reports of AIDS and newly diagnosed HIV infection, supplemented by HIV prevalence studies in sentinel populations. The AEG has also been involved in surveys of behaviours known to drive the spread of HIV and testing patterns.

Collectively these three components are now known as Second Generation HIV Surveillance.[6] While both diagnoses of AIDS and HIV infection are included in surveillance, since the introduction of effective antiretroviral treatment (ART) in the mid-1990s, the information obtained from AIDS notifications has been less valuable in understanding the epidemic of HIV infection than previously.

The findings from the AEG's surveillance have been regularly reported in the newsletter *AIDS—New Zealand*, but as there has

been no recent published review of the New Zealand epidemic, we have taken opportunity of the 30th anniversary of HIV testing in New Zealand to review the current epidemiology.

The aims of this article are therefore to (a) summarise key findings of the current epidemiology based on reports of diagnosed AIDS and HIV in New Zealand, (b) discuss how these, and findings from other sources, inform HIV care and prevention needs among particular groups in New Zealand, and (c) consider important areas for future epidemiological surveillance.

Methods

An individual with HIV infection is defined as having AIDS when he or she first develops one of a number of specific conditions uncommon in people with normal immunity. Clinicians diagnosing AIDS are required to make an unnamed coded notification to the Medical Officer of Health, which are then forwarded to the AEG; the code is based on the individual's initials, gender and date of birth. The information required includes key demographic characteristics, the AIDS-defining condition and likely means of infection.

Since antibody testing for HIV infection first became available in New Zealand in 1985, the number of people newly diagnosed with HIV on the basis of a confirmatory Western Blot (WB) antibody test has been available from the two laboratories undertaking this testing, Auckland City Hospital Virology Laboratory and the Institute of Environmental Science and Research Limited, Porirua. These laboratories have provided the age, sex and likely means of infection of these people when it was provided to them.

The information was sent initially to the Ministry of Health, and since 1989, to the AEG. As with AIDS, information is only supplied to the AEG by code and never identified by name. Since 1996, the AEG has undertaken enhanced surveillance of HIV, whereby further information is sought from the clinician who requested the test.[7] The additional information includes the site of and reason for the test, the infected person's ethnic group, district of usual residence, and likely country of infection. The categorisation of the regions is based on the areas covered by the Regional Health Authorities that existed when surveillance of HIV was intensified in the 1990s, with the population of the Northern Region being mainly made up of people living in Auckland. From the beginning of 2002, the laboratories performing HIV viral load (VL) testing have provided the codes—derived in the same ways as for AIDS notifications and HIV information—of people having their first VL test in their laboratory. If it appears through linking of the code to the AEG's HIV database that a person having a VL test had not had a positive HIV antibody test in New Zealand, information is sought from the clinician who requested the VL test. This was established initially to gain information on people being cared for in New Zealand with HIV infections diagnosed overseas, without having had an antibody test in this country. However, VL testing has increasingly been used to confirm new HIV infections, so is now an important source of people being first diagnosed here.

Since 2005, information on the initial CD4 cell count has been requested on people newly diagnosed with HIV infection in New Zealand;[8] initially, this was only among those whose diagnosis was confirmed through WB testing, but subsequently through VL testing, if the infection was first diagnosed in New Zealand. The initial CD4 count gives an indication of the stage of the disease at diagnosis, and when less than 350 cells per cubic milliliter, it is considered a late diagnosis.

To compare the recent epidemic among men who have sex with men (MSM) in New Zealand with that of other high-income countries, the annual diagnosis rate of HIV infection of MSM in selected countries were compared. These diagnosis rates were derived annually for each country from 2004–2013 using the number of diagnoses among MSM as the denominator and the number of men aged 15–64 as the numerator. Details of the method are reported in the Appendix.

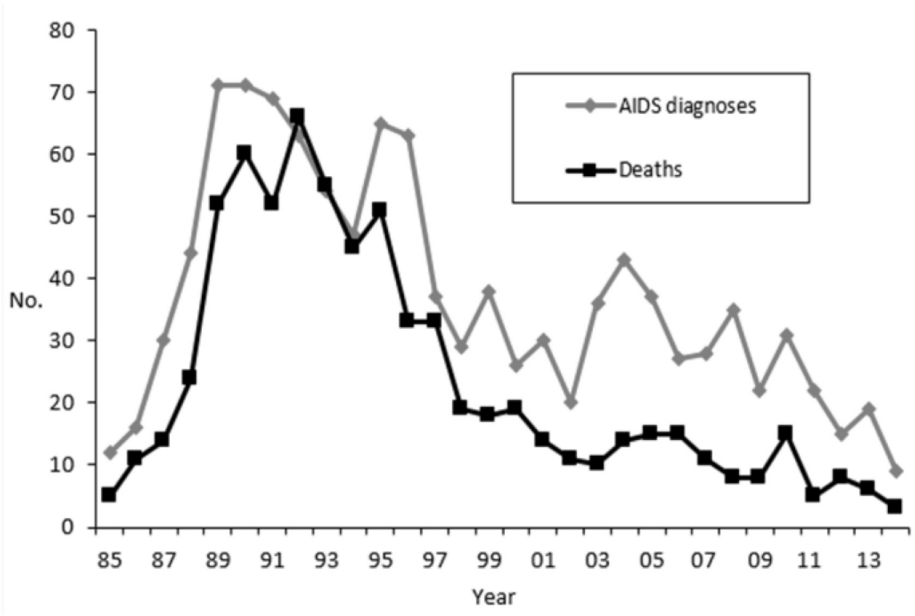
Information has been collected since 1998 from paediatricians, via the New Zealand Paediatric Surveillance Unit, on babies born to women with HIV diagnoses at the time of delivery.[9]

Table 1: Gender, likely means of infection, age (at diagnosis), and ethnicity of people diagnosed with AIDS in 2010–2014 and <2010 and in total.

	2010–2014		<2010		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Total	105	100.0	1,048	100.0	1,153	100.0
Gender						
Male	85	81.0	932	88.9	1,017	88.2
Female	20	19.0	113	10.8	133	11.5
Transgender	0	0.0	3	0.3	3	0.3
Likely means of infection						
Homosexual contact (MSM)	57	54.3	718	68.5	775	67.2
Homosexual (MSM) or IDU	1	1.0	14	1.3	15	1.3
Heterosexual contact	33	31.4	206	19.7	239	20.7
Injecting drug use (IDU)	1	1.0	24	2.3	25	2.2
Transfusion or blood product recipient	0	0.0	21	2.0	21	1.8
Mother to child transmission	0	0.0	18	1.7	18	1.6
Other	0	0.0	5	0.5	5	0.4
Unknown	13	12.3	42	4.0	55	4.8
Age at diagnosis (years)						
<5	0	0.0	12	1.1	12	1.0
5–14	0	0.0	10	1.0	10	0.9
15–19	0	0.0	4	0.4	4	0.3
20–29	9	8.6	159	15.2	168	14.6
30–39	21	20.0	399	38.1	420	36.4
40–49	41	39.0	298	28.4	339	29.4
50–59	20	19.1	123	11.7	143	12.4
> 60	14	13.3	40	3.8	54	4.7
Unknown	0	0.0	3	0.3	3	0.3
Ethnicity						
European	54	51.4	722	68.9	776	67.3
Māori	22	20.9	116	11.1	138	12.0
Pacific Islander	5	4.8	35	3.3	40	3.5
African	5	4.8	77	7.3	82	7.0
Asian	13	12.3	64	6.1	77	6.7
Other	5	4.8	27	2.8	32	2.8
Unknown	1	1.0	7	0.7	8	0.7

MSM = Men who have sex with men.

Figure 1: Annual number of diagnoses of AIDS and deaths among people notified with AIDS



We present and describe key findings on the reports of AIDS and diagnosed HIV infection. As this is a surveillance report, statistical testing is not undertaken. Where appropriate we have combined data reported over the five-year period 2010–2014 to give an indication of the current pattern of diagnoses.

Results

AIDS

Overall, there have been 1,153 people notified with AIDS to the end of 2014 (Table 1). Just over two-thirds (67.2%) of notifications were among gay, bisexual and other MSM infected through homosexual contact, with men and women infected through heterosexual contact the second largest group (20.7%). The age at diagnosis ranged from less than one to 78 years of age, with a median of 39 years; although for most of these people, infection would have occurred at a younger age, as the median time from HIV infection to the development of AIDS is around ten years in untreated young adults, and shorter in older people.[10]

The annual number of diagnoses of AIDS, and deaths of people notified with AIDS, are shown in Figure 1. AIDS diagnoses peaked in 1989 and 1990 with 71 cases, and deaths in 1992 with 66. The dramatic drop in the number of diagnoses in the mid-1990s, which was seen in other high-income countries, is contemporaneous with the introduction of effective antiretroviral therapy (ART).

As well as reducing the number of people with HIV infection progressing to AIDS, treatments available in the mid-1990s resulted in a marked improvement of the survival of people meeting the criteria for AIDS. As an indication of this, of those diagnosed with AIDS in New Zealand in 1990, less that 10% were still alive five years later, while this was the case for over 70% of people diagnosed a decade later in 2000.

Ideally, people are diagnosed with HIV infection before developing serious infections that classify them as having AIDS. However in the period 2010–2014, 74.3% (78/105) had been diagnosed with HIV infection at same time or less than 3 months prior to developing AIDS-defining conditions. Among many of those, an earlier HIV diagnosis and prior ART could have avoided progression to AIDS, so earlier HIV diagnosis could be expected to reduce the annual number of AIDS notifications further.

HIV infection

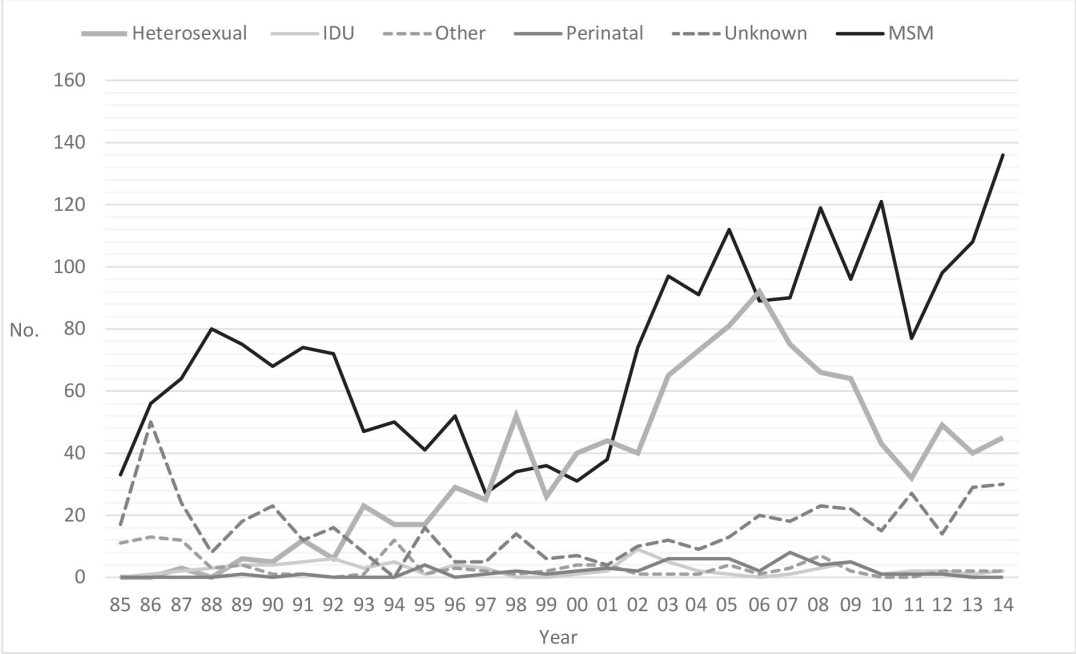
Information obtained from the HIV testing laboratories indicates that 4,168 people have been diagnosed with HIV in New Zealand to the end of 2014 (Table 2). Of these, 3,452 were through positive WB antibody tests, and 716 through having

Table 2: Likely means of infection of people diagnosed with HIV in 2010–2014, <2010 and total. These figures include people previously diagnosed overseas.

	2010–2014		<2010		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Total	883	100.0	3,286	100.0	4,168	100.0
Homosexual contact (MSM*)	543	61.4	1744	53.0	2,287	54.8
Homosexual contact (MSM*) or IDU	6	0.7	42	1.3	48	1.2
Heterosexual contact	209	23.7	897	27.3	1,106	26.5
Injecting drug use (IDU)	8	1.0	76	2.3	84	2.0
Blood product/transfusion recipient	0	0.0	62	1.9	62	1.5
Mother to child transmission	3	0.3	55	1.7	58	1.4
Other	7	0.8	32	1.0	39	1.0
Unknown/Not stated	107	12.1	378	11.5	484	11.6

*MSM – Men who have sex with men

Figure 2: Number of people diagnosed with HIV in New Zealand, by year of diagnosis and means of infection. These figures include people previously diagnosed overseas.



VL tests among people not known by the AEG to have had a prior WB test. While scrutiny of codes have been used to detect duplicate reports, these have not always been provided, especially in the early years of testing, so some duplication cannot be ruled out.

The annual number of diagnoses by means of infection is shown in Figure 2. It is important to appreciate that for many, the year of diagnosis will not have been the same as when the infection occurred, so is not an indication of true annual incidence.

As with AIDS, the majority (56.0%) of those diagnosed with HIV were MSM—men infected through homosexual contact—a small number of whom were also reported to have injected drugs (Table 2); the proportion rises to 63.4% if limited to those with a reported means of infection.

The next largest group were heterosexually infected men and women, 26.4% of all diagnosed, and 30.0% of those with a reported means of infection. Notably few people have been definitely or possibly infected through injecting drug use. In 2010–2014, the proportion of diagnoses among MSM has increased to 70.7% of those with a known means of infection.

Figure 3: Place of infection of MSM first diagnosed with HIV in New Zealand by year of diagnosis, 1996–2014. These figures exclude people previously diagnosed overseas

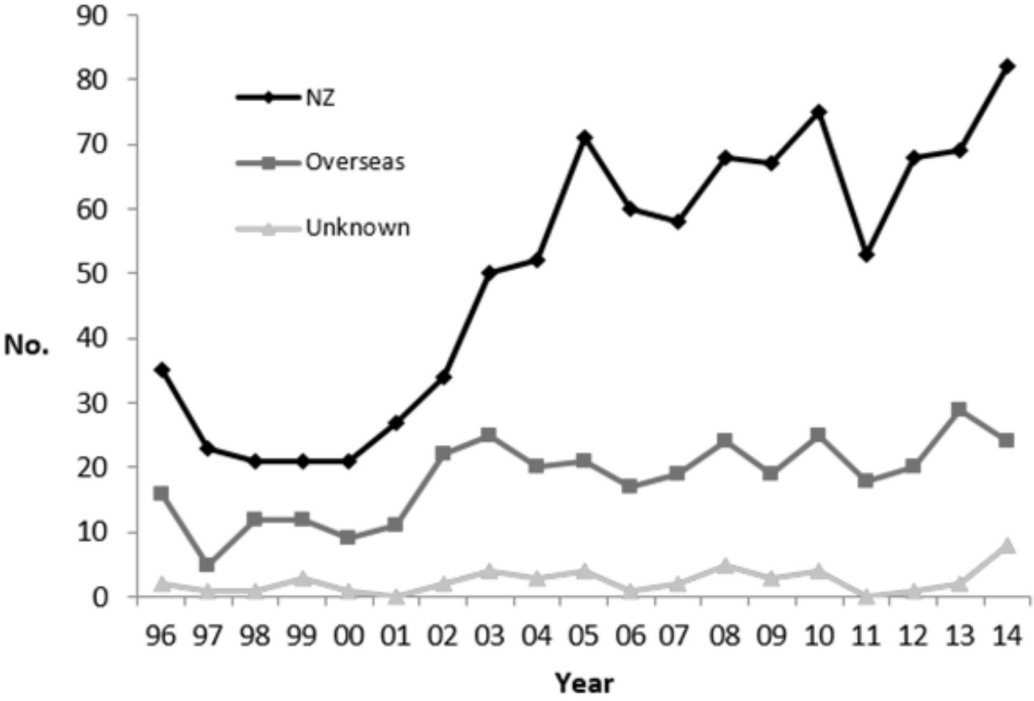
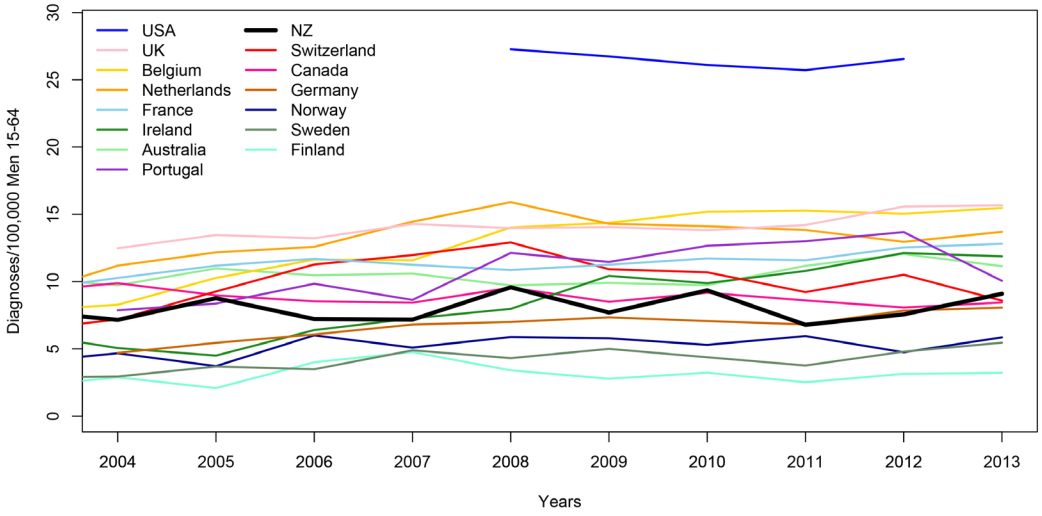


Figure 4: International comparison of MSM diagnosis rate per 100,000 men aged 15–64, 2004–2013



Gay, bisexual and MSM

Overall, there have been 2,335 MSM diagnosed with HIV. After an initial rise in the annual number in the late 1980s and early 1990s, the number dropped to a nadir in the late 1990s, with a subsequent rise in the early 2000s (Figure 2). While there was a steady increase in the years 2001 to 2005, since then the annual number has fluctuated. The highest ever annual number of MSM was diagnosed in 2014, and could indicate an upward trend in incidence, but it is too soon to conclude this. The overall rise since the early 2000s has been greatest among those infected in New Zealand rather than overseas (Figure 3).

Although the median age for HIV diagnosis among MSM was 37 years, the range is wide, with the youngest being 16 and oldest, 78 years. As well as appreciating that these are the ages at diagnosis not infection, it needs to be kept in mind that this will not reflect the current age profile of MSM living with HIV, which will be older in view of the success of current treatments.

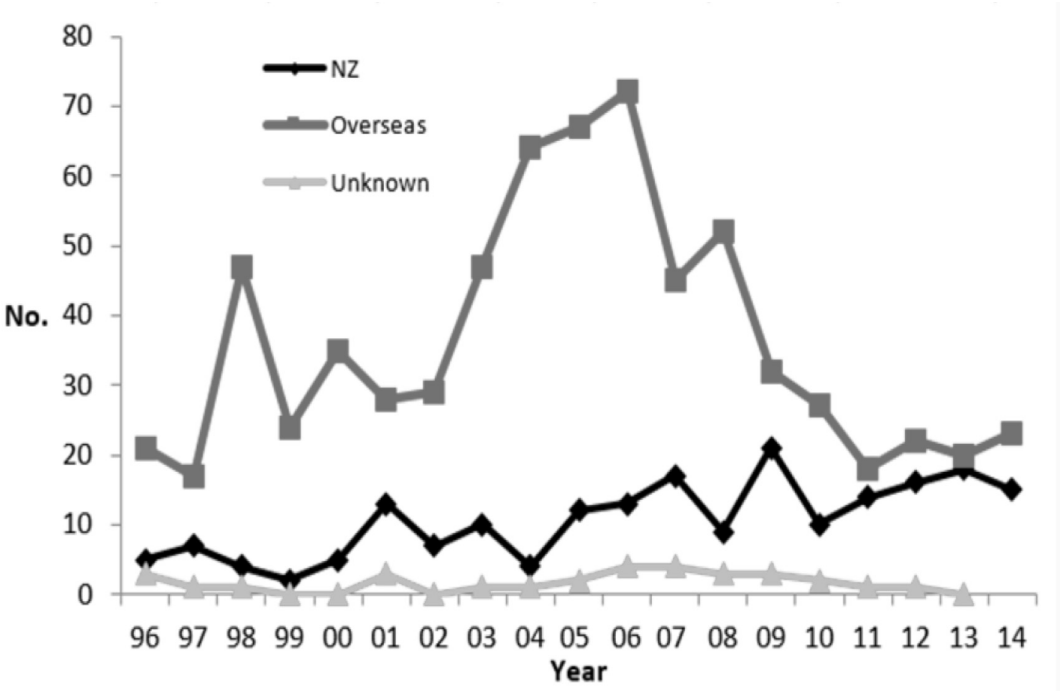
The ethnic profile of MSM diagnosed in the five-years 2010–2014 (Table 3) is broadly similar to that of the male population aged 15–64 in the 2013 census. The higher proportion of an “other” ethnicity among HIV diagnoses is a reflection of people from overseas diagnosed here. The increase in

Table 3: Characteristics of men who have had sex with men (MSM) diagnosed with HIV in 2010–2014, <2010 and total. These figures include people previously diagnosed overseas.

	2010–2014		<2010		Total	
	No.	**%**	**No.**	**%**	**No.**	**%**
Total	549	100.0	1,786	100.0	2,335	100.0
Age at diagnosis						
15–19	11	2.0	34	1.9	45	2.0
20–29	142	25.9	468	26.2	610	26.1
30–39	151	27.5	652	36.5	803	34.4
40–49	148	27.0	382	21.4	530	23.0
50–59	64	11.7	155	8.7	219	9.1
60 or more	33	5.9	45	2.5	78	3.3
Unknown	0	0.0	50	2.8	50	2.1
Likely place of infection*						
New Zealand	353	64.3	655	58.2	1,008	60.2
Overseas	177	32.2	414	36.8	591	35.3
Unknown	19	3.5	57	5.0	76	4.5
Ethnicity*						
European	348	63.4	838	74.3	1,186	70.7
Māori	50	9.0	121	10.7	171	10.2
Pacific	19	3.5	36	3.2	55	3.3
Asian	84	15.3	77	6.8	161	9.6
African	0	0.0	7	0.6	7	0.4
Other	46	8.4	45	4.0	91	5.4
Unknown	2	0.4	4	0.4	6	0.4
Usual residence*						
New Zealand	516	94.0	1,030	91.3	1,546	92.2
Northern	303	58.7	528	51.3	831	53.7
Midland	41	7.9	137	13.3	178	11.5
Central	104	20.2	177	17.1	281	18.2
Southern	68	13.2	188	18.3	256	16.6
Overseas	28	5.1	68	6.0	96	5.7
Unknown	5	0.9	30	2.7	35	2.1
Initial CD4 count**						
<200	83	15.1	72	14.2	155	14.7
200–350	76	13.8	58	11.5	134	12.7
>350	274	50.0	193	38.1	467	44.3
Unknown	116	21.1	183	36.2	299	28.3

* Information on likely place of infection, ethnicity and usual residence collected since 1996
** Information on initial CD4 count collected since 2005

Figure 5: Place of infection of people first diagnosed in New Zealand with heterosexually acquired HIV. These figures exclude those previously diagnosed overseas, 1996–2014



recent years in the proportion of Asian people likely reflects the changing ethnic make-up of Auckland, where over 50% of newly diagnosed MSM and the HIV epidemic in MSM is concentrated (Table 3).

Overall, of MSM diagnosed in 2010–2014 for whom an initial CD4 count was provided, 36.7% had an initial count of less than 350 cell per cubic mm, hence considered late diagnoses; however, when this was restricted to those who had not been previously diagnosed (many of those diagnosed overseas would have been on treatment) the proportion increased to 42.0%.

International comparison of HIV diagnosis rates among MSM

HIV diagnosis rates among MSM from 2004–2013 for the included countries are shown in Figure 4. The rate of diagnosis in New Zealand is lower than many of the countries examined. The US has a much higher rate of HIV diagnosis among MSM compared with all other countries, while the Scandinavian countries of Norway, Sweden and Finland have the lowest. Overall HIV diagnoses among MSM in the countries examined rose slightly from 2004–2013. In New Zealand over this period, the diagnosis rate shows moderate fluctuation as the numbers are relatively small, and the only country showing a sustained substantive drop has been Switzerland.

Heterosexually infected men and women

In contrast to the situation among MSM, each year more individuals are diagnosed in New Zealand with heterosexually acquired HIV who were infected overseas, rather than in this country (Figure 5). Figure 5 also shows that there was a marked rise in the annual number in this group in the period 2003–2006, with a subsequent drop over the ensuing five years. This rise and fall was due to an increase, and subsequent drop, in people coming to New Zealand from countries where heterosexually acquired HIV was relatively common, particularly sub-Saharan Africa. While the number of heterosexually acquired infections that have occurred in New Zealand remains relatively low, overall there has been a slight rise since 1996.

Similar numbers of men and women have been diagnosed with heterosexually acquired HIV infection (Table 4). While overall most infections were acquired overseas, the proportion was lower in 2010–2014 (63.1% of all men and women for whom a place of infection was reported), than in 1996–2010, when the comparable proportion was 82.4%, due mainly to a drop in overseas acquired infections rather than a rise in local ones. In addition, in the most recent five-year period, about half of the men (46.0%) and a quarter of the women (28.6%) diagnosed with heterosexually acquired HIV infection were of European ethnicity, a proportional increase from earlier years mainly due to a drop in the number of people of non-European ethnicity. In the period 2010–2014, 61.3% of the heterosexually infected men and 60.3%

Table 4: Characteristics of heterosexually infected men and women diagnosed with HIV in New Zealand in 2010–2014, <2010 and in total. These figures include people previously diagnosed overseas.

	Men				Women				Total	
	2010–2014		<2010		2010–2014		<2010			
	No.	%	No.	%	No.	%	No.	%	No.	%
Total	111	100.0	440	100.0	98	100.0	457	100.0	1,106	100.0
Age at diagnosis										
15–19	1	1.0	1	0.2	3	3.1	12	2.6	17	1.5
20–29	18	16.2	78	17.7	29	29.6	185	40.5	310	28.0
30–39	35	31.5	187	43	33	33.7	177	38.7	432	39.1
40–49	27	24.3	122	27.7	21	21.4	59	12.9	229	20.7
50–59	19	17.1	37	8.0	7	7.1	19	4.2	82	7.4
60 or more	11	9.9	15	3.4	5	5.1%	5	1.1	36	3.3
Likely place of infection*										
New Zealand	31	27.9	52	12.8	39	39.8	83	20.9	205	20.3
Overseas	73	65.8	334	82.0	58	59.2	298	75.1	763	75.3
Unknown	7	6.3	21	5.2	1	1.0	16	4.0	45	4.4
Ethnicity*										
European	51	46.0	110	26.8	28	28.6	76	19.1	265	26.0
Māori	4	3.6	11	2.7	8	8.2	18	4.5	41	4.0
Pacific	6	5.4	10	2.4	8	8.2	20	5.0	44	4.3
Asian	24	21.6	70	17.1	21	21.4	73	18.3	188	18.4
African	20	18	189	46.1	28	28.6	198	49.6	435	43.0
Other	6	5.4	16	3.9	5	5.0	12	3.0	39	3.8
Unknown	0	0.0	4	1.0	0	0.0	2	0.5	6	0.5
Usual residence*										
New Zealand	69	62.2	280	68.3	60	61.2	273	68.4	682	67.0
Northern	*7*	*10.1*	*28*	*10.0*	*9*	*15.0*	*31*	*11.4*	*75*	*11.0*
Midland	*4*	*6.0*	*16*	*5.7*	*1*	*1.7*	*5*	*1.8*	*26*	*3.8*
Central	*44*	*63.7*	*194*	*69.3*	*37*	*61.7*	*186*	*68.1*	*461*	*67.6*
Southern	*14*	*20.2*	*42*	*15.0*	*13*	*21.6*	*51*	*18.7*	*120*	*17.6*
Overseas	22	19.8	67	16.3	24	24.5	72	18.1	185	18.2
Unknown	20	18.0	63	15.4	14	14.3	54	13.5	151	14.8
Initial CD4 count**										
<200	33	30.0	55	28.6	25	25.5	35	18.4	148	25.0
200-–350	16	14.0	32	16.7	16	16.3	36	18.9	100	17.0
>350	31	28.0	47	24.5	27	27.6	63	33.2	168	28.4
Unknown	31	28.0	58	30.2	30	30.6	56	29.5	175	29.6

* Information on likely place of infection, ethnicity and usual residence collected since 1996
** Information on initial CD4 count collected since 2005

Table 5: Characteristics of heterosexually acquired men and women infected in New Zealand, diagnosed in 2010–2014, <2010 and in total. These figures include people previously diagnosed overseas

	Men				Women				Total	
	2010–2014		< 2010		2010–2014		< 2010			
	No.	%	No.	%	No.	%	No.	%	No	%
Total	31	100.0	52	100.0	39	100.0	90	100.0	212	100.0
Age at diagnosis										
15–19	1	3.2	0	0.0	3	7.7	5	5.6	9	4.2
20–29	6	19.4	11	21.2	8	20.5	46	51.1	71	33.5
30–39	16	51.6	16	30.8	16	41.0	21	23.3	69	32.5
40–9	6	19.4	18	34.6	7	18.0	12	13.3	43	20.3
50–59	1	3.2	3	5.8	3	7.7	5	5.6	12	5.7
60 or more	1	3.2	4	7.6	2	5.1	1	1.1	8	3.8
Ethnicity*										
European	21	67.7	33	63.5	16	41.0	32	38.6	102	49.8
Māori	1	3.2	6	11.5	8	20.5	15	18.0	30	14.6
Pacific	3	9.7	3	5.8	6	15.4	9	10.8	21	10.2
Asian	2	6.5	5	9.6	4	10.3	12	14.5	23	11.2
African	3	9.7	5	9.6	5	12.8	13	15.7	26	12.7
Other	1	3.2	0	0.0	0	0.0	2	2.4	3	1.5

* Information on ethnicity collected since 1996

Figure 6: Annual number of children diagnosed with perinatally-acquired HIV by year and place of birth. These figures include children previously diagnosed overseas.

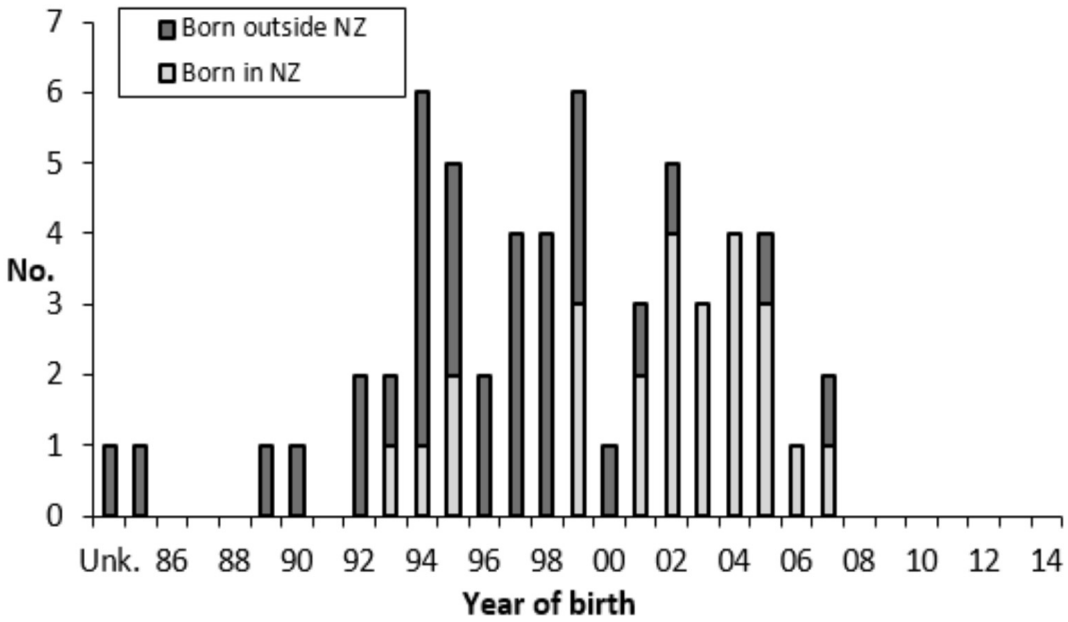


Table 6: Information on children (under the age of 15) diagnosed with HIV in 2010–2014,<2010 and in total. These figures include children previously diagnosed overseas

	2010–2014		<2010		Total	
	No.	%	No.	%	No.	%
Total	4	100.0	70	100.0	74	100.0
Means of Infection						
Blood product recipient	0	0.0	8	11.4	8	10.8
Transfusion recipient	0	0.0	0	0.0	0	0.0
Mother-to-child transmission	3	75.0	55	78.6	58	78.4
Other	0	0.0	1	1.4	1	1.3
Unknown/Not stated	1	25.0	6	8.6	7	9.5
Age at diagnosis						
<1 year old	0	0.0	12	17.0	12	16.2
1–4 year olds	2	50.0	25	36.0	27	36.5
5–9 year olds	1	25.0	21	30.0	22	29.7
10–14 year olds	1	25.0	12	17.0	13	17.6
Ethnicity						
European	1	25.0	4	6	5	6.8
Māori	0	0.0	8	11	8	10.8
Pacific	0	0.0	3	4	3	4.0
Asian	0	0.0	6	10	6	8.1
African	3	75.0	33	47	36	48.6
Other	0	0.0	1	1	1	1.4
Unknown	0	0.0	15	21	15	20.3
Likely place of infection						
New Zealand	3	75.0	24	34.2	27	36.5
Overseas	1	25.0	30	42.9	31	41.9
Unknown/Not stated	0	0.0	16	22.9	16	21.6

of the heterosexually infected women for whom an initial CD4 was available were diagnosed late, higher than the proportion among MSM (36.7%).

In the five-year period 2010–2014, similar numbers of men (31) and women (39) have been diagnosed with HIV infection, reportedly heterosexually-acquired in New Zealand (Table 5). While again there was a wide range of ages at diagnosis, for both men and women the most common age group was 30–39 years. About two-thirds (67.7%) of the men were of European ethnicity, but this was the case for less than half (41.0%) of the women. It is also notable that eight—three men and five women—of the 70 individuals were of African ethnicity, and that among the 39 women, 20.5% were of Māori, and 15.4% of Pacific, ethnicity.

Children

There have been 74 children under the age of 15 diagnosed with HIV in New Zealand (Table 6). In the early years, many were infected through the receipt of blood products to treat coagulation disorders, but there have been no new diagnoses of cases where infection had been transmitted in this way since 1997. Overall, most children have been infected through mother-to-child, or perinatal, transmission—that is being born to an HIV-infected mother, many of whom have come from overseas.

Table 7: Births in New Zealand to known HIV-infected pregnant women in 2010–2015, 1998–2010 and in total. This information has been collected since 1998.

	2010–2014		<2010		Total	
	No.	%	No.	%	No.	%
Total	43		85		128	
Region of birth						
Northern	25	58.1	42	49.4	67	52.3
Midland	4	9.3	8	9.4	12	9.4
Central	11	25.6	20	23.5	31	24.2
Southern	3	7.0	15	17.7	18	14.1
Timing of diagnosis						
Before pregnancy	39	90.7	63	74.1	102	79.7
During pregnancy	4	9.3	22	25.9	26	20.3
Ethnicity of mother						
European	8	18.6	13	15.3	21	16.4
Māori	2	4.7	10	11.8	12	9.4
Pacific	5	11.6	3	3.5	8	6.3
Asian	9	20.9	11	12.9	20	15.6
African	19	44.2	47	55.3	66	51.6
Other	0	0.0	1	1.2	1	0.7
Antiretroviral to mother						
Yes	42	97.7	82	96.5	124	96.9
No	1	2.3	2	2.3	3	2.3
Unknown	0	0.0	1	1.2	1	0.8
Delivery						
Vaginal	21	48.8	32	37.6	53	41.4
Caesarian	22	51.2	52	61.2	74	57.8
Unknown	0	0.0	1	1.2	1	0.8
Infant breast fed						
Yes	0	0.0	1	1.2	1	0.8
No	42	97.7	83	97.6	125	97.7
Unknown	1	2.3	1	1.2	2	1.5

Whereas most data are based on the year of diagnosis, the year of birth of perinatally-infected children gives an indication of the actual year of infection (Figure 6). While there has been no perinatally-infected children diagnosed who were born since 2007, as diagnosis can be delayed for many years, there may be children with undetected HIV infection currently living in New Zealand.

Data collected from paediatricians via the New Zealand Paediatric Surveillance Unit shows that from 1998 to 2014, there have been 128 babies born to women with HIV that had been diagnosed before or during their pregnancy (Table 7). None of these children are known to have acquired HIV, although it is too soon to be absolutely certain about this for some of those born in 2014. The data collected also show that virtually all infected pregnant women received ART and avoided breast-feeding, measures known to greatly reduce the risk

of HIV perinatal transmission. In recent years, more deliveries have been performed vaginally than by caesarian section than previously the case, in line with current understanding that for women with a well-suppressed VL, vaginal delivery does not carry a high risk.

Number of individuals living with HIV in New Zealand

The number of individuals living with diagnosed HIV in New Zealand will be less than the total ever found to be infected because of deaths from AIDS and non-AIDS-related causes, and an unknown number going overseas. Ministry of Health data show there were 2,059 adults (1,699 men, 360 women) and 23 children receiving subsidised ARTs the end of June 2015.[11] This was 192 more adults than at end of June 2014, giving an estimate at the end of 2014 of 1,963 on funded treatment.

Currently, just over 90% of people with HIV under the care of the Auckland Infectious Disease Unit are on ART. It is known that some people will opt out of specialist care, or not enter it for other reasons, which we estimate to be 5% of those diagnosed, based on UK data.[12] So, assuming the 2,059 adults receiving subsidised therapy represent 85% of those with diagnosed HIV infection in New Zealand, there were 2,309 adults in New Zealand living with diagnosed HIV at the end of 2014. If 20% of infected people are undiagnosed—based on a 2011 Auckland study which found 21% of MSM with HIV infection had not been diagnosed[12]—the total number of adults with HIV in New Zealand is 2,886, a prevalence of 64 per 100,000 total population. Presuming the same proportion of infected men and women in the population are on treatment and undiagnosed, the number of men with HIV in New Zealand will be 2,381, and women 505; giving prevalence estimates among men aged 15 and over of 136 per 100,000, and among such women of 29 per 100,000 population.

Discussion

While ideally epidemiological surveillance provides timely and accurate knowledge of the actual annual incidence of HIV, it is not possible to measure this directly, as many people are asymptomatic or for other reasons not diagnosed until many years after infection. However, as it is likely that most people with HIV will eventually become symptomatic and diagnosed, the general pattern and trends in diagnosis rate are likely to indicate those of true incidence over time. While no surveillance system will capture all data, cooperation between patients, laboratories, diagnosing physicians, and the AEG, has meant that the system has a high level of completeness, even though HIV is not a notifiable condition.

Clearly, New Zealand has an HIV epidemic concentrated among MSM. While an international comparison shows that the diagnosis rate of MSM is in the middle to low range found in high-income countries with accessible information on this, care is needed in interpreting these data. Not all infections would have occurred in the country of diagnosis, and this is most likely to impact on small countries, such as New Zealand and Sweden. Diagnosis rates will be dependent on testing rates, as when these are low the impact on changes in incidence will be delayed. Also the proportion of MSM may not be the same in all countries. Nevertheless, the New Zealand diagnosis rate being lower than in many high-income countries is consistent with the findings of a study of MSM in Auckland in 2011, in which HIV prevalence was 6.5%, lower than most comparative studies in the US, Australia, UK and France.[13]

The pattern of an increase in diagnoses in the early 2000s, followed by a plateauing, is also similar to the experience in many high-income countries.[14] The rise is generally ascribed to a relaxation of the behaviour changes take up by many MSM when AIDS first appeared, occurring after HIV was perceived as less threatening with the availability of better treatment; although the rise could have also been contributed to by changes to sexual partner acquisition facilitated by internet dating. The subsequent leveling out of annual HIV diagnoses is consistent with the relatively stable rates of condom use since 2002 in New Zealand behavioural studies among MSM.[15] Another likely driver of an increasing incidence in the early 2000s, is the rise in prevalence of HIV among MSM, which would be anticipated with decreasing mortality and ongoing incidence. Both factors are likely to be

important. Evidence of the former is the resurgence of other STIs among MSM, particularly syphilis, that occurred in the early 2000s in many countries, including New Zealand.[16] The ongoing occurrence of other STIs among MSM infected with HIV is also indirect evidence of the lack of universal condom use, although these do not necessarily always indicate HIV transmission risk, as they could have been acquired among seroconcordant men.

It is too soon to know if the rise in the number of MSM diagnosed in 2014 is an indication of rising incidence, however it seem prudent to review, and if possible strengthen, prevention strategies now, in case this is so.

The information on new diagnoses in recent year shows a clear increase the number of Asian men with HIV infection. This is likely to be a reflection of the increased size of this population, indicating that specific needs for care and prevention among this sector of the population should be considered.

The profile of men and women heterosexually infected is clearly different from the MSM. They are more likely to have been infected overseas than in New Zealand, particularly for those diagnosed before 2011. The rise in the number and proportion of HIV diagnoses of people heterosexually infected in the period 2002–2006 was a reflection of the increase in migrants to New Zealand from parts of the world where heterosexual infection was particularly prevalent, especially some areas of sub-Saharan Africa. It resulted in Africans being the second largest ethnic groups diagnosed with HIV. The peak in heterosexual diagnoses in 2006 is likely related to the requirement introduced in October 2005 that all people seeking a visa to remain in New Zealand for a year or more required an HIV test as part of an immigration medical, which applied to people already in New Zealand seeking to remain here, as well as those seeking entry. The drop after 2006 will be due to less migration from those high prevalence countries, and that if HIV is diagnosed overseas, it usually precludes entry.

There has been a slight upward trend in the number of people diagnosed with heterosexually acquired HIV that occurred in New Zealand since 1996 when this information was first collected. However, the numbers have averaged less than 16 annually over the past five years, only about a quarter of the annual number of MSM infected in New Zealand. When the respective sizes of the heterosexual and MSM populations are considered, the risk among heterosexuals is very much less than that of MSM. This lower perceived, and actual, risk is no doubt why more of those heterosexually infected are diagnosed late. While testing is less widespread among heterosexuals, and therefore the proportion undiagnosed may be higher than among MSM, there is no evidence that this number is large, or that HIV is spreading widely without being recognised. If it were, the number of pregnant women being diagnosed through antenatal testing would be very much higher than it is, as would be the number of blood donors diagnosed (all of whom are tested). Nevertheless, HIV should be considered when a person has been at risk, or has an illness consistent with HIV infection or an opportunistic infection. The information on those infected heterosexually in New Zealand shows a wide age range, and while all ethnic groups are affected, there appears to be a disproportionate number of African, Māori and Pacific women being diagnosed.

While it is tempting to attribute the drop in maternally-infected children to the progressive introduction of a universal offer of HIV testing during pregnancy in New Zealand since 2006, in fact the number of pregnant women diagnosed has been very low. In the five-year period 2010–2014, there were only nine women reported to the AEG as diagnosed through antenatal testing, less that anticipated from estimates based on the number of children infected in New Zealand prior to its introduction. Nevertheless, as the universal offer of HIV testing has successfully been introduced and accepted by the vast majority of pregnant women, it seems sensible to continue to include this in antenatal care, as the additional cost of HIV testing when added to other antenatal tests is low, and the possibility of the incidence increasing remains.

Another factor that has resulted in few children being infected is that pregnant

women with diagnosed HIV are being cared for in a way that is successfully minimising the risk of perinatal transmission. There have been over 120 babies born to women with diagnosed HIV in New Zealand since monitoring of this started in 1998, none of whom have been infected with HIV, less than the one percent rate generally reported.

The small number of people diagnosed with HIV reported to have been infected through sharing of equipment used to inject drugs is consistent with prevalence studies in this population, which have shown it to be less than one percent of people using the needle and syringe exchange scheme.[17] This is undoubtedly due to the early enactment of legislation enabling the needle and syringe exchange scheme prior to HIV being established in this sector of the community. Although not specially sought in the information obtained about people newly diagnosed, sex workers have not been identified as a major factor driving HIV infection in New Zealand.

The actual number of people currently living with diagnosed HIV is not known. These we have estimated to be 2,381 men and 505 women, based on the number of subsidised ART as monitored by PHARMAC and reported by the Ministry of Health, which assume 85% of people diagnosed and still living in New Zealand are on treatment. While this might be underestimated, as the criteria for being on ART has in recent years become less stringent, it also takes into account that some people will have opted out of specialist care. Another assumption, that 20% of infected people are undiagnosed, is based on the 21% found an Auckland-based 2011 study of MSM, which would be expected to get lower over time, if the incidence does not change significantly and survival continues. As well as allowing estimates to be made, the data suggests that the annual costs of ART alone for each individual on treatment is around $NZ 14,000 per year,[11] although this does not take into account possible confidential reductions in the cost of certain ART pharmaceuticals negotiated by PHARMAC. When added to the personal impact and costs of other aspects of medical care, this emphasises the need to prevent new infections wherever possible.

The appreciation that people on treatment are significantly less infectious, as they have a reduced level of virus in blood and in semen, has resulted in treatment of people with HIV being incorporated as one of the strategies of prevention, and is referred to as 'treatment as prevention'. There have been attempts to determine the potential effectiveness of this at a national level by estimating the cascade of care—being the proportion who are first diagnosed with HIV, referred to specialist care, retained in care, on ART, and subsequently have a fully suppressed blood viral load. The initial determination of the cascade in the US was disappointing, suggesting that in 2011 only around a quarter of people with HIV were on ART without detectable circulating virus.18 In other countries, this was very much better, with an estimated 58%, 53% and 58% on ART with a fully suppressed viral load in the UK, the Netherlands and France, respectively.[19] In New Zealand, an unpublished study by the AEG that sought this information from people diagnosed over a recent eight-year period, suggests that we were nearer these European figures. However, we were unable to emulate the study, as unlike in the UK, HIV surveillance is not linked to a unique number that allows the necessary information to be collected, resulting in a significant proportion of people for whom the outcome could not be determined.

Conclusion

Ongoing HIV surveillance shows that New Zealand has a well-described, mature, low prevalence, HIV epidemic with infection concentrated among MSM, and heterosexual individuals from sub-Saharan Africa and South-East Asia. The former is largely the result of transmission occurring within New Zealand, whereas the latter infections were mostly, but not universally, acquired overseas. Over 30 years, each sub-epidemic has demonstrated a distinct pattern reflecting different determinants. The prevalence of HIV among people who inject drugs, sex workers and children has been restricted to very low levels.

The control of HIV achieved in New Zealand is favourable compared to many countries, however several challenges remain, especially in prevention among MSM and more timely diagnosis for all those infected. HIV testing of those who

have been at risk needs to continue, as an unnecessarily high proportion of HIV infection is still diagnosed late, and some not before progression to AIDS. These people are missing opportunities for timely HIV treatment for personal wellbeing and prevention of secondary transmission. Deaths from AIDS are now rare but still occur, and conversely, the number living with diagnosed HIV is increasing markedly each year, with considerable implications for care and treatment costs. People with HIV are particularly infectious soon after acquiring infection, often before being diagnosed even with regular testing, so behaviours aimed to reduce the risk of transmission need to be promoted strongly among all at risk and control cannot be based on diagnosis and treatment alone.

Current epidemiological surveillance needs to continue. The addition of national monitoring of the clinical outcomes of people diagnosed with HIV would assess the provision of appropriate care and allow international benchmarking. However, this would only be feasible if there were a way that information from diagnosed individuals could be accessed through the health system, such as by using the National Health Index number in conjunction with notification of HIV. Behavioural surveillance also needs to continue to monitor sexual and HIV testing behaviour, and should, where feasible, be linked to HIV prevalence studies to estimate rates of undiagnosed infection. Routine or regular phylogenetic analysis of newly diagnosed cases, that has not so far been routinely undertaken, could be used to identify clustering of new infections and local HIV subtype diversity. Surveillance of other sexually transmitted infections needs to be strengthened so that it can provide information on the rates among MSM, as these are an indication of HIV risk. Importantly, all monitoring systems need to be acceptable to those in the general population and those in most affected communities, and keep individual's confidentiality paramount.

Appendix

Method used for international comparison of diagnosis rates among MSM

New Zealand, Australia, Belgium, Canada, Finland, France, Germany, Ireland, the Netherlands, Norway, Portugal, Sweden, Switzerland, the UK and the US were selected for comparison over the time period 2004–2013 having data on new diagnoses among MSM for the entire period. Publicly available data on HIV diagnoses were collected from the public health agencies of the countries selected. New Zealand's HIV data were directly available to the AIDS Epidemiology Group, Australia's from the Kirby Institute, Belgium's data from the Institut Scientifique de Santé Publique, Canada's from the Public Health Agency of Canada, Finland's from the Terveyden Ja Hyvinvoinnin Laitos, France's data from the Institut de Veille Sanitaire,[9] Germany's data from the Robert Koch Institut, Ireland's data from the Health Protection Surveillance Centre, The Netherlands' data from Stichting HIV Monitoring, Norway's data from the Norwegian Institute of Public Health, Portugal's data from the Instituto Nacional de Saúse, Sweden's data from the Folkhälsomyndigheten, Switzerland's data from the Bundesamt für Gesundheit, the UK's data from Public Health England and the US's data from the Centers for Disease Control.

Whole country data were only available from 2008–2012 for the US; however, as it is a major comparable country to New Zealand, the US data are displayed, though they are not included in the statistical analyses. Additionally, 2013 data from Portugal are affected by reporting delays, so the 2013 Portuguese data were not included in the statistical analyses.

For all countries, unknown or unreported mode of transmission cases were proportionally reallocated to aid comparisons between countries (except the UK and France, who report data adjusted for unknown mode of transmission cases and, for France, reporting delays). This reassignment may lead to slight biases for certain countries; for example, most unknown Swedish cases are for overseas acquired infections that may be different to domestic infections. However, reassignment prevents countries with more complete mode of transmission information having artificially higher rates of HIV infection among MSM.

Data for all countries are presented as diagnoses per 100,000 men aged 15–65, with population data drawn from official national governmental statistical offices.

LOWESS non-parametric smoothing of the data for all the countries was undertaken to produce a smooth curve representing the estimated underlying average diagnosis rate for the period 2004–2013 to give an indication of the overall trend.[20]

This was then used to examine trends in certain individual countries that might be exceptions to this. The weighting algorithm for the LOWESS smoothing was contained within the lowes' function from the statistical package of R, with a bandwidth of 2/3 of the data points.[21] Countries were not weighted by population.

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