New Zealand's HIV infected population under active follow-up during 2000

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Abstract

Aim. To audit New Zealand's HIV infected population currently under active follow-up.

Methods. Multiple sources were used to determine anonymously the demographic and management characteristics of HIV infected individuals being monitored with HIV viral load measurements and/or receiving antiretroviral therapy during 2000.

Results. 593 people (480 males and 113 females) were under active follow-up. The most common transmission risk was male homosexual contact (56%) followed by heterosexual contact (28%), injecting drug use (3%) and mother to infant transmission (1%). Ethnicity data showed a disproportionate number of Africans (13%) compared to recent census figures. Anti-retroviral therapy was used in 71% of the cohort of whom 62% had HIV viral load measurements below 400 copies/mL. An upper estimate of diagnosed HIV individuals living in New Zealand at 30/9/2000 was 801.

Conclusions. This is the first time that the demographic and clinical state of HIV infected individuals has been assessed throughout New Zealand. The results suggest a slightly lower number of HIV infected individuals currently living in New Zealand than previously estimated. Anti-retroviral therapy is being used effectively within the HIV infected population. The changing demographics, with a higher proportion of people under care from Africa, increasing numbers of females, and an increase in the proportion with heterosexual risk factors are particular challenges.

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HIV infection prevalence in New Zealand is currently low by world standards with the rate estimated by UNAIDS at the end of 1999 to be 6.2 per 10 000 adults aged 15-49 years.[1] This rate is less than half the estimate for Australia (14.7 per 10 000), very much lower than the United States (61 per 10 000) and almost pales into insignificance when compared with South Africa where it is estimated that 20% of the 15-49 year age group are infected.[1] Nevertheless, the effect of HIV infection in New Zealand has a major impact on the lives of those infected, their families and friends and those close to the more than 550 people who have already died as a consequence of HIV/AIDS.

The last six years have seen dramatic changes in the management of HIV infection, with the advent of highly active anti-retroviral therapy (HAART). HAART, defined as combination therapy with three or more anti-retroviral drugs, has led to marked falls in the incidence of opportunistic infections and increases in life expectancy for those with HIV infection. HIV medical care in New Zealand is provided by a limited number of infectious diseases physicians, sexual health specialists and some general practitioners (GPs) with high HIV caseloads. This small number of providers has enabled us to undertake a national audit of New Zealand's HIV infection population receiving ongoing follow-up.

The primary aims were to determine the number and demographic characteristics of those being followed during the first nine months of 2000 through linking HIV surveillance data to the immunological, viral load and treatment regimen status of individuals. In addition these data were used to estimate the total number of people with diagnosed HIV living in New Zealand.

Methods

This clinical audit was undertaken as a partnership between clinicians involved in the care of patients with HIV infection and the AIDS Epidemiology Group. An anonymous database was established of all living individuals at 30/9/2000 who had at least one plasma HIV viral load performed within New Zealand between January and September 2000 and/or were dispensed anti-retroviral therapy between July and September 2000. These individuals were considered to be under active follow-up. The project was undertaken by linking data elements from currently existing databases using the same anonymous code. These databases included HIV viral load results from the four New Zealand laboratories that are equipped to undertake this test; special authority approvals for the prescription of anti-retroviral drugs; prescription dispensing records between July and September 2000; mortality data from the New Zealand Health Information Service; and surveillance data held by the AIDS Epidemiology Group. Information was collected on the current age, sex, ethnicity, mode of transmission, location, the date and result of the latest HIV viral load and $CD4^+$ lymphocyte counts, current anti-retroviral regimen, and the treating clinician.

To estimate the total number of people diagnosed with HIV currently living in New Zealand (both those under and not under active follow-up), a review was undertaken of the 330 enhanced surveillance reports - introduced in 1996 for new diagnoses of HIV infection[2] - received between January 1996 and December 1999. The notifying clinicians of those people without evidence of being followed and who were not known to have died, were contacted in September 2001 to determine whether they were still in New Zealand, and to ascertain their current status with respect to clinical care. Statistical analysis was undertaken using EpiInfo™ 2000. Means of HIV RNA were calculated after log transformation. The Kruskal-Wallis test and Mantel-Haenszel Chi squared test were used where appropriate.

Results

Characteristics of the cohort. A total of 593 individuals met the definition of being under active follow-up. Of these, 480 (81%) were male and 113 (19%) female (Table 1). The mean

age for those sixteen years and over was 41.2 years for men and 34.2 years for women ($p < 0.0001$). There were ten children under sixteen years. Africans were disproportionately represented; 13% as against <0.2% of New Zealand residents.[5] African women made nearly a third of the infected women (Table 1). The commonest mode of transmission was male homosexual contact (56%), followed by heterosexual contact (28%). The frequency of injecting drug use (3%) and mother-to-infant transmission (1%) was low. There were considerable differences across ethnic groups with 89% of African men and 48% of Asian men acquiring HIV infection through heterosexual contact compared with 7% of European men. The clinical care of 93% of the 593 individuals occurred in four locations: Auckland (56%), Wellington (19%), Christchurch (12%) and Hamilton (6%).

Treated individuals. 419 (71%) of the cohort were currently on any anti-retroviral therapy with 373 (89%) of these receiving HAART. Among those treated, the latest HIV viral load result was below 400 copies/mL (<2.6 $\log_{10}$) in 62% (Table 2). Response to therapy did not show a gender difference as reflected by mean $\log_{10}$ HIV viral load (male 2.6 vs female 2.5; $p = 0.46$) and mean $CD4^+$ lymphocytes/mm^3 (male 455 vs female 476; $p = 0.58$). $CD4^+$ lymphocyte count and HIV viral load differences were not observed after stratification by ethnicity and mode of transmission (data not shown). Of the 196 individuals with $CD4^+$ lymphocyte counts below 350/mm^3, 158 (80.6%) were on anti-retroviral therapy.

Untreated individuals. 174 individuals were not receiving anti-retroviral therapy. Among the untreated, men had higher mean $\log_{10}$ HIV viral load than women (4.2 vs 3.8; $p = 0.003$) while differences were not seen in mean $CD4^+$ lymphocyte counts between men and women (507/mm^3 vs 462/mm^3; $p = 0.32$). Table 3 shows the demographic characteristics of untreated individuals by $CD4^+$ lymphocyte count. The proportion with a $CD4^+$ lymphocyte count below 350/mm^3 is shown because current guidelines[3] suggest limiting the offer of anti-retroviral therapy to these individuals. 38 of the untreated individuals had $CD4^+$ lymphocyte counts below this value with no evidence for any barrier to treatment by gender, ethnicity or mode of transmission.

Those at high risk of opportunistic infections. $CD4^+$ lymphocyte counts less than 200/mm^3 indicate significant immunosupression and increased risk of developing opportunistic infections. 77 subjects (13%) had counts of less than 200/mm^3 with 59 of these (77%) receiving anti-retroviral therapy. Only eighteen patients (12 male, 6 females) with $CD4^+$ lymphocyte counts below 200/mm^3 were not receiving therapy. There was no evidence of a gender or ethnicity bias in these individuals. Thirteen of these eighteen patients had very high HIV viral loads (>4.8 $\log_{10}$ copies/mL).

Estimate of total diagnosed HIV infected individuals living in New Zealand. Of the 330 individuals reported to the AIDS Epidemiology Group between January 1996 and December 1999 with newly diagnosed HIV, 206 were included in our audit, and 30 were known to have died. The clinicians who provided the original information were approached in September 2001 for further information on the remaining 94 individuals. Of these, 22 were reported to be overseas while seventeen had been reviewed in the previous twelve-month period. Further information was not received on the remaining 55. The demographic characteristics of these 55 individuals were similar to those of the 330 enhanced surveillance reports with respect to gender, ethnicity and mode of transmission rates (data not shown).

We used these findings to calculate upper and lower limits of the proportion of people diagnosed with HIV alive in New Zealand in 2000. If all 55 people diagnosed in that period for whom no information was obtained were living in New Zealand then our audit would have included 74% (206/278) of those diagnosed in that period. If none were still living in New Zealand, the proportion included in our audit would have been 92% (206/223). Assuming that the same proportions could be applied to the 593 diagnosed people within this audit, the number of HIV diagnosed cases living in New Zealand at the end of September 2000 would be between 644 and 801.

Table 1. Demographic characteristics and presumed mode of transmission for the cohort.

Age Group (years)	Male n=480		Female n=113		Total n=593	
<16	4	(1%)	6	(5%)	10	(2%)
16-29	46	(10%)	33	(29%)	79	(13%)
30-39	191	(40%)	49	(43%)	240	(41%)
40-49	143	(30%)	18	(16%)	161	(27%)
>49	96	(20%)	7	(6%)	103	(17%)
Ethnicity						
European	317	(66%)	42	(37%)	359	(61%)
Maori	42	(9%)	7	(6%)	49	(8%)
Pacific Is	11	(2%)	7	(6%)	18	(3%)
African	42	(9%)	37	(33%)	79	(13%)
Asian	29	(6%)	10	(9%)	39	(7%)
Other	11	(2%)	1	(1%)	12	(2%)
Unknown	28	(6%)	9	(8%)	37	(6%)
Mode of Transmission						
Male homosexual contact	334	(70%)	-		334	(56%)
Heterosexual contact	84	(18%)	83	(74%)	167	(28%)
Injecting drug use	11	(2%)	6	(5%)	17	(3%)
Mother to child	3	(1%)	3	(3%)	6	(1%)
Receipt of blood/products	12	(2%)	3	(3%)	15	(3%)
Other/undetermined	36	(7%)	18	(16%)	54	(9%)
Location of Care						
Auckland	266	(55%)	64	(57%)	330	(56%)
Hamilton	24	(5%)	9	(8%)	33	(6%)
Wellington	91	(19%)	24	(21%)	115	(18%)
Christchurch	63	(13%)	9	(8%)	72	(12%)
Other	36	(7%)	7	(6%)	43	(7%)

Ethnicity of New Zealand Population: European 79.9%, Maori 14.7%, Pacific Is 6.4%, African <0.2%, Asian 6.6%. NZ Census Data 2001.[5]

Table 2. Relationship between antiretroviral treatment, HIV viral load and CD4+ lymphocyte count.

	Untreated n=174		Treated n=419		Total n=593	
HIV viral load (log_{10} copies/mL)						
<1.7	5	3%	218	52%	223	38%
1.7-2.6	5	3%	43	10%	48	8%
2.6-3.3	16	9%	35	8%	51	9%
3.3-4.0	41	24%	40	10%	81	14%
4.0-4.8	68	39%	49	12%	117	20%
>4.8	39	22%	32	8%	71	12%
Missing			2		2	
Mean Log_{10}	4.1		2.6		3.1	
CD4 lymphocyte/mm^3						
<50	5	3%	13	3%	18	3%
50-199	13	8%	46	11%	59	10%
200-499	68	39%	189	45%	257	43%
>500	70	49%	152	36%	222	37%
Missing	18	10%	19	5%	37	6%
Mean	495		459		471	

Table 3. Characteristics of the 174 untreated individuals by CD4+ lymphocyte count (per mm^3).

	CD4<350 n=38	CD4 ≥350 n=118	Missing CD4 n=18
Male	27	85	11
Female	11	33	7
European	20	67	8
Maori	5	3	2
Pacific Is	1	3	1
African	7	23	1
Asian	3	10	1
Other	0	2	0
Unknown	2	10	5
Male homosexual contact	18	51	6
Heterosexual contact	12	45	6
Injecting drug use	3	3	0
Mother to child	0	1	0
Receipt of blood/products	1	3	0
Other/undetermined	4	15	6

Discussion

This national audit is the first attempt to ascertain the number, demographic characteristics and clinical state of diagnosed HIV infected individuals under active follow-up and currently living in New Zealand. The approach taken reduces the potential for bias that may be associated with reports from more selected cohort populations. In defining active follow-up for our study population, the assumption was made that HIV viral load testing would be undertaken as part of care at least once during the first nine months of 2000. This practice would be consistent with current guidelines[3] that recommend the measurement of plasma HIV viral load levels every 3-4 months. The observation that only two individuals receiving anti-retroviral therapies did not have an HIV viral load result during the study period suggests that New Zealand clinicians are following these recommendations for treated individuals. The requirement for an HIV viral load test to be undertaken within the first nine months of 2000 for inclusion in our cohort has excluded a small number of untreated subjects as indicated by the 'reappearance' of seventeen individuals in the twelve months after September 2000.

This study reflects the epidemiology and medical management of the diagnosed HIV infected population alive during 2000 and highlights a major shift in the characteristics of New Zealand's HIV infected population in recent years. Compared with AIDS notification data from the first seven years of the epidemic (1983-89)[4] the proportion of males under care for HIV infection is 81% (previously 97%), while the proportion of European, Maori or Pacific Island combined has fallen from 93% to 72%. Although male homosexual contact remains the major mode of transmission, this has fallen from 88% to 56% over the last decade. The increase in number of women diagnosed with HIV will have an ongoing impact on the nature of New Zealand's epidemic and will require new preventive strategies including efforts to avert perinatal HIV transmission. The number of HIV infected migrants from high prevalence countries has risen considerably in recent years.[5] This has created a number of challenges for both the clinicians providing clinical care and the associated support services as a result of cultural, religious and language differences.

The optimal time to initiate antiretroviral therapy remains uncertain with ongoing vacillation between aggressive and conservative approaches. Current guidelines[3] suggest that patients with fewer than 350 CD4+ lymphocytes/mm^3 should be offered therapy. In our cohort, 71% were currently receiving anti-retroviral therapy, which is slightly lower than the 78% treatment uptake rate during 2000 within the Australian HIV Observational Database[6] but higher than the 62% on therapy during 2000 within the Royal Free Hospital, London cohort of over 1000 patients (C Sabin, personal communication.) Evidence of barriers to therapy related to gender, ethnicity or mode of transmission were not seen with uptake rates among those with CD4+ lymphocyte counts below 350/mm^3 being similar. The sex difference in HIV viral load results among untreated patients has been noted in previous studies and is considered to have a biological basis.[7] Of those currently on treatment in New Zealand, 62% have HIV viral loads of less than 400 copies/mL. HIV virological control did not differ by gender, ethnicity or among subjects with differing modes of transmission. The reduction in HIV virological burden in New Zealand's treated population is comparable to cohort data during 2000 from the Australian HIV Observational Database (64% with HIV viral load <400 copies/mL)[6] and Royal Free Hospital (78% with HIV viral load <500 copies/mL, C Sabin, personal communication). The degree of virological control is extremely important, as the sustained reduction in HIV viral load is the strongest single predictor of an optimistic long-term clinical outcome.

The finding of only 13% of individuals with CD4+ lymphocyte counts less than 200/mm^3 is encouraging. It is this group who are most at risk of developing opportunistic infections and at greatest risk of death. The majority of the highly immunosuppressed individuals were on therapy with the expectation of immune reconstitution.

The final objective of this study was to estimate the number of people diagnosed with HIV living in New Zealand in 2000. We attempted to determine whether individuals previously found to be HIV infected continued under regular follow-up as defined by the performance of regular HIV viral load tests. 17% of the 330 reported individuals were unaccounted for, although a number of these may no longer be living in New Zealand or may have died. The demographic characteristics of the 55 'lost' individuals was similar to the 330 enhanced surveillance individuals suggesting that becoming 'lost' to care is not selective for any particular grouping. Anecdotal reports however have suggested that some individuals have excluded themselves from clinical care. There is considerable concern from both an individual and public health perspective for those with diagnosed HIV infection who are not receiving ongoing clinical care.

At the end of 1998, based on the number of individuals diagnosed with HIV and those with AIDS who had died or left the country, a calculation of 770 people living with diagnosed HIV in New Zealand was made.[8] The estimate for 30/9/2000 using the same calculation was 915 (AIDS Epidemiology

Group data). The true number is likely to be lower than previous estimates with an upper limit of 801 determined in this study. The discrepancy is probably the result of numbers of HIV infected people no longer residing in New Zealand. This re-evaluation of the estimate should not draw attention away from the fact that the number of HIV infected individuals requiring care continues to increase and that this study has not addressed the numbers in New Zealand with unrecognised HIV infection.

In conclusion, this study has revealed that anti-retroviral therapy is being used effectively within New Zealand's HIV infected population with rates of virological control in the complete New Zealand treated population similar to more selected cohorts. Effective treatment combined with the low number of people with significant immunosuppression is likely to continue the trend of low rates of opportunistic infections and early death in HIV diagnosed individuals under care.[9] It appears that the number of HIV infected individuals in New Zealand who have been lost to regular follow-up by clinicians with experience in treating HIV infection is at the most 26%, but is probably considerably lower than this. The significant epidemiological shift in mode of transmission in recent years requires a re-evaluation of the current control strategies if New Zealand is to continue to enjoy its status as a low prevalence country. Particular attention should be given to control spread within and from new immigrant communities arriving from high prevalence areas. The speed with which HIV can spread through a community leaves no room for complacency. It is essential that ongoing HIV surveillance is performed to monitor future changes as well as to guide an effective response.

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effect is widespread and has been shown to be comparable to