Twenty years of HIV surveillance in the Pacific – what do the data tell us and what do we still need to know?

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Abstract

Background:

Most Pacific Island countries and territories (PICTs) provide some level of HIV testing for their populations and record demographic data for diagnosed cases of HIV and AIDS. These routine HIV data are usually held within the national Department/Ministry of Health or National AIDS Council. Summary HIV data can illustrate important trends in HIV infection over time and by age, gender and exposure. For some countries no other data are available to illustrate the extent and distribution of HIV infection in the region.

Methods:

Annual HIV and AIDS data were requested from all PICT reporting authorities disaggregated by year, age group, sex and exposure. Data were grouped to provide regional and sub-regional totals. Descriptive statistics were reported, including age-adjusted rates and trends.

Results:

The first cases of HIV in the Pacific were reported in the mid-1980s in all three sub-regions (Melanesia, Micronesia and Polynesia). Many early cases were acquired either by men who have sex with men (MSM) or by recipients of blood products. Some early cases migrated from outside the region. Since then numbers have increased, with 12,169 HIV cases reported across the Pacific to December 2004, including 2,335 AIDS cases and 617 AIDS-related deaths. The majority have been observed in Papua New Guinea (PNG) – 11,139 HIV, 1,926 AIDS and 353 AIDS deaths). Other countries with relatively high HIV rates are New Caledonia, French Polynesia, Guam and Kiribati. Fiji, despite a high case count (182), has a mid-range rate of HIV infection due to its large population. Zero or very few cases have been reported in many other PICTs.

Nearly two thirds of HIV cases have been diagnosed in the predominant risk group – young, sexually active adults. The ratio of male to female cases is 1.1 to 1 (2.5 to 1 excluding PNG), much lower than in countries like Australia (14.2) and New Zealand (5.5) where MSM predominates exposure. Rates of observed cases in women and young people are increasing with heterosexual contact being an increasingly important mode of spread. Other exposures include injecting drug use (mostly imported), perinatal transmission (rising more recently with increased heterosexual risk) and blood exposures.

Discussion:

Apart from Papua New Guinea (PNG), which is currently experiencing an exponential increase in HIV infection, observed rates for most of the Pacific are currently low, and are either static or rising very slowly. Low observed HIV prevalence in pregnant women lends some support for this observation. However these data do not reflect the total HIV disease burden due to variable access to and uptake of testing, and incomplete notification. Several factors make the Pacific vulnerable to rapid spread such as close proximity to countries with high HIV prevalence, increasing migration, both in and outward, and expanding economic links with other regions. High levels of STIs and risk behaviours across the Pacific indicate significant potential for rapid spread where HIV is introduced. Efforts are currently under way to improve routine screening, complement with targeted surveillance surveys of at-risk and vulnerable groups. This expanded monitoring of HIV trends is designed to guide increasing efforts to prevent and control HIV in the region. (PHD, 2005 Vol 12 No 2 Pages 23 -37)

Introduction

Testing for human immunodeficiency virus (HIV), the virus that causes acquired immune deficiency syndrome (AIDS), is available to a varying extent in nearly all Pacific Island countries and territories (PICTs). All countries that offer testing keep records of diagnosed cases of HIV and AIDS and AIDS-related deaths. Access to HIV testing varies in each country. Often it is only available in central locations, with many remote communities having no direct access to testing. Testing uptake is variable, dependent upon community awareness and also attitudes – mainly due to concerns over confidentiality, and stigma and discrimination associated with an HIV or AIDS diagnosis. Apart from 'walk-in' testing, most PICTs also have in place a variety of HIV screening programmes for certain types of patients or population sub-groups. Antenatal/prenatal testing is usually offered to all pregnant women. Countries sourcing their blood product supplies in-country usually screen for HIV and hepatitis B virus (HBV). Other clinic-based and population groups

are tested to varying extents, including TB patients, sexually transmissible infection (STI) patients, migrant workers, students, prospective government employees and seafarers in some countries.

The above variations in testing access and practice mean that HIV and AIDS statistics reflect country-level HIV disease burden to a variable extent. In no country does routine reporting of HIV or AIDS include complete enumeration of all cases. However, for some countries this passive surveillance provides the only available data for illustrating the extent of HIV and which population sub-groups are most affected. Recently a round of second-generation HIV, STI and behavioural surveillance surveys (SGS) has commenced in the Pacific. This will complement routine testing and provide more detailed information on particular at-risk and vulnerable groups.

This paper summarises the routine reported HIV and AIDS case data for the Pacific. It identifies the major trends in time, age, sex and exposure within the region. Some comparisons are drawn between Pacific sub-regions, and with reported rates of infection in some neighbouring countries. The gaps in our knowledge about HIV in the region are identified and recommendations made regarding strengthening current surveillance activities.

Methods

PICT HIV, AIDS and population data

Reported cases of HIV, AIDS and AIDS-related deaths were collected for all PICTs (excluding Hawaii) and for Australia and New Zealand to enable comparative analyses. Data were requested from the official reporting authority in each country, usually within the national Department/Ministry of Health (DoH/MoH), e.g. Public Health, Health Statistics sections or HIV/STI vertical programmes. Papua New Guinea (PNG) data are currently managed by the National AIDS Council.

Password-protected spreadsheets were used to record annual case counts disaggregated by gender, age group (five-year age bands to 60+ years) and exposure/risk categories. Exposures were categorised as heterosexual, male-to-male sex (MSM), injecting drug use (IDU), blood, perinatal exposure, other (known) and unknown. A few men (<5) recorded as both MSM and IDU were included within IDU totals. PICT age-specific population counts were obtained from the Demography Section of the Secretariat of the Pacific Community (SPC). Australian and New Zealand age-specific population counts were obtained from the US Census Bureau.[1]

All data were forwarded to the HIV/AIDS & STI Surveillance Specialist within SPC for collation and analysis. Country data were aggregated to produce regional statistics for all PICTs combined and all PICTs excluding PNG. Sub-regional data were compiled for Melanesian, Micronesian and Polynesian countries to examine sub-regional variation. Age, sex, year and exposure trends were summarised and charted. Epi Info (v3.3) data analysis software[2] was used to calculate the cumulative incidence of HIV and AIDS per total country and regional populations (crude and direct age-adjusted rates), and direct rate ratios (individual country rates against the total PICT rate excluding PNG). Associated 95 and 99 per cent confidence intervals (95/99% CIs) were computed around all reported rate and ratio point estimates to indicate the level of certainty in these reported rates.[(a)] Age adjustment was against the World Standard population[3] using methods given in Kerr et al.[4] Confidence intervals were calculated based on the normal approximation of the binomial distribution for HIV or AIDS case counts of 50 or more, and a weighted Poisson method for counts less than 50.

Treatment of missing/unknown values

Complete reported case datasets were obtained for most countries. The numbers of cases in each country with unknown details (gender, age group, exposure) are given in Table 1. Gender details were available for nearly all reported cases – only Marshall Islands, New Caledonia and PNG reported any cases with unknown gender (under 0.5% of cases in each country). HIV case counts for Fiji Islands were reported by 10-year age groups. Five-year age-group counts were estimated by halving the 10-year counts. For PNG a large number of cases (39%) had unknown age groups. PNG cases of unknown age were allocated to five-year age bands proportionally to the distribution of cases of known age to enable age-adjusted rates to be estimated for the total case count. HIV age-group distributions were similarly estimated for a few cases of unknown age in several other countries. No age breakdowns were available for reported AIDS cases for Fiji, Marshall Islands or PNG. Fiji and PNG AIDS cases were allocated to five-year age groups proportionally to other Melanesian-country AIDS-case age distributions, and Marshall Islands cases proportionally to other Micronesian-country AIDS-case age distributions.[(b)] For exposures, three quarters of PNG's reported cases were of unknown exposure category and several other countries had high rates of

(a) All rates and associated confidence intervals relate to reported cases only. Actual disease rates are expected to be higher due to unknown numbers of undiagnosed cases.

(b) It is possible that persons of unknown age may be older than persons of known age (dates of birth and ages being less well recorded in the past). This would tend to inflate age-adjusted rates. However, in many instances poor recording is likely to have occurred regardless of age. The above age-group estimations reduce certainty of age-adjusted rates, but the effect is in the main conservative, reducing observed differences between countries.

Table 1: Cumulative reported HIV, AIDS and AIDS death cases, incidence rates, gender and cases with missing details, all Pacific Island countries and territories, Australia and New Zealand to December 2004

Country / Region	Mid-year population (2004)	Cumulative cases			Cumulative HIV incidence		Gender (HIV)		Missing details (HIV)		
		HIV (including AIDS)	AIDS (incl. deaths)	AIDS related deaths	Crude rate per 100,000 (99% CIs)	Age-adjusted rate per 100,000 (99% CIs)	M	F	Sex	Age†	Exposure
MELANESIA	**7,444,100**	**11,600**	**2,061**	**422**	**155.8 (152.1 to 159.6)**	**151.1 (147.4 to 154.8)**	**5,674**	**5,276**	**650**	**4,436**	**8,693**
MELANESIA (excluding PNG)	**1,748,800**	**461**	**135**	**69**	**26.4 (23.2 to 29.5)**	**25.3 (22.2 to 28.4)**	**311**	**147**	**3**	**12**	**26**
Fiji Islands	836,000	182	30	17*	21.8 (17.6 to 25.9)	19.9 (16.1 to 23.7)	109	73	0	1	2
New Caledonia	236,900	272	101	50	114.8 (96.9 to 132.7)	100.9 (84.9 to 117.0)	200	69	3	11	24
Papua New Guinea	5,695,300	11,139	1,926	353	195.6 (190.8 to 200.4)	191.2 (186.4 to 196.0)	5,363	5,129	647	4,424	8,667
Solomon Islands	460,100	5	2	2	1.1 (0.2 to 3.1)	1.2 (0.3 to 3.3)	2	3	0	0	0
Vanuatu	215,800	2	2	0	0.9 (0.0 to 4.3)	0.8 (0.0 to 3.5)	0	2	0	0	0
MICRONESIA	**536,100**	**286**	**159**	**116**	**53.3 (45.2 to 61.5)**	**47.9 (40.4 to 55.3)**	**213**	**69**	**4**	**18**	**59**
Federated States of Micronesia	112,700	25	15	12	22.2 (12.4 to 36.4	21.4 (12.0 to 35.2	14	11	0	6	8
Guam	166,100	168	97	67	101.1 (81.1 to 121.2)	89.5 (71.5 to 107.4)	145	23	0	0	34
Kiribati	93,100	46	28	23	49.4 (32.7 to 71.5)	49.3 (32.6 to 71.3)	30	16	0	8	8
Marshall Islands	55,400	10	2	2	18.1 (6.7 to 38.6)	16.5 (6.1 to 35.2)	3	3	4	4	4
Nauru	10,100	2	1	1	19.8 (1.0 to 91.8)	16.6 (0.9 to 76.8)	2	0	0	0	1
Northern Mariana Islands	78,000	27	12	8	34.6 (19.9 to 55.8)	24.8 (14.2 to 39.9)	14	13	0	0	4
Palau	20,700	8	4	3	38.6 (12.4 to 89.7)	27.2 (8.7 to 63.1)	5	3	0	0	0
POLYNESIA	**635,750**	**283**	**115**	**79**	**44.5 (37.7 to 51.3)**	**44.6 (37.7 to 51.6)**	**202**	**81**	**0**	**1**	**5**
American Samoa	62,600	3	1	0	4.8 (0.5 to 17.5)	4.2 (0.5 to 15.3)	2	1	0	0	0
Cook Islands	14,000	2	0	0	14.3 (0.7 to 66.2)	12.7 (0.7 to 58.7)	1	1	0	0	0
French Polynesia	250,500	243	94	61	97.0 (81.0 to 113.0)	89.9 (74.8 to 104.9)	175	68	0	0	4
Niue	1,600	0	0	0	-	-	0	0	0	0	0
Pitcairn Islands	50	0	0	0	-	-	0	0	0	0	0
Samoa	182,700	12	8	8	6.6 (2.7 to 13.2)	7.2 (3.0 to 14.5)	8	4	0	0	0
Tokelau Islands	1,500	0	0	0	-	-	0	0	0	0	0
Tonga	98,300	13	9	8	13.2 (5.7 to 25.9)	14.5 (6.2 to 28.4)	7	6	0	1	1
Tuvalu	9,600	9	2	2	93.8 (32.6 to 208.3)	102.7 (35.7 to 228.1)	8	1	0	0	0
Wallis and Futuna	14,900	1	1	0	6.7 (0.0 to 49.9)	5.3 (0.0 to 39.6)	1	0	0	0	0
All PICTs	**8,615,950**	**12,169**	**2,335**	**617**	**141.2 (137.9 to 144.5)**	**136.5 (133.2 to 139.7)**	**6,089**	**5,426**	**654**	**4,455**	**8,757**
All PICTs (excluding PNG)	**2,920,650**	**1,030**	**409**	**264**	**35.3 (32.4 to 38.1)**	**33.6 (30.9 to 36.3)**	**726**	**297**	**7**	**31**	**90**
New Zealand	3,993,817	1,975	845	607	49.5 (46.6 to 52.3)	44.5 (41.9 to 47.1)	1,657	300	18	98	343
Australia*	19,731,984	23,306	9,260	4,521	118.1 (116.1 to 120.1)	110.7 (108.8 to 112.6)	21,476	1,510	260	213	3,716

*Reporting period: to 31 December 2004 except for: Australia (December 2003); Fiji – AIDS-related deaths (December 2001).

†Numbers of cases for whom age was estimated for inclusion within age-adjusted HIV rates.

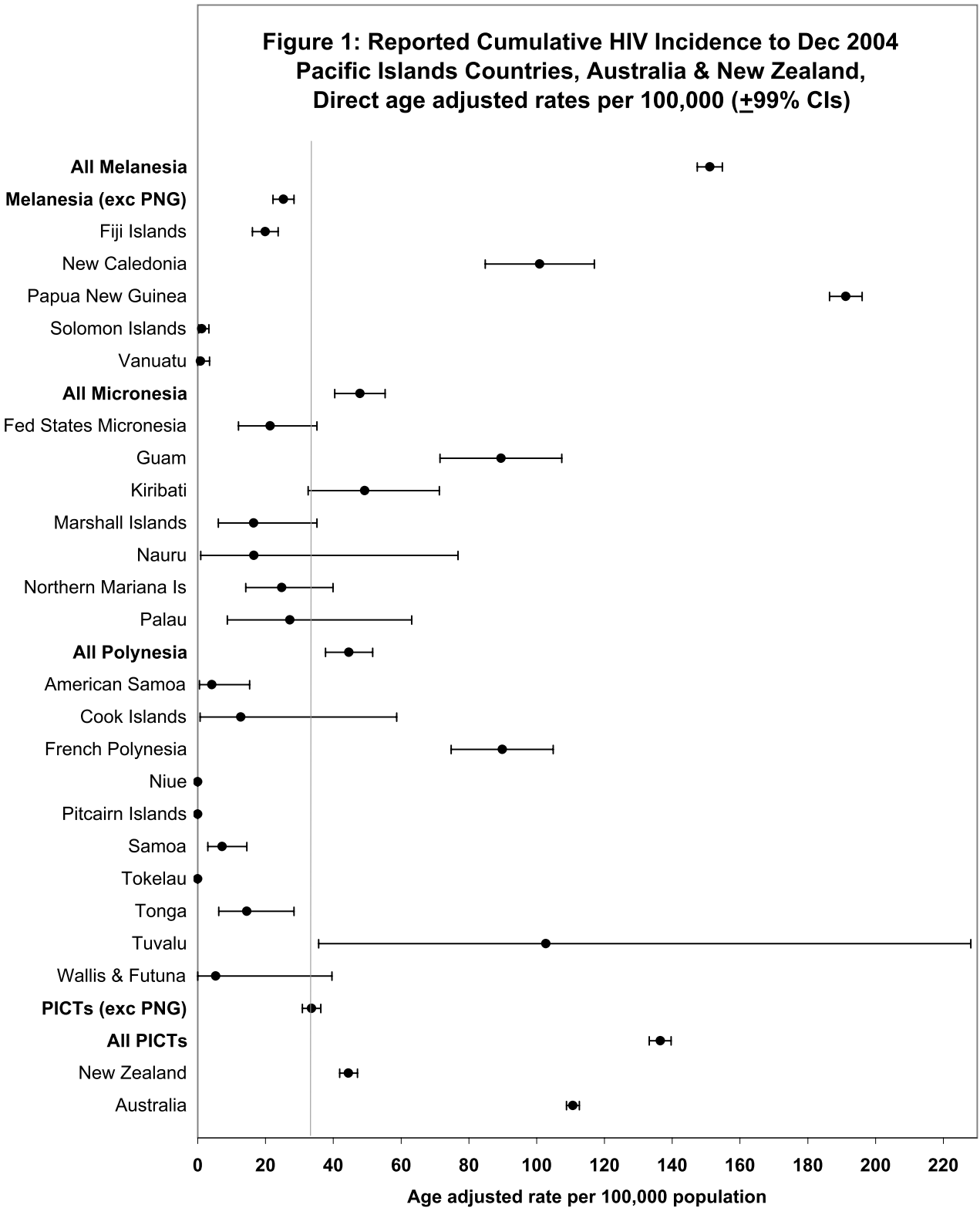
unknown exposure. Cases of unknown exposure were excluded from exposure analyses.

Trends of age-adjusted HIV rates against country per capita gross domestic product (GDP) were examined for any potential influence on rate of HIV infection.

Results

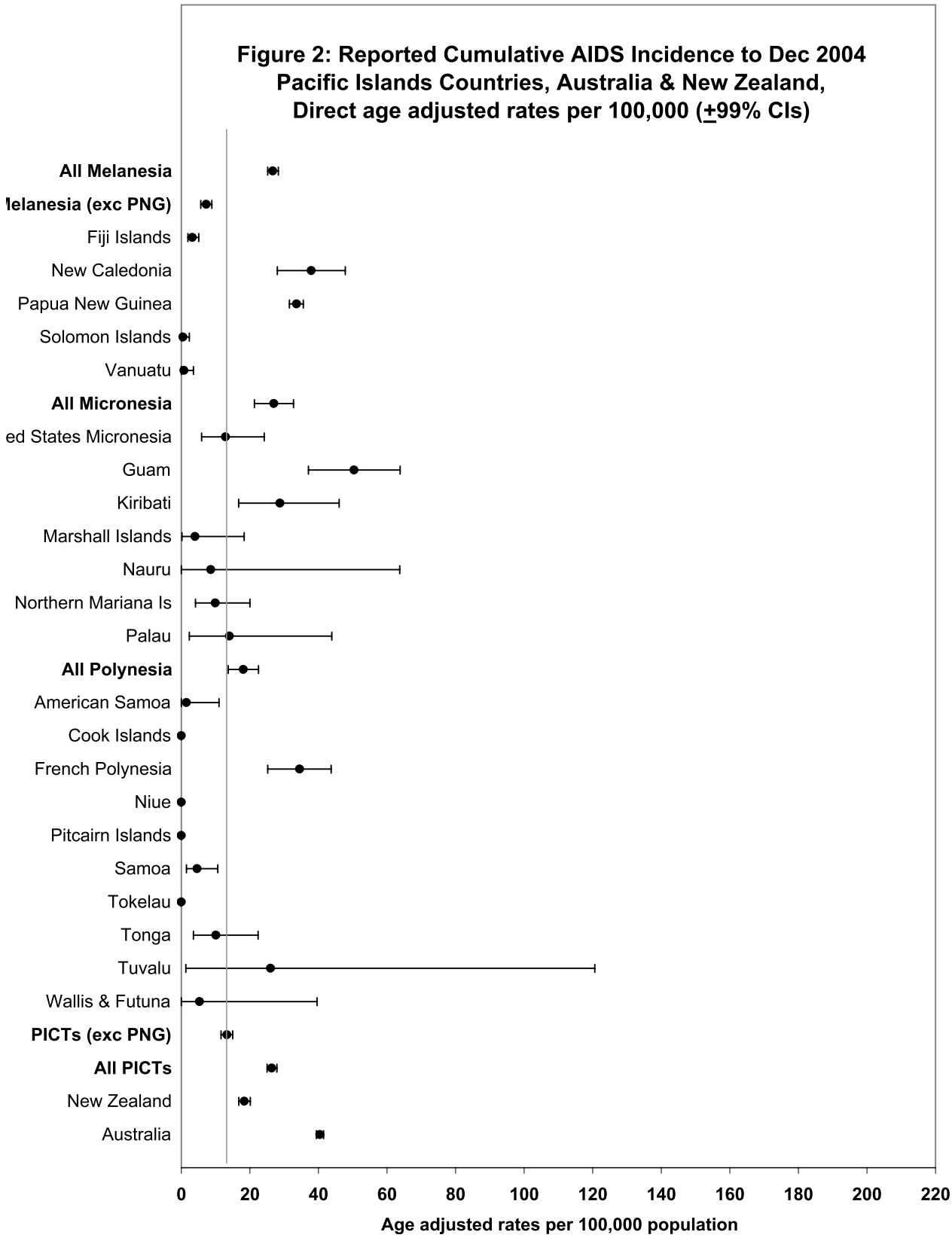
Temporal trends

The first HIV cases in the Pacific were reported in 1984 in the Marshall Islands, within Micronesia. Further cases were reported during the following two years in the French territories of French Polynesia and New Caledonia, and in the US-affiliated country of Guam. PNG diagnosed its



first HIV cases during 1987. Apart from PNG, many early cases of HIV diagnosed in the Pacific were transmitted via MSM or exposure to infected blood products. Some early cases were persons contracting HIV overseas (or receiving blood products from overseas) and were thus imported cases. Little heterosexual transmission was observed among these early reported cases, with this exposure subsequently growing to become the predominant mode of spread (discussed below).

To date, HIV cases have increased slowly in the Pacific but with wide variation (Table 1). Some countries are yet to diagnose any cases (Niue, Pitcairn and Tokelau) and others have diagnosed very few (American Samoa,



Cook Islands, Nauru, Palau, Solomon Islands, Vanuatu, Wallis and Futuna). For other countries numbers are trending upwards, with higher counts in Fiji (182), French Polynesia (243), Guam (168) and New Caledonia (272). PNG has reported the highest number of cases (11,139) and incidence currently continues to climb exponentially. As at December 2004, a total of 12,169 HIV cases have been reported across the Pacific (1,030 outside PNG). This includes 2,335 AIDS cases (409 outside PNG) and 617 AIDS-related deaths (264 outside PNG).

Table 1 and Figure 1 show cumulative, age-adjusted, reported incidence rates of HIV in each PICT, the three Pacific sub-regions, Australia and New Zealand. They illustrate the wide variation in reported cases per capita. It should be stressed that these reported cases do not reflect the underlying disease burden in each country, only the detected cases. The number of undiagnosed cases remains unknown. The highest reported HIV case count and age-adjusted rate is observed in PNG, the only country with a rate higher than neighbouring Australia. Other countries with HIV rates significantly higher than all PICTs combined (apart from PNG) are New Caledonia, French Polynesia and Guam. Tuvalu and Kiribati have high per capita rate estimates but case numbers are small and confidence intervals wide, leaving rates just significantly higher than the regional average for Tuvalu but not so for Kiribati. Higher case detection probably occurs in these two countries via active screening programmes for seafarers. For many other PICTs, rates are significantly below the regional average. Fiji, despite having a relatively high HIV case count (182), has a low per capita rate due to its large population size. Small case counts in many other countries expand confidence intervals, reducing certainty of the observed rate point estimates.

Age-adjusted cumulative incidence rates of AIDS (Figure 2) reflect a similar pattern to HIV, with significantly high rates in PNG (although not as extreme as for HIV), New Caledonia, French Polynesia, Guam and Kiribati. Whilst AIDS is perhaps more likely to be detected than HIV infection due to persons accessing treatment for AIDS-defining illnesses, for some countries AIDS is not well reported by medical practitioners (e.g. Fiji and PNG) and, similar to HIV, the observed counts do not reflect total disease rates.

Figures 3–5 chart the reported trends over time. Figure 3 shows annual HIV case counts in PNG and all other PICTs combined, compared to Australia and New Zealand. It illustrates the more established pattern of infection, especially in Australia, as opposed to the early stages of HIV spread in the Pacific – now rising exponentially in PNG. Figure 4 illustrates reported HIV trends in Pacific sub-regions (excluding PNG), with observed counts climbing in Melanesia (predominantly New Caledonia and Fiji) but not to date in the other

Figure 3: Annual reported HIV Cases, All Pacific Island Countries, Papua New Guinea, Australia & New Zealand (1980 to 2004)

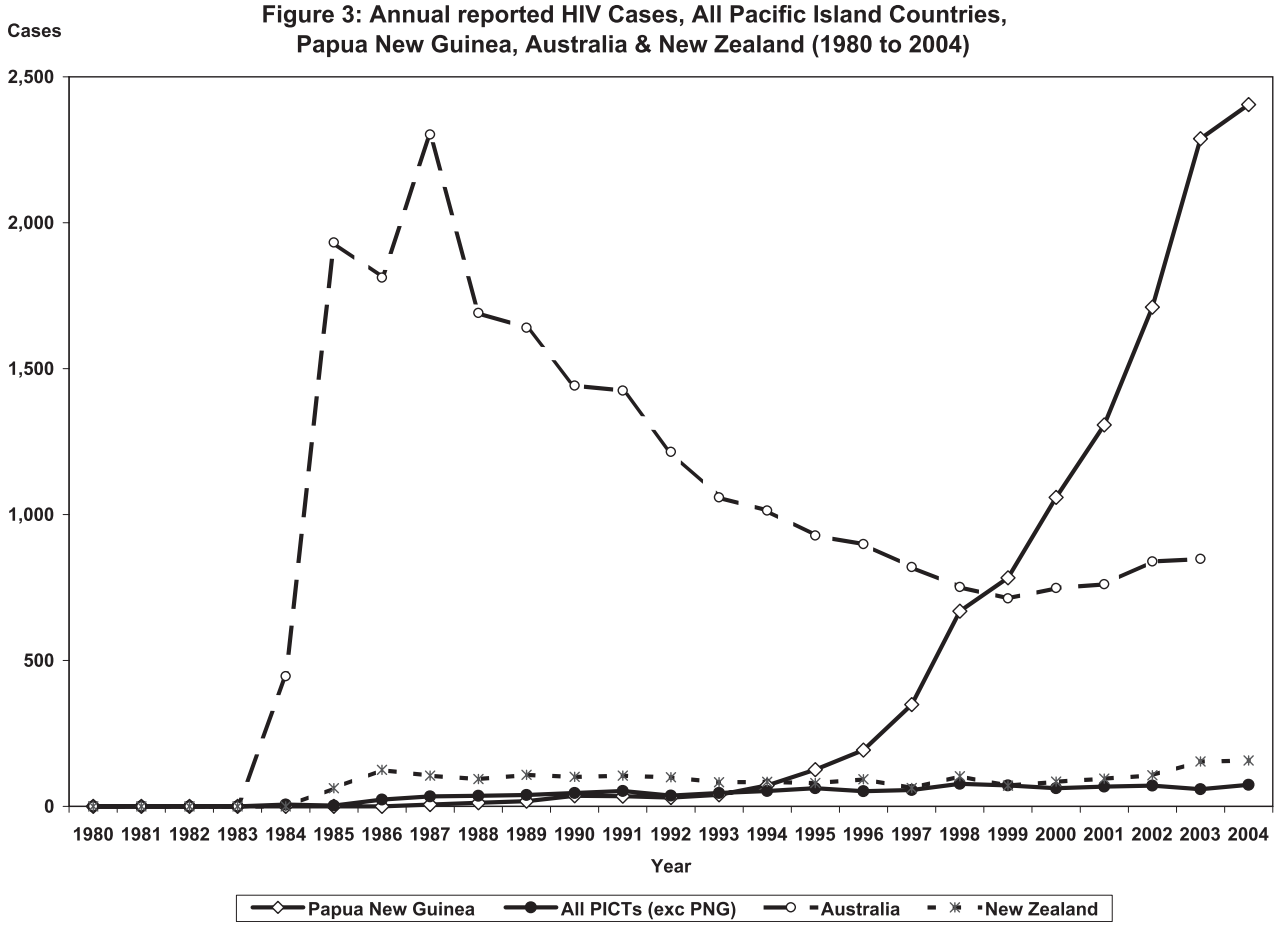
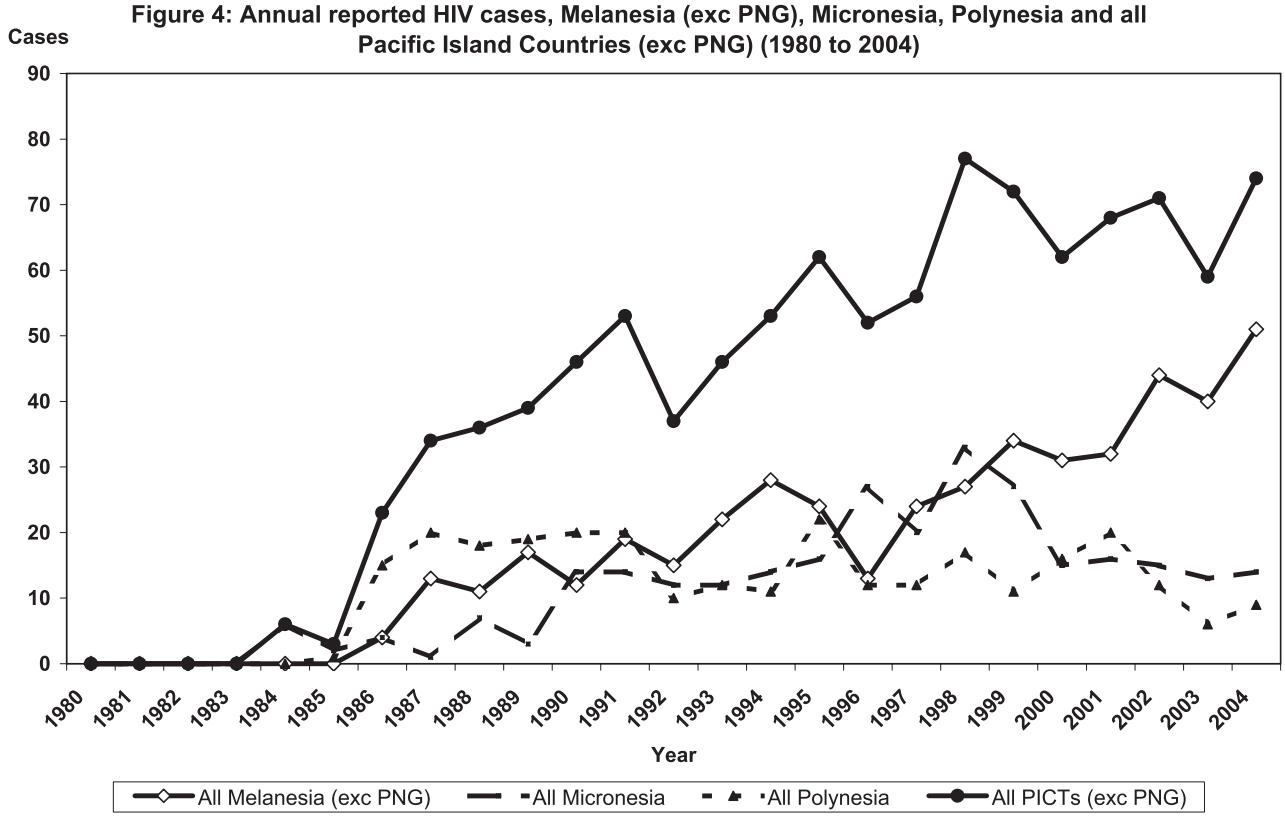


Figure 4: Annual reported HIV cases, Melanesia (exc PNG), Micronesia, Polynesia and all Pacific Island Countries (exc PNG) (1980 to 2004)



sub-regions. Figure 5 shows reported HIV, AIDS and AIDS death counts over time for all PICTs excluding PNG. Despite wide variation between countries, it again suggests steady and low rates of AIDS and AIDS deaths across the region as a whole to date.

Age and sex distributions

A fifth of HIV cases reported in the Pacific are persons aged 25–29 years, with nearly two thirds aged 20–34, reflecting the predominant risk group – sexually active young adults. Figure 6 shows the age–sex distribution of reported HIV cases in PNG and the rest of the Pacific.

Figure 5: Annual reported HIV, AIDS & AIDS death cases, all Pacific Island Countries (exc PNG) (1983 to 2004)

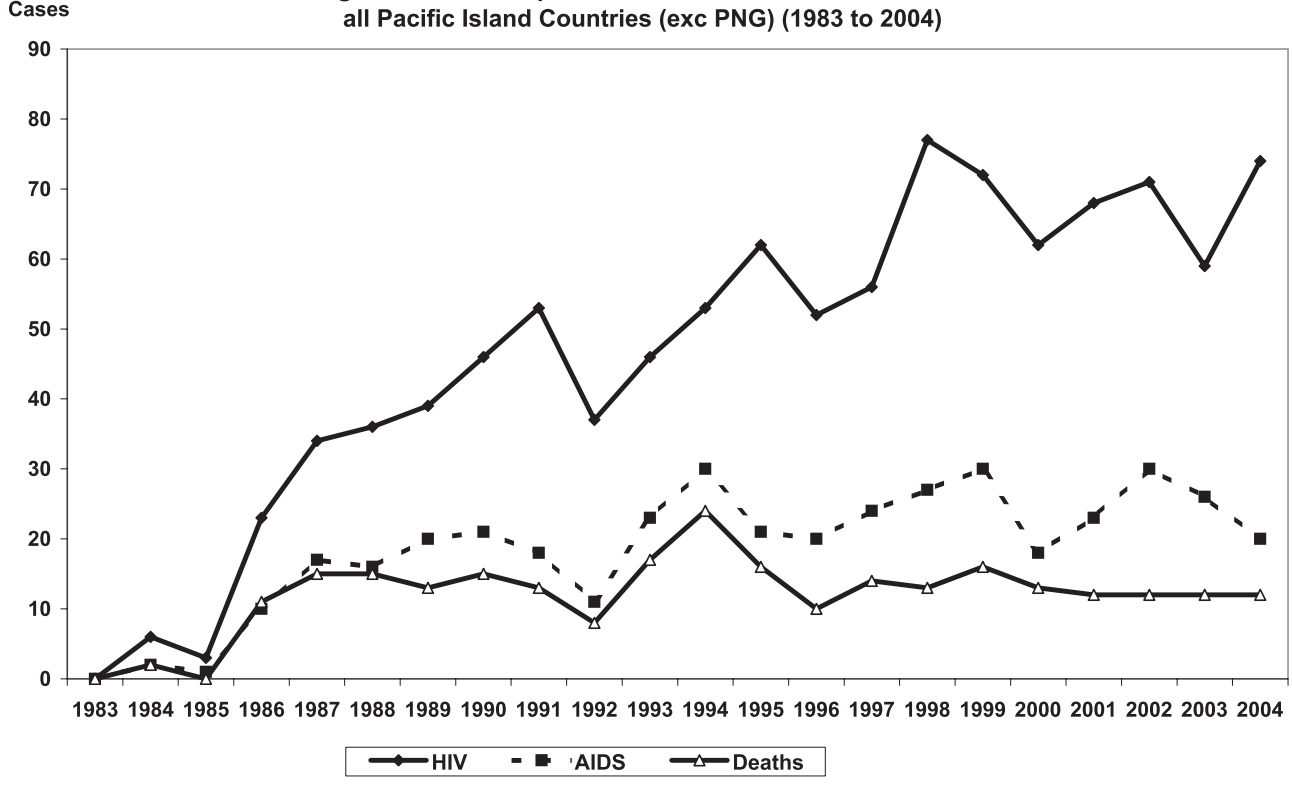


Figure 6: Cumulative HIV Cases by Age and Sex, Papua New Guinea and other PICTs (to December 2004)

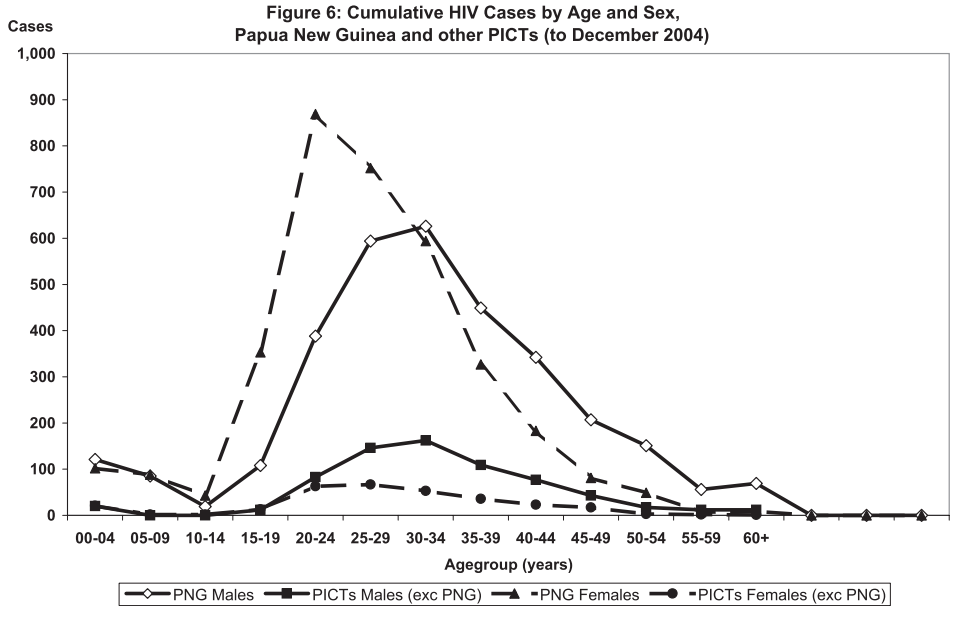


Figure 7a: Male to Female distribution of reported HIV cases, All PICTs (exc PNG), 1980's through to 2004

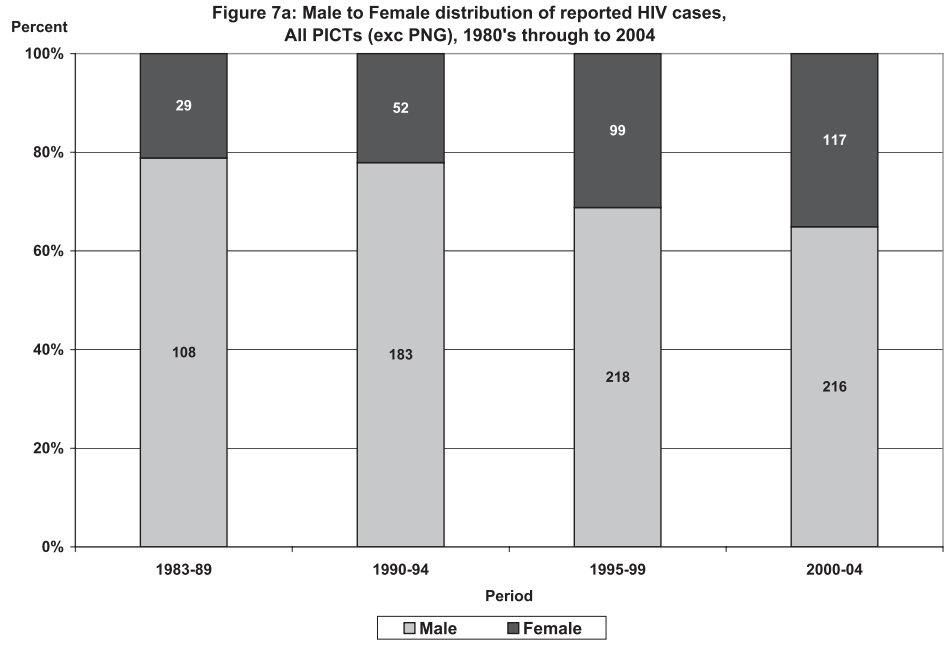


Figure 7b: Age distribution of reported HIV Cases, All PICTs (exc PNG), 1980's through to 2004

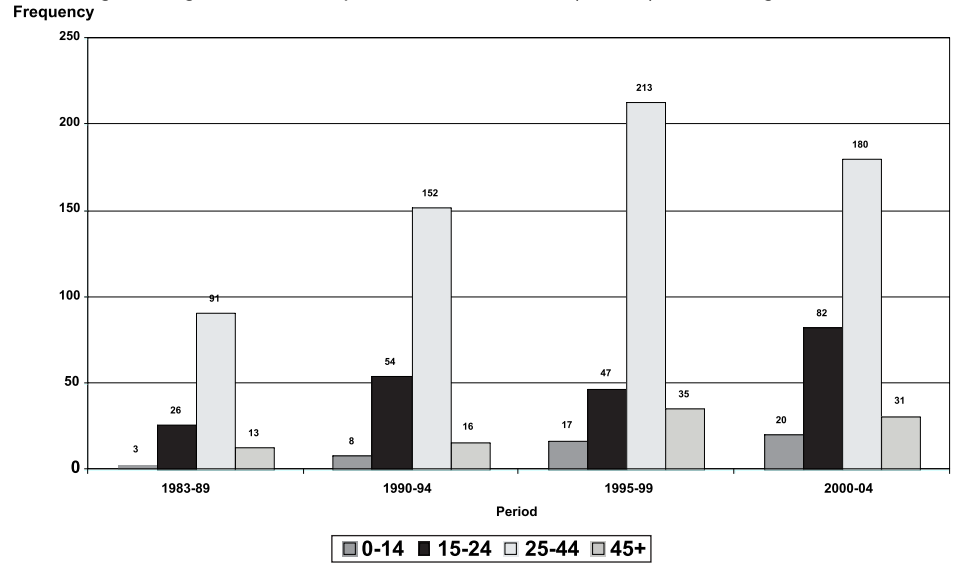


Figure 8.1: HIV exposures in all PICTs (excluding PNG) to December 2004

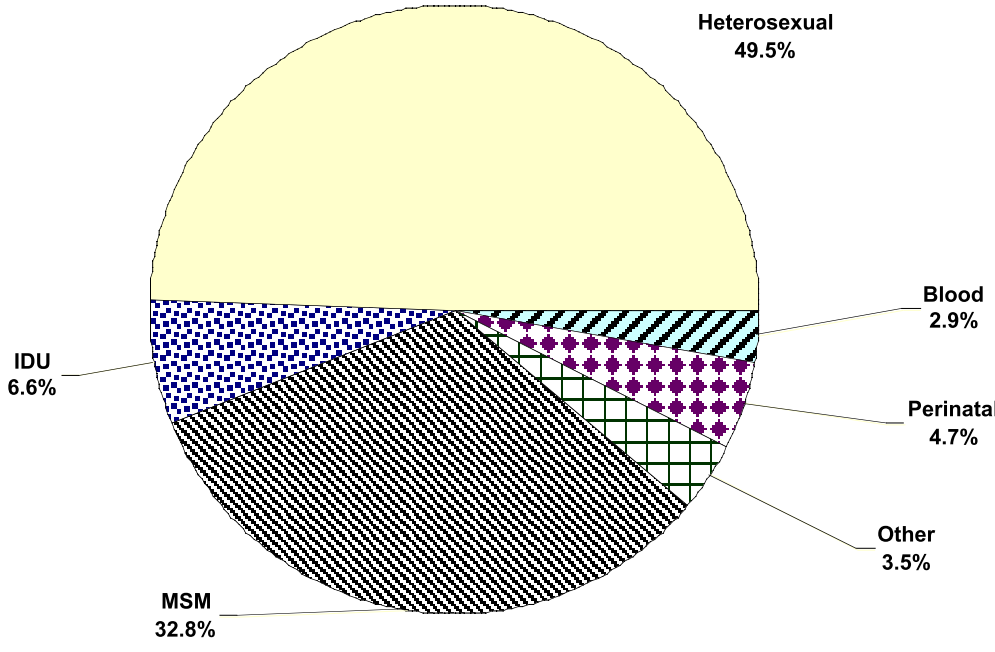
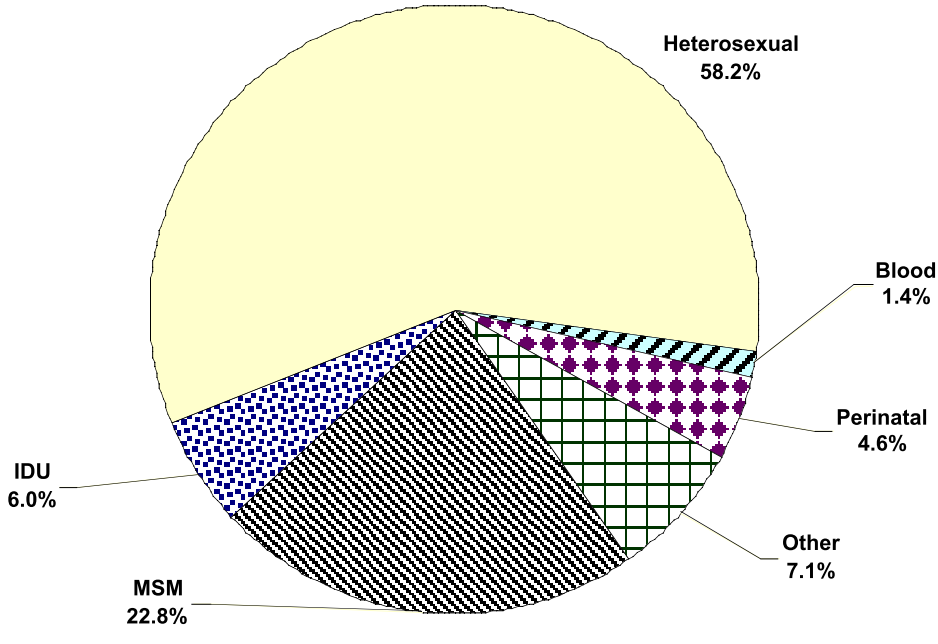


Figure 8.2: HIV exposures in Melanesia (excluding PNG) to December 2004



The peak in observed cases in young women 20–24 years in PNG probably reflects higher case detection via antenatal screening of pregnant women. In other PICTs MSM increases the observed young adult male cases. The overall ratio of male to female HIV cases is 1.1 (2.5 excluding PNG), much lower than in countries like Australia (14.2) and New Zealand (5.5) where MSM exposure predominates. Figures 7a and 7b show trends in gender and age distribution of cases over time. A significantly increasing proportion of females are becoming infected, with 3.7 times more males than females infected in the 1980s, dropping steadily to 1.8 more males than females during the period 2000–2004 (X^2 for trend: 15.39, df=1, $p<0.001$). This illustrates the shifting pattern of infection, with a rise in heterosexual transmission and the greater vulnerability of women as a result of this. Figure 7b shows that whilst most reported cases of HIV occur in adults 24 to 44 years of age, the proportion of youth 15-24 years has increased since 2000 indicating a recent shift to younger people being diagnosed with HIV.

Figure 8.3: HIV exposures in Micronesia to December 2004

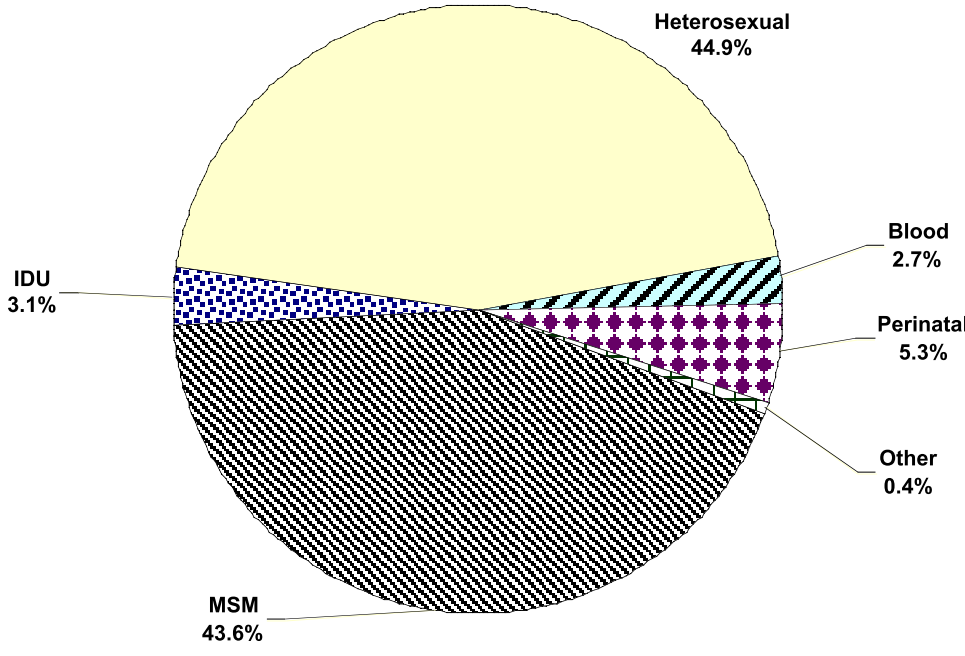
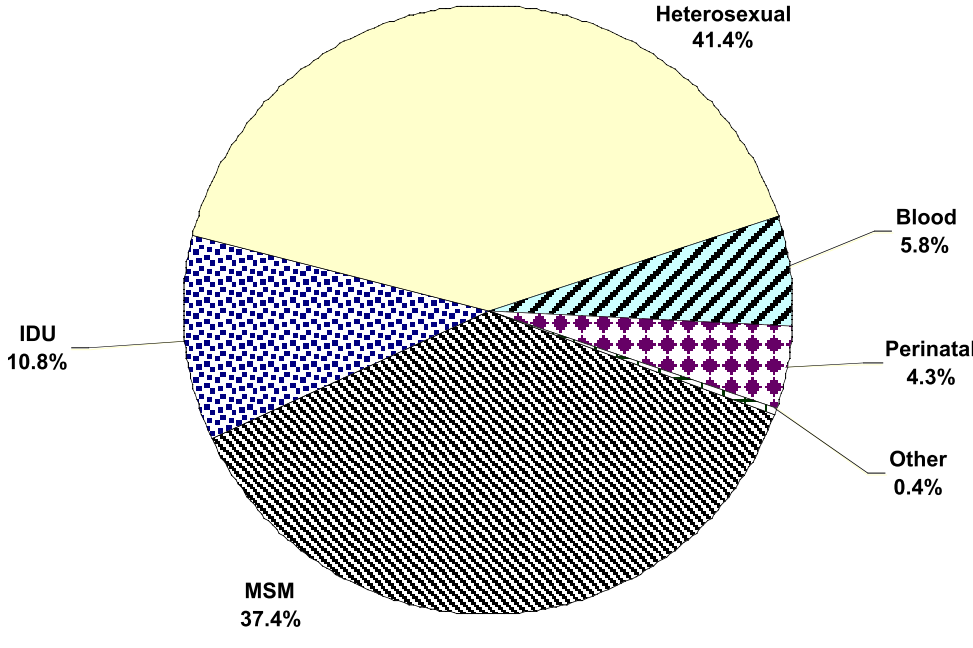


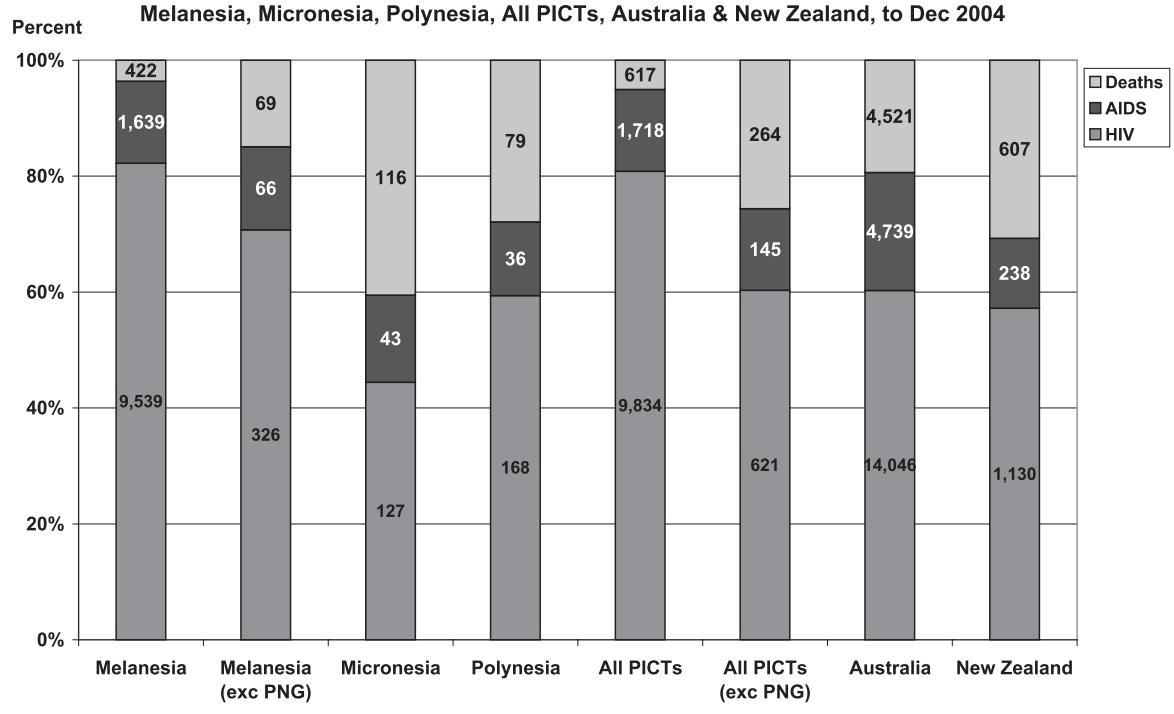
Figure 8.4: HIV exposures in Polynesia to December 2004



Exposure/transmission risks

Whilst exposure data are the least complete for reported HIV cases, some clear patterns emerge. Heterosexual contact accounts for four out of every five cases of known exposure across the Pacific region. Excluding PNG, this drops to half of all cases attributable to heterosexual contact (49.5%), with another third to MSM (32.8%), 6.7% to IDU (mostly imported), 4.7% to perinatal transmission, 2.9% to blood exposures and 3.5% to other known exposures. Levels of reported MSM contact vary between different PICTs and in different sub-regions, with relatively high levels in Guam (64.9%), Tonga (58.3%), French Polynesia (38.5%) and New Caledonia (37.1%), and minimal or zero reported cases via this route in other countries (Fiji, Kiribati, Marshall Islands, PNG, Solomon Islands and Tuvalu). Numbers of cases are too small in many countries to infer any clear MSM exposure patterns. Within sub-regions MSM accounts

Figure 9: Proportion of reported HIV (non-AIDS), AIDS (living) & AIDS deaths, Melanesia, Micronesia, Polynesia, All PICTs, Australia & New Zealand, to Dec 2004



for 43.6% of cases of known exposure in Micronesia, 37.4% in Polynesia and 22.8% in Melanesia excluding PNG (Figure 8). A handful of individual males reported both MSM and IDU. As noted above, a shift has occurred over time from MSM and blood exposure, with a rising proportion of heterosexual transmission. As might be expected, this has been followed by an associated rise in perinatal cases, although numbers are still small.

Ratios of HIV, AIDS and AIDS deaths

Figure 9 compares the proportion of reported HIV (non-AIDS) cases, people living with AIDS (PLWA) and AIDS-related deaths in the Pacific, its sub-regions, Australia and New Zealand. Once HIV infection has progressed and persons succumb to an AIDS-defining illness they may be more likely to seek treatment and be diagnosed, suggesting that enumeration of AIDS cases may be more complete than of HIV. Apart from PNG and with some local variation, ratios of HIV (non-AIDS) to AIDS cases (including deaths) are similar in Australia (1.5), New Zealand (1.3) and PICTs excluding PNG (1.5). The ratio in PNG is 4.8, perhaps indicating either a higher incidence of new HIV infections or lower rates of AIDS case ascertainment – perhaps due to poorer access to health services in remote locations.

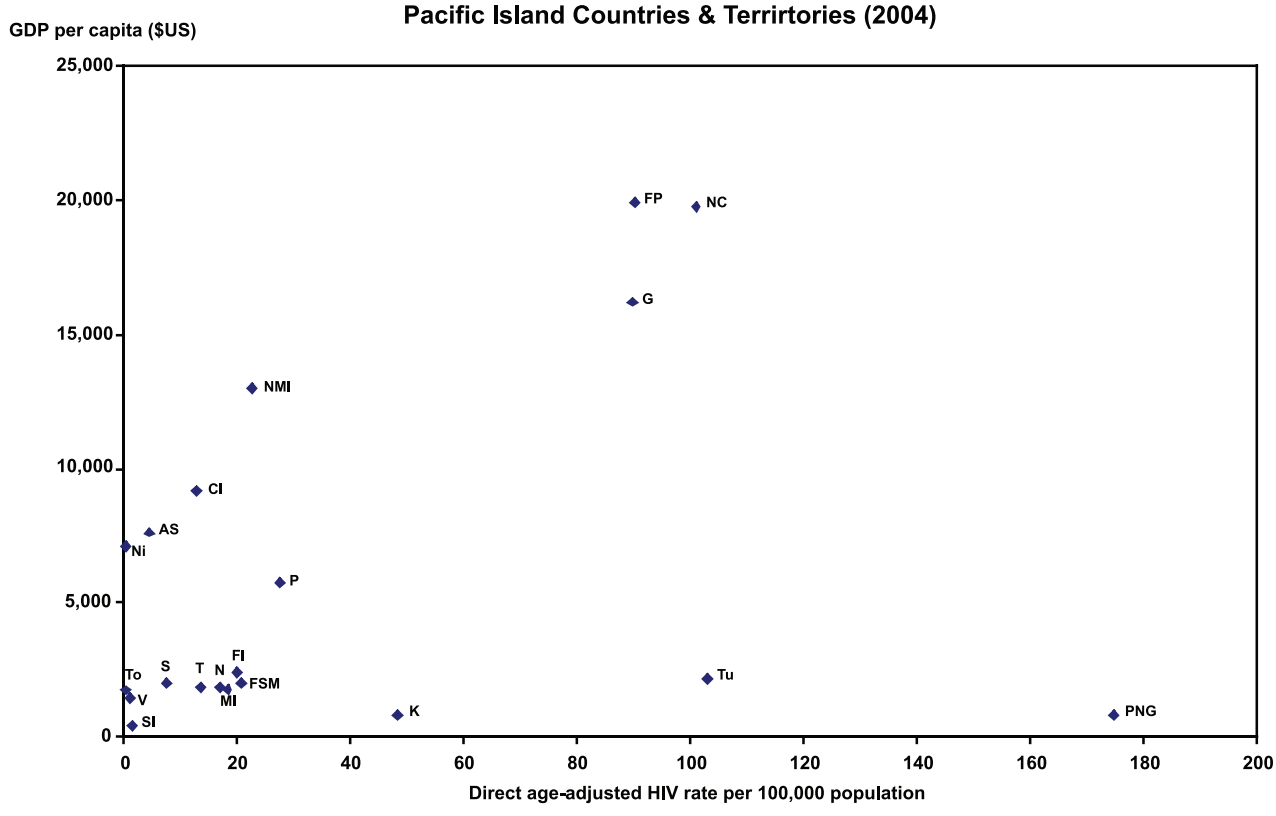
The impact of development

The impact of development on diseases such as HIV is complex and includes factors such as contact outside the region and social and economic change. National financial security is one element affecting overall access to services. Figure 10 shows age-adjusted HIV rates compared to levels of country GDP (per capita US$ equivalents). Whilst improvements in infrastructure and services bring benefits in terms of better access to testing and treatment, there are negative effects of development on disease transmission. Many of the American and French affiliated countries, despite having high levels of financial support, have some of the highest rates of HIV observed in the Pacific. Affiliation with foreign countries would appear to increase contact and possible importation of cases from high-prevalence countries outside the region, in turn leading to more local transmission within the country. Greater levels of MSM and IDU (although still low) are also observed in these countries. However, these broad-brush, country-level patterns are not clear cut. They mask wide within-country variations in terms of access to services (including HIV testing), socio-economic advantage and opportunities for external contact. PNG, Tuvalu and Kiribati, all low GDP per capita countries, have high rates of infection. Social and sexual networks both impact on local disease rates, together with a complex set of other socio-economic factors such as levels of education, awareness, land tenure, unemployment and poverty.

Discussion

Interpretation of routinely collected disease data is difficult. Passive surveillance systems suffer from several distinct limitations, including incomplete case diagnosis, variable case notification and unknown details of some reported cases. Incomplete case enumeration is especially true for conditions such as HIV, where both clinical request and community uptake of testing may be low. The reasons for this are complex. Variable access

Figure 10: Reported Cumulative HIV Incidence Rate by per capita GDP, Pacific Island Countries & Terrirtories (2004)



KEY: AS=Am. Samoa CI=Cooks FSM=Fed. States Micr. F=Fiji FP=Fr. Polynesia G=Guam K=Kiribati MI=Marshalls N=Nauru NC=New Caledonia Ni=Niue NMI=Northern Marianas P=Palau PNG=Papua New Guinea S=Samoa SI=Solomons To=Tokelau T=Tonga Tu=Tuvalu V=Vanuatu

to testing, lack of awareness about HIV, concerns over confidentiality, stigma and discrimination associated with HIV infection, and denial or fear of HIV and AIDS all reduce testing uptake. The type and extent of HIV screening programmes vary markedly across the Pacific, with active screening or survey programmes leading to higher levels of case detection. HIV infection can be symptom-free for many years, reducing the likelihood of health-care providers requesting testing from apparently healthy individuals. In low-resource settings as in much of the Pacific, persons who are diagnosed with HIV may seek treatment overseas, especially where PICTs have affiliations with more developed countries such as the United States, Australia, New Zealand or France. With regard to missing case details, these are either excluded or treated conservatively in the above analyses.

Reported HIV case counts and rates thus do not reflect the total disease burden in PICTs. Likewise, confidence intervals around rate point estimates only reflect the certainty of the reported case data, not of total disease levels. The problem of under-reporting is compounded in Pacific Island countries affiliated with the United States (American Samoa, Federated States of Micronesia, Guam, Marshall Islands, Northern Mariana Islands and Palau) as these countries only report HIV cases that have not been reported previously in other US jurisdictions. It has been estimated that across the Pacific region, reported cases may reflect around 10 per cent of actual infections.[5] This assumption is less certain for many individual PICTs, with very small populations and reported case numbers making estimations of the underlying disease burden unreliable. Attempts at total estimation have been made in the more populous countries of PNG and Fiji. For PNG, total HIV case numbers are estimated to be between 25,000 and 69,000 (median 47,000), a prevalence of 0.9 to 2.5% (median 1.7%).[6] In Fiji, non-linear modelling has been used to estimate projected case numbers.[7] Based on Fiji's annual reported HIV cases from 1989 to 2002, HIV incidence is projected to stabilise sometime between 2005 and 2013. A worst-case scenario suggests a continuing increase in cases until 2020, when incidence could begin to stabilise.

Despite the above limitations, the reported cases do appear, to some degree, to reflect the underlying prevalence of HIV in the Pacific. Antenatal/prenatal HIV screening is routinely offered to women in most PICTs. The low number of HIV cases diagnosed antenatally would suggest that HIV infection is still not generalised in most of the Pacific at this time. HIV case data reported here probably thus do to some degree reflect this low level of infection. The similar proportions of HIV to AIDS cases reported in the region compared to Australia and New Zealand suggest that levels of case ascertainment (and thus under-reporting) may be similar between countries.

Despite apparently low levels of HIV infection in much of the Pacific at this time, there is not room for complacency. The accelerating pace of transmission currently observed in PNG could be replicated in other PICTs and many factors make the Pacific vulnerable. There are strong and expanding links with some neighbouring Pacific rim countries with high rates of HIV. Increasing migration, both in and outward, is associated with trade, employment and expanding economic investment in the Pacific. Security concerns in some countries are precipitate population movements including incoming peace keeping forces. Other, intrinsic risk factors for HIV

Box 1: Strategies for improving routine HIV/AIDS surveillance in the Pacific

Improving case detection

- Expand training of health-care professionals in knowledge, awareness and diagnosis of HIV. Strengthen clinical referral mechanisms for management of people living with HIV and AIDS.
- Widen/broaden access to voluntary and confidential HIV counselling and testing (VCCT) to remote areas and generalist/non-specialist health services (i.e. primary health clinics, outpatient departments, general practitioners). Outreach and mobile clinics may be offered to isolated and remote communities.
- Ensure complete confidentiality of individual case details via use of code identifiers and strict limits on access to data (on a 'need to know' basis).
- Ensure treatments are available for HIV-infected persons as an incentive for testing.
- Increase community awareness and acceptance of HIV testing as an important but routine health service. Community leaders can do much to help reduce the stigma of HIV/AIDS, and to 'normalise' HIV testing and encourage uptake.
- Maintain and expand routine screening programmes to ensure all targeted at-risk and vulnerable population sub-groups are offered HIV testing.
- Increase active case finding, and contact tracing and testing of diagnosed cases (i.e. all sexual and/or blood exposure contacts – with the agreement and cooperation of the index case).

Improving case reporting

- Give HIV/STI vertical health programmes the responsibility for managing HIV and STI notification and reporting. This also helps to protect patient confidentiality. Ensure all other health-care providers notify cases to the HIV/STI programme.
- Ensure all health-care providers are aware of disease notification procedures.
- Consider Public Health legislation obliging health-care providers to notify cases. Ensure private health-care practitioners are aware of their obligation to notify cases to health authorities.
- Match notification to the method of diagnosis, i.e. require laboratories to notify all HIV-positive cases (as opposed to notification by the attending medical officer), and require clinicians to notify clinically diagnosed AIDS cases (based on presence of AIDS-defining conditions).
- Further, for laboratory surveillance of HIV, collect all relevant case details on test request forms to facilitate laboratory reporting (e.g. date/reason for test, location, age, sex, ethnicity, exposure).
- Build multi-function HIV/STI health information systems for patient management, programme management, monitoring and evaluation, and disease surveillance (HIV and STIs).
- Compile regular statistical reports of HIV, AIDS and STIs. Feedback reports to notifying health-care providers to inform them and encourage continued notification.
- For US-affiliated PICTs, it is recommended that all cases living in-country are recorded and included in country reports. Notification to the US Centers for Disease Control can be restricted to the subset of cases not previously notified from other US jurisdictions.

transmission include high rates of poverty, low literacy rates, and socio-cultural factors that make it difficult, especially for women, to negotiate safe sex. The data show women increasingly infected with HIV over time. High transmission of HIV in PNG may be reflective of high rates of genital, ulcerative disease. Other, non-ulcerative STIs are widespread in the Pacific, indicating patterns of sexual behaviours conducive to spread of HIV.[8,9,10] Changing societal values, high levels of risk behaviours such as multiple sexual partners, and low levels of access and use of condoms, all contribute to this risk. The extent of sexual networks will determine whether HIV infection once introduced becomes established with sustained local transmission or fades out. Pacific youth remain particularly vulnerable in this regard, with reduced adherence to traditional societal behaviours and reducing age at first sex. There is some indication that HIV infection may be accelerating in youth.

What do we still need to know?

Routine surveillance data, such as presented here, exhibit a high degree of uncertainty and raise many questions. Gaining a more complete and accurate picture of the extent and distribution of HIV requires a multifaceted approach to surveillance of HIV, other STIs and associated risk behaviours. Passive data need to be complemented with more active case finding, e.g. via:

- expanded access to voluntary and confidential counselling and testing (VCCT);
- further screening of at-risk and vulnerable groups; and
- contact tracing of cases.

Routine screening of sex workers and/or massage-parlour staff engaging in commercial sex (mostly covertly) is to be encouraged to again reduce the potential for widespread transmission associated with these high-risk sexual behaviours.

Surveillance surveys in at-risk groups can further identify the extent of both risk behaviours and HIV infection.[12] Antenatal testing continues to be a cornerstone of HIV surveillance in developing countries. It also acts to minimise maternal to child transmission (MTCT) of HIV, with effective treatment available perinatally to women diagnosed early in pregnancy. Screening of the blood supply provides limited information owing to pre-exclusion of many at-risk persons from donating blood products. HIV screening of at-risk groups is however a valuable surveillance tool and can provide early warning of introduction of HIV into bridging populations within otherwise isolated PICTs. At-risk/vulnerable groups vary in each country but may include MSM, IDU, clinic patients (e.g. TB and STI patients), occupational groups such as seafarers, port workers, fish cannery/processing workers, business and government representatives travelling overseas regularly, hotel staff and other persons employed in services with high contact with foreign visitors. Routine screening of sex workers and/or massage-parlour staff engaging in commercial sex (mostly covertly) is to be encouraged to again reduce the potential for widespread transmission associated with these high-risk sexual behaviours. French territories have illustrated how sex work can be informally regulated, with sex workers known to health services and encouraged to participate in regular STI and HIV testing and treatment. Liaison of health authorities with community-based organisations can also increase access to at-risk groups such as sex workers and women frequenting port areas to raise awareness of HIV and STI risks in these groups.

Ways to improve routine surveillance

A number of strategies can be put in place to increase the accuracy and completeness of HIV and AIDS case enumeration. These strategies may be categorised as improving both case detection and case reporting. Improved case detection relies on the 'triple As' – increasing community access, awareness and acceptance of HIV testing – and also acceptance of PLWHA. Improved reporting relies on strengthening notification of HIV and AIDS, and utilising health information systems for compiling HIV/AIDS statistics. These measures to improve HIV surveillance have been discussed[12] and are summarised in Box 1.

In summary, HIV prevalence across most of the Pacific appears to remain low at this time. The predominant group at risk is sexually active young adults, with heterosexual activity the main mode of transmission. Men who have sex with men are a second major risk group, including transgender individuals accepted to varying degrees within different Pacific cultures. Injecting drug use remains low across the region but may currently be increasing. Some of the persons most at risk are those whose lifestyle or occupation brings them into contact with foreign nationals either at home or overseas. Expanding economic investment in the Pacific is set to increase this contact. Sexual partners of these primarily at-risk are themselves vulnerable, especially if they have limited ability to negotiate safe sex. Women and youth are at increasing risk. Low status and/or other barriers to condom use, such as cultural and access issues, increase risk. Routine HIV reporting needs to be strengthened, and complemented with expanded screening programmes and surveillance surveys in at-risk groups. The devastating impact of generalised

transmission is clear in many African countries, and is now being played out in Papua New Guinea and some neighbouring Asian countries. Pacific Island countries are particularly vulnerable due to their small population size. The need for vigilance locally remains high.

Acknowledgments

All PICTs provided HIV and AIDS data for this report. The PICT officers within national reporting authorities who provided these data are gratefully acknowledged below. All data are subject to revision in light of further case ascertainment.

The following people provided country data for inclusion in this report:
American Samoa – Naseri Aitaoto, Department of Health
Australia – John Kaldor, Ann McDonald, National Centre in HIV Epidemiology and Clinical Research
Cook Islands – Edwina Tangaroa, Ministry of Health
Federated States of Micronesia – Amato Elymore, Johnny Hebel, Department of Health, Education and Social Services
Fiji – Litiana Raikuna, Ministry of Health
French Polynesia – Pascal Jarnot, Direction de la Santé
Guam – Robert Haddock, Bernie Schumann, Department of Public Health & Social Services
Kiribati – Kabwea Tiban, Ministry of Health
Marshall Islands – Zachraias Zachraias, Edlen Anzures, Ministry of Health and Environment
Nauru – Godfrey Waidubu, Nauru Department of Health
New Caledonia – Jean-Paul Grangeon, Nancy Klingler, Direction des Affaires Sanitaires et Sociales
New Zealand – Grant Storey, Ministry of Health
Niue – Puasina Tatui, Niue Health Department
Northern Mariana Islands – Bill Macaranas, Department of Public Health
Palau – Johana Ngiruchelbad, Ministry of Health
Papua New Guinea – Agnes Gege, National AIDS Council
Samoa – Saine Vaai, Ministry of Health
Solomon Islands – George Malefoasi, Ministry of Health & Medical Services
Tokelau – Rosa Toloa, Ministry of Health
Tonga – Seini Kupu, Ministry of Health
Tuvalu – Tekaai Nelesone, Ministry of Health
Vanuatu – Marina Laklotal, Ministry of Health
Wallis and Futuna – Jean-François Yvon, Agence de Santé

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