ASIAN DEVELOPMENT BANK

TAR:STU 38635

SOCIOECONOMIC IMPLICATIONS

OF HIV/AIDS IN THE PACIFIC

ABBREVIATIONS

ADB	–	Asian Development Bank
ART	–	antiretroviral Therapy
AusAID	–	Australian Agency for International Development
ARV	–	antiretroviral
CIE	–	Centre for International Economics
EPP	–	estimation and projection package
FSM	–	Federated States of Micronesia
GDP	–	gross domestic product
GNI	–	gross national income
MDG	–	Millennium Development Goal
MSM	–	men who have sex with men
NGO	–	nongovernment organization
PDMC	–	Pacific developing member country
PNG	–	Papua New Guinea
RMI	–	Republic of Marshall Islands
SPC	–	Secretariat of the Pacific Community
STI	–	sexually transmitted infection
UNAIDS	–	Joint United Nations Programme on HIV/AIDS
UNICEF	–	United Nations Children's Fund
WHO	–	World Health Organization

SOCIOECONOMIC IMPLICATIONS OF HIV/AIDS IN THE PACIFIC
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I. INTRODUCTION

A. Background

The Asian Development Bank's (ADB) Pacific developing member countries (PDMC) recorded 10,500 HIV/AIDS cases by the end of 2004.[1] However, this figure could underestimate the actual number of people infected with the virus, as surveillance systems only now are being developed and data on groups with high-risk behaviors remain limited.

Papua New Guinea (PNG) and the Fiji Islands have the most HIV cases among Pacific island countries. The Cook Islands, Federated States of Micronesia (FSM), Kiribati, Nauru, Palau, Republic of the Marshall Islands (RMI), Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu also have recorded HIV cases, though much fewer than PNG.

At a subregional level, almost all reported cases—10,373 of 10,500—are found in Melanesia due largely to the situation in PNG.

Table 1: Cumulative HIV Cases and AIDS-Related Deaths in PDMCs

Country	HIV Cases	AIDS-Related Deaths	AIDS Cases	Cumulative HIV Cases per 100,000 People
Melanesia	**10,373**	**372**	**1,868**	
Fiji Islands	182	17	25	21.8
Papua New Guinea	10,184	353	1,843	178.8
Solomon Islands	5	2	2	1.1
Vanuatu	2	0	2	0.9
Micronesia	**91**	**41**	**50**	
Federated States of Micronesia	25	12	15	22.2
Kiribati	46	23	28	49.4
Marshall Islands	10	2	2	18.1
Nauru	2	1	1	19.8
Palau	8	3	4	38.6
Polynesia	**36**	**18**	**19**	
Cook Islands	2	0	0	14.3
Samoa	12	8	8	6.6
Tonga	13	8	9	13.2
Tuvalu	9	2	2	93.8
All PDMCs	**10,500**	**431**	**1,937**	

Note: Data for Timor-Leste was unavailable.
Source: Secretariat of the Pacific Community. 2004. For ADB developing member countries. December.

Although the data are incomplete, a number of trends and regional conclusions can be drawn. The first such conclusion is that most HIV infections in ADB's PDMCs are in PNG. Despite growth in the number of cases in Fiji Islands and some smaller states, such as Kiribati, PNG accounts for about 97% of all reported cases—and its proportion is increasing.

In many Pacific island countries, excluding PNG, the epidemic is confined principally to groups practicing high-risk behaviors, such as vulnerable youth, sex workers, clients of sex

[1] Secretariat of the Pacific Community. 2005. AIDS Section, Public Health Program, December.

workers, mobile populations (e.g., seafarers), and men who have sex with men (MSM), although some evidence suggests transmission through intravenous drug use, as well as perinatal and blood exposure. The impacts of HIV infection often are confined to these vulnerable subpopulations and AIDS-affected households, and are not readily apparent in national demographic and economic indicators. Additionally, the effects of the evolving epidemic are not immediately apparent at a national level due to a lag between HIV infection and the need for treatment of AIDS symptoms

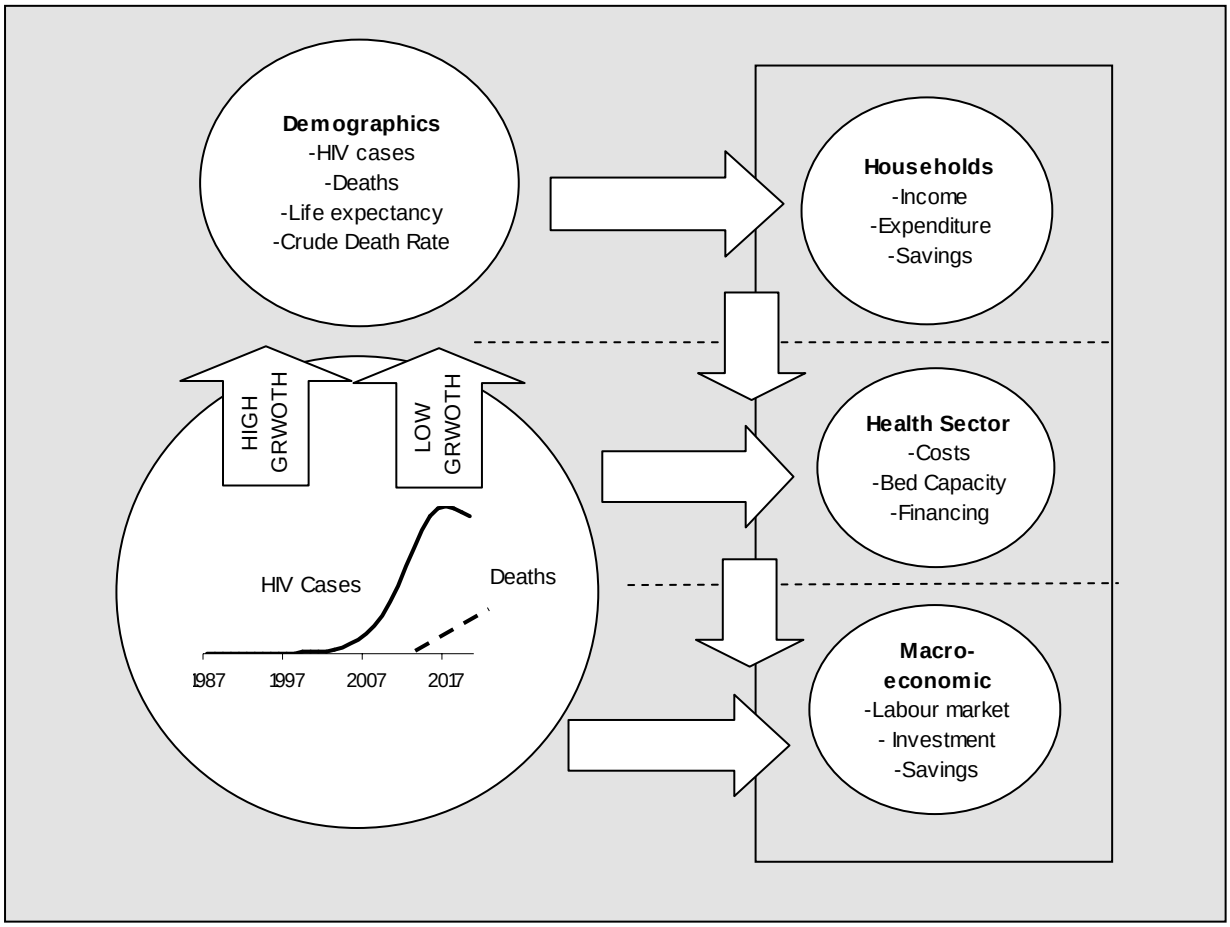
Since these impacts are not readily observable, an assessment of the possible future impacts of the epidemic on Pacific economies is urgently needed to determine the benefits of acting now rather than later. Currently, the data needed to inform decision makers on how the epidemic might affect households, vulnerable communities, and national economies within the Pacific are sparse.

Potential demographic, sectoral, and macro-level impacts need to be quantified and based on plausible HIV/AIDS epidemic growth scenarios. By assessing the potential future social and economic impacts of the epidemic, this study addresses this need. It also includes an analysis of national and health sector impacts. Given that PNG and Fiji Islands account for the bulk of HIV cases in the region, potential HIV impacts are projected for the general population and high-risk groups within these countries. Demographic impacts also are assessed for Kiribati, where the number of cases observed is relatively large and the cumulative HIV rate per 100,000 people is one of highest in the region.

B. Approach and Methodology

The impact of HIV/AIDS on development is complex and has widespread impacts. Initially, households are burdened with the economic and physiological impact of supporting an ill member. As the major age group at risk of infection are working adults (Murray and Lopez, 1996), key income earners in the household are the most likely to become infected and forego income. In addition, household members might have to forfeit paid employment to care for the sick, children might be orphaned, and assets might be sold or money borrowed to pay for health care. The epidemic also impacts the health sector, which provides prevention and care services. As the epidemic gains momentum, with more people succumbing to the affects of HIV infection, the costs of health sector care and treatment becomes more substantial.

Figure 1: Impact of High- and Low-Growth Epidemic Scenarios on Demographics, Households, Health Sector, and Macroeconomics



Source: Asian Development Bank consultant.

Increased HIV/AIDS prevalence has the potential to reduce national economic growth. The capacity of the labor force diminishes as the number of workers, as well as worker productivity declines, and the cost of employment rises. Despite considerable underemployment in some Pacific countries, loss of labor has been estimated to cause reductions in national economic growth in PNG, where HIV prevalence is relatively high (Centre for International Economics, 2002).

The availability of data, and projected HIV prevalence, governs the types of impact that could be observed and quantified in an HIV/AIDS impact study. Within low- and concentrated-prevalence countries (adult prevalence less than 1%), key impacts are evident in HIV-affected households and the health sector. National prevalence is not sufficient to have an impact on national indicators, such as growth in gross national income (ADB and UNAIDS, 2004; Bloom and Mahal, 1995). As the epidemic spreads into the general population, significant impacts on national demographic and economic indicators could be expected as death rates and health sector expenditures rise. Four main features of impact are explored in this report:

Box 1: Glossary of Medical Terms

Antiretroviral (ARV). A drug that interferes with the ability of a virus (such as HIV) to replicate.
Annual Crude Death Rate. Annual number of deaths in a population divided by the mid-year population.**Epidemic**. A disease that has spread rapidly through a segment of the human population in a given area.

Human Immunodeficiency Virus (HIV). A virus that causes AIDS.

Incidence. The number of new cases during a specific period of time, such as a year.

Prevalence. The number of cases of a disease present in a population expressed as a percentage of the population.

Source: U.S. Department of Health and Human Services. AIDSinfo Web site. Available: http://www.aidsinfo.nih.gov/.

- First, demographic impacts are quantified using the Spectrum[2] software package. The impacts include increased mortality, decreased life expectancy, and elevated crude death rates.

- Second, the number of orphaned children and the costs of child care are estimated using unit costs from the Resource Needs Model (Bollinger et al, 2002). Background age-dependant fertility, and sex structure of the populations were derived from data tables in the Spectrum package for PNG and Fiji Islands. These data were not available for Kiribati.

- Third, the impact upon on the health sector is evaluated. This sector, which is on the front line of care and support, marshals prevention activities to curb escalating infection rates. Health sector expenditures, potential bed capacity demand for AIDS patients, and drug therapy demand in the Pacific are modeled with the assistance of the Spectrum package to determine the possible burden of these impacts if the epidemic continues to spread.

- Last, increased HIV/AIDS prevalence and consequences for national economic growth are evaluated for PNG and Kiribati. In PNG, where HIV prevalence is widespread, the affects of elevated mortality and the implications for the labor market are likely to be significant enough to depress economic growth. The potential economic consequences for Kiribati focus on a reduction in seafarer remittances, as this mobile group are thought to be vulnerable to HIV infection (WHO, 2006).

[2] Spectrum is a Windows-compatible software program developed by the Futures Group in conjunction with the Joint United Nations Programme on HIV/AIDS, United Nations Children's Fund, US Agency for International Development, and World Health Organization. It contains a demographic projection model that allows data relating to age and sex, total fertility, age distribution of fertility, life expectancy at birth, age-related mortality, and characteristics of international migrants to be imputed (Stover, 2004). Most assumptions in this model are derived from the United Nations Population Division, although fertility and mortality can be modified using differing model life tables. HIV/AIDS projections are superimposed on base demographic projections using scenarios of HIV prevalence projection and assumptions about the epidemiology of HIV (Stover, 2004).

To estimate demographic, health sector, and macroeconomic impacts, the potential spread of the disease first needs to be determined. Given the uncertainties relating to how widespread the disease will become, high and low HIV/AIDS epidemic growth scenarios are employed throughout the report. These scenarios are generated using the Joint United Nations Programme on HIV/AIDS (UNAIDS) estimation and prediction software package (EPP).[3] Projections are made for the general population, as well as for the subpopulations in the region that are most vulnerable to infection, including sex workers, clients of sex workers, MSM, and seafarers.

C. Organization of the Report

The first section of the report provides an overview of the modeling approach used. Subpopulations within the region that engage in high-risk behavior then are described to provide context for modeling future HIV/AIDS prevalence. Behavioral characteristics within the general population, such as low condom usage, also are described as the virus has the potential to bridge into the general community.

Possible future impacts are based on high and low HIV/AIDS epidemic growth scenarios for PNG, Kiribati, and Fiji Islands—the Pacific countries with the most people with HIV/AIDS. In addition, data are most abundant for these countries. Initially, demographic implications of these scenarios are described. Indicators include the number of HIV and AIDS cases, life expectancy, number of orphans, and crude death rates.

The potential sectoral impact of growth in the HIV/AIDS epidemic on hospital capacity, health sector budgets, and the number of people requiring antiretroviral therapy (ART) are outlined. The resource requirements for these scenarios also are provided, and financial shortfalls are assessed.

The macroeconomic impacts of HIV/AIDS in PNG and Kiribati then are addressed. Key findings from the study are highlighted in the Conclusions section, and recommendations for development partners and governments conclude the report.

[3] Ghys et al (2004) note that the EPP program fits a simple epidemic curve to HIV prevalence data points, generating an HIV prevalence trend for each sub-epidemic. Estimated sub-epidemic curves are applied to subpopulations to map national prevalence trends. The EPP model curve is defined by four epidemiological parameters outlined in the Appendix, and provided for each population in PNG, Fiji Islands, and Kiribati. As Ghys et al (2004) point out the EPP, simply fits a curve to available surveillance data, and does not capture factors such as behavioral change (e.g., provision of clean needles and condoms, or reduction in risky sexual practices).

II. PROJECTING HIV PREVALENCE AND DEMOGRAPHIC IMPACT

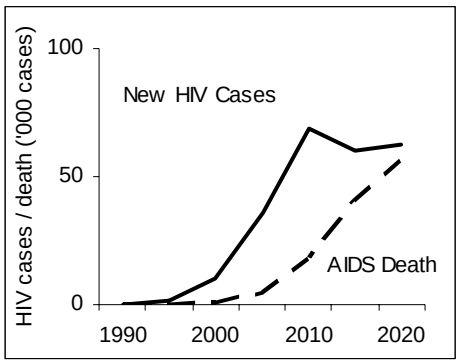
A. Overview

HIV affects particular geographical areas and subpopulations groups in different ways. Ghys et al (2004) suggested that most HIV epidemics consist of a series of multiple sub-epidemics, each with different dynamics and factors affecting infection rates. Modeling national epidemics, therefore, requires modeling the sub-epidemics within that country. A range of modeling approaches have been developed and used to predict future patterns of HIV infection. The tools and packages are reviewed on the UNAIDS Web site, and in papers such as Walker et al (2003) and UNAIDS (2002, 2006).

The UNAIDS EPP was developed as a tool for analysts to project national and subnational HIV prevalence. It has been used widely throughout the world to predict future prevalence of the HIV epidemic. Accordingly, this report uses this model to develop future scenarios of prevalence and their impacts. To estimate national prevalence, subpopulations most at risk are described, and future prevalence is estimated by fitting curves for high-growth and low-growth scenarios for the epidemic within these subpopulations

Further background on the modeling approach is provided in the Appendix, which outlines HIV prevalence modeling. As noted in the introduction, the projections derived from the EPP model are imputed into the Spectrum package to determine demographic consequences of the prevalence projections, including the number of people living with HIV, AIDS cases, AIDS deaths, and orphans as a result of AIDS, as well as increased crude death rates and reduced life expectancy.

Figure 2: Projected New HIV Cases and Deaths for the High-Growth Scenario in PNG



PNG = Papua New Guinea.
Source: Consultant estimates using UNAIDS estimation and projection package model and Spectrum package.

Before presenting this demographic and orphan data, the subpopulations within which epidemic curves are fitted are described. The sizes of these vulnerable populations, and extent of risk-taking practices apparent in each population, have important implications for predicting how fast the epidemic will spread. The next section provides an overview of these factors.

B. Modeling the Epidemic Within Subpopulations

Only PNG has a generalized epidemic in the Pacific. A generalized epidemic is evident when adult prevalence (15–49 year olds) is greater than 1%. In the rest of the Pacific, HIV infection is concentrated in subpopulations with risk-taking behaviors that make them more susceptible to infection. Some subpopulations have been identified as engaging in risky behaviors that lend themselves to higher rates of HIV infection: (i) sex workers and their clients; (ii) mobile populations, such as seafarers; and (iii) MSM.

Estimating the prevalence within these subpopulations is difficult, as people in these groups typically do not attend clinics where HIV testing is undertaken. However, population groups that are likely to be most at risk of contracting HIV due to their sexual behavior need to be

defined to generate accurate national and forecast levels of HIV/AIDS prevalence within low and concentrated epidemics.

In this study, prevalence projections are made for the general population, as well as vulnerable subpopulations within PNG, Fiji Islands, and Kiribati. Box 2 outlines the groups for which projections have been made within each country. Assumptions pertaining to sizes of the subpopulations and model parameters are in the Appendix.

Box 2: Subpopulations Used To Model HIV Prevalence in Each Country

	PNG	Fiji Islands	Kiribati
Sex Worker	XXX	XXX	
Client of Sex Worker	XXX	XXX	
MSM	XXX	XXX	
Mobile (seafarer)			XXX
General Population	XXX	XXX	XXX

1. Sex Workers and Clients

Sex work is prevalent throughout all Pacific island countries. However, the term “sex worker” might not be appropriate in all circumstances as sex might be exchanged for goods (known as transactional sex) instead of directly for cash. In PNG, for example, Jenkins (1995) notes that “girls (might) exchange sex for entry to a video or dance, along with food, fish or meat or male labor.” Sex work, either of a transactional or for direct cash payment typically involves multiple partners and people within these subpopulations are particularly vulnerable to sexually transmitted infections, such as HIV.

The frequency of sexual contact and high levels of non-HIV sexually transmitted infection – which act as a co-factor in HIV transmission – make this group particularly vulnerable to infection. Studies in PNG have documented the high prevalence of sexually transmitted infection. For example, a survey in 1997 outlined in World Bank (2005a) of sex workers in Port Moresby and Lae found 31% of participants were infected with chlamydia, 32 percent with syphilis and gonorrhea (36 percent).

A survey of youth behavior in Pacific countries found that a proportion of men in each country paid for sex with cash, gifts or alcohol in the last 12 months. Results of the survey are provided in Table 2 and demonstrate that cash/gift-based sex was widespread in Fiji and Kiribati where 6-23% of seafarer (Kiribati) and military (Fiji) men had purchased sex in the last year (WHO, 2006). The exchange of sex for gifts or cash for sex was lower in the women interviewed at antenatal clinics as part of the same survey.

Table 2: Paying for Sex With Cash, Gifts, or Alcohol in Past 12 Months

	Kiribati	Fiji Islands
Male Sex for money and gifts in past year (%)	22.5	5.8
Female Sex for money and gift in past year (%)	0.5	0.0

Source: WHO (2006).

Few reliable estimates of the numbers of sex workers in most countries are available. These populations are often heavily stigmatized, and are hard to reach. UNAIDS (2006a) HIV prevalence modeling utilizes a benchmark of approximately 0.8% of women 15–49 years old. In the absence of specific data for the Pacific, these estimates are used for Fiji Islands.

PNG has self-identified sex workers and women who engage in opportunistic, transactional sex. Sex worker estimates might be higher than national benchmarks suggested for other

countries. A study in the early 1990s found that about half of all women investigated said they had exchanged sex for money or gifts (National Sex and Reproduction Research Team and Jenkins, 1994). UNAIDS often refers to these women as indirect sex workers, non-brothel-based sex workers, or informal sex workers.

Other studies have highlighted the high frequency of sex work. For example, in Goroka, Port Moresby, and Lae, with a combined population of about 315,000, approximately 15,000 women are involved with sex work on transport routes and in small hotels (Jenkins, 1994b). Consequently, a higher proportion of sex workers is assumed for PNG. Numbers of sex workers and their clients that are assumed in the analysis are outlined in the Appendix.

2. Mobile Populations (Including Seafarers)

Mobility is perceived to be a major risk factor, meaning groups such as seafarers, fisherfolk, and military and police recruits are considered vulnerable to HIV infection. Hemrich and Topouzis (2000) noted that high mobility and extended absences from home, coupled with cash incomes, make these people particularly susceptible to infection. Aside from the risk of contracting infection, Seeley and Allison (2005) suggested that mobility impedes coverage of care and treatment services, as access to testing and treatment facilities is difficult and irregular working hours constrain adherence to treatment regimes (McGreevey et al, 2003). For Kiribati seafarers, the high frequency of paid sex, low use of condoms, and high background prevalence of non-HIV sexually transmitted infection (STI) were highlighted in a range of surveys by the World Health Organization (WHO), 2004; WHO, 2006; Armstrong, 2000; Dennis, 2003; Oriente, 2005; and Peteru, 2002.

Table 3: Condom Usage in Fiji Islands and Kiribati

	Fiji Islands Police and Military (%)	Kiribati Seafarer (%)
Condoms use with last non-commercial sexual partner	3	33
Condom use with last commercial sexual partner	8	38
Consistent condom use of young men with female commercial sexual partners (past 12 months)	0	22

Source: WHO (2006).

Relatively low condom usage was also evident in behavioral surveillance of mobile police and seafarer populations in Fiji Islands and Kiribati (WHO, 2006). Less than 8% of the men from Fiji Islands used condoms in their last contact with a sex worker. Availability of condoms is a major constraint on sexual health programs in the region. The assumptions used to forecast prevalence for this subpopulation in Kiribati are provided in the Appendix.

3. Men Who Have Sex With Men

MSM are found in all Pacific countries, and are often heavily stigmatized (UNAIDS, 2006a). In some traditional subcultures in the Pacific, such as *fakaleiti* in Tonga or *Fa'a fafine* in Samoa, men dress and live as a woman. UNAIDS (2006) suggests that in some communities approximately 2%–5% of the male population 15–49 years old practice male-to-male sex. This population includes bisexual and male-only homosexuals, all with differing frequencies of contact and heterogeneity of sexual networks. In Fiji Islands, MSM interaction within the 12 months prior to the WHO (2006) survey was relatively high in STI patients—6.4% of men reported having sex with other men. Meanwhile, 1.3% of the military and police participating in the survey reported male-to-male sex in the previous 12 months. This modeling study assumes that around 1%–2% of men 15–49 years old engage in frequent

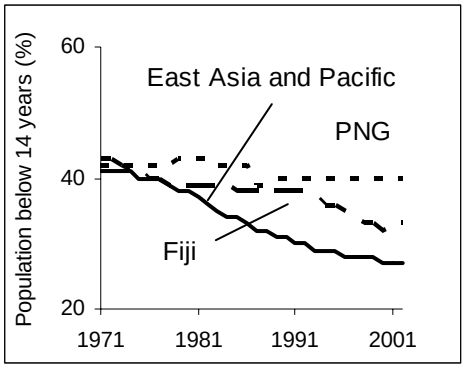
(within the past 12 months) male-to-male sex in Fiji Islands and PNG (see Appendix for details).

In a national survey of youth behavior in PNG, outlined by the World Bank (2005a), 22% of respondents indicated they had engaged in homosexual intercourse and/or mutual male masturbation during their lives. During surveys in PNG, Jenkins (1995) found that men reported male-to-male sex for payments in many male situations, such as boys' dormitories, jail, mining camps, and oil rigs. As many males do not practice male-to-male sex regularly, they are an important bridge for the virus into the wider heterosexual population. Jenkins (1995) suggests that this subpopulation needs to be targeted in social condom marketing and behavior change programs—especially in larger cities—to minimize the potential for an expansion of HIV into the wider community.

4. General Population

Some features of the general populations of these countries need to be considered when making HIV prevalence projections. First, the populations of Fiji Islands and PNG are very young when compared to other countries in East Asia and the Pacific (Figure 3). Younger people might take more sexual risks when compared to older members of the community. Moreover, in some instances, they might not have access to information about HIV transmission and means of prevention.

Figure 3: Population Below 14 Years Old (%)



PNG = Papua New Guinea
Source: World Bank Health, Nutrition, and Population database.

Many countries of the region also offer limited economic and employment opportunities, as economic growth has been insufficient to absorb the growing populations. The resulting increase in hardship and poverty within the region, particularly the inability of youth to find suitable employment, might make them more mobile—and hence more vulnerable to infection as they leave family networks. The economic situation also could lead people into sex work to support themselves and their families.

The United Nations Children's Fund (UNICEF, 2006) identified several factors that increase HIV prevalence: the low status of women, poverty, the emergence of commercial sex, limited access to testing and counseling, and stigma and taboo. Despite these factors, sexual behavior surveys of pregnant women and youth (WHO, 2006) found relatively low numbers of sexual partners within six Pacific island countries. However, Jenkins (1996) suggested that responses to questions regarding numbers of sexual partners are often misleading, as men tend to overreport and women underreport. Even considering these factors, the average number of partners is low, although it varies considerably. The results of behavioral surveillance surveys, outlined in Table 4, and demonstrate the wide range of partners for men interviewed in Fiji Islands and Kiribati.

Table 4: Number of Sexual Partners

	Police and Military Fiji Islands	Seafarers Kiribati
Male [a]		
Mean (number)	1	1
Range (number)	0–33	0–106

[a] Last 12 months

Source: WHO (2006).

A survey by Levantis, (2000) found more multiple partners in PNG. These surveys were not randomly drawn samples, however. The results are in line with a survey of young unemployed urban women, which found that 48% at least partly supported themselves through sex work (Levantis, 2000).

Table 5: Results of 1998 Eastern Highlands Youth Survey, PNG

	Married Men	Single Men	Married Women	Single Women
No. of partners last year (median)	5	5	2	4.5
10 partners or more last year (%)	29	22	11	20
Accepted cash for sex (%)	28	8	36	20
Paid cash for sex (%)	28	12	7	20
Paid gifts for sex (%)	40	30	7	24
Paid cash and gifts for sex (%)	20	7	2	15

Source: Levantis, (2000).

Other analyses in PNG have found that married men have extramarital sexual partners (Jenkins and Pataki-Schweizer, 1993a). Fewer married women reported having extramarital sex.

Low condom usage is a key factor driving high STI prevalence, as well as a risk factor associated with the spread of HIV/AIDS in PNG. In a survey of 192 randomly selected women of reproductive age in 1995, 9% had had more than one sexual partner in the previous year, 16% had been diagnosed with an STI in the previous 3 months, and only 7% reported ever using condoms. A survey of 300 STI clinic attendees in the highlands found that only 9% of patients were familiar with the role of condoms in HIV and STI prevention (Passey, 1996).

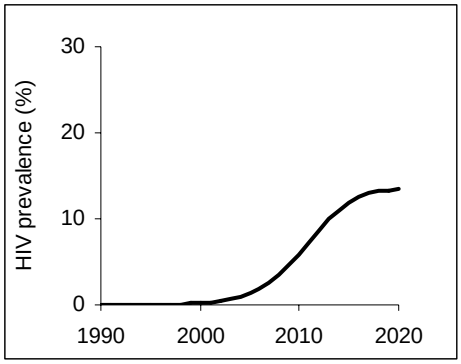
C. Papua New Guinea

Risk factors for HIV infection are high in PNG, as reflected in the large number of non-HIV STIs in many areas of the country and widespread risky sexual practices (Jenkins and Passey, 1998).

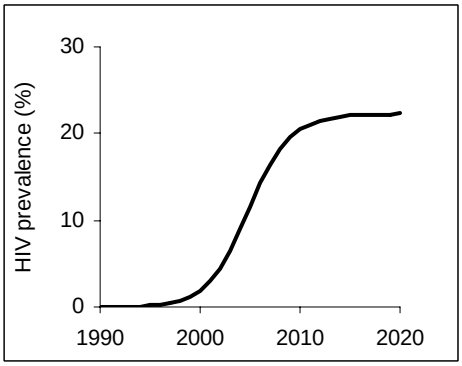
1. National Prevalence

Figure 4 shows the number of new HIV cases associated with a high-growth scenario, The virus evidently moved relatively slowly until about 2005, when it started to circulate in the broader community. The incidence began to accelerate until a large percentage of groups practicing high-risk behaviors became infected, and then the incidence began to slow.

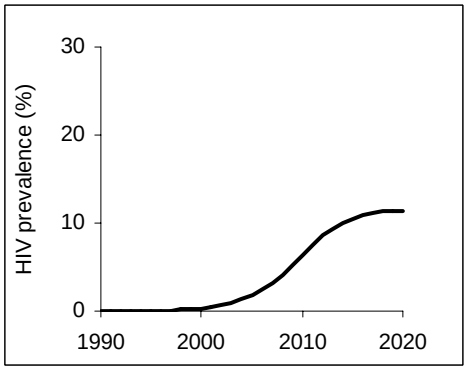
Figure 4: Projected National and Subnational HIV Cases in PNG for High-Growth Scenario



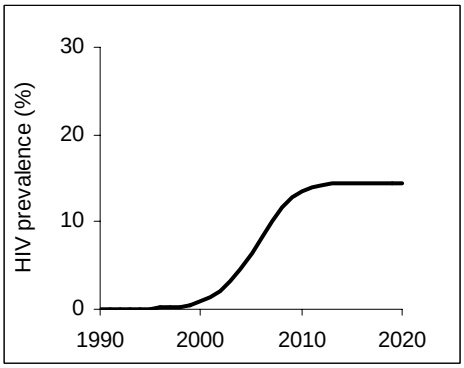
National Prevalence in PNG



Prevalence in Sex Workers



Prevalence in MSM



Prevalence in Sex Worker Clients

MSM = men who have sex with men, PNG = Papua New Guinea.
Source: Consultant estimates using estimation and projection package modeling and Spectrum package.

The consequences of the increase in new HIV cases have not been readily apparent due to the lag between HIV infection and a person succumbing to the effects of AIDS. This lag is apparent in Figure 2, which shows how the rise in AIDS deaths occurs several years after the increase in HIV prevalence. By the end of the projection, about 50,000 people per year are forecast to die from AIDS under the high-growth scenario.

2. Prevalence Among Vulnerable Groups

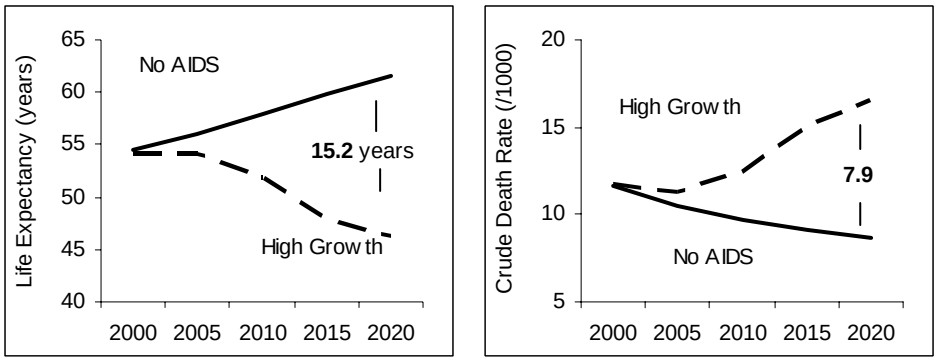
HIV prevalence among sex workers, clients of sex workers, and MSMs are presented in Figure 4 for the high-growth scenario. The rapid increase in HIV prevalence among sex workers is evident in 1995–2010, before tapering off. National HIV prevalence among sex workers in PNG was assumed to be 12% in 2005. The range of studies used for this assumption is outlined in the Appendix.

A dramatic increase in the HIV prevalence among clients of sex workers is another feature of the PNG high-growth epidemic projection. In 2005, about 5% of clients were assumed to have contracted the virus. HIV spreads from this reservoir of infection into the general community by infecting the partners of sex worker clients.

3. Demographic Impacts

HIV prevalence forecasts were incorporated in the Spectrum model to determine the number of AIDS cases, AIDS-related deaths, life expectancy, and crude death rates for high and low HIV epidemic scenarios. This model has algorithms that estimate the time from HIV infection to AIDS-related death, along with background life tables that can be used to estimate demographic impacts. The difference between life expectancy and crude death rates under "no HIV" and "high HIV" growth scenarios are illustrated in Figure 5.

Figure 5: Projected Life Expectancy and Crude Death Rate in PNG Using the High-Growth HIV Scenario



Life Expectancy in PNG **Crude Death Rate in PNG**

PNG = Papua New Guinea.
Source: Consultant estimates using estimation and projection package modeling and Spectrum package.

In the absence of a high growth rate in HIV/AIDS, life expectancy at birth would be 15.2 years longer in PNG, and 5.9 years longer under a low-growth epidemic scenario. The decrease in life expectancy is associated with the elevated death rates associated with AIDS. By 2020, 56,000 AIDS-related deaths are forecast under a high-growth scenario and 21,000 under low-growth projections.

Table 6 shows HIV prevalence, people requiring ART, AIDS deaths, life expectancy, and crude death rates associated with each scenario in PNG. Under the high-growth scenario, 87,550 people would require ART in 2020.

Table 6: HIV Prevalence and AIDS-Related Deaths in PNG

Current (2005)	
HIV Prevalence (%)	1.8
AIDS Cases	1,843
HIV/AIDS Deaths	353
2020 (High-Growth Scenario)	
HIV Prevalence (%)	13.3
People Requiring ART	87,550
HIV/AIDS Deaths	56,190
HIV/AIDS Dual Orphans ('000)	96.41
HIV/AIDS All Orphans ('000)	210.46
Public and NGO Sector Cost of Support ($ million)	38.4
Decrease in Life Expectancy	15.2 (46.3)
Increase in Crude Death Rate	7.93 (16.6)
2020 (Low-Growth Scenario)	
HIV Prevalence (%)	7.6

People Requiring ART	33,950
HIV/AIDS Deaths	20,570
HIV/AIDS Dual Orphans ('000)	18.97
HIV/AIDS All Orphans ('000)	55.87
Public and NGO Sector Cost of Support ($ million)	7.6
Decrease in Life Expectancy	5.9 (55.4)
Increase in Crude Death Rate	2.73 (11.4)

ART = antiretroviral therapy, NGO = nongovernment organization, PNG = Papua New Guinea.
Note: UNAIDS (2006b) report current national prevalence of 1.8%.
Source: Asian Development Bank consultant.

4. Orphaned Children

AIDS is the major cause of death of people 15–49 years old worldwide. An estimated 12.3 million children have been orphaned by AIDS across the world. However, only an estimated 5,000 children have been orphaned in the Pacific as of 2005 (UNAIDS, 2005). Even though this is relatively low by global standards, given the small size of many Pacific countries, such a number of orphans is likely to create substantial social and economic impacts.

Box 2: Definitions of Orphans

The United Nations report *Children on the Brink 2004* uses the following terms in estimating orphan subpopulations:

- Maternal orphans are children under age 18 whose mothers, and perhaps fathers, have died (includes double orphans).
- Paternal orphans are children under age 18 whose fathers, and perhaps mothers, have died (includes double orphans).
- Dual orphans are children under 18 whose mothers and fathers have died.
- All orphans are children under age 18 whose mothers or fathers (or both) have died. The total number of orphans is equal to the sum of maternal orphans and paternal orphans, minus double orphans (because they are counted in both the maternal and paternal categories).

Source: UNAIDS, UNICEF, and US Agency for International Development (USAID). 2004. *Children on the Brink 2004: A joint report of new orphan estimates and a framework for action*. USAID.

Given the increasing prevalence of the disease, the number of children orphaned by AIDS will continue to rise—along with the consequent economic and social costs. The number of orphans associated with high- and low-growth scenarios used throughout this report is estimated for PNG (Table 6. Approximately 210,000 children in PNG are expected to be orphaned by 2020 under the high-growth scenario, while 56,000 are estimated to be orphaned under the low-growth scenario.

During infancy and adolescence, the loss of parents might reduce school attendance (Hunter and Williamson, 2000), or force children into the workforce. The government might need to support children whose social situation is severe with community feeding posts, books, fees, uniforms, and orphanage accommodation. Following the resource needs model (Bollinger et al, 2002), which uses international benchmark orphan cost data, orphans could cost Pacific governments or nongovernment organizations (NGO) around $400 per year for each orphan in support. By including this cost for Pacific orphans, the projections suggest that, under the high-growth epidemic scenario in PNG, supporting dual orphans could cost $38 million a year in 2020.

D. Fiji Islands

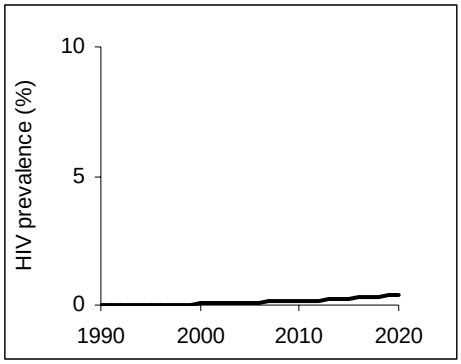
Early sexual debut, high rates of STIs, and a large mobile population make many people in Fiji Islands vulnerable to HIV/AIDS infection. As of May 2004, the country had nearly 182 confirmed cases. However, the Ministry of Health suggests that this figure could be only about a third of the actual cases in Fiji Islands (UNAIDS, 2005).

1. National Prevalence

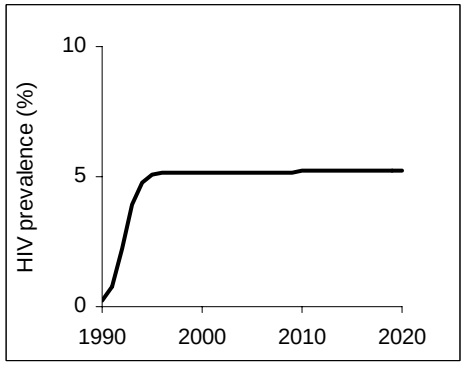
A number of modeling studies have been undertaken in Fiji Islands to estimate national prevalence. For example, Vanualalai et al.(2004) used models based on an initial slow HIV infection growth rate, followed by a rapid growth rate, to model national prevalence. Using this approach, about 23–54 new cases are anticipated in 2010 (Vanualailai et al, 2004), which approximates the reported case number. Other researchers, such as Goforth (1990), presented HIV-positive accumulated figures of about 60,000 in 2002, 85,000 in 2005, and 95,000 in 2010. Vanualalai et al (2004) suggest that these estimates overreport the future trajectory of the epidemic in this country.

As with the PNG projection, high- and low-growth scenarios were estimated for the high-risk groups in Fiji Islands for this report. These were aggregated to generate national prevalence. Using this approach, 536 new HIV cases were estimated in the general population in 2010 under the high-growth scenario, and 109 new cases for the low-growth scenario. The lower-growth scenario outlined in this study approximates the number of cases estimated by Vanualalai et al (2004).

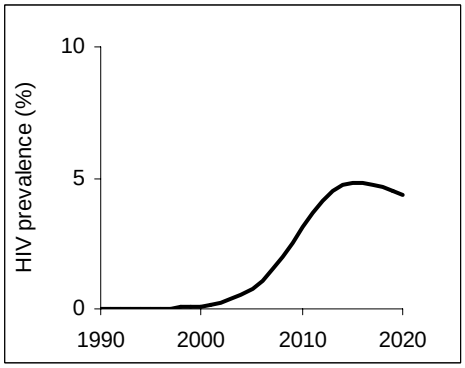
Figure 6: Projected National and Subnational HIV Cases in Fiji Islands for Low-Growth Scenario



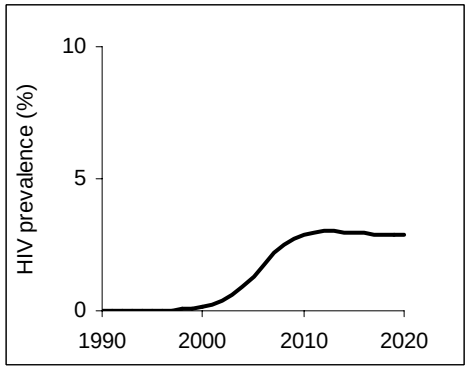
National Prevalence in Fiji Islands



Prevalence in Sex Workers



Prevalence in MSM



Prevalence in Sex Worker Clients

MSM = men who have sex with men.
Source: Consultant estimates using estimation and projection package modeling and Spectrum package.

2. Prevalence Among Vulnerable Groups

Given the low prevalence of the Fijian epidemic, an understanding of how the virus is transmitted in groups with high-risk behaviors, where prevalence is most apparent, is critical. The importance of sex workers, MSM, and clients of sex workers is evident in Figure 6, where more than 500 cases within these vulnerable subpopulations are forecast in 2020 under the high-growth scenario.

In 2004, only 160 cases were estimated for clients of sex workers, which is relatively low considering the subpopulation comprises 7,000 people. Since the recent behavioral and serological survey of vulnerable populations in the region did not find any HIV cases (WHO, 2006), a relatively low current estimation of prevalence should be apparent.

Prevalence is estimated to increase much more quickly in sex workers and MSM when compared to clients of sex workers Sex workers are assumed to have higher partner frequencies, and surveys suggest condom use in Fiji Islands is relatively low. For example, only 8% of military and police who engaged in paid sex within the previous 12 months used a condom during their last sexual contact (WHO, 2006). In the case of MSM, the probability of HIV transmission is much greater for unprotected sex, when compared with unprotected heterosexual sex. .

HIV prevalence rates of 8% for sex workers, 5% for sex worker clients, and 5% for MSMs are estimated in 2020 under the high-growth scenario for Fiji Islands. The estimated numbers of people within each of these high-risk groups are provided in the Appendix, using UNAIDS (2006) standard proportions of the 15–49 year old population estimates.

3. Demographic Impacts

As with PNG, HIV prevalence forecasts were incorporated in the Futures Group Spectrum model to determine the number of AIDS cases, AIDS-related deaths, life expectancy, and crude death rates for high and low HIV epidemic scenarios in Fiji Islands. Table 7 includes these estimates, as well as HIV prevalence and the number of people requiring ART.

If the epidemic follows the high-growth scenario, life expectancy might be some 1.3 years shorter in 2020 than would have been the case without HIV/AIDS. The annual number of AIDS-related deaths in Fiji associated with the high growth scenario is estimated to be 328 in 2020, while 143 people are forecast to die of AIDS-related illness under the low growth scenario in the same year.

Table 7: HIV Prevalence and AIDS-Related Deaths in Fiji Islands

Current (2005)	
HIV Prevalence (%)	< 0.2
AIDS Cases	25
HIV/AIDS Deaths	17
2020 (High-Growth Scenario)	
HIV Prevalence (%)	0.87
People Requiring ART	684
HIV/AIDS Deaths	328
HIV/AIDS Dual Orphans (‘000)	0.29
HIV/AIDS All Orphans (‘000)	2.06
Public and NGO Sector Cost of Orphan Support ($ million)	0.12
Decrease in Life Expectancy (years)	1.3 (68.7)
Increase in Crude Death Rate	8.5
2020 (Low-Growth Scenario)	
HIV Prevalence (%)	0.41

People Requiring ART	226
HIV/AIDS Deaths	143
HIV/AIDS Dual Orphans ('000)	0.08
HIV/AIDS All Orphans ('000)	0.57
Public and NGO Sector Cost of Orphan Support ($ million)	0.03
Decrease in Life Expectancy (years)	0.5 (69.5)
Increase in Crude Death Rate	8.1

ART = antiretroviral therapy, NGO = nongovernment organization.
Source: Asian Development Bank consultant.

In 2020, an estimated 684 people will require ART under the high-prevalence scenario, and 226 people under the low-growth epidemic scenario. Since the current estimate of people living with HIV is 182, ART demand is likely to grow significantly in the medium term.

4. Orphaned Children

Under the high-growth epidemic scenario, an estimated 290 children will become dual orphans as a result of AIDS deaths. Based on an estimated cost per year of $400 to support each orphan (Bollinger et al, 2002), the total cost of orphan support could reach $0.1 million in 2020. Under the low-growth epidemic scenario, the cost of orphan support resulting from AIDS will be $30,000 in 2020.

E. Kiribati

WHO (2006) noted that the epidemiology of STIs is poorly understood in Kiribati, as inadequate laboratory and public health information capacity curtail surveillance. Due to their high mobility, seafarers are considered the subpopulation with the highest risk of HIV infection. To improve the knowledge base relating to HIV in this country, WHO (2005) conducted a cross-sectional survey of STI prevalence among Kiribati seafarers and pregnant women. HIV was detected in one seafarer in this survey, while chlamydia was found in 14.3% and herpes simplex virus in 94.7%. Further research in 2006, (outlined in WHO, 2006) found very low rates of condom usage.

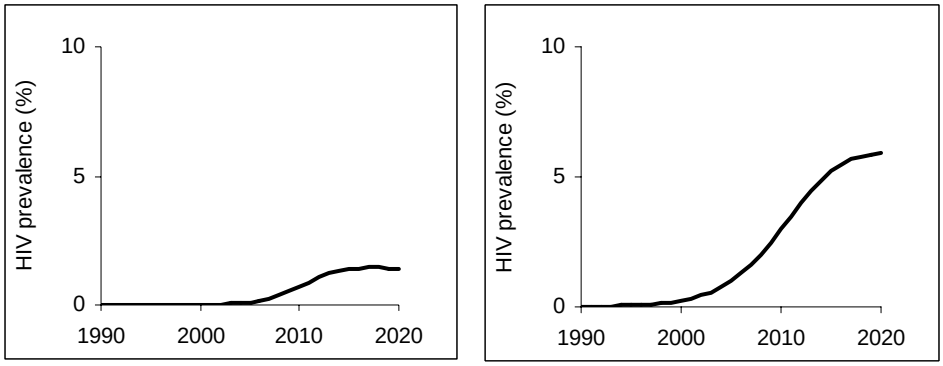
1. National Prevalence

The first confirmed HIV infection in Kiribati occurred in 1991, according to the WHO (2006) survey, and 46 HIV infections had been reported by the end of 2004. In 2004, 23 people were living with HIV (12 males and 11 females). Under a high-growth scenario, adult prevalence was assumed to reach 1.6% in 2020, while an adult prevalence of 0.8% was assumed under the low-growth scenario. The estimated number of people within each of these high-risk groups, and prevalence by year, is in the Appendix.

2. Prevalence Among Vulnerable Groups

Seafarers spend long periods away from home, often with stops in commercial centers where sex can be purchased readily. WHO (2006) found that 22.5% of seafarers interviewed had sex with commercial female partners, while 17.2% had sex with casual female partners in the previous 12 months. Few seafarers used condoms during their last contact with a commercial partner. This risk behavior is the key factor assumed to underpin increased HIV prevalence among this subpopulation (Figure 7). About two thirds of seafarers (66%) had received an HIV test and knew the result. Many of the international shipping companies require HIV testing, which will help curb increased prevalence.

Figure 7: Projected National and Subnational HIV Cases in Kiribati for High-Growth Scenario



General Population Prevalence **HIV Prevalence in Seafarers**

Source: Asian Development Bank consultant.

3. Demographic Impacts

HIV prevalence forecasts were incorporated with age-dependant life expectancies to determine changes in life expectancy for high- and low-growth HIV epidemic scenarios in Kiribati. If the epidemic follows the high-growth scenario, life expectancy is estimated to be 1.6 years shorter in 2020 than would be expected without HIV/AIDS. Background life table data was derived from the life tables for Fiji Islands, as Kiribati tables are not incorporated in the software packages used to estimate prevalence and demographic impact. The lack of this data precludes the estimation of orphan and other impact data.

Table 8: HIV Prevalence and AIDS-Related Deaths in Kiribati

Current (2005)	
HIV Prevalence (%)	0.05
2020 (High-Growth Scenario)	
HIV Prevalence (%)	1.56
Decrease in Life Expectancy	2.8
2020 (Low-Growth Scenario)	
HIV Prevalence (%)	0.75
Decrease in Life Expectancy	1.2

III. HEALTH SECTOR IMPACTS

As the epidemic spreads, health care expenditures will rise to meet the increasing demand for care and support. In addition, resources will be mobilized to limit the development of the epidemic. Tertiary care facilities will bear most of the burden, putting pressure on other treatment programs. To understand how HIV/AIDS might affect the health sectors in the Pacific, background information about health sector financing and external assistance to fight the epidemic is presented.

A. Health Sector Financing

Table 9 presents health expenditures, broken down by private and public expenditures. Typically, such expenditures increase with higher per capita national incomes. Countries with the largest populations spend the most on health. For example, PNG spent $123 million on health in 2002, while Fiji Islands had the next largest expenditures at $78 million (WHO, 2005).

Table 9: Health Expenditure in the Pacific, 2002

Country	Central Government Expenditure ($ million)	Private Health Expenditure ($ million)	Assistance By Development Partners ($ million)	Total Health Expenditure ($ million)	Hospital Beds
Melanesia					
Fiji Islands	46.1	27.7	4.4	78.1	2,097
Papua New Guinea	66.7	14.0	42.2	122.9	12,900
Solomon Islands	7.0	0.9	5.5	13.4	881
Vanuatu	4.9	2.4	1.8	9.1	397
Micronesia					
FSM	10.6	1.8	3.0	15.4	658
Kiribati	4.1	0.1	0.1	4.3	140
Marshall Islands	4.9	3.6	2.5	10.9	105
Nauru	7.6	1.0	—	8.5	60
Palau	7.0	0.8	1.0	8.8	90
Polynesia					
Cook Islands	4.0	0.3	0.2	4.6	80
Niue	0.7	0.0	—	0.7	—
Samoa	10.4	3.7	1.3	15.5	661
Tonga	4.6	2.5	2.2	9.4	296
Tuvalu	0.1	0.4	0.2	0.8	56
Total	**178.8**	**59.1**	**64.6**	**302.5**	**17,521**

FSM = Federated States of Micronesia. Note: $=$US.
Source: WHO (2005).

Nauru ($656), Palau ($439), RMI ($210), and FSM ($143) had the largest health expenditures per person. Assistance by development partners supports a great deal of health spending in the Solomon Islands, PNG, RMI, and FSM.

Health spending, as a percentage of gross domestic product (GDP), is low in Pacific countries where HIV prevalence is increasing, although some governments is the region—such as Fiji Islands—have allocated budgets for HIV prevention and care.

Overall, however, health expenditures are lower than in Africa and the world average. For example, health spending in PNG was 4.3% of GDP in 2002, compared to 6.1% on average in sub-Saharan African and 10% worldwide (World Bank, 2006).

Table 10: Health Expenditure and Sector Performance in the Pacific, 2002

Country	Health Expenditure ($ Per Capita)	Health Expenditure (% GDP)
Melanesia		
Fiji Islands	94	4.2
Papua New Guinea	22	4.3
Solomon Islands	29	4.8
Vanuatu	44	3.8
Micronesia		
Federated States of Micronesia	143	6.5
Kiribati	49	8.0
Marshall Islands	210	10.6
Polynesia		
Samoa	88	6.2
Tonga	91	6.9

Source: WHO (2005). Note: $=$US.

Low health spending is a key constraint to governments' efforts to reduce infant and maternal mortality, and halt infectious diseases, as agreed in the Millennium Development Goals (MDG).[4] WHO's Commission on Macroeconomics and Health estimated that health expenditure of about $31–34 per person per year is required for basic health care (WHO, 2003). Except in PNG, per capita spending is above this threshold in all Pacific island countries, though spending on national HIV/AIDS programs is limited.

B. External Assistance to the Health Sector

Health, Nutrition, and Population Assistance. As a percentage of overall aid, health and population program support is substantial in the Pacific. Per capita donor assistance is far greater in this region than any other part of the world. In 2003, for example, official aid totaled $183 per person in Oceania, compared to $27 per person in Africa and $6 per person in Asia (OECD, 2006). Of this total, health represented 9% of all aid flows, which is a smaller percentage of total aid than in Africa, but higher than in Asia, the Americas, and Europe.

Table 11: Official Aid and Health Aid in the Pacific

Country	Official Aid ($ Per Capita)	Health and Population Aid ($ Per Capita)	HNP External Assistance (%)
Africa	27	2.7	10
Asia	6	0.3	5
Oceania	183	16.5	9
Europe	55	0.6	1
Latin America	10	0.7	7

HNP = health, nutrition, and population.
Source: Organisation for Economic Co-operation and Development (OECD). Development Assistance Database. Available: http://www.oecd.org/dataoecd/39/50/7504885.PDF

[4] At the Millennium Development Summit in 2000, 147 heads of state adopted the MDGs to improve economic well-being, and enhance social and sustainable development. The health MDGs entail halting the spread of HIV/AIDS, reducing by two thirds the infant mortality rates, reducing by three quarters maternal mortality rates.

Development partners are unlikely to be able to cover all the financing gaps for HIV prevention and care, as external assistance to the region is already high.

Pacific HIV/AIDS Strategy and Assistance. The Pacific Regional Strategy on HIV/AIDS was developed in 1997, and then was reformulated for 2004–2008. This strategy, which takes into account the special features of the region, includes lessons learned from countries that have had some success in managing the epidemic. Much of the external assistance to the region has been channeled through the framework that the strategy provides. Key current initiatives are presented in Box 3.

Box 3: External HIV/AIDS Assistance in the Pacific

- **Asian Development Bank**. An HIV/AIDS grant of $8 million from the Asian Development Fund has been approved for Cook Islands, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu. Key components of the project are (i) surveillance; (ii) community-based interventions, such as sexually transmitted infection (STI) services; and (iii) targeted HIV prevention in vulnerable groups. in addition, the HIV/AIDS Prevention and Control in Rural Development Enclaves Project for Papua New Guinea (PNG) has been approved. The project will support behavior change, social marketing of condoms with Australian Agency for International Development (AusAID) and New Zealand's International Aid & Development Agency (NZAID), and improved surveillance.
- **Global Fund to Fight AIDS, Tuberculosis and Malaria**. Eleven small Pacific island countries were awarded an HIV/AIDS grant of $6 million over 5 years to (i) strengthen STI, HIV, and behavioral surveillance in five countries, and laboratory capacity (e.g., blood safety); (ii) improve STI and HIV services by 2007; and (iii) reduce the risk of HIV and other STIs through targeted interventions. PNG also was awarded a 5-year grant of $8.4 million in the fourth round to (i) reduce transmission among young people, (ii) scale up testing, and (iii) increase the availability of antiretroviral drugs.
- **Australia.** Australia has two regional HIV/AIDS-related projects in the Pacific, as well as a large HIV prevention investment in PNG. In PNG, $30 million is being invested over 5 years in 20 provinces to strengthen government response, STI treatment, and social marketing of condoms. The Pacific Regional HIV Project began in 2004 with A$12.5 million funding from the Government of Australia and €1 million from the Government of France. It has been designed to help strengthen the capacity of Pacific island governments, nongovernment organizations (NGO), and communities to develop, implement, and evaluate multisector responses to HIV/AIDS. Australia and New Zealand also are cofunding the Joint United Nations Programme on HIV/AIDS (UNAIDS) coordinator in Suva for 3 years.
- **France.** The Franco-Australian Pacific Regional HIV/AIDS & STI Initiative aims to reduce the vulnerability to, and impact of, HIV/AIDS. The key purpose is to strengthen the capacity of governments, NGOs, and communities to respond effectively to the epidemic.
- **New Zealand.** New Zealand has committed NZ$730,000 to support the Pacific Islands AIDS Foundation for 3 years. The organization promotes positive living, positive health, positive partnerships, and positive action and prevention. Furthermore, New Zealand contributes NZ$175,000 annually to a direct mail project
- **United Nations.** The United Nations agencies present in the Pacific are working with UNAIDS across a wide range of fields, such as (i) sexual abuse and exploitation of children, and the development of school curricula (United Nations Children's Fund); (ii) condom social marketing (United Nations Population Fund); (iii) reviews of HIV-related legal issues (United Nations Development Program); (iv) laboratory support, training in the treatment and care of HIV-infected patients, and a workshop on second-generation surveillance (World Health Organization); and (v) meetings with police, military, and other occupational groups regarding workplace policies (International Labour Organisation, UNAIDS)..

Source: ADB. 2005. Secretariat of the Pacific Community, Report and Recommendation of the President, November, 2005.

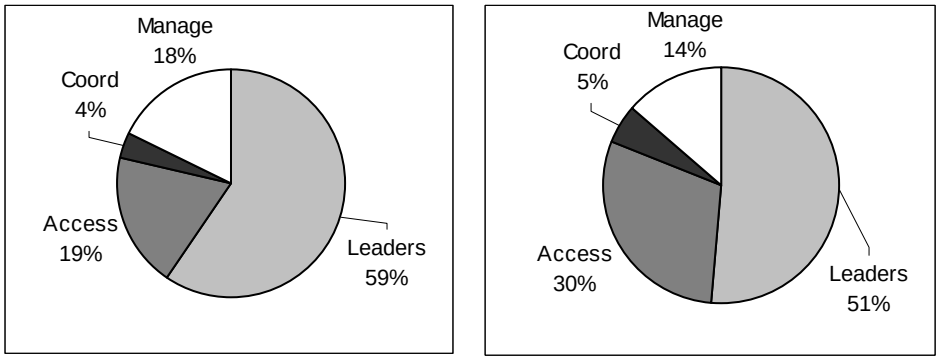
The high level of external assistance for HIV prevention and care in the region might not continue. Therefore, governments need to mobilize domestic resources to generate a more sustainable and less variable mode for financing such HIV activities.

ADB (2005) noted that a major challenge in the development of the Pacific Strategy 2004–2008 has been integrating the varying views and concerns in a region with diverse cultures and religious backgrounds, as well as differing national HIV epidemics, into a strategy based on universal principles, such as leadership, prevention, reducing vulnerability, care, support, and treatment. Member countries of the Secretariat of the Pacific Community (SPC) have adopted the strategy, which provides a framework for coordinating government and development partners' activities on HIV/AIDS and setting priorities.

C. Funding Gaps, 2004–2008

An estimated $15.1 million is needed to fight the epidemic in the Pacific, as broken down in Figure 8. Leadership costs include $4.5 million for supporting implementation of national strategic plans. Access includes national-level support for HIV prevention activities, service delivery systems, availability of HIV-related drugs, and laboratory services.

Figure 8: Regional Pacific HIV/AIDS Strategy and Current Funding Gap, 2004 - 2008



Resources Needed ($15.1 million) **Funding Gap ($8.5 million)**

Access = access to quality services, Coord. = regional coordination, manage. = project management, leaders. = leadership. Note: $ = $US
Source: Condon, R. 2005. Pacific Regional Strategy on HIV/AIDS, 2004–08 and Draft Regional Strategy Implementation Plan: Analysis of Programmatic and Funding Gaps. A report to AusAID (5 July 2005).

Despite the external assistance, a funding gap of $8.5 million remains. Key areas include (i) condom advocacy, distribution, and social marketing; (ii) prevention activities among higher-risk individuals (e.g., STI patients, mobile populations, "transactional" sex workers, MSM, etc.; and their partners); (iii) scaling up voluntary confidential counseling and testing (VCCT) services, ensuring good access to vulnerable and higher-risk groups; (iv) strengthening STI diagnosis and treatment; and (v) leadership.

Leadership, governance, and strengthening civil society involvement are important for achieving the longer-term behavioral and societal changes necessary to combat HIV/AIDS. A major funding gap in this area entails the implementation of national strategic plans. Another funding gap is associated with access to drugs and prevention.

D. Potential Future Health Sector Costs

As the number of AIDS cases increases, the demand for antiretroviral (ARV) drugs and other forms of care will rise. However, the use of these drugs and expensive treatments for

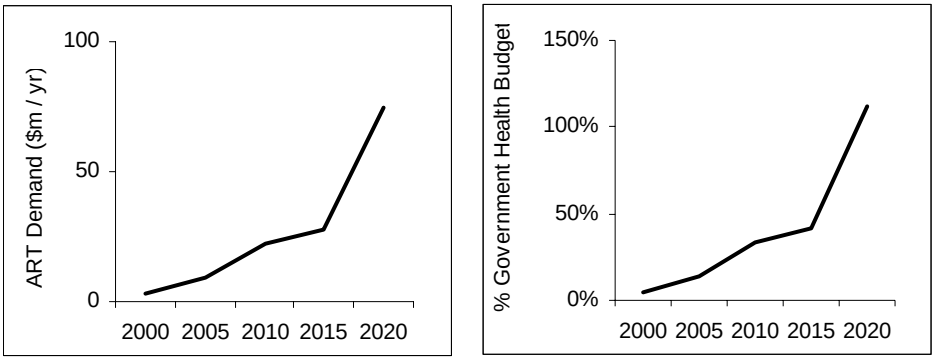
opportunistic infections is minimal in the region because of the low per capita GDP and, in many places, relatively poor access to health care.

In addition to drug costs, staff must be trained in service delivery and infrastructure must be provided to support the increase in demand for care and treatment. UNAIDS (2005) estimates that ART costs per patient per year, including drugs and other costs, were $1,993 in the Pacific in the early 2000s. The costs of ARV drugs are changing dramatically. In 2000, the annual cost of ARV drugs was estimated to be between $10,000 and $12,000 per patient. By 2002, however, some combinations of ARV drugs had decreased to $350 per patient per year (UNAIDS, 2005).

In the absence of up-to-date, publicly available ARV delivery data, the annual patient cost of $850 per patient per year in Thailand (World Bank, 2005b) is used to estimate the annual per patient cost of ARV drugs and delivery in the Pacific. When compared with average annual domestic public health spending of $11–$55 per person by the governments of relatively high HIV countries, a moderate HIV/AIDS epidemic clearly would put huge strains on government budgets in these countries, as well as on household health care spending (AusAID, 2001).

To appreciate how much ART costs will escalate in Fiji Islands and PNG, the number of people requiring treatment was estimated using prevalence estimates from the EPP projections and imputed into the Spectrum package, along with a cost of $850 per ART patient per year. The value of this ART demand was divided by central government health budgets to estimate the percentage of overall government health spending ART demand could represent.

Figure 9: Projected ART Demand as Percentage of PNG Government Budget



ART = antiretroviral therapy, PNG = Papua New Guinea. Note: $ = $US
Source: Consultant estimates using estimation and projection package modeling and WHO (2005) data.

Based on a unit cost of $850 and the demand for ART under the high-growth epidemic scenario in PNG, ART demand would total more than $74 million per year in 2020. This represents 116% of the current central Government health budget in PNG. Clearly, a low-income country such as PNG does not have the financial resources or the delivery capacity to handle an increase in demand on the health sector of this order. In addition to financial constraints, PNG has limited human resource capacity. PNG has about 250 doctors to serve the national population of 5.5 million (WHO, 2005).

The value of demand for voluntary counseling and testing also were estimated. The cost of testing varies, but it might average about $13 per person tested. This cost includes

awareness, peer education, and any STI treatment and testing (ADB/UNAIDS, 2004). In determining demand, the rule of thumb (WHO, 2002) that twice the number of people who are infected with HIV will be tested every 5 years is used. This is combined with prevalence projections from the EPP package for Fiji Islands, and PNG to calculate the annual value of demand for testing.

Health sector impacts are provided for the current situation, as well as low- and high-growth scenarios, for Fiji Islands, and PNG. At the moment, the demand on the health sector by those requiring care is modest. However, even under low-growth epidemic scenario this demand will increase dramatically as people living with HIV become symptomatic and HIV infection continues to spread.

Table 12: Health Sector Impacts for Selected Forecasts

Country	Fiji Islands	Papua New Guinea
Current (2005)		
VCT Client Demand	73	4,074
Cost of VCT ($ '000)	0.9	53.0
ART Demand	25	1,843
Cost of ART Demand ($ '000)	21	1,567
% of Government Budget	0%	2%
Demand for Hospital Beds (bed days)	500	36,860
% Bed Capacity	0.1%	1.0%
2020 (High-Growth Scenario)		
VCT Client Demand	2,384	239,600
Cost of VCT ($ '000)	31	3,115
ART Demand	684	87,550
Cost of ART Demand ($ '000)	581	74,418
% of Government Budget	1%	116%
Demand for Hospital Beds (bed days)	13,680	1,751,000
% Bed Capacity	2%	46%
2020 (Low-Growth Scenario)		
VCT Client Demand	800	148,400
Cost of VCT ($ '000)	10	1,929
ART Demand	226	33,950
Cost of ART Demand ($ '000)	192	28,858
% of Government Budget	0%	46%
Demand for Hospital Beds (bed days)	4,520	679,000
% Bed Capacity	1%	18%

ART = Antiretroviral Therapy, VCT= Voluntary Counseling and Testing. Note: $ = $US
Source: Asian Development Bank consultant.

In addition to human resource capacity constraints, PNG has a limited number of hospital and health center beds. Watters and Lourie (1996) noted that PNG had about 12,900 beds, including 4,400 hospital beds and 8,500 health center beds. As the epidemic grows, AIDS patients will demand a large percentage of bed capacity,. Already, HIV/AIDS is the leading cause of death in Port Moresby General Hospital, and accounts for 14% of admissions in the adult wards. Most of the people living with HIV/AIDS who are admitted to the hospital are in late stages of AIDS (ADB, 2005b).

Based on each AIDS patient requiring 20 days of hospital care per year, 1–2% of bed capacity in Fiji Islands will be devoted to AIDS patients in 2020 under the high-growth

scenario, while nearly half of PNG's bed capacity could be required by that time. The widespread availability of ART, combined with the decreasing the number of new infections through targeted prevention programs, would reduce dramatically the demand for hospital beds for AIDS-related illnesses.

IV. MACROECONOMIC IMPACT

Increased national HIV prevalence and the corresponding increase in death rates theoretically should decrease the size of the workforce, erode human capital, and possibly decrease economic growth. A number of theoretical studies have shown this to be the case, although empirical evidence is not conclusive (Bloom and Mahal, 1995). The impacts of HIV/AIDS on Fiji Islands and PNG workforces are outlined in this section, and case studies from PNG and Kiribati are presented to illustrate potential national economic costs in the Pacific setting.

A. Background

The link between HIV/AIDS prevalence and national economic growth has not been established clearly, although economic theory and a number of modeling studies—primarily in Africa—have suggested higher HIV prevalence would undermine the economic well-being of a country. Bloom and Mahal (1997) argued that these analyses probably overstate the threat that AIDS poses to per capita economic growth, because most developing countries have significant surplus labor that would mitigate the output losses due to AIDS morbidity and mortality. AIDS is linked to poverty, and the impact on savings might be smaller in the long run, as other adjustments in household and government expenditure are made (Centre for International Economics, 2002)

To determine empirically whether such a correlation exists, Bloom et al (1996) pooled socioeconomic and AIDS data from 51 countries. They concluded that the epidemic has had a negative, but statistically insignificant, effect on the growth rate of real income per capita. Specifically, they found that an annual average increase in cumulative AIDS prevalence of 1 per 1,000 adults would reduce the annual growth rate of real income per capita by 0.04%.

The elevated death rates from growth in the national HIV/AIDS epidemics in PNG and Fiji Islands are forecast to reduce the populations of people 15–64 years old in 2020. Under the high-growth scenario in PNG, the workforce is forecast to shrink by 8%. The magnitude of the economic impact of this labor supply contraction is difficult to estimate. However, the modeling study presented in the next section suggests that labor force impacts are the key driver of decreased GDP in AIDS-affected economies.

Table 13: HIV/AIDS Impact on Workforce in PNG and Fiji Islands

Country	PNG	Fiji Islands
2020 (No HIV Scenario)		
Population 15–64 Years Old (millions)	4.90	0.596
Reduction in Workforce (%)	—	—
2020 (High-Growth Scenario)		
Population 15–64 Years Old (millions)	4.50	0.592
Reduction in Workforce (%)	8.16	0.67
2020 (Low-Growth Scenario)		
Population 15–64 Years Old (millions)	4.81	0.595
Reduction in Workforce (%)	1.84	0.16

PNG = Papua New Guinea.
Source: Asian Development Bank consultant.

B. Papua New Guinea

Three key macroeconomic studies have been conducted to estimate the macroeconomic impact of HIV/AIDS in PNG. First, CIE (2003) used a computable general equilibrium model

of the national economy to investigate the possible impacts of the HIV/AIDS epidemic in PNG. Low-, medium-, and high-prevalence scenarios were forecasted based on epidemic growth in African countries. Under the high-growth scenario, many people were assumed to suffer AIDS-related deaths. The resulting large reduction in the labor force would have profound and complicated national economic impacts. The major result generated by this model was a decline in real GDP by 2.6% under the low-growth scenario and 7.5% under high-growth scenario.

The reduction in the labor supply was found to push up wages, particularly for high-skilled workers, while subsistence agriculture suffered the greatest national economic decline—contracting by 8.5% under the low-growth scenario and 24.2% under the high-growth scenario. In the CIE (2003) study, an average decline of 0.32% in per capita GDP was estimated for a 1% increase in HIV/AIDS prevalence in 2010 (under medium- and high-prevalence scenarios).

AusAID (2006) financed a recent study that assessed the effect of HIV/AIDS on GDP using an HIV/AIDS prevalence and GDP impact function published by the International Labour Organization. The relationship, derived mainly from African countries, focused on the economic impact of the premature deaths of productive adults. This model estimated that 10% prevalence in PNG by 2025 would decrease GDP growth by 1.3%.

Tandon (2005) also developed a model that extends the production function framework, incorporating the impact of HIV/AIDS on the accumulation of human capital. This model estimated an annual GDP per capita decline of about 4% in 2010 based on 6% prevalence.

These theoretical studies provide a range of relationships between GDP per capita and HIV/AIDS prevalence in PNG. Based on the higher prevalence CIE studies, if an average 0.32% decline in per capita GDP (the average for the three studies) is associated with a 1% increase in HIV/AIDS prevalence, real GDP would decline by 4–5% in 2020 under the high-growth scenario used in this analysis.

C. Economic Profile of PDMCs

FSM and Fiji Islands have the highest gross national incomes for the ADB PDMCS presented in Table 14. The large aid inflows are evident for FSM and RMI, while the dependence of Samoa, Tonga, and Kiribati on remittances also is apparent. Remittances to Tonga were P$63 million in 1999, about three times the value of exports and the largest component of the economy. Annual remittances in Fiji Islands have surpassed $140 million and are increasing (Connell and Brown 2005).

Table 14: Economic Performance and Remittance Flows in the Pacific

Country	GNI 2001 ($ million)	Ratio of Aid to GNI (%)	Remittances Significance
Melanesia			
Fiji Islands	2,000	1.5	Increasing
Papua New Guinea	560	6.8	No
Solomon Islands	620	24.0	No
Vanuatu	1,210	13.4	No
Micronesia			
Federated States of Micronesia	2,088	61.6	No
Kiribati	990	19.8	Yes
Marshall Islands	2,110	64.3	No
Polynesia			
Samoa	1,370	17.5	Yes
Tonga	1,500	13.5	Yes

GNI = gross national income.
Source: World Bank (2006).

Remittances from seafarers to Kiribati increased by a factor of 10 between 1979 and 1998 (Borovnik, 2004). Any threat to this financial inflow could have substantial economic ramifications for this vulnerable country. Many of those living with HIV are thought to be seafarers (Dennis, 2003).

D. Seafarers

An estimated 6,000 Pacific islanders were registered seafarers on fishing, chemical, and cargo ships in 1997. The majority are crew members with limited education from low-income backgrounds. Frequent risky behavior by seafarers, combined with the high degree of mobility, increases the risk of HIV infection for this group.

Oriente (2005) suggested seafarers probably brought HIV to the Pacific region. A study in Kiribati pointed out that 9% of seafarers had chlamydia and 3% had syphilis, with 0.3% HIV/AIDS prevalence (UNAIDS, 2004). Surveys of seafarers from Fiji Islands, Tuvalu, and Kiribati indicate that many practice unsafe sex. The reasons given for this risky practice included loneliness, drinking too much alcohol, and peer pressure (Table 15).

Table 15: Reasons Given by Seafarers for Practicing Unsafe Sex
(%)

	Tuvalu	Kiribati	Fiji Islands
Loneliness when away from home	82	79	70
Drinking too much alcohol	79	79	81
Influence of friends and peers	62	62	80
Uncomfortable using condoms	76	69	69
Believe will not catch STIs	71	52	57
Hearing bad news from home when away at sea	68	80	—

STI = sexually transmitted infection.
Source: Dennis, J. 2003.

As of December 2004, Kiribati had reported 46 cases of HIV/AIDS,. In 2004 WHO (2006) reported that there were 23 people living with HIV, with 12 being male and 11 female which reflects the concentration of infections undergoing a gender shift. Infections among seafarers and their wives has continued to increase, and some believe the actual number of cases could be as high as 300 (Peteru, 2002).

Table 16: Cost of Increased Prevalence in Kiribati

Country	Current Prevalence (0.05%)	Increased Prevalence (1.56%)
ART Demand	28	873
ART Cost ($ million)	—	0.3
10% Reduction in Seafarer Remittances ($ million)	—	1-2

ART = antiretroviral.
Note: The estimates assume AIDS cases are proportional to prevalence.
Source: Consultant estimate.

Seafaring remittances to Kiribati total approximately $6 million–$10 million per year (Connell and Brown, 2005; Dennis, 2003). If this financial flow was reduced—as a result of commercial shipping companies turning to other countries to source labor—due to high HIV prevalence, the costs would be considerable (Table 16). A drop of 10% in seafarers' remittances would be the equivalent to $1 million–$2 million per year. This cost is far greater

than the cost of treatment, and also exceeds the resources required to prevent the continued escalation in incidence.

A decline in national income also would have significant local or household impacts. In 2003, SPC reported that each seafarer supported an average of seven people in Tuvalu, eight in Kiribati, and six in Fiji Islands. Some seafarers reported supporting as many as 30 people at home (Dennis, 2003). These families would be deprived of their principal source of income.

V. CONCLUSIONS

A. Summary

By 2004, some 10,500 HIV cases had been recorded in ADB PDMCs. However, the low use of condoms, widespread multiple sexual partners, and high levels of background STIs suggest that HIV prevalence could escalate in the region.

Limited surveillance and prevention capacities, low public sector health spending, and a reliance on development partners to support public sector initiatives in the region constrain the ability of Pacific island countries to respond to the expanding epidemic. Failure to address the epidemic will (i) increase care and treatment costs for the health sector; (ii) devastate AIDS-affected households; (iii) raise mortality rates, with corresponding decreases in life expectancy; and (iv) slow national economic growth in PNG. This report quantifies the current and possible impact of HIV/AIDS in PNG, Kiribati, and Fiji Islands.

Key impacts for PNG in 2020 include:

- The generalized epidemic will deepen, with about 519,718 people living with HIV/AIDS under a high-growth scenario in 2020.
- HIV prevalence was estimated to reach 13.3% in the high-growth scenario and 7.6% under a low-growth scenario.
- The number of adult deaths is estimated to increased to between 20,000 (low-growth scenario) and 56,000 (high-growth scenario) in 2020.
- About 210,000 children will have lost a parent due to AIDS by 2020, corresponding with an HIV prevalence of 13.3% that year.
- The health sector will bear the brunt of the epidemic, with ART demand reaching 87,550 people by 2020, costing an equivalent of $74 million. About half of all health care beds will be dedicated to HIV/AIDS patients under the high-growth scenario.
- The workforce is forecast to decline by 8% under the high-growth scenario, and the dependency ratio will deteriorate as the most productive segment of the community is affected disproportionately by the virus.
- GDP per capita could decrease by as much as 4–5% in 2020 under the HIV high-growth scenario.
- Life expectancy at birth in PNG, which already has decreased as a result of HIV/AIDS, is predicted to fall by 15.2 years in 2020. Crude death rates also are increasing.

Key impacts for Fiji Islands in 2020 include:

- As the epidemic accelerates, an estimated 6,000 people will be living with HIV/AIDS under the high-growth scenario in 2020.
- HIV prevalence is forecast to reach 0.87% in the high-growth scenario and 0.4% under a low-growth scenario. High-risk groups, such as sex workers, clients of sex workers and their partners, and MSM, will have a higher prevalence than the general population.
- The number of adult deaths is estimated to increase to between 143 (low-growth scenario) and 328 (high-growth scenario) in 2020.
- Under the high-growth scenario, about 2,000 children will have lost a parent as a result of AIDS by 2020.
- ART demand is estimated to reach between 226 (low-growth scenario) and 684 (high-growth scenario) people by 2020, and about 1–2% of beds will be dedicated to HIV/AIDS patients for the respective scenarios.
- The workforce is forecast to decline by 0.2–0.7%.

Key impacts for Kiribati in 2020 include:

- HIV prevalence is forecast to reach 1.56% under a high-growth scenario and 0.75% under a low-growth scenario.
- Life expectancy is predicted to decrease by 2.8 years under the high-growth scenario and 1.2 years under the low-growth scenario compared to the case without any growth in HIV prevalence.

Achieving Millennium Development Goals. A key MDG aims to have halted and begun to reverse the spread of HIV/AIDS by 2015. Achieving this MDG in the Pacific will depend on progress in preventing the further spread of the virus. Based on projections and scenarios presented in this report, PNG is particularly vulnerable to the affects of the virus. Key MDG targets will not be met without political commitment and the mobilization of government and development partners. A coordinated and comprehensive response is essential to avoid the erosion of the gains in reduced infant mortality rates and increased life expectancy due to the spread of HIV into the wider community.

B. Recommendations

Groups with High-Risk Behavior and Coverage. Except in PNG, the HIV/AIDS epidemic in the Pacific generally is concentrated in groups with high-risk behaviors—sex workers, clients of sex workers, vulnerable youth, and MSM. The spread of the epidemic can be prevented with effective interventions targeted at these high-risk groups. The behaviors and needs of these groups must be defined and effective interventions implemented. Further, prevention and care interventions must attain critical levels of coverage in these dynamic populations, and resources should be earmarked for longer-term action as activities need to be sustained to benefit these fluid populations.

Mobilizing Domestic Resources and Political Commitment. Political and economic commitment within PDMCS has been weak. Even in PNG, where incidence is rising at an alarming rate, ADB (2005) noted that few leaders have acknowledged HIV/AIDS as a major issue. Governments in the region need to address the multiple infectious and non-communicable disease challenges that require enhanced health services delivery and management capacity. Within this context, health personnel need to be trained and health systems strengthened. PDMCs cannot continue to rely on foreign aid agencies as their assistance already far exceeds that observed in other parts of the world. Furthermore, mobilizing domestic resources would provide a more sustainable and less volatile mode of financing, as external financing fluctuates with the objectives of the funding agencies. This study clearly shows that a high-growth HIV epidemic will inflict substantial economic and social costs on the affected countries. A modest commitment to prevention today will save considerable resources in the future. Governments need to commit to, and implement, successful HIV prevention interventions to decrease the potential impact of the disease. Such commitment and ownership could be imparted through extensive dialogue and community-led development of prevention and care initiatives.

Private Sector Involvement. Mines, logging camps, fisheries, and other economic enclaves are hot spots for HIV transmission. The private sector could be encouraged to provide much-needed services in these areas. ADB (2006) noted that some mines have begun to respond though peer-based education. Although large companies are providing basic health services, they need technical and financial support. ADB recently approved the HIV/AIDS Prevention and Control in Rural Development Enclaves Project in PNG. The project entails assisting the Government in establishing public-private partnerships for the delivery of Voluntary counseling and testing, treatment and care, and primary health care services. The project also will support the rollout of home-based care and social marketing of condoms, which will

be designed specifically for participating development enclaves and surrounding communities (ADB, 2005).

Priority Setting. Estimates of the physical and economic burden of HIV/AIDS under the two scenarios presented in this report are a first step toward evidence-based interventions in the health sector. Public sector and aid agency investment should prioritize diseases that inflict the highest burden, and for which cost-effective and technically sound interventions are available. The situation in the Pacific is complicated, because the patterns of mortality in many countries are highly variable and much of the existing data also is contradictory and unreliable (Taylor et al 2005, 1991; Taylor and Thomas, 1985). The results of this HIV/AIDS study need to be corroborated with health survey data and secondary sources of data to improve the targeting of health sector resources and funding agency intervention and coordination.

Cost-Effectiveness and Benefit-Cost Analysis. The cost-effectiveness analysis is an important tool in strategic planning. The HIV/AIDS epidemic has increased the economic burden on health care systems that are already stretched thin. With the major burden of HIV infection falling on resource-poor nations, the requirement for low-cost, effective interventions is paramount. Policy makers and planners are responsible for allocating limited resources. Cost-effectiveness analysis, which can compare the merits of alternative HIV/AIDS prevention and care activities, should be employed to determine which elements of the Pacific HIV/AIDS framework need priority funding. Since the cost-effectiveness of interventions in generalized epidemics and concentrated (high-risk group) epidemics differs, country-level evaluations must be undertaken to determine which key gaps need to be addressed first. This report clearly shows that failure to halt the progress of the epidemic today will lead to severe economic and social consequences in the future.

Implications for Development Partners. Many development partners and key stakeholders have become involved in the response to the HIV/AIDS epidemic. Partly as a result of differing funding modalities, investment priorities, portfolio management requirements, and reporting requirements, national HIV programs sometimes have become disjointed, creating a substantial administrative burden. A strategy for fighting the epidemic, formulated through extensive consultation, has been adopted by Pacific island countries. Despite this endorsement, about half of the resources required to mount a comprehensive response still need to be mobilized. International development partners and governments should address gaps in this regionally endorsed strategy systemically. Given the shared priorities of ADB and the Pacific regional HIV/AIDS strategy—and the urgent need to intensify prevention and care activities in the region—ADB approved a grant of $8 million in late 2005. Following the regional strategy's framework, the project aims to improve management and delivery of HIV/AIDS prevention services in 10 countries: Cook Islands, Kiribati, FSM, Nauru, RMI, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

VI. REFERENCES

ADB. 2001. *Handbook for Integrating Poverty Impact Assessment in the Economic Analysis of Projects*. Manila.

———. 2004. *Hardship and Poverty in the Pacific*. Manila.

———. 2005a. *Remittances in the Pacific: An Overview*. Manila.

———. 2005b. *Report on the Management of AIDS Patients Using Antiretroviral Drugs (ARVs)*. Pilot Project, Heduru Clinic, Port Moresby General Hospital. September, 2005.

———. 2005c. *PNG HIV/AIDS Prevention and Control in Rural Development Enclaves Project*. ADB, Manila.

ADB/UNAIDS (2004) *Socio-Economic Impact of HIV/AIDS in Asia and the Pacific: Current and Future Scenario*. ADB/UNAIDS Study Series: Paper IV. Manila.

Armstrong, W. 2000. HIV/AIDS and STD Among Seafarers in the Pacific Region. In *Proceedings of the 1st Pacific Regional HIV/AIDS and STD Conference* (23–25 February, 1999: Nadi, Fiji Islands) Noumea: Secretariat of the Pacific Community (SPC).

AusAID. 2001. *The Potential Economic Impact of HIV/AIDS in the Pacific*. Paper prepared by Access Economics for the Asia Pacific Ministerial Meeting, 9–10 October 2001. Melbourne.

———. 2006. *Impacts of HIV/AIDS 2005–2025 in Papua New Guinea, Indonesia and East Timor*. Canberra.

Bloom, D.E. and A.S. Mahal. 1995. Does the AIDS Epidemic Threaten Economic Growth? *Journal of Econometrics* Vol. 77: 105–124.

Bollinger, L., J. Stover, S. Bertozzi, and J.P. Gutierrez. 2002. *Resource Needs for HIV/AIDS: Model for Estimating Resource Needs for Prevention, Care, and Mitigation*. Washington, D.C.: Inter American Development Bank.

Bonnel, R. 2000. HIV/AIDS and Economic Growth: A Global Perspective. *South African Journal of Economics* Vol. 68 (5): 820–855.

Borovnik, M. 2003. *Seafarers in Kiribati—Consequences of International Labour Circulation*, Unpublished PhD thesis, University of Canterbury, Christchurch.

Centre for International Economics (CIE). 2002. *Potential Economic Impacts of an HIV/AIDS Epidemic in Papua New Guinea*. Report for AusAID, Canberra, February.

Chin, J. 1996. A Beginner's Guide for Understanding and Using EpiModel, Version 2.1. Available from James Chin: 456 Kentucky Avenue, Berkeley, CA 94707.

Chin, J., and S.K. Lwanga. 1989. The World Health Organization Approach: Projections of Non-Paediatric HIV and AIDS in Pattern II Areas. In *The AIDS Epidemic and Its Demographic Consequences*. Proceedings of the United Nations/World Health Organization Workshop on Modeling the Demographic Impact of the AIDS Epidemic in Pattern II Countries: Progress to Date and Policies for the Future. New York, 13–15 December 1989.

Clark, P. 2003. *Economic Tracer Study for Pacific Islands Seafarers' Expenditure*. Suva: SPC Regional Maritime Programme.

Connell, J., and R. Brown. 2005. *Remittances in the Pacific: An Overview*. Manila: ADB.

Dennis, J. 2003. *Pacific Island Seafarers. A study of the economic and social implications of seafaring on dependants and communities*. Suva: SPC.

Jenkins, C. 1994a. *Behavioural Risk Assessment for HIV/AIDS Among Workers in the Transport Industry, Papua New Guinea*. Final report to AIDSCAP/FHI, Bangkok.

———. 1994b. *Knowledge vs. Behaviour Change. Preventing AIDS Transmission in PNG*. 30th Annual Symposium of the Medical Society of Papua New Guinea, 7–10 September, Mt. Hagen (Abstr).

———. 1994c. Sex as Work in Papua New Guinea (Poster), Xth International Conference on AIDS, Yokohama, 6–12 August (Abstract Book 2).

———. 1995. Report on Youth, Urbanization And Sexuality In Papua New Guinea. Papua New Guinea Institute of Medical Research, October.

———. 1996. *Survey for South Pacific Commission Youth Peer Education Project*, Port Moresby: Papua New Guinea Institute of Medical Research.

———. 2000. *Female Sex Worker HIV Prevention Projects: Lessons Learnt from Papua New Guinea, India and Bangladesh*. Geneva: UNAIDS. UNAIDS Case Study. Available: http://www.unaids.org/html/pub/publications/irc-pub05/jc438-femsexwork_en_pdf.pdf

Jenkins, C and K. Pataki-Schweizer. 1993. Knowledge of AIDS in Papua New Guinea. *Papua New Guinea Medical Journal* 36(3):192–204.

Ghys, P. D. et al. 2004. The UNAIDS Estimation and Projection Package: a software package to estimate and project national HIV epidemics. *Sex Transm Infect* 80:i5.

Goforth, R. 1990. Forecasts for HIV Infections and AIDS in Fiji. *Fiji Medical Journal* 16: 4–15.

Hammar, L. 1998. Sex industries and sexual networking in Papua New Guinea: public health risks and implications. *Pacific Health Dialog* 5(1):47–53.

Hauquitz, A.C. 2004. Looking down the barrel of a cannon: the potential economic costs of HIV/AIDS in Papua New Guinea. *PNG Med J* 47:39–49.

Horimoto, K, I. Hofuku, and K. Oshima. 1997. Population dynamics of HIV positive by application of a locally modified Gompertz Curve: a case study for Japan. *Nonlinear Analysis: Theory, Methods and Applications* 30: 985–993.

Hunter S., and J. Williamson. 2000. *Children on the Brink 2000*. Executive Summary, Updated Estimates and Recommendations for Intervention. USAID. Available: www.usaid.gov.

Kumaranayake L., and C. Watts. 2000). Economic costs of HIV/AIDS prevention activities in sub-Saharan Africa. *AIDS* 14(Suppl 3):S239–S252

Levantis, T. 2000. *Papua New Guinea: Employment, Wages and Economic Development*. Canberra : Asia Pacific Press, Australian National University.

McGreevey, W., S. Alkenbrack, and J. Stover. 2003. Construction Workplace Interventions for Prevention, Care, Support and Treatment of HIV/AIDS. In *Economics of AIDS and Access to HIV/AIDS Care in Developing Countries. Issues and Challenges*. Edited by J.P. Moatti, B. Coriat, Y. Souteyrand, T. Barnett, J. Dumoulin, and Y.A. Flori, Paris: Agence Nationale de Recherches sur le Sida.

Mgone, C., T. Lupiwa, and W. Yeka. 2002. High prevalence of Niesseria gonorrhoeae and multiple sexually transmitted diseases among rural women in the Eastern Highlands Province of Papua New Guinea, detected by polymerase chain reaction. *Sexually Transmitted Diseases* 29 (12):775–779.

Mgone, C. et al. 2002. Human immunodeficiency virus and other sexually transmitted infections among female sex workers in two major cities in Papua New Guinea. *Sexually Transmitted Diseases* 29 (5):265–270.

Murray, C.L., and A.D. Lopez. 1996. *The Global Burden of Disease: A Comprehensive Assessment of Mortality and Disability from Disease, Injuries and Risk Factors in 1990 and Projected to 2020*. Vol 1. Cambridge: Harvard University School of Public Health on behalf of WHO and the World Bank.

National Sex and Reproduction Research Team (NSRRT) and C. Jenkins. 1994. *National Study of Sexual and Reproductive Knowledge and Behaviour in Papua New Guinea*. Goroka: Papua New Guinea Institute of Medical Research.

Organisation for Economic Co-operation and Development (OECD). 2006. Development Assistance Database. Available: http://www.oecd.org/dataoecd

Oriente, R. 2005. *HIV/AIDS and Pacific Island Regional Fishers and Seafarers: Information, Education and Communications Needs and Available Resources*. SPC, Unpublished Report.

Papua New Guinea National AIDS Council Secretariat and Department of Health HIV/AIDS. 2004. Quarterly Reports.

Palloni A., and M. Glicklich. 1991. Review of approaches to modeling the demographic impact of the AIDS epidemic. In *The Aids Epidemic and Its Demographic Consequences*. New York: United Nations and Geneva: WHO.

Passey M. 1996. Issues in the management of sexually transmitted diseases in Papua New Guinea. *PNG Med J* 39:252–260.

Peteru, P. 2002. *Pacific Island Seafarers: A Study on HIV/AIDS and STI Risk-Related Behaviour*. Noumea: SPC.

Schwartlander, B. et al. 2001. Resource needs for HIV/AIDS. *Science* 29 June, 292 (5526): 2434–2443. Available: www.scienceexpress.org.

Seeley, J., and A. Allison. 2005. HIV/AIDS in fishing communities: Challenges to delivering antiretroviral therapy to vulnerable groups. *AIDS Care* August 2005, 17(6): 688–697.

SPC. 2004. HIV/AIDS Statistics for Pacific Island Countries and Territories. Unpublished

———. 2004. Final Working Draft of the Pacific Regional Strategy on HIV/AIDS (2004–2008). Pacific Regional HIV/AIDS Project. Suva.

———. 2005. AIDS Section, Public Health Program, December.

Stover, J. 2004. Projecting the demographic consequences of adult HIV prevalence trends: the Spectrum Projection Package. *Sex Transm Infect* 80:i14.

Suligoi, B. et al. 2005. Infection with human immunodeficiency virus, herpes simplex virus type 2, and human herpes virus 8 in remote villages of southwestern Papua New Guinea. *American Journal of Tropical Medicine and Hygiene*. 72(1):33–36.

Tandon, A.J. 2005. Macroeconomic impact of HIV/AIDS in the Asian and Pacific region. ERD Working Paper No. 75. ADB.

Taylor R, N.D. Lewis, and T. Sladden. 1991. Mortality in Pacific Island countries around 1980: geopolitical, socioeconomic, demographic and health service factors. *Australian Journal of Public Health* 15:207–21.

Taylor, R., D. Bampton, and A. Lopez. 2005. Contemporary patterns of Pacific Island Mortality. *International Journal of Epidemiology* 34:207–214.

Taylor R., and K. Thoma. 1985. Mortality patterns in the modernized Pacific Island nation of Nauru. *Am J Public Health* 75:149–55.

Vanualailai, J., A. Deo, B. Sharma, and S. Chandra. 2004. Nonlinear Dynamics of the Observed HIV-Positive Population Size in Fiji. *Pacific Health Dialogue: Journal of Community Health and Clinical Medicine for the Pacific* Vol.10, No.2: 45–52.

UNAIDS. 2002. Improved methods and assumptions for estimation of the HIV/AIDS epidemic and its impact: recommendations of the UNAIDS Reference Group on Estimates, Modeling and Projections. *AIDS* 16: 1–16.

———. 2004. Oceania in AIDS Epidemic Update: December 2004.

———. 2006a. The Work-Book, Beta- April 2004, Audit Assumptions. http://www.unaids.org /en/resources/epidemiology/epi softwaretools.asp..

———. 2006b. Report on the Global AIDS Epidemic, UNAIDS/WHO, May 2006. Geneva: UNAIDS.

UNAIDS et al. 2005. *Women and HIV/AIDS: Confronting the Crisis*. Geneva: UNAIDS. A joint publication of UNFPA, UNIFEM, and UNAIDS.

UNAIDS. UNICEF, and USAID. 2004. *Children on the Brink 2004: A joint report of new orphan estimates and a framework for action*. New York: UNAIDS.

UNICEF. 2006. Pacific: Children and HIV/AIDS—A Call to Action**.** Bangkok: UNICEF.

Walker N. et al. 2003. Methods and procedures for estimating HIV/AIDS and its impact: the UNAIDS/WHO estimates for end of 2001. *AIDS* 17(15): 2215–2225.

Watters, D.A.K., and J.A. Lourie. 1996. Trauma in Papua New Guinea—an epidemic out of control. *PNG Med J* 39: 91–92

World Bank. 1997. *Confronting AIDS: Public Priorities in a Global Epidemic (A World Bank Policy Research Report)*. New York: Oxford University Press.

———. 2005a. Control of HIV/AIDS in Papua New Guinea: A situation assessment and proposed strategy. Component report of the Human Development Strategy undertaken by World Bank, AusAID, and ADB, 18 July 2005.

———. 2005b. Expanding Access to ARV Treatment in Thailand: Achieving Treatment Benefits While Promoting Effective Prevention. Washington, D.C.: World Bank.

WHO. 2002. Coverage of Selected Health Services for HIV/AIDS Prevention and Care in Less Developed Countries in 2001. Geneva.

———. 2003. *Investing in Health—A Summary of the Findings of the Commission on Macroeconomics and Health*. Geneva.

———. 2005. *STI/HIV Prevalence Surveys of Sexually Transmitted Infections Among Seafarers and Women Attending Antenatal Clinics in Kiribati 2002–2003*. WHO Regional Office of the Western Pacific, Manila, Philippines

———. 2005. *World Health Report 2005*. Geneva

———. 2006. *Second Generation Surveillance Surveys of HIV, Other STIs and Risk Behaviours in Six Pacific Island Countries*. SPC and WHO..

APPENDIX

HIV PREVALENCE MODELING

A. Model Structure

The EPP model has been used to project HIV prevalence from the late 1980s to 2020 in PNG and the Fiji Islands. The UNAIDS Modeling Reference Group developed the model, which is used by the WHO's Global Programme on AIDS and also within UNAIDS. For background information, refer to Chin (1996) and Chin and Lwanga (1989). The dynamics of this model are described by four parameters:

- to – the initial year of the epidemic.
- fo – the initial proportion of the population that is at-risk of infection.
- r – the force of infection.
- phi – a parameter that governs the infection risk of new entrants to the population.

The EPP models helps calculate these parameters, enabling prevalence curves to be fitted to available surveillance data and projections made. The progression to AIDS death is assumed to be constant throughout the projection. It is a nonlinear function that has been fitted to available information on survival times.[5]

B. PNG Modeling Summary

The first HIV case was reported in 1987, and since the mid-1990s the epidemic has gathered pace. A national workshop in 2005 estimated that the number of people 15–49 years old living with HIV in 2004 ranged from 24,528 (low scenario) to 68,966 (high scenario). The estimated prevalence corresponding to these estimates ranges from 0.9% to 2.5%, with a median of 1.7%. In Port Moresby, 3–4% of the general population is infected, with 2% in other urban areas and over 1% in rural areas. The HIV epidemic in PNG is due primarily to heterosexual transmission, which accounts for about 90% of all detected cases. Two scenarios are modeled to forecast future prevalence—a lower-growth scenario and a high-growth scenario. Results and assumptions are presented.

1. Low-Growth Scenario

Under the low-growth scenario, HIV prevalence among people 15–49 years old is estimated to be around 7.6% by 2020, with males and females having similar levels of infection. The rate of new infection is estimated to peak in 2010, with 30,000 new adult infections that year, before dropping to 26,000 new cases in 2020.

Table A1: HIV Cases and Deaths Under Low-Growth Scenario in PNG

	1990	1995	2000	2005	2010	2015	2020
HIV population ('000)							
Total	0.01	0.92	7.05	18.49	59.47	178.90	356.40
Males	0.01	0.32	1.82	8.05	32.05	97.71	190.40
Females	0.00	0.60	5.23	10.44	27.42	81.19	166.00
Adult prevalence	0.00	0.04	0.25	0.57	1.60	4.18	7.61
New AIDS cases ('000)							
Total	0.00	0.02	0.30	1.07	3.06	9.47	23.70

[5] www.unaids.org (modeling sections of the site)

	1990	1995	2000	2005	2010	2015	2020
Males	0.00	0.01	0.12	0.43	1.64	5.59	13.60
Females	0.00	0.01	0.18	0.65	1.42	3.87	10.10
Annual AIDS deaths ('000)							
Total	0.00	0.01	0.22	0.89	2.53	7.76	20.57
Males	0.00	0.01	0.09	0.34	1.29	4.56	11.90
Females	0.00	0.01	0.13	0.55	1.24	3.20	8.66
Per 1,000	0.00	0.00	0.04	0.15	0.39	1.12	2.76
Adult population 15–49 (million)							
Total	2.03	2.30	2.62	2.95	3.39	3.79	4.11
Male	1.03	1.17	1.33	1.52	1.75	1.96	2.13
Female	1.00	1.14	1.28	1.44	1.65	1.84	1.98

PNG = Papua New Guinea.
Source: Asian Development Bank consultant.

A number of assumptions were made regarding population size, population growth rates, numbers of people within high- and lower-risk groups, and saturation prevalence within each of these populations. Key assumptions for the low-growth scenario are summarized in Table A2.

Table A2: HIV Assumptions Under Low-Growth Scenario in PNG

	Estimate	Year
Total 15+ population		
Base 15–49 population	3,515,546	2005
Birth rate 15+	0.06	2005
Survival to 15	0.82	2005
15+ growth rate	0.0258	2005
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV prevalence (ANC)[a]	0.2–1.2%	2001–2004
ANC Model Projection Parameters (r, fo, to, phi)	2.4161, 0.1477, 1994, 201.34	
Sex Worker		
Base 15–49 population ('000)[b] (2%)	40	2005
Base HIV prevalence	0%	1987
HIV point prevalence for modeling	8%	2005
HIV point prevalence for modeling	12%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	6.2416, 0.1611, 1989, 5,033	
Client of Sex Worker		
Base 15–49 population ('000)[c]	200	2005
HIV point prevalence for modeling	5%	2005
HIV point prevalence for modeling	10%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	2.4161, 0.1678, 1990, 1,409	
Men Who Have Sex With Men (MSM)		
Base 15–49 population ('000)[d]	40	2005
HIV point prevalence for modeling	5%	2005
HIV point prevalence for modeling	8%	2010
MSM Model Projection Parameters (r, fo, to, phi)	2.8111, 0.1544, 1988, 5,838	

ANC = antenatal clinic.
[a] Port Moresby General Hospital ANC, Goroka ANC, Lae ANC, and Daru ANC.
[b] An estimated 2% of women 15–49 years old are involved in sex work. In PNG, there are differences between self-identified sex workers and women who engage in opportunistic transactional sex.
[c] Clients of sex workers in Port Moresby and Lae are most often office workers, businessmen, foreigners, policemen, loggers, soldiers, truck or bus drivers, security guards, and students (Mgone et al., 2002). A national study of rural and peri-urban men found 36% have paid for sex with cash, most of whom were

married. In addition, 33% usually paid in gifts (NSRRT and Jenkins, 1994). It is assumed that 11% of men 15–49 years old regularly procure sex.

[d] Ascertaining the number of MSM is difficult. Of 89 men questioned in a national youth study, 22% of 78 stated they had engaged in homosexual intercourse and/or mutual masturbation to the point of climax (World Bank, 2005). It is assumed 2% of men are MSM.

Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.

2. High-Growth Scenario

Under the high-growth scenario HIV prevalence among people 15–49 years old is estimated to be 12% by 2020, with males and females having similar levels of infection.

Table A3: HIV Cases and Deaths Under High-Growth Scenario in PNG

	1990	1995	2000	2005	2010	2015	2020
HIV population ('000)							
Total	0.12	3.80	29.49	135.01	376.13	555.66	596.60
Males	0.10	2.35	18.97	77.87	201.60	291.69	313.29
Females	0.02	1.45	10.52	57.13	174.53	263.96	283.31
Adult prevalence	0.01	0.15	1.05	4.24	10.22	13.25	13.25
New AIDS cases ('000)							
Total	0.00	0.12	1.08	6.07	21.36	44.48	57.47
Males	0.00	0.08	0.74	4.00	12.77	24.55	30.63
Females	0.00	0.04	0.34	2.08	8.59	19.93	26.84
Annual AIDS deaths ('000)							
Total	0.00	0.08	0.77	4.69	17.62	40.34	56.19
Males	0.00	0.05	0.52	3.11	10.70	22.58	30.02
Females	0.00	0.03	0.26	1.58	6.92	17.76	26.16
Per 1,000	0.00	0.02	0.15	0.80	2.78	5.98	7.96
Adult population 15–49 (million)							
Total	2.03	2.30	2.61	2.94	3.35	3.66	3.87
Male	1.03	1.17	1.33	1.51	1.72	1.88	2.00
Female	1.00	1.14	1.28	1.43	1.63	1.78	1.87

PNG = Papua New Guinea.

Source: Asian Development Bank consultant.

A number of assumptions were made regarding population size, population growth rates, numbers of people within high- and lower-risk groups, and saturation prevalence within each of these populations. Key assumptions for the high-growth scenario are summarized in Table A4.

Table A4: Assumptions Under High-Growth Scenario in PNG

	Estimate	Year
Total 15+ population		
Base 15–49 population	3,515,546	2005
Birth rate 15+	0.06	2005
Survival to 15	0.82	2005
15+ growth rate	0.0258	2005
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV prevalence (ANC)	0.2–1.2%	2001–2004
ANC Model Projection Parameters (r, fo, to, phi)	2.4161, 0.1812, 1990, 6,107	
Sex Worker		
Base 15–49 population ('000)	40	2005
Base HIV prevalence	0%	1987

	Estimate	Year
Base HIV prevalence	12%	2005
HIV point prevalence for modeling	20%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	2.1075, 0.3170, 1987, -4.31	
Client of Sex Worker		
Base 15–49 population (‘000)	200	2005
HIV point prevalence for modeling	5%	2005
HIV point prevalence for modeling	10%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	3.6242, 0.1678, 1987, 3,959	
Men Who Have Sex With Men (MSM)		
Base 15–49 population (’000)	40	2005
HIV point prevalence for modeling	5%	2005
HIV point prevalence for modeling	10%	2010
MSM Model Projection Parameters (r, fo, to, phi)	3.2215, 0.1879, 1989, 3,154	

ANC = antenatal clinic.
Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.

C. Fiji Islands Modeling Summary

The factors influencing the population's vulnerability to HIV are early initiation of sex, taboos related to sexuality, high rates of sexually transmitted infection, gender inequalities, and a large young and transient population. The official number of confirmed HIV cases in Fiji Islands was 156 as of May 2004. However, the Fiji Islands’ Ministry of Health estimates that this figure represents only about one third of the actual cases (UNAIDS, 2005).

1. Low-Growth Scenario

Under the low-growth scenario, HIV prevalence among people 15–49 years old is estimated to be 0.41% by 2020, with males and females having similar levels of infection.

Table A5: HIV Cases and Deaths Under Low-Growth Scenario in Fiji Islands

	1990	1995	2000	2005	2010	2015	2020
HIV population (‘000)							
Total	0.00	0.09	0.19	0.45	0.80	1.33	2.28
Males	0.00	0.02	0.09	0.29	0.53	0.79	1.27
Females	0.00	0.07	0.10	0.15	0.27	0.53	1.01
Adult prevalence	0.00	0.02	0.04	0.09	0.15	0.24	0.41
New AIDS cases							
Total	0	4	12	28	56	94	158
Males	0	1	5	16	38	62	95
Females	0	2	8	11	17	32	62
Annual AIDS deaths							
Total	0	3	10	24	49	86	143
Males	0	1	4	13	34	57	88
Females	0	2	7	11	16	28	55
Per 1000	0.00	0.00	0.01	0.03	0.06	0.10	0.16
Adult population 15–49 (‘000)							
Total	371.10	399.37	427.45	449.68	459.64	463.95	470.00
Male	187.60	202.43	217.27	229.35	234.92	238.21	242.03
Female	183.50	196.94	210.18	220.34	224.72	225.74	227.97

Source: Asian Development Bank consultant.

A number of assumptions were made regarding population size, population growth rates, numbers of people within high- and lower-risk groups, and saturation prevalence within each of these populations. Key assumptions for the low-growth scenario are summarized in Table A6.

Table A6: Assumptions Under Low-Growth Scenario in Fiji Islands

	Estimate	Year
Total 15+ population		
Base 15–49 population	579,139	2005
Birth rate 15+	0.04147	2005
Survival to 15	0.82438	2005
15+ growth rate	0.02746	2005
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV prevalence (ANC)	0.12%	2003
ANC Model Projection Parameters (r, fo, to, phi)	9.26, 0.3, 1990, 872	
Sex Worker		
Base 15–49 population ('000)[a]	2	2005
Base HIV prevalence	0%	1987
HIV point prevalence for modeling	1.5%	2005
HIV point prevalence for modeling	3%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	27.18, 0.06, 1987, 872	
Client of Sex Worker		
Base 15–49 population ('000)[b]	6	2005
HIV point prevalence for modeling	0.5%	2005
HIV point prevalence for modeling	1%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	13.95, 0.04, 1987, 604	
Men Who Have Sex With Men (MSM)		
Base 15–49 population ('000)[c]	3	2005
HIV point prevalence for modeling	0.5%	2005
HIV point prevalence for modeling	2%	2010
MSM Model Projection Parameters (r, fo, to, phi)	16.2, 0.04, 1990, 4,228	

ANC = antenatal clinic.
[a] An estimated 0.8% of women 15–49 years old are involved in sex work.
[b] 4% of men 15–49 years old are assumed to procure sex regularly.
[c] 2% of men 15–49 years old are primarily MSM.
Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.

2. High-Growth Scenario

Under the high-growth scenario, HIV prevalence among people 15–49 years old is estimated to be 0.87% by 2020.

Table A7: HIV Cases and Deaths Under High-Growth Scenario in Fiji Islands

	1990	1995	2000	2005	2010	2015	2020
HIV population ('000)							
Total	0.03	0.47	0.98	1.55	2.89	4.49	4.89
Males	0.02	0.42	0.82	1.06	1.72	2.50	2.69
Females	0.01	0.05	0.16	0.49	1.17	1.99	2.19
Adult prevalence	0.01	0.11	0.21	0.31	0.56	0.82	0.87
New AIDS cases							
Total	1	9	65	112	192	338	462
Males	0	8	58	89	128	201	260

	1990	1995	2000	2005	2010	2015	2020
Females	0	1	7	23	64	136	202
Annual AIDS deaths							
Total	0	4	53	104	172	308	446
Males	0	3	48	85	118	187	253
Females	0	1	6	19	54	121	193
Per 1000	0.00	0.01	0.07	0.13	0.20	0.36	0.51
Adult population 15–49 ('000)							
Total	371.10	399.36	427.35	449.32	458.96	462.82	468.16
Male	187.60	202.43	217.16	228.99	234.33	237.42	240.94
Female	183.50	196.94	210.19	220.33	224.62	225.40	227.22

Source: Asian Development Bank consultant.

A number of assumptions were made regarding population size, population growth rates, numbers of people within high- and lower-risk groups, and saturation prevalence within each of these populations. Key assumptions for the high-growth scenario are summarized in Table A8.

Table A8: Assumptions Under High-Growth Scenario in Fiji Islands

	Estimate	Year
Total 15+ population		
Base 15–49 population	579,139	2005
Birth rate 15+	0.04147	2005
Survival to 15	0.82438	2005
15+ growth rate	0.02746	2005
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV prevalence (ANC)	0.12%	2003
ANC Model Projection Parameters (r, fo, to, phi)	8.85, 0.03, 1987, -335.57	
Sex Worker		
Base 15–49 population ('000)	2	2005
Base HIV prevalence	0%	1987
HIV point prevalence for modeling	2%	2005
HIV point prevalence for modeling	5%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	2.44, 0.22, 1987, 841.1	
Client of Sex Worker		
Base 15–49 population ('000)	6	2005
HIV point prevalence for modeling	1%	2005
HIV point prevalence for modeling	2%	2010
Sex Worker Model Projection Parameters (r, fo, to, phi)	13.89, 0.067, 1987, 5,167	
Men Who Have Sex With Men (MSM)		
Base 15–49 population ('000)	3	2005
HIV point prevalence for modeling	1%	2005
HIV point prevalence for modeling	3%	2010
MSM Model Projection Parameters (r, fo, to, phi)	22.95, 0.07, 1990, 67.11	

ANC = antenatal clinic.
Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.

D. Kiribati Modeling Summary

Since the first confirmed HIV infection in Kiribati in 1991, the number of people infected has continued to rise. As of the end of 2004, 46 HIV infections had been reported. The Spectrum and EPP packages do not have country models for Kiribati. Sub-models for seafarer and

general populations were developed for high- and low-growth HIV scenarios until 2020, which were superimposed over life expectancies from Fiji Islands to gauge the possible demographic impacts for this country. Due to this shortcoming, absolute numbers of HIV cases, AIDS cases, and AIDS deaths were not estimated.

1. Low-Growth Scenario

A number of assumptions were made regarding population size, population growth rates, numbers of people within high- and lower-risk groups, and saturation prevalence within each of these populations. Key assumptions for the low-growth scenario are summarized in Table A9.

Table A9: Assumptions Under Low-Growth Scenario in Kiribati

	Estimate	Year
Total population		
Base population	93,100	2004
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV point prevalence for modeling	0.02%	2005
ANC Model Projection Parameters (r, fo, to, phi)	19, 0.02, 1996, 2,080	
Seafarer		
Base population (’000)	2,500	2005
Base HIV prevalence	0%	1987
HIV point prevalence for modeling	0.5%	2005
Projection Parameters (r, fo, to, phi)	4, 0.09, 1989, -604	

ANC = antenatal clinic.
Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.

2. High-Growth Scenario

Under the high-growth scenario, HIV prevalence among people 15–49 years old is estimated to be 1.5% by 2020. Key assumptions for the high-growth scenario are summarized in the Table A10.

Table A10: Assumptions Under High-Growth Scenario in Kiribati

	Estimate	Year
Total population		
Base population	93,100	2004
General Population Women		
HIV prevalence (ANC)	0%	1987
HIV point prevalence for modeling	0.02%	2005
ANC Model Projection Parameters (r, fo, to, phi)	27, 0.02, 1996, 2,080	
Seafarer		
Base population (’000)	2,500	2005
Base HIV prevalence	0%	1987
HIV point prevalence for modeling	0.5%	2005
Projection Parameters (r, fo, to, phi)	4, 0.09, 1989, 6,375	

ANC = antenatal clinic.
Source: Asian Development Bank consultant estimates derived from literature and surveys outlined in footnotes.