INTRODUCTION

This report on the possibility of an epidemic of acquired immunodeficiency syndrome (AIDS) focuses on Papua New Guinea (PNG) as seen within its Melanesian and, more broadly, Pacific Island context. PNG with 5.3 million people constitutes 80% of the population of Melanesia and 60% of that of the Pacific, i.e. Oceania without Australia and New Zealand. For almost as long as human immunodeficiency virus (HIV)/AIDS has been identified, it has been realized that PNG, the largest nation of Melanesia, was in danger of a serious epidemic of AIDS. One reason is that the mode of transmission of HIV is (apart from ensuing vertical transmission from mother to child) almost entirely heterosexual. Evidence for the mode of transmission is derived both from information collected from seropositive persons and from a sex ratio (male: female) of infected persons close to 1.

Heterosexual epidemics place almost the whole community in danger, and not a segment of a community, as occurs when the predominant mode of transmission is homosexuality or intravenous drug injection. Homosexual transmission is entirely among males, and everywhere intravenous drug users have a male majority. Thus, the heterosexual epidemic in sub-Saharan Africa exhibits a sex ratio of 0.81 (earlier reported as about 1.0) and that in Papua New Guinea a ratio around 1.0. This is comparable with other countries with largely
heterosexual epidemics: Thailand with a ratio of 1.4, India 1.7, the Caribbean 1.7, and Cambodia 2.0. The sex ratio in PNG contrasts with areas where other modes of transmission are important: Europe 2.9, Latin America 3.0, North America 3.9, East Asia 7.0, and Australasia 12.6 (1).

Parity between men and women in infection does not mean equally high-risk sexual activities, because transmission from males to females during sexual intercourse is about three times more likely than from females to males. Sub-Saharan African data are often cited in this paper, because we have more information on the epidemic there than on other heterosexual epidemics.

The other reason for fearing an epidemic of AIDS is that sexual intercourse outside marriage is treated fairly tolerant in Melanesia, as it is elsewhere in the Pacific, in sub-Saharan Africa, parts of Southeast Asia, and in many developed countries. Treating premarital and extramarital sexual relations of females as a heinous sin has meant an unenviable position for women in much of the Middle East and North Africa, but it has provided a defence against AIDS. 50% of countries of the Middle East and North Africa record adult seroprevalence levels below 0.04% (1). Melanesia is more sexually permissive (2). Such permissiveness can make HIV infection more likely and has long explained the high prevalence of sexually transmitted infections (STIs), now a serious matter in that these may act as cofactors for AIDS. In the first few decades of the twentieth century, the islands of the Melanesian archipelago were noted for high levels of STIs, and PNG still has among the highest levels in the Western Pacific (3). Levels of STIs are also high in Vanuatu (4) and doubtless too in the Solomons.

AIDS was first identified in 1981, although transmission of HIV on a considerable scale must have been occurring for some years previously. Within a few years, the epidemic of AIDS spread throughout most of the world. It began relatively slowly in some places only to spread rapidly in later years. Until the early 1990s, the level of HIV/AIDS in Southern Africa was well behind that in East Africa, but it is now the highest in the world (5). Anderson’s models of heterosexual epidemics predicted that some of the later, faster-moving epidemics would eventually surpass the earlier, slower-moving ones in proportion of population infected (6,7). There is some evidence of this pattern in Nigeria where levels of HIV infection in adults were well below 1% until the mid-1990s, but now exceed 5%.

LEVELS OF HIV/AIDS IN MELANESIA

Despite early fears for the safety of Melanesia, HIV/AIDS was not detected until 1987, and levels have so far remained low. There are signs now that this situation may be changing, at least in PNG. Before examining the evidence, it should be noted that the data base is insecure. One of the most pressing needs for Melanesia is more adequate surveillance of HIV/AIDS.

The periodic global surveillance reports of UNAIDS omit countries with small populations, with the result that the most recent report (1), like the earlier reports, lists for Melanesia only PNG and Fiji. It records an HIV/AIDS level of 0.22% in adults (15–49 years) in PNG and 0.07% in Fiji compared to 0.15% in Australia and 0.06% in New Zealand. The U.S. Census Bureau lists seroprevalence levels for a greater number of countries (8). It subdivides them into low-risk and high-risk populations and by residence in the capital (or major) city and elsewhere. This is somewhat inconvenient, but the estimates of UNAIDS are based on the same measurements tied together by modelling assumptions about the relative levels of these groups and their weight in the population.

‘Low-risk’ means general population and ‘high-risk’ refers to persons attending STI clinics or employed in commercial sex. Seroprevalence levels of high-risk groups can give a warning about the direction in which the epidemic is moving. Even in a stable situation, the levels in the high-risk group are usually well above those of the general population. There is, however, no general rule, as African experience shows. For instance, in the Namibian capital, the levels are approximately equal, while in Mali, the level found in high-risk groups is 17 times that in low-risk groups. Similarly, seroprevalence levels are usually higher in urban than in rural areas, but the ratio between the two may decline over time. In Zimbabwe, tested rural areas (which may not be representative) record a higher level than the capital Harare, while the urban: rural ratio is three to one in Rwanda. Once WHO’s AIDS programme modelled an urban: rural ratio of ten to one, but in sub-Saharan Africa (although perhaps not in Melanesia), those times are past. The U.S. Census Bureau reports are also of value, because these give the data sources.

The U.S. Census Bureau provides the greatest detail on the Pacific, but most data refer to the first half of the 1990s when WHO was pressing for information, and when most countries provided the seroprevalence levels of their blood donors to represent the general population (9). Only
PNG provided data from outside the capital, and a seroprevalence level of 0.0% was recorded there. Among the low-risk populations of the capitals, zero levels were recorded in the Cook Islands, Fiji, French Polynesia, Marshall Islands, Micronesia, Palau, Solomon Islands, Tonga, Tuvalu, Vanuatu, and Western Samoa; 0.1% in Guam, Kiribati, and New Caledonia; and 0.2% in PNG. Only five countries provided information on high-risk groups in their capitals, and the seroprevalence level was zero in Palau and Tonga, 0.1% in Fiji, 1.9% in PNG, and 3.0% in French Polynesia. All that one can conclude is that, in the early 1990s, the level of HIV/AIDS was low in the Pacific, but the greatest area of concern was PNG and possibly the rest of Melanesia about which little was known or is yet known, bearing in mind that Melanesia constitutes almost three-quarters of the population of the Pacific.

The cause for alarm arising from statistics on HIV/AIDS was the rise of reported HIV and AIDS cases in PNG during 1994-1998 (10). During 1989-1994, reported new HIV cases increased from 17 to 69, only to rise in the next four years from 69 to 634, and appearing as if they would exceed 1,000 in 1999. AIDS cases increased from 6 to 26, and then 232 in 1998. HIV cases appeared recently to be rising exponentially by almost 60% per annum, and it was feared that, if unchecked, there would be several thousand new cases per annum in a few years. Much depended on the extent to which notification had been tightened. In this situation, it was impossible to construct real projections. The projection of the WHO Office for Western Pacific (WPRO) for 2003 showing 650 new AIDS cases in that year must now be considered linear and conservative, as revealed by the figures released in mid-2001 (10).

There has been surveillance at times in antenatal clinics in Port Moresby and Popondetta, in STI clinics in Port Moresby, Goroka, and Mt Hagen, and in the armed forces (11). The epidemic may be at present largely confined to Port Moresby and the armed forces, but the limited surveillance system makes it difficult to be certain.

Very recent figures modify this picture (12). The steep upward trend in HIV cases reported from 1996 to 1998 slackened in 1999 when fewer than 800 new cases were reported. New cases reported during the first quarter of 2000 were 25% higher than in the previous year and back again on the earlier trend. During the first three months of 2000, new cases were reported in 11 of PNG’s 20 provinces. Since the beginning of the epidemic, some cases have been reported in every province. Nevertheless, 69% of cumulative cases and 72% of new ones were identified in the National Capital District. A rise in the number of tuberculosis cases, many of them being seropositive, is also evidence of a looming AIDS epidemic.

These new figures did not make the task of constructing projections for the future of the epidemic any easier. The following conclusions are warranted:

- Trends over the late 1990s suggest that a major epidemic, perhaps exceeding levels in Thailand and Cambodia, is possible.
- Epidemic levels of HIV/AIDS are already found in Port Moresby, especially among the poor and migrants in the settlement or shanty areas.
- A pattern found elsewhere, and one likely to be followed in PNG, is one where the disease first takes hold in a major urban area of the country and then spreads from there, facilitated by circular migration.
- The epidemic in PNG is the most advanced in Melanesia, because of both relatively large population of the country and size of its capital.
- There is now sufficient likelihood of a major epidemic to warrant a strong effort to combat its spread. This is not a conclusion that could have been reached until very recently.

The probability of a major epidemic has been given substantial support by the most recent information from the PNG Health Department (13). During the period from the end of 1995 until June 2001, the number of HIV-positive persons ever reported rose from 335 to 3,901, symptomatic AIDS cases from 141 to 1,336, and deaths due to AIDS from 65 to 249. The surveillance system is still far from comprehensive, and accordingly, the Health Department estimated the prevalence of HIV/AIDS at 10,000-15,000 or perhaps 0.5-0.7% of the adult population.

This conclusion does not rest on surveillance evidence alone. It would be made with less assurance were there not strong cultural and social evidence that features of Melanesian society strongly resemble those of other societies which have been susceptible to epidemics of heterosexually-transmitted AIDS. This can be shown by summarizing the situation in sub-Saharan Africa, the world’s largest AIDS epidemic, one that is almost entirely heterosexual, and the one about which we know most.
Caldwell (14) summarizes the conditions of the acute epidemic in East and Southern Africa, which has been made possible there by the combination of the following factors:

- There is a good deal of sexual activity outside marriage through either premarital or extramarital sexual relations.

- A significant amount of this sexual activity involves persons having more than one sexual partner during a relatively short period of time. This is partly promoted by the existence of polygyny which implies that men have a biological need for more than one woman.

- A significant portion of male sexual activity goes on with prostitutes who, because of their large numbers of partners, are likely to be characterized by above-average levels of HIV infection. This situation is aggravated by migration to towns or mining or plantation areas, because the migrants are usually men unaccompanied by wives and they earn wages and have ready money in these places.

- There is a significant level of STIs caused by the same conditions that facilitate an epidemic of AIDS and which act as cofactors in promoting the transmission of HIV.

- There is a poorly-resourced health system, incapable of keeping STIs at a low level.

- There is much poverty which, at the individual level, makes cheap commercial sex readily available and, at the national level, makes it impossible to provide adequate medical services.

- Transmission of HIV is facilitated by most males being uncircumcised, and it is this situation which characterizes those African populations where levels of HIV/AIDS are the highest.

The social science evidence as to the situation in PNG in these respects is summarized in the remainder of this review.

WHY MAY PNG BE SUSCEPTIBLE TO A MAJOR EPIDEMIC OF AIDS?

The evidence is that PNG’s risk of a major epidemic of AIDS depends on its level of high-risk sexual activity. Almost 90% of HIV transmission is attributed directly to heterosexual relations and a further 10% to vertical transmission from mother to child. It is claimed that 99% of all blood used in transfusion is tested and that, although marijuana is widely used, there is little intravenous drug injecting (15). Although ritual homosexuality has been reported at length, anal sex is believed to be of very low incidence compared to vaginal sex. The only evidence throwing any doubt on this model is that there is a small predominance of men recorded as seropositive or having AIDS in contrast to the significant predominance of women in the African epidemic and that intimate male companionship is a feature of the society.

In explaining the African epidemic of AIDS, Caldwell et al. (16,17) followed Goody (18) in regarding the traditional agrarian societies of Asia and the Mediterranean as anomalous in their fierce control of the non-marital sexual activity of women, first with the practical aim of preserving the inheritance of land and social position, and subsequently embedded in social mores and religious teachings. This has not occurred in other parts of the world where land is communally owned and where there is shifting or garden cultivation.

The evidence seems to suggest that the societies of the Pacific and some of Southeast Asia resemble those of Africa in having a more relaxed attitude to sexual relations and having experienced an increasing amount of premarital and extramarital sexual relations. One of the reasons that sexual prohibitions are more relaxed is the existence of polygyny. This has two effects: one is the implication that men need multiple female partners; and the other is the necessity in polygynous societies for men to marry late so as to create a surplus of women available to be the second and third wives of older men, with the consequence that large numbers of unmarried adult males seek sexual outlets. The proportion of wives in PNG in polygynous marriages is lower than that in most parts of sub-Saharan Africa (19). In addition, the duration of postpartum sexual abstinence by wives is shorter in PNG than in most of sub-Saharan Africa. Nevertheless, there is abundant and uncontested evidence of a good deal of sexual activity in PNG outside marriage (20-24). The National Sex and Reproduction Research Team (NSRRT) and Jenkins (24) reported the number of lifetime sexual partners averaged by men rising from around 10 during adolescence to over 20 by 60 years of age, and the number of different sexual partners during the previous year as having been above one for over 50% of both men and women. They warn that there may be biases in the data, but levels well below these would sustain a heterosexual epidemic of AIDS.

Most research emphasizes a high level of teenage sexual activity and a low level of condom use during
The Highlands syphilis epidemic of 1969-1970 was a product of building the Highlands Highway (28). There are no traditional words for STIs in the Eastern Highlands (29) and probably elsewhere. The epidemic of STIs peaked in the late 1980s, but this may be an artefact of deteriorating surveillance (15). The WPRO of WHO shows most STIs to be at a higher level in PNG than elsewhere in the WHO Western Pacific region, although, in the case of syphilis, Cambodia rates equally (3). Ulcerating STIs, probably the most dangerous cofactors for HIV/AIDS, are common, especially donovanosis (granuloma inguinale)—now rare outside PNG—and lymphogranuloma venerereum, syphilis, genital herpes, and impetigo (32-35). A hopeful contrast with East and Southern Africa is the relatively low level of chancreoid. The level of STIs is high also in Vanuatu (4,36,37) and the Solomons, although the latter has surveillance problems (38,39). The high level of STIs is probably the major cause of a lower level of fertility in PNG than might otherwise have been anticipated (40,41), although quite a high rate of abortion in non-sterile conditions may also play a role.

The results of recent research by the PNG Institute for Medical Research suggest that the epidemic of STIs has not abated (42). In a study of rural women in the East Highlands Province, it was found that 46% were infected with trichomoniasis, 25% with chlamydia, 18% with gonorrhoea, 14% with pelvic inflammatory disease, and 4% with syphilis. In a study by the PNG Institute of prostitutes in the two largest urban areas, Port Moresby and Lae, 36% had gonorrhoea, 33% trichomoniasis, 32% syphilis, 31% chlamydia, and perhaps more significantly, 10% HIV/AIDS.

PNG being a developing country can spend a limited amount on health, and this explains the inability of the health service of the country to combat STIs effectively and to carry out adequate surveillance. Health expenditure as a percentage of GDP peaked in 1981 and 1982 at 3.6% and had fallen by 1994 to 2.3%. As a percentage of the budget, it peaked in 1985 (13). In 2000, Koczberski reported that health services were still declining (22). In the developing world as a whole, 4% of GNP is spent on health; in Melanesia that figure is equalled by the Solomon Islands, while PNG spends 3% and Vanuatu 2% (43). During 1974-1983, levels of STIs increased, despite a national programme for prevention (44), before the rise ceased in the late 1980s. In 1994, the health service was in crisis (45). The situation reversed once again with per-capita real expenditure rising by 27% during 1996-1998 and projected to rise by almost 50% by 2000 reaching almost 4% of GNP,

such activity. Adolescent boys are driven by peer pressures to feel that they cannot lose any opportunity for sexual relations (15), and adolescent girls feel that they will not acquire or retain boy friends without sexual relations (21). Furthermore, all sexual activity involves fully penetrative sex with little resort to intermediate types of physical relationship. In the villages, elders still assert some control over the behaviour of young men and women, but there is little to modify the behaviour of young persons once they migrate to Port Moresby or other large towns.

Male-initiation rites characterized by anal sexual relations among male groups were spread widely across Melanesia (25-27). Such sexual activities were apparently not subsequently common, and, in any case, puberty rituals have been declining.

Two other factors in PNG are important and find parallels in parts of the main AIDS belt in East and Southern Africa. The first is ‘binge drinking’ or group drinking until drunkenness, with almost invariably an ensuing search for sexual satisfaction. The second is a belief by individuals that AIDS is somehow predetermined and unlikely to strike themselves, partly because of their lust for life, a philosophy expressed in the term ‘living it up’.

In PNG there has always been a transactional component in most non-marital sexual relations. Strictly commercial sex has increased only with paid wages and with migration to towns, plantations, and mines, but sex for favours exists on a very large scale. Brothels, in the Southeast Asian sense, are still rare, and even prostitutes renting a room for their business, as in Africa, are not the pattern (15,20). The growth of prostitution followed the construction of the Highlands Highway and the opening up of the Ok Tedi mine (24). One reason for the availability of women for commercial sex is that the women involved are usually not condemned by their families as long as their earnings are shared (15). Even in such high-risk relationships, condoms are used on only 7% of occasions (10).

The same conditions that are now giving rise to the threat of AIDS were previously responsible for an epidemic of STIs (3,10,15,20,28-31). This epidemic is little more than a century old, and hence the STIs are characterized by greater virulence than in developed countries. The first epidemics were in the islands and on the coast at the end of the nineteenth century (20). The Highlands syphilis epidemic of 1969-1970 was a product of building the Highlands Highway (28).
largely as a result of Australian technical aid spurred
generally by fear of a health crisis and specifically by
the threat of a serious epidemic of AIDS.

Lack of male circumcision is almost certainly
associated with a greater risk of transmission of HIV
(46-48). Melanesia compares with the main AIDS belt
in East and Southern Africa in that most ethnic groups
did not traditionally circumcise males. Murdock listed
30 ethnic groups of PNG and classified them as 27 not
circumcising, one circumcising, and two with no
information (49). Morris adds that foreskins tend in PNG
to be well-developed (50). On the other hand, there are
also reports of the recent spread of non-traditional types
of circumcision and of foreskin laceration (24).

Uncontested evidence suggests that sexual activities
can be accompanied by a substantial degree of violence
in Melanesia generally (51), in PNG specifically
(15,20,22,24,52-54), and in the Solomons (55). Violence
is reported in both marital and non-marital relations.
Hospitals of PNG often treat vaginal tearing (56). Rape,
including traditionally-sanctioned payback rape, and
pack rape are reported. Clearly, this raises the chance of
bleeding during sexual relations and of transmitting HIV.
There is a related male dominance in sexual relations
which means that women have only a limited possibility
of insisting on condom use even in commercial sexual
relations.

THE PRESENT SITUATION

A comparison is possible between the social conditions
set out earlier in this article for the East and Southern
African AIDS epidemic and the conditions described in
Papua New Guinea and Melanesia more generally. There
are clearly close parallels, in sexual activity outside
marriage, multiple and parallel sexual partners, a high
level of STIs, and a lack of male circumcision. The
incidence of commercial sex, especially institutionalized
in brothels where prostitutes have large numbers of
partners, is less developed in PNG, even in Port Moresby,
than in African cities, but is expanding. This may explain
the relatively late appearance of the epidemic in PNG
and may provide PNG with a degree of protection. On
the other hand, it does mean that the continuing growth
of Port Moresby poses dangers. The population of the
city reached a quarter of a million in 1995 (57). In
addition, the pattern of sex for favours partly offsets the
small size of the commercial sex sector.

The weak condition of the health system in the effort
to control STIs also has African parallels, although the
health infrastructure and STI clinic system in PNG are
probably stronger than those in the majority of sub-
Saharan countries. The high levels of STIs are significant,
because not only are many of them cofactors for AIDS,
but their existence at this level is a strong indicator that
the social system is probably conducive to an epidemic
of HIV/AIDS. PNG is a poor country, but has a rich and
often promiscuous elite. The only sub-Saharan African
countries with high income are found in Southern Africa:
in South Africa, Botswana, Zimbabwe, and Namibia.
These comparisons are not as reassuring as they might
seem, because the worst epidemic of AIDS in the world
is, in fact, in these Southern African countries
comparable in per-capita income and health
infrastructure with PNG. However, some observers
suggest that the high income levels in southern Africa
promote the spread of AIDS through commercial activity,
especially through the highly-developed road system and
the density of road transport. Thus, PNG may receive
some protection from its mountainous terrain, and the
fact that the whole country is not connected by highly-
trafficked road systems. On the other hand, transport by
plane is common and is used by circular migrants
between rural and urban areas.

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