

Wilfrid Laurier University

## Scholars Commons @ Laurier

---

Southern African Migration Programme

Reports and Papers

---

2002

### No. 24: Spaces of Vulnerability: Migration and HIV/AIDS in South Africa

Brian Williams

*Southern African Migration Programme*

Eleanor Gouws

*Southern African Migration Programme*

Mark Lurie

*Southern African Migration Programme*

Jonathan Crush

*Balsillie School of International Affairs/WLU, jcrush@wlu.ca*

Follow this and additional works at: <https://scholars.wlu.ca/samp>



Part of the [African Studies Commons](#), [Economics Commons](#), and the [Migration Studies Commons](#)

---

#### Recommended Citation

Williams, B., Gouws, E., Lurie, M., & Crush, J. (2002). Spaces of Vulnerability: Migration and HIV/AIDS in South Africa (rep., pp. i-63). Waterloo, ON: Southern African Migration Programme. SAMP Migration Policy Series No. 24.

This Migration Policy Series is brought to you for free and open access by the Reports and Papers at Scholars Commons @ Laurier. It has been accepted for inclusion in Southern African Migration Programme by an authorized administrator of Scholars Commons @ Laurier. For more information, please contact [scholarscommons@wlu.ca](mailto:scholarscommons@wlu.ca).

SPACES OF VULNERABILITY:  
MIGRATION AND HIV/AIDS  
IN SOUTH AFRICA

SPACES OF VULNERABILITY:  
MIGRATION AND HIV/AIDS  
IN SOUTH AFRICA

BRIAN WILLIAMS, ELEANOR GOUWS, MARK LURIE,  
JONATHAN CRUSH

SERIES EDITOR:  
PROF. JONATHAN CRUSH

SOUTHERN AFRICAN MIGRATION PROJECT  
2002

Published by Idasa, 6 Spin Street, Church Square, Cape Town, 8001, and Queen's University, Canada.

Copyright Southern African Migration Project (SAMP) 2002  
ISBN 1-919798-38-2

First published 2002  
Design by Bronwen Dachs Müller  
Typeset in Goudy

All rights reserved. No part of this publication may be reproduced or transmitted, in any form or by any means, without prior permission from the publishers.  
Bound and printed by Creda Communications, Cape Town

CONTENTS	PAGE
EXECUTIVE SUMMARY	1
INTRODUCTION	6
EXPLAINING THE EPIDEMIC	8
POVERTY	9
DIFFERING STRAINS OF HIV	10
PRESENCE OF STIS	10
SEXUAL NETWORKING AND PATTERNS OF SEXUAL CONTACT	12
MALE CIRCUMCISION	14
THE PRESENCE OF OPPORTUNISTIC INFECTION	14
CONNECTING MIGRATION AND HIV/AIDS	15
THE SOUTH AFRICAN CONNECTION	16
MACRO-GEOGRAPHIES OF HIV	21
CASE STUDY 1: COMPOUNDING THE EPIDEMIC	25
CASE STUDY 2: RURAL RISKS	27
CASE STUDY 3: ON THE ROAD	29
CONCLUSION	30
TABLES	33
FIGURES	35
ENDNOTES	42
MIGRATION POLICY SERIES	55

TABLES	PAGE
TABLE 1: COUNTRIES WITH HIGHEST RATES OF HIV INFECTION	33
TABLE 2: PREVALENCE OF STIs IN VARIOUS POPULATION GROUPS	33
TABLE 3: PREVALENCE OF HIV INFECTION IN PEOPLE ATTENDING BLOOD TRANSFUSION SERVICES, 1998	34
TABLE 4: EXPECTED DECREASE IN AFRICAN POPULATION	34
TABLE 5: HIV PREVALENCE RATES AT KWAZULU-NATAL TRUCK STOPS	34

FIGURES	PAGE
FIGURE 1: NATIONAL PREVALENCE OF HIV INFECTION FROM ANTE-NATAL CLINIC DATA	35
FIGURE 2: PREVALENCE OF HIV INFECTION AMONG WOMEN ATTENDING ANTE-NATAL CLINICS, 2001	35
FIGURE 3: DISTRIBUTION OF PEOPLE WITH HIV, 1998	36
FIGURE 4: ASYMPTOMATIC PREVALENCE OF INFECTION (%)	36
FIGURE 5: DOUBLING TIME OF PREVALENCE (MONTHS)	37
FIGURE 6: INCIDENCE OF HIV INFECTION FOR WOMEN ATTENDING ANTE-NATAL CLINICS IN HLABISA, 1998	37
FIGURE 7: MAP OF CARLETONVILLE DISTRICT	38
FIGURE 8: AGE PREVALENCE OF INFECTION AMONG MEN AND WOMEN IN CARLETONVILLE AND KWAZULU-NATAL	39
FIGURE 9: AGE-PREVALENCE FOR MINeworkERS TRUCK DRIVERS, 1998	39
FIGURE 10: DEMOGRAPHIC PROFILE OF HLABISA	40
FIGURE 11: MIGRANT DESTINATIONS FROM HLABISA (%)	41



---

## EXECUTIVE SUMMARY

**S**eventy per cent of the 36 million people infected worldwide with HIV live in Sub-Saharan Africa and within this region the countries of Southern Africa are the worst affected. The eight countries with the highest rates of infection are in Southern Africa, followed by six countries in East Africa, and then five other countries, only one outside Africa. The reasons why the highest rates of infection in the world occur in Southern Africa are unclear. Although the countries of the region have much in common, their histories over the last twenty years have been very different.

A number of different factors have been advanced to explain the general picture of HIV/AIDS in South Africa including its rapid spread, high prevalence and uneven distribution. They include poverty and economic marginalization; differing strains of HIV; high rates of sexually transmitted disease and other opportunistic infection; sexual networking and patterns of sexual contact; the presence or absence of male circumcision; and the role of core-groups such as commercial sex workers. These factors are discussed in greater detail in the paper, reviewing the current state of knowledge about each in South Africa.

The paper argues that a key neglected factor in explaining the rapid spread and prevalence of HIV/AIDS in Southern Africa over the last decade is human mobility. The paper therefore examines what is currently known about the connections between migration and HIV/AIDS. Although both migration and HIV have been examined separately in South Africa, we are still far from understanding in detail just how and to what extent migration affects the spread of HIV. Part of the reason for this is that studies of migration and disease tend to concentrate on the urban, or 'receiving' areas with little attention being paid to people living in the rural or 'sending' areas. Furthermore, there have been very few well-designed epidemiological studies documenting the relationship between migration and infectious diseases. Even more importantly, at this late stage of the Southern African HIV epidemic, there have been few intervention programmes, even on a small scale, which attempt to reduce transmission among migrants and their rural or urban partners.

Without a proper understanding of the social, behavioural and psychological consequences of migration, it will not be possible to understand the consequences of migration for the spread of HIV and the particular vulnerability to infection of mobile populations. To effect this conceptual refocus on the social (and sexual) disruption that accompanies migration and mobility, a number of reorientations are required, including:



- A more detailed understanding of the complex and changing patterns of migrancy in its different forms;
- Appreciation of the particular vulnerabilities of migrants as migrants (and those with whom they interact) and hence the economic, social, sexual and gender regimes associated with migrancy;
- Since generic HIV/AIDS interventions seem to be having so little impact in migrant settings and situations of high mobility, there is a need to develop models of intervention that are sensitive to the circumstances of mobile people;
- As attention is increasingly directed towards models of care and the development of appropriate 'toolkits', there is a need to develop interventions appropriate to the situation of migrants and their divided households.

The paper argues that none of these objectives can be adequately reached without attention to both the macro- and micro-geographies of mobility, social connectivity and sexual behaviour.

The connections between migrancy and HIV/AIDS are more difficult to unravel because HIV/AIDS arrived in the region at a time when population mobility and systems of migrant labour were undergoing considerable change. Migrancy is, by its very nature, highly dynamic and has changed dramatically in scope, scale and diversity over the last two decades. Today it is much more difficult to map the prevalence and spread of disease onto spatial patterns of migration than it was in the past. Several important migration changes that coincided with the advent of HIV/AIDS need to be mentioned:

- The collapse of apartheid brought new opportunities and reasons for migration across borders within the region. Migrants from neighbouring countries and further afield see South Africa as a new place to trade, shop, seek essential services, work and seek asylum.
- South Africa's formal trade with the rest of the continent has exploded, goods carried in the main by long-distance truckers. Informal sector cross-border trading has also expanded dramatically since the end of apartheid.
- Significant growth in levels of urbanization in South African cities. One consequence has been the displacement of the rural poor to the towns.
- The new gendering of migrancy. Women are becoming considerably more mobile, migrating for formal and informal work in ever-growing numbers and travelling more frequently for a variety of social and other reasons.
- The mining industry persists with its regional single-sex contract

labour system but there are much higher levels of social contact between migrants miners and people living near the mines.

The vulnerabilities to HIV of people (migrant and non-migrant, mobile and relatively immobile) associated with this changing regime of migrancy are poorly understood. The evidence seems to suggest that migrants and migrant households in town and countryside are particularly at risk. So too are the residents of non-migrant communities with whom migrant workers interact on a daily basis.

After discussing the general evidence on the causal connections between HIV/AIDS and migration in South Africa, this paper seeks to move the South African debate from the macro- to the micro-scale. By reviewing the findings of research in three different settings the complexity of the connections between migration and HIV/AIDS begins to emerge. The case study areas are spaces of vulnerability, places in which to observe why migrants and those with whom they come into contact are highly susceptible to HIV infection, and hence to develop approaches to decreasing this vulnerability. If workable interventions, based on a sound understanding of local regimes of migration and sexuality, can be developed in disparate case studies such as these, then such best-practice models could have much wider relevance for resisting the ravages of the epidemic.

Much can still be done to reduce the impact and the spread of HIV in South Africa. Mother-to-child transmission could be substantially reduced using standard drug regimens. Control of curable STIs would reduce transmission of HIV. The effective promotion of condoms and a reduction in high risk sexual behaviour would have an effect in the longer term. Tuberculosis prophylaxis could substantially reduce tuberculosis morbidity and mortality among those with HIV and this is particularly important in the context of gold mining. The public health implications of the provision of free anti-retroviral therapy to people who are HIV-positive need to be examined. And adequate resources must go to the development of a vaccine for HIV subtype C .

None of these interventions are likely to be effective without a sound understanding of the reasons why Southern Africa is the worst affected region in the world, why the epidemic has spread in this region more rapidly than in any other, and why there are such great differences in the infection rates in different provinces, between men and women and critically between migrants and non-migrants. In addition, in all of these interventions special attention should be given to people at high risk of infection, which includes not only commercial sex workers, but also migrants and the partners of migrants. In this context, effort needs to go into the development of epidemiological models to understand the current state and the likely future course of the epidemic, to provide

a context for planning and designing interventions, and to evaluate the effectiveness of such interventions.

This paper highlights the current state of knowledge about the linkages between HIV/AIDS and migration but it is abundantly clear that there are large gaps in our knowledge of the extent to which migration, and the particular forms of migration that are found in Southern Africa, can explain why the levels of infection in this region are so much higher than anywhere else in the world. Areas in which more work is urgently needed include:

- Research on the dimensions and social and health impacts of cross-border and internal migration. To what extent does migration contribute to the overall spread of HIV and other STIs? What steps are being taken to ensure that all migrants, legal as well as undocumented, can readily access the treatment services for STIs and HIV prevention programmes?
- The economic consequences of out-migration from labour-sending areas have been studied in some depth. But what are the consequences of such migration for the sexual health of those who are left behind? As migrants return home with HIV, suffering from other opportunistic infections and soon to develop AIDS, what are the economic implications for their families and communities who will not only lose a bread winner but must also find the resources to provide some level of care for the dying men and women?
- As the gold mines, in particular, retrench more men and as the economy slows down and unemployment increases, there are indications that more and more women are migrating in search of work. Because of the highly discriminatory labour market, some will have no choice but to engage in commercial sex work. All are likely to be at increased risk of HIV. What kinds of public health interventions can be developed to assist women at such high risk?
- While it is certain that migration has fuelled the epidemic of HIV in Southern Africa, infections are now so widespread that it seems likely that migration is no longer driving the epidemic. However, programmes to control the epidemic will certainly be considerably less effective if migrant workers continue to spread infections. Programmes aimed at supporting migrants should be given the highest priority but much more work is needed to provide an understanding of the social, behavioural and sexual context of the lives of migrants.
- Perhaps, most importantly, policy issues need to be addressed including the nature and extent of migration, the rights of

migrant workers, and the kinds of services to which they have access. This must be done both for those in the formal and in the informal sector and even undocumented migrants must be able to access health services without fear of exposure.

The epidemic of HIV/AIDS threatens to devastate much of Southern Africa. Dealing with the epidemic must be given the highest priority and treated with the greatest urgency. However, unless the issues of migration and disease are understood and dealt with effectively, it is unlikely that the greater struggle to control and manage AIDS can be won.

## INTRODUCTION

At the end of the year 2000 an estimated 36 million people globally were living with HIV/AIDS and 2.5 million adults and half-a-million children died in that year as a consequence of being infected with HIV.<sup>1</sup> However, seventy per cent of all those infected with HIV live in Sub-Saharan Africa and within this region the countries of Southern Africa are the worst affected.<sup>2</sup> Ranking countries according to the prevalence of HIV shows that the eight countries with the highest rates of infection are in Southern Africa, followed by six countries in East Africa, and then five other countries, only one outside Africa (Table 1, p. 33).<sup>3</sup>

The reasons why the highest rates of infection in the world occur in Southern Africa are unclear. Although the countries of the region have much in common, their histories over the last twenty years have been very different. Botswana, with the highest rate of infection, has experienced stable, democratic government and a strong economy since independence in 1966. Mozambique, with the lowest rate of infection, experienced sixteen years of devastating civil war from which it only emerged in 1992. While South Africa and Botswana are the two richest countries in Sub-Saharan Africa (as measured by per capita gross domestic product), Mozambique is the poorest. The countries of Southern Africa are, however, linked through a particular form of migration and the worst affected countries are those with the best transportation infrastructure.

Several general attempts have been made to link population migration to the continental spread and prevalence of HIV.<sup>4</sup> In the main, this literature tracks the diffusion of HIV/AIDS in relation to major transportation arteries and migration routes. Others have sought to explain spatial variation in HIV prevalence within and between countries and rural and urban areas.<sup>5</sup> The present paper undertakes a similar exercise for South Africa using national census and seroprevalence data. While this is a useful baseline exercise, and helps to define the nature and the extent of the problem, much more empirical work is needed before it will be possible to unravel the complex causal connections between migration and HIV/AIDS.

Decosas and Adrien suggest that the association between migration and HIV is more likely to be a consequence of 'the conditions and structure of the migration process than the actual dissemination of the virus along corridors of migration.'<sup>6</sup> They argue that a focus on the routes of spread tends to direct attention to the migrants themselves rather than the socio-economic context of migration. This in turn can easily lead to policies aimed at restricting movement and stigmatising

vulnerable groups of people. Indeed, Decosas *et al* argue that ‘the fact that population movements distribute HIV is secondary to the fact that certain types of migration cause HIV epidemics.’<sup>7</sup> Without a proper understanding of the social, behavioural and psychological consequences of particular forms and patterns of migration, it will not be possible to understand the consequences of migration for the spread of HIV and the vulnerability to infection of mobile populations.

To effect this conceptual refocus on ‘the social (and sexual) disruption’ that accompanies various types of migration and forms of mobility, a number of reorientations are required. First, there needs to be a much more detailed and nuanced understanding of migration itself, of the complex and dynamic spatial and temporal patterns of migrancy in its different forms. Second, building upon this analysis, we need to understand the particular vulnerabilities of migrants as migrants (and those with whom they interact) and hence the economic, social, sexual and gender regimes associated with migrancy in its many different manifestations. Third, since generic HIV/AIDS interventions seem to be having so little impact in migrant settings and situations of high mobility, there is a need for models of intervention that are sensitive to the modalities of mobile people. Finally, as attention is increasingly directed towards models of care, there is a need to develop interventions appropriate to the situation of migrants and their divided households.

After reviewing the general evidence on the connections between HIV/AIDS and migration, this paper seeks to move the South African debate from the macro- to the micro-scale. Our basic premise is that none of the above objectives can be adequately reached without attention to the micro-geographies of mobility, social connectivity and sexual behaviour. By reviewing the findings of research in three disparate settings, the complexity of the connections between migration and HIV/AIDS begin to emerge. But while each local situation has its own distinct characteristics, it is not necessary to conclude that lots more local studies are necessary before we can say anything ‘representative’ or make sound recommendations for workable prevention strategies and models of care. The case studies presented here represent three instances of a more general set of like situations across the country. The case study areas are spaces of vulnerability, places in which to observe why migrants and those with whom they come into contact are highly susceptible to HIV infection, and hence to develop approaches to decreasing this vulnerability. If workable interventions, based on a sound understanding of local regimes of migration and sexuality, can be developed in disparate case studies such as these, then such best-practice models could have much wider purchase for resisting the ravages of the epidemic.

## EXPLAINING THE EPIDEMIC

In 1990, the South African Department of Health initiated a national HIV surveillance programme based on anonymous, unlinked, cross-sectional surveys of women attending public antenatal clinics. In October and November each year approximately 2 000 blood samples, taken for the prevention of haemolytic disease in newborn babies, are collected in each of the nine provinces.<sup>8</sup> Initially, clinics were chosen randomly within each province but in 1998 probability-proportional-to-size cluster sampling was introduced in all provinces except Mpumalanga.<sup>9</sup> These national antenatal clinic HIV surveys provide information on the overall prevalence, age-prevalence, time trends and geographical variation of HIV among women of reproductive age. The rapid spread of HIV-infection in South Africa over the last ten years is shown in Figure 1 (p. 35).<sup>10</sup> Once introduced into the heterosexual population in South Africa, HIV-1 spread rapidly and widely, overwhelmingly through heterosexual transmission.<sup>11</sup> In 1990 the prevalence of HIV-1 among women attending antenatal clinics was 0.8%; at the end of 1999 it was 24%.<sup>12</sup> By the year 2010, life expectancy is projected to fall by 20 years (from 68 to 48 years), child mortality to double (from an anticipated 49 per 100 000 without AIDS to 100 per 100 000), and there may be an additional two million AIDS orphans.<sup>13</sup>

There is substantial geographical variation in antenatal HIV prevalence (Figure 2, p. 35). Best estimates of the current (July 2001) levels of infection show the prevalence declining from a high of 35% in KwaZulu/Natal, through the north-eastern provinces, to 20% in the Eastern Cape, with a low of 9% in the Western Cape. The population of South Africa is very unevenly distributed, however, and it is more instructive to combine provincial prevalence data with population density data to get the distribution of people infected with HIV (Figure 3, p. 36).<sup>14</sup> Although the Western Cape has low rates of infection, Cape Town has a high density of people infected with HIV. While the provincial infection rates in KwaZulu/Natal are high, the population is patchily distributed and infections do not occur evenly through the province. In the Eastern Cape, to the northeast of East London, infected people are more evenly spread over a large area. The mining centres at Carletonville, Klerksdorp and Welkom show high densities of infected people as do the port cities of Port Elizabeth, East London and Durban and the major industrial and commercial centre of Johannesburg.

A number of different factors have been advanced to explain the rapid spread, high prevalence and uneven distribution of HIV/AIDS in South Africa as well as in Africa more generally. They include poverty and economic marginalization; differing strains of HIV; high rates of

sexually transmitted disease and other opportunistic infection; sexual networking and patterns of sexual contact; the presence or absence of male circumcision; and the role of core-groups such as commercial sex workers. These factors are discussed in greater detail below, highlighting the current state of thinking about each.

## POVERTY

HIV/AIDS, like all communicable diseases, is linked to poverty.<sup>15</sup> While South Africa is one of the richest countries in Africa it also has the greatest disparity in wealth. In the context of migration to the mines in South Africa poverty forces men to leave their rural homes, wives and families to work on the mines where they find dangerous and physically stressful jobs and are put at very high risk of infection.<sup>16</sup> At the same time, as discussed below, the women who remain in rural areas remain poor and unsupported and they too are placed at high risk of being infected with HIV.

The most devastating consequences of HIV infection arise not simply because many people will die but because the deaths will occur mainly among adults between the ages of 25 and 45 years, the very people who work to support families and should be most productive economically. Poverty fuels the epidemic of HIV/AIDS. But without strong public support for those infected with HIV the epidemic will greatly exacerbate poverty. A recent report on the economic consequences of HIV in South Africa suggests that the sector that will be hardest hit will be mining, followed closely by transportation and storage, and that about 27% of current mine workers and 22% of all transport and storage workers will die of AIDS by 2005.<sup>19</sup> Economic growth will be hit badly as the diversion of funds away from savings to pay for the costs of the illness decreases the country's investment potential. By 2005, companies could see their remuneration budgets increase by 15% as they face higher benefits payments to medical aids, life policies and disability cover, as well as the cost of replacing workers.

One of the most important determinants of the spread of HIV/AIDS as well as other sexually transmitted infections (STIs) is the extent to which there are core groups of people who are themselves at high risk and who have many sexual partners.<sup>17</sup> Commercial sex work will clearly flourish in settings where women are poor, marginalized and unskilled, and selling sex may be their only way to support themselves.<sup>18</sup> Furthermore, impoverished women may provide sex in exchange for a range of commodities including food, shelter, support and protection so that sex work takes on many forms.



## DIFFERING STRAINS OF HIV

Southern Africa has been subjected to differing strains of HIV.<sup>20</sup> Phylogenetic analysis of the DNA sequences of strains of HIV from South Africa suggests that the epidemic in South Africa is the result of the multiple introduction of viral strains and the dominant subtype C virus is also found in central and other Southern African countries which are linked to South Africa by migration.<sup>21</sup> Indeed, it may be that the multiplicity of strains partly determines the severity of the epidemic. HIV-1 is the dominant virus in South Africa and HIV-2 is rare. Differences in subtype distribution within South Africa have been recorded and in early phylogenetic studies on HIV-1 isolates from Cape Town, heterosexual infections were all subtype C while subtypes B and D were also found in homosexual and bisexual men.<sup>22</sup> Similar results were obtained in more extensive studies, also using HIV-1 isolates from Cape Town, in which subtype B was found in 96% of infected homosexual men, subtype C in 81% of heterosexuals and in cases of vertical transmission from mother to infant.<sup>23</sup> Subtype D was also found in both homosexual and heterosexual groups and subtype E was found in Cape Town in heterosexuals. This study clearly showed that at this early stage of the HIV-1 epidemic in South Africa, using the genetic distances between viral *gag* sequences, multiple introductions of subtype C strains must have occurred in the region at about the same time. A similar predominance of subtype C infections has also been found among migrant mine workers from Botswana, Lesotho, Swaziland and Mozambique, as well as in heterosexuals infected with HIV from Zimbabwe and Botswana.<sup>24</sup> More recently, subtype A, the most common subtype in Kenya and Uganda has been found in South Africa.<sup>25</sup>

Recombination between different HIV subtypes provides greater genetic diversity making it more likely that the viruses will survive the host's defence mechanisms, vaccines and anti-retroviral therapy. Recombination in HIV-1 has been shown to occur globally and especially in Africa.<sup>26</sup> Although recombinant HIV viruses were not found in South Africa early in the HIV epidemic, recent work has clearly demonstrated a low prevalence (3%) of inter-subtype recombinants in the country.<sup>27</sup>

## PRESENCE OF STIS

A third factor is the high rates of other sexually transmitted diseases (STDs) in the region including those that cause ulceration such as syphilis and Herpes simplex II (HSV-2), or discharges such as gonorrhoea, as well as chlamydia, bacterial vaginosis, trichomoniasis and others.<sup>28</sup> Genital ulcer disease (GUD), in particular, is strongly associated

with HIV; the ulcers provide an easy access route for the virus into the recipient's blood plasma and swabs taken from genital ulcers show an elevated concentration of the virus.<sup>29</sup> Non-ulcerative sexually transmitted infections are also believed to increase the risk of HIV transmission and elevated concentrations of the virus are found in discharges arising from sexually transmitted infections.<sup>30</sup>

The results of various surveys carried out among commercial sex workers, mine workers, women attending antenatal clinics, and adults in a rural and an urban population are summarised in Table 2 (p. 33). The prevalence of recently acquired syphilis (RPR and TPHA positive) ranges from 5 to 10% for men, 7 to 10% for community women and 23 to 42% for commercial sex workers. The prevalence of gonorrhoea is generally lower than that of recently acquired syphilis, ranging from 2.3 to 3.4% for men, 5.8 to 8% for community women, and 14 to 16% for commercial sex workers. The prevalence of chlamydia generally lies between that of syphilis and gonorrhoea excepting that in pregnant women the prevalence is higher than for syphilis or gonorrhoea. Asymptomatic infections are common especially among non-pregnant women. In the Hlabisa district of KwaZulu/Natal, among pregnant women with syphilis, gonorrhoea and chlamydia, 4.9%, 6.1% and 8.0%, respectively, were asymptomatic while the corresponding rates among non-pregnant women were much higher at 67%, 37% and 36%, respectively. Among men attending STI clinics in 1993 and 1994, those with genital ulcer disease were more likely to be infected with HIV than were patients with urethritis (39% v 21%), and those with HSV-2 were more likely to be co-infected with HIV.<sup>31</sup>

In a multivariate analysis of social and biological risk factors for HIV among young people in Carletonville in 1999, HSV-2 (*Herpes Simplex II*) was the single best predictor of HIV status.<sup>32</sup> For women below 20 years of age the odds ratio was 22 while for women above 20 years of age it was 8.3. For men the corresponding odds ratios were 7.6 and 7.7, respectively. For both sexes the prevalence of HSV-2 is greater than that of HIV and very few women are infected with HIV only. While the association between HIV and HSV-2 is strong, the extent to which each contributes to the spread of the other is more difficult to establish. However, there is some evidence that the rise in the prevalence of HIV has coincided with an increase in the prevalence of HSV. For example, between 1991 and 1998 when the prevalence of HIV among men attending STI clinics in Durban increased from 5 to 64%, the prevalence of HSV-2 increased from 10% to 41%.<sup>33</sup>

## SEXUAL NETWORKING AND PATTERNS OF SEXUAL CONTACT

Clearly if all those who had sex were monogamous, sexually transmitted infection would not persist as the spread of HIV clearly depends on the patterns of sexual networking within a population. If many men have sex with commercial sex workers this is very likely to enhance the spread of HIV and other STIs.<sup>34</sup> This was the motivation for the '100% condom use' programme among commercial sex workers in Thailand which is thought to have contained the spread of HIV there.<sup>35</sup> Attempts to directly associate the prevalence of HIV at a population level have, however, been ambiguous and the association is complex.<sup>36</sup> It has been suggested that having concurrent partners is critical for the spread of HIV.<sup>37</sup> Patterns of sexual networking may also be more important in the early stages of the epidemic when few people are infected than in the later stages when infection is widespread. Among women in Carletonville, for example, more than 20% of those who had had one sexual partner were infected with HIV.<sup>38</sup>

With regard to safe sex, several studies have suggested that knowledge of HIV/AIDS and the associated risk factors and behaviour is high in most African settings. However, safe sex is not widely practised. Although condom distribution in South Africa increased from 6 million in 1994 to 172 million in 1997, levels of condom use remain low and inconsistent.<sup>39</sup> A nation-wide survey in 1996 reported that only 38% of male and 21% of female black adolescents had ever used condoms and in the same year a study among rural adults found that only 14% had used condoms.<sup>40</sup> A national survey conducted among the employees of a large company in 1999 found that only 36% had used a condom in their last encounter with a non-regular partner.<sup>41</sup> Another study of rural dwellers in 29 villages in the Highlands of Lesotho found that only 3% of women and 17% of men had ever used condoms.<sup>42</sup> None of the 38% of men who had had sex with a non-regular partner in the previous three months had used condoms.

Condom use varies with the nature of the sexual relationship. Studies conducted between 1998 and 1999 among truck drivers, men from STI clinics and men from the general population, found that between 7% and 13% of men used condoms with their girlfriends or wives, while approximately 50% reported condom use with casual partners.<sup>43</sup> In a 1998 survey in Carletonville, 23% of men and 17% of women said that they used a condom with their regular partner and 47% of men and 27% of women used a condom with their last casual partner.<sup>44</sup> Low levels of perceived risk of contracting HIV may contribute to low levels of condom use. In 1998, only 20% of men and 17% of women in Carletonville thought that they had a good chance of

being infected. Of those who thought that they were at no risk of infection, 28% were already infected.<sup>45</sup>

No studies have yet systematically investigated the extent to which unequal power relations between women and men contribute to the spread of HIV in South Africa. Wood and Jewkes argue that it is these power relations which 'determine women's ability – or inability – to protect themselves against sexually transmitted diseases, pregnancy and unwelcome sexual acts.'<sup>46</sup> Their own study of teenagers in a Cape Town township shows that men usually defined the conditions and timing of sexual relations and often used violent and coercive strategies from the start of relationships.<sup>47</sup> Sixty percent of the teenagers, married or unmarried, said they had been beaten by their male partner. This is symptomatic of the much larger problem of male violence against women, in both impersonal and intimate relationships. Rates of sexual violence and assault against women are certainly amongst the highest in the world.

Infection rates in young women are far higher than those in young men. The HIV-prevalence rate in females aged 15-24 is twice that of males of the same age. Part of the explanation is that the ease of transmission is greater for females for various physiological reasons. However, sexual assault is clearly also a factor. About 240 cases of rape per 100 000 women are reported to the police each year (51 249 cases in 1999 alone).<sup>48</sup> The victim age group with the highest incidence is 12-17 year old girls with 471 per 100 000, but even the 0-11 age group had an incidence of 130 per 100 000.

The reporting rate of rape is reckoned to be extremely low and official figures seriously underestimate the extent of the problem. According to Statistics South Africa only half of all rapes are reported to the police. The majority of offenders (57%) were unknown to the victims. Data from community-based surveys, however, suggest that there may be over 2 000 rapes per 100 000 women per year.<sup>49</sup> Forty percent of reported rapes were against females in the 0-17 age group.<sup>50</sup>

The highest rates of rape among girls and young women, as well as the greater prevalence of HIV compared to boys of comparable age, has been attributed in some parts of the country to the so-called 'virgin-rape myth' which leads men in some communities to the profoundly erroneous belief that sexual intercourse with a young virgin will cleanse the perpetrating male of HIV/AIDS. The pervasiveness of the practise is unknown, though Human Rights Watch calls it 'major problem.'<sup>51</sup> Clearly, further investigation is needed into the extent to which sexual violence contributes to the spread of HIV, but that it plays a major role is not in dispute by most experts.

## MALE CIRCUMCISION

There is compelling international epidemiological evidence showing that male circumcision provides significant protection against HIV infection and circumcision reduces a man's chance of becoming infected by two to eight times.<sup>52</sup> The inner surface of the foreskin contains Langerhans' cells with HIV receptors; these cells are likely to be the primary point of viral entry into the penis of an uncircumcised man. Furthermore, circumcision also protects against other sexually transmitted infections, such as syphilis and gonorrhoea.<sup>53</sup> Since people who have a sexually transmitted infection are more likely to become infected with HIV, circumcision may be even more protective.<sup>54</sup> In a study of couples in Uganda among whom the woman was HIV positive while her male partner was not, no new infections occurred among any of the 50 circumcised men over 30 months, whereas 40 of 137 uncircumcised men became infected during this time.<sup>55</sup> Both groups had been given free access to HIV testing, intensive instruction about preventing infection, and free condoms (which were continuously available), but 89% of the men never used condoms, and condom use did not seem to influence the rate of transmission.

Similar results have recently been reported from South Africa. Migrant mineworkers in Carletonville who were circumcised were 35% less likely to be infected with HIV than men who were not; for men in Khutsong the reduction was 38%. Furthermore, the higher rates of infection in KwaZulu/Natal than in the Eastern Cape may be because Zulu men are not generally circumcised unlike most Xhosa men.<sup>56</sup>

## THE PRESENCE OF OPPORTUNISTIC INFECTION

Tuberculosis (TB) is the most important opportunistic infection associated with HIV/AIDS and in East and Southern Africa. TB rates may be the best predictor of HIV infection.<sup>57</sup> Since the beginning of the 20th century tuberculosis has been a major cause of morbidity and mortality in South Africa and in 1980 accounted for an estimated 7% of all deaths among black people between 15 and 64 years of age.<sup>58</sup> In 1994 the overall incidence was 311 per 100 000 per year.<sup>59</sup> After trauma, tuberculosis claims the largest number of lives amongst working miners, with a mortality rate of 25 per 100 000 in 1993; the industry wide incidence of tuberculosis in the same year was 1 100 per 100 000.<sup>60</sup>

The link between HIV, tuberculosis and silicosis has been explored in some depth.<sup>61</sup> The incidence of tuberculosis among mineworkers is closely associated with both silicosis and HIV infection. Among men with HIV, the annual incidence of tuberculosis is now almost 10% and among men with HIV and silicosis it is 16%. A study of ex-mineworkers

in the Libode District in the Eastern Cape Province of South Africa found that approximately one in three had radiological evidence of silicosis in their lungs.<sup>62</sup> Another study showed that about the same proportion of gold-miners in service had silicosis.<sup>63</sup>

Over the past ten years the incidence of tuberculosis among HIV-negative mineworkers was steady at about 1 000 per 100 000 per year and apparently unaffected by the epidemic of HIV. This rate is extremely high, at three times the national average.<sup>64</sup> Partly the high rate is due to the living conditions on the mines but in part it is due to the high prevalence of silicosis among gold-miners. Silicosis increases the risk of tuberculosis by about three times (depending on the extent of the disease) and HIV infection increases the risk by about five times (depending on the degree of immuno-suppression).<sup>65</sup>

All of the factors discussed in this sector are important to understanding the course of the HIV/AIDS epidemic in South Africa at the national and local level and need to be explored further. What has not been fully factored in, however, is the crosscutting role of human migration and mobility.

## CONNECTING MIGRATION AND HIV/AIDS

**I**t has recently been argued that migration is one of the most important determinants of global health and social development and that migration has important implications for those who migrate, those who are left behind, and those communities that host migrants.<sup>66</sup> Throughout the world, migrants are particularly vulnerable to disease.<sup>67</sup> Many migrants are undocumented and live in economically deprived and unhealthy conditions. In foreign countries they may have difficulty in accessing health services. If they are highly mobile they may also inadvertently contribute to the spread of infectious disease.

Research in Africa has long demonstrated that the prevalence and patterns of spread of infectious disease are closely associated with patterns of human mobility.<sup>68</sup> With regard, specifically, to sexually transmitted disease, there is considerable evidence that migrancy plays a key role in increasing susceptibility to HIV, sexually transmitted infections (STIs) and other opportunistic infections.<sup>69</sup> Migrant men are more likely to have casual partners and to engage with sex workers, many of whom are themselves migrants.<sup>70</sup> Research has tended to show that people who migrate in search of work are at risk in their places of work or that people who are highly mobile, such as truck drivers, are at high risk of contracting STIs themselves or that people living close to trucking routes are more likely to be infected with STIs than those who live farther away.<sup>71</sup>

A study on HIV and migration in Uganda, for example, showed a strong correlation between HIV infection and migration status.<sup>72</sup> People who had moved within the last 5 years, were three times more likely to be infected with HIV than those who had lived in the same place for more than ten years and people who had moved frequently had more sexual partners, on average, than those who moved less frequently.

In a study of seasonal migration and HIV in Senegal, the authors concluded that HIV was ‘mainly transmitted first to adult men through sexual contacts with infected women met during their seasonal migration and second to their wives or regular partners once they are back home.’<sup>73</sup> This study suggests that the predominant pattern of spread is from returning male migrants to their rural partners and similar findings have been reported from Ghana and Mexico.<sup>74</sup>

In a study of male factory workers in Zimbabwe, HIV positive men were more likely to live apart from their wives and to have multiple sexual partners than HIV negative men.<sup>75</sup> In Ghana, Anarfi has indicated that migration ‘acts to increase the extent of sexual networking.’<sup>76</sup> In a rural community in KwaZulu/Natal people who had recently changed their place of residence were three times as likely to be infected with HIV compared to those who had not.<sup>77</sup> In Kenya, a recent study concluded that ‘migration is a critical factor in high-risk sexual behaviour and that its importance varies by gender and direction of movement.’<sup>78</sup>

A recent HIV/AIDS risk assessment of Lesotho and Swaziland clearly demonstrates that migration has played a major role in the dissemination of HIV/AIDS. The assessment also highlights various “migrant sites” and spaces of high vulnerability.<sup>79</sup>

## THE SOUTH AFRICAN CONNECTION

**I**n South Africa, the precise linkages between migration and the health of migrants (as well as those they come into contact with) are complex and difficult to unravel. The main emphasis in recent migration studies has been on the determinants of migration rather than the health consequences of migration.<sup>80</sup> Studies linking health and migration have focused mainly on migrants at their place of work, especially on the gold mines, and to a much lesser extent on rural labour sending areas.<sup>81</sup> Work on the relationship between vulnerability to infection and the whole process of migration is comparatively rare.

Traditionally, long-distance migrancy to the mines and towns was *largely* male. To ensure that a regular and regulated supply of labour was maintained, a regional system of ‘circular migration’ was developed by the Chamber of Mines of South Africa and enforced by the apartheid state and neighbouring colonial administrations. The Chamber of

Mines set up an employment agency, known since 1976 as The Employment Bureau of Africa (TEBA), which recruited men from other countries to work on the mines. TEBA had the right to recruit foreign workers as well as South Africans, but without giving the former rights of permanent residence.

To ensure that migrant miners did not remain in the mining centres of South Africa they were prohibited from bringing their families with them and were given annual contracts which obliged them to return home once a year with no guarantee of continued employment. As a result, the pattern of migration that developed early in the century, and persists to this day on the mines, was predominantly that of circular migration in which men leave their partners in rural areas in search of urban employment, and return home as frequently as money, contracts and distance allow. This form of migration had the added benefit, from the point of view of the mining industry and the state, that the rural areas of Southern Africa provided a form of social security for the men on the mines where the costs fell entirely on rural families.

The size of the mine workforce fluctuated over time, as did the numbers of mineworkers from any one area. However, the proportion of foreign miners on the gold mines never dropped below 40%.<sup>82</sup> In the early 1970s, it rose as high as 80% and is currently around 55%.<sup>83</sup> Mozambique, Malawi, Swaziland and Botswana remain the primary foreign suppliers. Malawians had a significant presence on the mines until the late 1980s, when they were sent home after their government refused to implement compulsory HIV testing for recruits, as demanded by the South Africans.<sup>84</sup>

It once seemed relatively easy for researchers to discern clear casual linkages between this system of oscillating migration and the prevalence and spread of disease. As early as 1949, Kark suggested that the widespread prevalence of gonorrhoea and syphilis in both urban and rural areas of South Africa was a consequence of the migrant labour system.<sup>85</sup> Jochelson has recently affirmed this argument, suggesting that the migrant labour system 'facilitated the transmission of venereal and endemic syphilis to new regions, and into communities without previous exposure to the disease.'<sup>86</sup> Wilson argued more broadly that the system of housing male migrants in hostels away from their wives and families led to massive social and health dysfunction including 'family break-ups, bigamy, prostitution, alcoholism, violence, corruption, venereal disease, tuberculosis and malnutrition.'<sup>87</sup> The migrant labour system clearly increased the vulnerability of migrants to infection and greatly facilitated the spread of sexually transmitted, as well as other, infectious diseases.

The inter-connections between migrancy and disease have been



noted in several other studies. Packard, for example, has detailed the way in which the migration of men between urban and rural areas led to the spread of tuberculosis in South Africa during the early part of the 20th century.<sup>88</sup> Other studies have revealed how vulnerable the current generation of migrant miners are to occupational lung disease.<sup>89</sup> Many have returned home, placing very severe social and economic burdens on individuals, households, and the migrant labour-sending communities as a whole. In the Eastern Cape, a recent study found that 24% of ex-miners were eligible for compensation. The mining industry paid out approximately US\$500 000 in unpaid compensation as a direct consequence of this study.<sup>90</sup> Unfortunately, no effort has been made to ensure that the remaining one to two million ex-gold mineworkers, from the neighbouring countries as well as South Africa, receive the compensation to which they are entitled under law.

Throughout the 20th century, therefore, the migrant labour system played a central role in the spread of infectious diseases such as tuberculosis and STIs like syphilis and gonorrhoea. The system also made miners and their dependents particularly vulnerable to infectious and occupational disease.

These connections are more difficult to unravel in relation to HIV/AIDS partly because HIV/AIDS arrived in the region at a time when population mobility and systems of migrant labour were undergoing considerable change. Migrancy is, by its very nature, highly dynamic and has changed dramatically in scope, scale and diversity over the last two decades. Today it is much more difficult to map the prevalence and spread of disease onto spatial patterns of migration than it was, say, twenty years ago.

Several important migration changes that coincided with the advent of HIV/AIDS in the last twenty years need to be mentioned. First, the collapse of apartheid brought new opportunities and reasons for migration across borders within the region. Migrants from neighbouring countries and further afield see South Africa as a new place to trade, shop, seek essential services, work and seek asylum. The number of people crossing South Africa's borders in both directions has burgeoned since 1990 to over 7 million a year.<sup>91</sup> So too has South Africa's formal trade with the sub-continent, goods carried in the main by long-distance truckers. Informal sector cross-border trading has also expanded dramatically since the end of apartheid. Trading is highly gendered, with women playing a major role in the buying and selling of goods across international boundaries throughout the region.<sup>92</sup>

Second, there has been significant growth in levels of urbanization in South African cities. One consequence has been the displacement of the rural poor to the towns, as manifested in the ubiquitous informal

settlements that dot the urban landscape.<sup>93</sup> What is equally clear is that many of the new urban residents retain rural linkages and order their lives around the two poles of the 'split household.' While this is not a new phenomenon its scope and scale is unprecedented.

The third significant shift has been in the gendering of migrancy. Women are becoming considerably more mobile, migrating for formal and informal work in ever-growing numbers and travelling more frequently for a variety of social and other reasons.<sup>94</sup> A recent cross-sectional survey carried out in a rural area of KwaZulu/Natal (see p. 27) found that about one-third of adult women were migrants at the time of the survey but unlike their male counterparts, female migrants tended to stay closer to home, and were therefore able to return home more frequently.<sup>95</sup> Another study in Lesotho has shown how increasing retrenchments on the gold mines in particular have led to an upsurge in migration by women seeking work on South African farms.<sup>96</sup>

The greatest degree of continuity with the past is probably in the mining industry which persists with its regional contract labour system. In the 1990s, the South African gold mining industry employed half-a-million migrant mine workers from rural areas in South Africa, Botswana, Mozambique, Lesotho and Swaziland. The number of men living in single sex hostels has dropped slightly as the mining industry experimented with the provision of married quarters, but in the late 1990s, 89% of miners still lived in single sex hostels and only 2.1% lived in married quarters. The rest found their own accommodation in the local communities.<sup>97</sup> In 1995 the assessors of a judicial commission of enquiry, set up by the government and chaired by Justice Ramon Leon, to investigate the regulation of occupational health and safety in the mining industry, visited three hostels on two mines. Each room was occupied by between twelve and twenty men, giving an average of just over five square metres per person. The assessors were 'shocked by the conditions in which food was prepared' and by ablution facilities 'so squalid as to shock the most hardened.'<sup>98</sup> With men living in single sex hostels, sometimes with up to twenty men sleeping in one room, many away from their wives and families for months at a time, they are highly vulnerable to STIs.

The spatial perimeter of hostels has become much more permeable than formerly, facilitating higher levels of social contact between migrants miners and people living near the mines. As well as those living in settled urban communities around the mines there are numerous 'hotspots', informal settlements where women come to sell alcohol and sex. Developments in the transportation industry (particularly the deregulation of the taxi industry) and the removal of political barriers such as pass laws and influx controls have also had a significant impact

on the behaviour patterns of migrant mineworkers, making them much more mobile than in the past. While Mozambican migrants still follow the old pattern and return home once a year, migrants closer to home have effectively become long-distance commuters. In Lesotho, for example, 60% of migrant miners now return home at least once a month.<sup>99</sup> On the one hand, this could lessen the pressures for infidelity and family breakdown in the future. On the other, it means that the rural areas are far less ‘insulated’ than formerly from a virus such as HIV.

Accompanying this shift in migrant behaviour, there has been a marked upsurge in the informal movement of impoverished rural women to the mining areas from within South Africa, particularly the Eastern Cape. Accompanying these women are many ‘country wives’ who seek to maintain relationships and access to mine wages by moving to town. As Moodie and Ndatshe point out, ‘if policy makers are worried about the instability of marriages of black mineworkers, the most constructive approach would be to extend the right of mine visits to “foreign” wives and girlfriends’ as well.<sup>100</sup> Migrant women – whether ‘town women’ or ‘country wives’ – are often forced to the margins of the local economy. Common income-earning strategies include brewing and commercial sex-work, often in combination. Others enter longer-term, more stable relationships with migrant miners.<sup>101</sup> A recent study of women who self-identified as migrants in Carletonville showed that they were at significantly higher risk of being infected with HIV than women who did not and indeed most of the commercial sex workers in one of the ‘hotspots’ in Carletonville were migrants from rural areas in South Africa or neighbouring countries.<sup>102</sup>

In spite of the attention paid to the gold mines, the majority of migrant workers are employed in other sectors. Migrants work in manufacturing, agriculture, construction and services and – in the case of women – domestic service. Indeed, while single-sex hostels are discussed almost exclusively in relation to gold mines, they are common outside of the mining industry as well. Within a twelve-kilometre radius of Durban, for example, there are at least seven men’s hostels with in excess of 43 000 officially registered beds, one women’s hostel with over 1 000 beds and one mixed hostel with 11 000 beds.<sup>103</sup>

The particular vulnerabilities to HIV of people (migrant and non-migrant, mobile and relatively immobile) associated with this changing regime of migrancy are currently very poorly understood. The evidence to hand does seem to suggest that migrants and migrant households in town and countryside are particularly at risk. So too are the residents of non-migrant communities with whom migrants interact on a daily basis. This should not mean that migrants are to be stigmatised as carriers of HIV. The reality is that the relationship is reciprocal. Many of these

impoverished non-migrant communities have high rates of unemployment and interaction with migrants represents their only means of access to wage income. They offer to migrants social interaction and escape from the drudgery of work.

## MACRO-GEOGRAPHIES OF HIV

**A**n area requiring further exploration is the role of these new forms of mobility in the astonishingly rapid dissemination of HIV in South Africa. As a starting point, this section of the paper documents the macro-geography of the HIV/AIDS epidemic in South Africa in the 1990s.

Data on the extent and patterns of migration in South Africa at a macro-level is generally poor. However, certain general insights can be gleaned from the demography of the provinces structured by age, race and gender.<sup>104</sup> In most provinces the population is overwhelmingly African; only in the Northern and Western Cape is it predominantly coloured. The Northern and Western Cape and also Gauteng have a significant proportion of whites; most Indian people live in KwaZulu/Natal.

Census data suggests that significant numbers of African adults between 20 and 50 are leaving the Eastern Cape and the Northern Province and in both cases there are more men leaving than women. Similarly, in KwaZulu/Natal a deficit of African men as compared to women between the ages of 20 and 50 years reflects differential out-migration by men. Many of them are clearly migrating to Gauteng, giving rise to a peak in the age distribution for men between the ages of 20 and 50 years in that province, and to a lesser extent to the Western Cape and the Free State. The legacy of apartheid in the Western Cape has meant that the province has been relatively isolated from the perspective of migration but it has become increasingly integrated with the Eastern Cape.

To fully understand the impact of migration on the spread of HIV, data on the places of origin and destination of the migrants are needed on a much finer geographical scale. Given that HIV/AIDS will mainly kill young adults the impact is likely to be felt most keenly in Gauteng although if people go home to pass away their deaths may occur in other provinces.

In all provinces, the current HIV-prevalence will probably reach a peak in the next one or two years so that the prevalence in the Western Cape is likely to remain significantly below the current level in the Eastern Cape and the prevalence there below that of KwaZulu/Natal (Figure 4, p. 36).<sup>105</sup> These trends will become clearer over the next few

years. The intrinsic doubling times at the start of the epidemic shown in Figure 5 (p. 37) varies considerably at 11 months in the Western Cape and 15 months in KwaZulu/Natal. It is possible that the initial epidemic in KwaZulu/Natal spread relatively slowly but once it was established there, migration within South Africa led to more rapid growth within the other provinces even though they will probably peak at lower prevalence rates than KwaZulu/Natal.<sup>106</sup>

The HIV data highlights the importance of migration in spreading disease over wide geographical areas but also between urban and rural communities in Southern Africa. By analysing a range of age-specific prevalence data, it is possible to identify four different patterns of infection in South Africa among (a) women attending antenatal clinics; (b) women in the general population; (c) men in the general population; and (d) male migrant workers.<sup>107</sup> Within each of the four groups represented by the different patterns, the shapes of the age prevalence curves have not changed significantly over time suggesting that the prevalence is increasing at the same rate for people of all ages and that the shape of the age-prevalence curves gives a reasonable estimate of the variation of the relative age-specific risk of infection.

The difference between the patterns of infection in women attending antenatal clinics and women in the general population is slight for two reasons.<sup>108</sup> Since young women who attend antenatal clinics must have been sexually active, the antenatal clinic data may overestimate the prevalence of infection among young women. On the other hand, since older women who are at high risk of HIV are also at high risk of contracting syphilis, which may lead to abortions, or gonorrhoea, which may render them sterile, the antenatal clinic data may underestimate the prevalence of infection among older women.

While the prevalence of infection gives a measure of the cumulative risk of infection, the incidence of infection gives the rate at which new infections are acquired and is therefore a more sensitive measure of the growth of the epidemic. It is, however, more difficult to measure incidence than prevalence. Ideally, one would follow a cohort of people for a year or more and determine the number who became infected with HIV during the course of the study. Because of the cost, time and ethical difficulties associated with cohort studies, two alternative methods have been developed for estimating incidence.

The first method estimates incidence by combining age-specific estimates of the current prevalence and of the time trend of overall prevalence for the preceding ten or so years.<sup>109</sup> The second method uses a so-called de-tuned or sensitive-less sensitive (SLS) enzyme linked immunosorbent antibody (ELISA) test, which relies on the fact that HIV anti-body levels build up over several months after infection so

that people who have recently been infected with HIV have low antibody concentrations.<sup>110</sup>

Both of these methods have been used to estimate the incidence of HIV-infection among women in the Hlabisa district of Kwazulu/Natal, as shown in Figure 6 (p. 37).<sup>111</sup> The two independent methods confirm that 25 year-old women in rural Hlabisa, a source of migrant labour, have a 27% risk of being infected with HIV each year. A similarly high incidence of 18% per annum was found in a cohort study of sex workers operating at truck stops in the KwaZulu/Natal Midlands between 1996 and 1999.<sup>112</sup>

In order to estimate the likely impact of HIV on the demography of South Africa we need to know the incidence of infection among people according to race, age, gender and province. Unfortunately, there are no good data on the prevalence of infection among people of different races. The only source of data in which race is explicitly recorded is from the blood transfusion services (Table 3, p. 34) but the service deliberately excludes those who it regards as being at high risk so that the sample is extremely biased. This is evidenced by the fact that rates among black women donating blood was only about one fifth of the rates seen in women attending public ante-natal clinics in the same year.

Nevertheless, if we take these data at face value we see that among white and Indian blood donors, men are more likely to be infected than women which might suggest that male-to-male transmission is relatively important in these communities. We also see that the overall rates in white, Indian and coloured donors are 1.2%, 3.0% and 7.2% of the rates in black donors. Data by race were collected in a relatively small sample of people from a parastatal organization (which cannot be named for reasons of confidentiality) and the rates of infection found among white people in that study were 20% of the rates among black people.<sup>113</sup>

Another way to estimate the relative prevalence among African and coloured people is to note that the overwhelming majority of women in the Eastern Cape (where the prevalence among women is about 20%) are black but that the provincial prevalence declines from north east to south west. We assume therefore that the rate among black women in the Western Cape is about 15%, and we know that the overall rate in the province is about 10%. This implies that about 8% of coloured people in the Western Cape are infected with HIV, about half the rate among black people there.

The weakness of the data and the argument are acknowledged but we assume, in the absence of better data, that the rates of infection among black, coloured, Indian and white South Africans are in the proportions 1.0:0.5:0.25:0.1, respectively.<sup>114</sup> Based on these assumptions two of the authors (Williams and Gouws) have developed a model which

can be used to predict the demographic impact of HIV on people by race, gender, province and age.

The model forecasts population increase among different racial groups and women and men, with and without AIDS. The model suggests that the impact of HIV/AIDS on mortality will be felt among women at younger ages than among men. For black men the impact in the Eastern Cape and KwaZulu/Natal will be mitigated by the fact that so many men between the ages of 20 and 50 have already left those areas to work as migrants in Gauteng and the Free State. More women than men will die and South Africa faces the prospect of a continuing rise in the number of older children and adolescents with a dramatic decline in the number of parents.

The overall patterns of African population decrease predicted by the model are summarised in Table 4 (p. 34). In relation to KwaZulu/Natal, for example, Table 4 shows that in the year 2005, there will be about 150 000 fewer children, 400 000 fewer adult women and 200 000 fewer adult men than would have been the case without AIDS.<sup>15</sup> Without AIDS the population would be expected to increase by approximately one million people over the next five years; AIDS will reduce this to 250 000. The biggest impact will be in KwaZulu/Natal, which has the highest overall prevalence, and in Gauteng, which has a high prevalence but also has a very high proportion of people between the ages of 20 and 40 years, precisely those most likely to be infected and subsequently to die.

The immediate impact of AIDS will be felt through the direct effects of deaths on people, their families and society. The greater long-term impact of AIDS is likely to be felt through changes in the age structure of the population. We see that in the model, the number of young people in KwaZulu/Natal aged 0 to 20 will *increase* by 340 000 while the number of adults aged 20 to 50 will *decline* by 200 000.

For African people the overall patterns of change are broadly similar but the likely difference in impact between the high and low-prevalence provinces is seen if we compare KwaZulu/Natal and the Western Cape. The impact of the epidemic is by no means negligible in the Western Cape but the adult numbers will only be 20 000 less than expected without AIDS while the equivalent figure in KwaZulu/Natal is approximately 600 000. Even allowing for the fact that KwaZulu/Natal has eight times as many black people as does the Western Cape, the model suggests that the effect in KwaZulu/Natal will still be four times greater than in the Western Cape.

The above analysis provides macro-level insights into the geography of HIV prevalence and incidence and, by extension, the geography of vulnerability. As the data improves so too will the reliability of the projections. However, it is clear from this preliminary exercise that spatial

patterns of prevalence and vulnerability are linked, in complex ways, with the mobility of the population. To understand the nature of these linkages, it is necessary to move from the macro- to the micro-scale. The next section of the paper therefore focuses on three contrasting migration situations which have been examined in some depth. Extensive biomedical, behavioural and socio-economic studies have been carried out at two sentinel sites, one in Hlabisa, a rural district of KwaZulu/Natal, the other in Carletonville, an urban gold-mining centre in Gauteng. Data have also been collected at STI, family planning and tuberculosis clinics, as well as referral hospitals and work places. Particular risk groups that have been studied include sex workers and truck drivers. These studies provide considerable insights into the connections between migrancy and HIV/AIDS at the local level.

## CASE STUDY 1: COMPOUNDING THE EPIDEMIC

Carletonville is the biggest gold mining complex in the world. The mines employ approximately 70 000 men, almost all of them migrants from rural areas, living in single sex hostels without their wives or families. The Mothusimpilo ('Working-together-for-health') Project was designed to demonstrate the feasibility of using sustainable, community-based interventions to reduce the transmission of HIV/AIDS.<sup>116</sup> The location of Carletonville is indicated in Figure 3 and Figure 7 provides a more detailed map of the area (p. 36, 38). The most important urban settlement in the district is the township of Khutsong with approximately 56 000 people

Working on gold mines is extremely dangerous; miners suffer from high rates of debilitating and potentially fatal diseases such as tuberculosis and silicosis. Accidents, including rock-bursts, are common and men face the real prospect of being killed or of literally breaking their backs.<sup>117</sup> Campbell argues that in order to deal with the psychological trauma of life on the gold mines with little or no social and emotional support, men develop a culture of masculinity that enables them to face the physical and emotional trauma associated with minework which involves drinking and engaging in frequent commercial sex.<sup>118</sup> Miners are socially isolated and there are few opportunities for any kind of human contact or intimacy in the hostels in which they live. Consequently, alcohol and intercourse with sex workers are the only means of 'entertainment,' with the resulting patterns of HIV infection.<sup>119</sup> Campbell argues further that norms of masculinity that enable miners to cope with and to survive the lonely, harsh and dangerous conditions of work on the mines, also reinforce a 'macho' sexuality which increases their likelihood of being infected with HIV.<sup>120</sup>



Miners earn an average of about US\$250 per month so that the monthly wage bill is almost US\$20 million per month. If, say, 10% of this is spent on alcohol and sex this will give rise to an informal sector industry worth approximately US\$2 million per month in a community where only 53% of the men and 24% of the women are employed.<sup>121</sup> It is not surprising that Carletonville has a very substantial informal sector providing alcohol and sex to mine workers. Much of the sex work takes place in what are referred to locally as 'hotspots' (squatter camps close to mine compounds). This industry is unregulated, still illegal, and the women there have had little access to health services. Women migrants from rural areas in South Africa, and from neighbouring countries, are attracted to places such as Carletonville.<sup>122</sup>

In August 1998 a confidential survey was conducted with random samples of (a) 1 185 men and women aged 13 to 59 years stratified by housing type in Khutsong, (b) 899 mineworkers stratified by hostels, and (c) 145 sex workers living in informal settlements or 'hotspots.'<sup>123</sup> Blood and urine samples were tested for HIV, HSV, syphilis, gonorrhoea and chlamydia, and participants answered a modified version of the UNAIDS four-centre study questionnaire.<sup>124</sup> The questionnaire included sections on demography; social factors including education and income; knowledge of STIs including HIV; attitudes towards HIV and to people infected with HIV; details of sexual practices and networking; and social capital. The survey was repeated in August 1999 but the Khutsong sample was limited to those aged 15 to 25 years to obtain more precise information on young people. A survey carried out in October 2000 was a repeat of the 1998 survey but this data has still to be analysed.

Gender differences in the age-specific prevalence are striking when comparing young men and women in the Carletonville region (Figure 8, p. 39). The prevalence of infection is close to zero for both sexes before the age of fifteen years but increases rapidly thereafter reaching 39% in 20 year-old women but only 8% in 20 year-old men. The peak prevalence is 58% at 24 years of age among women and 45% at 32 years of age among men. The median age at first sex is close to 16 years for both men and women in Carletonville and the prevalence of infection increases rapidly thereafter. Older men and women likely are now having relatively little high risk sex and when they were young there was little or no HIV so that the fall in prevalence amongst older men and women is expected.

While there are important gender differences between men and women the shape of the age-prevalence curves have not changed over time and are similar in urban and rural settings. Figure 8 shows the age specific HIV prevalence for rural men and women in KwaZulu/Natal in 1991 and for urban men and women in Carletonville in 1998. Although

the overall prevalence in the later urban survey is approximately ten times higher than in the earlier rural survey the shape of the age-prevalence curves for men and women are statistically the same. This suggests that the shape of the age-specific prevalence curves reflect the age-specific risk of infection. The differences between the shapes of the age-prevalence curves for men and women are particularly interesting, especially the very rapid rate of increase among young women as compared to men. Several factors have been advanced to explain these differences including female genital mutilation (which is common in parts of Africa but not in Southern Africa),<sup>125</sup> rape and coercive sex,<sup>126</sup> 'dry sex'<sup>127</sup> and an increased vulnerability of women at around the age of puberty.<sup>128</sup> Perhaps surprisingly, none of these factors has been shown to significantly increase the risk of infection and the differences between the age-specific prevalence of infection in men and women can be best explained in terms of the age matching of sexual partners (women have sex with men who are, on average, five years older than they are) and the fact that female-to-male transmission is approximately three times more likely than the reverse.<sup>129</sup>

Comparing the age-specific prevalence of HIV-infection for miners with men in the surrounding community is especially revealing: from 25 and to 55 years of age the prevalence is essentially constant and the decline in prevalence among older men in the community is not seen in mineworkers (Figure 9, p. 39) suggesting that migrant mineworkers have the same risk of infection at the age of 50 years as they have at the age of 25 years. Since the mines offer few opportunities for privacy, intimacy or any kind of social support and there are few recreational facilities, it is not surprising that miners, of all ages, turn to alcohol and sex. It is also interesting to note that the overall level of infection among mine-workers is similar to that in the men living in the local community. Since the miners are almost all migrants from distant rural areas many of them will choose to return home to die and since the mines commonly repatriate seriously ill men on medical grounds, it is likely that the levels of infection among mineworkers are kept artificially low. Unfortunately, there are no data on the levels of infection among miners who have been retrenched or repatriated.

## CASE STUDY 2: RURAL RISKS

**A**bout 215 000 predominantly Zulu-speaking people live in the Hlabisa district of northern Kwazulu/Natal. The location of Hlabisa district is indicated in Figure 3 (p. 36). Homesteads are widely scattered and people depend on subsistence farming, migrant labour and pensions. The South African

Medical Research Council (MRC) has conducted research in the area since the early 1990s.<sup>130</sup> Following an STI survey carried out in 1996, a mass media campaign was developed to increase awareness of, and treatment-seeking behaviour for, STIs, to strengthen STI case management in the public and private sectors, and to design strategies to reduce STIs among migrant workers and their partners.<sup>131</sup>

Hlabisa has been identified as a potential site for HIV vaccine trials. A Community Advisory Board was elected in 1998 to promote a partnership among researchers, research participants and community members, and to ensure that the needs and concerns of the local people are properly considered, understood and dealt with.<sup>132</sup> Estimates of HIV prevalence and incidence in the general population are being made, and baseline data are being collected on key demographic and health variables.<sup>133</sup>

One of the striking features of the epidemic of HIV in South Africa is the lack of obvious differences in the prevalence of infection between urban and rural areas, which is found in East Africa in particular.<sup>134</sup> This is clearly illustrated with reference to data from the Hlabisa district of northern Kwazulu/Natal. Although Hlabisa is a rural area, the prevalence of infection there increased from 4.2% in 1992 to 34% in 1999, almost exactly matching the prevalence in KwaZulu/Natal as a whole, where antenatal HIV prevalence increased from 4.5% to 33%.<sup>135</sup> One of the reasons is the extent to which Hlabisa is integrated into local and long-distance systems of migration.

The extent of migration is clearly shown by the demographic profile of men and women in Hlabisa. The number of women in the community falls rapidly after the age of 17 years (Figure 10, p. 40) and the number of men even more rapidly leading to the extraordinarily distorted sex ratio (inset in Figure 10). In Hlabisa the proportion of men falls to about 35% at 32 years of age, and then increases again as migrant workers return home, often with severe and debilitating disease.<sup>136</sup>

Of those who migrate for work from Hlabisa, Figure 11 (p. 41) shows the percentage of men and women from Hlabisa, measured in a cross-sectional survey, who seek work in various destinations. Men tend to migrate further than women with 32% of men but no women going to Johannesburg and 41% of women and only 8% of men going to Nongoma and Matubatuba. About 60% of adult men and 30% of adult women in Hlabisa spend most nights away from the district.<sup>137</sup> A study of the impact of migration on HIV transmission is being conducted with men from Hlabisa who work on the gold mines in Carletonville (800 km away) and in factories in Richards Bay (80km away) and with their partners who stay in Hlabisa. For comparison, a group of non-migrant couples in Hlabisa were also recruited.<sup>138</sup>

The study permits closer examination of the relationship between migration and HIV in the rural areas.<sup>139</sup> Migrant men from Hlabisa district were recruited at two frequent migration destinations, Carletonville and Richards Bay. Later, their Hlabisa-based partners were recruited, and for comparison, a group of non-migrant couples based in Hlabisa were also recruited. Biological and social data were collected from all participants. The prevalence of HIV among migrant men was 25.9% compared to 12.7% among non-migrant men, so that migrant men were 2.4 times more likely to be infected with HIV than non-migrant men. The study found that migrant men were significantly more likely than non-migrant men to be infected with HIV. Among women, however, having a migrant partner did not confer any additional risk for HIV infection.

The study also sheds light on the question of directionality of spread of the epidemic. It has long been argued that in relation to migration and HIV, it is migrant men who become infected while away, and then return home to infect their rural partners.<sup>140</sup> The assumed directionality of spread has therefore been from returning male migrants to their rural partners. In this study, migrant couples were significantly more likely to be HIV discordant (one partner infected, the other not) than non-migrant couples, and among these discordant couples, the woman was the infected partner in nearly 40% of the cases.<sup>141</sup> These data certainly illustrate the complex interaction between sexual networks, migration and HIV, for these women could only have been infected by men other than their husbands. Frequently the reason for these sexual liaisons is because in deprived areas women are pushed towards selling sex or swapping it for favours as often sex is the only commodity that they have to sell in order to survive.<sup>142</sup>

### CASE STUDY 3: ON THE ROAD

**T**he vulnerability of sex workers and their truck driver clients to HIV has been well documented.<sup>143</sup> Truck drivers, due to the migratory nature of their profession, tend to have multiple partners. Since 1992 the MRC has conducted research among an estimated 800 sex workers operating at truck stops on the national highway in the KwaZulu/Natal Midlands between Durban and Johannesburg.<sup>144</sup> Between August 1996 and June 1998, 477 women from five truck stops were screened for HIV as part of a microbicide trial and in 1998 ten sex workers were trained as field workers to collect socio-demographic data from among their clients and to obtain a saliva sample to determine the HIV-status of their clients.<sup>145</sup>

A total of 320 truckers were interviewed. The truckers mean age was

37 years and they had been in the profession for an average of 8 years. Seventy per cent reported having wives or regular girlfriends. As many as sixty six per cent of the men reported having had an STI in the previous six months and 37% always stopped for sex along the route. Twenty nine per cent said that they never using condoms with sex workers while only 13% had ever used condoms with their wives. Among the sex workers at these truck stops 42% said that they had engaged in anal sex with their clients. Only 23% reported ever using condoms during anal sex.

In terms of the geography of trucking, all of the truck drivers had travelled to three or more provinces in South Africa and 65% had been to neighbouring countries (including Zimbabwe, Malawi, Mozambique, Zambia, Botswana, Namibia, Swaziland and Angola). Their high-risk sexual practices and their highly mobile lifestyle ensure rapid transmission of the disease along the major transportation routes. Some 180 of the truckers (56%) were HIV positive. Prevalence varied between truck stops from a low of 52% at Warden to a high of 95% in Newcastle (Table 5, p. 34). Prevalence rates were also high but varied amongst sex-workers at each of the truck stops. The age prevalence curves were quite different for truckers and sex workers. HIV prevalence among men increased significantly with age to a high of 69% among men aged 55 to 59 years. For the sex workers, prevalence peaked at 20-24 years.

The high HIV prevalence and low condom use among truck drivers and sex workers as well as the complex web of travel and sexual mixing creates a milieu that is highly conducive to the spread of HIV and other STIs. The extent to which they contribute to the spread of HIV throughout the region needs to be examined if the epidemic of HIV is to be contained.

## CONCLUSION

**M**uch could be done to reduce the impact and the spread of HIV in South Africa. Mother-to-child transmission could be substantially reduced using standard drug regimens. Control of curable STIs would reduce transmission of HIV. The effective promotion of condoms, which are seldom used at present, and a reduction in high risk sexual behaviour would have an effect in the longer term.

In all of these interventions special attention should be given to people at high risk of infection, which includes not only commercial sex workers, but also migrants and the partners of migrants. Tuberculosis prophylaxis could substantially reduce tuberculosis morbidity and mortality among those with HIV and this is particularly important in the

context of gold mining where the high rates of silicosis and HIV lead to a situation in which the incidence of tuberculosis is about 3 000 per hundred thousand men per year and among men with both silicosis and HIV the incidence of tuberculosis is approximately 16 000 per 100 000 men per year, probably the highest rate every recorded. Consideration should also be given to the public health implications of providing free anti-retroviral therapy to people who are HIV-positive drawing on the experience of Brazil and Argentina, where it is provided free in the public sector, and possibly soon Botswana, and to the development of a vaccine for HIV subtype C.

Greater effort also needs to go into the development of epidemiological models to understand the current state and the likely future course of the epidemic, to provide a context for planning and designing interventions, and eventually to evaluate the effectiveness of such interventions.

However, none of these interventions are likely to be effective without a sound understanding of the reasons why Southern Africa is the worst affected region in the world, why the epidemic has spread in this region more rapidly than in any other, and why there are such great differences in the infection rates in different provinces, between men and women and critically between migrants and non-migrants. It appears almost self-evident that a major determinant of the spread and the rate of increase of HIV in Southern Africa is migration, which takes a particular form in this region. And yet while more is known about both migration and HIV/AIDS in Southern African than anywhere else on the continent, few studies have considered both together.

Although both migration and HIV have been separately examined in South Africa, we are still far from understanding in detail just how and to what extent migration affects the spread of HIV. Communicable diseases cannot spread from one area to another unless they are carried by people who move between different places. But we still do not know how much such 'movement' is needed to ensure that an epidemic of HIV, which is already established in one area, will become established elsewhere. While it is likely that migrant men carry their infections home with them, to what extent does the absence of men in rural areas put women who remain at home in a situation of high risk? Even if migration is necessary to spread the infection in the early stages and even if the extent and nature of such migration determines the rate of spread of infection, does migration become unimportant once the infection has established itself over a wide geographical area?

Part of the reason for the fact that we still do not understand the precise role of migration in the spread of HIV is that studies of migration and disease tend to concentrate on the urban, or 'receiving' areas

with little attention being paid to people living in the rural or 'sending' areas. Furthermore, there have been very few well-designed epidemiological studies documenting the relationship between migration and infectious diseases. Even more importantly, at this late stage of the Southern African HIV epidemic, there have been few intervention programmes, even on a small scale, which attempt to reduce transmission among migrants and their rural or urban partners.

This paper has highlighted the current state of knowledge about the linkages between HIV/AIDS and migration and proposed a conceptual basis for greater understanding of that relationship but it is abundantly clear that there are large gaps in our knowledge of the extent to which migration, and the particular forms of migration that are found in Southern Africa, explain why the levels of infection in this region are so much higher than anywhere else in the world. Applied social and epidemiological research on the migration-HIV nexus is an essential complement to any national and local strategy of AIDS prevention. So too can it assist in understanding and coping with the burden of AIDS which will be felt particularly acutely by migrant communities, urban and rural.

Migration has clearly fuelled the epidemic of HIV in southern Africa. But infection is now so widespread that it seems likely that migration is no longer driving the epidemic. However, programmes to control the epidemic will certainly be considerably less effective if migrant workers continue to spread infections. Programmes aimed at supporting migrants should be given the highest priority but much more work is needed to provide an understanding of the social, behavioural and sexual context of the lives of migrants.

Perhaps, most importantly, policy issues need to be addressed including the nature and extent of migration, the rights of migrants, and the kinds of services to which they have access. This must be done both for those in the formal and in the informal sector and even illegal migrants must be able to access the health services without fear of exposure.

The epidemic of HIV/AIDS threatens to devastate much of Southern Africa. Dealing with the epidemic must be given the highest priority and treated with the greatest urgency. But unless the issues of migration and disease are understood and dealt with effectively, it is unlikely that the greater struggle to control and manage AIDS can be won.

Region	Country	Prevalence (%)
Southern Africa	Botswana	43.0
Southern Africa	South Africa	32.5
Southern Africa	Lesotho	31.3
Southern Africa	Malawi	30.4
Southern Africa	Swaziland	30.3
Southern Africa	Zimbabwe	28.0
Southern Africa	Zambia	27.1
Southern Africa	Namibia	22.7
East Africa	Rwanda	19.0
East Africa	Burundi	18.6
East Africa	Ethiopia	17.6
East Africa	Kenya	15.9
East Africa	Uganda	13.8
East Africa	Tanzania	13.7
West Africa	Côte d'Ivoire	12.1
Central Africa	Central African Republic	11.7
North Africa	Liberia	10.1
Caribbean Africa	Haiti	10.0
Southern Africa	Mozambique	9.9
West Africa	Burkina Faso	7.7

<http://www.census.gov/ipc/www/hivaidsw.html>

Place	Population	Syphilis	Gonorrhoea	Chlamydia
National <sup>1</sup>	ANC	7.6	8.0	16.0
Hlabisa <sup>2</sup>	Men	9.3	2.3	5.6
Hlabisa <sup>2</sup>	Women	8.5	5.8	6.4
Hlabisa <sup>3</sup>	Pregnant	8.4	7.8	12.9
Hlabisa <sup>3</sup>	Not pregnant	8.0	4.0	8.0
Carletonville <sup>4</sup>	Miners	5.2	3.0	3.8
Carletonville <sup>4</sup>	Men	6.1	3.4	5.2
Carletonville <sup>4</sup>	Women	9.7	6.9	8.1
Carletonville <sup>4</sup>	CSW	23.3	15.7	9.1
KZN <sup>5</sup>	CSW	42	14	16

1. Antenatal clinics nationwide, 1980 to 1996.

2. Community survey, 1995.

3. Pregnant and non-pregnant women from STI surveillance in primary health care, antenatal and family planning clinics, and a community survey in 1996. Approximately 6 900 pregnant and 49 000 non-pregnant women aged 15 to 49 years.

4. Community survey, 1998.

5. Commercial sex workers recruited at five truck stops in the KwaZulu/Natal midlands, 1996 and 1997.



**Table 3: Prevalence of HIV Infection in People Attending Blood Transfusion Services, 1998 (First time donors only)**

	African (%)	Coloured (%)	Indian (%)	White (%)
Male	4.134	0.213	0.203	0.077
Female	6.738	0.588	0.080	0.052
Total	5.397	0.391	0.161	0.065
Ratio (m/f)	0.61	0.36	2.54	1.18

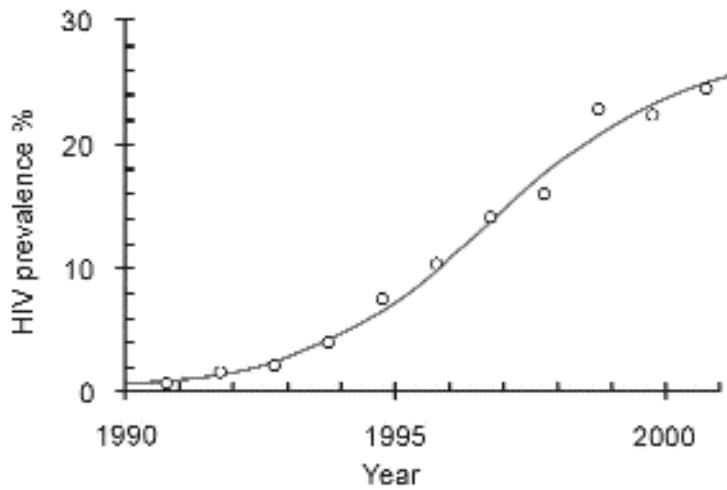
**Table 4: Expected Decrease in African Population (in Thousands)**

Province	Children (male or female)	Adult females	Adult males
Eastern Cape	35.6	142.8	63.0
Free State	12.0	107.9	74.8
Gauteng	53.6	291.4	227.2
KwaZulu-Natal	152.8	414.2	206.4
Mpumalanga	27.2	110.6	52.0
Northern Cape	1.6	9.4	3.4
Northern Province	12.0	75.4	33.8
North West	36.4	114.4	77.2
Western Cape	1.0	11.0	7.8
Total	332.2	1 277.1	745.6

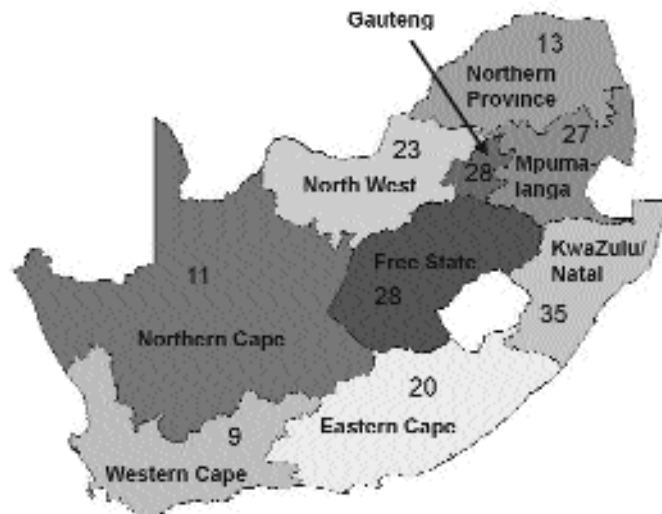
**Table 5: HIV Prevalence Rates at kwaZulu-Natal Truck Stops (% HIV Positive)**

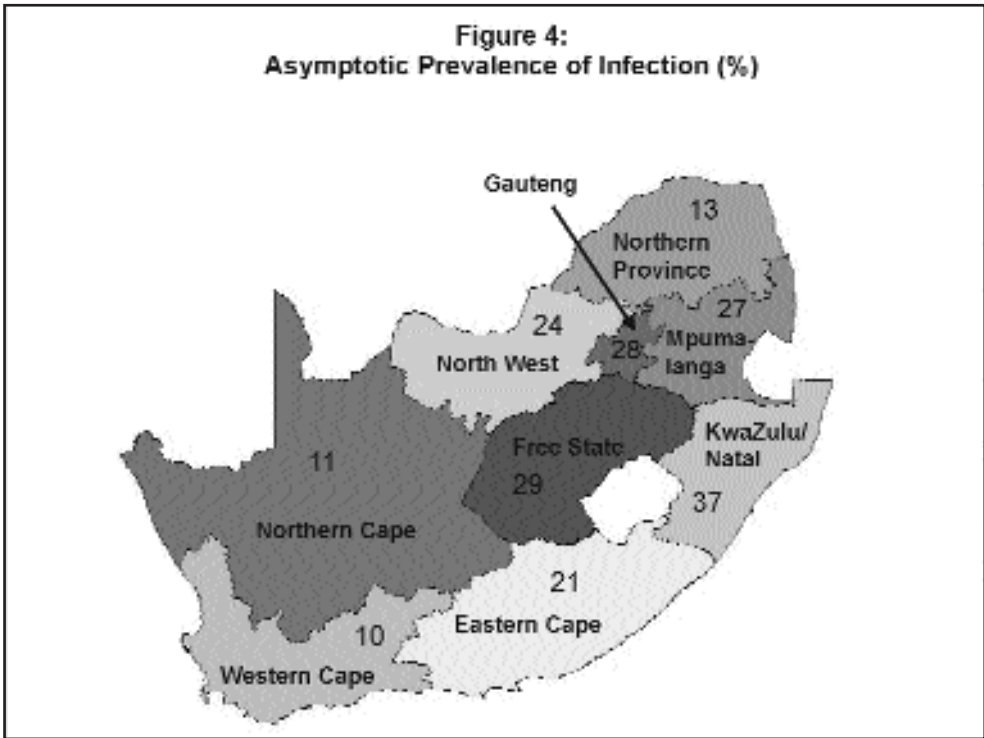
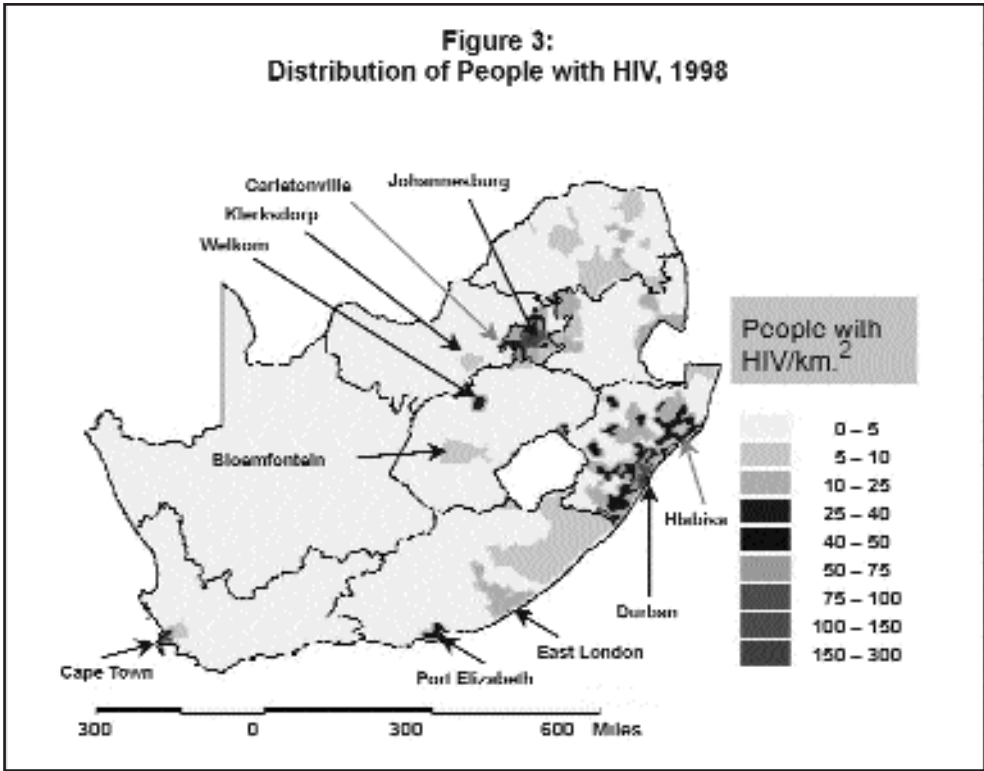
Truck Stop	Truckers	Sex Workers
Van Reenen	57	44
Reids	52	42
Tugela	50	62
Warden	52	74
Newcastle	95	64

**Figure 1:**  
National Prevalence of HIV Infection from Ante-Natal Clinic Data

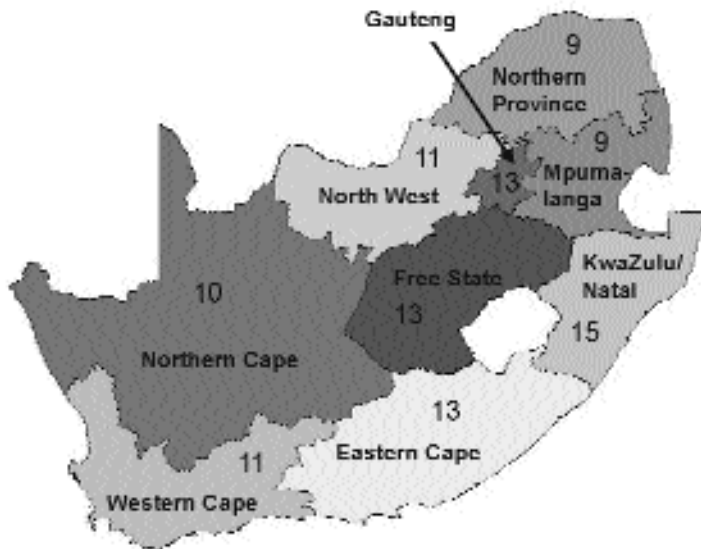


**Figure 2:**  
Prevalence of HIV Infection among Women Attending Ante-Natal Clinics, 2001 (%)

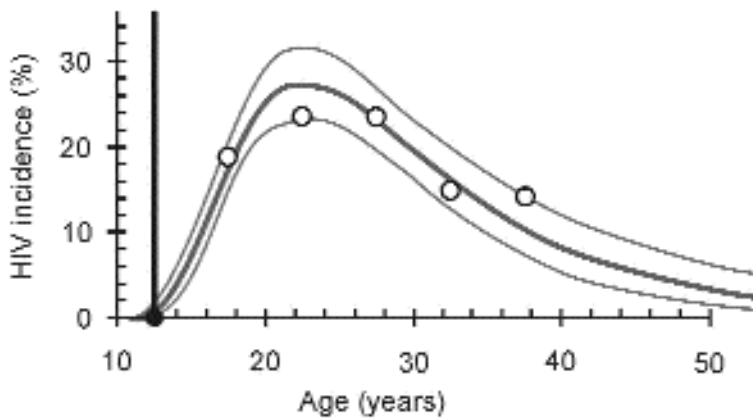


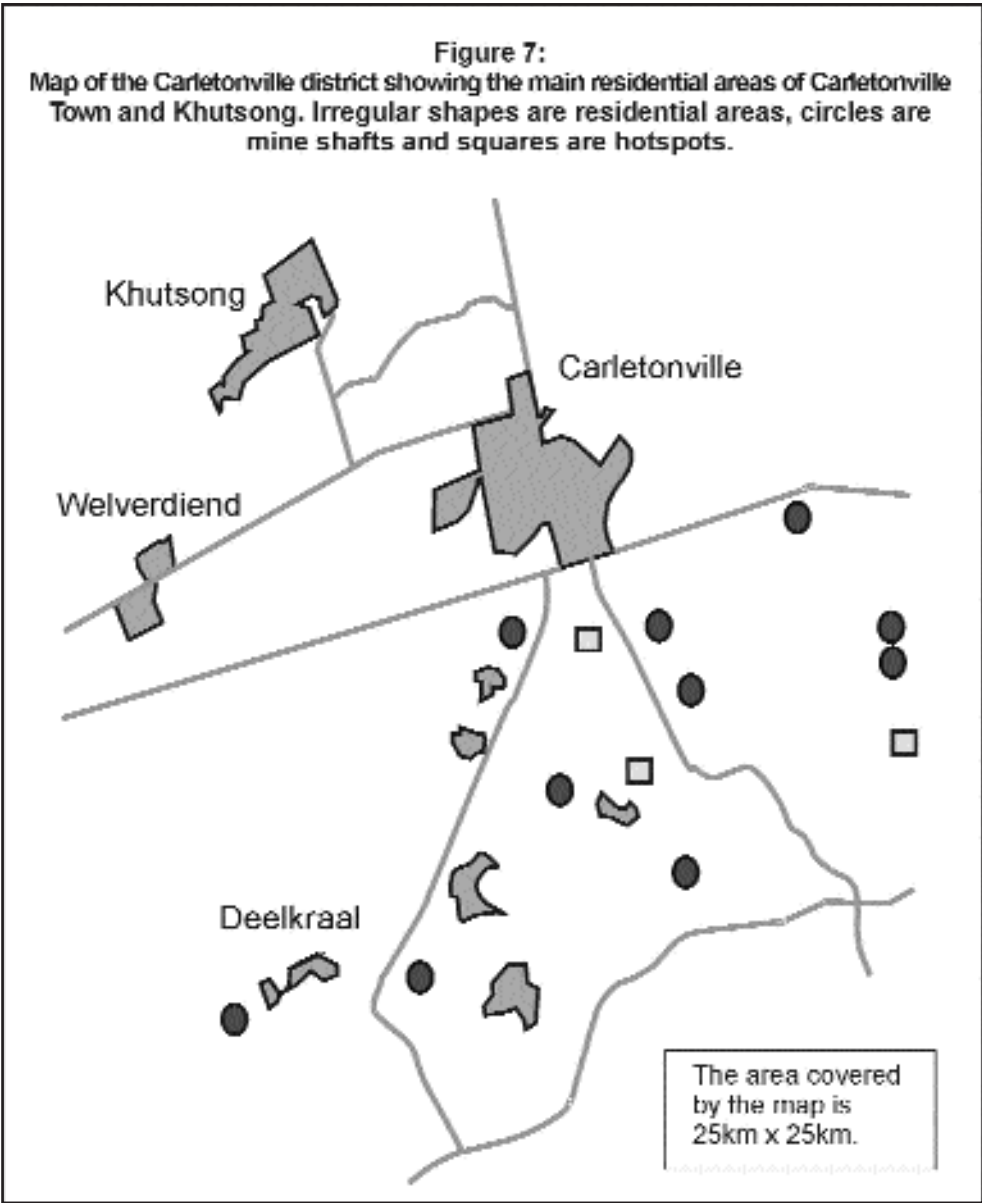


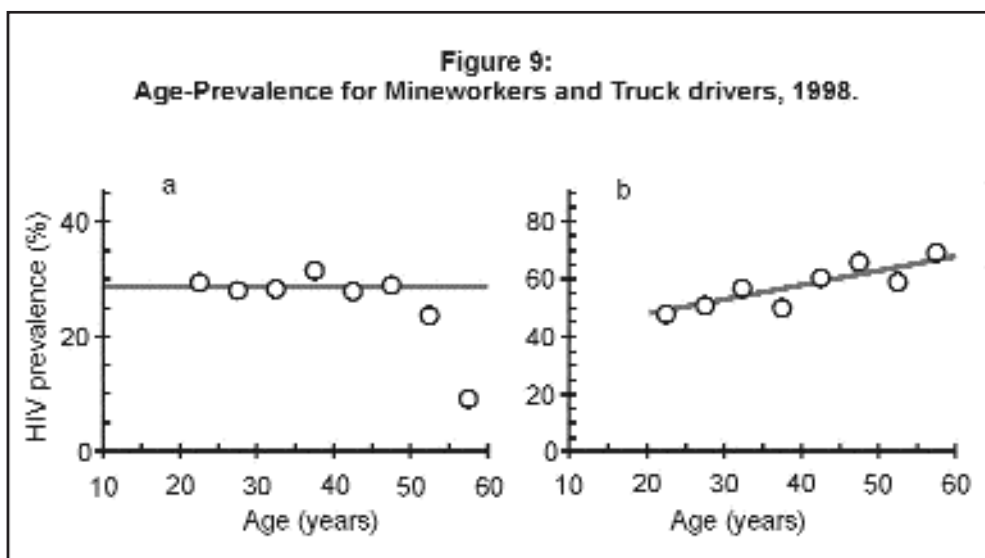
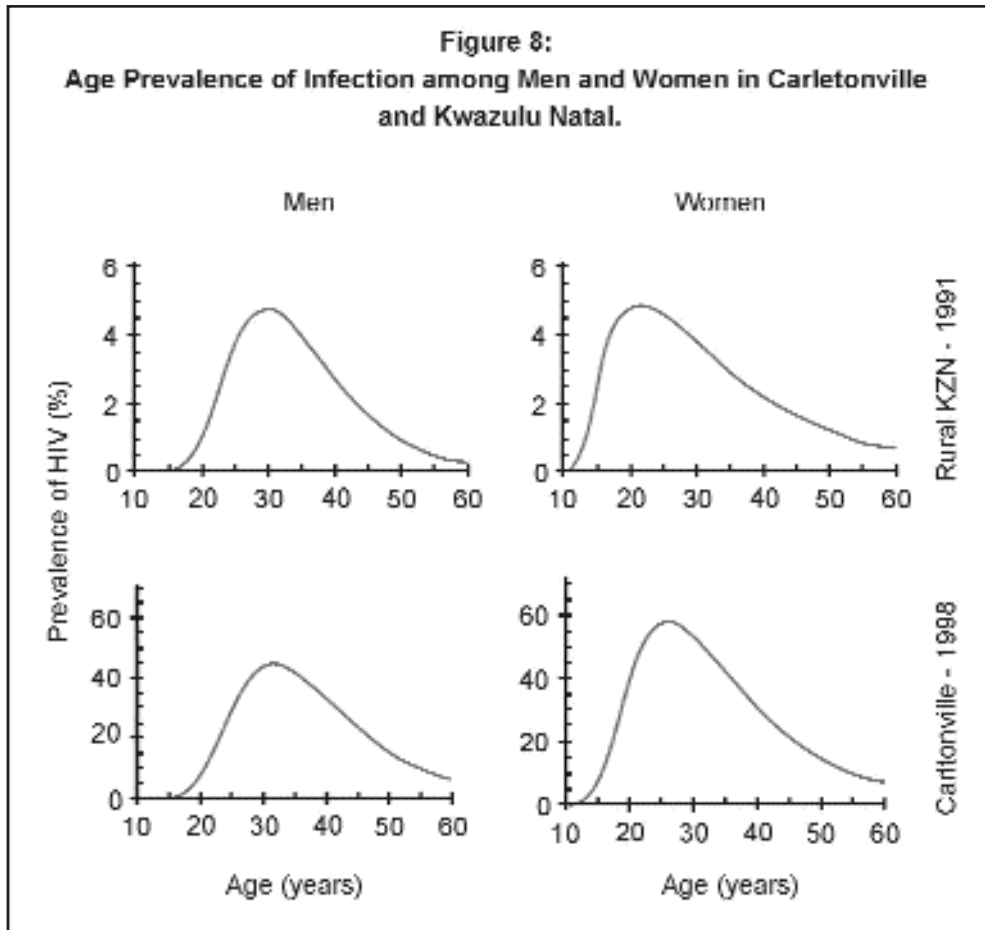
**Figure 5:**  
Doubling Time of Prevalence (Months)

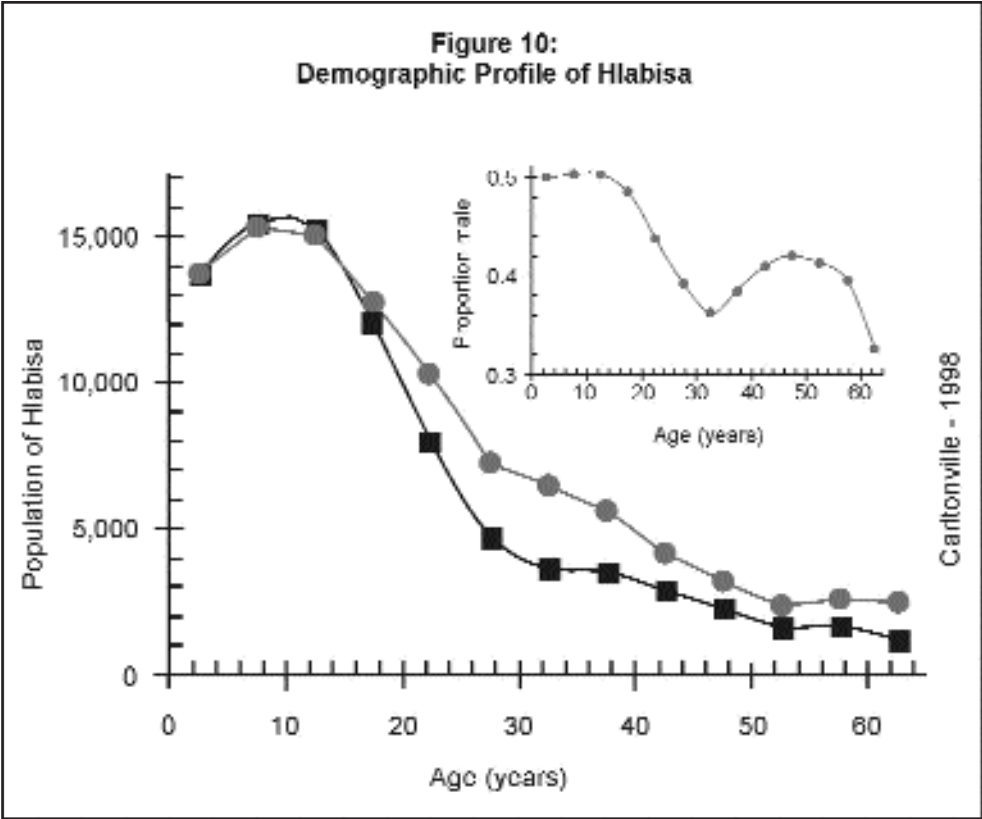


**Figure 6:**  
Incidence of HIV Infection for Women Attending Ante-Natal Clinics  
in Hlabisa, 1998.









**Figure 11:**  
Migrant Destinations from Hlabisa (%)





## ENDNOTES

- 1 Data from the Joint United Nations Program on HIV/AIDS (UNAIDS) and available at <http://www.unaids.org>
- 2 See: <http://www.census.gov/ipc/www/hivaidsw.html>
- 3 The median prevalence of HIV infection for low risk groups outside of capital cities in Africa ranges from 2.9% in West Africa (0.3-9.8%,  $n = 14$ ), to 7.5% in East Africa (1.0-18%,  $n = 7$ ), and 28% Southern Africa (10-32%,  $n = 10$ ) (UNAIDS, 2000; available at [www.unaids.org](http://www.unaids.org)).
- 4 C. Hunt, 'Migrant Labour and Sexually Transmitted Disease: AIDS in Africa' *Journal of Health and Social Behavior* 30 (1989): 353(73; J. Caldwell, P. Caldwell and P. Quiggin, 'Mobility, Migration, Sex, STDs, and AIDS: An Essay on Sub-Saharan Africa with Other Parallels' In G. Herdt, ed., *Sexual Cultures and Migration in the Era of AIDS* (Oxford: Clarendon Press, 1997); B. Girdler-Brown, 'Eastern and Southern Africa' in Special Issue on Migration and HIV/AIDS of *International Migration* 36 (1998): 513-51. For Southern Africa, see D. Webb, *HIV and AIDS in Africa* (Cape Town: David Philip, 1997).
- 5 A. Buve, M. Carael, R. Hayes and N. Robinson, 'Variations in HIV Prevalence between Urban Areas in Sub-Saharan Africa: Do We Understand Them?' *AIDS (Suppl. A)* (1995): S103-109; B. Auvert, G. Buonamico, E. Lagarde and B. Williams, 'Sexual Behaviour, Heterosexual Transmission, and the Spread of HIV in Sub-Saharan Africa: A Simulation Study' *Computers and Biomedical Research* 33(2000): 84-96.
- 6 J. Decosas and A. Adrien, 'Migration and HIV' *AIDS* 11 (Suppl. A) (1997): S77-S84.
- 7 J. Decosas, F. Kane, J. Anarfi, K. Sodji and W. Wagner, 'Migration and AIDS' *The Lancet* 346 (1995): 826-8.
- 8 J. Swanevelder, H. Küstner and A. Van Middelkoop, 'The South African HIV Epidemic, Reflected by Nine Provincial Epidemics 1990-1996' *South African Medical Journal* 88 (1998): 1320-5.
- 9 Department of Health (DOH), 'National HIV Sero-Prevalence Survey of Women Attending Public Antenatal Clinics in South Africa, 1999' (Pretoria: Department of Health, 2000).
- 10 R. Swanevelder, H. Küstner and A. Van Middelkoop, 'The South African HIV Epidemic.' Fitting a logistic curve with a variable asymptote gives an asymptotic prevalence of 27.3  $\pm$  4.0% with an intrinsic doubling time at the start of the epidemic of 14.5  $\pm$  3.0 months (here and elsewhere errors are 95% confidence limits).
- 11 B. Williams, E. Gouws and S. Abdool Karim, 'Where Are We Now? Where Are We Going? The Demographic Impact of HIV/AIDS in South Africa' *South African Journal of Science* 96 (2000): 297-304.
- 12 Department of Health, *National HIV Sero-prevalence Survey of Women attending*

- Public Antenatal Clinics in South Africa 1999* (Pretoria: Department of Health, 2000).
- 13 V. Taylor, *HIV/AIDS and Human Development: South Africa* (Geneva: UNAIDS and UNDP, 1998).
  - 14 The human population data were derived from three sources: a global coverage of population number per image pixel obtained from the University of California at Berkeley provided by FAO AGL at 5 minute resolution; a population density coverage at the same resolution from the Consortium for International Earth Science Information Network (CIESIN: <http://www.ciesin.org>), derived from data collated by the National Center for Geographic Information and Analysis (NCGIA: <http://www.ncgia.ucsb.edu>); and the population data from the Intergovernmental Authority on Drought and Development. The average of these three estimates was calculated through the raster image manipulation functions within the IDRISI software package by William Wint (personal communication).
  - 15 D. Cohen, *Poverty and HIV/AIDS in Sub-Saharan Africa* (United Nations Development Programme, Issues Paper No. 27). See also *AIDS Poverty and Development* (Global Policy Forum; [www.igc.org/globalpolicy/soecon/develop/indxids.htm](http://www.igc.org/globalpolicy/soecon/develop/indxids.htm).)
  - 16 B. Williams, C. Campbell, N. Mqoqi and I. Kleinschmidt, 'Occupational Health, Occupational Illness: Tuberculosis, Silicosis and HIV on the South African Mines' in Daniel E. Banks and John E. Parker, eds., *Occupational Lung Disease: An International Perspective* (New York: Chapman and Hall, 1998); C. Campbell, 'Migrancy, Masculine Identities and AIDS: The Psycho-Social Context of HIV Transmission on the South African Gold Mines' *Social Science and Medicine* 45 (1997): 273-281; C. Campbell, 'Going Underground and Going after Women: Masculinity and HIV Transmission on the Gold Mines' in R. Morrell, ed., *Masculinities in South Africa* (Pietermaritzburg: University of Natal Press, 2000).
  - 17 C. MacPhail and C. Campbell, '“I think condoms are good but, aai, I hate those things”: Condom Use Among Adolescents and Young People in a Southern African Township' *Social Science and Medicine* 52 (2000): 1613-27.
  - 18 C. Campbell, 'Selling Sex in the Time of AIDS: The Psycho-Social Context of Condom Use by Southern African Sex Workers' *Social Science and Medicine* 50 (2000): 479-494.
  - 19 *Economic Impact of AIDS in South Africa: A Dark Cloud on the Horizon* (Report by ING Barings, April 2000). See also B. Anderson, 'AIDS to exacerbate SA skills shortage' *Business Day*, 28 December 1999.
  - 20 L. Soto-Ramirez, B. Renjifo, M. McLane, and M. Essex, 'HIV-1 Langerhans Cell Trophism Associated with Heterosexual Transmission of HIV' *Science* 271(1996): 1291-3; T. Mastro, C. Kunanusont, T. Dondero and C. Wasi, 'Why do HIV-1 Subtypes Segregate among Persons with Different Risk Behaviours in South Africa and Thailand' *AIDS* 11(1997): 113-6.

- 21 H. Bredell, G. Hunt, B. Morgan, C. Tiemessen, D. Martin and L. Morris, 'Identification of HIV Type 1 Inter-subtype Recombinants in South Africa Using env and gag Heteroduplex Mobility Assays' *AIDS Research and Human Retroviruses* 2000; 16(5): 493-497; L. Morris, C. Williamson, C. Gray and C. Tiemessen, 'HIV-1 Subtype C as a Major Determinant of the Global AIDS Epidemic' *South African Journal of Science* 96 (2000): 339-346.
- 22 C. Williamson, S. Engelbrecht, M. Lambrick, E. Janse Van Rensburg, R. Wood, W. Bredell and A. Williamson, 'HIV-1 Subtypes in Different Risk Groups in South Africa' *Lancet* 346 (1995): 782.
- 23 J. Van Harmelen, R. Wood, M. Lambrick, E. Rybicki, A. Williamson and C. Williamson, 'An Association Between HIV-1 Subtypes and Mode of Transmission in Cape Town South Africa' *AIDS* 11 (1997): 81-87.
- 24 H. Bredell, C. Williamson, P. Sonnenburg, D. Martin and L. Morris. 'Genetic Characterisation of HIV Type 1 from Migrant Workers in Three South African Gold Mines' *AIDS Research and Human Retroviruses* 14 (1998): 677-684; P. Tien, T. Chiu, A. Latif, S. Ray, M. Batra, C. Contag, L. Zejena, M. Mbizvo, E. Delwart, J. Mullins and D. Katzenstein, 'Primary Subtype C HIV-1 Infection in Harare, Zimbabwe' *Journal of Acquired Immune Deficiency Syndrome and Human Retrovirology* 20 (1999): 147-153; V. Novitsky, M. Montano, M. Mclane, B. Renjifo, F. Vanneberg, B. Foley, T. Ngundu, M. Rahman, M. Makena, R. Marlink and M. Essex, 'Molecular Cloning and Phylogenetic Analysis of Human Immunodeficiency Virus Type 1 Subtype C: A Set of 23 Full Length Clones from Botswana' *Journal of Virology* 73 (1999): 4,427-4,432.
- 25 M. Rayfield, R. Downing, J. Baggs, D. Hu, et al., 'A Molecular Epidemiologic Survey of HIV in Uganda' *AIDS* 12 (1998) 521-527; J. Neilson, G. John, J. Carr, P. Lewis, J. Kreiss, et al., 'Subtypes of Human Immunodeficiency Virus Type 1 and Disease Stage among Women in Nairobi, Kenya' *Journal of Virology* 73 (1999): 4,393-4,403; J. Van Harmelen, E. Van der Ryst, A. Loubser, D. York, S. Madurai, S. Lyons, R. Wood and C. Williamson, 'A Predominantly HIV Type 1 Subtype C Restricted Epidemic in South African Urban Populations'. *AIDS Research and Human Retroviruses* 15 (1999): 395-398.
- 26 M. Cornelissen, R. Van den Burg, F. Zorgdrager and J. Goudsmit, 'Spread of Distinct Human Immunodeficiency Virus Type 1 AG Recombinant Lineages in Africa' *Journal of General Virology* 81 (2000): 515-523.
- 27 J. Van Harmelen, E. Van der Ryst, R. Wood, S. Lyons and C. Williamson, 'Restriction Fragment Length Polymorphism Analysis for Rapid Gag Subtype Determination of Human Immunodeficiency Virus Type 1 in South Africa' *Journal of Virology Methods* 78 (1999): 51-59; H. Bredell, G. Hunt, B. Morgan, C. Tiemessen, D. Martin and L. Morris, 'Identification of HIV Type 1 Inter-subtype Recombinants in South Africa Using env and gag Heteroduplex Mobility Assays' *AIDS Research and Human Retroviruses* 16

- (2000): 493-497. These recombinants were identified from HIV specimens taken from individuals mainly visiting urban Johannesburg based AIDS clinics, but a few specimens were also taken from commercial sex workers resident in KwaZulu-Natal.
- 28 N. Robinson, D. Mulder, B. Auvert and R. Hayes, 'Proportion of HIV Infections Attributable to Other Sexually Transmitted Diseases in a Rural Ugandan Population: Simulation Model Estimates' *International Journal of Epidemiology*. 26 (1997): 180-9; R. Hayes, K. Schulz and F. Plummer, 'The Cofactor Effect of Genital Ulcers on the Per-exposure Risk of HIV Transmission in Sub-Saharan Africa' *Journal of Tropical Medicine and Hygiene*. 98 (1995): 1-8; and T. Mertens, R. Hayes and P. Smith, 'Epidemiological Methods to Study the Interaction Between HIV Infection and Other Sexually Transmitted Diseases' *AIDS* 4 (1990): 57-65.
  - 29 J. Wasserheit, 'Epidemiological Synergy: Interrelationship between Human Immunodeficiency Virus Infection and Other Sexually Transmitted Diseases' *Sexually Transmitted Diseases* 19 (1992): 61-77.
  - 30 *Ibid.*; and G. Pham-Kanter, M. Steinberg and R. Ballard, 'Sexually Transmitted Diseases in South Africa' *Genitourinary Medicine* 72 (1996): 160-171.
  - 31 C. Chen, R. Ballard, M. Beck-Sague, Y. Dangor, F. Radebe, and S. Schmid, 'Human Immunodeficiency Virus Infection and Genital Ulcer Disease in South Africa' *Sexually Transmitted Diseases* 27(2000): 21-9.
  - 32 B. Auvert, R. Ballard, C. Campbell, M. Caraël, M. Carton, E. Gouws, C. MacPhail, D. Taljaard, J. van Dam, and B. Williams, 'High Prevalence of HIV Infection among Youth in a South African Town is Associated with HSV-2 infection and Sexual Behaviour' *AIDS* 15 (2001): 885-898.
  - 33 A. Kharsany, Y. Mahabeer, C. Connolly, and A. Sturm, 'Changing Aetiology of Genital Ulcer Disease (GUD) in STD Clinic Attendees with a Rising HIV Prevalence' Presentation at 13th International AIDS Conference, Durban, South Africa, 2000.
  - 34 L. Morison, H. Weiss, A. Buve, M. Carael, S. Abega, F. Kaona, L. Kanhonou, J. Chege and R. Hayes, 'Commercial Sex and the Spread of HIV in Four Cities in Sub-Saharan Africa' *AIDS* 15 (2001): Suppl. 4, S61-9.
  - 35 *Connecting Lower Infection Rates with Changes in Sexual Behaviour in Thailand: Data Collection and Comparison*. UNAIDS Case Study, June 1998 UNAIDS/98.15 ([www.unaids.org](http://www.unaids.org)).
  - 36 B. Auvert, G. Buonamico, E. Lagarde and B. Williams, 'Sexual Behavior, Heterosexual Transmission, and the Spread of HIV in Sub-Saharan Africa: A Simulation Study' *Computers in Biomedical Research* 33 (2000): 84-96
  - 37 M. Morris, 'Sexual Networks and HIV' *AIDS* 11 (1997): Suppl A:S209-16; M. Morris and M. Kretzschmar, 'Concurrent Partnerships and the Spread of HIV' *AIDS* 11(1997): 641-8; J. Konde-Lule, N. Sewankambo and M. Morris, 'Adolescent Sexual Networking and HIV Transmission in Rural Uganda'

- Health Transition Revue* 7 (1997): Suppl. 89-100; M. Morris, C. Podhisita, M. Wawer and M. Handcock, 'Bridge Populations in the Spread of HIV/AIDS in Thailand' *AIDS* 11 (1996):126-71; and M. Morris, J. Zavisca and L. Dean, 'Social and Sexual Networks: Their Role in the Spread of HIV/AIDS Among Young Gay Men' *AIDS Education* 7 (1995): Suppl. 24-35.
- 38 B. Williams, C. MacPhail, C. Campbell, D. Taljaard, E. Gouws, S. Moema, Y. Mzaidume and B. Rasego, 'The Carletonville-Mothusimpilo Project: Limiting Transmission of HIV Through Community Based Interventions' *South African Journal of Science* 96 (2000): 351-359; D. Gilgen , B. Williams , C. MacPhail , C. van Dam , C. Campbell , R. Ballard and D. Taljaard, 'The Natural History of HIV/AIDS in a Major Goldmining Centre in South Africa: Results of a Biomedical and Social Survey' *South African Journal of Science* 97 (2001).
- 39 L. Myer, C. Mathews, F. Little and A. de Kock, *The Fate of Condoms Distributed to the Public Sector in South Africa*, Report for Department of Health and Medical Research Council, 1999.
- 40 L. Richter, 'A Survey of Reproductive Health Issues among Urban Black Youth in South Africa' Society for Family Health, unpublished report, 1996; and M. Colvin, S. Abdool Karim, C. Connolly, A. Hoosen and N. Ntuli, 'HIV Infection and Asymptomatic Sexually Transmitted Infections in a Rural South African Community' *International Journal of STD and AIDS* 9(1998): 548-50.
- 41 M. Colvin, E. Gouws and I. Kleinschmidt, 'The Prevalence of HIV in a South African Working Population' Poster presented at 13th International AIDS Conference, Durban, South Africa, 2000.
- 42 M. Colvin and B. Sharp, 'Sexually Transmitted Infections and HIV in a Rural Community in the Lesotho Highlands' *Sexually Transmitted Infections* 76(2000): 39-42; and N. Romero and D. Himmelgreen, 'More Than Money for Your Labour: Migration and the Political Economy of AIDS in Lesotho' in M. Singer, ed., *The Political Economy of AIDS* (Amityville, NY: Baywood Publishing, 1998).
- 43 G. Ramjee and E. Gouws 'Truck Drivers and the Spread of HIV in Southern Africa' *Journal of Acquired Immune Deficiency Syndrome* (in press); and G. Ramjee, E. Gouws, A. Andrews, L. Myer and A. Weber 'The Acceptability of Vaginal Microbicide among South African Men' *International Family Planning Perspectives* (in press).
- 44 Williams, *et al.* "The Carletonville-Mothusimpilo Project"; and Gilgen, *et al.*, 'Natural History of HIV/AIDS'.
- 45 *Ibid.*
- 46 K. Wood and R. Jewkes, 'Violence, Rape, and Sexual Coercion: Everyday Love in a South African Township' *Gender and Development* 5(2) (1997): 41.
- 47 *Ibid.* See also C. Campbell, 'Male Gender Roles and Sexuality: Implications for Women's AIDS Risk and Prevention' *Social Science and Medicine* 41(2)

- (1995):197-210; G. Buga, D. Amoko and D. Ncayiyana, 'Sexual Behaviour, Contraceptive Practice and Reproductive Health Among Schooled Adolescents in Rural Transkei' *South African Medical Journal* 86(5) (1996):523-7; K. Wood, F. Maforah and R. Jewkes, 'He Forced Me to Love Him: Putting Violence on Adolescent Sexual Health Agendas' *Social Science and Medicine* 47(2): (1998); and Human Rights Watch, *Scared at School: Sexual Violence Against Girls in South African Schools* (New York: Human Rights Watch, 2001).
- 48 R. Jewkes and N. Abrahams, *Violence Against Women in South Africa: Rape and Sexual Coercion* (Cape Town: Medical Research Council, 2000).
- 49 Jewkes and Abraham, *Violence Against Women*.
- 50 Statistics South Africa (SSA), *Quantitative Research Findings on Rape in South Africa* (Pretoria: SSA, 2000): 22.
- 51 Human Rights Watch, 'Scared at School.'
- 52 R. Szabo and R. Short, 'How Does Male Circumcision Protect Against HIV Infection?' *British Medical Journal* 320 (2000): 1,592-1,594; R. Bailey, F. Plummer and S. Moses, 'Male Circumcision and HIV Prevention: Current Knowledge and Future Research Directions' *Lancet Infectious Diseases* 1 (2001): 223; and D. Halperin and R. Bailey, 'Male Circumcision and HIV Infection: 10 Years and Counting' *Lancet* 354 (1999):1,813-1,815.
- 53 L. Cook, L. Koutsky and K. Holmes, 'Circumcision and Sexually Transmitted Diseases' *American Journal of Public Health* 84 (1994): 197-201; and D. Fleming and J. Wasserheit, 'From Epidemiological Synergy to Public Health Policy and Practice: The Contribution of Other Sexually Transmitted Diseases to Sexual Transmission of HIV Infection' *Sexually Transmitted Infections* 75 (1999):3-17.
- 54 S. Moses, R. Bailey and A. Ronald, 'Male Circumcision: Assessment of Health Benefits and Risks' *Sexually Transmitted Infections* 74 (1998): 368-373.
- 55 T. Quinn, M. Wawer, N. Sewankambo, D. Serwadda, C. Li, F. Wabwire-Mangen, et al., 'Viral Load and Heterosexual Transmission of Human Immunodeficiency Virus Type 1' *New England Journal of Medicine* 342 (2000): 921-929.
- 56 Williams, *et al.*, 'The Carletonville-Mothusimpilo Project'. Amongst migrant mineworkers in Carletonville 23% of Zulu men and 75% of Xhosa men were circumcised.
- 57 E. Corbett, C. Watt, N. Walker, D. Maher, S. Lazzari, B. Williams, M. Raviglione and C. Dye, 'The Growing Burden of Tuberculosis: Global Trends and Interactions with the HIV Epidemic (in press).
- 58 D. Yach, 'Tuberculosis Deaths in South Africa' *South African Medical Journal* 72(1980): 149-51.
- 59 Department of Health, 'Review of the Tuberculosis Control Programme of South Africa' Unpublished draft report.
- 60 Chamber of Mines, *Chamber of Mines Statistical Tables*, 1993 (Johannesburg:

- Chamber of Mines, 1994).
- 61 E Corbett, G. Churchyard, T. Clayton, P. Herselman, B. Williams, R. Hayes, D. Mulder and K. De Cock, 'Risk Factors for Pulmonary Mycobacterial Disease in South African Gold Miners: A Case-Control Study' *American Journal of Respiratory and Critical Care Medicine* 159 (1999): 94-99.
- 62 A. Trapido, N. Mqoqi, B. Williams, N. White, A. Solomon, R. Goode, C. Macheke, A. Davies and C. Panter, 'Prevalence of Occupational Lung Disease in a Random Sample of Former mineworkers, Libode District, Eastern Cape Province, South Africa' *American Journal of Industrial Medicine* 34(1998): 305-13.
- 63 E. Corbett, G. Churchyard, T. Clayton, B. Williams, D. Mulder, R. Hayes and K. De Cock, 'HIV Infection and Silicosis: The Impact of Two Potent Risk Factors on the Incidence of Mycobacterial Disease in South African Miners' *AIDS* 14(2000): 2,759-68.
- 64 C. Dye, S. Scheele, P. Dolin, V. Pathania, M. Raviglione, 'Consensus Statement. Global Burden of Tuberculosis: Estimated Incidence, Prevalence, and Mortality by Country. WHO Global Surveillance and Monitoring Project' *Journal of the American Medical Association* 282 (1999): 677-86.
- 65 Corbett, *et al*, 'Impact of Two Potent Risk Factors'.
- 66 M. Carballo, J. Divino and D. Zeric, 'Migration and Health in The European Union' *Tropical Medicine and International Health* 3(1996): 936-44
- 67 G. Herdt, ed., *Sexual Cultures and Migration in the Era of AIDS* (New York: Oxford University Press, 1989); and M. Haour-Knipe and R. Rector, eds., *Crossing Borders: Migration, Ethnicity and AIDS* (London: Taylor & Francis, 1996).
- 68 R. Stock, *Cholera in Africa: Diffusion of the Disease* (London : International African Institute, 1976); R. Prothero, 'Disease and Human Mobility: A Neglected Factor in Epidemiology' *International Journal of Epidemiology* 6(1977): 259-67.
- 69 For example, Q. Abdool Karim, S. Abdool Karim, B. Singh, R. Short, and S. Ngxongo, 'Seroprevalence of HIV infection in Rural South Africa' *AIDS* 6(12)(1992): 1,535-9; T. Quinn, 'Population Migration and the Spread of Types 1 and 2 Human Immunodeficiency Virus' *Proceedings of the National Academy of Sciences* 91(1994): 2,407-14; A. Nunn, H. Wagner, A. Kamali, J. Kengeya-Kayondo and D. Mulder, 'Migration and HIV-1 Seroprevalence in a Rural Ugandan Population' *AIDS* 9(1995): 503-6; Decosas, *et al*, 'Migration and AIDS'; M. Colvin, S. Abdool Karim and D. Wilkinson, 'Migration and AIDS' *Lancet* 346(1995): 303-4; M. Colvin, S. Abdool Karim, C. Connolly, A.A. Hoosen and N. Ntuli, 'HIV Infection and Symptomatic Sexually Transmitted Infections in a Rural South African Community' *International Journal of Sexually Transmitted Diseases and AIDS* 9 (1998): 548-550; and M. Brouckerhoff and A. Biddlecom, 'Migration, Sexual Behaviour and the Risk of HIV in Kenya' *International Migration Review* 33(1999): 833-56.

- 70 M. Carael, J. Cleland, J-C. Deheneffe, B. Ferry and R. Ingham, 'Sexual Behaviour in Developing Countries: Implications for HIV Control' *AIDS* 9 (1995): 1171-5; and Hunt, 'Migrant Labour and Sexually Transmitted Disease.'
- 71 For example, J. Carswell, G. Lloyd and J. Howells, 'Prevalence of HIV-1 in East African Lorry Drivers' *AIDS* 3 (1989): 759-61.
- 72 A. Nunn, H. Wagner, J. Okongo, S. Malamba, J. Kengeya-Kayondo and D. Mulder, 'HIV-1 Infection in a Ugandan Town on the Trans-African Highway: Prevalence and Risk Factors' *International Journal of STD and AIDS*. 7 (1996):123-30; and A. Nunn, H. Wagner, A. Kamali, J. Kengeya-Kayondo and D. Mulder, 'Migration and HIV-1 Seroprevalence in a Rural Ugandan Population' *AIDS* 9 (1995): 503-6.
- 73 G. Pison, B. Le Guenno and E. Lagarde, 'Seasonal Migration: A Risk Factor for HIV in Rural Senegal' *Journal of Acquired Immune Deficiency Syndromes* 6 (1993): 196-200.
- 74 J. Decosas, 'HIV and Development' *AIDS* 10 (1996): S69-74; and M. Santarriaga, C. Magis, E. Loo, J. Baez-Villasenor and C. del Rio, 'HIV/AIDS in a Migrant Exporter Mexican State' Paper presented at 11th International Conference on AIDS, Vancouver, Canada, July 1996.
- 75 M. Bassett, J. Emmanuel, and J. Katzenstein, 'HIV Infection in Urban Males in Zimbabwe' Paper presented at 6th International Conference on AIDS, San Francisco, 1990.
- 76 J. Anarfi, 'Sexuality, Migration and AIDS in Ghana: A Socio-Behavioural Study' *Health Transition Review* 3 (1993): 45-67.
- 77 Q. Abdool Karim, B. Singh, R. Short and S. Ngxongo, 'Seroprevalence of HIV Infection in Rural South Africa' *AIDS* 6 (1992): 1535-9.
- 78 Brockerhoff and Biddlecom, "Migration, Sexual Behavior and the Risk of HIV".
- 79 D. Wilson, *Lesotho and Swaziland: HIV/AIDS Risk Assessment at Cross-Border and Migrant Sites in Southern Africa*. (Arlington: FHI, 2001).
- 80 J. Crush, A. Jeeves and D. Yudelman, *South Africa's Labor Empire: A History of Black Migrancy to the Gold Mines* (Boulder and Cape Town: Westview and David Philip, 1991); and D. McDonald, ed., *On Borders: Perspectives on International Migration in Southern Africa* (New York and Cape Town: St Martin's Press and SAMP, 2000).
- 81 J. Leger, 'Occupational Disease in South African Mines: A Neglected Epidemic' *South African Medical Journal* 91(1992); and R. Packard and D. Coetzee, 'White Plague, Black Labour Revisited: TB and the Mining Industry' in J. Crush and W. James, eds., *Crossing Boundaries: Mine Migrancy in a Democratic South Africa* (Cape Town: Idasa, 1995), pp. 101-15.
- 82 Crush, Jeeves and Yudelman, *South Africa's Labor Empire*.
- 83 J. Crush, T. Ulicki, T.Tseane and E.Jansen Van Vuuren, 'Undermining Labour: The Rise of Sub-Contracting in South African Gold Mines' *Journal*



- of *Southern African Studies* 27(2001): 5-32.
- 84 W. Chirwa, 'Malawian Migrant Labour and the Politics of HIV/Aids, 1985 to 1993' in Crush and James, eds., *Crossing Boundaries*, pp. 120-8; and W. Chirwa, 'Aliens and AIDS in Southern Africa: The Malawi-South Africa Debate' *African Affairs* 97 (1998): 53-79.
- 85 S. Kark, 'The Social Pathology of Syphilis in Africans' *South African Medical Journal* 23(1947): 77-84.
- 86 K. Jochelson, *The Colour of Disease: Syphilis and Racism in South Africa, 1880-1950* (London: Palgrave, 2001), p. 10; see also P. Setel, M. Lewis and M. Lyons, eds., *Histories of Sexually Transmitted Diseases and HIV/AIDS in Sub-Saharan Africa* (Westport, CT: Greenwood Press, 1999).
- 87 F. Wilson, *Migrant Labour in South Africa* (Johannesburg: SACC/SPROCAS, 1972), pp. 174-202.
- 88 R. Packard, *White Plague, Black Labor: Tuberculosis and the Political Economy of Health and Disease in South Africa* (Berkeley: University of California Press, 1987).
- 89 B. Williams C. Campbell, N. Mqoqi and I. Kleinschmidt, 'Occupational Health, Occupational Illness: Tuberculosis, Silicosis and HIV on the South African Mines' in Daniel E. Banks and John E. Parker, eds., *Occupational Lung Disease: An International Perspective* (New York: Chapman and Hall, 1998).
- 90 Trapido *et al.* 'Prevalence of Occupational Lung Disease'.
- 91 J. Crush, 'The Discourse and Dimensions of Irregularity in Post-Apartheid South Africa' *International Migration* 37(1999): 125-51.
- 92 S. Peberdy and C. Rogerson, 'Transnationalism and Non-South African Entrepreneurs in South Africa's Small, Medium and Micro-Enterprise (SMME) Economy' *Canadian Journal of African Studies* 34(2000): 20-40.
- 93 J. May, ed. *Poverty and Inequality in South Africa* (Cape Town: David Philip, 2000).
- 94 B. Dodson, 'Porous Borders: Gender and Migration in Southern Africa' *South African Geographical Journal* 82 (2000): 40-46.
- 95 M. Lurie, D. Wilkinson, A. Harrison and S. Abdool Karim, 'Migrancy and HIV/STDs in South Africa – A Rural Perspective' *South African Medical Journal* 87 (1997): 908-9.
- 96 T. Ulicki and J. Crush, 'Gender, Farmwork and Women's Migration from Lesotho to the New South Africa' *Canadian Journal of African Studies* 34 (2000): 64-79.
- 97 J. Crush, 'Mine Migrancy in the Contemporary Era' in Crush and James, eds., *Crossing Boundaries*, pp. 14-32.
- 98 R. Leon, A. Davies, M. Salomon and J. Davies, *Leon Commission of Enquiry into Safety and Health in the Mining Industry* (Pretoria: Government Printers, 1995).
- 99 Sechaba Consultants, *Riding the Tiger: Lesotho Miners and Permanent Residence*

- in South Africa, SAMP Migration Policy Series No.2 (Cape Town: SAMP, 1997); and F. de Vletter, *Sons of Mozambique: Mozambican Miners and Post-Apartheid South Africa*, SAMP Migration Policy Series No.8 (Cape Town: SAMP, 1998). In the 1970s, nearly 70% of miners made no visits home during the average nine-month long contract.
- 100 D. Moodie with V. Ndatshe, 'Town Women and Country Wives: Housing Preferences at Vaal Reefs Mine' in Crush and James, eds., *Crossing Boundaries*, pp. 68-81.
  - 101 S. Lubkemann, 'The Transformation of Transnationality among Mozambican Migrants in South Africa' *Canadian Journal of African Studies* 34(2000): 41-63.
  - 102 K. Zuma, E. Gouws and B. Williams, 'Risk Factors for HIV Infection Among Women in Carletonville, South Africa: Migration, Demography and Sexually Transmitted Diseases' (in preparation).
  - 103 M. Williams, 'Hostel leaders vow to fight violence in run-up to elections' *Natal Mercury*, 25 September 1998.
  - 104 E. Udjo and R. Hirschowitz, eds., *The People of South Africa Population Census 1996; Summary Report* (Pretoria: Statistics South Africa, 2000).
  - 105 B. Williams and E. Gouws. The Epidemiology of HIV in South Africa. *Philosophical Transactions of the Royal Society B* 356 (2001): 1,077-1,086.
  - 106 M. Coffee, G. Garnett and M. Lurie, 'Modelling the Impact of Circular Migration on the Rate of Spread and Eventual Scale of the HIV Epidemic in South Africa' Presentation at 13th International AIDS Conference, Durban, South Africa, 2000.
  - 107 B. Williams, E. Gouws, M. Colvin, F. Sitas, G. Ramjee and S. Abdool Karim, 'Patterns of Infection: Using Age Prevalence Data to Understand the Epidemic of HIV in South Africa' *South African Journal Science* 96(2000): 305-12
  - 108 *Ibid.*
  - 109 B. Williams, E. Gouws, D. Wilkinson, and S. Abdool Karim, 'Estimating HIV Incidence Rates from Age-specific Prevalence Data in Epidemic Situations' *Statistics in Medicine* 20 (2001): 2,003-2,016.
  - 110 R. Janssens, G. Satten and S. Stramer, 'New Testing Strategy to Detect Early HIV-1 Infection for Use in Incidence Estimates and for Clinical and Prevention Purposes' *Journal of the American Medical Association* 280 (1998): 42-8.
  - 111 E. Gouws, B. Williams, H. Sheppard, B. Enge and S. Abdool Karim, 'High Incidence of HIV-1 in South Africa Using a Standardized Algorithm for Recent HIV Sero-conversion (STAHRS)' (submitted).
  - 112 G. Ramjee, 'Vaginal Microbicides in the Prevention of HIV and STDs' Presentation at Reproductive Health Priorities Conference, Cape Town, 2000
  - 113 A multivariate logistic regression was carried out including age, race, job band, age and gender in the analysis.

- 114 In other words, rates of infection among coloured, Indian and white South Africans are 50%, 25% and 10% respectively of the rate of infection among black South Africans.
- 115 The provision of anti-retroviral therapy could largely eliminate mother-to-child transmission. M. Abdullah, T. Young, L. Bitalo, N. Coetzee and J-E. Myers, 'Public Health Lessons from a Pilot Programme to Reduce Mother-to-Child Transmission of HIV-1 in Khayelitsha.' *South African Medical Journal* 91 (2001): 579-83; A. Coutsooudis, 'Influence of Infant Feeding Patterns on Early Mother-to-Child Transmission of HIV-1 in Durban, South Africa' *Annals of the New York Academy of Science* 918 (2000):136-44; and D. Wilkinson, K. Floyd and C. Gilks, 'National and Provincial Estimated Costs and Cost Effectiveness of a Programme to Reduce Mother-to-Child HIV Transmission in South Africa' *South African Medical Journal* 90 (2000): 794-8.
- 116 For further details see <http://www.csir.co.za/aidsproject/index.html>
- 117 Based on data published by the Chamber of Mines in 1993, in a twenty year career a gold miner had a 2% chance of being killed in an accident, a 33% chance of suffering a reportable injury, a 20% chance of developing active tuberculosis with a case-fatality rate of 2.5%, a 10% chance of developing silicosis and a 97% chance of contracting an STD.
- 118 Cambell, 'Migrancy, Masculine Identities and HIV/AIDS'.
- 119 C. Ijsselmuiden, W. Padayachee and W. Mashabala, 'Knowledge, Beliefs and Practices among Black Goldminers Relating to the Transmission of Human Immunodeficiency Virus and Other Sexually Transmitted Diseases' *South African Medical Journal* 78 (1990): 520-3; and T. Moodie with V. Ndatshe, *Going For Gold: Men Mines and Migration* (Berkeley: University of California Press, 1994).
- 120 Cambell, 'Migrancy, Masculine Identities and HIV/AIDS'.
- 121 Gilgen, *et al*, 'Natural History of HIV/AIDS'.
- 122 Campbell and co-workers have worked closely with women living in such hotspots for a number of years and describe in detail their lives and the conditions in which they live. See Campbell, 'Selling Sex in the Time of AIDS'.
- 123 Williams, *et al*. "The Carletonville-Mothusimpilo Project"; and Gilgen, *et al*, 'Natural History of HIV/AIDS'.
- 124 *Ibid*.
- 125 K. Kun, 'Female Genital Mutilation: The Potential for Increased Risk of HIV Infection' *AIDS Patient Care STDS* 13 (1999): 709-716; and M. Brady, 'Female Genital Mutilation: Complications and Risk of HIV Transmission' *AIDS Patient Care STDS* 13 (1999): 683-8. Female genital mutilation (FGM) is the term used to refer to the removal of part, or all, of the female genitalia. The most severe form is infibulation, also known as pharaonic circumcision. An estimated 15% of all mutilations in Africa are infibulations. The vast majority (85%) of female genital mutilations performed in Africa consist of clitoridectomy or excision; see Amnesty International at

- <http://www.amnesty.org/ailib/intcam/femgen/fgm1.htm#a3>
- 126 M. Miller, 'A Model to Explain the Relationship Between Sexual Abuse and HIV Risk Among Women' *AIDS Care* 11 (1999): 3-20.
- 127 M. Beksinka, H. Rees, I. Kleinschmidt and J. McIntyre, 'The Practice and Prevalence of Dry Sex Among Men and Women in South Africa: A Risk Factor for Sexually Transmitted Infections?' *Sexually Transmitted Diseases* 75 (1999): 178-180; A. Ruganga and J. Kasule, 'The Vaginal Use of Herbs/Substances: An HIV Transmission Facilitatory Factor?' *AIDS Care* 9 (1995): 287-296; and L. Sandala, P. Lurie, M. Sunkutu, E. Chani, E. Hudes and N. Hearst N, '“Dry Sex” and HIV Infection Among Women Attending a Sexually Transmitted Diseases Clinic in Lusaka, Zambia' *AIDS* 9 (1995): 941-943.
- 128 M. Garenne and N. Lydie, 'Gender and AIDS' Paper prepared for the WHO monograph on Gender Analysis of Health (2001).
- 129 B. Williams, C. MacPhail and C. Campbell, 'Relative Risk of HIV Infection Amongst Young Men and Women in a South African Township' *AIDS Care* (in press).
- 130 D. Wilkinson, A. Connolly, A. Harrison, M. Lurie and S. Abdool Karim. 'Sexually Transmitted Syndromes in Rural South Africa: Results from Health Facility Surveillance' *Sexually Transmitted Diseases* 25 (1998): 20-23.
- 131 Ibid.
- 132 J. Frohlich, 'Mobilizing Communities for Participation in HIV Vaccine and Prevention Research' Proceedings of the 13th International AIDS Conference, Durban, July 2000.
- 133 E. Gouws, J. Frohlich, Q. Abdool Karim and S. Abdool Karim, 'Preparing for Phase III HIV Vaccine Trials: Experiences from Rural South Africa' Presentation at 13th International AIDS Conference, Durban, South Africa, 2000.
- 134 S. Gregson, P. Mason, G. Garnett, T. Zhawau, C. Nyamukapa, R. Anderson and S. Chandiwana, 'A Rural HIV Epidemic in Zimbabwe? Findings from a Population-Based Survey' *International Journal of Sexually Transmitted Diseases and AIDS* 12 (2001): 189-96.
- 135 Gouws, *et al*, 'Phase III Vaccine Trials'.
- 136 Wilkinson, *et al*, 'Sexually Transmitted Syndromes in Rural South Africa'.
- 137 M. Lurie, A. Harrison, D. Wilkinson and S. Abdool Karim, 'Circular Migration and Sexual Networking in Rural South Africa: Implications for the Spread of HIV and Other Sexually Transmitted Diseases' *Health Transition Review* Suppl. 3 to 7(1997): 15-24.
- 138 M. Lurie, G. Garnett, S. Abdool Karim, A. Sturm, D. Wilkinson and B. Williams, 'Migration and the Spread of HIV and Other Sexually Transmitted Diseases in South Africa: Interlocking Urban and Rural Cohort Studies' Unpublished manuscript, 1998.
- 139 M. Lurie, *Migration and the Spread of HIV in South Africa*. PhD Thesis, Johns

- Hopkins University School of Hygiene and Public Health, 2001.
- 140 M. Lurie, 'Migration and AIDS in Southern Africa: A Review' *South African Journal of Science* 96(2000): 343-7.
- 141 M. Lurie, B. Williams, A. Sturm, G. Garnett, D. Mkaya and S. Abdool Karim, 'HIV Discordance Among Migrant and Non-Migrant Couples in South Africa' Presentation at 13th International AIDS Conference, Durban, South Africa, 2000.
- 142 C. Evian, 'The Socio-Economic Determinants of the AIDS Epidemic in South Africa – A Cycle of Poverty' *South African Medical Journal* 83(1993): 653-6; D. Wilkinson, S. Abdool Karim, A. Harrison, M. Lurie, M. Colvin, C. Connolly and W. Sturm, 'Unrecognised Sexually Transmitted Infections in Rural South African Women: A Hidden Epidemic' *Bulletin of the World Health Organisation* 77 (1999): 22-28; and N. Dladla, C. Hiner, E. Qwana and M. Lurie, 'Speaking to Rural Women: The Sexual Partnerships of Women Whose Partners are Migrant' Presentation at 13th International AIDS Conference, Durban, South Africa, 2000.
- 143 See J. Burayo et al, 'Long Distance Truck Drivers: Knowledge and Attitudes Concerning Sexually Transmitted Diseases and Sexual Behaviour' *East African Medical Journal* 68(1991): 714-19; S. McLigeyo, 'Long Distance Truck Driving: Its Role in the Dynamics of the HIV/AIDS Epidemics' *East African Medical Journal* 7(1997): 341-2; J. Marck, 'Long-Distance Truck Drivers' Sexual Cultures and Attempts to Reduce HIV Risk Amongst Them: A Review of the African and Asian Literature' In J. Caldwell et al, eds., *Resistances to Behavioural Change to Reduce HIV/AIDS Infection in Predominantly Heterosexual Epidemics in Third World Countries* (Canberra: ANU Health Transition Centre, 1999); L. Mukodzoni, K. Mupemba and J. Marck, 'All Roads Lead to Harare: The Response of the Zimbabwean Transport Industry to AIDS' In I. Orubuloye, J. Caldwell and J. Ntozi, eds., *The Continuing HIV/AIDS Epidemic in Africa* (Canberra: ANU Health Transition Centre, 1999); A. Bryan, J. Fisher and T. Benziger, 'Determinants of HIV Risk Among Indian Truck Drivers' *Social Science and Medicine* 53(11) (2002): 1413-26. In the South African case see the references below plus T. Marcus, *AIDS: Interpreting the Risks. A Case Study of Long Distance Truck Drivers* (Pietermaritzburg: University of Natal, 1996); and Family Health International, 'Corridors of Hope in Southern Africa: HIV Prevention Needs and Opportunities in Four Border Towns' Report of Corridors of Hope Initiative, USAID, 2000.
- 144 G. Ramjee, S. Abdool Karim and A. W. Sturm. 'Sexually Transmitted Infections Among Sex-workers in KwaZulu/Natal, South Africa' *Sexually Transmitted Diseases* 25 (1998): 346-349.
- 145 *Ibid.*; and Ramjee and Gouws, 'Truck Drivers and the Spread of HIV in Southern Africa'.

## MIGRATION POLICY SERIES

1. *Covert Operations: Clandestine Migration, Temporary Work and Immigration Policy in South Africa* (1997) ISBN 1-874864-51-9
2. *Riding the Tiger: Lesotho Miners and Permanent Residence in South Africa* (1997) ISBN 1-874864-52-7
3. *International Migration, Immigrant Entrepreneurs and South Africa's Small Enterprise Economy* (1997) ISBN 1-874864-62-4
4. *Silenced by Nation Building: African Immigrants and Language Policy in the New South Africa* (1998) ISBN 1-874864-64-0
5. *Left Out in the Cold? Housing and Immigration in the New South Africa* (1998) ISBN 1-874864-68-3
6. *Trading Places: Cross-Border Traders and the South African Informal Sector* (1998) ISBN 1-874864-71-3
7. *Challenging Xenophobia: Myth and Realities about Cross-Border Migration in Southern Africa* (1998) ISBN 1-874864-70-5
8. *Sons of Mozambique: Mozambican Miners and Post-Apartheid South Africa* (1998) ISBN 1-874864-78-0
9. *Women on the Move: Gender and Cross-Border Migration to South Africa* (1998) ISBN 1-874864-82-9.
10. *Namibians on South Africa: Attitudes Towards Cross-Border Migration and Immigration Policy* (1998) ISBN 1-874864-84-5.
11. *Building Skills: Cross-Border Migrants and the South African Construction Industry* (1999) ISBN 1-874864-84-5
12. *Immigration & Education: International Students at South African Universities and Technikons* (1999) ISBN 1-874864-89-6
13. *The Lives and Times of African Immigrants in Post-Apartheid South Africa* (1999) ISBN 1-874864-91-8
14. *Still Waiting for the Barbarians: South African Attitudes to Immigrants and Immigration* (1999) ISBN 1-874864-91-8
15. *Undermining Labour: Migrancy and Sub-contracting in the South African Gold Mining Industry* (1999) ISBN 1-874864-91-8
16. *Borderline Farming: Foreign Migrants in South African Commercial Agriculture* (2000) ISBN 1-874864-97-7
17. *Writing Xenophobia: Immigration and the Press in Post-Apartheid South Africa* (2000) ISBN 1-919798-01-3
18. *Losing Our Minds: Skills Migration and the South African Brain Drain* (2000) ISBN 1-919798-03-x
19. *Botswana: Migration Perspectives and Prospects* (2000) ISBN 1-919798-04-8
20. *The Brain Gain: Skilled Migrants and Immigration Policy in Post-Apartheid South Africa* (2000) ISBN 1-919798-14-5
21. *Cross-Border Raiding and Community Conflict in the Lesotho-South African Border Zone* (2001) ISBN 1-919798-16-1

22. *Immigration, Xenophobia and Human Rights in South Africa* (2001)  
ISBN 1-919798-30-7
23. *Gender and the Brain Drain from South Africa* (2001) ISBN 1-919798-35-8
24. *Spaces of Vulnerability: Migration and HIV/AIDS in South Africa* (2002) ISBN  
1-919798-38-2

PUBLISHED BY:

SOUTHERN AFRICAN MIGRATION PROJECT  
6 Spin Street  
Church Square  
Cape Town 8001

and

SOUTHERN AFRICAN RESEARCH CENTRE  
Queen's University  
Kingston  
Canada



PARTNERS:

Queen's University (Canada)  
Idasa (South Africa)  
Sechaba Consultants (Lesotho)  
ARPAC (Mozambique)  
University of Zimbabwe  
MRC, University of Namibia  
ITPPSD, University of Botswana  
University of Swaziland  
P&DM, Wits University

This project is funded by the  
Canadian government through the  
Canadian International Development Agency (CIDA).