Sentinel surveillance of sexually transmitted infections in South Africa: a review

L F Johnson, D J Coetzee, R E Dorrington

Methods: Studies of the prevalence of syphilis, chancroid, granuloma inguinale, lymphogranuloma venereum, gonorrhoea, chlamydia, trichomoniasis, bacterial vaginosis, candidiasis, and herpes simplex virus type 2 (HSV-2) were considered. Results were included if they related to women attending antenatal clinics or family planning clinics, commercial sex workers, individuals in the general population (household surveys), patients with STIs, patients with genital ulcer disease (GUD), or men with urethritis.

Results: High STI prevalence rates have been measured, particularly in the case of HSV-2, trichomoniasis, bacterial vaginosis and candidiasis. The aetiological profile of GUD appears to be changing, with more GUD caused by HSV-2 and less caused by chancroid. The prevalence of gonorrhoea and syphilis is highest in “high risk” groups such as sex workers and attenders of STI clinics, but chlamydia and trichomoniasis prevalence levels are not significantly higher in these groups than in women attending antenatal clinics.

Conclusions: The prevalence of STIs in South Africa is high, although there is extensive variability between regions. There is a need for STI prevalence data that are more nationally representative and that can be used to monitor prevalence trends more reliably.

METHODS
Sentinel surveillance studies were identified using a number of different sources. A computerised search of the Medline database was conducted on 4 February 2004. The search term was “South Africa and (herpes or syphilis or treponema pallidum or chancroid or haemophilus ducreyi or chlamydia or gonorrhoea or neisseria gonorrhoeae or trichomoniasis or trichomonas vaginalis or bacterial vaginosis or candidiasis or candida albicans or lymphogranuloma venereum or granuloma inguinale or donovanosis or calymmatobacterium granulomatis).” This search yielded a total of 916 hits. Further studies were identified from an earlier review of studies conducted between 1980 and 1995,8 and by manually searching the Southern African Journal of Epidemiology and Infection. Grey literature was identified by searching the abstracts of recent AIDS conferences and by consulting local STI experts.

The focus of this study is restricted to sentinel populations that are frequently studied: women attending antenatal clinics and family planning clinics, commercial sex workers, men and women in the general population (household surveys), patients with STIs, patients with genital ulcer disease (GUD), and men with urethritis. Human papilloma-virus has not been included in this review, as the sentinel populations in which this disease is monitored usually differ from those in which other STIs are monitored, and the epidemiology of the disease is complex. Human immunodeficiency virus (HIV) has also not been included, as the prevalence of this disease has already been studied extensively in more nationally representative studies.8 The focus of this review is further limited to microbiological prevalence data and does not include estimates of the prevalence of STI symptoms. Studies were excluded if they were conducted before 1985 or (in cases where the date of the study was not reported) published before 1985.

RESULTS
After applying the exclusion criteria, a total of 47 independently conducted studies (that is, studies conducted in different periods or by different investigators) were identified.
Table 1  STI prevalence rates in sentinel surveys

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#### Commercial sex workers

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#### Pregnant women attending antenatal clinics

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#### Women attending family planning clinics

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<tbody>
<tr>
<td>Fehrer</td>
<td>1998</td>
<td>Johannesburg</td>
<td>8.6%</td>
<td>8.6%</td>
<td>18.1%</td>
<td>10.6%</td>
<td>35.1%</td>
<td>22.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Froehlich</td>
<td>2002</td>
<td>Vlindelwane</td>
<td>221</td>
<td>2.2%</td>
<td>2.2%</td>
<td>8.8%</td>
<td>23.8%</td>
<td>58.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoosen</td>
<td>1997</td>
<td>Durban</td>
<td>40</td>
<td>8%</td>
<td>5%</td>
<td>15%</td>
<td>20%</td>
<td>15%</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hoosen</td>
<td>1997–7</td>
<td>Durban</td>
<td>50</td>
<td>8%</td>
<td>10%</td>
<td>26.6%</td>
<td>20%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kharsany</td>
<td>1994</td>
<td>Durban</td>
<td>55</td>
<td>22.2%</td>
<td>5%</td>
<td>13%</td>
<td>25%</td>
<td>36%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schneider</td>
<td>1994</td>
<td>Bushbuckridge</td>
<td>249</td>
<td>5%</td>
<td>3%</td>
<td>12%</td>
<td>18%</td>
<td>29%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wilkinson</td>
<td>1997</td>
<td>Hlabisa</td>
<td>189</td>
<td>7.9%</td>
<td>4.2%</td>
<td>7.4%</td>
<td>13.8%</td>
<td>15.3%</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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Sample sizes are given in parentheses where these differ according to the STI.

TP, *Treponema pallidum* (syphilis); NG, *Neisseria gonorrhoeae* (gonorrhoea); CT, *Chlamydia trachomatis* (chlamydia); TV, *Trichomonas vaginalis* (trichomoniasis); BV, *bacterial vaginosis*; CA, *Candida albicans* (candidiasis); HD, *Haemophilus ducreyi* (dysuria); HSV-2, herpes simplex virus type 2; CG, *Calymmatobacterium granulomatis* (granuloma inguinale); LGV, *lymphagranuloma venereum*.

*Date of publication. †Excluding individuals who were not sexually experienced. ‡Non-treponemal, confirmed by treponemal tests. §*Non-treponemal. **Positive on dark-field microscopy or culture. ***Culture. ****PCR on swabs/vaginoscopy. *****DNA amplification. ******Direct immunofluorescence. *******Indirect immunofluorescence. ********Investigation of specimens. *******Direct immunofluorescence and culture. *******Clinical diagnosis, confirmed by culture, microscopy. *******Microscopy. *******Clinical diagnosis, confirmed by culture/microscopy. *******Clinical diagnosis, confirmed by culture/microscopy. *******Macroscopic examination. *******Clinical diagnosis, confirmed by culture/microscopy. *******Clinical diagnosis, confirmed by culture/microscopy.*

Excluding individuals who were not sexually experienced.

Western blot.
been conducted in men. It would appear that this disease
responds differently in various settings, such as high-risk groups
such as sex workers and STI clinic attenders, compared to
low-risk groups such as those attending family planning clinics.
The prevalence of syphilis in high-risk populations is generally
higher than in low-risk populations. However, the disease is
not limited to these groups and can also be found in the general
population.

Chlamydia (Chlamydia trachomatis) is a much more common
infection than gonorrhea, with an estimated prevalence of 20%
among women attending antenatal clinics and up to 50% among
sex workers. The disease is typically found in young women
and is highly prevalent in adolescent girls.

DISCUSSION

This study updates the earlier review of Pham-Kanter et al.,
and demonstrates the continuing STI burden in South Africa.
STI prevalence rates in South Africa are high, even when
compared to other African countries. The prevalence of
syphilis, gonorrhea, and chlamydia in South African
household surveys exceeds that estimated in recent house-
hold surveys conducted in various African cities and
in communities in Uganda and Tanzania. The prevalence of
these STIs in South African sex workers is also generally
comparable to or higher than that observed recently in sex
workers from other African countries. This high STI
prevalence rate may be a reflection of the high levels of
migration in South Africa, the legacy of the migrant labour
system that existed during the apartheid era. It may also be
because the HIV/AIDS epidemic in South Africa is less mature
than the epidemic in other African countries. Model
simulations suggest that bacterial STIs decline in prevalence
over the course of an HIV/AIDS epidemic, and the relatively
late start to the South African HIV/AIDS epidemic would
therefore suggest a higher prevalence of curable STIs than in
other African countries.

Studies from other African countries suggest that there
have been significant declines in the prevalence of curable
STIs in recent years. The data reviewed in this paper are of
limited use in determining whether or not similar declines
are occurring in South Africa. Although it is possible to adjust
for the differences in diagnostic techniques used in different
sentinel surveys, there remains substantial heterogeneity
between individual surveys in terms of populations sampled,
and this reduces the reliability of statistical tests for trend.
Only three studies have involved periodic assessments of STI
prevalence in the same sentinel population, and these do not
show consistent trends.

These limitations aside, it would appear that HSV-2 is
accounting for an increasingly high proportion of GUD cases
accounts for less than 20% of male urethritis cases, a lower
proportion than that for gonorrhea and chlamydia. In
women, however, the disease is highly prevalent, with
prevalence rates typically in excess of 20%. Like chlamydia,
its prevalence appears not to differ substantially between
women in antenatal and family planning clinics and women
in STI clinics.

Bacterial vaginosis and candidiasis (Candida albicans) are
also conditions that are highly prevalent in women, although
they are not traditionally regarded as STIs. In both cases,
there is much inconsistency in the diagnostic algorithms
used, and the data also show little consistency. It is clear,
however, that the prevalence of bacterial vaginosis is
extremely high, with the highest prevalence rates being
observed in STI clinic attenders and sex workers. The
prevalence of candidiasis is usually between 20% and 40%,
except in studies in which definitions are based on clinical
diagnosis.

Three of the studies have involved periodic assessments in
the same sentinel population. A study of pregnant women in
Hlabisa found that the prevalence of syphilis and trichomo-
niasis had declined significantly between 1995 and 2002, but
changes in diagnostics used over the period obscure the
change in the prevalence of other STIs. In contrast, a study
in Carletonville found increases in the prevalence of syphilis,
gonorrhea, and chlamydia between 1998 and 2000, in both
men and women in the general population and in sex
workers. The third survey, also conducted in Carletonville,
found significantly increased detection of HSV-2 in male
genital ulcers between 1993–4 and 1998, while the frequency
of chancroid detection reduced significantly and the fre-
quency of syphilis detection remained roughly unchanged.
in men, while chancroid is accounting for fewer GUD cases. The decline in the detection of chancroid in recent years may be related to the introduction of syndromic management protocols in South Africa since 1994, or to the rising levels of condom use observed in South Africa recently. However, it is not clear to what extent the increased isolation of HSV-2 in genital ulcers is the result of declines in the prevalence of other STIs that cause GUD, and to what extent it is the result of changes in HSV-2 seroprevalence. HIV prevalence might be associated with rising HSV-2 seroprevalence, since HIV co-infection increases HSV-2 viral shedding and hence HSV-2 transmissibility.

However, there are no reliable local seroprevalence data to demonstrate temporal changes in HSV-2 seroprevalence. Although the HSV-2 seroprevalence in men with GUD appears to be lower in 1993–4 than the seroprevalence rates of close to 100% recorded in male GUD patients in the early 1980s, the latter are probably exaggerated owing to the poor performance of the early HSV-2 enzyme linked immunosorbent assay (ELISA), which showed extensive cross reactivity with HSV-1. There is a need for greater monitoring of HSV-2 seroprevalence in South Africa, particularly as this infection has been found to be highly correlated with HIV infection.

Within South Africa, STI prevalence levels are highly variable. Chancroid, for example, seems to account for a higher proportion of GUD cases in Gauteng than in Durban and Cape Town. This may be the result of the association between chancroid and sex work, as levels of migrant labour and corresponding frequencies of commercial sex are particularly high in Gauteng.

Although the risk of syphilis and gonorrhoea infection is substantially higher in “high risk” groups than in women attending antenatal clinics, this is not the case for trichomoniasis and chlamydia. Other African studies have also failed to detect a significant association between trichomoniasis infection and sexual risk behaviours, which suggests that other factors may play a more important part in the epidemiology of this disease. Acquired immunity to chlamydia may explain the lack of association between chlamydia and sentinel facility type.

The geographical distribution of sentinel surveillance studies is generally not proportional to that of the South African population. Of the 47 independently conducted studies, 43 were conducted in KwaZulu-Natal, Gauteng, or Western Cape, though these provinces accounted for only 49% of the South African population in the 1996 census. Thirty four of the studies were conducted exclusively in urban areas, though only 54% of the 1996 population lived in urban settlements. Most of the rural studies were conducted in Hlabisa (now Umkanyakude) in KwaZulu-Natal. In addition, many of the studies were conducted in Carletonville, the largest gold mining complex in the world. Exceptionally high HIV prevalence rates have been observed in this centre, and STI prevalence rates observed in Carletonville are not likely to be representative of those in the rest of the country. Several other problems result from the above sources of geographical bias. Granuloma inguinale, for example, occurs mainly in tropical and subtropical regions. Almost all of the South African studies of this disease have been conducted in Durban, and it is unlikely that these would be representative of other less tropical parts of the country.

Given the limitations associated with the sentinel surveillance data reviewed here, it is clear that there is a need for studies that are more nationally representative. There is also a need for more cross sectional studies conducted periodically in the same population, using the same diagnostic techniques, which can be used to monitor trends in STI prevalence more reliably. In addition, it is necessary to develop strategies for monitoring STIs treated in the private health sector. Only two of the studies reviewed here were conducted among patients of private practitioners, although almost half of STI cases are believed to be treated by private practitioners.

Currently, the South African Department of Health conducts annual surveys of HIV and syphilis prevalence levels in pregnant women attending public antenatal clinics, and these surveys suggest significant declines in syphilis prevalence since 1997. The Department of Health also collects data on numbers of STI cases and male urethritis cases treated at public STI clinics, which do not show any significant trend. Data on the prevalence of other STIs and STI symptoms are lacking, but improved microbiological surveillance and drug resistance monitoring for different STI syndromes are currently being introduced. The microbiological surveillance will be conducted in selected sites on a periodic basis, and its initial focus will be on ciprofloxacin resistance in gonococcal isolates. A clinical sentinel surveillance system is also being introduced at selected sites to collect more detailed data on the age, sex and presenting syndromes of patients attending public health facilities.

While the new microbiological data will be useful, data collected only from STI clinics will be of limited use in monitoring trends in STI prevalence in the general population. It is therefore recommended that the new microbiological surveillance system incorporate other facilities such as antenatal and family planning clinics.

ACKNOWLEDGEMENTS
We would like to thank Lydia Altini, Francesca Little, and the anonymous reviewers for their helpful comments.

CONTRIBUTORS
This study was conceptualised by LJ; it is part of a larger project conducted by LJ and supervised by RD; DC assisted in identifying unpublished literature; the manuscript was prepared by LJ, with contributions from DC and RD.

Authors’ affiliations
L J Coetzee, School of Public Health and Family Medicine, University of Cape Town, South Africa
D J Coetzee, School of Public Health and Family Medicine, University of Cape Town, South Africa

Competing interests: none.

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CALL FOR PAPERS

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H Ward
Editor, STI, BMJ Journals, BMA House, Tavistock Square, London WC1H 9JR, UK; h.ward@imperial.ac.uk

Sevgi Aral
Centers for Disease Control and Prevention (CDC), 1600 Clifton Road, Atlanta 30333, USA