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SEXUALLY TRANSMITTED DISEASES

IN SUB-SAHARAN AFRICA

AND

ASSOCIATED INTERACTIONS WITH HIV

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SUMMARY

STDs are a major cause of morbidity in Sub-Saharan Africa. Certain sociological and demographic trends have influenced the spread of STDs, including urbanization and family living patterns. In patrilineal societies, where men maintain a strong control over women, STD rates appear to be higher.

STD infections tend to persist in core groups of individuals who practice high-risk behaviors (i.e., have many partners) and serve as reservoirs of infection. Core groups can include prostitutes, male clients of prostitutes, long-haul truckers, military personnel and migrant workers. However, core group members do not restrict their sexual activities to other core group members and the extent of sexual mixing is a strong determinant of prevalence levels.

Only limited information is available on STD rates in Sub-Saharan Africa. It is difficult to ascertain consistent patterns in the STD prevalence data. Even within the same population groups, much variability was discovered. Most studies have been conducted on prostitutes and STD clinic patients, but these are not representative of the general population. More screening programs need to be developed for women, since many infected women are asymptomatic.

The interaction between STDs and HIV is complex. Both HIV and the traditional STDs share a common mode of transmission through sexual contact. They share the same behavioral risks. An array of studies is presented which shows that both ulcerative and non-ulcerative STDs increase the risk for HIV transmission. Chancroid and syphilis have clearly been implicated as risk factors for HIV transmission. Other studies are also finding an association between gonorrhea and HIV infection. Interventions which lead to the reduction of the levels and durations of these STDs should have an impact on the HIV epidemic.

There are few STD surveillance systems in Sub-Saharan Africa. Surveillance and rapid response to identify disease threats are at the core of preventive medicine. Better testing and monitoring of infection levels will lead to clearer program and control objectives. STD control is one of the key components to HIV prevention and control. Intervention programs that include condom promotion and behavior change would benefit both STD and HIV control programs. In addition, early detection and treatment of STDs would reduce the incidence and duration of STDs and, as a result, would reduce the incidence of HIV infection.

Since there are few sentinel surveillance systems in Africa reporting levels of STDs, a compilation of studies that report STD seroprevalence level into an STD database would be extremely useful for those interested in assessing the extent of STD infection in these countries. The data presented in this report will be the basis for such a database.

TABLE OF CONTENTS

VIRAL AGENTS:

Herpes simplex type 2	genital ulcer	genital cancer
Human papilloma virus (HPV)	genital warts	genital cancer
Hepatitis B virus (HBV)	acute hepatitis	chronic hepatitis cirrhosis hepatoma vasculitis

PROTOZOAL AGENTS:

Trichomonas vaginalis (trichomoniasis)	vaginitis	pelvic inflammatory disease

Chancroid is considered the most common type of genital ulceration in Africa, but there are marked geographical variations in rates. In some West African countries, herpes and syphilis may be more common [3,225]. Chancroid may constitute between 40-80% of genital ulceration, syphilis 9-17%, chlamydia 0-12% and herpes 5-15% in sub-Saharan Africa [4]. Ulcerative and non-ulcerative STDs have both been implicated in the transmission of HIV. In fact, the impact of non-ulcerative STDs on HIV transmission may be more important on a population level since their prevalence and incidence is much higher than genital ulcer disease (GUD) in many populations [8,142,235]. It is vital that the incidence of both ulcerative and non-ulcerative STDs be controlled and cases properly managed.

THE SOCIAL CONTEXT OF STDS IN AFRICA

STDs are transmitted through a complex interplay among the natural infectiousness of the pathogen, the duration of infectivity of the human host, and the rate of sexual interaction between people [2]. The rate of change in sexual partnerships is a major determinant in STD rates. It must be noted however, that sexual behavior across societies is very heterogeneous. Unfortunately, there is a scarcity of information on sexual behavior, particularly in developing countries [227].

Certain demographic and sociological trends witnessed in Africa have been linked to the prevalence of STDs. Since independence, countries in Africa have seen an increase in rural-urban migration. This creates an excess of males in urban areas and a corresponding excess demand for female sexual partners. In East and Southern Africa, this migration stream has been mostly male since few employment opportunities exist for women. The result is a reliance by women in these urban settings upon prostitution as a way to earn a living. In other cities, poverty, war and political upheaval have influenced sexual behavior patterns [226]. To a certain extent, a delay of "formalized unions" is also seen as a contributor to the spread of STDs. "Free unions" constitute approximately 10-40% of all unions in Africa while 15-20% of first marriages are broken after 5-10 years duration [17].

STD infections tend to persist in core groups of individuals who practice high-risk behaviors (i.e., have many partners) and serve as reservoirs of infection. In Africa, core groups which have been identified include

INTRODUCTION

Sexually transmitted diseases (STDs) have long been a major cause of adult morbidity and mortality in Africa, resulting in serious health problems particularly for women and children. Now, with acquired immune deficiency syndrome (AIDS) causing inordinate amounts of morbidity and mortality in Africa and the implication of STDs in the transmission of the human immunodeficiency virus (HIV), it is time to readdress the STD problem with a new sense of urgency.

The actual number of persons in Africa infected with HIV, the virus that eventually causes AIDS, is not known. Neither do we know with any degree of reliability the percentage of the populace afflicted with sexually transmitted diseases because African governments have been unable or unwilling to develop disease surveillance systems which allow measurement of disease burden. STDs cause a higher incidence of long term complications and consequences in tropical regions than in any other regions of the world [8]. There is now increasing evidence that certain STDs are implicated in facilitating transmission of HIV.

This report provides an extensive epidemiology of STDs and illuminates possible interactions between them and HIV/AIDS. A number of studies are cited in support of the various hypothesized interactions. Detailed tables of STD prevalence in Africa are found in Appendix A. In Appendix B, recommendation for an STD data base, coupled with pertinent information to include in the data base, and suggestions for accompanying reports are presented. The rationale for and implications of implementing surveillance systems are explored in Appendix C. The natural history and treatment for each of the most common STDs in Africa are described in Appendix D. For more indepth clinical and treatment information on STDs, the reader is referred to several recent books and reviews: Wasserheit, Aral, Holmes, and Hitchcock [1], Piot and Holmes [8], and Piot and Tezzo [83].

The following table lists the more commonly-occurring STD pathogens with associated acute and chronic diseases which result from infection [2].

BACTERIAL AGENTS:

Pathogen	Acute Disease	Chronic Disease
Neisseria gonorrhoeae (gonorrhea)	cervicitis urethritis salpingitis	pelvic inflammatory disease ectopic pregnancy infertility
Chlamydia trachomatis (chlamydia)	same as gonorrhea	same as gonorrhea
Treponema pallidum (syphilis)	primary/secondary syphilis	neurosyphilis cardiovascular syphilis gumma
Haemophilus ducreyi (chancroid)	genital ulcer	impotence

A large percentage of the prevalence studies cited in this report are nonrepresentative of the general populations of these countries and are self-selected samples. Most of the research has been conducted amongst STD clinic patients and prostitute populations where infection rates are undoubtedly higher than in the general population. Those who do eventually participate may have certain demographic and socioeconomic characteristics not shared by those who do not participate. Generalizations of these results to the general population may be inappropriate. Nevertheless, STD patients could be considered representative of those in a population with multiple sexual partners even though the sample is self-selected. To the extent that people are reluctant to go to a clinic for treatment or self-treat, the sample is biased, and any inferences still need to be made with caution.

A number of studies have been carried out in populations of pregnant women. These women can be surrogates for a general population grouping even though the data are still subject to biases. Pregnant women tend to be at higher than average risk for sexually transmitted disease since they are sexually active. They also are younger than the overall female population, drawn from a narrow age range and overwhelmingly married. On the other hand, studies of pregnant women may actually under-estimate the prevalence of some STDs, since infertility is often a sequela of STDs in Africa.

A rigorous review of epidemiological methods used to study the interaction between STDs and HIV has been written by Mertens, *et al.* [228]. This review discusses in detail the issue of cofactors, study design and analysis in studying the association between STDs and HIV. The authors recommend the use of intervention studies to overcome many of the biases associated with observational studies.

HIV and STDs are generally both acquired through sexual activity, therefore sexual behavior is an important cofactor. The study design needs to control for the sexual behavior of the subjects, their age, the duration of any HIV infection (if a subject of the study), their baseline immune response and coinfection with other STDs. Misclassification of confounding variables may lead to either an overestimate or underestimate of the extent of the association between STDs and HIV [228]. The number of exposures to STD pathogens rather than actual presence or absence of pathogens at the time of the study may be the real risk factor for HIV infection and/or progression [16]. There is a risk of misclassification and underdetection of STDs in studies of women because women with STDs are largely asymptomatic [235]. Therefore, asymptomatic STD cases and the usual resource constraints may make it difficult to reach definitive conclusions of STD/HIV interactions under the best of circumstances.

Prevalence studies (case-control or cross-sectional studies) cannot establish causality between STD and HIV infection nor obtain true incidence rates for the various diseases. Since HIV is an STD and is transmitted in the same way, the presence of another STD could merely be a marker for high-risk behavior rather than a causal link in HIV transmission. A number of cross-sectional studies are focused on high-risk populations, reducing the number of patients that need to be studied. However, care must be taken in generalizing the results of these studies to the general population as there may be major differences in risk factors and cofactors [228].

Longitudinal studies are required in order to establish both temporality and incidence. Randomized controlled trials which include a comparison group are ideal in this regard. Unfortunately, there are few studies that utilize a comparison group for control purposes, mainly due to cost constraints. The question of including comparison groups is probably the single most important consideration for researchers when they design their studies. Two other problems which affect all longitudinal studies include: 1) the ethical issue of treating the STDs promptly as they occur therefore reducing the likelihood of detecting any association between STDs and HIV, and 2) the frequency of HIV testing and the accuracy of data on the time STDs were acquired [228].

Even prospective studies may not be able to establish a temporal sequence due to the delay between HIV infection and the development of antibodies [229]. Some researchers believe that a community intervention study is the only design that will establish a causative association between STDs and HIV. This study design is extremely complex and costly. The unit of study is the community, and a comparison community is needed to

prostitutes, male clients of prostitutes, STD patients, long-haul truckers, military personnel and migrant workers. Core groups, by definition, do not have to be large in number. Their size may be unique to each STD because some STDs require higher partner change rates to maintain their prevalence than do other STDs. For example, to sustain gonorrhea the size of the core may need to be smaller than that needed to maintain chlamydia due to the lower infectivity (per contact) of chlamydia [2].

Provided that core individuals limit their sexual interactions to other core members, the potential for epidemics of STDs outside of the core is lessened. In reality, though, we know that these individuals normally do not restrict their activities solely to other high-risk individuals. They also have relations with those not considered to be in high-risk groups. Such is the situation in many parts of the world where clients of prostitutes generally infect their spouses or long term partners. The extent of sexual mixing and behavioral characteristics of the population are strong determinants of the resultant prevalence levels. The more sexual partners one has, the greater the likelihood of encountering high frequency transmitters of STD pathogens [14].

Accurate generalizations about sexual behaviors are difficult to make. However, two major modes of sexual networking operate in Africa and may very well apply to other regions. The first is the common situation of a patrilineal society where men maintain a strong control over women. Women give up their ties to their families, while marriages are secure and divorce is rare. The majority of pre-marital and extra-marital urban sexual relations involve a small core of female prostitutes with a large and overlapping male clientele [226]. Women, on the other hand, are not granted the same amount of sexual freedom by society.

The second network finds women more independent and educated. Marital stability is weaker with both sexes having fluid sexual partnerships with others, and the role of prostitution is less clear within this pattern of behavior. What this means for STD infection levels remains uncertain. However, there is evidence that in areas where the second behavioral pattern predominates, STD levels are generally lower. For example, in Rwanda, which has a patrilineal society, STD levels are higher than in neighboring Zaire, where people carry on freer relationships with each other [176].

In general, the double standard is very strong, with many societies not even recognizing that men can commit adultery and others merely putting some limits on men's extra-marital sexual behavior [226]. Women in many regions of the world have very little control over the conduct of sexual relations. There are existing inequalities between the sexes which lead to behavioral practices that impart higher infection levels in women. If women become more equal partners in their relationships with men, we may, perhaps, witness a drop in future infection levels.

DATA QUALITY AND STUDY DESIGN CONSIDERATIONS

For epidemiological purposes, data on incidence are preferable to data on prevalence. Incidence is the number of new cases of an STD which occur during a specified time period and is the measure most useful to studies of causal factors. Prevalence rates, on the other hand, provide an estimate of the proportion of people in the community with a given disease at a given point in time. But although incidence studies are preferable, they are more difficult to implement due to field conditions and methodological difficulties. Incidence rates are dependent upon complete case reporting, and this is clearly not the case in Africa due to the lack of facilities and resources for diagnosis and treatment. Low literacy, poor communication systems, language barriers, ethnic differences and internal conflicts all impinge on the most carefully planned study. Hence, most of our knowledge about STDs in Africa is gained through ad hoc prevalence surveys.

Biases introduced into the study design -- insufficient sample size, nonrepresentative samples, geographical bias, unreliable and invalid tests resulting in misdiagnosis, nonresponse to survey questions, recall bias, self-selected samples, intentional or unintentional misclassification of responses (particularly relevant to sex-related research) -- and the extent of such biases, may invalidate study results.

High levels of chlamydial infection were found within the prostitute group and STD patients. Among men attending STD clinics, half the studies reported rates above 12.5 percent. Among prostitutes, the median rate was similar, 13 percent, with infection levels over 50 percent reported in Rwanda and Côte d'Ivoire.

Trichomoniasis infection rates were similar among all three groups. The median rate among women of reproductive age was 16 percent, among men attending STD clinics the median rate was 14.5 percent and among prostitutes, the median rate was 18.5 percent.

disentangle the effects of other factors. Several intervention and control communities are required because any difference in HIV incidence may be due to underlying differences of risk. Baseline surveys are required along with the monitoring at regular intervals. There are also the issues of contamination (people from control communities travelling to intervention communities for treatment) and compliance [228]. Some community intervention studies are currently underway [184]. In the meantime, HIV infection continues to spread.

STD PREVALENCE IN AFRICA

The STD tables found in Appendix A summarize results of an extensive literature review designed to collect prevalence figures for those STDs that cause a large proportion of morbidity in Africa. Although there are many limitations of these data as described earlier, in the aggregate, they provide valuable information.

It is difficult to ascertain consistent patterns in the STD prevalence data. Even within the same population groups, much variability was discovered. However, some patterns can be described.

Rates of gonorrhea among women of reproductive age range from one percent to as high as 33 percent. However, half of the studies report gonorrhea prevalence levels of 4 percent or less among this group. In a study of infertile women in Banjul, 65 percent of the women were found to be infected with gonorrhea. One of the major consequences of gonorrhea, however, is infertility and this study may be biased towards women with gonorrheal infection. In Nairobi, where HIV infection levels have reached 15 percent among pregnant women as of 1993, 1991 and 1992 rates of gonorrhea infection range from 6 to 10 percent (Map 1). In Senegal, where the levels of HIV infection have remained low among this population group, the rates of gonorrhea infection reported from the sentinel surveillance program have ranged from 1 to 4 percent during the early 1990's.

Higher gonorrheal prevalence was found within STD patients (the median rate was 20 percent) and prostitute populations (the median rate was 23.5 percent). The risk of infection from an STD is higher among those who have multiple sexual partners.

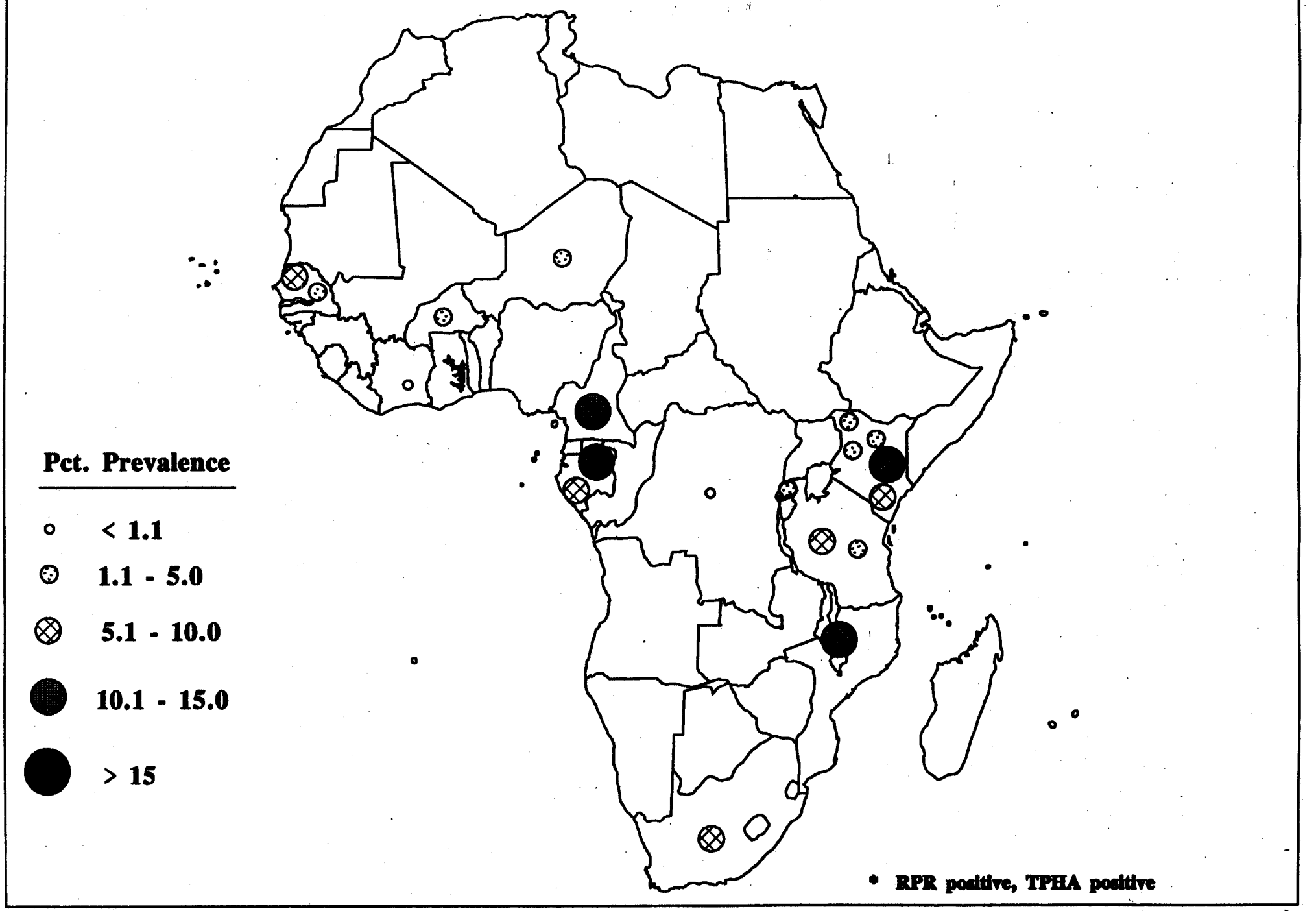
Looking at rates of active syphilis (positive results for both TPHA and RPR or VDRL tests), overall prevalence was fairly low among women of reproductive age (half of the studies reported rates of 6 percent or less). However, four areas reported prevalences rates over 10 per cent, Kajiado District, Kenya, 12 percent; Yaoundé, Cameroon, 15 percent; Estuaire, Gabon, 12 percent; and Blantyre, Malawi, 11 percent (Map 2). Syphilis prevalence rates in Kajiado District, Kenya, increased from 2.5 percent in 1989 to 12 percent in 1992. In Nairobi, Kenya, active syphilis rates increased from 4 percent in 1989/90 to 6 percent in 1992/93. Women run a high risk of serious consequences to their fetus if they acquire syphilis while pregnant or become pregnant in the early stages of disease.

Active syphilis infection within the STD patient group was higher than among pregnant women with a median rate of 13.5 percent. Prostitutes have the highest rates of active infection with a median rate of 22.5 percent. Among lorry drivers, a group generally associated with multiple sexual partners, active syphilis levels ranged from 4 to 14 percent with median rate of 7 percent.

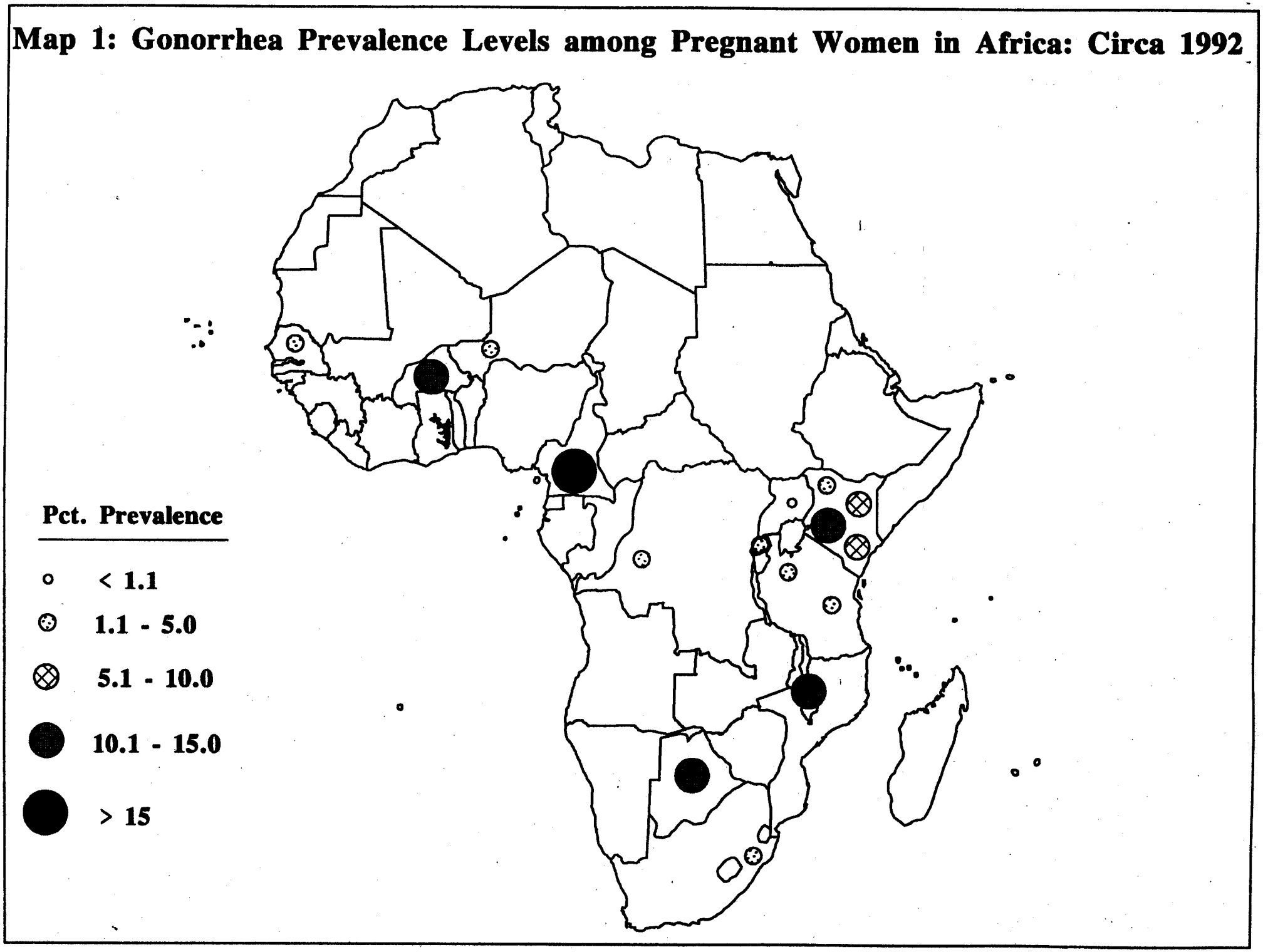
Unfortunately, few studies investigating chancroid infection among women of reproductive age were located. In the STD patient group, the median rate was 15.5 percent. In the prostitute group, levels were unexpectedly low; the median rate among prostitutes was 4.5 percent. More data on chancroid levels needs to be collected, especially since it appears to be implicated in HIV transmission, before any trends can be spotted.

Among women of reproductive age several studies reported rates of chlamydial infection over 40 percent. However, some of these were studies of infertile women and women attending family planning clinics. Since chlamydia results in infertility, these studies may be biased. Excluding these studies, the median rate for chlamydia infection in this group is 7 percent.

Map 2: Syphilis* Prevalence Levels among Pregnant Women in Africa: Circa 1992



Map 1: Gonorrhea Prevalence Levels among Pregnant Women in Africa: Circa 1992



There are biological plausibilities for these mechanisms. Under the theory of epidemiological synergy, there is increased presence of lymphocytes and macrophages when one is infected with certain STDs. These cells are targets of HIV infection. In the HIV-negative individual with genital ulceration, there are more target cells available to infect. In the HIV-seropositive person who also has a genital ulceration, the presence of extra HIV target cells serve as a means for further autoinoculation with HIV. The ulcerations are further exacerbated by HIV infection and their pathogens are passed on to the next person. HIV has been isolated from the surface of genital ulcers and from cervical and vaginal secretions [243,244]. Especially for women, the presence of genital ulcers increases the risk of HIV infection. With men, the lack of circumcision, concomitant with genital ulcers, serves as a cofactor in HIV acquisition. In addition, for women, disruption of the epithelial cells in the genital tract is common. Early sexual activity is more conducive to this epithelium breakage due to immaturity of the genital tract cells. This has profound implications for Africa since the cultural pattern is one of relationships between older men, with many different sexual partners, and young women [156]. In the presence of genital ulcer disease (GUD), bleeding is easily induced during sexual intercourse. A portal of entry for the HIV virus is then present, making infection easier.

It is reasonable to think that the immune systems of Africans are in a continually activated state due to generally poor health, making these individuals more susceptible to a whole multitude of maladies, including HIV/STD. Repeated reactivation of T lymphocytes may weaken the body's immune response towards HIV acquisition and/or progression of HIV. Immunosuppression by HIV can alter the natural history of the STDs [16].

Circumcision and its association with HIV and STD transmission has been an issue for some time. A review of epidemiological studies by Moses, *et al.* [230], identified 30 relevant studies concerning circumcision and HIV transmission. Eighteen cross-sectional studies from 6 countries reported a statistically significant association between circumcision and HIV transmission on univariate or multivariate analysis, four reported a trend towards an association and four studies found no association. Two prospective studies in Kenya reported significant associations as did two ecological studies from sub-Saharan Africa. The two ecological studies by Moses, *et al.* [231] and Bongaarts, *et al.* [232], relate male circumcision status as recorded for sub-Saharan ethnic groups with HIV seroprevalence data from the literature and from the *HIV/AIDS Surveillance Data Base* [231,232]. In locations where male circumcision is practiced, HIV seroprevalence is considerably lower than in areas where it is not practiced. However, these analyses are based on anthropological studies conducted between 1920 and 1950. The desire for a study of a homogeneous group, in which some men are circumcised and others are not, is not possible in Africa where circumcision divides along ethnic borders [233].

There are very few studies that look directly at circumcision and STDs. A study in the U.S. at a public health STD clinic found the prevalence of current syphilis was higher in uncircumcised men than in circumcised (OR=4.0 95% CI=1.9,8.4)[1], as was the prevalence of gonorrhea (OR=1.6, 95% CI=1.2,2.2) [234]. A study of genital ulcers in Kenya reported a higher prevalence among the ethnic group which is traditionally uncircumcised [95]. Although one of the best longitudinal studies linking HIV transmission to STDs was not able to disentangle GUD from lack of circumcision with the increased risk of HIV seroconversion[2], 71% of uncircumcised men compared with 43% of circumcised men presented with genital ulcer disease (OR=3.2, 95% CI=1.8,5.7) [139]. A case-control study from the same population group (men presenting with an STD) confirmed that chancroid and other genital ulcer disease develop more commonly in uncircumcised men [140]. However, uncircumcised men were at a higher risk of HIV infection only if they did not report a history of

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[1]Odds Ratio, OR, is the ratio of the odds of exposure among the cases to the odds in favor of exposure among the controls. Confidence Interval, CI, a range of values surrounding the estimate which have a specific probability of including the true population value.

[2]Seroconversion is the onset of measurable antibodies against the virus found in blood or other tissues usually occurring two months after acquisition of the infection.

INTERACTIONS/LINKS BETWEEN HIV AND OTHER STDS

Both HIV and the traditional STDs share a common mode of transmission through sexual contact. They share the same behavioral risk factors. Since HIV is also an STD, it makes intuitive sense that there might be some connection between HIV infection and infection with other STDs. In 1984, health authorities in Kinshasa, Zaire reported that 50% of AIDS cases had a past history of STD compared to 14% of controls [14]. A past history of STDs in HIV/AIDS infected persons was reported at 35% in Tanzania and 70% in Rwanda [14]. In Zimbabwe, 75% of male AIDS cases reported a past history of STD infection and 51% of female AIDS cases report such a history [15].

The proportion HIV seropositive among STD clinic attenders compared to the overall population was 9.2% vs. 4.4% in Tanzania, 29% vs. 9% in Zambia, 18.5% vs. 4.3% in Burundi and 30% vs. 1.4% in rural Rwanda, respectively [15]. Studies have also shown that the association between STDs, in general, and HIV became stronger with increasing episodes of STD infection [155]. This association was independent of the actual number of sexual partners.

Several review articles on the interaction between HIV and other STDs have been published. Three mechanisms are mentioned in the literature which explain in what manner STDs and HIV interact with one another. The first is termed "epidemiological synergy" [16]. Under this mechanism, coinfection with HIV prolongs or augments infectiousness of the person with the STD. The STD further facilitates HIV transmission, at the community level. The two infections, thus, mutually reinforce one another. The data available at this point suggest that this mechanism may be applicable to interactions between chancroid, genital herpes and syphilis (the genital ulcerations) and HIV. In fact, chancroid and syphilis are regularly implicated in HIV transmission. Wasserheit [16] discusses in detail the issue of epidemiological synergy. Further discussions on epidemiological synergy can be found in Clottey and Dallabetta [235].

The relationships postulated between HIV and other STDs are summarized in the following table [16]:

STD ⇔ HIV "epidemiological synergy"	STD → HIV STD increases HIV	STD ← HIV HIV increases STD
chancroid	gonorrhea	genital warts
genital herpes	chlamydia	hepatitis B
syphilis	trichomoniasis	

The second mechanism acts in a unidirectional fashion in which the STD may promote HIV transmission but HIV infection does not cause an increase in the prevalence of the STD. The data available suggest that gonorrhea, chlamydia and trichomoniasis may behave in this fashion.

The third mechanism is also one which operates in a unidirectional fashion but represents the traditional opportunistic infection pattern. Probabilities that the STD promotes HIV transmission are low but HIV infection may alter the natural history of the STD. Genital warts and hepatitis B may be implicated here.

Cameron and Padian [229] focus on the second and third mechanisms and the issue of "core groups." They discuss the biological interaction that some STDs facilitate the transmission of HIV and secondly, the mechanism by which HIV may increase the virulence of some STDs. Laga and others [225], review the current epidemiological data of STDs in Africa, the link between STDs and HIV, the impact of these interactions and possible control strategies.

prevalence levels of chancroid are high, interventions to prevent the transmission of chancroid such as condom use would significantly impact transmission of HIV.

Syphilis

A majority of cross-sectional studies have found significant associations between HIV infection and *T. pallidum* antibodies. HIV infection was associated with TPHA+ reaction in studies of pregnant women in Kinshasa, Zaire, [33] Yaoundé, Cameroon, [153] and Malawi [236]; and among STD clinic patients in Zimbabwe [152] and in Cameroon [133]. HIV antibodies were weakly associated with active syphilis in a study of STD patients in Uganda but not significantly associated with past or positive serological evidence of syphilis [35]. Another study in Uganda of inpatients and outpatients from 15 hospitals found HIV to be significantly associated with reported syphilis [149]. In a random selection of population in Mwanza, Tanzania [148], the presence of syphilis was associated with HIV infection. After adjustment for risk variables linked to sexual behavior, a cross-sectional study of gynecological inpatients in Dar es Salaam found syphilis infection associated with a more than two times higher risk of HIV infection [260]. In the previously-mentioned study of male STD clinic patients in Abidjan [32], positive TPHA was associated with HIV. Thirty-three percent of HIV-seropositive pregnant women were RPR positive compared to 9.5% of HIV-seronegative pregnant women ($p<0.05$) in a case-control study in Soweto, South Africa [177]. In a case-control study of women attending family planning clinics in Nairobi, syphilis serology (RPR) was associated with a threefold increase in HIV infection [249].

In a prospective study of pregnant women in Nairobi, Kenya [115], HIV-seropositive women were more likely to be seroreactive for syphilis than HIV-seronegative mothers. However, the OR of the association between RPR and HIV antibody prevalence decreased over the three year length of the study. HIV seroprevalence rate was high among the syphilis-seroreactive women but did not increase over the study period, nonetheless, HIV infection rose from 6.9 to 12.5% in the syphilis-seronegative group. This study concluded that although the high-risk populations may be approaching a stable HIV seroprevalence, infection among the low-risk population continues to increase.

A cross-sectional study of STD clinic patients in Yaoundé, Cameroon, [103] found no association between clinical genital ulcers and HIV seropositivity but found a positive serological test for *T. pallidum* associated with HIV seropositivity.

A few cross-sectional studies found no significant associations between syphilitic antibodies and HIV infection including a study of Zambian prisoners [124], prostitutes in Moshi and Arusha, Tanzania [98], outpatients in southwestern Uganda [99], or in STD patients in Mbeya, Tanzania [154]. In one of these studies [99], an association was found between syphilis seropositivity and the presence of Hepatitis B markers.

A number of studies in Kinshasa, Zaire have found no association between syphilis and HIV infection. Two cross-sectional studies, one among pregnant women and one among prostitutes, found that the prevalence of syphilis was not higher in HIV-positive women compared with HIV-negative women [109,110]. HIV-negative prostitutes from the cross-sectional study were enrolled in a prospective cohort study [142] with similar results; there was no significant difference between cases and controls in the presence of syphilis conversion. The incidence of syphilis was similar in HIV-negative and HIV-positive women in a prospective study of pregnant women in Malawi [187].

The prevalence of syphilis and serological response to standard therapy did not differ in HIV-positive and HIV-negative prostitutes in Kinshasa [66]. In a case-control study in New York, HIV-positive patients with primary syphilis were less likely to be considered a 'serological success' than patients with primary syphilis who were HIV negative [300]. However, HIV-infected patients with secondary syphilis were no more likely to be either 'serological failures' or 'serological successes' compared with HIV-negative controls. In a review of major works on syphilis, secondary syphilis in HIV-infected patients appeared to respond only slowly to appropriate

genital ulceration. No effect of circumcision on HIV infection was observed among those men with a history of genital infection.

In a case-control study of women attending family planning clinics in Nairobi, having a husband (or partner) who is uncircumcised was a strong independent risk factor for HIV infection (OR=2.9 after controlling for potential confounders) [249]. In a population-based survey and a case-control study from the same population in Masaka, Uganda, Muslims had lower risks than non-Muslims of HIV infection (OR=5.4) [250,251]. Male circumcision in this population is not practiced outside the Muslim community.

A cycle appears to be emerging in which genital ulcer disease enhances HIV transmission, HIV infection increases genital ulcer disease frequency, and the lack of male circumcision augments the transmission of both [242]. The interpretation of most of these results is limited by the poor assessment of sexual behavior and other potential confounders, such as hygienic behaviors [248].

For the following discussions on the interactions between HIV and the ulcerative and non-ulcerative STDs please refer to Tables 1. and 2.

GENITAL ULCER DISEASE

Chancroid

The available data overwhelmingly support a significant association between the genital ulcerations, or genital ulcer disease (GUD), including chancroid, and HIV infection. Chancroid, in particular, has been found to be a true risk factor for HIV transmission and acquisition rather than simply being a marker for high-risk behavior. Among several cross-sectional and case-control studies, three studies showed an association between a past history of GUD and HIV infection: a study of truck drivers in Nairobi, Kenya [82], among men attending an STD clinic in Nairobi [137], and from a random sample of people from Mwanza, Tanzania [148]. In a population-based survey and a case-control study from the same population group in Masaka, Uganda, a recent history of genital ulcer was found to be a significant risk factor for HIV infection in adults [250,251].

Several other studies report an association between the presence of GUD and concurrent HIV infection: in Kampala among male and female STD clinic patients [143], and among male STD clinic patients in Durban, South Africa [147]. A cross-sectional study of male STD clinic attenders in Zimbabwe showed that male-to-female transmission of HIV is facilitated by the presence of genital ulcers in infected men [146]. Another cross-sectional study in Abidjan among male STD clinic attenders found prior and current genital ulcers to be associated with HIV [32]. In a cross-sectional study of patients from 15 Uganda hospitals, chancroid was associated with HIV infection [149].

Chancroid was the primary cause of ulcers in the study of male STD clinic patients in Nairobi where a history of GUD and current GUD was associated with HIV infection [140]. In a case-control study of men in Nairobi presenting with chancroid, the HIV-positive group had more ulcers per patient and treatment failure at day 7 was more common in the HIV-positive group [302,303]. In two prospective studies in Nairobi, men presenting to an STD clinic with GUD were nearly 5 times as likely to seroconvert [139] and female prostitutes with GUD had a threefold increase in the risk of HIV seroconversion [145].

Prevalence of GUD (including chancroid) is lower in Kinshasa compared to Nairobi. Two studies in Kinshasa, a cross-sectional study of pregnant women [33] and a prospective study of prostitutes [142] did not find a significant association between GUD and HIV.

Based on these studies, it is clear that chancroid is a true risk factor for HIV infection. Close monitoring of chancroid serology could potentially aid in assessing the spread of AIDS in Africa and afford the opportunity to help control these illnesses. This means a renewed emphasis on detection of this STD. In areas where

HIV-positive and HIV-negative women [109,23]. Cross-sectional studies of prostitutes in Tanzania [98], male blood donors in Zimbabwe [159], and pregnant women in Kigali, Rwanda [183] found no association between gonococcal infection and HIV seropositivity. Also, a prospective study of pregnant women in Nairobi, Kenya [115] found no difference in gonococcal infection between HIV-positive and HIV-negative women.

However, other studies are finding an association between gonorrhea and HIV infection. A study to determine the level of STDs in Mwanza, Tanzania found genital discharge as a risk factor for HIV infection [148]. A cross-sectional study in Uganda, focusing on a history of gonorrhea, [149] found a greater likelihood of HIV infection with increasing number of gonorrhea episodes. A history of gonorrhea was significantly correlated with HIV infection in spouses of HIV-infected people [155]. A prospective study of HIV-negative prostitutes in Kinshasa [142] found incident gonorrhoea was associated with an increased risk of HIV seroconversion even after number of partners and level of condom use were considered. In Malawi, a cross-sectional study of pregnant women found HIV infection significantly associated with gonorrhoea [236] and a prospective study of pregnant women found incidence of gonorrhea significantly higher among HIV-seropositive women [187]. A cross-sectional study of women attending family planning clinics in Nairobi found that both a history of gonorrhea and a positive gonorrhea culture were associated with a twofold increase in HIV infection [249].

Early studies did not find an association between gonorrhea and HIV transmission. However, as discussed above, several recent studies have documented gonorrhea as a risk factor. Condom use is effective in preventing the transmission of gonorrhea and as a result would impact on the transmission of HIV.

Chlamydia

Overall, evidence demonstrating a link between chlamydia and HIV infection is scanty, at best. Cross-sectional or case-control studies of pregnant women in Kinshasa [33,110], female prostitutes in Kinshasa [109], prostitutes in northern Tanzania [98], and STD clinic patients in Nairobi, Kenya [166] found no association between chlamydia and HIV serostatus.

A prospective study of high-risk women in Kinshasa, however, did find incident chlamydial infection associated with an increased risk of HIV seroconversion in women [142]. Two other studies [162,177] found significant differences between HIV positive and negative individuals and presence of chlamydial infection. This might be attributable to an accompanying inflammatory response associated with chlamydial infection, which attracts lymphocytes. Generally, any STD that causes inflammation and/or erodes tissue may facilitate HIV transmission.

There are currently no published data which authoritatively document any changes in the natural history of chlamydial infection as a result of HIV infection [16]. Condom use is effective in preventing sexual transmission of chlamydia. Further research is urgently needed in light of the fact that chlamydia appears to be on the rise worldwide.

Trichomoniasis

Research linking trichomoniasis with HIV is limited. Neither are there any published data which have documented change in the course of infection when one is infected with HIV [16]. Trichomoniasis remains the least well studied of the common STDs although it is fairly prevalent in Africa, particularly amongst women.

A few studies have documented an association between trichomoniasis and HIV infection. A prospective study of pregnant women in Malawi found only trichomoniasis as a risk factor for seroconversion [261]. A cross-sectional study of pregnant women in Kinshasa, Zaire, manifested an association between trichomoniasis and HIV [33]. After adjusting for sexual behavior, a cross-sectional study of gynecological inpatients in Dar es Salaam found trichomonas vaginalis infection associated with nearly three times higher risk of HIV infection [260]. A prospective study of prostitutes in Kinshasa found incident trichomoniasis associated with an increased

treatment and the incidence of neuro-syphilis in HIV-infected patients and those at high risk for HIV infection had greatly increased [301].

A majority of studies found a relationship between syphilis and HIV infection. Condom use has limited effectiveness in reducing the transmission of syphilis since condoms may not prevent direct contact with other infectious lesions. On the other hand, syphilis is easy to diagnose and treat. Interventions to screen and quickly treat patients with syphilis would have an impact on the transmission of HIV.

Genital Herpes

Herpes simplex 2 virus (HSV) is the other major genital ulceration found in Africa. However, it may only cause 5-15% of ulcerations in the region [164]. These infection levels do not approach those seen in the industrialized nations. Few studies contained a discussion of interactions between HIV and herpes and they offer conflicting conclusions.

Studies reviewed suggest that herpes may be an independent risk factor for HIV infection. A case-control study of patients attending sexually transmitted disease clinics in the U.S. found HSV infections associated with an increase risk of HIV (OR=2.0, 95% CI=1.2-3.2) [138]. A cross-sectional study of prostitutes in Kinshasa, Zaire, reported HSV as the identifiable cause of 12% of GUD, [109] and that HSV was more common among HIV positive women (96% vs 76%). A study conducted in Zimbabwe found that a past history of herpes in the man was a factor for HIV serologic concordance between married couples [15].

Herpes is characterized by lesions located on or in the genital areas of both sexes but transmission may not be as efficient as chancroid is in promoting HIV because herpes lesions recur only on an occasional basis. The possible impact of HIV on herpes simplex includes larger lesions, longer duration, a higher recurrence rate of genital herpes and an increased incidence of acyclovir resistance [225]. However, a case-control study of women found no such association [162]. Yet another study suggested neither frequency nor severity of herpes simplex infection was affected by HIV infection [163].

NON-ULCERATIVE STDS

Gonorrhea

At first, studies of the association between gonorrhea and HIV transmission were fairly inconclusive and results were mixed. The relationship between bacterial STDs, as a whole, and HIV has received little attention from researchers, and mechanisms operating remain poorly understood. Gonorrhea is usually evidenced through urethral discharge and lower genital tract infection. There are no data which indicate that HIV infection alters the clinical presentation of gonorrhea or chlamydia [16]. However, there are some indications that previously acquired HIV infection may promote development of gonococcal complications, such as pelvic inflammatory disease (PID) and increase in penicillin resistant strains of gonorrhea [16]. In Nairobi, a prospective study of prostitutes found that HIV-positive women were three times as likely to acquire cervical gonorrhea and about three times as likely to acquire gonococcal PID than were HIV-negative women [151]. One study suggests that HIV infection may alter the clinical course and response to therapy of PID [245]. Two other recent studies, one from the U.S. and one from Abidjan, Côte d'Ivoire, suggest that HIV prevalence is high in women with PID, that the illness is more severe at presentation in HIV-positive women but the response to therapy is similar [246,247].

Many of the studies reviewed for this paper did not find significant differences between HIV seropositive and seronegative individuals and current gonococcal infection [155]. In Zaire, cross-sectional studies of pregnant women showed no difference in current gonococcal infection and HIV seropositivity [33,110,181]. Two other studies of high-risk women in Kinshasa, one cross-sectional the other prospective, concluded that there was no significant association between current gonococcal infection or the incidence of gonococcal infection between

confounding the results. A cross-sectional study in Sudan found that one risk factor for HBV seropositivity was a positive serology for syphilis but found no association between HIV and HBV itself [10]. Therefore, HBV infection may interact with HIV in the presence of syphilitic infection.

Most of the studies reviewed did not find significant differences between HIV-positive/negative people and frequency of HBV markers: a prospective study in Guinea-Bissau [173], and cross-sectional studies in rural areas of Uganda and Burundi [100], in Tanzania [126], of blood donors in Brazzaville, Congo [174], and among women attending STD clinics in South Africa [177].

risk of HIV seroconversion in women [142]. However, two cross-sectional studies in Kinshasa, one of prostitutes [109] and one of pregnant women [110] revealed no significant associations between trichomonas infection and HIV serostatus.

Human Papilloma Virus (Genital Warts)

Cervical cancer is among the most common malignancies in developing countries and the most frequent cancer in women in East Africa. Significant positive association between HIV infection and cervical neoplasia was found in a case-control study of family planning clinic attenders in Nairobi, Kenya [238]. Human Papilloma Virus (HPV) infection is strongly associated with the development of cervical dysplasia and cancer [237]. Strong evidence exists that HIV facilitates infection or persistence of HPV infection [241]. Multiple studies utilizing comparison groups illustrate an increased progression to dysplasia/neoplasia, decreased responsiveness to therapy resulting in increased HPV infection as HIV infection worsens [239,240,241]. However, there is little research showing that HPV actually facilitates HIV transmission. In fact, no well-designed prospective study demonstrating this is available [16]. HPV simply may be a traditional opportunistic disease in the HIV infected.

Two cross-sectional studies of pregnant women in Malawi demonstrated a significant association between a history of warts [167] or current genital warts [236] and HIV infection. A marked association between HIV and cervical dysplasia, caused by HPV, was demonstrated through a case-control study conducted in Senegal [169]. Another study in Senegal of high-risk women presenting to STD clinics found an association with HIV and the detection of HPV [283]. A prospective study of prostitutes in Zaire showed an association between low CD4 counts and incidence or recurrence of genital warts [23]. Surprisingly, a cross-sectional study of post-partum women found an inverse relationship between the severity of HPV infection and level of immunosuppression caused by HIV [168]. However, they did find that HIV-infected women have a higher risk of cervical squamous intraepithelial lesions (SIL) than uninfected ones, and that women co-infected with HPV and HIV with CD4 cells over 500 had almost three times the risk for abnormal cytology than HIV-negative, HPV-positive women. A cross-sectional study of Zairian prostitutes [109] found higher prevalence of HPV amongst HIV-positive women but called for further research since the cytologic evidence remained unclear and the temporal relationships unknown.

Although a case-control study in Tanzania of cancer patients found HPV significantly higher in the HIV-positive than in the HIV-negative patients, it did not show an increase in the rate of cervical cytological abnormalities [237]. The researchers felt these results may be due to dysplasia measurement difficulties or the time lag between HIV infection and its potential cancer-promoting effect. A prospective study of prostitutes in Nairobi found no association between genital warts and HIV infection [151]. A case-control study of prostitutes in Nairobi also did not find an association with HIV and the risk of cervical HPV [256].

Hepatitis B Virus

The majority of findings are inconclusive regarding the relationship between HIV and Hepatitis B virus (HBV) infection. It is possible that HBV may be reactivated in HIV patients or there may be increased susceptibility of developing a highly infectious HBV state in those people with HIV infection [170].

A study in Uganda showed that HBV exposure in adults was significantly associated with a history of STDs [170]. However, it could not be determined if prior parenteral treatment of STDs was a confounder. A study of HIV-infected Zairian patients indicated that HIV infection may increase the rate of HBV replication and result in more persistent infection, exposing people to a greater risk of liver cancer and other serious long term consequences [171]. Presence of HBV markers were found to be strongly associated with HIV antibodies [44]. Thus, HBV and HIV could be acting as cofactors for each other's transmission but which occurs first is unclear. A cross-sectional study in southwestern Uganda found an association between a history of STDs and seropositivity for HBV but not HIV [99]. Once again, however, parenteral treatment for STDs may be

Table 1. Cross-sectional studies investigating the association between sexually transmitted diseases (STDs) and HIV infection contd.

Study population and location	Evidence of current/previous STD		Crude		Adjusted		Adjusted for
	HIV seropositive	HIV seronegative	OR	CI	OR	CI	
Women attending STD clinic, Johannesburg (case-control) [177]							
sS	33.3	9.5		S			
C	95.2	71.4		S			
Men attending STD clinic, Kampala [143]							
U	49	48	1.04	0.54-2.02			
GU	41	24	2.21	1.08-4.53			
Women attending STD clinic, Kampala [143]							
U	6	16	0.35	0.04-1.84			
GU	22	3	8.54	1.45-87.55			
Population based survey, Masaka District [250]							
hGU			3.4	2.2-5.3	3.6	1.7-7.7	
Random sample of Adults, Mwanza [148]							
sS			1.8				
hGU			1.8				
hU			2.9				
Gynecological inpatients, Dar es Salaam [260]							
sS	32.6	13.7			2.6		
T	43.2	22.8			2.96		
Prostitutes, Kinshasa [109]							
S	16	15		NS			
TPHA	31	27		NS			
G	25	22		NS			
C	15	12		NS			
T	25	20		NS			
GU	9	3			2.32	1.05-5.13	
HD	82	57			4.31	2.53-7.32	
HSV-2	96	76		S			
HPV	11	5			2.30	1.14-4.63	
Childbearing women, Kinshasa [33]							
T	20.4	15.6		S			
C	7.7	4.7		NS			
sTPHA	6.2	2.1		S			
sS	2.8	1.3		S			
G	1.4	1.4		NS			
GU	1.8	2.1		NS			
Pregnant women, Kinshasa [110]							
T	23.3	16.8		NS			
G	3.6	1.7		NS			
C	7.1	6.2		NS			
S	3.4	0.8		NS			

OR, odds ratio; CI, confidence interval; C, chlamydial infection; G, gonorrhoea; GU, genital ulcer; GW, genital warts; HB, hepatitis B, HD, *haemophilus ducreyi*; HSV-2, herpes simplex; PID, pelvic inflammatory disease; S, syphilis; U, urethritis; T, trichomoniasis; h, history of STD; s, serological marker for STD. No prefix indicates current infection.

Table 1. Cross-sectional studies investigating the association between sexually transmitted diseases (STDs) and HIV infection

Study population and location		Evidence of current/previous STD		Crude		Adjusted		Adjusted for
		HIV seropositive	HIV seronegative	OR	CI	OR	CI	
Patients attending STD clinic, Yaoundé [103]								
	sTPHA	57.1	35.3	2.4	1.1-3.0			
Men reporting to STD clinic, Abidjan [32]								
HIV-1	GU	30	10	8.3	5.3-13.0	2.2	1.4-3.5	
	hGU	42	23	2.5	1.7-3.4	2.0	1.5-3.1	
	sTPHA	20	13	1.7	1.1-2.6	1.8	1.4-2.8	
HIV-2	GU	22	10	2.6	NS			
	hGU	44	23	2.7	1.2-6.2	2.4	1.1-5.4	
	sTPHA	33	13	3.3	1.4-8.0			
HIV-1&2	GU	40	10	6.1	2.9-13.2	2.9	1.2-6.6	
	hGU	40	23	2.3	1.1-4.7			
	sTPHA	37	13	3.9	1.8-8.4	3.9	1.8-8.3	
Women attending family planning clinics, Nairobi (case-control) [249]								
	sRPR	14.5	4.7	3.4	1.7-6.6	3.1	1.6-6.1	
	T	12.2	4.8	2.8	1.7-4.4	2.4	1.5-3.8	
	hG	11.5	4.5	2.8	1.8-4.2	2.1	1.4-3.3	
Women attending family planning clinics, Nairobi (case-control) [238]								
	CIN			2.78	1.32-5.85			
Men reporting to STD clinic, Nairobi [137]								
	hGU	63.2	31.3	2.35	1.01-5.47			
	HD	57.9	72.9		NS			
	sS	0	3.1		NS			
	HSV-2	15.8	7.3		NS			
	G	5.3	6.3		NS			
	C	0	1.0		NS			
Men reporting to STD clinic, Nairobi [140]								
	hU	57.8	46.3		NS			
	hGU	63.1	19.2	7.2	3.8-13.8			
	U	44.7	53.9		NS			
	GU	63.1	45.6	2.0	1.0-4.1			
Long distance truck drivers, Nairobi [82]								
	hGU	34.5	15.9	2.72	1.11-6.82			
Pregnant women, Malawi [236]								
	hG	3	1	2.4	S			
	hS	5	3	1.69	S			
	hGU	3	1	2.12	S			
	hGW	5	2	2.92	S			
	sG	11	3	3.69	S			
	sT	47	28	2.26	S			
	sS	16	10	1.79	S			
	GU	11	6	2.12	S			
	GW	8	2	4.13	S			
Pregnant women, Malawi [167]								
	hS	6	3	2.28		1.84		
	hPID	5	3	2.19		1.93		
	hGU	7	5		NS			
	hGW	6	2	3.19		3.07		

Table 2. Prospective studies investigating the association between sexually transmitted diseases (STDs) and HIV infection

Study population and location	Evidence of current/previous STD		Crude		Adjusted		Adjusted for
	HIV seropositive	HIV seronegative	OR	CI	OR	CI	
Prostitutes, Nairobi [145]							
GU	36	15	3.32	1.86-5.4			
G	52	48		NS			
C	24	26		NS			
GW	10	3		NS			
sS	31	33		NS			
Men attending STD clinic, Nairobi [139]							
GU			7.7	2.6-22.0	4.7	1.3-17.0	
Pregnant women, Nairobi [115]							
sS	7.7	3.2	2.5	1.7-3.8			
G	7.3	8.9	0.8	0.4-1.5			
Women, Malawi [261]							
T			3.75	1.11-12.7			
Prostitutes, Kinshasa [23]							
G	12	10.1		NS			
C	6.4	6.4		NS			
T	12	11		NS			
GU	2.3	0.5		S			
PID	5	6		NS			
GW	3.1	0.7		S			
Prostitutes, Kinshasa [142]							
GU	4.4	0.8	5.7	0.5-14.6			
PID	16	5	3.6	1.2-12			
G	56	17	6.3	3.0-13.2	4.8	2.4-9.8	no. partners,CU
C	31	7	5.8	2.3-15.0	3.6	1.4-9.1	no. partners,CU
T	38	21	2.4	1.2-4.8	1.9	0.9-4.1	no. partners,CU
GW	1.4	2	0.96	0.1-10.6			
sS	9	3	3.4	0.7-17.6			
HD	1	0.8	1.87	0-69.5			

OR, odds ratio; CI, confidence interval; C, chlamydial infection; G, gonorrhoea; GU, genital ulcer; GW, genital warts; HB, hepatitis B, HD, *haemophilus ducreyi*; HSV-2, herpes simplex; PID, pelvic inflammatory disease; S, syphilis; U, urethritis; T, trichomoniasis; h, history of STD; s, serological marker for STD. No prefix indicates current infection.

Table 3. Gonorrhea

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Botswana	rural area	1990	pregnant women	14.0	114	80
Burkina Faso	Bobo-Dioulasso	1992	gyn. patients	10.9	223	263
Cameroon	Douala	1990	pregnant women	33.3	69	85
Cameroon	Yaoundé	1977	pregnant women	13.5	296	211
Cameroon	Yaoundé	1980	postpartum	10.1	296	208
Cameroon	Yaoundé	1980	family planning	1.9	53	208
Cameroon	Yaoundé	1980	pregnant women	13.6	110	208
Cameroon	Yaoundé	1980	infertile women	9.1	55	208
Côte d'Ivoire	Abidjan	1992	pregnant women	3.7	547	191
Gabon	Franceville	1980-82	pregnant women	5.5	530	215
Gambia	Bakau	1981-82	pregnant women	6.7	90	28
Gambia	Banjul	1985	infertile women	64.9	37	207
Gambia	Banjul	1985	pregnant women	27.0	37	207
Ghana	Accra	1985	postpartum	3.4	148	79
Ghana	Accra	1985	gyn. patients	3.1	162	79
Kenya	Burnt Forest	1992	MCH/FP	3.8	79	198
Kenya	Eldoret	1993	MCH/FP	14.4	230	273
Kenya	Huruma	1992	MCH/FP	8.8	80	198
Kenya	Nairobi	1984	pregnant women	6.7	728	218
Kenya	Nairobi	1991	pregnant women	9.8	399	132
Kenya	Nairobi	1992	MCH	6.5	400	201
Kenya	Nairobi	1984-86	IUD acceptors	3.5	1725	217
Kenya	rural area	1985	pregnant women	10.0	68	216
Kenya	rural area	1988-89	pregnant women	2.9	549	111
Kenya	unknown	1973	family planning	17.5	NA	30
Kenya	urban area	1984	pregnant women	5.0	200	216
Kenya	urban area	1987	pregnant women	1.0	402	216
Malawi	urban area	1991	pregnant women	4.9	6482	25,37
Malawi	urban area	1989-90	pregnant HIV+	11.0	1480	236
Malawi	urban area	1989-90	pregnant HIV-	3.0	5026	236
Malawi	urban area	1992	pregnant HIV+	19.8	644	187
Malawi	urban area	1992	pregnant HIV-	7.9	677	187
Niger	Niamey	1993	pregnant women	1.5	400	279
Nigeria	unknown	1973	pregnant women	3.0	NA	30
Rwanda	Kigali	1992-93	pregnant HIV+	7.0	384	281
Rwanda	Kigali	1992-93	pregnant HIV-	2.4	381	281
Senegal	5 areas	1990	gyn. patients	3.8	NA	59
Senegal	5 areas	1990	pregnant women	1.6	NA	59
Senegal	countrywide	1989-93	pregnant women	1.1	928	284
Senegal	countrywide	1989-93	gyn. patients	2.1	1203	284
Senegal	Pikine	1987	pregnant women	1.5	200	76
Senegal	Pikine	1987	gyn. patients	4.4	250	76
Senegal	Unknown	1992	gyn. patients	2.0	102	285
South Africa	Bloemfontein	1981	pregnant women	11.4	1200	202
South Africa	Durban	1992	pregnant women	4.1	170	258
South Africa	rural Natal	late 80's	pregnant women	6.0	NA	27
South Africa	unknown	1978	family planning	10.2	NA	30
Swaziland	Manzini	1978	pregnant women	3.9	51	36
Swaziland	Manzini	1978	family planning	1.9	52	36
Swaziland	unknown	1978	MCH/FP	2.9	NA	30
Tanzania	Dar es Salaam	1978	family planning	7.2	405	221
Tanzania	Dar es Salaam	1991-92	family planning	4.2	2031	128
Tanzania	Dar es Salaam	1993	pregnant women	1.2	255	293
Tanzania	Mwanza (urban)	1992	pregnant women	3.1	97	189
Tanzania	Mwanza region	1992-93	rural preg. women	2.1	964	288
Uganda	Ankole	1980	women	2.4	168	222

APPENDIX A

STD PREVALENCE TABLES FOR AFRICA

The tables are organized by major risk groups and are alphabetized by country. Reputable scientific journals and international conference presentations are the sources for these prevalence figures.

The information on syphilis is accompanied by the testing information when available. Serological tests for syphilis can be subdivided into nonspecific nontreponemal reagin tests and specific treponemal tests [8]. The quantitative or qualitative rapid plasma reagin test (RPR) is an easy test which can be performed without sophisticated laboratory equipment. It is commonly used for screening. The Venereal Disease Research Laboratory test (VDRL) reaction has a comparable sensitivity and specificity. The predictive value of a positive RPR or VDRL test is low in populations which have a low prevalence of the disease. Biological false-positive reactions may occur in pregnancy and in any condition accompanied by a strong immunological response, as occurs in many chronic bacterial and parasitic diseases common in the tropics. The quantitative VDRL or RPR tests are used to evaluate the effect of treatment, which should produce a decline in titer in patients treated for early syphilis.

Specific treponemal tests such as the TPHA use *T. pallidum* as the antigen and therefore are more specific than the RPR or VDRL. However, they are at least twice as expensive and are technically more difficult to perform. In the tropics, TPHA will remain positive even after treatment. Thus, because of the extremely high incidence of the disease, many individuals with previously treated syphilis will yield a positive treponemal test with a negative RPR or VDRL. In Swaziland nearly 25 percent of the healthy adult population not attending an STD clinic showed this pattern [8]. Treponemal tests are rarely available in developing areas and, because of their cost, should be reserved for confirmation of a positive reagin test.

Table 3. Gonorrhea contd.

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
STD Patients contd.						
Tanzania	Dar es Salaam	1991	men	37.1	286	48
Tanzania	Dar es Salaam	1991-92	men	40.3	176	190
Tanzania	Dar es Salaam	1991-92	women	4.2	142	190
Tanzania	Dar es Salaam	1991-92	men	39.1	634	287
Tanzania	Dar es Salaam	1991-92	women	12.2	296	287
Tanzania	Dar es Salaam	1992-93	men	22.5	120	286
Tanzania	Dar es Salaam	1992-93	women	4.0	50	286
Tanzania	Pemba Island	1992-93	men	33.7	199	291
Tanzania	Pemba Island	1992-93	women	32.1	140	291
Tanzania	Zanzibar Island	1992-93	men	37.1	202	291
Tanzania	Zanzibar Island	1992-93	women	31.9	160	291
Zambia	countrywide	1989	unknown	24.5	84180	84
Zambia	Lusaka	1982	unknown	30.0	NA	26
Zambia	Lusaka	1983	both	20.7	NA	185
Zambia	Lusaka	1991	both	10.5	NA	185
Zimbabwe	Harare	1979-80	men	35.3	695	20
Zimbabwe	Harare	1979-80	women	22.7	234	20
Zimbabwe	Harare	1983	women	8.3	156	224
Zimbabwe	Harare	1990	women	19.0	100	81
Prostitutes						
Burkina Faso	Ougadougou	1984		20.2	114	29
Cameroon	Yaoundé	1989-90		3.0	273	259
Côte d'Ivoire	Abidjan	1992-93	HIV-1+	31.0	369	269
Côte d'Ivoire	Abidjan	1992-93	HIV-	13.0	103	269
Côte d'Ivoire	Abidjan	1992-93	HIV-1/2+	37.0	255	269
Ethiopia	Addis Ababa	1990		27.7	282	22
Kenya	Nairobi	1983		30.0	193	216
Kenya	Nairobi	1984		30.0	193	83
Kenya	Nairobi	1990-91		30.0	200	130
Kenya	Nairobi	1992		53.6	386	195
Mali	unknown	1991		47.6	103	63
Mali	unknown	1993		5.7	122	275
Niger	Niamey	1993		24.9	253	279
Rwanda	Butare	1974		51.2	86	204
Senegal	5 areas	1990		5.3	NA	59
Senegal	countrywide	1989-93		15.8	600	284
Senegal	Dakar	1990		14.9	388	282
Senegal	Dakar	1991		8.7	474	282
Senegal	Dakar	1990-91	foreign	12.1	91	129
Senegal	Dakar	1990-91	Senegalese	18.2	99	129
Senegal	Dakar	1992		7.3	494	282
Somalia	Mogadishu	1987		11.2	89	47
Somalia	urban areas	1986-87		13.0	287	19
Tanzania	Arusha	1991		56.3	48	98
Tanzania	Morogoro	1993		0.0	46	292
Tanzania	Moshi	1991		46.7	45	98
Uganda	Layantonde	1991	bar girls	0.0	98	295
Zaire	Kinshasa	1988		23.0	1233	109
Zaire	Kinshasa	1988		35.0	140	112
Zaire	Kinshasa	1988		37.0	801	83
Zaire	Kinshasa	1991	hotel	24.0	182	62

Table 3. Gonorrhea contd.

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age contd.						
Uganda	Kampala	1992	pregnant women	1.0	NA	131
Uganda	Teso	1980	women	18.3	295	222
Zaire	Kinshasa	1989-90	pregnant HIV+	1.8	324	253
Zaire	Kinshasa	1989-90	pregnant HIV-	1.0	253	253
Zaire	Kinshasa	1990	pregnant women	1.7	701	110
Zaire	Kinshasa	1993	pregnant women	1.6	1160	181
Zimbabwe	Harare	1983	pregnant women	0.0	199	224
Zimbabwe	Harare	1986-87	pregnant women	7.0	214	223
STD Patients						
Burkina Faso	Bobo-Dioulasso	1990	men	37.8	74	254
Burkina Faso	Bobo-Dioulasso	1991	men	39.0	182	61
Cameroon	Elig-Essono	1990	women	10.6	66	85
Cameroon	Elig-Essono	1990	men	16.7	54	85
Cameroon	unknown	1992	men	17.0	120	133
Cameroon	unknown	1992	women	11.0	120	133
Cameroon	Yaoundé	1993	men	23.0	161	264
C.A.R.	Bangui	1992-93	both	22.5	4865	182
Côte d'Ivoire	Abidjan	1993	men	52.9	255	268
Comoros Islands	Moroni	1987-88	both	23.0	719	46
Djibouti	Djibouti city	1988	men	32.3	105	86
Gabon	Franceville	1980-82	men	69.7	261	215
Gabon	Franceville	1980-82	women	15.3	261	215
Kenya	Nairobi	1980	unknown	5.2	97	95
Kenya	Nairobi	1991	unknown	35.7	1293	132
Kenya	Nairobi	1992	women	12.3	130	136
Kenya	Nairobi	1992	women	7.0	380	201
Lesotho	Maseru	1988-89	men	61.0	495	49
Malawi	Blantyre	1992	women	14.0	505	97
Nigeria	Maiduguri	1987	both	37.8	174	50
Rwanda	Kigali	1986	men	3.6	110	41
Rwanda	Kigali	1986	women	11.0	100	41
Senegal	5 areas	1990	men	78.0	NA	59
Senegal	countrywide	1989-93	men	34.4	462	284
Senegal	Dakar	1989-91	men outpatients	27.1	995	21
Senegal	unknown	1990	men at risk	0.6	498	252
Sierra Leone	Freetown	1989	both	0.6	940	57
Sierra Leone	Freetown	1990-91	both	24.0	626	58
Somalia	Mogadishu	1983	women	3.8	185	206
Somalia	Mogadishu	1983	men	9.0	376	206
Somalia	Mogadishu	1986	men	53.2	47	55
Somalia	Mogadishu	1987	unknown	6.7	45	47
Somalia	urban areas	1986-87	unknown	7.0	194	19
South Africa	Durban	1984	men	1.0	100	78
South Africa	Durban	1988-89	women	11.0	100	96
South Africa	Durban	1988-89	men	34.5	1745	147
South Africa	Durban	1988-89	women	10.4	937	147
South Africa	Durban	1988-89	men	12.0	100	38
South Africa	Mbabane	1979	both	6.5	155	106
Sudan	Khartoum	1985	women	7.7	404	77
Sudan	Khartoum	1985	men	36.7	90	77
Swaziland	Mbabane	1973	unknown	51.7	240	203
Swaziland	Mbabane	1979	both	6.5	155	106
Tanzania	Dar es Salaam	1985	unknown	8.0	125	14
Tanzania	Dar es Salaam	1988	unknown	4.2	120	14

Table 4. Syphilis

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Women of Reproductive Age						
Botswana	Maun	1985-87	pregnant women	41.0(RPR,TPHA)	113	87
Burkina Faso	Bobo-Dioulasso	1992	pregnant women	2.0(RPR,TPHA)	290	209
Burkina Faso	Bobo-Dioulasso	1992	gyn. patients	6.3	223	263
Cameroon	7 sites	1989	pregnant women	10.0(RPR,TPHA)	900	42
Cameroon	NW/SW provinces	1989	pregnant women	23.5(TPHA)	608	34
Cameroon	Yaoundé	1989	pregnant women	10.3(RPR,TPHA)	2892	153
Cameroon	Yaoundé	1990	pregnant women	14.6(RPR,TPHA)	2892	153
Cameroon	Yaoundé	1990	pregnant women	17.4(TPHA)	350	85
Cameroon	Yaoundé	1991	pregnant women	14.6(RPR,TPHA)	2892	153
Cameroon	Yaoundé	1992	pregnant women	18.0(RPR,TPHA)	300	192
Cameroon	Yaoundé	1992	pregnant women	13.0	2445	210
Cameroon	Yaoundé	1992	pregnant women	16.0(RPR,TPHA)	200	192
Cameroon	Yaoundé	1992	pregnant women	15.0(RPR,TPHA)	300	192
Côte d'Ivoire	Abidjan	1992	pregnant women	0.7(RPR,TPHA)	546	191
Côte d'Ivoire	unknown	1988	pregnant women	8.0(TPHA)	NA	65
Côte d'Ivoire	urban areas	1986-87	pregnant women	7.6	513	53
Ethiopia	Addis Ababa	1974-75	pregnant women	17.6(VDRL)	2717	213
Gabon	Estuaire	1993	rural women 16-30	12.1(RPR,TPHA)	248	270
Gabon	Libreville	1983	pregnant women	12.1(VDRL,TPHA)	527	214
Gabon	Libreville	1984	pregnant women	13.3(VDRL,TPHA)	715	214
Gabon	Libreville	1985	pregnant women	14.0(VDRL,TPHA)	623	214
Gabon	Libreville	1993	women 16-30 years	5.2(RPR,TPHA)	272	270
Gambia	Bakau	1981-82	pregnant women	1.0(VDRL,TPHA)	100	28
Kenya	Burnt Forest	1992	MCH/FP	3.8(RPR,TPHA)	79	198
Kenya	Eldoret	1993	MCH/FP	2.6(RPR,TPHA)	230	273
Kenya	Huruma	1992	MCH/FP	3.8(RPR,TPHA)	80	198
Kenya	Kajiado district	1989	pregnant women	2.5(RPR,TPHA)	2209	274
Kenya	Kajiado district	1990	pregnant women	2.4(RPR,TPHA)	2209	274
Kenya	Kajiado district	1991	pregnant women	5.9(RPR,TPHA)	2209	274
Kenya	Kajiado district	1992	pregnant women	11.9(RPR,TPHA)	2209	274
Kenya	Nairobi	1989-91	pregnant women	3.6(RPR,TPHA)	4753	115
Kenya	Nairobi	1989-91	family planning	1.9(RPR)	4058	238
Kenya	Nairobi	1991	pregnant women	2.8	2585	132
Kenya	Nairobi	1992	MCH	4.2(RPR,TPHA)	400	201
Kenya	Nairobi	1992	pregnant women	7.0(RPR)	923	188
Kenya	Nairobi	1992-93	pregnant women	5.8(RPR,TPHA)	3772	272
Kenya	rural area	1985	pregnant women	9.0	68	216
Kenya	rural area	1988-89	pregnant women	3.8(RPR,TPHA)	549	111
Kenya	urban area	1981	pregnant women	1.0	15649	216
Malawi	unknown	1993	pregnant women	13.5(RPR)	6603	262
Malawi	urban area	1989	pregnant HIV+	18.5(VDRL,FTA)	81	161
Malawi	urban area	1989	pregnant HIV-	6.3(VDRL,FTA)	380	161
Malawi	urban area	1991	pregnant women	11.3(RPR,FTA)	6482	25,37
Malawi	urban area	1989-90	pregnant HIV+	16.0(RPR,FTA)	1480	236
Malawi	urban area	1989-90	pregnant HIV-	10.0(RPR,FTA)	5026	236
Mali	unknown	1991	pregnant women	6.7(VDRL)	304	63
Mozambique	Beira/Maputa	1982-83	pregnant women	9.7(VDRL)	713	40
Mozambique	Beira/Maputa	1982-83	pregnant women	8.3(VDRL,TPHA)	713	40
Mozambique	countrywide	1982-83	pregnant women	6.9(VDRL)	755	40
Mozambique	countrywide	1982-83	pregnant women	4.5(VDRL,TPHA)	755	40
Niger	Niamey	1993	pregnant women	4.0(RPR,TPHA)	400	279
Niger	Tahoua	1992	pregnant women	15.1(TPHA)	650	278
Rwanda	Kigali	1992-93	pregnant HIV+	6.3(RPR,TPHA)	384	281
Rwanda	Kigali	1992-93	pregnant HIV-	3.7(RPR,TPHA)	381	281
Senegal	5 areas	1990	pregnant women	6.9(active)	NA	59

Table 3. Gonorrhea contd.

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Others						
Kenya	Nairobi	1987	pts. health center	3.5	398	18
Kenya	Nairobi	1991	lorry drivers	1.8	331	82,255
Kenya	Nairobi	1990	truck drivers	31.8	22	255,82
Kenya	Nairobi	1991	truck drivers	4.7	533	132
Nigeria	Ibadan	1993	adult males	0.5	212	280
Sierra Leone	countrywide	1991	military recruits	1.0	1560	114
Somalia	Jambaluul village	1987	male rural pop.	0.0	189	104
Somalia	Jambaluul village	1987	female rural pop.	0.0	200	104
Tanzania	Dar es Salaam	1989	hotel/rest. workers	1.7	481	113
Tanzania	Dar-Njombe	1993	fem. @ truck stops	8.6	418	294
Uganda	Kampala	1976	fem. food handlers	8.5	636	31
Uganda	Teso district	1973	dist. resd. (men)	8.9	NA	30
Uganda	Teso district	1973	dist. resd. (women)	18.3	NA	30
Uganda	Kasangati	1972	pts. health center	52.9	NA	304

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
STD Patients contd.						
Cameroon	NW/SW provinces	1989	unknown	31.2(TPHA)	282	34
Cameroon	unknown	1992	men	20.0(TPHA)	NA	133
Cameroon	unknown	1992	women	23.0(TPHA)	NA	133
Cameroon	Yaoundé	1992	unknown	35.0	582	210
Cameroon	Yaoundé	1989-90	both	35.3(RPR,TPHA)	1161	103
C.A.R.	Bangui	1992-93	both	20.0(TPHA)	4865	182
Comoros Islands	Moroni	1987-88	both	11.0	719	46
Côte d'Ivoire	Abidjan	1990	men	2.4(RPR,TPHA)	1169	32
Djibouti	Djibouti city	1988	men	13.3(RPR,FTA)	105	86
Guinea	Conakry	1993	women	20.9(RPR,TPHA)	450	271
Kenya	Nairobi	1980	unknown	11.3(TPHA,VDRL)	97	95
Kenya	Nairobi	1985	women	13.5(RPR,TPHA)	89	107
Kenya	Nairobi	1991	unknown	14.0	400	157
Kenya	Nairobi	1991	unknown	10.2	5053	132
Kenya	Nairobi	1992	women	5.0(RPR,TPHA)	380	201
Lesotho	Maseru	1988-89	women	28.0	578	49
Lesotho	Maseru	1988-89	men	19.0	495	49
Malawi	Blantyre	1992	women	25.0	505	97
Morocco	Agadir	1990	both	37.3	276	135
Morocco	Agadir	1991	both	52.5	259	135
Morocco	Casablanca	1991	both	15.1	317	135
Morocco	Essaouira	1991	both	13.3	98	135
Morocco	Marrakech	1991	both	71.9	306	135
Nigeria	Maiduguri	1987	men	4.0	200	50
Rwanda	Kigali	1986	women	40.0	100	41
Rwanda	Kigali	1986	men	20.9	110	41
Senegal	5 areas	1990	men	11.5(active)	NA	59
Senegal	countrywide	1989-93	men	9.5	462	284
Senegal	Dakar	1989-91	men outpatients	5.5(RPR,TPHA)	819	21
Senegal	unknown	1990	men at risk	2.4	498	252
Sierra Leone	Freetown	1989	both	1.6	940	57
Somalia	Badoa	1983	unknown	10.8(RPR,MHA-TP)	371	206
Somalia	Kisamayo	1983	unknown	11.4(RPR,MHA-TP)	282	206
Somalia	Mogadishu	1983	men	18.9(RPR,MHA-TP)	376	206
Somalia	Mogadishu	1983	women	16.2(RPR,MHA-TP)	185	206
Somalia	Mogadishu	1986	men	5.0(VDRL,TPHA)	101	55
Somalia	Mogadishu	1987	unknown	4.4	45	47
Somalia	Mogadishu	1989	unknown	12.6	79	39
Somalia	urban area	1986-87	unknown	19.0(RPR)	194	19
South Africa	Durban	1984	men	44.0(RPR)	100	78
South Africa	Durban	1988-89	women	40.0(RPR,TPHA)	100	96
South Africa	Durban	1988-89	men	42.0(RPR,TPHA)	100	38
South Africa	Durban	1988-89	women	17.2(RPR,TPHA)	937	147
South Africa	Durban	1988-89	men	14.3(RPR,TPHA)	1745	147
South Africa	Johannesburg	1987	women	13.9(RPR)	195	123
Sudan	Khartoum	1985	men	2.2(VDRL)	90	77
Sudan	Khartoum	1985	women	2.5(VDRL)	404	77
Swaziland	Mbabane	1973	unknown	10.8(VDRL)	240	203
Swaziland	Mbabane	1979	both	19.4(RPR)	155	106
Tanzania	Dar es Salaam	1991-92	women	6.4(RPR,TPHA)	296	287
Tanzania	Dar es Salaam	1991-92	men	5.8(RPR,TPHA)	634	287
Tanzania	Mbeya region	1989	unknown	46.3(TPHA)	178	60
Tanzania	Mwanza region	1992	women (urban)	11.3(RPR,TPHA)	672	289
Tanzania	Mwanza region	1992	men (urban)	15.3(RPR,TPHA)	668	289
Uganda	Kampala	1990	women	20.6(RPR,TPHA)	414	35

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Women of Reproductive Age contd.						
Senegal	5 areas	1990	gyn. patients	7.8(active)	NA	59
Senegal	countrywide	1989-93	gyn. patients	6.2(RPR,TPHA)	1203	284
Senegal	countrywide	1989-93	pregnant women	4.9(RPR,TPHA)	928	284
Senegal	unknown	1992	gyn. patients	2.0(RPR,TPHA)	102	285
South Africa	Durban	1992	pregnant women	7.7(RPR,TPHA)	170	258
Swaziland	Manzini	1978	pregnant women	14.0(RPR)	50	36
Swaziland	Manzini	1978	family planning	6.4(RPR)	47	36
Swaziland	Mbabane	1986	pregnant women	13.1(RPR,TPHA)	283	220
Tanzania	Arusha region	1993	pregnant women	2.3(VDRL)	306	290
Tanzania	Bukoba	1991	pregnant women	4.4(VDRL)	299	257
Tanzania	Dar es Salaam	1988-90	gyn. patients	16.2(TPHA)	359	260
Tanzania	Dar es Salaam	1991	pregnant women	4.9(VDRL)	304	257
Tanzania	Dar es Salaam	1991-92	family planning	2.5(VDRL,TPHA)	2009	128
Tanzania	Dar es Salaam	1993	pregnant women	2.8	255	293
Tanzania	Kilimanjaro	1991	pregnant women	3.8(VDRL)	53	257
Tanzania	Mafinga	1991	pregnant women	17.5(VDRL)	137	257
Tanzania	Mbeya	1983-84	pregnant women	16.4(VDRL,TPHA)	5430	205
Tanzania	Mtwara	1991	pregnant women	5.6(VDRL)	90	257
Tanzania	Musoma	1991	pregnant women	1.2(VDRL)	501	257
Tanzania	Mwanza region	1992-93	rural preg. women	10.4(RPR,TPHA)	1199	289
Tanzania	Mwanza region	1992-93	urban preg. women	8.6(RPR,TPHA)	4906	289
Tanzania	Mwanza (urban)	1992	pregnant women	6.2(RPR,TPHA)	97	189
Uganda	Kampala	1992	pregnant women	10.2	NA	131
Zaire	Kasumbalesa	1990	pregnant women	3.2(RPR)	686	194
Zaire	Kinshasa	1989-90	pregnant HIV+	4.8(RPR)	324	253
Zaire	Kinshasa	1989-90	pregnant HIV-	3.0(RPR)	253	253
Zaire	Kinshasa	1990	pregnant women	.9(RPR,TPHA)	701	110
Zaire	Kinshasa	1991-92	pregnant women	0.9(RPR,TPHA)	227	196
Zaire	Kinshasa	1993	pregnant women	1.1	1160	181
Zaire	Kinshasa	1993	pregnant women	0.4(RPR,TPHA)	498	297
Zaire	Likasi (urban)	1989-90	pregnant women	7.4(RPR)	487	121
Zaire	Lubumbashi	1989	pregnant women	4.9(RPR,TPHA)	345	122
Zaire	Lubumbashi	1989-90	pregnant women	5.1(RPR)	810	121
Zaire	Musoshi (rural)	1989-90	pregnant women	1.4(RPR)	357	121
Zambia	Chililabombwe dist.	1983	pregnant women	6.1(RPR)	NA	186
Zambia	Chililabombwe dist.	1987	pregnant women	4.8(RPR)	NA	186
Zambia	Chililabombwe dist.	1991	pregnant women	3.4(RPR)	NA	186
Zambia	Lusaka	1982	pregnant women	12.4(RPR,TPHA)	202	88
Zambia	Lusaka	1982	at delivery	6.5(RPR,TPHA)	464	88
Zambia	Lusaka	1982	w/ stillbirths	42.0(RPR,TPHA)	100	88
Zambia	Lusaka	1982	w/ spont. abort.	18.8(RPR,TPHA)	240	88
Zambia	Lusaka	1983	pregnant women	13.2(RPR)	NA	186
Zambia	Lusaka	1987	pregnant women	8.0(RPR)	NA	186
Zambia	Lusaka	1991	pregnant women	6.0(RPR)	NA	186
STD Patients						
Botswana	Maun	1985-87	men	39.0(RPR,TPHA)	178	87
Botswana	Maun	1985-87	women	42.0(RPR,TPHA)	175	87
Burkina Faso	Bobo-Dioulasso	1990	men	1.4(RPR,TPHA)	74	254
Burkina Faso	Bobo-Dioulasso	1991	men	11.0(RPR,TPHA)	182	61
Burkina Faso	Bobo-Dioulasso	1992	men	3.0(RPR,TPHA)	205	209
Cameroon	7 sites	1989	unknown	30.4(RPR,TPHA)	467	42
Cameroon	Elig-Essono	1990	women	22.8(TPHA)	101	85
Cameroon	Elig-Essono	1990	men	19.8(TPHA)	91	85

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Prostitutes contd.						
Tanzania	Arusha	1991		21.7(RPR)	60	98
Tanzania	Morogoro	1993		21.7(VDRL)	46	292
Tanzania	Moshi	1991		33.3(RPR)	45	98
Tanzania	Moshi	1991		82.2(TPHA)	45	98
Tanzania	Mwanza region	1992-93	urban	9.1(RPR,TPHA)	143	289
Uganda	Layantonde	1991	bar girls	28.1(RPR,TPHA)	98	295
Uganda	SW region	1986	suspected	45.5(TPHA)	33	99
Zaire	Kinshasa	1988		18.0(RPR,TPHA)	801	83
Zaire	Kinshasa	1988		16.0(RPR,TPHA)	1233	109
Zaire	Kinshasa	1988		18.0	140	112
Zaire	Kinshasa	1988-89		15.7(active)	1233	66
Zaire	Kinshasa	1991	hotel	5.0(active)	182	62
Others						
Botswana	Kalahari desert	1988	San people	14.5(VDRL)	68	68
Burundi	central area	1987	female rural pop.	10.3(TPHA)	39	100
Burundi	central area	1987	male rural pop.	5.9(TPHA)	51	100
Cameroon	7 sites	1989	TB patients	34.5(RPR,TPHA)	373	42
Cameroon	Bamenda	1990-91	women w/mult. prt.	42.4	NA	71
Cameroon	Douala	1993	prisoners	19.7(TPHA)	147	265
Cameroon	Edea	1990-91	women w/mult. prt.	14.4	NA	71
Cameroon	Littoral Province	1992	rural pop. male	9.6(RPR,TPHA)	411	193
Cameroon	Nkongsamba	1993	male gen. pop.	3.0(RPR,TPHA)	264	266
Cameroon	NW/SW provinces	1989	blood donors	48.1(TPHA)	384	34
Cape Verde	Santa Cruz/Santiago	1982-83	general population	3.8(RPR,TPHA)	316	212
C.A.R.	Bangui	1986	male gen. pop.	14.4(TPHA)	354	69
C.A.R.	Bangui	1986	female gen. pop.	12.0(TPHA)	586	69
C.A.R.	Bangui	1987	male gen. pop.	13.3(TPHA)	173	69
C.A.R.	Bangui	1987	female gen. pop.	12.4(TPHA)	210	69
Congo	Brazzaville	1991	prisoners	16.7(TPHA)	252	119
Congo	Likouala/Sangha	1990	Pygmies	40.0(TPHA)	230	120
Congo	Likouala/Sangha	1990	Bantus	28.0(TPHA)	680	120
Côte d'Ivoire	unknown	1988	hotel staff	22.3(TPHA)	NA	65
Côte d'Ivoire	unknown	1988	prison staff	21.0(TPHA)	NA	65
Côte d'Ivoire	unknown	1988	prisoners	45.4(TPHA)	NA	65
Gabon	Franceville	1988	gen. pop. male	8.6(RPR,TPHA)	547	89
Gabon	Franceville	1988	gen. pop. female	7.4(RPR,TPHA)	704	89
Guinea-Bissau	unknown	1990-91	police officers	13.1(TPHA)	797	200
Kenya	Nairobi	1987	pts. health center	3.8	398	18
Kenya	Nairobi	1991	lorry drivers	4.6(RPR,TPHA)	326	82,255
Kenya	Nairobi	1990	truck drivers	5.1	297	255,82
Kenya	Nairobi	1991	truck drivers	7.7	478	132
Kenya	Nairobi	1992	prostitute clients	12.5	80	180
Kenya	Rift Valley	1986	hosp. pts./staff	8.7	379	72
Lesotho	unknown	1987	blood donors	2.5(VDRL)	5223	199
Lesotho	unknown	1988	blood donors	2.4(VDRL)	5225	199
Lesotho	unknown	1989	blood donors	5.0(VDRL)	5124	199
Lesotho	unknown	1990	blood donors	5.3(VDRL)	6427	199
Lesotho	unknown	1991	blood donors	4.4(VDRL)	5736	199
Madagascar	Antananarivo	1990	male blood donors	7.5(VDRL)	1366	117
Madagascar	Antananarivo	1990	female blood donors	6.1(VDRL)	263	117
Mauritania	Nouakchott	1990-92	blood donors	7.5(VDRL)	NA	276
Niger	Niamey	1993	nat. truck drivers	7.9	113	277

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
STD Patients contd.						
Uganda	Kampala	1990	men	16.2(RPR,TPHA)	995	35
Uganda	Kampala	1990-91	both	11.0(RPR)	100	52
Zambia	countrywide	1989	unknown	15.9(TPHA)	84180	84
Zambia	Lusaka	1982	unknown	15.8	NA	26
Zambia	Lusaka	1983	both	18.6	NA	185
Zambia	Lusaka	1991	both	16.1	NA	185
Zimbabwe	Harare	1979-80	women	4.7(VDRL)	234	20
Zimbabwe	Harare	1979-80	men	3.2(VDRL)	695	20
Zimbabwe	Harare	1990	women	17.0(RPR,TPHA)	100	81
Zimbabwe	rural area	1991	both	38.1(RPR)	176	152
Zimbabwe	rural area	1991	both	42.1(TPHA)	176	152
Prostitutes						
Burkina Faso	Ougadougou	1984		21.3	127	29
Burkina Faso	Bobo-Dioulasso	1992	bar girls	10.0(RPR,TPHA)	182	209
Cameroon	Yaoundé	1989-90		36.0(TPHA)	273	259
Cameroon	Yaoundé	1992		39.0	314	210
Côte d'Ivoire	Abidjan	1992-93	HIV-1/2+	44.0(RPR,TPHA)	255	269
Côte d'Ivoire	Abidjan	1992-93	HIV-	16.0(RPR,TPHA)	103	269
Côte d'Ivoire	Abidjan	1992-93	HIV-1+	30.0(RPR,TPHA)	369	269
Côte d'Ivoire	unknown	1988		42.7(TPHA)	NA	65
Côte d'Ivoire	urban areas	1986-87		49.2	390	53
Ethiopia	Addis Ababa	1990		37.4(RPR,TPHA)	203	22
Kenya	Nairobi	1983		33.0	193	216
Kenya	Nairobi	1984		41.0(RPR,TPHA)	193	83
Kenya	Nairobi	1988		18.2(RPR)	33	243
Kenya	Nairobi	1990-91		21.0	200	130
Kenya	Nairobi	1992		22.5	80	180
Mali	unknown	1991		24.3	103	63
Mali	unknown	1993		5.7(RPR)	122	275
Niger	Niamey	1993		26.5(RPR,TPHA)	253	279
Rwanda	Butare	1987		81.8(TPHA)	33	43
Rwanda	Butare	1987		57.6(RPR)	33	43
Senegal	5 areas	1990		4.2(active)	NA	59
Senegal	countrywide	1989-93		22.9	600	284
Senegal	Dakar	1990		3.6	388	282
Senegal	Dakar	1990-91	foreign	23.1(TPHA)	91	129
Senegal	Dakar	1990-91	foreign	4.4(RPR)	91	129
Senegal	Dakar	1990-91	Senegalese	30.3(TPHA)	99	129
Senegal	Dakar	1990-91	Senegalese	17.2(RPR)	99	129
Senegal	Dakar	1991		2.1	474	282
Senegal	Dakar	1992		1.4	494	282
Somalia	Chismayu	1990		5.6(RPR)	36	101
Somalia	Merca	1990		10.0(RPR)	20	101
Somalia	Mogadishu	1987		28.1	89	47
Somalia	Mogadishu	1988-89		47.7(active)	155	102
Somalia	Mogadishu	1990		41.9(RPR)	246	101
Somalia	rural areas	1989		50.8	57	39
Somalia	southern area	1990		35.3(RPR,FTA)	303	51
Somalia	urban areas	1986-87		23.0(RPR)	287	19
Sudan	Port Sudan	1988		23.0(RPR)	176	73
Tanzania	Arusha	1991		66.1(TPHA)	59	98

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Others contd.						
Uganda	Kasangati	1972	pts. health center	7.2(active)	NA	304
Zaire	Kinshasa	1989	prostitute clients	6.3(RPR,TPHA)	111	118
Zaire	Kinshasa	1989	blood donors	13.3(TPHA)	2237	67
Zambia	unknown	1987-88	prisoners	23.3	1670	124

** TPHA(*T. pallidum* hemagglutination assay)
FTA (fluorescent treponemal antibody absorption test)/MHA-TP (micro-hemagglutination assay)
RPR/(Rapid Plasma Reagin)/VDRL(Venereal Disease Research Laboratory)
Syphilis serological tests done as cited in study.
Active/Acute Syphilis: TPHA+ RPR+
Ever Infected/"Old" Syphilis: TPHA+ RPR-
t only total size given; unknown male and female

Table 4. Syphilis contd.

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Others						
Niger	Niamey	1993	mixed truck drivers	6.6	121	277
Niger	Niamey	1993	intern. truck drivers	10.3	29	277
Nigeria	Borno State	1991	HIV+ population	19.1(TPHA)	21	160
Nigeria	Borno State	1991	HIV- population	10.0(TPHA)	80	160
Nigeria	Ibadan	1993	adult males	0.0(VDRL)	212	280
Rwanda	Butare	1987	prost. customers	40.0(TPHA)	25	43
Rwanda	Butare	1987	male control pop.	3.7(RPR)	27	43
Rwanda	Butare	1987	prost. customers	40.0(RPR)	25	43
Rwanda	Butare	1987	male control pop.	33.3(TPHA)	27	43
Rwanda	Butare	1987	female control pop.	18.2(TPHA)	33	43
Rwanda	Butare	1987	female control pop.	6.1(RPR)	33	43
Rwanda	rural area	1992	blood donors	2.8	325	178
Rwanda	rural area	1992	student blood donors	0.9	108	178
Somalia	Harguesa	1983	nursing school	5.9(RPR,MHA-TP)	102	206
Somalia	Harguesa	1983	military	6.3(RPR,MHA-TP)	127	206
Somalia	Jambaluul village	1987	male rural pop.	4.3(VDRL,TPHA)	187	104
Somalia	Jambaluul village	1987	female rural pop.	16.0(VDRL,TPHA)	200	104
Somalia	Mogadishu	1983	blood donors	6.5(RPR,MHA-TP)	324	206
Somalia	Mogadishu	1986	healthy men	1.9(VDRL,TPHA)	103	55
Somalia	southern area	1990	nonprostitutes	3.3(RPR,FTA)	245	51
South Africa	Carletonville	1986	black miners	25.8(RPR,FTA)	240	105
Tanzania	Dar es Salaam	1989	hotel/rest. workers	2.1(VDRL,TPHA)	481	113
Tanzania	Dar-Njombe	1993	female@truckstops	25.8(active)	924	294
Tanzania	Mbeya	1983-84	outpatients	13.2(VDRL,TPHA)	1351	205
Tanzania	Mbeya	1983-84	blood donors	8.5(VDRL,TPHA)	188	205
Tanzania	Mbeya region	1989	clinic outpatients	40.6(TPHA)	434	60
Tanzania	Mbeya region	1989	clinical AIDS	37.7(TPHA)	123	60
Tanzania	Mbeya region	1989	TB patients	46.9(TPHA)	98	60
Tanzania	Mwanza region	1992	gen. pop. male	7.7(RPR,TPHA)	12300t	184
Tanzania	Mwanza region	1992	gen. pop. female	7.8(RPR,TPHA)	12300t	184
Tanzania	Mwanza-gold mines	1992-93	females	17.0(RPR,TPHA)	589	289
Tanzania	Mwanza-gold mines	1992-93	males	11.1(RPR,TPHA)	673	289
Tanzania	rural NW region	1988	hospital patients	16.2	253	116
Tanzania	unknown	1992	female@close vills.	15.7(active)	115	134
Tanzania	unknown	1992	female@close vills.	12.2(ever inf.)	115	134
Tanzania	unknown	1992	female@truckstops	31.9(active)	116	134
Tanzania	unknown	1992	female@truckstops	12.1(ever inf.)	116	134
Tanzania	unknown	1992	male lorry drivers	9.7(active)	62	134
Tanzania	unknown	1992	male lorry drivers	30.6(ever inf.)	62	134
Tanzania	unknown	1992	male@close vills.	10.9(active)	64	134
Tanzania	unknown	1992	male@close vills.	10.9(ever inf.)	64	134
Tanzania	unknown	1992	male@truckstops	13.7(active)	102	134
Tanzania	unknown	1992	male@truckstops	18.6(ever inf.)	102	134
Uganda	Kampala	1976	food handlers	14.5(VDRL)	979	31
Uganda	Kampala	1986	lorry assistants	43.5(TPHA)	23	70
Uganda	Kampala	1986	lorry drivers	62.2(TPHA)	45	70
Uganda	Kampala	1986	blood donors	34.6(TPHA)	130	70
Uganda	northern area	1986	male rural pop.	26.3(TPHA)	213	100
Uganda	northern area	1986	female rural pop.	42.1(TPHA)	145	100
Uganda	rural SW	1993	adult population	10.8	294	296
Uganda	SW region	1986	female outpatients	8.3(TPHA)	24	99

Table 6. Chlamydia

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Burkina Faso	Bobo-Dioulasso	1992	gyn. patients	27.3	223	263
Cameroon	Douala	1990	pregnant women	43.5	69	85
Congo	Brazzaville	1993	women	57.4	108	267
Côte d'Ivoire	Abidjan	1992	pregnant women	2.9	453	191
Côte d'Ivoire	unknown	1988	pregnant women	21.0	NA	65
Côte d'Ivoire	urban areas	1986-87	pregnant women	20.7	513	53
Gabon	Franceville	1988	infertile women	9.6	218	91
Gabon	Franceville	1988	postpartum	9.9	598	91
Gambia	Bakau	1981-82	pregnant women	6.9	87	28
Gambia	Banjul	1985	infertile women	67.6	37	207
Gambia	Banjul	1985	pregnant women	35.1	37	207
Ghana	Accra	1985	gyn. patients	4.9	162	79
Ghana	Accra	1985	postpartum	7.7	148	79
Kenya	Burnt Forest	1992	MCH/FP	5.4	74	198
Kenya	Eldoret	1993	MCH/FP	7.0	230	273
Kenya	Huruma	1992	MCH/FP	3.8	80	198
Kenya	Nairobi	1984	pregnant women	20.8	728	218
Kenya	Nairobi	1984-86	IUD acceptors	12.0	1725	217
Kenya	Nairobi	1992	MCH	9.0	400	201
Kenya	rural area	1985	pregnant women	6.0	68	216
Kenya	urban area	1987	pregnant women	16.0	402	216
Malawi	urban area	1989-90	pregnant women	3.0	401	236
Malawi	urban area	1991	pregnant women	3.0	403	25,37
Niger	Niamey	1993	pregnant women	1.5	400	279
Nigeria	Ibadan	1982	family planning	40.0	160	90
Nigeria	Ibadan	1982	pregnant women	11.6	155	90
Rwanda	Kigali	1992-93	pregnant HIV+	3.4	384	281
Rwanda	Kigali	1992-93	pregnant HIV-	5.5	381	281
Senegal	5 areas	1990	pregnant women	12.0	NA	59
Senegal	5 areas	1990	gyn. patients	8.0	NA	59
Senegal	countrywide	1989-93	gyn. patients	6.7	1203	284
Senegal	countrywide	1989-93	pregnant women	7.4	928	284
Senegal	Pikine	1987	gyn. patients	7.6	250	76
Senegal	Pikine	1987	pregnant women	7.0	200	76
South Africa	Durban	1992	pregnant women	4.7	170	258
South Africa	rural Natal	late 80's	pregnant women	11.0	NA	27
Tanzania	Mwanza (urban)	1992	pregnant women	6.8	59	189
Tanzania	Mwanza region	1992-93	rural preg. women	6.3	1139	288
Uganda	Kampala	1992	pregnant women	7.2	NA	131
Zaire	Kinshasa	1989-90	pregnant HIV+	8.0	324	253
Zaire	Kinshasa	1989-90	pregnant HIV-	3.9	253	253
Zaire	Kinshasa	1990	pregnant women	6.1	701	110
Zaire	Kinshasa	1993	pregnant women	5.5	1160	181
Zaire	Kyondo	1988	pregnant women	8.9	101	92
Zimbabwe	Harare	1986-87	pregnant women	9.0	188	223
STD Patients						
Burkina Faso	Bobo-Dioulasso	1990	men	4.1	74	254
Burkina Faso	Bobo-Dioulasso	1991	men	5.0	182	61
Cameroon	Elig-Essono	1990	women	19.7	66	85
Cameroon	Elig-Essono	1990	men	15.9	69	85
Cameroon	unknown	1992	men	16.0	135	133
Cameroon	unknown	1992	women	20.0	135	133

Table 5. Chancroid

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Kenya	Nairobi	1992	MCH	2.0	400	201
STD Patients						
Burkina Faso	Bobo-Dioulasso	1990	men	12.2	74	254
Burkina Faso	Bobo-Dioulasso	1991	men	33.0	182	61
Kenya	Nairobi	1980	unknown	61.9	97	95
Kenya	Nairobi	1985	women	49.4	89	107
Kenya	Nairobi	1992	women	46.2	130	136
Kenya	Nairobi	1991	unknown	39.6	1175	132
Kenya	Nairobi	1992	women	6.0	380	201
Morocco	Agadir	1990	both	16.3	276	135
Morocco	Agadir	1991	both	18.9	259	135
Morocco	Casablanca	1991	both	5.1	317	135
Morocco	Essaouira	1991	both	9.2	98	135
Morocco	Marrakech	1991	both	3.6	306	135
Rwanda	Kigali	1986	men	23.6	110	41
Rwanda	Kigali	1986	women	12.0	100	41
Senegal	Dakar	1989-91	men	6.8	995	21
Senegal	Dakar	1989-91	men	49.1	108	45
Sierra Leone	Freetown	1989	both	2.1	940	57
Somalia	Mogadishu	1983	men	1.6	376	206
South Africa	Durban	1984	men	40.0	100	78
South Africa	Durban	1988-89	men	22.0	100	38
South Africa	Durban	1988-89	women	14.0	100	96
Swaziland	Mbabane	1979	both	43.9	155	106
Uganda	Kampala	1990-91	both	5.0	100	52
Zambia	countrywide	1989	unknown	17.3	84180	84
Zambia	Lusaka	1983	both	5.1	NA	185
Zambia	Lusaka	1991	both	7.5	NA	185
Zimbabwe	Harare	1979-80	women	15.4	234	20
Zimbabwe	Harare	1979-80	men	38.4	695	20
Prostitutes						
Kenya	Nairobi	1983		5.0	193	216
Kenya	Nairobi	1984		2.5	193	83
Kenya	Nairobi	1988		23.3	30	243
Kenya	Nairobi	1990-91		45.0	200	130
Kenya	Nairobi	1992		30.0	30	180
Zaire	Kinshasa	1988		4.0	801	83
Zaire	Kinshasa	1988		.02	1233	109
Zaire	Kinshasa	1988		10.0	140	112
Zaire	Kinshasa	1991	hotel	1.0	182	62
Others						
Kenya	Nairobi	1987	pts. health center	0.3	398	18
Kenya	Nairobi	1992	prostitute clients	36.7	30	180
South Africa	Carletonville	1986	black miners	68.3	240	105
Uganda	rural SW	1993	adult population	10.4	294	296
Uganda	Kasangati	1972	pts. health center	10.9	NA	304

Table 6. Chlamydia

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Prostitutes contd.						
Uganda	Layantonde	1991	bar girls	1.4	98	295
Zaire	Kinshasa	1988		13.0	801	83
Zaire	Kinshasa	1988		13.0	1233	109
Zaire	Kinshasa	1988		20.0	140	112
Zaire	Kinshasa	1991	hotel	24.0	182	62
Others						
Congo	Brazzaville	1991	prisoners	86.5	252	119
Congo	Brazzaville	1993	blood donors	34.6	162	267
Côte d'Ivoire	unknown	1988	hotel staff	47.8	NA	65
Côte d'Ivoire	unknown	1988	prisoners	66.0	NA	65
Côte d'Ivoire	unknown	1988	prison staff	41.0	NA	65
Kenya	Nairobi	1992	prostitute clients	3.8	80	180
Nigeria	Ibadan	1982	blood donors	17.8	101	90
Nigeria	Ibadan	1993	adult males	1.7	212	280
Rwanda	Butare	1987	male control pop.	29.6	27	43
Rwanda	Butare	1987	prost. customers	20.0	25	43
Rwanda	Butare	1987	female control pop.	39.4	33	43
Somalia	Jambaluul village	1987	male rural pop.	5.8	189	104
Somalia	Jambaluul village	1987	female rural pop.	17.5	194	104
South Africa	Carletonville	1986	black miners	6.7	240	105
Tanzania	Dar-Njombe	1993	fem. @ truck stops	14.0	279	294
Uganda	rural SW	1993	adult population	66.0	294	296
Uganda	Kasangati	1972	pts. health center	1.5	NA	304

Table 6. Chlamydia

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
STD Patients						
Cameroon	Yaoundé	1993	men	24.2	161	264
C.A.R.	Bangui	1992-93	both	5.0	4865	182
Comoros Islands	Moroni	1987-88	both	16.0	719	46
Côte d'Ivoire	Abidjan	1993	men	25.1	255	268
Djibouti	Djibouti city	1988	men	49.0	105	86
Gabon	Franceville	1988	men	17.9	218	91
Gabon	Franceville	1988	women	16.1	517	91
Kenya	Nairobi	1992	women	10.0	380	201
Malawi	Blantyre	1992	women	5.0	175	97
Nigeria	Ibadan	1982	women	28.0	75	90
Nigeria	Ibadan	1982	men	21.4	187	90
Nigeria	unknown	1977	unknown	2.5	NA	30
Rwanda	Kigali	1986	women	18.0	100	41
Rwanda	Kigali	1986	men	10.0	110	41
Senegal	5 areas	1990	men	14.0	NA	59
Senegal	countrywide	1989-93	men	12.6	462	284
Senegal	Dakar	1989-91	men	13.3	995	21
Senegal	unknown	1990	men at risk	3.0	498	252
Somalia	Mogadishu	1986	men	13.9	101	55
South Africa	Durban	1984	men	1.0	100	78
South Africa	Durban	1988-89	women	7.0	100	96
South Africa	Durban	1988-89	men	6.0	100	38
South Africa	Johannesburg	1987	women	91.8	195	123
Sudan	Khartoum	1985	men	2.2	90	77
Sudan	Khartoum	1985	women	0.0	404	77
Sudan	unknown	1979	unknown	2.7	NA	30
Swaziland	Mbabane	1979	both	12.3	155	106
Uganda	Kampala	1990-91	both	2.0	100	52
Zimbabwe	Harare	'990	women	8.0	100	81
Prostitutes						
Cameroon	Yaoundé	1991		41.1	168	93
Côte d'Ivoire	Abidjan	1992-93	HIV-	2.0	103	269
Côte d'Ivoire	Abidjan	1992-93	HIV-1+	6.0	369	269
Côte d'Ivoire	Abidjan	1992-93	HIV-1/2+	6.0	255	269
Côte d'Ivoire	unknown	1988		62.1	NA	65
Côte d'Ivoire	urban areas	1986-87		64.9	390	53
Kenya	Nairobi	1983		11.0	193	216
Kenya	Nairobi	1990-91		4.0	200	130
Kenya	Nairobi	1992		9.6	386	195
Kenya	Nairobi	1992		12.5	80	180
Niger	Niamey	1993		4.4	251	279
Rwanda	Butare	1987		93.9	33	43
Senegal	5 areas	1990		23.4	NA	59
Senegal	countrywide	1989-93		13.0	600	284
Senegal	Dakar	1990-91	foreign	16.5	91	129
Senegal	Dakar	1990-91	Senegalese	21.2	99	129
Senegal	Dakar	1990-91		19.0	190	64
South Africa	Johannesburg	1987		94.6	56	123
Tanzania	Arusha	1991		25.5	47	98

Table 7. Trichomoniasis

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
STD Patients						
Somalia	Mogadishu	1983	women	18.9	185	206
Sudan	Khartoum	1985	women	52.2	404	77
Sudan	Khartoum	1985	men	0.0	90	77
Tanzania	Dar es Salaam	1985	unknown	4.0	125	14
Tanzania	Dar es Salaam	1988	unknown	0.0	120	14
Tanzania	Dar es Salaam	1991	women	18.5	108	48
Tanzania	Dar es Salaam	1991-92	men	2.1	634	287
Tanzania	Dar es Salaam	1991-92	women	22.6	296	287
Tanzania	Pemba Island	1992-93	men	11.6	199	291
Tanzania	Pemba Island	1992-93	women	25.2	140	291
Tanzania	Zanzibar Island	1992-93	women	28.3	160	291
Tanzania	Zanzibar Island	1992-93	men	8.9	202	291
Zambia	countrywide	1989	unknown	7.1	84180	84
Zimbabwe	Harare	1983	women	36.5	156	224
Zimbabwe	Harare	1979-80	women	0.9	234	20
Zimbabwe	Harare	1979-80	men	0.9	695	20
Zimbabwe	Harare	1990	women	32.0	100	81
Prostitutes						
Burkina Faso	Ougadougou	1984		16.7	114	29
Cameroon	Yaoundé	1989-90		15.0	273	259
Côte d'Ivoire	Abidjan	1992-93	HIV-1+	29.0	369	269
Côte d'Ivoire	Abidjan	1992-93	HIV-	18.0	103	269
Côte d'Ivoire	Abidjan	1992-93	HIV-1/2+	24.0	255	269
Ethiopia	Addis Ababa	1990		22.0	282	22
Mali	unknown	1991		7.8	103	63
Mali	unknown	1993		13.1	122	275
Niger	Niamey	1993		13.5	230	279
Senegal	countrywide	1989-93		21.0	600	284
Senegal	Dakar	1990		47.4	388	282
Senegal	Dakar	1990-91	Senegalese	21.2	99	129
Senegal	Dakar	1990-91	foreign	25.3	91	129
Senegal	Dakar	1991		23.6	474	282
Senegal	Dakar	1992		19.0	494	282
Tanzania	Morogoro	1993		8.7	46	292
Uganda	Layantonde	1991	bar girls	35.3	98	295
Zaire	Kinshasa	1988		22.0	1233	109
Zaire	Kinshasa	1988		16.0	140	112
Zaire	Kinshasa	1991	hotel	12.0	182	62
Zaire	Kinshasa	1991	HIV+	12.0	215	23
Zaire	Kinshasa	1991	HIV-	11.0	433	23
Others						
Kenya	Nairobi	1987	pts. health center	1.0	398	18
Nigeria	Ibadan	1993	adult males	1.3	212	280
Sierra Leone	countrywide	1991	military recruits	1.7	1560	114
Tanzania	Dar es Salaam	1989	hotel/rest. workers	1.0	481	113
Tanzania	Dar-Njombe	1993	fem. @ truck stops	32.1	767	294
Tanzania	Kilimanjaro region	1988	rural population	3.3	338	125
Uganda	Kampala	1976	fem. food handlers	31.3	636	31

Table 7. Trichomoniasis

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Botswana	rural area	1990	pregnant women	48.0	114	80
Burkina Faso	Bobo-Dioulasso	1992	gyn. patients	27.8	223	263
Cameroon	Yaoundé	1980	infertile women	12.7	55	208
Cameroon	Yaoundé	1980	family planning	7.6	53	208
Cameroon	Yaoundé	1980	pregnant women	14.6	110	208
Côte d'Ivoire	Abidjan	1992	pregnant women	13.2	547	191
Gambia	Bakau	1981-82	pregnant women	32.0	100	28
Kenya	Burnt Forest	1992	MCH/FP	11.4	70	198
Kenya	Eldoret	1993	MCH/FP	16.1	230	273
Kenya	Huruma	1992	MCH/FP	8.1	62	198
Kenya	rural area	1985	pregnant women	2.0	68	216
Kenya	rural area	1988-89	pregnant women	1.6	549	111
Kenya	urban area	1984	pregnant women	8.0	200	216
Malawi	urban area	1991	pregnant women	32.4	6482	25,37
Malawi	urban area	1989-90	pregnant HIV+	47.0	1480	236
Malawi	urban area	1989-90	pregnant HIV-	28.0	5026	236
Malawi	urban area	1992	pregnant HIV+	51.3	644	187
Malawi	urban area	1992	pregnant HIV-	35.6	677	187
Niger	Niamey	1993	pregnant women	12.0	400	279
Nigeria	Ibadan	1986-89	gyn. patients	3.0	2224	219
Rwanda	Kigali	1992-93	pregnant HIV+	20.2	384	281
Rwanda	Kigali	1992-93	pregnant HIV-	10.9	381	281
Senegal	countrywide	1989-93	gyn. patients	17.6	1203	284
Senegal	countrywide	1989-93	pregnant women	15.8	928	284
Senegal	unknown	1992	gyn. patients	16.0	102	285
South Africa	rural Natal	late 80's	pregnant women	50.0	NA	27
Swaziland	Manzini	1978	family planning	15.4	52	36
Swaziland	Manzini	1978	pregnant women	23.5	51	36
Tanzania	Dar es Salaam	1988-90	gyn. patients	25.5	278	260
Tanzania	Dar es Salaam	1991-92	family planning	14.3	2031	128
Tanzania	Dar es Salaam	1993	pregnant women	21.2	255	293
Tanzania	Mwanza (urban)	1992	pregnant women	17.6	91	189
Tanzania	Mwanza region	1992-93	rural preg. women	28.8	1141	288
Uganda	Kampala	1992	pregnant women	42.5	NA	131
Zaire	Kinshasa	1989-90	pregnant HIV+	18.1	324	253
Zaire	Kinshasa	1989-90	pregnant HIV-	10.0	253	253
Zaire	Kinshasa	1990	pregnant women	17.1	701	110
Zaire	Kinshasa	1993	pregnant women	18.4	1160	181
Zimbabwe	Harare	1983	pregnant women	30.7	199	224
Zimbabwe	Harare	1986-87	pregnant women	18.2	214	223
STD Patients						
Burkina Faso	Bobo-Dioulasso	1990	men	2.7	74	254
Burkina Faso	Bobo-Dioulasso	1991	men	6.0	182	61
C.A.R.	Bangui	1992-93	both	11.9	4865	182
Gabon	Franceville	1980-82	men	1.9	261	215
Gabon	Franceville	1980-82	women	23.0	261	215
Kenya	Nairobi	1992	women	15.0	380	201
Lesotho	Maseru	1988-89	women	27.0	578	49
Malawi	Blantyre	1992	women	26.0	505	97
Senegal	countrywide	1989-93	men	13.7	462	284
Senegal	unknown	1990	men at risk	0.4	498	252
Sierra Leone	Freetown	1990-91	both	20.0	626	58

Table 9. Genital Herpes

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Somalia	Mogadishu	1985-86	pregnant women	100.0	56	54
STD Patients						
Kenya	Nairobi	1980	unknown	4.1	97	95
Kenya	Nairobi	1985	women	2.2	89	107
Rwanda	Kigali	1986	women	20.0	100	41
Rwanda	Kigali	1986	men	17.3	110	41
Sierra Leone	Freetown	1989	both	1.1	940	57
Somalia	Mogadishu	1983	men	2.9	376	206
South Africa	Durban	1984	men	7.0	100	78
South Africa	Durban	1988-89	men	10.0	100	38
South Africa	Durban	1988-89	women	18.0	100	96
Swaziland	Mbabane	1979	both	11.6	155	106
Uganda	Kampala	1990-91	both	48.0	100	52
Zambia	Lusaka	1983	both	1.8	NA	185
Zambia	Lusaka	1991	both	6.5	NA	185
Zimbabwe	Harare	1979-80	men	3.7	695	20
Prostitutes						
Kenya	Nairobi	1983		3.0	193	216
Senegal	Dakar	1985		95.7	NA	94
Somalia	Mogadishu	1985-86		100.0	85	54
Zaire	Kinshasa	1988		2.0	801	83
Others						
Congo	Brazzaville	1982	adult pop.	71.2	NA	94
Rwanda	rural areas	1985	adult pop.	27.1	NA	94
Rwanda	rural areas	1985	adult pop.	33.3	NA	94
Rwanda	rural areas	1985	army recruits	27.7	NA	94
Rwanda	rural areas	1985	hosp. workers	51.3	NA	94
Senegal	Dakar	1985	surgical patients	20.1	NA	94
Somalia	Mogadishu	1985-86	educated women	100.0	30	54
South Africa	Carletonville	1986	black miners	3.4	240	105
Uganda	rural SW	1993	adult population	67.9	294	296
Zaire	Kinshasa	1985	adult pop.	40.8	NA	94

Table 8. Hepatitis B

Country	Subregion	Year	Population	% Prevalence**	Sample Size	Reference
Women of Reproductive Age						
Cameroon	NW/SW provinces	1989	pregnant women	15.3(S)	608	34
Rwanda	Kigali	1992	pregnant women	5.0(S)	128	178
Somalia	Mogadishu	1985-86	pregnant women	36.5(S)	52	54
Zaire	Kinshasa	1988	pregnant women	20.6(S)	223	108
Zaire	Lubumbashi	1989	pregnant women	9.4(S)	308	122
STD Patients						
Cameroon	NW/SW provinces	1989	unknown	13.5(S)	282	34
Djibouti	Djibouti city	1988	men	18.0(S)	105	86
Somalia	Mogadishu	1986	men	25.7(S)	101	55
South Africa	Johannesburg	1987	women	4.1(S)	195	123
Tanzania	Mbeya region	1989	unknown	58.2(S/C)	178	60
Prostitutes						
Rwanda	Butare	1987		6.1(S)	33	43
Somalia	Mogadishu	1985-86		20.0(S)	85	54
South Africa	Johannesburg	1987		1.8(S)	56	123
Others						
Botswana	Kalahari desert	1988	San people	70.0(C)	68	68
Burundi	central area	1986	male rural pop.	17.7(S)	51	100
Burundi	central area	1986	female rural pop.	12.8(S)	39	100
Cameroon	Bamenda	1990-91	women w/mult. prt.	7.1	NA	71
Cameroon	Edea	1990-91	women w/mult. prt.	11.6	NA	71
Cameroon	NW/SW provinces	1989	blood donors	22.0(S)	384	34
C.A.R.	Bangui	1986	male gen. pop.	25.7(S)	354	69
C.A.R.	Bangui	1986	female gen. pop.	18.8(S)	586	69
C.A.R.	Bangui	1987	male gen. pop.	27.2(S)	173	69
C.A.R.	Bangui	1987	female gen. pop.	20.0(S)	210	69
Congo	Brazzaville	1991	prisoners	9.5(S)	252	119
Ethiopia	countrywide	1985-86	military recruits	12.0(S)	5270	75
Kenya	Nairobi	1987	pts. health center	6.8	398	18
Kenya	Rift Valley	1986	hosp. pts./staff	41.7	379	72
Madagascar	Antananarivo	1990	male blood donors	5.2(S)	1366	117
Madagascar	Antananarivo	1990	female blood donors	2.3(S)	263	117
Rwanda	Butare	1987	female control pop.	3.0(S)	33	43
Rwanda	Butare	1987	prost. customers	20.0(S)	25	43
Rwanda	Butare	1987	male control pop.	11.1(S)	27	43
Rwanda	rural area	1992	blood donors	4.6(S)	325	178
Rwanda	rural area	1992	student blood donors	9.2(S)	108	178
Somalia	Mogadishu	1985-86	educated women	21.8(S)	55	54
Somalia	Mogadishu	1986	healthy men	11.7	103	55
Tanzania	Dar es Salaam	1989	hotel/rest. workers	9.2(S)	481	113
Tanzania	Dar es Salaam	1989	general population	40.0	515	126
Tanzania	Mbeya region	1989	clinic outpatients	59.2(S/C)	434	60
Tanzania	Mbeya region	1989	TB patients	62.9(S/C)	98	60
Tanzania	rural NW region	1988	hospital patients	69.2	253	116
Uganda	northern area	1986	male rural pop.	12.7(S)	213	100
Uganda	northern area	1986	female rural pop.	6.2(S)	145	100
Zaire	Kinshasa	1989	blood donors	13.1(S)	2237	67

** C = Core antigen (ever infected chronic carrier)
S = Surface antigen (recent infection)

Table 10. Genital Warts

Country	Subregion	Year	Population	% Prevalence	Sample Size	Reference
Women of Reproductive Age						
Malawi	urban area	1991	pregnant women	3.6	6482	25,37
Malawi	urban area	1989-90	pregnant HIV+	8.0	1480	236
Malawi	urban area	1989-90	pregnant HIV-	2.0	5026	236
Malawi	urban area	1992	pregnant HIV+	23.6	644	187
Malawi	urban area	1992	pregnant HIV-	13.6	677	187
Senegal	Pikine	1987	gyn. patients	1.2	250	76
Senegal	Pikine	1987	pregnant women	4.0	200	76
Tanzania	Mwanza (urban)	1992	pregnant women	1.0	97	189
STD Patients	—					
Côte d'Ivoire	Abidjan	1990	men	6.6	1169	32
South Africa	Durban	1988-89	men	12.0	1745	147
South Africa	Durban	1988-89	women	1.6	937	147
Tanzania	Dar es Salaam	1984-91	men	5.4	1668	197
Tanzania	Dar es Salaam	1984-91	women	18.8	483	197
Tanzania	Dar es Salaam	1985	unknown	4.8	125	14
Tanzania	Dar es Salaam	1988	unknown	12.5	120	14
Tanzania	Pemba Island	1992-93	men	1.0	199	291
Tanzania	Pemba Island	1992-93	women	3.6	140	291
Tanzania	Zanzibar Island	1992-93	men	3.0	202	291
Tanzania	Zanzibar Island	1992-93	women	6.6	160	291
Zimbabwe	Harare	1990	women	14.0	100	81
Prostitutes						
Ethiopia	Addis Ababa	1990		9.2	NA	22
Uganda	Layantonde	1991	bar girls	6.9	98	295
Zaire	Kinshasa	1991	hotel	2.0	182	62
Zaire	Kinshasa	1991	HIV+	3.1	215	23
Zaire	Kinshasa	1991	HIV-	0.7	433	23
Others						
Malawi	Lilongwe	1989	outpatients	.3	705	56

APPENDIX B

ESTABLISHMENT OF AN STD DATA BASE

There is a practical need for the establishment of an STD data base for the use of researchers and others interested in assessing the extent of STD infection in African countries.

This data base would be used as a resource for those organizations involved in STD prevention and control activities, very similar to what is currently done with the U.S. Bureau of the Census's ***HIV/AIDS Surveillance Data Base***. Taking advantage of the excellent reputation of the Bureau of the Census in regard to its data quality and research efforts, the STD Data Base could be developed and maintained by Census Bureau staff, in collaboration with USAID personnel.

Data to be included in the data base would include the three basic epidemiological variables of time, place and persons. The following information could likely be culled from the majority of STD information sources to form the foundation of the STD data base:

Date(s) of study
Country
Geographic region and/or city/town
Population subgroup
Total sample size
Sex and age
STD pathogen(s) diagnosed
Type of procedures/tests used to diagnose disease i.e. clinical, lab or combination of both
Type of study: prospective, cross-sectional/case-control, intervention
Prevalence and/or incidence
Source of data (reference code used to identify)

The following information, if available, would be helpful for epidemiological analysis:

Occupation
Marital status
Ethnicity
Odds ratios (measuring associations with HIV infection)

Occupational data provides first a measure of socio-economic level which has become very important in evaluating intervention programs. Occupation can also be used in identifying specific risks, e.g, commercial sex workers or long haul truck drivers. But in addition, occupation is an indication of general conditions. While associations of disease rates with such general conditions may be less strong than those dependent on specific risks, they may be of greater epidemiological interest because of their relevance to circumstances outside particular risk groups.

There are numerous formats for reports compiled from the information in the data base. The more common information to include in a report are: type of STD and its prevalence, geographic region, population subgroup, gender and year(s). Graphs are highly effective in conveying information, especially of trends in prevalence levels, and therefore should be included as part of a package of data base reporting options. There should be procedures to tailor reports in accordance with the researcher's requirements. The data base software should be user friendly and flexible in order to meet the needs of various users. Ultimately, the STD data base should be made available in hard copy and disk format.

There are few STD surveillance systems in Africa; Zambia, Zimbabwe, Cameroon and Senegal, are all sentinel surveillance systems [24,34,59,74,127]. Recent data from the Zambian system have suggested a decrease in new cases of STD infections along with increased geographic coverage. However, it is not clear if this is due to a genuine decline in STDs rather than a declining attendance at the clinics under the National STD Control Programme. Private practitioners and hospitals do not report to the Zambian National STD Control Programme [84]. In fact, the annual cases of chancroid and syphilis combined, which previously were much less than gonorrhoea, have since surpassed those of gonorrhoea at the University Teaching Hospital, Lusaka.

Surveillance of STDs, in general, poses its own unique challenges. For example, gonorrhea and chlamydia share similar symptoms. Accurate diagnosis of the STD is difficult to obtain unless laboratory testing is employed. The emergence of infectious penicillin resistant strains is another threat. Estimates of resistant gonococcal strains range from 55% of all gonococcal strains in Kenya, 41% in Zambia, 60% in Zaire and 52% in Kigali, Rwanda [6]. Multiple reporting can be a problem when patients go from facility to facility in search of care for the same episode of STD. Those people who seek private sources of treatment are excluded from the official surveillance figures.

At the present time, it seems more realistic to establish sentinel systems (passive surveillance) in Africa and work towards making these systems function in an optimum manner. Monitoring STDs in target populations may be a rapid and simple way to track the combined effects of partner change, STD treatment, and condom use in large populations. Criteria for sentinel site selection would include: multiple sites covering subpopulations who practice high-risk behaviors; available routine services with staff who are cooperative, enthusiastic and accessible to the public; and available laboratory facilities at the central and provincial level to make correct diagnosis. These systems by themselves will not possibly render a complete picture of the STD situation in any one country but they can be supplemented by ad hoc surveys.

The rudiments of a surveillance system would include: statement of objective; standardized case definitions for each STD which is a public health threat in the region; standardized case-reporting forms; continuing education for health personnel; use of a microcomputer (if possible), at least at a centralized level; and generation/dissemination of reports on a regular basis to those who can take appropriate corrective action.

The reporting forms should include demographic data for each STD case including occupation if possible; symptoms and physical findings, of which urethritis and ulcerations are more useful markers of infection; behavioral risk factors involved; lab test results, if done; and follow up and outcome for as many of the cases as possible.

Without the information obtained through STD surveillance, it is not possible to know how and where disease control efforts should be focused or to analyze the impact of ongoing efforts.

APPENDIX C

SURVEILLANCE SYSTEMS FOR STD MONITORING AND CONTROL

STD control is one of the key components of HIV prevention and control. Intervention programs that include condom promotion and behavior change would benefit both STD and HIV control programs. In addition, early detection and treatment of STDs would reduce the incidence and duration of STDs and as a result would reduce the incidence of HIV infection.

Behavioral change can be tracked through close monitoring of STD levels and trends in the population, particularly subgroups most at risk. For example, overall declines in gonorrheal levels were noted in Israel in the years 1981-1987 [5]. It is hypothesized that a fear of AIDS led to a substantial decrease in risky sexual behavior, resulting in an unusually sharp decline in gonorrhea incidence between 1985-1987. However, it is better to track behavioral changes through analysis of STDs of low infectivity rather than STDs of high infectivity, such as syphilis [44]. Big increases in the incidence or prevalence of a slightly contagious diseases would signify disturbing trends in behaviors which expose people to a high risk of infection. STDs with short incubation periods, such as gonorrhea, could also indicate behavior trends better than those with longer incubation periods [6].

The overall objective of an STD control program would be to decrease incidence and duration and the resulting disabilities from STDs. Epidemiological information is the first requirement in setting up a control program. Knowledge of the current incidence and prevalence of the various STDs is required in order to provide the appropriate drugs and in adequate amounts. Surveillance systems can fulfill the traditional role as monitor of disease occurrence, even in less developed regions. Targeted interventions can be planned if health authorities have up-to-date epidemiological data on disease incidence/prevalence. To be effective, any surveillance network must be interactive and reciprocal.

Surveillance and rapid response to identified disease threats are at the core of preventive medicine [298]. Surveillance is the ongoing collection and use of health data, with the stress on ongoing. A well-designed and well-implemented infectious disease surveillance program can provide a means to detect unusual clusters of disease, document the geographic and demographic spread, estimate the magnitude of the problem, describe the natural history of the disease, facilitate laboratory and epidemiological research, and assess the success of specific intervention efforts [298].

Seasonal fluctuations in occupational or recreational activities may account for variation in exposures to sources of infection. For example, there is a pronounced September peak of births in Kenya corresponding to urban workers' December holidays [226]. An understanding of the seasonal variation might have a great preventive potential.

Poor surveillance leaves policy makers and practitioners without a basis for developing and implementing policies for controlling the spread of infectious diseases. It would be ideal to institute an active system of surveillance where health systems personnel continually solicit reports of disease occurrence. The enormous cost involved in doing this usually negates implementation of an active system. Therefore, one is left to consider a nationwide passive system, which relies on health personnel to submit disease reports to the surveillance monitors, or sentinel systems, where a limited number of general practitioners report on a defined list of carefully chosen topics in a few specially chosen sites, employing active surveillance techniques.

Passive surveillance has one major disadvantage: incomplete reporting of cases. Of necessity, passive systems rely on the interest and involvement of health personnel in maintaining the system. Feedback on how the surveillance system is operating is vital in order to maintain health personnel interest in reporting cases.

HISTORY OF DISEASE AND TREATMENT MEASURES

Chancroid is a localized STD. Infection commences with shallow, small ulcers displaying ragged edges. The ulcers bleed easily and are extremely painful when appearing on the skin surface, often making further sexual activity impossible. The bases of these ulcers are covered with a pussy exudate. Lesions usually are found externally on the genitalia in men, but, in women, they usually appear at the entrance to the vagina. The majority of men develop swollen lymph nodes in the groin region which swell with pus and subsequently rupture to form larger ulcerations. Complications may include tissue death due to gross ulceration if left untreated. Sexual partners should be examined whether they are symptomatic or not. Ulcers should improve after 7 days. Erythromycin or ceftriaxone are the drugs of choice.

The lack of a serologic test and variations in outcomes that are dependent upon the type of medium used to diagnose infection are the two major problems in diagnosing this illness. Difficult diagnosis may also explain the paucity of studies in the literature giving prevalence figures for this STD.

To make accurate diagnosis, it is necessary to obtain a culture of the organism, *H. ducreyi*, in order to exclude other possible diseases. The more common diagnostic tests utilize a chocolate (GC) agar base or enriched Mueller-Hinton agar to isolate the pathogen. After a 2 to 4 day incubation period, definitive diagnosis can be made.

Syphilis is a systemic STD easy to diagnose and treat. There are four stages of disease: primary, secondary, latent and tertiary. Symptoms begin with a painless, firm chancre with a clear base and well-defined edges found on the external genitalia in men and usually found inside the vagina in women. Secondary stages are indicated by flat, wartlike growths on genitalia and mucous membranes. There is presence of a nonitching skin rash with raised surfaces often found on the palms of the hand and soles of the feet. The tertiary stage evidences itself through neurosyphilis and cardiovascular syphilis. Insanity and/or death remain distinct possibilities.

Infectious syphilis is clinically diagnosed using dark-field microscopy. Unfortunately, significant experience and suitable equipment is necessary for this type of diagnosis. Serological tests for syphilis are divided into nontreponemal reagin tests and specific treponemal tests. The nontreponemal rapid plasma reagin (RPR) test is easy to do and does not require sophisticated equipment. The RPR is the usual screening test and is used, along with the Venereal Disease Research Laboratory (VDRL) test, to detect early infectious syphilis. The *T. pallidum* haemagglutination assay (TPHA) test is more specific than the RPR and VDRL test and diagnoses presence of the antigen *T. pallidum*. This test is twice as expensive as the RPR or VDRL tests and more technically difficult to do. Therefore, TPHA should only be done to confirm a positive RPR or VDRL test.

Syphilis is amenable to antibiotic treatment in all its stages. Cerebrospinal fluid tests should be administered only when there are clear signs of neurologic damage or previous treatment failure. The drug of choice remains penicillin for all stages of syphilis, even in HIV infected patients. Screening is imperative for those groups potentially most affected. Many successful screening programs have been carried out amongst pregnant women. Pregnant women are understandable targets of such programs since congenital syphilis continues to be a major public health threat in Africa.

Congenital syphilis is only a threat if the mother has not received adequate penicillin treatment for syphilis during her pregnancy. All newborns, however, should be examined at birth for infection. Infants can be asymptomatic and test negative if the mother acquired her infection late in her pregnancy. Therefore, subsequent exams should continue at frequent intervals until nontreponemal serological tests prove negative. If there is any doubt as to the mother's infection status and/or appropriate follow up of the infant cannot be done, then the infant should be treated as if infected.

APPENDIX D

GENERAL COMMENTS ON DIAGNOSIS AND TREATMENT

Some general comments regarding diagnosis and treatment in the African context need to be addressed. Special challenges are posed to those working in this part of the world. Two major obstacles are cost and availability of both testing materials and effective drugs to treat infection. Multiple STD infection and reinfection are common, thereby making diagnosis and treatment more difficult. Similar symptoms for certain STDs make it a challenge to identify which pathogen is involved if the wherewithal to properly diagnose is not there. Even if lab diagnosis is done, the sensitivity and specificity of some tests can be low under conditions commonly found in developing countries. Simple tests, such as stained smears, can be unreliable while more complex ones, like bacterial/viral cultures and dark field microscopy, are either not available or not used. Test results may also be available too late to significantly affect the course of disease. Due to the poor health state of the general population in this part of the world, the drug regimen of choice may not work in the optimal fashion.

A way to simplify diagnosis is to utilize the "syndromic approach" recommended by WHO for use at the field level [6,9,299]. Reliance is placed upon groups of symptoms, or syndromes, and patient histories rather than on specific STDs. Primary health care workers make the diagnosis based upon the presence of vaginal or urethral discharge and lower abdominal pain. Lab tests are not required. These workers are instructed to follow strict protocols and first line treatment is given to treat the most costly and severe disease in those cases where there may be more than one possible STD pathogen. If first line treatment is not effective, treatment consonant with the second possible cause of disease is begun. Surveillance of STDs can identify the most prevalent STDs in the area, and for a particular syndrome, reduce the number of STDs that providers need to treat. Frequent and careful review needs to be done to monitor changing disease conditions and resistant strains of pathogen. The record keeping system must be fully functional. Of course, this approach is dependent upon the correctness of diagnosis, the health-seeking behaviors of the individual and the patient's adherence to any treatment regimen.
Any treatment prescribed should ideally be single dose and have few side effects. The cost should be minimal and the drug culturally acceptable and easy to take. The best drug satisfying the maximum number of criteria should be administered.

The question of mass treating certain populations considered at high risk of infection is one that is often debated. Ordinarily, this practice should not be done except under the most extreme circumstances or with certain groups such as nomads and remote villagers. If mass treatment or any treatment regimen, for that matter, is not done with care, drug resistance can arise.

In Africa, people often go to private sources for STD consultation or they may self-medicate. Private sources range from traditional healers to pharmacists, private physicians and market vendors. Many times, these treatments are ineffective due to improper diagnosis, indiscriminate use of the drugs, and medical incompetence on the part of those prescribing the treatment. These poor health-seeking behaviors have long term consequences for STD treatment and control. Women, in particular, are less likely to seek any sort of treatment due to the social stigma of STDs and differences in social standing of women in the community, vis-a-vis men.

was within 30 days of onset of symptoms [7]. Chlamydia, if left untreated, can remain infectious for up to fifteen months in over 50% of women [2]. The drug of choice is doxycycline or tetracycline. While this treatment is usually effective, reinfections are common and multiple dose regimens are required.

Trichomoniasis is caused by a motile, single-celled parasite which is able to attach itself to the walls of the vagina and subsequently infect the vaginal lining and urethra. The protozoan produces vaginal inflammation with vulvar itching. Discharge is common in women and there is occasional mild urethritis in men. However, the majority of men are asymptomatic. Trichomoniasis is almost always an STD and seems to be more prevalent in women. Diagnosis through direct microscopic examination of vaginal discharge on a saline wet-mount or diagnosis in a Pap smear are the common methods of detection. Culture is not widely available but is the method to use for diagnosis in men. There is some indication that drug resistant strains are becoming more common. This STD can cause pelvic inflammatory disease (PID) if allowed to progress up the genital tract of women or may result in adverse pregnancy outcome. In men, few complications are reported and infection seems to be self-limited. Treatment is necessary for infected women. Symptomatic and asymptomatic patients should always be treated with metronidazole taken orally in a single dose. Treatment is almost always effective if the sexual partners are also treated.

Human papilloma virus infects the innermost layers of skin and mucous membranes. The virus then proceeds to replicate itself in infected cells and progresses to the surface of the skin where infection is, at this point, passed on to someone else. Replication of viral cells occurs in a disorderly fashion and can cause precancerous growths, warts or cancer. Most growths occur in the genital region of both sexes. Recurrences are common.

Diagnosis is done clinically since the virus cannot be grown in tissue culture. Unfortunately, a large proportion of growths cannot be detected clinically. Treatment involves the removal of growths through cryosurgery with liquid nitrogen.

Hepatitis B virus is an STD of rather low infectivity spread through exchange of blood or other bodily fluids. The role of heterosexual transmission of Hepatitis B in the developing world is little understood. Indications are that HBV is acquired through horizontal transmission (absence of parenteral or sexual exposure) between the ages of 6 months and 5 years in Africa [175]. However, some studies note an independent association between prostitution and Hepatitis B infection and further studies need to clarify this association. Hence, there may be sexual transmission of HBV in Africa. Initial, nonspecific symptoms include fever, rash, and aching joints. This is shortly followed by complaints of fatigue, nausea, appetite loss and jaundice. In some cases, death due to liver failure or liver cancer may follow. Hepatitis antibodies can be detected in sera using appropriate tests. Once hepatitis develops, no effective therapy exists to treat the illness but, fortunately, the majority of cases resolve themselves. There is an effective vaccine to prevent Hepatitis B and WHO recommends that HBV vaccination be incorporated into the Expanded Programme of Immunization (EPI) [175].

Although not specifically detailed above, **granuloma inguinale, known as donovanosis**, needs some mention. Worldwide prevalence is fairly low except in a few areas of India and the South Pacific [11]. However, a few cases have been found in South Africa [12]. Most researchers know very little about this STD. We do know, however, that donovanosis causes extreme ulceration in the genital areas of both sexes. Therefore, it can be safely assumed that infection could easily facilitate HIV transmission. Most cases of this STD are often mistaken for early stages of syphilis and penicillin is administered, which is not effective against this STD [12]. Many cases of diagnosed donovanosis are, in actuality, incompletely treated cases of chancroid [11]. Direct examination of the affected tissue is usually required in order to diagnose donovanosis. The literature mentions that the Donovan organism normally resides in the bowel and is spread through anal intercourse to the genitalia. If this be the case, then one might theorize that the potential for this disease to occur in large numbers in Africa is doubtful, since most Africans claim they do not practice anal intercourse.

Genital herpes is almost exclusively a sexually transmitted disease which remains localized in the body. It is an incurable, latent disease. Those afflicted are prone to frequent recurrences. The virus replicates itself in skin cells, then proceeds to invade sensory nerve cells. Vesicles and pustules are primary evidence of infection. Urinary retention is common. Viral shedding is characteristic of this disease. The virus is passed on to uninfected individuals during this period when the virus is shed. Viral shedding is triggered by physical, hormonal and immunological stimuli. After infection, approximately one week elapses before ulcers appear. Once a person contracts herpes infection, it is imperative that a condom be used during each act of sexual intercourse.

When vesicles are present, it is relatively simple to make a clinical diagnosis. However, if such is not the case, then viral cultures are required to confirm infection.

Acyclovir taken orally is prescribed to reduce possibilities of transmission. However, it does not prevent transmission. Continuous use of this drug should be stopped after 1 year to reassess the patient's condition.

Gonorrhea is a localized STD, resulting in profuse, pussy discharge and painful or difficult urination in men. Contrary to what is widely believed, women usually do exhibit signs and symptoms, although nonspecific, of infection [8]. These symptoms include lower abdominal pain and vaginal discharge.

This disease is particularly significant in Africa because most cases of infertility may be traceable to repeated infectious episodes from this pathogen. Urethral stricture is the most severe complication in males. It is estimated that the duration of infectivity for untreated gonorrhea can last up to six months [2]. Thayer-Martin chocolate agar medium is used for the culture of smears in order to properly diagnose this pathogen. Carbon dioxide is also necessary to isolate the pathogen. Unfortunately, routine culture capabilities are expensive and present barriers to widespread, ongoing usage in less developed regions. Serological tests are not sensitive nor specific enough to employ.

Treatment must be carefully prescribed and adhered to since penicillin-resistant gonorrhea is common in Africa. For example, it is estimated that in Kenya, 55% of gonorrhea cases are resistant to drug therapy while in Zaire the proportion is 60% [6]. Ceftriaxone and doxycycline are the drugs of choice for penicillin-resistant strains.

All patients testing positive for gonorrhea should be given HIV and syphilis tests [7]. Ideally, the drug of choice for gonorrhea should also be effective against chlamydia since the two STDs often occur simultaneously [7]. Ofloxacin is such a drug.

Chlamydia is a localized STD. There are two strains of this disease - lymphogranuloma venereum (LGV) and trachoma. Most individuals infected with the trachoma strain are asymptomatic. Screening may need to be relied upon in order to detect the trachoma strain. Common complications include pelvic inflammatory disease, infertility and ectopic pregnancy. This strain may cause the majority of chlamydial infections in Africa.

The trachoma strain produces symptoms in men, albeit of a milder nature, similar to those found in gonococcal infection. Women may evidence a yellowish, mucoid discharge and present with an inflamed cervix. Painless ulcerations in the genital area evidence themselves if infected with the LGV strain. The infected individual will then usually proceed to develop swollen lymph nodes in the groin area. Both strains of the disease are believed to be on the upswing in less developed nations.

Cell culture to isolate the pathogen in tissue is the optimal diagnostic testing methodology. However, this requires a level of technical sophistication that may not be available in all venues. All sexual partners of anyone diagnosed with chlamydia should be tested and treated, if necessary, if their contact with the infected person

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