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Gender and AIDS

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Abstract

The paper reviews empirical evidence of gender differences in HIV prevalence, incidence and mortality as well as possible risk factors. For HIV/AIDS cases and deaths among adults other than those due to heterosexual transmission, there seems to be an overwhelming excess of males. For AIDS among children, there seems to be a small excess of males over females overall, and a small excess of females over males for perinatal transmission. For adult cases due to heterosexual transmission, sex differences vary greatly according to time and place. In the United States, female cases far exceed male cases, whereas there are more male cases in Europe. In Africa, based on limited available evidence, the life time risk of contracting AIDS seems to be approximately balanced between the two sexes, but females tend to be infected earlier in life and to have lower mortality. However, the ratio of female to male cases changed during the course of the epidemic. In the early phase, there were higher numbers of cases among men, whereas there were equal or higher numbers of females in the later phase. Reasons for these differences are explored, focusing on biological, behavioral and social factors.
Introduction

More than 20 years after the beginning of the HIV pandemic, the issue of differences between males and females in HIV/AIDS remains complex and controversial. The relationships between male and female prevalence, incidence, severity, and mortality are by no means stable. They may vary with time in the same location during the course of the epidemic, and vary greatly by place of residence. Gender differences with respect to HIV/AIDS depend on patterns of disease transmission, as well as on the stage of the epidemic. They are produced by differential exposure and differential susceptibility by age and sex. These, in turn, are the product of a wide range of biological, behavioral and social factors that vary between males and females, because they relate to gender specific roles and behaviors. Understanding gender differences may have important theoretical implications, in particular for better delineating differential susceptibility to diseases, and many practical implications for targeting interventions aimed at controlling HIV/AIDS.

The virus causing AIDS (HIV) can be transmitted in a variety of ways: sexual routes (male homosexual and heterosexual), blood transfusion, exposure of blood and blood products, intravenous drug use, mother to child (perinatal and breastfeeding), and in rare cases casual exposure to an infected person. Transmission rates for a number of those routes seem to be relatively balanced between the two genders, although precise data are lacking for the world as a whole. Among the most striking differences are the high risks among male homosexuals (compared to virtually no risk for their female counterparts), and the higher number of males among intravenous drug users, hemophiliacs and recipients of blood transfusion (table 1). Occupational hazards for physicians and laboratory personnel who are exposed to blood products can go either way depending on the sex ratio of the personnel in the country considered. It is worth noting that a majority of certified cases among health personnel reported in developed countries (50 out of 95) were among nurses and midwives. Furthermore, since the proportion of females employed in medicine and laboratories has increased over the past 20 years, their risk of HIV infection has also risen. However, certified cases of HIV transmission by occupational hazard seem exceedingly rare compared to other sources of infection (95 certified cases and 191 possible cases by December 1997 according to Eurosurveillance), although no data is available from sub-Saharan Africa. Data on blood transfusion by age and sex in the world are lacking, but in developing countries it is likely that blood transfusions are more frequent among young women because of specific risks, particularly in the case of complications during child birth. Among pediatric AIDS cases in the USA for which the most likely mode of transmission was mother to child, there were more females than males (+1.4%), the difference with the sex ratio at birth being statistically significant (P= 0.005), which suggests either a higher transmission to female fetuses and babies, or a faster rate of incubation for infected females. For the other sources of pediatric AIDS (blood transfusion and hemophiliacs) there was an overwhelming majority of males (sex ratio of 3.2 to 1). In
developed countries overall, typical risk ratios of male to female AIDS cases and AIDS deaths for all sources combined are 4 to 5 males to 1 female (table 1).

The most critical area to be examined with respect to male-female differences in HIV/AIDS is the sex distribution in the heterosexual transmission of HIV in the general population. This is the most common route of HIV infection in developing countries, and accounts for roughly two thirds of all cases in the world (Anonymous, 1998). Empirical evidence in developed countries, primarily in Europe and North America, indicates that, when the most likely mode of transmission is heterosexual contact, the ratio of male to female cases can go either way: more females than males in the USA (ratio M/F = 0.6), more males than females in Europe (ratio M/F= 1.2) (table 1). Reasons for this discrepancy are not fully understood, and may be related to the prevalence of male circumcision (see below).

In this paper, we will focus on heterosexual transmission in Africa, by far the continent most hardly hit by HIV/AIDS, accounting for roughly two thirds of the world’s cases and only about 10% of the world’s population. In Africa, heterosexual contact is by far the most frequent mode of transmission. The scanty empirical evidence of sex differences will be reviewed, and factors contributing to these differences will be analyzed. At first glance, since heterosexual intercourse involves the same numbers of male and female partnerships, one could expect the same number of men and women to be infected. Reality is more complex, since mixing is not random, and since strong age differences are involved in both exposure and susceptibility, in addition to a variety of biological, behavioral, social and gender issues.

1. Demographic evidence

Prevalence / Incidence

Most of data presented on HIV prevalence in sub-Saharan African populations comes from sentinel sites where pregnant women attending antenatal clinics are routinely screened. The available information is therefore strongly biased, since it does not include men, and since pregnant women are a peculiar group, made of women who are younger and more likely to be married. Furthermore, for a given age and marital status, women infected by HIV or other STDs are less likely to become pregnant (Zaba et al. 1998), adding to the other biases. Of course, these data cannot be used for studying differences between males and females. Other data are available from high-risk groups, in particular STD patients and tuberculosis patients, but here again recruitment biases forbid any systematic
analyses. In addition, they are often not broken down by age and sex in published statistics, which forbids any comparison.

The scarce data useful for documenting gender differences in HIV prevalence or incidence come from the very few serologic surveys in national populations, and from local, population based studies, most of them longitudinal. At the country level, a systematic search provided only three such surveys, conducted at the beginning of the epidemic: Rwanda (1986), Uganda (1988), and Côte d’Ivoire (1989). In the two studies from central Africa, HIV-1 seroprevalence was higher among females, whereas in Côte d’Ivoire HIV-1 seroprevalence was higher among males. In all three studies however, HIV prevalence was higher among younger women, especially those under 20-year of age, but higher among older men, especially those aged 25-year and above (figure 1). It is worth noting that this age pattern of prevalence is similar to that of tuberculosis (more young women, more older men), another lethal persistent infection, which is also a common opportunistic infection for HIV.

Similar findings are reported from local, population based longitudinal studies of HIV-1 seroprevalence (figure 2; table 2): Uganda (Mulder et al. 1994; Berkley et al. 1990; Seeley et al. 1994; Sewankambo et al. 1994; Sewankambo et al. 2000; Waver et al. 1994, Kilian et al. 1999), Tanzania (Todd et al. 1997; Barongo et al. 1992; Grosskurth et al. 1995; Boerma et al. 1999), Zimbabwe (Gregson, 1999), the Gambia (Wilkins et al. 1991), Guinea-Bissau (Wilkins et al. 1993), Ethiopia (Fontanet et al. 1998), Zambia (Fylkesnes et al. 1997), and four cities of West and East Africa (Buvé 1999).

When all adults are considered together, because of the age structure of the population which gives more weight to the youngest age groups, one usually finds a higher prevalence of HIV-1 among female than among male adults in Africa. A summary table of available evidence (adapted from earlier work by Gregson, 1999) shows a 33% excess prevalence among females on average from various studies throughout Africa (table 2).

The pattern of age and sex differences seems somewhat different for HIV-2 infection in West Africa, with an overall excess of males (table 3). In community studies, the age pattern of infection showed some similarity with that of HIV-1, but with less differences between male and female adults (age < 30 years), and no significant difference at older ages (> 30 years) (Wilkins et al. 1991; Pison et al. 1993). However, in the national survey of Côte d’Ivoire (1989), the age pattern of sex differences in HIV-2 prevalence was identical to that of HIV-1, with a slightly higher prevalence of HIV-2 among females in the 15-24 age group, a much higher prevalence among males in the 25-44 age group, and about the same prevalence at age 55-64 years. Higher female sex ratios at older ages may be due to a higher susceptibility of older women, or to a selection effect due to excess mortality of infected men. Since the mode of transmission of the two viruses seems identical, gender differences in seroprevalence between HIV-1 and HIV-2 are likely to reflect different dynamics or different stages of the epidemics.
Life time risk of developing AIDS

Seroprevalence surveys do not readily provide the life time risk of contracting HIV and developing AIDS. However, lifetime risks can be estimated from incidence data. Gregson (1999) provided an estimate from cross-sectional data in a community of South Eastern Zimbabwe, which had a typical age and sex pattern of seroprevalence. Lifetime risk of HIV-1 infection was found to be virtually identical for men and women at age 55 (about 68 %), despite a much earlier age of infection for females. This corresponded to a peak seroprevalence of about 35 % for women at age 25-29 years, and of 40 % for men at age 30-34 years. Annual incidence is by no means constant between age 15 and 55 years, and comparisons with other populations is not possible because of the extreme scarcity of data outside of small communities involved in prospective studies. So far however, there is no evidence of striking differences in lifetime risk of HIV infection between men and women in countries where heterosexual transmission is the overwhelming mode of HIV transmission.

Mortality

The mortality picture is even more complex, due to both demographic and epidemiologic factors (table 4). On the demographic side, survival rates are much higher among younger people, depicting the general age pattern of mortality (Darby et al. 1996; Coutinho, 2000). Since women are infected earlier on average, they tend to survive longer than older men. For instance, in the General pattern of model life tables, the average pattern for developing countries, at 55 years of life expectancy, a typical value of the level of mortality in sub-Saharan Africa, death rates for all causes combined at age 35-44 among men are about 65 % higher (76 per 1000) than death rates at age 25-34 among women (46 per 1000). HIV/AIDS case fatality rates seems to follow the same pattern (Morgan et al. 1997). Therefore the number of male HIV/AIDS deaths occurring in the population is likely to far exceed female HIV/AIDS deaths, despite the higher number of infected females. A recent study from Rakai clearly illustrates this pattern (Sewankambo et al. 2000): in a careful follow-up study of about 20 000 adults aged 15-59 years over a 30-month period, mortality was lower among HIV infected women than among HIV infected men (-15%), and this was true in all age groups considered, whereas HIV prevalence was higher among women (+45%), especially among the 15-29 years old (+130%). On the epidemiologic side, the dynamics of the epidemic further complicates the picture. In the early stage of an HIV epidemic, female commercial sex workers (CSWs) play an important role in transmission (core group), and usually a small number of females can infect a large number of male customers within a few years. Therefore, it is common to see many more men dying in the early years of an epidemic. This was the case, for instance, in Abidjan, Côte d’Ivoire, where during the first three years of the epidemic (1985-1988) about 3 times more men died of HIV/AIDS than women (De Cock et al. 1989; De Cock et al. 1989; De Cock et al. 1991; Djomand et al. 1995; Garenne et al. 1995;
Garenne et al. 1996). However, in the closely linked epidemic in Ghana at about the same time, more women died than men, mostly because they were infected CSWs coming back from Abidjan. In his systematic review of adult mortality in sub-Saharan Africa using indirect demographic methods, Timaeus (1997) also found a higher increase in mortality among men, using retrospective data from the early years of the epidemic.

In conclusion, the pattern of age and sex differences in infection and mortality appears complex, and is the product of several dynamics: earlier infection and lower mortality among women, and later infection and higher mortality among men. This in turn is due to a combination of epidemiological, biological, social and behavioral factors, which we review in the next section.

2. Potential explanatory factors

Epidemiological and biological factors were reviewed primarily from published literature. Unpublished data derived from the “four cities study” (Buvé 1999) were also used. This study was conducted on fairly large random samples of men and women in four cities of West, Central, East, and Southern Africa: Cotonou (Benin), Yaounde (Cameroon), Kisumu (Kenya), and Ndola (Zambia). The first two sites had a relatively low prevalence of HIV among women (3.5% and 7.7%), whereas the two others had a high prevalence (30.1% and 32.2%). The surveys were conducted in 1997, and contain a variety of biological and behavioral data.

Exposure

Age at first intercourse delineates the beginning of the period at risk for the transmission of STDs. It is roughly the same around the world, with a median of about 18 years +/- 3 years, with little difference between men and women. Data from Demographic and Health Surveys (DHS) indicate a range from 15.1 years (females in Niger) to 20.7 years (males in Mali). In Africa, according to DHS data, the median age at first intercourse is usually lower for females than for males, whereas the opposite seems to be true in other developing countries of Latin America and Central Asia. On average, the median age at first intercourse in Africa (16.5 years), was lower than in the other developing countries investigated by about three years (19.5 in Latin America and Central Asia). This is primarily due to earlier marriages. The relatively small difference in absolute terms may have an important epidemiological significance, since adolescent women seem to be at much higher risk for HIV than older women. This point has not been much investigated. With respect to the number of
partners, adolescent women seem to have slightly more partners than adolescent men on the average, but the opposite is true at ages above 20 years (Cleland and Ferry, 1996).

**Efficacy of transmission**

A question that has been seriously debated in the literature is whether HIV transmission is more efficient from male to female than from female to male. Currently available evidence appears conflicting at first glance. Earlier reports, based on USA data, suggested a higher transmission from male to female than from female to male (Padian et al. 1991). However, two recent well designed prospective studies in Europe and in Africa showed a similar risk for both ways. In Europe, 304 discordant couples (108 female infected and 196 male infected) were followed for an average duration of 22 months (de Vicenzi et al. 1995). Both groups had the same incidence when couples were not using condoms regularly (11.4% for male positive and 13.4% for female positive, the difference being not statistically significant). In Uganda, a prospective study conducted in the Rakai district had similar findings (Quinn et al. 2000): incidence among discordant couples was basically identical (12.0% and 11.6% respectively) over the 22 months of the follow-up study. Furthermore, no case of HIV transmission was found in the group of female positives when the male partner was circumcised. The difference between the discordant couples with HIV+ females and uncircumcised men and the discordant couples with HIV+ males was not significant. A possible explanation for the discrepancy between the European and American data may be that most American men are circumcised, whereas most European men are not, and therefore have lower chances of being infected (see below).

More important, a recent study from Masaka, Uganda (Carpenter et al. 1999) shows that HIV incidence among discordant couples varies substantially with age and sex (figure 3). For females, incidence is very high in the age group 13-24 years, and declines markedly with age, while for males incidence was nil in the age group 13-24 years, and increased sharply with age. The two curves seem to cross each other (same incidence) in the 35-44 age group. The difference between males and females in the first age group was highly significant. Since exposure was probably similar across the age groups (assuming no bias associated with age and extramarital sex) these differences most likely reflect differences in biological susceptibility. In fact, among seronegative couples in the same study (where extramarital sex was likely to be the source of infection) the pattern of incidence was just the opposite, and paralleled that of the number of partners (figure 4). This biological effect (higher susceptibility of young women) could well explain a large part of the age differences in HIV prevalence, in particular the high seroprevalence among young women who have a small number of partners.
Male circumcision

Male circumcision has consistently been found to reduce the risk of female to male HIV transmission, by about half in both univariate and multivariate analyses, in developing as well as in developed countries (Bongaarts et al. 1990; O’Farrell and Egger 2000; Weiss et al. 2000). Male circumcision has also been shown to reduce the risk of ulcerative STDs, such as chancroid and syphilis in a variety of settings. Age at circumcision (before puberty), and the completeness of circumcision (whether the foreskin is fully removed) seem to be important factors of the protective effect of circumcision (Kelly et al. 1999).

However, if circumcision has some protective power for individuals, it seems to have a smaller effect in the long run in populations because of repeated exposure. For example, if we assume a discordant couple with an infected female and an uninfected male, not using condoms, and an annual risk of transmission of 12% (as in Uganda), 92% of male uncircumcised partners will be infected after 20 years of repeated exposure compared to 71% of circumcised partners with half an annual risk. This only adds up to a 30% reduction in cumulative incidence over 20 years, and virtually the same life time cumulative incidence (92% and 99% respectively). Furthermore, it is worth noting that a rapid spread of HIV can occur in populations where most males were circumcised prior to puberty, such as in the homosexual groups in the United States, or heterosexuals in large African cities such as Abidjan.

Female genital mutilation

A review of the main bibliographic databases such as Medline, AIDSline and Popline yielded no published evidence that female genital mutilation is a risk factor for HIV/AIDS, although such an effect cannot be ruled out (Brady, 1999). It is worth noting that in areas where female genital mutilations is widely practiced, such as the Sahelian part of sub-Saharan Africa from Somalia to Burkina Faso, HIV seroprevalence among women does not seem to be higher than in other parts of the continent after 20 years of HIV epidemic.

Commercial sex

Commercial sex workers (CSW’s) are in majority young women, and they seem to be among the first persons to become infected by HIV in developing countries. In Africa in particular, they seem to become infected very quickly if not using protection. For instance, in large cities such as Nairobi or Abidjan about 80% of CSWs became infected within the first 5 years of the epidemic. Commercial sex is a strong risk factor for HIV infection among females, primarily due to the high number of partners and possibly to the young age of CSWs. In many African countries CSWs accounted for a
large number of female AIDS patients in the early stage of the epidemic. CSWs tend to transmit HIV to a larger number of males, thus, within a few years, the sex ratio of infected persons becomes imbalanced the other way, as exemplified by the case of Abidjan (Djomand et al. 1995). As the epidemic progresses, the sex ratio seems to tend towards one.

**Sex with older men**

Much has been written about older men having intercourse with younger women, the so-called ‘sugar daddies’, and its potential role in the HIV epidemic in sub-Saharan Africa (Anonymous, 1993). This pattern of intercourse seems closely related to income differences between younger and older people, and to a certain extent to schooling and women’s status. However, thus far, there is no convincing evidence demonstrating that sex with older men is a major risk factor for female HIV infection at the population level.

The four-cities study provides further insight into the pattern of sexual mixing in Africa. This study, based on fairly large numbers, recorded the sexual behavior of adults of both sexes. In addition to regular partnership, it included detailed information on up to eight casual partners. The data on sexual behavior were very consistent when analyzed by age, and consistent with other similar studies conducted in Africa. We cumulated the information from the four sites (3654 relationships of women and 5060 relationships of men), and included both regular unions and casual partnerships over the past 12 months. Data reveal a high consistency between male and female respondents (figure 5). The mean age of female partners in all these relationships was linearly related to that of the male partner. The average female partner’s age increased from 18.3 years for men aged 20 years to 31.3 years for men aged 40 years. The age gap between the partners increased linearly with age, but was very small for young adults (1 to 2 years on average). Similarly, the proportion of women who reported having at least one partner above age 45 was very low for young women (< 1 % at age 15-24 and about 10 % at age 25-34) and very high for older women (84 to 90 % at age 45+). Here again, the data were very consistent between male and female respondents, as well as between the four sites (figure 6). Therefore, sex with older men seems an unlikely explanation for high seroprevalence among young women, which now ranges from 20 to 60 % in many urban settings of Southern Africa.

**Dry sex**

Dry sex is a common practice in Africa. This consists in drying the vaginal walls using various herbal preparations or a towel prior to intercourse, in order to increase the male partner’s pleasure. Studies in Southern Africa show about half the population has ever been practicing it. In the four cities study, ever use of dry sex was rare (< 6 %) in three sites, and moderately frequent (35 %) in the fourth site located in Southern Africa (Ndola). Even in this site, the majority of women acknowledged
practicing it only rarely (20.7% out of the 35%), with only 5.6% saying that they were always practicing dry sex. Furthermore, the practice of dry sex was rare (< 6 %) in the 15-19 age group, and increased with age with a peak in the 30-39 age group. The relationship of dry sex with HIV transmission remains controversial. Studies in South Africa, Zimbabwe, and Zambia show an increased risk for males (RR= 1.35), borderline significant, but no effect on females (Beksinka et al. 1999; Runganga and Kasule 1995; Sandala et al. 1995). Dry sex is therefore unlikely to explain the high risk of young females.

Intercourse during menstrual periods

Intercourse during menstrual periods has been argued to be more risky than in non-menstrual times. In a study conducted in the USA among 20-37 year-old women, intercourse during menstrual periods was positively associated with self-reported STD history (Tanfer and Aral, 1996). These results seem to apply to HIV transmission in Africa, controlling for other factors (Malamba et al. 1994). However, no study of HIV transmission in discordant couples practicing sex during menstrual periods seems to be available so far. The extent of intercourse during menstrual periods in Africa also remains poorly documented. In the four cities study, its prevalence was 12 %, with minor differences between sites and no age effect. Prevalence of intercourse during menstrual periods was lowest (6 %) in the site where HIV seroprevalence was highest (Ndola). Last, higher risk during menstrual periods could also work both ways (male to female and female to male), and is therefore unlikely to account for the higher prevalence of HIV among young women.

Biological susceptibility of adolescent women

Very young women have lower levels of estrogens, and therefore more anovulatory cycles and less lubrication of the vaginal walls. This may increase their susceptibility to viral infections, such as HIV or Herpes infections. These effects have been poorly searched so far, and would require a thorough biological investigation since they may well explain some of the demographic findings.

Possible effect of hormonal contraception

Hormonal contraception has been shown to increase susceptibility to HIV/AIDS. In a meta-analysis based on 28 studies throughout the world based on prospective and retrospective studies, oral contraceptives were shown to increase the risk of HIV by about 20 % (Wang et al. 1999). Similarly, in prospective studies, injectable contraceptives (Depo-Provera) was shown to be a risk factor (RR= 2.0) for HIV transmission in Kenya (Martin et al. 1998), as well as in Thailand (Rehle et al. 1992). Possible biological mechanisms are the effects of progesterone on the cervical and vaginal epithelium, which is
particularly fragile among adolescents, as well as the complex effects of sex hormones on the immune system. It should be noted that Depo-Provera in particular is widely used in Eastern and Southern Africa among adolescents and young women, and that this area is among the hardest hit by HIV/AIDS. In summary, injectable contraceptives may play a role in the rapid spread of HIV/AIDS in certain African countries, and this effect might be particularly strong for the very young women. This issue however requires further and more extensive investigation.

Dynamics of the epidemic

Much has been changing during the first 20 years or so of the HIV/AIDS epidemic. The precise origin of the AIDS epidemic is still a controversial matter, but sporadic cases of HIV/AIDS have been reported from 1959 to 1979. Among the earliest cases cited in the book ‘The River’ (Hopper et al. 1999) which extensively reviews the origin of HIV/AIDS, the numbers of men and women infected with HIV-1 prior to 1980 are balanced (15 males and 16 females), whereas the number of men infected with HIV-2 prior to 1975 (27 men) far exceeds the number of women (3 women). This may reflect two different early dynamics of the epidemics in diseases transmitted the same way.

Since then, several phases seem to have developed in sub-Saharan Africa, although evidence remains limited. In a first phase, it seems that sexually mobile men infect female CSWs who in turn infect other male clients. In a second phase, infected males infect other casual and regular partners, younger and older women. Often, these men were clients of CSWs before marriage, who became infected, and in turn infect their new wife. In a third phase, young women infect casual and regular partners, in particular newly married men, as well as their children later on. Consequently, sex differentials depend very much on the stage of the epidemic, tending towards equality in the long run. Another consequence of these dynamics is that marriage is no longer protective, and that a faithful partner after union is no longer a protection against HIV since the partner might well have been infected long before (Malamba et al. 1994; Nunn et al. 1994).

3. Gender issues

The main question at this stage is why young women remain at very high risk of HIV infection, even when they are aware of the disease and its consequences (as shown by high level of knowledge in DHS surveys), and when a simple method of protection (condom) exists and is now widely available. Lack of protection, multiple partners and other risky behaviors are often the
consequence of difficult psychological and social situations as well as discrimination. Furthermore, the roles of women may place them at increased health risks. Here, we briefly review the gender issues associated with the vulnerability of women as they relate to the demographic evidence discussed above.

**Women’s status and roles, self esteem and imbalance of power**

Adolescent women in developing countries frequently suffer from low self esteem, a major factor of high-risk behavior such as unprotected intercourse. Low self-esteem may well be ultimately a major factor contributing to the rapid spread of HIV among African adolescents. Low self esteem among young women seems to be the consequence of a variety of factors, including low status of women in the society and the specific family environment, in particular the various forms of child neglect and child abuse (Gupta and Weiss, 1993).

More important, the imbalance of power between the genders reinforces these factors and impairs the negotiation power of young women for safe practices during intercourse (Preston-Whyte and Gcadinja, 1993). In certain societies, especially in developing countries, adolescent and young women have very little power either to say no when they do not want to have sex, or to ask their male partner to use condoms if they accept sexual intercourse. This seems primarily due to the perception of women’s status, which is deeply rooted in both male and female subconscious. However, the imbalance of power is likely to change in the future, with the increasing education of women, as well as the growing awareness of reproductive health matters and the danger of unprotected intercourse.

Women’s roles seem to change quite rapidly in Africa, with increasing economic independence of women (Orubuloye et al. 1997). Unfortunately so far, an increase in women’s autonomy seems to be associated with higher risks for HIV/AIDS because of a later age at marriage and a higher number of partners. These negative effects could be addressed by health education: in countries such as Uganda, powerful education campaigns have been associated with a decrease in high risk behavior and lower prevalence of HIV/AIDS among young adults (Mulder et al. 1995; Kilian et al. 1999).

**Rape and violence against women**

Violence against women, another factor closely linked to women’s status, could also contribute to higher risk of HIV infection among women (Maman et al. 2000; Coker et al. 1998; van der Straten et al. 1995; Heise, 1993). In particular, forced sex is usually perpetrated on very young women, and is a potential risk factor of HIV infection, even though the probability of transmission is assumed to be low in a single intercourse. Traumatic sex with severe bleeding is common in rape, and could also be an additional risk factor of HIV infection in such cases. The prevalence of rape depends
very much on the definition used. In South Africa, about 3% of women admit to having been raped (1998 DHS survey), and this should be considered as low estimate since women tend to underreport rape in surveys. In other settings, much higher values have been reported, such as 11% and 22% in the Central African Republic (Blankhart et al. 1999; Chapko et al. 1999). Collective rapes of village women by armies and guerilla bands has been argued to be at the origin of the rapid spread of HIV in Southern Uganda in the 1970’s. In such situations, rape could play a significant role in the dynamics of the epidemic, and the high level of HIV infection among young women.

Beyond rape perpetrated by persons other than regular or casual partners, various forms of forced sex could also be considered. Forced sex with a regular partner is a frequent phenomena throughout the world, affecting a quarter to half of women and often accompanies physical abuse (Garcia-Moreno and Watts, 2000). However, it seems unlikely to be a risk factor for HIV infection since it does not change the usual pattern of risk within relationships when unprotected intercourse is common, unless trauma occurs. Furthermore, forced sex probably works both ways (male to female and female to male), and therefore seems unlikely to help explain gender differences.

Multiple partnership and commercial sex.

Multiple partnerships seem to be widely prevalent among adolescents and young adults of both sexes throughout the world, with the exception of conservative (usually religious) groups. However, the case of commercial sex is more important to consider for HIV/AIDS. If economic incentives are important throughout the world, it is also clear that low status of women, economic discrimination, lack of economic opportunities, and above all violence against females play critical roles, especially in developing countries of South-Asia, South-East Asia, and Africa. Forced prostitution is widely prevalent throughout the world, and is induced primarily by sex traffickers or sometimes by families, placing large numbers of very young women in situations of extreme vulnerability. Patterns of commercial sex seem to vary greatly throughout the world, and a full-scale analysis is beyond the scope of this paper. In any case, it seems likely that the many forms of violence against women underlying and causing forced prostitution are ultimately at the origin of the rapid spread of HIV/AIDS among young adults of both sexes in the general population of many developing countries.

Care of sick persons and differential exposure

Women are more likely than men to take care of sick people at home, and this is most likely the case for AIDS patients in Africa. Although daily interactions with HIV infected persons is rarely a cause of infection, it should be noted that taking care of AIDS patients puts women at risk of other infections, such as tuberculosis in particular. Little is known about this risk issue, but in places like
Southern Africa it remains possible that older women, mothers or care takers of young adults with AIDS, have an increased risk of contracting tuberculosis.

Discussion

Gender differences in HIV/AIDS are complex and involve a variety of biological, behavioral and social factors. The difference between HIV-1 and HIV-2, two similar diseases transmitted the same way, add further complication to the overall picture. Little hard data are yet available to substantiate current hypotheses explaining gender differences, and much remains to be studied in developing countries. Building this evidence seems essential, as policy should be driven by evidence.

A recent comparative study reviewed factors that may explain differences in levels of HIV seroprevalence in four African cities located in Kenya, Zambia, Cameroon, and Benin, two places with high seroprevalence, and two places with low seroprevalence. The main conclusion from the comparative study of the four sites was that no known behavioral risk factor could explain the observed differences in HIV seroprevalence. Another question posed by the study was why young women are infected so early in life (before age 20 years), when they do not have any obvious behavioral risk factor. In particular, these infected women do not seem to have more sexual partners than others in their own settings, and no more than women in developed countries where HIV infection is rare in the general population.

Little is known still on the susceptibility of the host by age. This type of data seems to be crucial to the understanding of the age pattern of the HIV/AIDS epidemic in sub-Saharan Africa, and probably elsewhere as well. It has been noted earlier that the age pattern of HIV infection closely resembles that of tuberculosis (more younger women and more older men). It seems likely that age is also a risk factor for HIV infection for biological reasons, and that males and females interact differently with age, as in the case of a number of other infectious diseases.

The aim of this paper was to investigate the differentials in HIV infection and HIV/AIDS mortality between men and women, and not the level of infection or the dynamics of the epidemic. Many of the social factors discussed above most likely play a role in the rapid spread of HIV in Africa in both men and women. However, they do not seem to explain the main difference between men and women, which is the earlier age at infection for women. In the very heterosexual HIV epidemic in Africa, men and women seem to eventually share the same life-time risks of morbidity and mortality, but not at the same age. This has consequences for the ‘burden of the HIV related diseases’, which appears to be higher for women in terms of years of healthy life lost.
If the emphasis has been on women in this report, one should not forget that in a heterosexual epidemic men are also at high risk, and also engage in high-risk behavior despite proper information. The various factors related to high-risk behavior of men have not been addressed here. These factors are likely to also include lack of maturity, low level of education, low socioeconomic status, lack of economic opportunities, low income, and possibly denial and fatalism due to the fear of AIDS itself. Stigmatizing one gender or the other proves to be counter-productive for fighting an heterosexually transmitted disease. It is quite clear that efforts to prevent male to female transmission will be more successful if similar efforts are made to prevent female to male transmission, and fortunately, the condom protects both sexes. Several studies have emphasized the role of communication between partners for ensuring the success of prevention efforts (Preston-White et al., 1993; Miles, 1993; Lear, 1993).

This literature review leads to propose a few directions for further research. First, the apparent higher susceptibility of very young women (adolescents), and possibly of older men, needs to be studied in detail, since it seems to be a critical factor in the early infection of women. This pattern of interaction has numerous consequences on the infection of husbands and regular partners later on, as well as on children. The role of intercourse between older men and very young women and the role of rape in adolescents also need to be further studied, in particular bearing in mind that these groups may be at higher risk for different reasons. Quantifying the role of violence against women in forced prostitution and its multiplicative effect on the transmission of HIV and other STDs would also be useful. The apparent correlation between high seroprevalence and the use of injectable contraceptives among adolescents deserves a thorough investigation, even though it could be a purely spurious relationship. Last, the fragility of the vaginal epithelium among adolescent women could be studied more thoroughly, since it could be a risk factor per se and interact with other factors such as hormonal contraceptives and traumatic sex.

Acknowledgment

The authors would like to thank Dr. Anne Buvé from Antwerp and Mr. Benoit Ferry at CEPED for sharing many thoughts and data, colleagues from Heidelberg University, department of international health, who provided many comments to an oral presentation of this paper, and Dr. Shelah Bloom who commented on a later version.
References


Table 1: Sex ratio (male / female) of AIDS cases and AIDS deaths in Europe and the United States, according to the source of infection (cumulated cases until June 1999)

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Table 2: Sex differentials in HIV-1 prevalence: evidence from population-based surveys in sub-Saharan Africa

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Table 3: Sex differentials in HIV-2 prevalence: evidence from population-based surveys in sub-Saharan Africa

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Table 4: Sex differences in HIV/AIDS adult mortality in sub-Saharan Africa

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List of figures

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