

## **The effects of HIV and AIDS on fertility in East and Central Africa**



**Philip Setel**

*National Centre for Epidemiology and Population Health, The Australian National University*

### **Abstract**

**Concern has been expressed about the fertility of people infected with HIV: the worry has been that on learning of their condition, HIV-affected individuals may attempt to accomplish unmet reproductive goals knowing that they will not live a normal life span. This article addresses the potential effects of AIDS on fertility and reproductive decisions in East and Central Africa. The problem is seen in terms of a tightly knit continuum of biological, epidemiologic and cultural contexts, and the prevailing conditions of response to the epidemic. AIDS can influence fertility among individuals and groups regardless of any awareness of serostatus by increasing death rates among reproductive populations, and damaging the physical capacities of infected men and women to reproduce. In much of the region, high prevalence of STDs may simultaneously impair the fertility of men and women and increase their risk of contracting HIV. These biological conditions are compounded among those for whom fertility is a highly valued marker of adult status, where the social and economic marginality of young women contributes to reliance on commercialized sex, where the mobility of young men leads to instability in sexual partnerships and frequent partner change, or where women lack the ability to negotiate their fertility with spouses. It appears that even focused programs of testing and counselling with HIV-positive women in Europe and in Africa have not motivated a significant change in reproductive action. Were there a demonstrable effect of counselling on the fertility choices of infected persons, there are numerous practical limitations on the role that interventions can play in affecting the fertility of HIV-positive people.**

### **An overview of the problem**

As the AIDS epidemic continues, the question of how HIV will affect fertility and reproductive decisions in sub-Saharan Africa has been raised in many settings, from fieldwork interviews with rural Tanzanians to international conferences attended by professional researchers. Specifically, the concern has been voiced that men and women who are infected with HIV may attempt to 'hurry up' their fertility. This concern derives from the centrality of reproduction to life courses, adult identities, and access to social support, particularly for women, in many African settings. Were a 'hurrying up' of fertility to become a characteristic response to having AIDS in heavily affected communities, there would be understandable concerns about short-term service needs and quality-of-life issues for perinatally infected infants and children, and long-term care and quality-of-life issues for children destined to lose one or both biological parents. This article draws on published material from several countries, and upon fieldwork conducted between 1991 and 1993 on cultural dimensions of AIDS in Kilimanjaro, Tanzania, to puzzle out some of the potential fertility-related consequences of the epidemic.

While awareness of AIDS has brought about changes in some aspects of sexual life, AIDS may not be substantially influencing choices about reproduction in most contexts. Understanding why this is the case depends upon viewing the disease in the context of closely interrelated social and epidemiological conditions, and against a background of HIV detection systems with limited resources and coverage. Although there are reports from Uganda that prospective spouses and partners in some heavily affected communities have begun to voluntarily seek out premarital or pre-relationship testing and counselling (Mukiza-Gapere and Ntozi n.d.), in most settings, few individuals appear to be motivated to do so without being prompted by the knowledge that a partner, spouse, or child has AIDS. Limited identification of asymptomatic cases through other routes restricts the number of HIV-affected individuals who will know about their condition to a small proportion of the total number of those infected. Many who do become aware of their serostatus will do so upon progressing to symptomatic HIV disease, and are not likely to remain well long enough to significantly alter their total fertility. Thus, the fertility decisions of the majority of HIV-infected people will probably not depend on an awareness of their serostatus.

For those who are in good health and who are also aware of having HIV, decisions to continue reproducing will depend on a variety of personal and socio-cultural factors. Although interventions have been shown to foster risk reduction, particularly among stable HIV-discordant couples, reproductive responses to AIDS cannot be expected to be based primarily upon personal assessments of risk to self, partner, or child that derive from HIV counselling programs. A decision by a healthy HIV-infected person to continue childbearing is likely to be influenced by the importance of fertility for men and women in tenuous socio-economic contexts, and by how reproductive power is configured in culturally supported hierarchies of gender and generation. In some cases, continued reproduction may not be a matter of choice. For those women who lack the power to negotiate fertility, it seems plausible that those who become infected with HIV may also be reluctant to reveal their serostatus to partners. As recorded by Biswalo and Lie (1995:229-230), even women who receive intensive counselling may not feel willing or able to discuss their status with spouses or family, despite being pressed by spouses to have more children. In-depth interviews with a small sample of HIV-positive men and women in Tanzania during the early 1990s, however, revealed that most were either too ill to consider having children, or were more concerned with providing for existing children than having additional ones.

### **Direct and indirect effects of HIV on reproductive capacities**

High levels of adult mortality due to AIDS, combined with HIV-related damage to the reproductive capacities of infected men and women, must be taken into consideration over and above any responses motivated by being diagnosed with the disease. Although this article does not address demographic projections about the effect of AIDS on fertility rates, it seems clear that AIDS will decrease the rate of population growth in several countries in Eastern and Central Africa, mostly by raising mortality rates (United Nations 1994). Although HIV reduces the reproductive capacities of infected men and women, whether the epidemic will alter fertility rates is unclear.

In men, HIV disease causes progressive damage to sperm morphology and function (Krieger et al. 1991; Crittenden, Handelsman and Stewart 1992; Gresenguet et al. 1992; Politch et al. 1994). Many HIV-positive men experience these effects, although in the early stages of disease they also appear to retain seminal parameters consistent with fertility<sup>1</sup>. As

---

<sup>1</sup>In less heavily affected countries in Africa where trends toward lower fertility have been demonstrated, it will probably not further reduce fertility rates (cf. Ainsworth 1993), although the aggregate effect of

the disease progresses, however, the motility and quality of sperm decrease. One study from Central African Republic has shown high rates of seminal abnormalities likely to affect fertility among men as HIV disease becomes more severe (Gresenguet et al. 1992). Among women, research in Africa and Europe indicates that positive serostatus may lower fertility rates in all HIV-infected birth cohorts (Batter et al. 1994; Johnstone 1994). HIV-positive women also have significantly more negative pregnancy outcomes than uninfected women, including miscarriages, spontaneous abortions, and stillbirths (De Cock et al. 1994; Temmerman, Chomba, and Piot 1994); in later stages of disease they may also suffer from menstrual disturbances (Strecker et al. 1993).

These fertility-related effects of disease progression may combine with other social and epidemiological factors that influence fertility and risk for HIV. For HIV-positive women in sub-Saharan Africa who are trying to have children, higher rates of stillbirth, spontaneous abortion, or infant and neonatal mortality will eliminate or truncate culturally prescribed periods of abstinence. This is one way in which HIV can play an indirect role in reproductive decisions among infected persons. In addition, a history of STDs in both sexes (especially repeated or untreated episodes of disease) is related to risk of HIV infection (Germain et al. 1992; Grosskurth et al. 1995), and HIV itself may increase susceptibility to certain STDs.

Chlamydia and gonorrhoea appear to be increasing in several locations (Brunham, Garnett et al. 1991; Brunham, Cheang et al. 1993; Temmerman et al. 1992). The socio-economic characteristics associated with high risk of HIV infection in occupational sub-groups common among young adults, for example, itinerant businessmen and market women, women engaged in temporary bar work, and male transport workers (Mhalu et al. 1991; Orubuloye, Caldwell and Caldwell 1993; Talle 1995:22) along with instability in long-term relationships (Nabaitu, Bachengana and Seeley 1994), have been linked to STD-induced infertility in both sexes (Evina 1991; Imade et al. 1993). Given this conjunction, STD-induced infertility among men and women may be more prevalent among those with HIV and AIDS, and create what has been called, in another context, a 'synergism of plagues' (Wallace 1988; see Larson 1989:203–204; Schoepf 1992).

Because social behaviour, sexual risk, fertility, and vulnerability to STD/HIV infection are often so intertwined in Africa, as Ainsworth and Over (1994) point out, comparing fertility rates among infected and uninfected women becomes extremely complicated. In one study of pregnancy rates among HIV-infected women in Rwanda, the combined effect of factors simultaneously associated with different levels of HIV infection and different levels of fertility meant that researchers were unable to determine the role of testing and counselling in accounting for different pregnancy rates within the study cohort (Allen et al. 1993).

### **HIV detection: how many do not know?**

Constraints on the early detection of cases limit the scope of conscious, intentional fertility-related responses among those who are infected with HIV, and have clear implications for individual or familial coping strategies across the gamut of issues evoked by being HIV-positive. The later in their disease diagnosis takes place, the more likely individuals are to be suffering the effects of HIV disease on their health and fecundity, and to die before they can increase their fertility.

Sentinel surveillance programs monitoring HIV prevalence and incidence in East and Central Africa are not designed as screening programs to detect and notify at-risk individuals;

---

the epidemic on fertility rates in more severely affected populations has yet to be determined (Palloni and Lomas 1989; Gregson 1994). If, as seems to be the case, AIDS has a significantly shorter incubation or 'latency' period in sub-Saharan Africa than in other settings (Killewo et al. 1993), it may contribute to the reduction of total fertility rates in heavily affected groups.

they are meant to serve as markers of the epidemic's progress in sub-groups which represent various sections of the overall population and various categories of risk. The programs are frequently conducted using anonymous and unlinked blood samples from hospital blood donors, pregnant women attending antenatal clinics, or STD-clinic attenders. Thus, those with asymptomatic HIV disease who are tested in such a program will not receive notification of their serostatus.

The identification and counselling of HIV-positive people without symptomatic disease has largely been confined to mechanisms such as participation in community-based serosurveys, longitudinal cohort studies, and research undertaken in tertiary care facilities. Even when counselling and test results are made available to study participants, they may not receive them. In one community-based study of STDs and HIV, only 40 per cent of study subjects who stated that they wanted to know their test results returned to collect them (Klouman et al. 1995:213). Some cases may be detected through having an infected and often symptomatic partner or child. Results from my fieldwork interviews with young adults in Tanzania indicated that some people were prompted or coerced by a partner to seek out testing, or underwent testing voluntarily because of fears they might have been infected. Taken together, however, informed HIV-positive study subjects can only make up a small percentage of all those affected by the disease, and voluntary testing among the so-called 'worried well' is not widespread.

Once they are diagnosed, men living in Europe who have HIV infection and who use available drug therapies have a one-in-four chance of surviving twenty years after seroconversion before developing AIDS (Phillips et al. 1994). After diagnosis with AIDS, European men and women have a median survival time of seventeen months (Lundgren et al. 1994). In sub-Saharan Africa the estimates of the latency period from infection to symptomatic HIV disease for men and women are much shorter, ranging from five to ten years (Killewo et al. 1993; Ainsworth and Over 1994). If many of those infected were identified soon after their infection, they might be able to alter their short-term fertility, although probably not by much. At an individual level, any 'extra' children that infected persons might have through a strategy of hurrying up their fertility would be offset by children they will not be able to have later in life.

Most of those diagnosed with HIV outside the context of prospective studies or serosurveys are identified when they develop symptoms—well into the course of the illness—and not through linked HIV testing when asymptomatic. Yet governments of countries with severe epidemics, such as Tanzania, have estimated that under-detection of symptomatic cases, itself a difficult task (Evans 1991:1261), has contributed to the inability to identify and report on more than 25 to 33 per cent of those afflicted with AIDS (NACP 1994). A number of African studies have placed the mean and median survival times among men and women with symptomatic HIV disease in the range of three to six months for those with HIV-1 (Mbagi et al. 1990; Whittle et al. 1992) and thirteen months for those who have HIV-2 (Whittle et al. 1992); data from Eastern Zaire indicate that there are few differences between male and female survival times (Salinari, Filippo and Claudio 1990).

Under such circumstances, many infected people who become aware of their illness will not live long enough to alter their fertility, even if they want to. In fact, many of those who are diagnosed with AIDS contact the formal health care sector so late, and with such severe super-infections, that their survival after diagnosis is a matter of days, not years, particularly if they cannot afford expensive medications to treat secondary infections (Mbagi et al. 1990; Naucler et al. 1992). Clearly this influences the scope and character of responses that individuals and groups might be expected to have to this disease; if only a small proportion of HIV-positive people are identified and notified overall, regardless of the clinical stage of disease, knowledge of serostatus will have a small effect on the fertility objectives and

reproductive action among them. In the absence of widespread early knowledge of HIV status, there can be few planned responses of the kind we are concerned with here.

### **Knowledge of HIV serostatus and possible responses**

If these substantial obstacles to early case detection can be overcome, the range of possible fertility-related responses to knowledge of HIV infection is limited to continuing or discontinuing contraception among those already using a contraceptive technique; or starting or failing to start to use contraception among those who are not users already. Women may also have the option of terminating pregnancies, usually illegally, and often under dangerous and unhealthy conditions (Mpangile, Leshebari and Kihwele 1993; Rogo 1993; IPPF 1994). While the hypothesis that knowledge of having HIV will lead to increased fertility objectives has not been the central concern of focused research, findings from a few African cohort studies among urban women indicate a need to combine a clear understanding of cultural and social responses to AIDS with an analysis of the cultural context of fertility.

Even under carefully designed HIV testing and counselling programs, and with good communication between heterosexual partners about HIV status, condom use can be sporadic (Mayes et al. 1992; de Vincenzi 1994) and the effect on future reproductive decisions insignificant (Higgins et al. 1991; Sunderland et al. 1992). An initial intent to cease reproduction may give way, in time, to a desire for children that overrides considerations of transmission risk to an uninfected partner or child (Green 1994). One meta-analysis of studies from around the world found 'little evidence for the impact of counselling and testing on pregnancy and/or pregnancy termination rates for seropositive or seronegative high-risk women' (Higgins et al. 1991:2419), although there was often substantial risk reduction among HIV discordant couples.

In sub-Saharan Africa, HIV and AIDS counselling services in general are not as well developed as in Europe and America, and informing a partner or spouse about serostatus often carries the threat of negative consequences that militate against open communication (Ryder et al. 1991; Temmerman et al. 1993), thus hampering the negotiation of subsequent fertility. Nevertheless, HIV counselling in Kigali that included the male partners of HIV-infected women resulted in much higher rates of condom use than among those women who either told their partners or spouses of their serostatus and were not counselled as a couple, or who withheld the information about their HIV infection from partners (Keogh et al. 1994). In Kinshasa, where HIV testing and counselling among HIV-infected women did not include many partners or spouses, there were much higher rates of intention to use condoms, but no correlation of such intent with an increase in actual condom use; there were, however, slightly higher rates of hormonal contraception use after counselling (Heyward et al. 1993). Studies in Nairobi found that testing and a single session of counselling did not have much effect at all on the subsequent reproductive behavior of HIV-positive women (Temmerman et al. 1990; Temmerman et al. 1993).

The Kigali cohort study in particular affords a glimpse at some of the complexities in fertility-related responses to knowledge of HIV infection (Allen et al. 1993). To summarize some of the findings, Allen et al. reported significantly different odds of becoming pregnant among two groups of HIV-positive women, and between the HIV-negative and HIV-positive women in the cohort. In the first two years of follow-up after HIV testing, seronegative women were significantly more likely to become pregnant than HIV-positive women, partly because HIV-positive women were also more likely to be single, hormonal contraceptive

users, and be less sexually active<sup>2</sup>. Among HIV-positive women, however, those with fewer than four children were more likely to become pregnant than those with four or more children, and married or cohabiting women were more likely than unmarried women to become pregnant.

Lower completed fertility among HIV-negative women was not associated with increased pregnancy, and married women who were HIV-negative were also less likely to become pregnant. Significantly, the use of 'injectable hormonal contraceptives was associated with a decreased incidence of pregnancy, condoms and spermicide were not' (Allen et al. 1993:709). Because of difficulties in controlling for potential confounding variables, the significantly lower rates of pregnancy among HIV-positive women could not be attributed primarily to testing and counselling. Furthermore, despite counselling, the desire to have children among HIV-positive women remained high, at 40 per cent, while 49 per cent of seronegative women stated a desire for more children. Allen et al. speculated that 'for women who must live with HIV, becoming pregnant may also be a way to continue a normal life-style—to reduce the risk of losing spouse and family support' (p. 709). At one level, becoming pregnant may serve as a social and psychological coping mechanism for HIV-positive women. Yet the matter is probably a good deal more complex.

The finding that testing and counselling can lead to risk-reduction (i.e. higher reported condom use) without bringing down fertility among infected women suggests that distinctly different sets of considerations relating to sex and reproduction are called into play. Therein lies one of the cruellest paradoxes of AIDS; regardless of concerns about the risks of perinatal transmission, fertility for women in much of sub-Saharan Africa is inextricably linked to broader concerns that touch upon almost every aspect of their adult lives. Similar conditions can be assumed to pertain to African men, despite the fact that general reproductive concerns among them are not well documented, and even less is known about the relationship between knowledge of HIV-status and subsequent male fertility.

During the course of my fieldwork, it appeared that for HIV-infected individuals who were in relatively good health, the main concern was providing and planning for the children they already had. Several HIV-positive individuals, some in reasonably good health, were interviewed. Most of them had children. For them, there was no hint that their diagnosis had brought about an urge to have more children. In one case, an HIV-positive man was concentrating his efforts on arranging for his children's school fees to be paid after his death, and upon the completion of a well constructed house for his family. At the time he learned of his serostatus, this man was the primary source of financial support for thirteen people including his parents, seven of his children, and some of his siblings and their children. Although he had been told that he could expect to live for at least four or five years after being diagnosed HIV-positive, additional children were not a consideration. Similarly, a young HIV-positive woman with one son was putting a great deal of energy into making fostering arrangements for him. Most other infected persons interviewed were extremely ill when they became aware of their serostatus, and the majority did not often leave their beds before dying.

## Conclusions

In Africa, public and professional sentiment has actively discouraged women with HIV from becoming pregnant and has even advocated legalizing abortion services for them

---

<sup>2</sup> The difference in pregnancy rates was not related to educational status, type of marriage, or partner's participation in testing, and the differences persisted when the cohort was stratified by age, marital status, and level of sexual activity.

(*Reproductive Health Matters* 1993; Strebel 1994). Yet it appears that the former objective may not be accomplished, and the latter may be politically unfeasible, regardless of the demand there may or may not be for abortions among HIV-positive women. While most studies indicate little or no effect on subsequent pregnancy rates, the Kigali study suggests that a subset of HIV-positive women—those with greater completed fertility and those who received counselling as part of a couple—may be much less likely to conceive after diagnosis. Experience among a small number of HIV infected people in Tanzania also demonstrates that for some, extending their fertility is not an issue.

What, then, are possible directions for further unravelling the complex relationship between AIDS and fertility, and for searching for points of entry into an aspect of the AIDS epidemic that many feel ought to be addressed through policy and intervention? From a policy and program perspective, men must be firmly incorporated into services and interventions, even when the primary objective may be to improve the condition of women; HIV prevention, family planning and reproductive health services can be integrated; and the limitations on programmatic responses from the formal health care sector should be candidly assessed. For example, the intensive services offered to women after diagnosis in Nairobi, Kigali and Kinshasa are probably not sustainable or replicable in more than a few well-funded projects elsewhere on the continent.

Since resources for testing and counselling are so scarce, some researchers assert that finances should be directed toward providing condoms in places such as bars rather than toward counselling (Pickering et al. 1993). Still, others find enough encouragement to advocate continued confidential counselling programs focused on HIV-positive women and cohabiting partners. They argue that counselling can substantially increase rates of condom use (Allen et al. 1992), and perhaps reduce the possibility of perinatal transmission or orphanhood for additional uninfected children among some of the service recipients.

In terms of research, better cross-cultural understanding of sexuality and fertility can inform testable hypotheses regarding fertility-related responses of individuals and groups to the AIDS epidemic. An initial step in this process might be to undertake a project of 're-situating' the way in which reproduction is understood in relation to social, cultural, historical, and political-economic conditions (Greenhalgh 1995; Kertzer 1995). To this list might be added the perceptions of local actors to the disease ecology of STDs and HIV. The goal is to move from simple notions of risk groups and risk behaviour to a more dynamic understanding of contexts of vulnerability and the motivations for action.

Overall, the fertility-related responses of individuals to knowledge of HIV-status is not something we know a great deal about at present. On the other hand, the empirical findings to date do not suggest—as some have feared—that AIDS has been leading to a 'hurrying up' of fertility in African contexts. Furthermore, given low rates of contraception in much of the continent, it is questionable how much more fertility could occur to those few infected people who consciously decide to increase their fertility.

In sum, HIV and AIDS may well diminish the fertility of affected individuals and groups in Africa, but probably not through conscious action on the part of infected persons themselves. The damage done by the virus to reproductive physiology, its effects during pregnancy, its synergistic relationship with STDs and the conditions of risk for HIV that relate to STDs and STD-induced infertility, will all contribute to a spectrum of interconnected effects that could lower fertility among people with HIV. Under present circumstances, it seems unlikely that a sufficient number of infected people will know about their disease early enough to respond in such a way as to affect the total fertility of large groups or nations.

The numbers of infected individuals for whom certain knowledge of HIV-status can be factored into reproductive choice will be further reduced by the relatively short period

between infection and death in sub-Saharan Africa, and the fact that the small proportion of infected individuals who are identified are diagnosed late in their disease. All of these AIDS-specific issues, in turn, exist within cultural frameworks and socio-economic conditions that form a substrate to sexuality and fertility for adults in any society. Future understanding of how AIDS and fertility interrelate, and the design of interventions to address this matter will depend upon taking all of these factors into account.

## References

- Ainsworth, M. 1993. *The Impact of HIV/AIDS in African Development*, Washington DC: World Bank.
- Ainsworth, M. and M. Over. 1994. AIDS and African development. *World Bank Research Observer* 9, 2:203–240.
- Allen, S., A. Serufulira, J. Bogaerts, et al. 1992. Confidential HIV testing and condom promotion in Africa. Impact on HIV and gonorrhea rates. *Journal of the American Medical Association* 268, 23:3338–3343.
- Allen, S., A. Serufulira, V. Gruber, S. Kegeles, P. Van de Perre, M. Carael, and T.J. Coates. 1993. Pregnancy and contraception use among urban Rwandan women after HIV testing and counseling. *American Journal of Public Health* 83,5:705–710.
- Batter, V., B. Matela, M. Nsuami, et al. 1994. High HIV-1 incidence in young women masked by stable overall seroprevalence among childbearing women in Kinshasa, Zaire: estimating incidence from serial seroprevalence data. *AIDS* 8,6:811–817.
- Biswalo, P.M. and G.T. Lie. 1995. Hospital-based counselling of HIV-infected people and AIDS patients. Pp.222–238 in *Young People at Risk. Fighting AIDS in Northern Tanzania*, ed.K.-I.Klepp,P.M.Biswalo and A.Talle. Oslo:Scandinavian University Press.
- Brunham, R.C., G.P. Garnett, J. Swinton and R.M. Anderson. 1991. Gonococcal infection and human fertility in sub-Saharan Africa. *Proceedings of the Royal Society of London, Series B: Biological Sciences* 246,1316:173–177.
- Brunham, R.C., M. Cheang, J. McMaster, G. Garnett and R. Anderson. 1993. Chlamydia trachomatis, infertility, and population growth in Sub-Saharan Africa. *Sexually Transmitted Diseases* 20, 3:168–173.
- Crittenden, J.A., D.J. Handelsman and G.J. Stewart. 1992. Semen analysis in human immunodeficiency virus infection. *Fertility and Sterility* 57,6:1294–1299.
- De Cock, K.M., F. Zadi, G. Adjorlolo, et al. 1994. Retrospective study of maternal HIV-1 and HIV-2 infections and child survival in Abidjan, C<sup>TM</sup>te d'Ivoire. *British Medical Journal* 308, 6926:441–443.
- de Vincenzi, I. 1994. A longitudinal study of human immunodeficiency virus transmission by heterosexual partners. European Study Group on Heterosexual Transmission of HIV. *New England Journal of Medicine* 331,6:341–346.
- Evans, B.G. 1991. Estimating underreporting of AIDS: straightforward in theory—difficult in practice. *AIDS* 5:1261–1262.
- Evina, A. 1991. The effect of sexually transmitted diseases on fertility: infertility in Sub-Saharan Africa. Unpublished manuscript.
- Germain, A., K. Holmes, P. Piot, and J. Wasserheit, eds. 1992. *Reproductive Tract Infections. Global Impact and Priorities for Women's Reproductive Health*. New York: Plenum.
- Green, G. 1994. The reproductive careers of a cohort of men and women following an HIV-positive diagnosis. *Journal of Biosocial Sciences* 26,3:409–415.



- Greenhalgh, S. 1995. Anthropology theorizes reproduction. In *Situating Fertility. Anthropology and Demographic Inquiry*, ed. S. Greenhalgh. Cambridge: Cambridge University Press.
- Gregson, S. 1994. Will HIV become a major determinant of fertility in Sub-Saharan Africa? *Journal of Development Studies* 30,3:650–679.
- Gresenguet, G., L. Belec, V.M. Herve, M. Massanga and P.M. Martin. 1992. Anomalies quantitatives et qualitatives du sperme chez des individus Africains infectés par le VIH. *Bulletin de la Société de Pathologie Exotique et de Ses Filiales* 85,3:205–207.
- Grosskurth, H., F. Mosha, J. Todd, et al. 1995. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania: randomised controlled trial. *Lancet* 346:530–536.
- Heyward, W.L., V.L. Batter, M. Malulu, N. Mbuyi, L. Mbu, M.E. St Louis, M. Kamenga and R.W. Ryder. 1993. Impact of HIV counseling and testing among child-bearing women in Kinshasa, Zaire. *AIDS* 7,12:1633–1637.
- Higgins, D.L., C. Galavotti, K.R. O'Reilly, D.J. Schnell, M. Moore, D.L. Rugg and R. Johnson. 1991. Evidence for the effects of HIV antibody counseling and testing on risk behaviors. *Journal of the American Medical Association* 266,17:2419–2429.
- Imade, G.E., O.A. Towobola, A.S. Sagay and J.A. Otubu. 1993. Sexually transmitted diseases and medico-social factors associated with male infertility in Nigeria. *Archives of STD/HIV Research* 7, 3–4:245–52.
- International Planned Parenthood Foundation (IPPF). 1994. Unsafe abortion and post-abortion family planning in Africa. Paper presented at Unsafe Abortion and Post-Abortion Family Planning in Africa Conference, Mauritius.
- Johnstone, F. 1994. HIV and fertility. *British Journal of Family Planning* 20,2:45–46.
- Keogh, P., S. Allen, C. Almedal and B. Temahagili. 1994. The social impact of HIV infection on women in Kigali, Rwanda: a prospective study. *Social Science and Medicine* 38,8:1047–1053.
- Kertzner, D.I. 1995. Political-economic and cultural explanations of demographic behavior. In *Situating Fertility. Anthropology and Demographic Inquiry*, ed. S. Greenhalgh. Cambridge: Cambridge University Press.
- Killewo, J.Z.J., J. Comoro, J. Lugalla and G. Kwesigabo, eds. 1993. *Systemic Interventions and Their Evaluation against HIV/AIDS in Kagera Region, Tanzania. Proceedings of a Workshop Held in Bukoba, Tanzania, 10–11 May*. Dar-es-Salaam: Muhimbili University College of Health Sciences.
- Klouman, E., E.J. Masenga, N.E. Sam and Z. Lauwo. 1995. Control of sexually transmitted diseases: experiences from a rural and an urban community. Pp. 204–221 in *Young People at Risk. Fighting AIDS in Northern Tanzania*, ed. K.I. Klepp, P. M. Biswalo and A. Talle. Oslo: Scandinavian University Press.
- Krieger, J.N., R.W. Coombs, A.C. Collier, J.K. Koehler, S.O. Ross, K. Chaloupka, V.L. Murphy and L. Corey. 1991. Fertility parameters in men infected with human immunodeficiency virus. *Journal of Infectious Diseases* 164,3:464–469.
- Larson, U. 1989. A comparative study of the levels and the differentials of sterility in Cameroon, Kenya, and Sudan. In *Reproduction and Social Organization in Sub-Saharan Africa*, ed. R. J. Lesthaeghe. Berkeley: University of California Press.
- Lundgren, J.D., C. Pedersen, N. Clumeck, et al. 1994. Survival differences in European patients with AIDS, 1979–89. The AIDS in Europe Study Group. *British Medical Journal* 308, 6936:1068–1073.
- Mayes, S.D., V. Elsesser, J.H. Schaefer, H.A. Handford and L. Michael Good. 1992. Sexual practices and AIDS knowledge among women partners of HIV-infected hemophiliacs. *Public Health Reports* 107,5:504–514.

- Mbaga, J.M., K.J. Pallangyo, M. Bakari. and E.A. Aris. 1990. Survival time of patients with acquired immune deficiency syndrome: experience with 274 patients in Dar-es-Salaam. *East African Medical Journal* 67,2:95-9.
- Mhalu, F., K. Hirji, P. Ijumba, J. Shao, E. Mbena, D. Mwakagile, C. Akim, P. Senge, H. Mponzuya, and U. Bredberg Raden. 1991. A cross-sectional study of a program for HIV infection control among public house workers. *Journal of Acquired Immune Deficiency Syndromes* 4,3:290-296.
- Mpangile, G.S., M.T. Leshebari and D. Kihwele. 1993. Factors associated with induced abortion in public hospitals in Dar es Salaam, Tanzania. *Reproductive Health Matters* 2: 21-31.
- Mukiza-Gapere, J. and J.P.M. Ntozi. No date. Impact of AIDS on marriage patterns, customs, and practices in Uganda. Unpublished manuscript.
- Nabaitu, J., C. Bachengana and J. Seeley. 1994. Marital instability in a rural population in South-West Uganda: implications for the spread of HIV-1 infection. *Africa* 64, 2:243-251.
- National AIDS Control Programme (NACP). 1994. *National AIDS Control Programme HIV/AIDS/STD Surveillance Report* No. 8. Dar es Salaam: United Republic of Tanzania Ministry of Health.
- Naucler, A., P. Albino, S. Andersson, A.P. da Silva, H. Linder, P.A. Andreasson and G. Biberfeld. 1992. Clinical and immunological follow-up of previously hospitalized HIV-2 seropositive patients in Bissau, Guinea-Bissau. *Scandinavian Journal of Infectious Diseases* 24, 6:725-31.
- Orubuloye, I.O., P. Caldwell and J.C. Caldwell. 1993. The role of high-risk occupations in the spread of AIDS: truck drivers and itinerant market women in Nigeria. *International Family Planning Perspectives* 19, 2:43-48 and 71.
- Palloni, A. and L. Lamas. 1989. The Palloni approach: a duration-dependent model of the spread of HIV/AIDS in Africa. Paper presented to United Nations/World Health Organization Workshop on Modelling the Demographic Impact of the AIDS Epidemic in Pattern II Countries, New York.
- Phillips, A., C.A. Sabin, J. Elford, M. Bofill, G. Janossy and C.A. Lee. 1994. Use of CD4 lymphocyte count to predict long term survival free of AIDS after HIV infection. *British Medical Journal* 309:309-313.
- Pickering, H., M. Quigley, J. Pepin, J. Todd and A. Wilkins. 1993. The effects of post-test counselling on condom use among prostitutes in The Gambia. *AIDS* 7, 2:271-273.
- Politch, J.A., K.H. Mayer, A.F. Abbott and D.J. Anderson. 1994. The effects of disease progression and zidovudine therapy on semen quality in human immunodeficiency virus type 1 seropositive men. *Fertility and Sterility* 61, 5:922-928.
- Reproductive Health Matters* . 1993. Abortion and HIV-positive women in Sub-Saharan Africa. 2:130.
- Rogo, K.O. 1993. Induced abortion in Sub-Saharan Africa. *East African Medical Journal* 70, 6:386-395.
- Ryder, R.W., V.L. Batter, M. Nsuami, N. Badi, L. Mundeke, B. Matela, M. Utshudi and W.L. Heyward. 1991. Fertility rates in 238 HIV-1-seropositive women in Zaire followed for 3 years post-partum. *AIDS* 5, 12:1521-1527.
- Salinari, R.K., C. Filippo and C. Claudio. 1990. Preliminary survival analysis of AIDS data from Goma, Zaire. Letter. *Tropical Doctor* 20, 4:169-170.
- Schoepf, B.G. 1992. Women at risk: case studies from Zaire. In *The Time of AIDS: Social Analysis, Theory, and Method*, ed. G. Herdt and S. Lindenbaum. Newbury Park: Sage Press.
- Stebel, A. 1994. Counselling women with a focus on their specific needs: examining pregnancy, abortion and paediatric issues. *AIDS Bulletin* 3, 4:16-17.
- Strecker, W., L. Gurtler, M. Binibangili and K. Strecker. 1993. Clinical manifestations of HIV infection in Northern Zaire. *AIDS* 7, 4:597-598.

- Sunderland, A., H.L. Minkoff, J. Handte, G. Moroso and S. Landesman. 1992. The impact of human immunodeficiency virus serostatus on reproductive decisions of women. *Obstetrics and Gynecology* 79,6:1027–1031.
- Talle, A. 1995. Bar workers at the border. Pp. 18-30 in *Young People at Risk. Fighting AIDS in Northern Tanzania*, ed. K.-I. Klepp, P. M. Biswalo and A. Talle. Oslo: Scandinavian University Press.
- Temmerman, M., F.M. Ali, J. Ndinya-Achola, S. Moses, F.A. Plummer, and P. Piot. 1992. Rapid increase of both HIV-1 infection and syphilis among pregnant women in Nairobi, Kenya. *AIDS* 6, 10:1181–1185.
- Temmerman, M., E.N. Chomba and P. Piot. 1994. HIV-1 and reproductive health in Africa. *International Journal of Gynecology and Obstetrics* 44,2:107–112.
- Temmerman, M., S. Moses, D. Kiragu, S. Fusallah, I. Amola, and P. Piot. 1993. Post-partum counselling of HIV infected women and their subsequent reproductive behaviour. In *Women and HIV/AIDS: An International Resource Book*, ed. M. Berer and S. Ray. London: Pandora Press.
- Temmerman, M., S. Moses, D. Kiragu, S. Fusallah, I.A. Wamola, and P. Piot. 1990. Impact of single session post-partum counselling of HIV infected women on their subsequent reproductive behaviour. *AIDS Care* 2,3:247–252.
- United Nations. 1994. *AIDS and the Demography of Africa*. New York: Department for Economic and Policy Analysis.
- Wallace, R. 1988. A synergism of plagues: 'planned shrinkage', contagious housing destruction, and AIDS in the Bronx. *Environmental Research* 47:1–33.
- Whittle, H., A. Egboga, J. Todd, et al. 1992. Clinical and laboratory predictors of survival in Gambian patients with symptomatic HIV-1 or HIV-2 infection. *AIDS* 6,7:685–689.