Sexual behaviour change in countries with generalised HIV epidemics? Evidence from population-based cohort studies in sub-Saharan Africa

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It has been 27 years since the beginning of the HIV epidemic in Africa and, although we understand more about the transmission and treatment of the disease, our knowledge of how new infections can be prevented remains limited.[1] The risk of HIV acquisition is known to be closely associated with unprotected sexual intercourse,[2 3] and adoption of safer sexual behaviour is still the main message of most national HIV prevention programmes. However, while declines in HIV prevalence have been associated with changes in sexual behaviour,[4] ecological studies have failed to find associations between risk behaviour and the prevalence of HIV[5] or other sexually transmitted infections (STI),[6] and scientific trials show no evidence for a population-level effect of behavioural interventions.[7 8] Measurement and comparison of sexual behaviour is challenging because, for example, variations in social desirability and other reporting bias can distort data on levels and trends in behaviour.[9] Thus, limitations in the reliability and consistency of the methods used to collect and analyse data on sexual behaviour, particularly when made across time or space, could contribute to these apparently contradictory findings. This supplement presents 10 recent analyses of sexual behaviour data from longitudinal studies in five countries—Uganda, Tanzania, Malawi, Zimbabwe and South Africa—experiencing different sizes and stages of the HIV epidemic. The results provide valuable information for use in evaluating trends in HIV epidemics and the impact of HIV prevention programmes. An underlying purpose of this is to highlight appropriate methods and to encourage better analysis and presentation of sexual behaviour data, especially as they relate to HIV and HIV prevention.

The Demographic and Health Surveys (DHS) conducted in many African countries have provided a wealth of data on age at first sex. Survival analysis has been proposed as the best way of analysing such data, allowing comparison of easily understood measures based on the cumulative risk of becoming sexually active.[10] Using these methods with Ugandan DHS data, Slaymaker *et al*[11] show that later cohorts of women (born after the 1980s) are delaying sexual debut compared with earlier cohorts (born before 1980), although the trend is less clear in men. Different methods can be used to obtain similar results; cross-sectional analyses by Biraro *et al* also suggest a clear delay in age at first sex in Ugandan women but less clear changes in Ugandan men.[12] In contrast, Cremin *et al* show that little change has occurred in age at first sex for Zimbabwean women but sexual debut is younger in later cohorts of men.[13]

Survival analysis is useful, not only for spatial and temporal comparisons but also because it can give easily comparable hazard ratios for different exposures.[10] McGrath *et al* show that in rural KwaZulu Natal, for both sexes, early sexual debut was associated with peri-urban residence and the death of the mother or father,[14] which accords with other South African studies.[15] In their analysis of data from the DHS in Uganda, Slaymaker *et al*[11] looked at risk factors for sexual debut and found little change in boys but greater changes in the risk factors for age at first sex in girls occurring in rural areas and in poorer households.

Survival methods are also used in this supplement by Cremin *et al* to look at age at first marriage in Zimbabwe,[13] and by Marston *et al* and Slaymaker *et al* to compare different cohort and DHS studies.[11 16] In Zimbabwe, later male cohorts (born after 1970) report younger age at first marriage compared with earlier cohorts (before 1970), although little change is seen in Zimbabwean women. The comparisons of reported age at first sex from the longitudinal cohorts with reports from DHS surveys covering Tanzania, Uganda and Zimbabwe did not reveal any large anomalies. In most locations, time spent single (between first sex and first marriage) had increased slightly for both sexes, except for men in Rakai, Uganda (who experienced a decrease) and in Manicaland, Zimbabwe where there was no overall change for either sex.

Wringe *et al*[17] report on the quality of the reporting of age at first sex and age at first marriage using longitudinal data from three countries, and Żaba *et al* apply similar methods to Tanzanian data.[18] In common with other papers in the supplement,[13 16] a high proportion of unreliable reports are noted for both age at first sex and age at first marriage among individuals who provide age data on two or more occasions. However, all of these papers note that unreliable or inconsistent reporting of age at first sex and age at first marriage make little difference to the levels and trends of the estimated summary measures, suggesting that reporting anomalies introduce noise rather than bias to the patterns observed at the population level. This is an important finding—a vote of confidence in cross-sectional studies such as DHS which cannot identify or measure the effects of inconsistent reporting from one round to the next.

Three papers in this supplement report on sexual behaviour after marriage. Boileau *et al*[19] show how HIV infection in Malawi is linked to early sexual experience and subsequent marital history: women who delayed sex and married their first sexual partner had the lowest prevalence of HIV. In Tanzania, Żaba *et al*[18] found that early marriage was associated with subsequent marital instability and polygamy, and that longer intervals between sexual debut and first marriage were associated with higher numbers of sexual partners later in life. Marital disruption increases the risk of

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HIV,[20] and Lopman *et al*[21] modelled the effect of subsequent sexual activity on the incidence of HIV, concluding that 6–17% of new HIV infections arise through the sexual activity of widows and widowers.

Using data from four longitudinal cohorts in Africa, Todd *et al*[22] show the similarity of the reported number of sexual partners across different birth cohorts and in the different locations. In a comparative analysis of trends covering the years 1998–2007, the results for Zimbabwe were in agreement with earlier findings of a recent reduction in numbers of sexual partners.[23] However, no similar behaviour changes were observed in the Ugandan cohorts during the period of observation, a period when the prevalence of HIV stagnated in the country.[24]

These findings from cohort studies provide some reassurance as to the reliability, at the aggregate level, of data collected on sexual behaviour in cross-sectional and longitudinal population surveys. This is important since these data are advocated for use in Second Generation HIV Surveillance[25] and have been used to demonstrate associations between reductions in sexual risk behaviour and declines in HIV prevalence.[23 26 27] Furthermore, reliable data on patterns and trends in sexual behaviour such as those described in the papers in this supplement are also needed for the design and scientific evaluation of both behavioural and (to control for possible confounding) biomedical interventions.

The substantive findings on patterns and trends in different aspects of sexual behaviour reported in the supplement are also important. While only considerable delays in onset of sexual activity could plausibly contribute to declines in HIV prevalence,[28] early sexual debut is an important individual-level risk factor for STIs including HIV infection[29] and also for teenage pregnancy.[30] Thus, the limited evidence for delays in sexual debut is a critical issue for both HIV prevention and family planning programmes.[31] Early marriage may also be a risk factor for HIV infection, particularly at young ages, owing to its potential for early exposure to an infected (potentially newly infected) partner.[32 33] However, it has been argued that countries where men and women marry later tend to have larger HIV epidemics owing to greater premarital sexual activity.[34] From this perspective, the finding that the interval between sexual debut and marriage may be widening in several countries, as a result of earlier sexual debut and/or delayed marriage, must be a concern for policymakers.

The reduction in reported numbers of sexual partners in Zimbabwe is more encouraging and has contributed to the national decline in HIV prevalence.[23] No similar reduction was observed in either of the studies in Uganda described in this supplement. However, behaviour change was observed over an earlier period during which HIV prevalence rates were seen to decline.[35 36] The extent to which national HIV prevention programmes contributed to these changes in behaviour remains uncertain.[37] Increased availability, from serial DHS and from cohort studies, of reliably and consistently measured data on sexual behaviour, linked to data on HIV infection and the coverage of prevention and treatment programmes, could contribute to improved evaluation and enhancement of these programmes.

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