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**Editorial for STI supplement – second draft.**

**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 (Potts et al. 2008). The risk of HIV acquisition is known to be closely associated with unprotected sexual intercourse (Kapiga et al. 1998; Lopman et al. 2008) and adoption of safer sexual behaviour is still the main message of most national HIV prevention programmes. However, whilst declines in HIV prevalence have been associated with changes in sexual behaviour (Hallett et al. 2006), ecological studies have failed to find associations between risk behaviour and prevalence of HIV (Buve et al. 2001a) or other sexually transmitted infections (STI) (Buve et al. 2001b), and scientific trials show no evidence for a population-level effect of behavioural interventions (Kamali et al. 2003; Gregson et al. 2007). Measurement and comparison of sexual behaviour is challenging; for example, because variations in social desirability and other reporting bias can distort data on levels and trends in behaviour (Catania et al. 1990). 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 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 HIV epidemic. The results provide useful 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 it relates 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 (Zaba et al. 2004). Using these methods with Ugandan DHS data, Slaymaker et al. (ref this volume) show that later cohorts (born after 1980's) of women are delaying sexual debut compared to earlier cohorts (born before 1980), although the trend is less clear in males. Different methods can be used to obtain similar results: cross-sectional analyses also suggest a clear delay in age at first sex in Ugandan women, but less clear changes in Ugandan men (Biraro et al., this volume). In

contrast, little change has occurred in age at first sex for Zimbabwean women but sexual debut is younger in later cohorts of males (Cremin et al., this volume).

Survival analysis is useful not only for spatial and temporal comparisons but also because it can give easily comparable hazard ratios for different exposures (Zaba et al. 2004). In South Africa, for both sexes, early sexual debut was associated with peri-urban residence and the death of the mother or father (McGrath et al., this volume), which accords with other South African studies (Budlender et al., 2005). In an analysis of data from the DHS in Uganda, Slaymaker et al. (ref this volume) 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 to look at age at first marriage in Zimbabwe (Cremin et al.), and to compare different cohort and DHS studies (Marston et al. and Slaymaker et al.). In Zimbabwe, later male cohorts (born after 1970) report younger age at first marriage compared to 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 males in Rakai, Uganda (who experienced a decrease) and in Manicaland, Zimbabwe where there was no overall change for either sex.

Wringe et al (this volume) report on the quality of the reporting of age at first sex and age at first marriage using longitudinal data from three countries. In common with other papers in the supplement (Cremin et al., Marston et al. and Zaba et al.), 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 four 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. (ref this volume) 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, Zaba et al. (ref this volume) 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 HIV (Quigley et al. 2000), and Lopman et al. (ref this volume) modelled the effect of subsequent sexual activity on HIV incidence, 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. (ref this volume) 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 to 2007, the results for Zimbabwe were in agreement with earlier findings of a recent reduction in numbers of sexual partners (UNAIDS 2005). However, no similar behaviour changes were observed in the Ugandan cohorts during the period of observation, a period when HIV prevalence stagnated in the country (Uganda AIDS Commission 2007).

These findings from cohort studies provide some re-assurance 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 2<sup>nd</sup> Generation HIV Surveillance (UNAIDS 2002) and have been used to demonstrate associations between reductions in sexual risk behaviour and declines in HIV prevalence (UNAIDS 1997; UNAIDS 1998; UNAIDS 2005). 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. Whilst only considerable delays in onset of sexual activity could plausibly contribute to declines in HIV prevalence (Hallett et al. 2007), early sexual debut is an important individual-level risk factor for STIs including HIV infection

(Pettifor et al. 2004) and also for teenage pregnancy (Bongaarts and Cohen 1998). Thus, the limited evidence for delays in sexual debut is a critical issue for both HIV prevention and family planning programmes (Zaba, Boerma & Marchant 1998). Early marriage may also be a risk factor for HIV infection, particularly at young ages, due to its potential for early exposure to an infected (potentially newly infected) partner (Clark 2004; Clark, Bruce and Dude 2006). However, it has been argued that countries where men and women marry later tend to have larger HIV epidemics, due to greater pre-marital sexual activity (Bongaarts 2008). From this perspective, the finding that the interval between sexual debut and marriage may be widening – due to earlier sexual debut and/or delayed marriage - in several countries 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 (UNAIDS 2005). 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 (Asiimwe et al. 1997; Stoneburner and Low-Beer 2004). The extent to which national HIV prevention programmes contributed to these changes in behaviour remains uncertain (Parkhurst 2002). 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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