Commentary: Disease modelling to inform policy on male circumcision for HIV prevention

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The findings from three randomized trials1–3 and multiple observational studies4 that male circumcision prevents HIV acquisition in men has been welcomed as an historic opportunity to control the HIV epidemic, particularly in sub-Saharan Africa.5 However, the challenges are daunting because we have never attempted to use surgery as a means of controlling an infectious disease, the African health infrastructure is weak and trained personnel required to provide circumcision surgery on a massive scale are limited. Therefore, modelling the impact of circumcision on the future course of the HIV epidemic is needed to persuade health authorities and donors to invest resources in this unprecedented initiative.

The paper by Londish and Murray in this volume6 adds to the growing body of models, all of which suggest that circumcision has the potential to abate but not abolish the African HIV epidemic over a period of 10–20 years.7–10 A variety of model projections were reviewed at a recent Joint United Nations Programme on AIDS (UNAIDS) meeting at Imperial College, London (March 5–6, 2008). A report will be forthcoming. The models have varied in their assumptions and structures, and in the endpoints used (e.g. HIV prevalence or incidence over time, HIV infections or AIDS deaths prevented, the number of surgeries needed to avert one HIV infection and the costs per infection averted). Irrespective of these differences in modelling methods and outputs, the direct biological effect of circumcision on reducing HIV acquisition in men by ~60%, and the secondary protection afforded to women via reduced exposures to HIV infected men, are so overwhelming that, under most plausible scenarios, the impact of circumcision on the African HIV epidemic is clear and substantial. The impact of circumcision will likely be greatest in settings, such as those in southern Africa, where HIV incidence is high and the prevalence of circumcision is low.

The circumcision trials provide an estimate on the numbers needed to treat per HIV infection over a short period of two years. However, since the efficacy of circumcision is likely to be life long, models can estimate the number of surgeries needed to prevent one HIV infection over a period of 10–20 years. In most sub-Saharan African settings, the number of surgeries per HIV infection averted over a decade ranges from 5–15, depending on male HIV incidence. This makes circumcision a highly cost effective intervention, particularly when costs are discounted by savings for future antiretroviral care due to prevention of HIV acquisition.

Other policy relevant questions addressed by modelling include whether to provide services to all men or to focus on specific segments of the population such as limited age groups or subgroups with higher sexual

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risk behaviours. Thus, as suggested by Londish and Murray, priority might be given to men aged 20–34 among whom incidence is generally greatest in Africa, and because such men often have relationships with younger female partners, the derivative benefits to women are likely to be maximized. Similarly, a focus on high risk core groups such as STD clinic attendees or clients of commercial sex workers might provide greater benefit. However, there are practical limitations to such strategies. First, HIV prevalence will be high in such high incidence subgroups, and since circumcision of HIV-infected men does not appear to directly benefit women, the impact of the program will be diluted and there would be substantial number of surgeries in already HIV infected men who may infect their female partners if intercourse is resumed before full wound healing is complete. Second, such ‘targeting’ could exclude large segments of the male population who, given the belief that circumcision is protective, might seek services from unsafe sources. Therefore, although models predict greater impact from targeting specific adult age or risk groups, this may be of limited practical programmatic value.

Models can also address the question of whether to devote resources to surgery in adolescents and adults, or to infant circumcision. Again, the results are clear. Adolescent and adult surgery will reduce HIV over 10–20 years, whereas with infant circumcision, HIV impact will be delayed for more than 20 years due to delayed onset of sexual activity. Similarly, models can provide guidance for the speed of program scale up. Rapid achievement of high circumcision coverage will maximize impact by more rapidly preventing new HIV infections in the population.

In summary, modelling the effectiveness of circumcision for HIV prevention can be an important tool for policy and planning. The only remaining question is whether policy makers will use this information in their decision making, whether they will devote resources to this initiative, and whether programs can be brought to scale in a timely manner.

References