

Commentary: Probability of HIV transmission through anal intercourse

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Anal intercourse remains the most common means of HIV transmission in most of the developed world. Homosexual men represent the largest group of new HIV infections in Australia,¹ Western Europe and North America.² The rate of HIV diagnosis in homosexual men is on the increase in these regions,^{1–3} and this most likely reflects a true increase in HIV incidence. Recently, it has become clear that homosexual men are also disproportionately affected by HIV in much of the developing world.² A detailed understanding of the transmissibility of HIV through anal intercourse, and co-factors which influence risk, is fundamental to the formulation of effective HIV prevention policy for homosexual men, and is also important for the substantial minority of heterosexual people who also practice anal intercourse.

A recent review of the per-contact probability of HIV transmission by vaginal intercourse included data from dozens of prospective studies.⁴ In contrast, there is a dearth of data on per-contact probability of HIV transmission by anal intercourse. In the review published in this issue of the *IJE*, Baggaley *et al.*⁵ were able to include only four studies, including only a single prospective cohort. They were unable to find a single published estimate of the per-contact probability of HIV transmission by insertive anal intercourse. Baggaley *et al.* report a summary per-contact probability of transmission through receptive anal intercourse of 1.4%. This accords precisely with the probability calculated in an Australian study published in early 2010.⁶ In that study, the authors also concluded that the per-contact probability of transmission was lower (0.65%) when withdrawal prior to ejaculation occurred. The study also provided the first estimate of per-contact probability of HIV transmission via insertive anal sex, of 0.11% when the insertive partner was circumcised and 0.62% when the insertive partner was uncircumcised. The summary estimate of probability of transmission by receptive anal intercourse of 1.4% is ~18-fold higher

than the estimated probability of male to female vaginal intercourse,⁴ and goes some way to explain why homosexual men have been so disproportionately affected by HIV in developed countries.

What co-factors might influence HIV transmission by anal intercourse? For vaginal intercourse, HIV viral load in the index case is of fundamental importance. In people with early- and late-stage HIV disease, both of which are associated with high HIV viral load, per-contact probability of transmission through vaginal intercourse has been estimated to be 7–9-fold higher than in the asymptomatic phase of HIV infection.⁴ In untreated African heterosexuals, the HIV transmission rate increased dramatically with increasing viral load from 0 in couples where the HIV positive partner had a viral load of less than 1500, to 23 per 100 person-years in those couples where the viral load was more than 50 000.⁷ As effective anti-retroviral therapy generally reduces HIV viral load to undetectable levels, it has been hypothesized that widespread treatment of HIV within a population could have a central role in HIV prevention.⁸ The question of whether anti-retroviral therapy will reduce sexual transmission of HIV is being addressed directly by a randomized controlled trial of early vs standard anti-retroviral therapy of HIV-infected individuals in serodiscordant couples. The primary outcome in this study is the rate of HIV infection in the initially HIV-negative partner.⁹ Trial results, anticipated to be available in 2013, will shape our understanding of the role of HIV treatment in HIV prevention in heterosexuals.

What do we know about the effect of viral load and anti-retroviral therapy on rates of HIV transmission by anal intercourse? The fact that the per-contact probability of transmission is close to 20-fold higher than for vaginal intercourse is a strong argument for not simply extrapolating data from heterosexual populations. The modelling data presented by Baggaley⁵ and others^{10,11} demonstrate that the

potential long-term efficacy of HIV treatment as HIV prevention is fundamentally dependent on how strongly treatment reduces transmission and how consistent this effect is over time. These may differ across homosexual and heterosexual populations. A recent meta-analysis of longitudinal studies of HIV viral load and HIV transmission in serodiscordant couples identified no studies that included homosexual men.¹² We are therefore almost completely in the dark about how HIV treatment might influence HIV prevention when HIV transmission is occurring through anal intercourse.

In an era when there are increasingly loud calls for HIV treatment as HIV prevention in heterosexual populations,¹¹ we are in urgent need of studies that quantify the rate of transmission through anal intercourse by HIV viral load. While data from randomized trials in heterosexuals will contribute to an evidence-based response in that population, we are lacking even observational data in homosexual men. The fact that HIV transmission rates are increasing in homosexual men in developed countries despite the widespread adoption of regular HIV testing and HIV treatment, strongly suggests that the effect of anti-retroviral therapy on transmission through anal intercourse is likely to be incomplete.

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