Cost effectiveness of one to one STI prevention interventions

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A cost effective use of public health resources

Barham and colleagues¹ provide a valuable review of cost-effectiveness studies of one to one sexually transmitted infection (STI) prevention interventions; one to one interventions are those delivered to one person at a time, such as screening or individual counselling (as opposed to group counselling, community-level interventions, and so on). Their review summarises the findings of 55 cost-effectiveness studies, most of which focus on chlamydia and HIV prevention interventions. A more comprehensive version of their review providing methodological details and a listing of hundreds of other cost-effectiveness studies excluded from their review is available online.

One to one STI prevention interventions were found to be cost effective in a vast majority of the studies in the review. This abundance of evidence for the cost effectiveness of one to one interventions adds significant support to the idea that risk reduction counselling should be part of the standard of STI care.^{2,3}

Barham and colleagues¹ rate the quality of each study included in the review. These ratings should be viewed with caution, owing to the difficulties in developing and applying an appropriate set of criteria. The quality ratings of the dynamic and static models (those that incorporate population-level transmission dynamics and those that do not, respectively) may reflect a preconceived notion that cost-effectiveness studies based on dynamic models are automatically of higher quality than those based on static models. For example, all of the studies based on dynamic models scored the highest possible quality rating compared to less than 10% of the studies based solely on static models. Although dynamic models are needed to advance our understanding of the costs and benefits of STI prevention strategies, we need not dismiss static models in this pursuit. The incorporation of STI transmission dynamics is inherently uncertain, and dynamic models are not necessarily more accurate than static models. As

George Box reportedly stated, "All models are wrong, but some are useful".⁴ Static and dynamic models have been and should continue to be useful tools in the field of STI prevention.

Cost-effectiveness studies, like all other studies, have limitations. For example, as Barham and colleagues¹ note, the existing literature on the cost effectiveness of chlamydia screening has been questioned because of the reliance on static models and the uncertainty in the probability of developing pelvic inflammatory disease.⁵

However, perhaps the main reason why a study's estimate of an intervention's cost-effectiveness ratio differs from the intervention's "true" cost-effectiveness ratio is not a shortcoming of the model applied or the choice of a particular parameter value, but rather the omission of a wide range of benefits of STI prevention—such as the impact of STI prevention on HIV incidence, the indirect costs (such as lost productivity) and intangible costs (such as pain and suffering) averted by STI prevention, the impact of the intervention on other STIs not addressed in the analysis, and a host of other benefits, which, if included in the analysis, would result in far more favourable cost-effectiveness estimates. The prevention of STI-attributable HIV cases can be a valuable outcome of STI prevention activities.⁶ Because the average lifetime direct medical cost per case of HIV is roughly 1000 times that of gonorrhoea or chlamydia,^{7,8} even miniscule impacts of an STI prevention intervention on STI-attributable HIV cases could have a sizeable impact on the estimated cost effectiveness of the intervention. The indirect costs of STIs can be substantial as well. A recent study suggested productivity losses of about \$130 per case of untreated chlamydia in women;⁹ roughly half the estimated lifetime direct medical cost per case of chlamydia in women.⁸ Similarly, the inclusion of intangible costs would also lead to more favourable cost-effectiveness estimates. Although the intangible costs of STIs are virtually impossible to assess, the intangible cost burden could easily outweigh the direct medical cost burden.

One way to incorporate the indirect and intangible costs averted by an intervention, at least in part, would be to assess the intervention's impact on quality of life, using a metric such as quality-adjusted life years (QALYs). As noted by Barham and colleagues,¹ very few of the studies in their review applied QALYs. One of the exceptions was a study that found that chlamydia screening would cost \$2000 to \$7500 per QALY saved (in 2000 US dollars),¹⁰ which is quite favourable compared to many other public health interventions. The usefulness of future cost-effectiveness studies could be greatly enhanced by the use of QALYs, and the call by Barham and colleagues¹ for the development and refinement of STI-specific QALY estimates is certainly reasonable.

The estimation of the cost effectiveness of STI prevention programmes is not an exact science. However, it is known that STIs impose a considerable health and economic burden, and that one to one STI prevention interventions are effective in preventing STIs. As such, it is no surprise that the vast majority of studies reviewed by Barham and colleagues¹ find that one to one STI prevention programmes are a cost effective use of public health resources.

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Bacterial vaginosis

Elusive aetiology of bacterial vaginosis. Do lesbians have a clue?

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In bacterial vaginosis (BV), hydrogen peroxide+ lactobacilli (LB), which define normal vaginal microbiology, are replaced by anaerobic/facultative bacteria.¹ BV is the most common cause of vaginitis and associated with preterm delivery, pelvic inflammatory disease and HIV acquisition.^{2–3} Its cause is unknown. Treatment with metronidazole, clindamycin or tinidazole improves symptoms and restores normal flora and associated mucosal defences,^{4–5} but BV frequently persists (11–29%) and recurs (72% by 7 months).^{6–8} Unprotected sex may contribute.^{7–9} In fact, the debate about sexual transmission of a potentially causative agent for BV has been given new urgency by the report of newly defined *Clostridiales* bacteria detected, along with other novel BV-associated bacteria (such as *Atopobium vaginae*), which appear to be highly specific for BV—that is, they appear to be present rarely in women without BV.^{10–11} Newer data also support a role for BV in promoting HIV acquisition in women.¹² The prevalence of BV in lesbians has been reported to be high (25–52%) in several studies and most female sex partners are concordant for BV, supporting a role for sexual transmission of vaginal fluid as a possible precipitant event in the disruption of normal vaginal flora that may result in BV.^{13–17} However, the available data are limited in part by diversity and possible lack of reproducibility in the populations studied, and by the absence of well-characterised comparison groups of women enrolled in the same settings.

In this issue of *Sexually Transmitted Infections*, Evans and colleagues provide interesting and relevant data that address BV prevalence among self-identified lesbians relative to a control group of heterosexual women.¹⁸ The data are timely and provide potentially important

insights into the puzzling finding of higher BV prevalence among women who report sex with women. The investigators sought to determine BV prevalence and associated risks among lesbians and heterosexual women outside of traditional sexual health clinics in the UK, and to assess BV concordance within female couples. Lesbian subjects were recruited through venues and events whereas heterosexual women were recruited from a community-based clinic. Importantly, the groups did not differ significantly in report of receptive oral sex, which has been proposed as a risk for BV among lesbians (although, as of yet, with no clear underlying biologically plausible hypothesis). BV prevalence in lesbians (26%) was significantly higher than that in heterosexual women (14%). In multivariate analysis, lesbians' risk of BV was still doubled, with significant exposure risks, including cigarette use; interestingly, report of bubble bath use conferred an inverse association with BV. Among 33 lesbian couples (66 women; unfortunately the duration of partnership required to qualify as a couple is not provided), BV concordance was observed significantly more frequently than expected, as noted in prior studies. Among the study's strengths are the use of Gram stain to characterise vaginal flora, with consistently good quality self-obtained vaginal swabs, and the clinic-based recruitment of heterosexual women for comparison (for whom rates of recruitment were similar to those of the lesbian group).

Although the study contributes to the dialogue on this interesting topic, some limitations deserve mention. Most important is the issue—faced by many studies of sexual minority populations—of reliance on self-referral of volunteer subjects targeted through high-yield events or advertisements, as the authors acknowledge. Traditionally, this has been viewed

as a weakness in such studies. However, it is important to keep in mind that disclosure of same-sex behaviour is still problematic for many potential subjects, and recruitment rates can be especially low among racial minorities in research studies because of a combined stigma related to race and sexual minority status;¹⁹ thus, alternative approaches to recruitment are often critical. Because BV is strongly associated with race,²⁰ these considerations should be accounted for in interpreting in all such studies; in the study under discussion, lesbians were more likely to be Caucasian.¹⁸

Welcome evolution in the composition of data collection instruments for population-based studies may play an important role in breaking down these barriers, and will hopefully contribute to better characterisation of women at risk for BV. Some key studies using population-based samples have finally begun to collect data that allow characterisation of women subjects by report of same-sex behaviour. Recently, BV prevalence measured by Nugent criteria was reported for women in the National Health and Nutrition Survey (NHANES),²¹ which uses a complex, stratified, multistage probability sample design with unequal probabilities of selection to obtain a nationally representative sample of the US civilian non-institutionalised population.¹⁷ Of women in the 2001–2004 NHANES who reported sex with another woman, BV prevalence was 45.2% (95% confidence interval (CI) 35.5 to 57.4) compared to overall prevalence of 29.2% (95% CI 27.2 to 31.3) ($p = 0.003$). Thus, the finding of high BV prevalence in the “imperfectly” recruited samples reported in studies prior to NHANES may not be that off the mark.

Finally, as the authors also note, sexual orientation is a multifaceted entity; binary labels such as “lesbian” or “straight” belie the complexity of a lifetime's worth of sexual choices. Notably, as most other studies have reported, 75% of “lesbian” subjects in this study reported prior sex with a male partner (median lifetime number of male partners: two). With BV, the challenges are numerous: we need better tools to describe the sexual behavioural patterns that probably put women at risk for this infection, and we need better ways to characterise the exceedingly complex vaginal microbiology that “simple” BV represents.