Unpacking the recommended indicator for concurrent sexual partnerships

Jeffrey W EATON[*],
Department of Infectious Disease Epidemiology, Imperial College London, London, United Kingdom

Nuala MCGRATH, and
Africa Centre for Health and Population Studies, University of KwaZulu-Natal, Mtubatuba, South Africa, and London School of Hygiene and Tropical Medicine, London, United Kingdom

Marie-Louise NEWELL
Africa Centre for Health and Population Studies, University of KwaZulu-Natal, Mtubatuba, South Africa, and Centre for Paediatric Epidemiology and Biostatistics, UCL Institute of Child Health, London, UK

Summary

Using sexual behaviour survey data, we examine the methodological choice for the time period underlying the UNAIDS Reference Group recommended 'point prevalence' indicator for concurrency. Results confirm that 6 months before the interview is a good time point for calculating the recommended indicator, and that this retrospective estimate is substantially lower than the estimate of concurrency based on the number of current partnerships. The discrepancy is only partially explained by disproportionate missing data in those with more sexual partners.

The UNAIDS Epidemiology Reference Group recently recommended that the primary indicator for measuring concurrent sexual partnerships be the *point prevalence* of concurrent partnerships 6 months before the interview and recommended 9 survey questions to calculate this indicator [1]. A consensus indicator for concurrency allows comparison across populations and reproducible research about the association between concurrency and HIV, but uncertainties remain about the indicator and its calculation [2, 3]. Particularly debated was the decision to estimate concurrency at a retrospective point before the interview rather than at the time of the interview using the reported number of current ongoing partnerships. For a short retrospective period, the indicator might not detect concurrent partnerships where the respondent has not recently had sex with a long-term partner, but too long a period might incur censoring bias by only collecting the 3 most recent partners. An optimal retrospective period would minimise these downward biases, but the recommendation to use a period of 6 months was made without the benefit of empirical data.

We use sexual behaviour survey data collected in a high HIV prevalence rural population in KwaZulu-Natal, South Africa [4] to explore the effect of different choices on the accuracy of the indicator. Since 2005, all adults (age 15 and older) in the surveillance area have been invited every year to complete a face-to-face general health survey. These surveys include questions about the three most recent sexual partners in the past year, including the three questions required to calculate the recommended concurrency indicator: (1) Are you still in

[*]Corresponding author: St Mary's Campus, Norfolk Place, London W2 1PG, United Kingdom, jeffrey.eaton@imperial.ac.uk.

a sexual relationship with [partner]?, (2) How long were you/have you been sexually involved with this partner?, and (3) When was the last time you had sex with [partner]? The latter two questions are answered as duration before the interview in days, weeks, months, or years at the discretion of the respondent.

We use these data to calculate the 'current' point prevalence of concurrency based on the reported number of ongoing sexual partners at the time of the survey and the 'retrospective' point prevalence of concurrency for each month from 1 to 11 months before the interview. In each round fewer than 0.4% of women reported concurrency. Thus results presented are for men aged 15-49 resident at the time of the interview who completed the sexual behaviour survey, aggregated over the 6 data collection rounds from 2005 through 2010, for a total of 26,088 observations on 13,785 men.

Panel (a) of the figure shows the estimates of concurrency at each retrospective month. At about 4 to 6 months the estimate stabilises, which confirms 6 months to be within the optimal measurement period. Closer to the interview, the estimate of concurrency is lower, which could be because respondents have not recently had sex with a long-term partner [1], or because of reluctance to report recently initiated or dissolved partnerships. Estimates of concurrency relating to the period 7 to 11 months before the interview are also lower, which could possibly be due to the censoring of the survey instrument to only 3 partners in the past year, although this is unlikely to have exerted substantial bias since only 0.2% of men reported having more than 3 partners in the past year who were not already classified as having concurrent partners. We believe this bias is more likely due to poor recall leading to under- or mis-reporting details of sexual behaviour so long before the interview.

We find substantial discrepancy between the point prevalence of 6.7% concurrency based on the reported number of current partners and the 4.7% estimated using the 6-month retrospective period recommended by UNAIDS ($p < 0.001$). It is not immediately obvious which represents a more accurate estimate of the true point prevalence of concurrency. The "current" concurrency indicator might overestimate true concurrency if respondents are overly optimistic about their future prospects with previous sexual partners, and report that they are still in a sexual partnership with a partner when in fact future sexual relations (and hence the overlapping concurrent partnerships) are not realised. Alternately, the 6-month retrospective indicator could underestimate true concurrency if respondents under-report partnerships dissolved by the time of the survey or misreport the dates of these partnerships, or if individuals with more partners are more likely to be missing data on the dates of first and most recent sex, which are needed to calculate retrospective concurrency, but not current concurrency [5]. To investigate the latter possibility, panel (b) shows the proportion of respondents missing some data on the start or end date of at least one of their partnerships by the number of partnerships in the past year. The proportion missing at least one item of partner data increases from 5.9% of those with one partner in the past year to 20.2% of those with three partners in the past year, suggesting that disproportionate missing data in those with more partners could be downward biasing estimates of retrospective concurrency.

Panel (c) compares the current concurrency indicator with the 6-month retrospective indicator by five-year age groups. To explore the extent to which the difference in the estimates is accounted for by disproportionate missing data amongst those with more partners, we crudely adjusted for the missing data by re-weighting the complete records according to the inverse of the probability of complete partner data for a given number of partners in the past year, using the weights

$$w_{i,j} \frac{\text{Total number of respondents in age group } i \text{ with } j \text{ partners in the past year}}{\text{Number with complete partner loop data in age group } i \text{ with } j \text{ partners in the past year}}$$

Adjusting for the disproportionate missing data explains the discrepancy between the current and retrospective concurrency in the older age groups, but not for those less than 30 years old. That the discrepancy is mostly in young people suggests that intentions about unrealised sexual relations with previous partners could account for some of the discrepancy.

In conclusion, 6 months before a survey appears to be a relatively good choice for measuring retrospective concurrency, but missing data on aspects of relationships likely downward bias estimates of retrospective concurrency. Data collection and quality control procedures should focus on addressing the increased risk of missing sexual partnership history information when multiple partnerships in the past year are reported, and estimates of concurrency should adjust for missing data. Further research needs to determine whether residual discrepancies are attributable to overestimation of future relations or under-reporting of retrospective partners [6, 7].

Acknowledgments

References

1. UNAIDS Reference Group on Estimates, Modelling, and Projections: Working Group on Measuring Concurrent Sexual Partnerships. HIV: consensus indicators are needed for concurrency. Lancet. 2009; 375:621–622. [PubMed: 19954832]

2. UNAIDS Reference Group on Estimates, Modelling, and Projections. [accessed Jul 20, 2011] Consultation on concurrent sexual partnerships: recommendations from a meeting of the UNAIDS Reference Group on Estimates, Modelling and Projections held in Nairobi, Kenya. Apr 20—21. 2009 http://www.epidem.org/Publications/Concurrency%20meeting%20recommendations_Final.pdf

3. Morris M, Epstein H, Wawer M. Timing is Everything: International Variations in Historical Sexual Partnership Concurrency and HIV Prevalence. PLoS ONE. 2011; 5:e14092. [PubMed: 21124829]

4. Tanser F, Hosegood V, Bärnighausen T, et al. Cohort Profile: Africa Centre Demographic Information System (ACDIS) and population-based HIV survey. Int J Epidemiol. 2008; 37:956–62. [PubMed: 17998242]

5. Nelson SJ, Manhart LE, Gorbach PM, Martin DH, Stoner BP, Aral SO, et al. Measuring Sex Partner Concurrency: It's What's Missing that Counts. Sex Transm Dis. 2007; 34:801–7. [PubMed: 17551413]

6. Helleringer S, Kohler H-P, Kalilani-Phiri L, Mkandawire J, Armbruster B. The reliability of sexual partnership histories: implications for the measurement of partnership concurrency during surveys. AIDS. 2011; 25:503–11. [PubMed: 21139490]

7. Maughan-Brown B, Venkataramani AS. Measuring concurrent partnerships: potential for underestimation in UNAIDS recommended method. AIDS. 2011; 25:1549–51. [PubMed: 21617519]
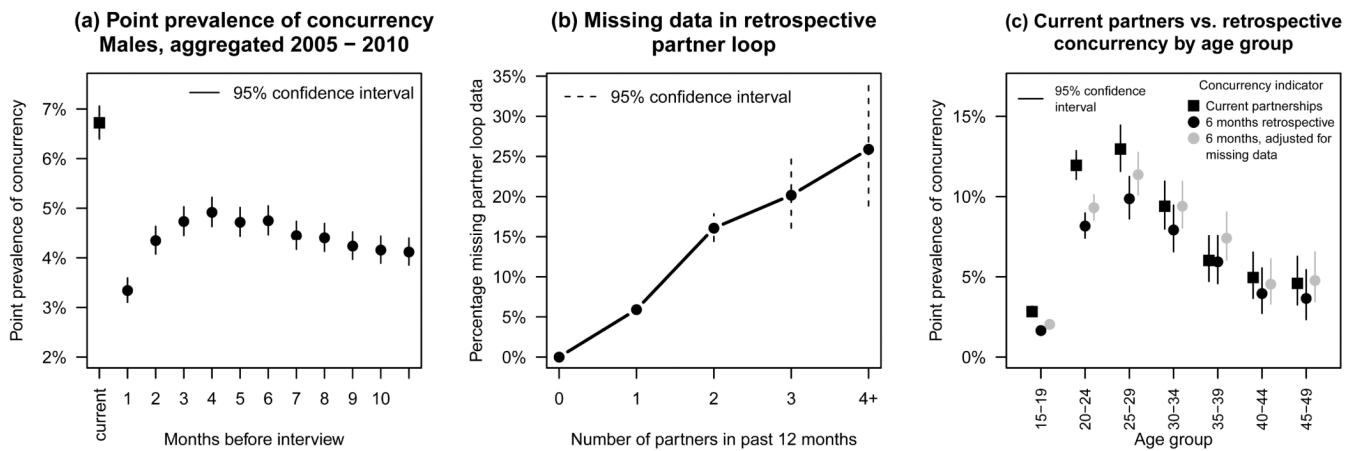
(a) Point prevalence of concurrency Males, aggregated 2005 − 2010

(b) Missing data in retrospective partner loop

(c) Current partners vs. retrospective concurrency by age group

Figure.
(a) Point prevalence of concurrency based on number of current partners (left most square) and retrospective cut-offs for male respondents aged 15-49. (b) The proportion of male respondents that are missing date of first sex or date of most recent sex for at least one partner by number of reported partners in past year. (c) Estimates of concurrency by 5-year age groups: current partner concurrency, 6 month retrospective concurrency, and 6 month retrospective concurrency adjusted for increased missing data among those reporting more partnerships