Published: November 2013

Coital frequency and condom use in monogamous and concurrent sexual relationships in Cape Town, South Africa

Wim Delva - Epidemiologist, SACEMA and Ghent University, Belgium.

Concurrent relationships are overlapping sexual partnerships in which sexual intercourse with one partner occurs between two acts of intercourse with another partner (1). The importance of concurrency in driving HIV transmission in hyperendemic settings remains controversial. While some have argued, primarily using modelling studies, that concurrency accelerates HIV transmission in the population, others have dismissed the concurrency hypothesis.

In 2012, Sawers et al. conducted another modelling study and concluded that the role of concurrency in accelerating the spread of HIV is dramatically reduced by coital dilution. The term "coital dilution" points to the reduction in frequency of sex acts per sexual partner, as a result of acquiring additional partners (2). In general, a decreased frequency of unprotected sex during episodes of concurrent relationships would reduce the transmission-facilitating effect of concurrency. Such decrease could be the result of coital dilution and/or increased condom use during concurrency.

Survey on sexual behaviour in Cape Town

In a recent publication we examined self-reported data on coital frequency and condom use during monogamous and concurrent relationship episodes from an egocentric sexual network survey (all the information is provided by the respondent only, including information about his/her sexual partners) in three communities with a high HIV prevalence around Cape Town, South Africa (3). A key question in our analysis was whether or not there was evidence for coital dilution and/or increased condom use during episodes of concurrency.

The survey explored one-year sexual histories, with a focus on start and end dates of periods of sexual activity, age differences between sexual partners, sex frequency, condom use and the use of alcohol and recreational drugs. The questionnaire was administered in a safe and confidential mobile interview space, using Audio Computer-Assisted Self-Interview (ACASI) technology on touch screen computers. ACASI has the benefit of providing privacy to participants and avoids the white coat effect when answering questions about sensitive topics. To read more about the validity and appropriateness of this ACASI approach, see the article in the September 2013 issue of the SACEMA Quarterly by Roxanne Beauclair (4).

For up to 5 main partners and 15 casual partners, participants indicated the periods (episodes) they were in the relationship on a touch screen timeline (5). A participant could select multiple different time periods for each partner. The dependent variables, frequency of intercourse and condom use, were asked for each episode indicated on the timeline. Periods of a week or longer during which participants indicated not having slept with a particular partner, were counted as "breaks" between relationship episodes. For each relationship episode, participants were asked what the weekly average number of sex acts was (0, 1, 2, ..., 13, 14, 15, >15) and how frequently they used condoms during sexual intercourse (always, sometimes, never). For each round of questions concerning a particular episode, the timing of the episode was highlighted on the touch screen timeline.

Figure 1 outlines how the concurrency status of each relationship episode was derived from the relationship history time line. Building on the defining characteristic of concurrency that individuals return to a previous partner (A) after having had intercourse with another partner (B), any episode for which this condition was true, was considered concurrent in the primary analysis (1). Under this definition, as proposed by UNAIDS, 1A, 1B, 2A, 2B and 3B are concurrent episodes. However, this definition may be problematic as it lacks any indication of time scale over which the presence of overlap should be evaluated. Consequently, apparently very different kinds of "overlap" are grouped into the category of concurrent episodes, ranging from a situation in which participants move back and forth between sexual partners multiple times per week for many consecutive weeks, to a situation in which

participants alternate between multiple partners, but none of the episodes actually overlap (relationship type 3 in Figure 1). To explore how sensitive our results are to the definition of concurrency, we conducted two parallel analyses. In the first analysis, we applied the literal definition of concurrency according to the UNAIDS reference group (relation episodes 1A, 1B, 2A, 2B and 3B in figure 1 defined as concurrent). In the second analysis, we only defined episodes as concurrent if there was an actual temporal overlap of at least 1 week (3B in figure 1 no longer included).

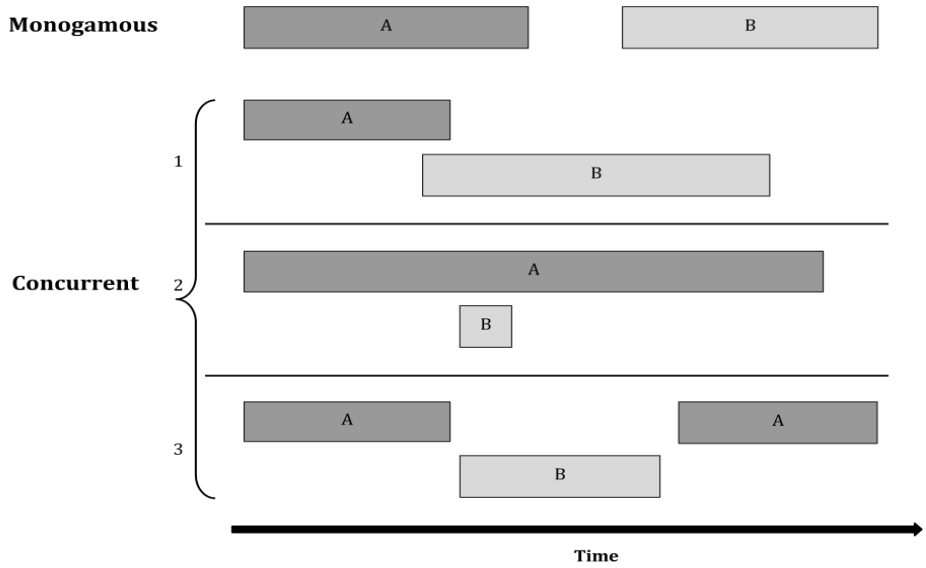


Figure 1. Schematic representation of monogamous and concurrent relationship episodes

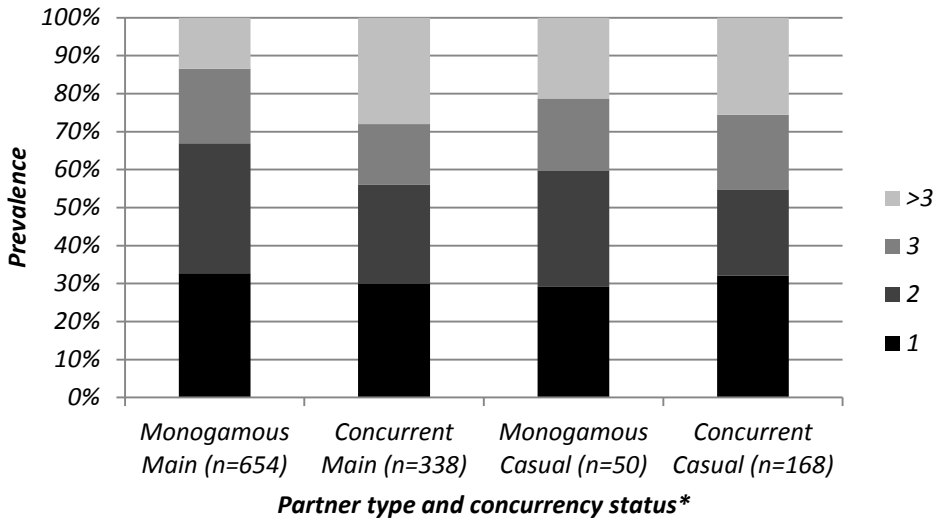
Is there evidence of coital dilution and/or increase condom use during concurrency?

Most respondents only reported one sexual partner in the last year (72%), and the vast majority of relationship episodes involved a main partner (82%). Forty-two percent (506/1210) of all episodes were concurrent according to the UNAIDS definition, while 41% (491/1210) were concurrent according to our modified definition. The median of the per-partner average coital frequency was 2 sex acts per week (IQR: 1-3; mean: 2.5), and consistent condom use (always used condoms) was reported in 36% of episodes. Only 28% (146/527) of the study sample reported consistent condom use in all episodes with all partners of the last year. Figures 2 and 3 depict average weekly coital frequency and condom use, by concurrency status and partner type.

Figure 2 shows no immediately obvious, stark differences in coital frequencies in monogamous versus concurrent episodes. In the statistical analysis, there was no evidence for concurrency being associated with a lower average coital frequency. Rather, both definitions showed a slight, albeit non-significant, increase in coital frequency during concurrent episodes. Using our modified concurrency definition did not qualitatively change these estimates.

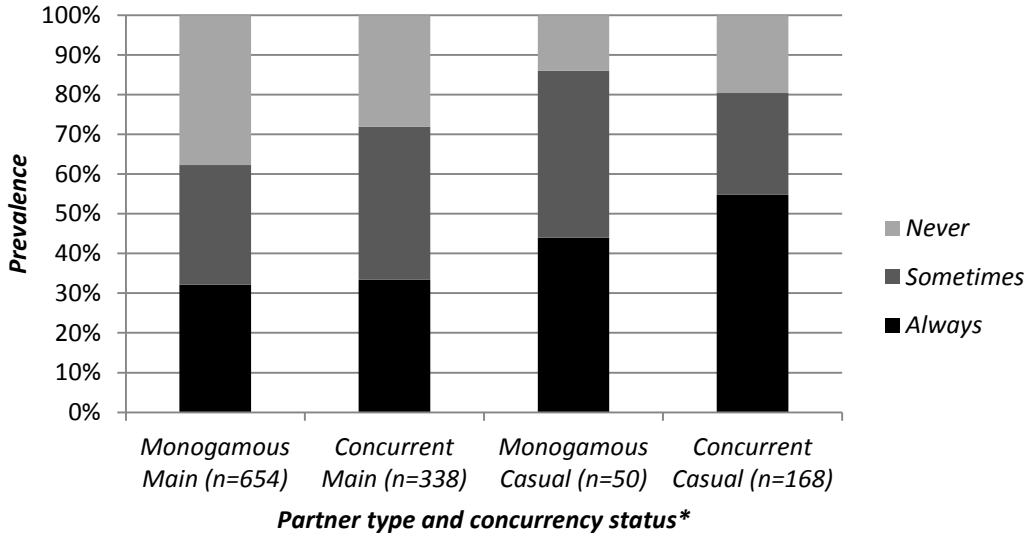
The condom use outcomes shown in Figure 3 indicate higher consistent condom use in concurrent episodes with casual partners, and similarly low levels of condom use in episodes with main partners, regardless of concurrency status. In the statistical analysis, concurrency was not significantly associated with consistent condom use. Similarly to the coital frequency analysis, using our modified concurrency definition did not qualitatively change these estimates.

When thinking about the implications of our findings for the debate around the role of concurrency in the spread of HIV, one should keep in mind that key factors that determine the role of concurrency in HIV transmission dynamics are prevalence of concurrent relationships, duration of concurrent episodes, variability of HIV infectiousness with time since infection, connectedness of the entire sexual network and differences in frequencies of HIV exposures (unprotected sex acts) during monogamous versus concurrent episodes.



**Using the UNAIDS definition*

Figure 2. Distribution of coital frequency, by partner type and concurrency status



**Using the UNAIDS definition*

Figure 3. Distribution of condom use, by partner type and concurrency status

Our study only shed light on the latter. However, the influence of sex frequency and consistent condom use on transmission risk is large. Hence, if concurrency indeed led to fewer HIV exposures, through coital dilution and/or more consistent condom use, this could substantially lower or even annihilate the transmission-catalysing effect of concurrency.

Our study did not lend support to the coital dilution hypothesis, nor did it suggest increased condom use during periods of concurrency. Instead, in our study sample of black and coloured respondents from three communities around Cape Town with a high HIV prevalence, the coital frequency was higher, although not significantly, in concurrent compared to monogamous relationship episodes, regardless of the definition of concurrency. This finding is at odds with the survey findings from sub-Saharan Africa cited by Sawers et al. (2, 6, 7). We believe the apparent discrepancies between these two studies cited by Sawers et al. and ours can be explained by differences in how coital frequency was measured and how concurrency status was assigned.

Our crude estimators for consistent condom use in monogamous and concurrent relationship episodes (Figure 3) compare well with related statistics previously reported (8). Implications of our findings for HIV prevention efforts follow primarily from the observation that consistent condom use was generally low, especially in relationships with main partners. Consistent condom use is known to be extremely hard to achieve in long-term, trusting relationships (9), even if they involve transactional sex (10). Although consistent condom use was more frequently reported with casual partners, as was also seen elsewhere (11, 12), there is still a lot of potential for averting HIV transmissions in casual relationships, especially since casual partners may carry a higher burden of sexually transmitted infections, which are known to facilitate HIV transmission (13).

In conclusion, we found no evidence for coital dilution, i.e. for a decreased per-partner sex frequency, nor for increased condom use during concurrent relationship episodes in three communities around Cape Town with a high HIV prevalence, after adjusting for confounding variables. Instead, concurrency was associated with a slight, borderline-significant (at alpha=0.05) increase in coital frequency. The main implication of our findings for the concurrency debate is that, if the frequency of unprotected sex with each of the sexual partners is sustained during concurrent relationships, HIV infected individuals with concurrent partners may disproportionately contribute to onward HIV transmission. Additional analyses from other geographic and epidemiological settings are needed to create a larger body of evidence related to coital frequency and condom use in monogamous and concurrent relationship episodes, and more generally, to deepen our understanding of the determinants of coital frequency and consistent condom use.

Acknowledgement: co-authors Fei Meng, Roxanne Beauclair, Nele Deprez, Marleen Temmerman, Alex Welte and Niel Hens.

Wim Delva, Epidemiologist, SACEMA and Ghent University, Belgium. Areas of interest: statistical analysis of sexual behaviour data, stochastic and deterministic modelling of sexual network dynamics and HIV transmission. Wim.Delva@ugent.be

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. 2010;375(9715):621-2.
2. Sawers L, Isaac AG, Stillwaggon E. HIV and concurrent sexual partnerships: modelling the role of coital dilution. J Int AIDS Soc. 2011;14:44.
3. Delva W, Meng F, Beauclair R, Deprez N, Temmerman M, Welte A, Hens N. Coital frequency and condom use in monogamous and concurrent sexual relationships in Cape Town, South Africa. J Int AIDS Soc. 2013;16:18034.
4. Beauclair R. Assessing the validity and appropriateness of audio computer-assisted self-interviews in urban disadvantaged Cape Town Communities. SACEMA Quarterly September 2013 http://sacemaquarterly.com/methodology/assessing-the-validity-and-appropriateness-of-audio-computer-assisted-self-interviews-in-urban-disadvantaged-cape-town-communities.html Accessed 24 September 2013.
5. Delva W, Beauclair R, Welte A, Vansteelandt S, Hens N, Aerts M, et al. Age-disparity, sexual connectedness and HIV infection in disadvantaged communities around Cape Town, South Africa: a study protocol. BMC Public Health. 2011;11:616.
6. Morris M, Epstein H, Wawer M. Timing is Everything: International Variations in Historical Sexual Partnership Concurrency and HIV Prevalence. PLoS One. 2010;5(11).
7. Harrison A, Cleland J, Frohlich J. Young people's sexual partnerships in KwaZulu-Natal, South Africa: patterns, contextual influences, and HIV risk. Stud Fam Plann. 2008;39(4):295-308.
8. Maughan-Brown B. Variation in concurrent sexual partnerships and sexually transmitted diseases among African men in cape town, South Africa. Sex Transm Dis. 2012;39(7):537-42.
9. Chimbiri AM. The condom is an 'intruder' in marriage: evidence from rural Malawi. Soc Sci Med. 2007;64(5):1102-15.
10. Voeten HA, Egesah OB, Varkevisser CM, Habbema JD. Female sex workers and unsafe sex in urban and rural Nyanza, Kenya: regular partners may contribute more to HIV transmission than clients. Trop Med Int Health. 2007;12(2):174-82.
11. Chimbindi NZ, McGrath N, Herbst K, San Tint K, Newell ML. Socio-Demographic Determinants of Condom Use Among Sexually Active Young Adults in Rural KwaZulu-Natal, South Africa. Open AIDS J. 2010;4:88-95.
12. Westercamp N, Mattson CL, Madonia M, Moses S, Agot K, Ndinya-Achola JO, et al. Determinants of consistent condom use vary by partner type among young men in Kisumu, Kenya: a multi-level data analysis. AIDS Behav. 2010;14(4):949-59.
13. Wasserheit JN. Epidemiological synergy. Interrelationships between human immunodeficiency virus infection and other sexually transmitted diseases. Sex Transm Dis. 1992;19(2):61-77.