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ORIGINAL PAPER

Concurrent Sexual Partnerships and the HIV Epidemics in Africa: Evidence to Move Forward

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Abstract The role of concurrent sexual partnerships is increasingly recognized as important for the transmission of sexually transmitted infections, particularly of heterosexual HIV transmission in Africa. Modeling and empirical evidence suggest that concurrent partnerships—compared to serial partnerships—can increase the size of an HIV epidemic, the speed at which it infects a population, and its persistence within a population. This selective review of the published and unpublished literature on concurrent partnerships examines various definitions and strategies for measuring concurrency, the prevalence of concurrency from both empirical and modeling studies, the biological plausibility of concurrency, and the social and cultural underpinnings of concurrency in southern Africa.

Keywords HIV prevention · Concurrent sexual partners · Heterosexual transmission · HIV epidemiology

Introduction

The heterogeneity of HIV epidemics generally, and across sub-Saharan Africa specifically, has been explained by differences in proximate determinants or risk factors at the individual- and population-levels. Previous research has investigated the role of a multitude of biomedical and behavioural determinants on epidemic size and spread (Auvert et al. 2001; Boerma et al. 2003; Chan 2005). Although concurrency was initially identified in the early 1990s, only more recently has its role been seriously reconsidered by many researchers and international organizations (Halperin and Epstein 2004, 2007; Potts et al. 2008; Shelton 2007; Southern Africa Development Community 2006; UNAIDS/WHO 2006). This article aims to provide a careful review and analysis of the evidence identifying concurrency as a critical aspect of sexual behavior that must be considered for the prevention of HIV in sub-Saharan Africa.

Methodology

A literature review was undertaken using various online databases, including PubMed and Google Scholar. Search terms included: concurrency, concurrent partnerships, and HIV. The review focuses primarily though not exclusively on data from developing countries, mainly in sub-Saharan Africa. While this review is not fully comprehensive, it includes literature which the authors believe are useful in understanding concurrency in the context of sub-Saharan Africa in particular, including to better understand the heterogeneity of HIV prevalence and its relationship to concurrency.

Concurrent Partnerships

Concurrency has been variably defined and measured in the literature. In general, concurrent partnerships are sexual

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relationships whereby an individual has overlapping sexual relationships with more than one person. This is contrasted with sequential or serial partnerships, whereby an individual engages in a sexual relationship with only one partner, with no overlap in time with subsequent partners. Other variables such as the duration of overlap and coital frequency also help determine the epidemiological importance of concurrency in various HIV epidemics and regions.

The term "concurrent partnerships" was first mentioned in the epidemiological literature over 15 years ago. In one of the earliest articles citing the term, Watts and May (1992) developed a mathematical model, based on transmission per partnership, which demonstrated that the rate of spread of infection is much faster than would be predicted in the absence of concurrent partnerships. Hudson (1993, 1996) proposed that observed differences in HIV prevalence between and within countries could be partially determined by varying levels of prevalence of concurrent sexual partnerships. Hudson hypothesized that due to high levels of viremia during initial infection, epidemic spread of HIV would tend to occur in populations with high rates of overlapping partnerships.

Early mathematical models by Watts and May showed theoretically how concurrent partnerships could help promote the spread of HIV. Using the more sophisticated technique of stochastic modeling, (Kretzschmar and Morris 1996; Morris and Kretzschmar 1997) found that for a fixed mean number of partners per individual the distribution of the contact patterns, ranging from serial monogamy to concurrency, had a major influence on the speed of the spread of an epidemic. Using data from Uganda and simulation models, Morris and Kretzschmar (2000) investigated how increases in levels of concurrency and the number of partnerships would affect epidemic spread. They concluded that increasing the level of concurrency had a more significant impact on epidemic spread than increasing the number of partnerships. In comparing serial monogamy to concurrency in 50% of the partnerships, over five years, they projected that the epidemic became about ten times as large in the latter scenario.

Defining and Measuring Concurrency

In the literature, numerous definitions of concurrency are utilized and methods for measurement vary. There is currently no consensus definition of concurrency nor a universally accepted method of measurement. These critical areas require attention, since reported prevalences of concurrency are not always directly comparable.

Two general measurement methods have been used to collect partnership and concurrency data. The first asks an interviewee directly if he/she has had *additional* sexual partners during a specific partnership(s). If characteristics of the partner or partnership are not also collected, it is difficult to determine the epidemiological importance, since some partnerships may be one-time sexual encounters. A similar method asks about the number of *regular* partnerships a respondent was and/or is engaged in. A calendar method, in which detailed information about previous partnerships—including the start and end dates of sexual relationships and characteristics of the partners (e.g. regular, casual, commercial, etc.)—allows researchers to create sexual partnership calendars. This method allows for various definitions of concurrency to be calculated. For instance, concurrency can be defined by different periods of partnership overlap or can include/exclude casual partnerships. Although this partner calendar method provides rich data, there may be recall bias related particularly to the start and end dates of partnerships. This can severely limit the ability to accurately construct such partnership calendars. This methodology also requires more questions to be asked in order to calculate a measure of concurrency. Given these limitations, survey designers may opt to not include such lines of questioning.

In comparing these two methodologies among young adults visiting STD clinics in the US, Nelson et al. (2007) found that reporting of concurrency was common in both methodologies, however the results were not interchangeable. 29% of those reporting concurrent partners by direct question did not do so by overlapping dates and 26% of those reporting concurrency by a calendar method did not do so by direct question.

Reporting of concurrency, like other sexual behaviors, may be affected by social-desirability or self-reporting bias. Given the intensely personal nature of such questions, certain types of household surveys which do not guarantee privacy and/or a presumed sense of confidentiality are not the ideal methodology for collecting such data.

Given the various possible methods of measurement, a single operational definition of concurrency is difficult to provide. However, we suggest that the definition of concurrency be the overlap of one or more sexual partnerships for a period of one month or longer. The one month time period accounts for the approximate time duration of acute HIV infection, which is an important element for transmission during concurrent partnerships. Measurement of concurrency should include aspects of the direct and calendar methods. Specifically, individuals should be asked directly if s/he has had additional partners during a specific partnership. The characteristics of that partnership should also be obtained, such as the length of overlap between the partners and the types of sexual partners.

Empirical Evidence

In the early 1990s, Global Programme on AIDS (GPA) surveys found that the percentage of 15–49 year old men who reported more than one regular partner—defined as someone with whom one has had sexual relations for at least one year—was highest in sub-Saharan African countries or sites (including Lesotho—55%; Côte d'Ivoire—36%; Lusaka, Zambia—22%) and was much lower in Asian countries or sites (including Manila, Philippines—3%; Singapore—2%; Thailand—3%) (Caraël 1995). Fewer women reported more than one regular partner in all sites compared to men. Among women, there were similar trends of much higher reporting in sub-Saharan Africa compared to Asia or Latin America. Though HIV serostatus was not collected along with these behavioural surveys, HIV prevalence was generally far higher in those sites where more men and women reported having more than one regular partner during the previous year. A separate analysis of this GPA data found that in Kampala, Uganda, 12% of men and women reported that they had two or more regular partners, one of whom was a spouse (Caraël et al. 2001).

In comparing sub-Saharan Africa to other regions of the world, several studies indicate that concurrency is much less frequently reported in the latter. In an urban and rural study in Bangladesh, only 5% of married men reported having a concurrent (extramarital) partner (Caldwell et al. 1999). In Amsterdam, Netherlands, researchers found that 45% of migrant men in their study reported concurrent partners, compared to only 6% of Dutch men in a national survey (Gras et al. 1999).

A 1999 study of 15–29 year olds in rural and urban areas of Kenya found that 11% and 3% of married men and women, respectively, and 26% and 6% of nonmarried men and women in urban areas were engaged in concurrent partnerships. In rural areas, similar levels were reported, except among married men, of whom 27% were engaged in concurrent partnerships (Voeten et al. 2004). A 2004 study of sexually active young men in Kisumu, Kenya found that 63% had had at least one concurrent partnership in their lifetime. Of those, 49% had 3 or more instances of partnership overlaps (Mattson et al. 2007).

A 1995 survey in rural KwaZulu Natal, South Africa found that 40% of sexually active men reported more than one partner during the past three months, although it is unclear whether those relationships were serial or concurrent (Colvin et al. 1998). A 2006 study in rural Swaziland found that 70% of males and 62% of females reported having 2 or more partners in the last 3 months (James and Matikanya 2006). Though the overlap between relationships was not measured, the high frequency of two or three partners suggests that a large proportion of the population in Swaziland, which has the world's highest HIV prevalence, are probably engaged in concurrent partnerships.

A 2003 study in Botswana, where adult HIV prevalence (25%) is nearly as high, found that 23% of sexually active respondents reported having had a concurrent partnership with any of their last three partners over the last 12 months (Carter et al. 2007). Additionally, men, youths (age <25 - years) and non-religious people were more likely to report concurrency. Another survey in 2003 in Botswana found a similar prevalence of concurrent partnerships in the past year (18–22%) among sexually active respondents (Meyerson et al. 2003).

Some other research, however, has suggested that concurrent partnerships may not be a major determinant of the rate of spread of HIV. Lagarde et al. (2001), in the "four cities" study, "could not find evidence that concurrent sexual partnerships were a major determinant of the rate of spread of HIV in four cities in sub-Saharan Africa". However: (1) the study measured *current* concurrency, rather than concurrency over a specific recall period, which could have underestimated the prevalence and therefore the effects on HIV infection of concurrency, (2) no measure of partnership overlap was recorded, thus some of the concurrent partnerships may have been commercial or casual sex encounters, which have a different epidemiological effect, and (3) importantly, concurrency was only measured in the index case (interviewee) and not his/her partners.

In studies among African-American populations, Adimora et al. (2004) have found higher levels of reported concurrency within the study population, compared to other ethnic groups in the US. The researchers report that the prevalence of concurrency in the African-American population over the previous five years was 53% and 31% among men and women, and that most (61%) of respondents believed that a recent partner had had a concurrent partnership. In a more recent study, Adimora et al. (2007) reported that 11% of men in the US reported a concurrent partnership during the year preceding the survey. Adimora et al. (2002) also reported prevalence of concurrency by ethnic categories for women in the US: 21% among blacks, 11% among whites, 8% among Hispanics, and 6% among Asian American and Pacific Islanders. Some researchers have similarly suggested that concurrency may be one of the critical factors behind the heterogeneous HIV prevalence among different populations in the US.

Biological Plausibility

Variability in viremia over the course of HIV infection, and in particular very high viral loads during acute infection, provides one important biological explanation for the large

role that concurrency appears to play in HIV transmission dynamics. During acute infection, defined as approximately the first three weeks to two months following viral acquisition, viral replication is relatively unchecked by host immune responses, resulting in unusually high viral loads in both blood and semen and increased genital shedding of HIV (Pilcher et al. 2004). Using data from Rakai, Uganda, Wawer et al. (2005) and Pinkerton (2007) report higher HIV transmission probability during acute infection compared to asymptomatic or late HIV infection periods. Additionally, researchers have hypothesized that HIV infected men, without STD co-infection, would infect 7–24% of their female sex partners during the first two months of infection; if either partner had an STD, this rate could exceed 50% (Pilcher et al. 2004).

Concurrent partnerships increase the overall probability that uninfected partners will have sexual intercourse and be exposed to a partner during acute infection. This is because in regular concurrent partnerships as opposed to casual partnerships, there would tend to be a higher number of total coital acts—along with less consistent condom use. Some definitions of concurrency may include more casual partnerships. However, such partnerships are likely to play a smaller role in the relationship between HIV transmission and concurrency, given the reasons just stated. Additionally, since there may be multiple regular partners involved, the number of individuals exposed could be larger. Therefore, concurrent partners are at an increased risk for HIV infection. This pattern of transmission can be contrasted to serial monogamy. During serial monogamy, given the time gaps between sexual relationships, few and possibly only one uninfected partner will typically be exposed to an infected partner during the acute infection stages. Additionally, if one partner in a relationship is serially monogamous, it is likely that he/she will not expose any individual during the acute infection period. These effects would result in a lower per-act risk of transmission and place fewer individuals at risk. Additionally, during serial monogamy previous partners are obviously not at risk for exposure, whereas during concurrent relationships partners who started a relationship earlier and continue to be sexually involved also continue to be at risk of infection.

Qualitative Data from Southern Africa

The social, cultural, and economic contexts associated with sexual behavior and partnering practices vary greatly between different regions and countries. The aforementioned evidence suggests that concurrency is more prevalent in sub-Saharan Africa compared to other regions of the world. This region is also, of course, where HIV prevalence is highest, which may in part be due to the high prevalence of concurrency (Halperin and Epstein 2007). It is therefore particularly important to better understand the socio-cultural underpinnings of concurrency in this region. In southern Africa, a small body of literature has emerged in the fields of public health and the social and behavioral sciences examining the socio-cultural nature of concurrent relationships. Some anthropological literature and more recently gender studies literature have made attempts to describe multiple and concurrent partnerships within the context of the rapid political and socio-demographic shifts occurring in the region.

Some historical explanations of multiple concurrent partnerships are rooted in biology and polygyny. Spiegel (1991) writes that "informants referred to their own conceptions of the institution of polygyny in order to make sense…of a contemporary practice [i.e. multiple partnerships] which they knew to be morally non-normative." Selikow (2004) notes that "[u]sing the language of tradition and biology, leads to the belief that some practices are 'meant to be,' as they are based in biological realities and/or tradition". In both of these writings, concurrent partnerships are viewed as culturally-rooted social structures that have existed and continue to persist, despite social changes and changes in the health risks (i.e. HIV/AIDS) associated with such practices. Another explanation for the roots of concurrency relates to the migrant labor system of mines and industrial areas, which resulted in men and women spending considerable time apart, having implications for multiple partnering and marital non-exclusivity (Romero-Daza 1994; Spiegel 1991).

In addition to historic explanations, recent socio-demographic and economic changes in South Africa appear to have greatly impacted the nature of sexual relationships. Quickened in part by the coming of democracy to South Africa and rapid 'globalization,' the transactional nature of relationships in South Africa—different than the phenomena of 'survival sex' and 'prostitution'—also plays a critical role in multiple partner behaviors and in the timing of these relationships for men and particularly for women (Hunter 2002; Leclerc-Madlala 2003; Selikow et al. 2002). Leclerc-Madlala (2003) writes:

> For reasons not unrelated to post-apartheid 'liberalisation' of markets, privatisation, growing urban unemployment, and the media promotion of conspicuous consumption, multi-partnered transactional sexual relationships have come to play an integral role in the lives of many urban young women.

Kaufman and Stavrou (2002) found that among young people in urban South Africa, gift-giving and a transactional aspect of relationships was common and widely accepted. Hunter (2002) found that this association between sex and gifts (i.e. transactional sex) has been a

central factor in driving "multiple-partnered sexual relationships." In examining the gender dynamics of such transactional relationships, Hunter (2002) and Leclerc-Madlala (2002) both concluded that women often were not "passive victims" of such relationships but rather acted to "access power and resources." Leclerc-Madlala (2003) writes that "[m]aintaining relationships with more than one partner concurrently was viewed as a 'modern' activity and not uncommonly framed by discourses on gender equality and human rights". In writing about language, sexuality and HIV/AIDS, Selikow (2004) found that male sexuality in townships was defined by how many sexual partners men have and is encapsulated in the terms such as *ingagara*—a "real man" or "top dog"—and *isithipa*—an unfashionable man without many girlfriends.

Several other recent qualitative studies in the public health literature have examined the social and cultural context of concurrent partnerships in southern Africa. Motivations for engaging in concurrent partnerships include exchange of material goods and money, sexual dissatisfaction with one sexual partner, a "safety-net" against losing a main partner, peer and social pressures, particularly among young people, and the social acceptance of having multiple partners (Epstein 2007; Parker et al. 2007; Psaki et al. 2007).

Conclusion

It has long been recognized that understanding the nature of sexual behavior is critical to improving HIV prevention efforts. Approaches to primary prevention through promotion of behavior change would be improved by better understanding of the dynamics of important behaviors, including concurrent partnerships. Partner reduction messages are critically important for reducing HIV incidence. Targeted messages, focusing on concurrency, such as encouraging people to have only one partner at a time, have the potential to improve the effectiveness of interventions (Potts et al. 2008; Shelton 2007; Halperin and Epstein 2007). As clearly emerges from the anthropological literature, concurrency is often a deeply rooted social and cultural phenomenon. Thus as with other interventions, but perhaps particularly so, messages around concurrency must be locally informed and culturally relevant.

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