THE WORLD BANK

USAID FROM THE AMERICAN PEOPLE

World Bank Debate Series: Debate 4

Concurrent Sexual Partnerships

The World Bank 2010

The debate on concurrency attracted more than 150 people to the event in Washington, DC. They were joined by participants at 15 videoconference sites across sub-Saharan Africa, Europe and North America; over 145 computers logged into the live webcast.

Executive Summary[1]

On October 27, 2010, the World Bank and the U.S. Agency for International Development (USAID) co-hosted the fourth in a global series of debates on emerging issues in HIV prevention. In an era when development aid (in general and for HIV/AIDS in particular) is under pressure and the dynamics of the pandemic are constantly changing, it is imperative that governments, civil society organizations, and other partners have the best evidence and knowledge to maximize the effectiveness of development dollars and achieve results. The debate series was designed to advance discussion and begin to build consensus about contentious issues within the HIV community. The World Bank's global video conferencing and web-based technologies allowed country teams in Africa and other partners from across the globe to participate in real time in the debate (15 to 20 videoconference sites were connected at any given point in time). Additional information about the debate series can be found at http://go.worldbank.org/A47FWU5140 (this website contains the links to all proceedings, reports of previous debates, as well as links to download and watch some of the previous debates).

Debate 4 focused on the possible role of concurrent sexual partnerships in accelerating ongoing HIV transmission patterns. The debate was based on the following proposition: Concurrent sexual partnerships have been and remain a key driver of HIV epidemics in southern and eastern Africa, and interventions to this effect should receive the majority of prevention resources.[2]

The debate was moderated by Karl Hofmann, President and Chief Executive Officer of Population Services International. Three

[1] The views expressed in this report are not necessarily those of USAID, the World Bank, or the organizations to which the panelists are affiliated. Statements in this document have not been checked for factual accuracy and should not be cited.

[2] The points argued by the panelists were in the spirit of the debate, and do not necessarily reflect panelists' personal agreement/opposition to the proposition, or their own opinions.

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panelists spoke in favor of the proposition (listed in alphabetical order): Dr. Daniel Halperin, Lecturer on International Health at the Department of Global Health and Population, Harvard School of Public Health; Dr. Martina Morris, Professor of Statistics and Sociology at the University of Washington and Director of Sociobehavioral and Prevention Research Core at the University of Washington Center for AIDS Research; and Dr. James Shelton, Science Advisor, Bureau for Global Health at USAID. The three panelists who spoke against the proposition were: Dr. Geoffrey Garnett, Professor of Microparasite Epidemiology at Imperial College, London; Dr. Mark Lurie, Assistant Professor of Medical Science, Department of Community Health, Warren Alpert Medical School, Brown University, Rhode Island; and Dr. Eileen Stillwaggon, Professor of Economics and Harold G. Evans-Eisenhower Professor at Gettysburg College, Pennsylvania. The debate opened with remarks from Dr. David Stanton, Chief of Technical Leadership and Research Division, Office of HIV/AIDS, USAID.

The proponents presented evidence that concurrent sexual partnerships (referred to subsequently in this document as concurrency) were and remain a major driver of the epidemic based on a variety of data sources, but acknowledged that because of some limitations with empirical evidence, there is a necessity to examine mathematical models and to more carefully explore other evidence—including a range of epidemiological and qualitative data—to demonstrate the exponential impact of concurrency on HIV acquisition and transmission. Opponents of the proposition countered that there is not enough evidence to conclude that concurrency has been or remains a major driver of HIV transmission. The opponents cited problems with the evidence of concurrency as an epidemic driver offered by advocates, such as flawed data and mathematical modeling based on questionable, undisclosed, and inflated assumptions. Some opponents provided alternative explanations to concurrency that might contribute to sustaining the epidemic in eastern and southern Africa, such as other sexually transmitted infections (STIs) and the amplifying effect of parasitic infections and malnutrition on sexual and vertical transmission of HIV. The six panelists engaged in a spirited debate that reviewed recent literature and assessed the dangers of having multiple sexual partners. The question-and-answer session focused on responding to inquiries about other drivers of the epidemic, survey methodologies, overlapping sexual networks, and how best to allocate prevention resources.

Over 145 computers logged into the live webcast, and more than 150 people attended the event in Washington, DC. In addition, participants at a meeting on concurrent and multiple sexual partners representing 14 states of the Southern African Development Community joined the debate via webcast from Gaborone, Botswana, along with a dozen additional videoconference sites across sub-Saharan Africa and three others in Europe and North America.

Debate Proceedings

The moderator introduced the proposition for the debate: Concurrent sexual partnerships have been and remain a key driver of HIV epidemics in eastern and southern Africa, and interventions to this effect should receive the majority of prevention resources. Each panelist had eight minutes to present arguments for or against the proposition. Following the final presentation, each panelist had two minutes to rebut arguments made during the debate. Once the rebuttals concluded, the moderator posed questions submitted by debate attendees to the two sides.

Arguments Defending the Proposition

The following summarizes the key points made by the panelists in defense of the proposition.

The definition of *concurrency* has implications for empirical research at the individual and population levels.

A proponent of the proposition first noted that there has been some confusion in the literature about the definition of *concurrency*. The panelist cited the layman's definition of *concurrency* as when one partnership

begins before the previous one ends. The definition of *concurrency* as given in a short paper by a 2009 Joint U.N. Programme on HIV/AIDS (UNAIDS) Reference Group on Estimates, Modeling and Projections is when an act of sex with one partner occurs between two acts of sex with another partner (UNAIDS Reference Group 2010). The proponent observed that the UNAIDS definition could cover a wide range of different patterns, including but not limited to one night sexual relationships concurrent with a long-term partnership, two long-term partners with whom one has sex frequently, partners in different places who visit occasionally whenever they are in town, and transitional periods where one partner continues to have sex with a soon-to-be ex-lover but also with a new lover. While each pattern has different implications for how concurrency influences HIV transmission, the panelist noted that all patterns of concurrency pose risk. When a person living with HIV is introduced into a network where people engage in concurrency, for instance, the virus can potentially spread much more rapidly between partners.

The panelist then explained how the definition of *concurrency* has implications for empirical research and for predicting the correlation between concurrency and HIV at the individual and population levels. At the individual level, the panelist said concurrency does not increase risk of HIV infection for those who practice it; their risk comes from having multiple partners. Instead, concurrency increases the risk for that person's sexual partner(s). An example is a person with only one partner—but that partner may have other partner(s). The concurrency connects the monogamous person to a larger sexual network. This breaks the traditional link between behavior and risk at the individual level.

The proponent pointed out that this pattern creates difficulties for epidemiological studies, because these studies typically only sample individuals and not their partners. Researchers who then try to evaluate the concurrency hypothesis use these kinds of studies and test whether a respondent's concurrency predicts his or her own HIV status. The concurrency hypothesis does not make this prediction, so this is not a correct test of the hypothesis. To accurately test the concurrency hypothesis with individual-level data, information is needed on the behavior of the individual and of all of his or her partners, as well as appropriate HIV biomarkers.

The panelist also noted that it is important to keep in mind that current HIV status (or HIV prevalence at the population level) may result from behavior that occurred decades earlier and that what really needs to be measured is HIV incidence—seroconversion, or the rate of new infections in a population—to capture the predicted impact.

At the population level, the panelist noted that only under very specific conditions would the concurrency hypothesis predict a correlation between HIV prevalence and the prevalence of concurrency, including stabilized HIV prevalence for a decade or more, unchanged sexual behavior for a decade or more, and unchanged mortality rates. If these conditions do not exist (and they do not in almost all settings), then the expected correlation between concurrency and HIV prevalence at any single point in time may not exist.

In the panelist's opinion, testing the concurrency hypothesis with population-level data is much more challenging than a traditional ecological analysis, where correlations between the prevalence of a behavior and the prevalence of an outcome are predicted under much less restrictive conditions. The panelist suggested that a well-designed randomized controlled trial measuring HIV incidence may be the only option for empirically measuring the effects of concurrency on HIV acquisition.

Mathematical modeling is necessary to understand how concurrency affects transmission of HIV.

The panelist also noted that it is not just the prevalence of concurrency that matters but the various patterns of concurrency, such as the length of overlap, frequency of coitus, and gender symmetry; few existing empirical studies capture this diversity. The panelist proposed criteria to be used in study design: partnership length, overlap of sexual partnerships, coital frequency, the reported number of partners, and recommended concurrency measurements as standard indicators, measures of partner's behavior, and appropriate HIV biomarkers. The panelist commented that given this lengthy list of requirements, it is not surprising that few

technically sound studies have been conducted and the data from existing studies are sometimes misinterpreted, leading to a diverse set of conclusions.

The daunting criteria partially explain the importance of mathematical modeling in this field, as modeling is one way to understand the complex interplay of factors in transmission dynamics. The panelist emphasized that "remarkable" progress has been made in modeling the sexual transmission of HIV. The panelist underscored three findings that the most recent models consistently show: 1) a critical interaction between concurrency and acute infection, because concurrency takes advantage of the brief window of acute infection when probability of transmission is highest; 2) serial monogamy cannot produce the generalized epidemics observed; and 3) concurrency's non-linear effects on a sexual network means that small reductions in concurrency, which "break up" components of sexual networks, can potentially reduce transmission below the threshold for epidemic persistence. This has practical implications outside the world of modeling. The panelist summarized that HIV transmission in populations where sexual concurrency is common is qualitatively different from those where multiple serial monogamous partnerships is more common. Concurrency can have a large impact on network connectivity, and interventions that induce a small reduction in concurrency offer the possibility of a large prevention impact.

Collective evidence shows that concurrency is a main driver of the epidemic.

A panelist cited four lines of epidemiological evidence that collectively show concurrency is a main driver of the epidemic. First is the very rapid increase in the number of HIV infections that occurred within a short period of time in eastern and southern Africa. In the panelist's opinion, the introduction of HIV infection into sexual networks is the only plausible explanation, especially during the window of acute infection that occurs during the weeks immediately following infection and during which HIV is more easily transmitted. The panelist argued that in the early days of the epidemics in southern Africa, very few people would have been in the second or third phase of infection; thus, the only explanation for the origins of the epidemic is a phenomenon of major sequential acute infection. The panelist cited the recent Centre for the AIDS Programme of Research in South Africa microbicide trial, where HIV incidence among young women was over 9 percent in one year, and noted that serial monogamy could not account for that rate of infection in such a short amount of time (Abdool Karim et al. 2010).

The second line of evidence comes from cohort studies on couples where the couples are either discordant or concordant-negative. In a recent Partners in Prevention clinical trial on discordant couples, 29 percent of new infections that occurred within discordant couples came from a sexual partnership occurring outside the relationship[3] (Celum et al. 2010). Only 71 percent of new infections came from the positive partner, meaning there had to be concurrency. In a cohort study of concordant-negative couples in Mwanza, Tanzania, approximately 78 percent of new infections occurred within couples where neither partner was infected at the start of the study. The panelist concluded that such statistics demonstrate that concurrency is a "smoking gun" for infection (Hugonnet et al. 2002).

The third line of evidence is from a small Ugandan study that satisfies three of the rigid criteria for research topics, including incidence, coital frequency, and measures of multiple partnerships and sexual concurrency. The single most important risk factor found in the study was the number of times the person had sex in the last six months with someone they knew or suspected was having sex with another partner (Guwatudde et al. 2010). The fourth line of evidence is from an intervention cohort study of younger people in Manicaland, Zimbabwe, which found a major decrease in concurrency correlated to a major decline in HIV transmission (Gregson et al. 2006; Halperin et al. [forthcoming]).

[3] This study used phylogenetic analysis to compare DNA sequencing between virus strains. If partners had the same sequencing, it is assumed that the HIV-positive partner infected their primary partner; if the sequencing was different, the virus must have come from outside the relationship.

From a programmatic standpoint, concurrency demonstrates the importance of prevention messaging.

A panelist addressed programmatic implications of concurrency and suggested four ways that addressing concurrency—specifically, by using effective and relevant messaging to urge individuals to decrease their number of concurrent sexual partnerships—can add value to prevention programming. The four ways emphasize the important behavioral impact of:

1. Knowing about the existence of and risk associated with sexual networks and how having multiple partners exposes an individual to the network and its risks.
2. Needing to be concerned about one's partner's behavior as well as one's own.
3. Knowing that the risk from multiple partners is not just for those having many, but could be from having two, especially if coital frequency is high.
4. Knowing that having multiple partners puts loved ones at risk, much in the same way that knowing about the effects of secondhand smoke has affected the behaviors of smokers and helped to change social norms about smoking.

The panelist summed up by saying that the programmatic application of the concurrency issue is straightforward and salient, reaches people, and has validity.

Imperfect data should not stop messaging about the dangers of sexual networks.

A panelist noted that applying the same standards of evidence advocated by the opponents of prevention efforts aimed at concurrency to all existing HIV prevention approaches would leave only male circumcision and prevention of mother-to-child transmission as proven interventions. Such interventions as condom promotion in generalized epidemics and testing and counseling would "fall apart" under such rigid standards, which the panelist thinks no one believes to be appropriate. The panelist admitted that the data are not perfect and never will be, but then drew an analogy to the causal links between smoking and lung cancer: the absence of perfect data does not mean we should end campaigns to warn people about the dangers of first- and secondhand smoke. The panelist did not believe there is harm in warning people in regions such as southern Africa about the dangers of sexual networks, noting that a person in a sexual network is at increased risk of acquiring HIV and other STIs, as well as other health and social problems resulting from this behavior. The panelist reiterated that very small reductions in concurrency could potentially have a large impact on the spread of HIV.

Long-term concurrency sets sub-Saharan Africa apart from the rest of the world.

The panelist noted that although concurrency occurs throughout the world, a recent paper by Dr. Martina Morris shows that there are important differences in concurrency between Thailand and places such as Uganda, including in terms of length of concurrency and coital frequency (Morris et al. 2010).

The panelist added that a preponderance of data suggest higher rates of concurrency in southern and parts of eastern Africa. Many surveys using the appropriate indicators (like those defined in the 2009 meeting of the UNAIDS Reference Group on Estimates, Modelling and Projections) find that 20 to 60 percent of people report concurrency, and a 2003 South Africa study found that migrant men were 26 times more likely and non-migrant men were 10 times more likely to be infected from outside their regular relationships (Lurie et al. 2003). A 2010 study similarly found that nearly all male and about half of female participants reported overlapping partnerships at some point during the two-year study period. The long duration of both primary and secondary partnerships was unexpected, especially the high proportion of primary relationships ongoing at two-year follow-up (Harrison and O'Sullivan 2010). After looking exhaustively at other parts of the world, the panelist has not found evidence of such long-term concurrency outside the sub-Saharan African region. The epidemiological data compellingly argue that long-term concurrency affects

HIV transmission. The panelist added that serial monogamy appears to be very rare in most of Africa and that he has not found any evidence that it is at all common.

Arguments Opposing the Proposition

The following is a summary of key points panelists made in opposition to the proposition.

Multiple studies have failed to find a link between high levels of concurrency and HIV.

An opponent stated that significantly more studies fail to find concurrency to be a major driver of the epidemic than find a positive association. The opponent added that the evidence on the concurrency hypothesis rests on a "thin layer of ice." The panelist further asserted that to conclude concurrency is a major driver of HIV in eastern and southern Africa, evidence would need to show that 1) there is more concurrency in eastern and southern Africa than elsewhere; 2) there is more HIV in places where there are high rates of concurrency; and 3) those who become infected with HIV should be more likely to be in concurrent partnerships. The panelist commented that the empirical evidence is limited for each of these pieces of evidence.

According to the panelist, the majority of studies on concurrency were completed before UNAIDS finalized the definition of *concurrency*. The panelist commented that the UNAIDS definition of *concurrency* is broad and encompasses too wide a spectrum of types of partnerships. Under this definition of *concurrency*, both a man in a polygamous marriage with two wives and no other partners for 25 years, and a married man with multiple overlapping partners in one year are considered to be in concurrent relationships, although they have profoundly different levels of risk. The panelist pointed out that while the proponents have argued that "all patterns of concurrency pose risk," the empirical evidence does not support that statement. For example, it has now been well documented that some kinds of concurrency actually protect people from becoming infected with HIV. Georges Reniers and colleagues, for example, have shown that polygamy—which they term *benign concurrency*—a form of long-term concurrency that is widely practiced in many parts of Africa, is actually protective against HIV transmission (Reniers and Watkins 2009).

The panelist then discussed studies that are often used to demonstrate that there is more concurrency in Africa than elsewhere. The panelist pointed out that there are few comparative studies that examine the issue, and that none of those studies conclude that there is more concurrency in Africa. Of the two most referenced, the most recent study assessed sexual behavior from 59 countries and concluded that there are not enough data to assess rates of concurrency in different parts of the world (Wellings et al. 2006). The other study repeatedly cited is one by the World Health Organization (WHO), which was conducted in 11 countries between 1989 and 1990 (Caraël 1995). This more than 20-year-old study does not provide up-to-date evidence that there is more concurrency in Africa than elsewhere. Moreover, the WHO study was far from conclusive: three countries had high levels of concurrency and large HIV epidemics, but there were also countries with low levels of concurrency and large HIV epidemics, as well as countries with high levels of concurrency and small HIV epidemics. In all, the panelist noted, none of the studies cited by the proponents of concurrency convincingly show that there is more concurrency in Africa than elsewhere—a basic necessity if the concurrency hypothesis is to be believed. Demographic and Health Surveys (DHS) data from 22 African countries similarly found that the prevalence of sexual concurrency does not seem to be correlated with HIV prevalence at the community level or at the country level among either men or women, nor was it confounded by male circumcision (Mishra and Bignami-Van Assche 2009).

A panelist observed that even if there were evidence of concurrency in the presence of large HIV epidemics, this would demonstrate association rather than causation. A panelist agreed with the proponents that the best empirical evidence we have comes from longitudinal studies that carefully measure sexual relationships and HIV incidence. The panelist further noted that only two studies—both conducted in South Africa—meet this criteria, and neither study finds concurrency to be associated with HIV incidence. The first study at the Africa Center in KwaZulu/Natal measured HIV incidence among more than 9,000 people who tested

more than once for HIV. They found no evidence that living in a community with high levels of partnership concurrency increases HIV risk (Tanser et al. 2009). Rachel Jewkes similarly followed 1,000 women in the Eastern Cape and found that male partner concurrency was not significantly associated with incidence (Jewkes 2010). Thus incidence studies—the very study design that the proponents say would provide the best evidence—actually fail to find a connection between concurrency and HIV incidence.

Questions remain about the methodology and evidence provided by proponents of the concurrency hypothesis.

The panelist contended that the proponents of the concurrency hypothesis have employed methods that systematically overestimate concurrency's contribution to HIV epidemics and favorably interpret data to prove their hypothesis (Lurie and Rosenthal 2010; Lurie and Rosenthal 2009; Sawers and Stillwaggon 2010). The methods incorrectly employed by the concurrency proponents include reporting multiple partnerships as if they were concurrent, even when no questions about partnership overlap were asked; removing people who are not deemed to be sexually active from the denominator and then not specifying the denominator (thereby inflating the amount of concurrency reported); omitting the fact that several studies cited as evidence for the concurrency hypothesis actually recruited high-risk individuals; repeatedly and incorrectly citing qualitative studies as if they are quantitative and representative of larger populations; and finally criticizing research methodologies that show no relationship between concurrency and HIV while at the same time repeatedly citing studies of the same design as evidence for the concurrency hypothesis. The panelist further pointed out that each time the proponents incorrectly cite the evidence, it inflates the supposed contribution of concurrency (Sawers and Stillwaggon 2010).

The panelist concluded that the empirical evidence does not justify putting the majority of prevention resources into concurrency interventions. The panelist further noted that no concurrency intervention has been rigorously tested and evaluated, and that these interventions may well lead to severely negative unintended consequences. For example, a message that advises people not to have concurrent partnerships can be interpreted to condone multiple partnerships as long as they do not overlap in time. The panelist concluded that we would be better off investing in interventions that are known to work, rather than "magic-bullet" solutions that are untested and rest on mixed and questionable scientific evidence.

Concurrency has not been proven to be a distinct factor in the transmission of HIV.

An opposing panelist posed three questions for the concurrency debate:

- Does concurrency play an important and distinct role in the HIV epidemic separate from other sexual risk behaviors?
- Does concurrency make a difference between the wide spread of HIV within a population and a narrower, more limited spread of HIV?
- Does concurrency make sense as a focus for interventions?

The panelist noted that, in models, it is difficult to separate concurrency from other correlated sexual risk behaviors. In a model, to increase the level of concurrency, some combination of increases in the number of sexual partners, more heterogeneity in sexual partner numbers, altered mixing patterns, and extended duration of sexual partnerships is required. Thus, concurrency is inextricably correlated to other measures of sexual behavior. All of these other factors increase sexual exposure to HIV and risk of HIV spread and do not allow the isolation of concurrency as the primary source of risk. While it may be difficult to distinguish concurrency from other variables describing sexual behavior, modelers still argue that two factors make concurrency particularly important: stopping sequencing in sexual contacts and narrowing the gap between sexual partnerships (which is important because of the role of acute HIV infection and high transmissibility). The panelist contended that narrowing the gap is common with rapid change of sexual partners in serial monogamy, so it does not necessarily identify concurrency as the major driver of the epidemic.

The panelist commented that measuring the impact of concurrency is problematic because, for example, it involves asking people to remember when they started and ended sexual partnerships. The panelist added that modeling is useful but does not make a convincing argument that concurrency is the primary driver because models require variables such as heterogeneity in sexual behavior, a high turnover of sexual partners, other STIs, and the absence of male circumcision within populations. The panelist noted that concurrency could be an untestable hypothesis.

The panelist then asked: Even if concurrency does matter, what does it mean for interventions within a population? The panelist did not see how concurrency interventions differ from interventions to reduce the number of sexual partners or reduce unprotected sex within populations, because reducing partners ultimately reduces concurrency. The panelist noted that reducing partners is a difficult goal to achieve. The panelist expressed concern that concurrency messages that focus on one particular type of partnership and risk behavior inadvertently condone other types of risky behavior, such as casual partnerships and commercial sex. There is a grave danger of miscommunication if interventions focus on only one type of risky behavior.

Mathematical models misrepresent the pervasiveness of concurrency in eastern and southern Africa.

A panelist contended that HIV policy research has been plagued from the beginning by Type III errors: asking the wrong questions. The panelist made an analogy to the current cholera outbreak in Haiti, pointing out that people should not be asking whether Haitians drink more water than others. Immune status, environmental factors, and infectious dose play a role in individual HIV infection and in the spread of such epidemics as cholera or HIV. The panelist noted that the concurrency argument mirrors earlier attempts to explain HIV epidemics in Africa based only on sexual behavior, which assumes that status of one's immune risks, environmental risks, and viral load are the same everywhere. The concurrency argument also seeks to ascertain how Africans are different from other populations. For more than 20 years, people have been trying to find exceptional sexual behavior in sub-Saharan Africa to explain the high prevalence of HIV, but numerous empirical studies show that the most risky sexual behaviors—including a higher lifetime number of partners—are more common in Europe and North America than in Africa. The panelist stressed that concurrency proponents have failed to prove that concurrency sets Africans apart and that concurrency is especially effective in spreading HIV.

The panelist described several problems with the mathematical modeling that proponents use to show that concurrency spreads HIV more effectively than other sexual behaviors. The panelist said that when concurrency proponents use real survey data from Africa in modeling simulations, they find that concurrency makes a trivial difference in HIV incidence. The panelist also noted that the modeling makes questionable assumptions, such as that individuals have sex every day with every partner up to four times a day and that the per-act transmission rate is 1/20 and not the 1/1,000 that is generally accepted. The panelist noted that those assumptions are so farfetched that the model cannot even provide a proof of concept. The panelist said that the data presented by the proponents do not show that concurrency is especially high. The panelist's review of the proponents' work in a recent paper explains why the sources do not support the proponents' arguments (Sawers and Stillwaggon 2010). The panelist listed the following concerns: in reporting data, the proponents repeatedly mix up long-term, short-term, and non-concurrent partnerships; in other instances, they simply copy the wrong numbers from the articles they cite or incorrectly report other information from their sources; and they erroneously compare data with different numerators, different denominators, or different definitions of concurrency. In addition, the proponents make policy recommendations based on data from surveys conducted nearly two decades ago. Most of the studies they cite cover cities or regions that are not representative of the country of which they are a part. Many of the cited studies are based on very small and/or non-random samples from which one cannot make reliable statistical inferences. Many studies were designed to interview populations that were known or suspected of high levels of risky sexual behaviors. All the errors, inaccuracies, and imprecision—more than

100 instances in the articles reviewed by the opposing panelist—exaggerate the difference between concurrency in Africa and concurrency elsewhere.

Prevention efforts should expand the focus from sexual behavior to comprehensive health status.

A panelist noted that the spotlight is on sexual behavior, while the epidemic itself gets very little attention. The panelist stressed the importance of asking why each sex act and each birth in Africa is more risky and how malnutrition, parasites, and bacterial, viral, and fungal infections (all endemic in Africa) affect individual immune status and increase viral load. The panelist said that HIV programming is a good place to start integrating health programs. The panelist gave examples of how other infections impact HIV transmission and can be remedied inexpensively. The panelist mentioned that anemia increases viral shedding in the birth canal but can be treated at a low cost, and that malaria increases viral load up to 10 times for as much as seven weeks after an episode of fever. That tenfold increase in viral load can double the risk of heterosexual HIV transmission (Abu-Raddad, Patnaik, and Kublin 2006; Cuadros, Branscum, and Crowley 2011; Fideli et al. 2001; Hoffman et al. 1999; Quinn et al. 2000; Whitworth et al. 2000).

The panelist also provided the example of urinary schistosomiasis, which the panelist noted afflicts 200 million people, almost exclusively in Africa. Schistosomiasis worms and eggs colonize the reproductive tract in men and women, causing inflammation and genital ulcers that increase HIV transmission. Women with genital ulcers are three times more likely to acquire HIV than women without genital ulcers, and treating girls now helps to protect them later when they have sex. Women who are treated for schistosomiasis before the age of 20 have a much lower risk of persistent genital ulcers (Attili, Hira, and Dube 1983; Feldmeier et al. 1995; Kjetland et al. 2006; Leutscher et al. 1998). The panelist said that, according to WHO, schistosomiasis is highly prevalent in every country in sub-Saharan Africa, including Botswana, Swaziland, Lesotho, South Africa, and Namibia (WHO and Department of Measurement and Health Information 2004). The panelist noted that all the interventions cited are low-cost and highly effective on their own, and have the potential to increase the efficiency of HIV interventions. Moreover, people are more likely to listen to safe sex messages when they are integrated into such everyday health concerns as anemia, diarrhea, malaria, STIs, and schistosomiasis. The panelist concluded that good health is a package, and we should care for people as a whole and not just chase one virus, one person at a time.

KEY POINTS RAISED DURING THE REBUTTAL

By Panelists Defending the Proposition

The panelists defending the proposition made the following points in response to the opponents' arguments:

- There are seven studies that have information on both partners, include the appropriate biomarkers of incidence or strain type, and show the effect of concurrency. In the first five studies, 40 to 78 percent of incident infections in all stable couples were found to come from couples that start out as concordant-negative, so these infections must have been acquired from outside partners. The last two studies show that among the remaining discordant couples, 30 percent of incident infections in the negative partner actually cannot be strain typed to the positive partner, so must also come from outside the relationship. Together, the results from these studies suggest that 60 to 80 percent of infections in stable couples come from outside the partnership.
- Today's mathematical models do not use "absurd" assumptions. The data used in current models show that one cannot generate the rapid epidemic increase witnessed (for example, in Zimbabwe) unless there is concurrency (Eaton, Hallett, and Garnet 2010; Goodreau et al. 2010).
- Serial monogamy is not a sufficient explanation.

- Almost every participant in a Soul City survey of 2,000 people in 10 countries said that concurrency is a norm in their communities. Furthermore, this study did not, as some concurrency critics have written, exclusively enroll high-risk individuals (Soul City Regional Program 2008).
- The preponderance of qualitative data point to concurrency as playing an important role.
- Investments to fight parasitic infections such as schistosomiasis and malaria may not impact HIV transmission because not all infections are endemically epidemic where HIV prevalence is highest. For instance, malaria and schistosomiasis rates are low in Namibia, South Africa, and Botswana; there is little malnutrition in Botswana or South Africa; and central and west Africa have much more malaria, schistosomiasis, and STIs, but HIV prevalence is much lower.

By Panelists Opposing the Proposition

The panelists opposing the proposition made the following points in response to the proponents' arguments:

- The data collected in the Morris paper cited as "new" by the proponents is actually from 1992 and 1994, and cannot be used to draw conclusions about whether concurrency is currently driving HIV in Africa (Morris et al. 2010).
- The epidemic in Africa is complex and driven by numerous intersecting factors, but to conclude that one thing—concurrency—is the major driver is tantamount to searching for a "magic bullet" solution in the face of empirical evidence to the contrary.
- Other factors such as STIs need to be explored in the models because they also affect HIV transmission and may be much more important than concurrency. While some models show that concurrency may be important, this occurs only when researchers exponentially inflate parameters so that they bear no resemblance to the actual data about patterns of sexual mixing, coital frequency, and HIV transmission probabilities.
- New mathematical models still use "outlandish" assumptions, and if one only puts in behavioral variables such as concurrency then one only gets behavioral effects out. It is thus important to put all variables from sub-Saharan Africa into models, such as realistic values for coital frequency, rates of concurrency, and risk of transmission that are based on the ample evidence available, as well as rates of new infections that are due to blood exposures, whether medical or cosmetic, and amplified rates of transmission that are due to cofactor infections, including malaria, schistosomiasis, and STIs.

KEY THEMES COVERED DURING THE QUESTION-AND-ANSWER SESSION

What are the drivers of the epidemic if concurrency is not the main driver?

An audience member asked the following: If multiple concurrent partnerships are not the main driver, what accounts for the rapid rise of infection in generalized epidemics and the continued high incidence in eastern and southern Africa? An opposing panelist responded that, in generalized epidemics, moderate levels of risk can maintain high levels of incidence. Further, according to the panelist, while that does not fully explain the start of the epidemic, concurrency alone is also not a sufficient cause and requires other factors such as heterogeneity in risk behaviors, high turnover in sexual partnerships, and high transmissibility. Another panelist opposing the proposition responded that it would be helpful to examine per-act transmission rates, particularly given the impact of other infections and the population's health status on HIV transmission and acquisition. A panelist from the defending side responded that the data currently used in models to explain the origins of the HIV epidemic actually come from data on current behaviors, which the panelist agrees

would not generate the explosive epidemics of southern Africa. The panelist believes that this may indicate changes in behavior since the epidemic began.

Why should researchers rely on data from self-reported behavioral studies?

Another audience member asked why researchers place so much stock on self-reported sexual behaviors in surveys. A panelist agreed that self-reported data are often invalid but could be improved by using more confidential ways for respondents to answer. The problems with self-reported data also demonstrate how difficult it is to measure whether concurrency matters. Another panelist agreed, citing Kenya as an example of how self-reported data on risky sexual behavior in household surveys like the DHS can be greatly under-reported. A survey conducted recently by Population Services International in Kenya initially found low rates of concurrency reported by men and women in a traditional, individually administered household survey. They set up ballot boxes where people could anonymously leave their responses. Using this confidential methodology, the number of women reporting concurrency increased from approximately 2 to 12 percent, and the number of men reporting concurrency doubled to over 30 percent (Kuria et al. 2010).

What is the impact of other types of sexual networks on heterosexual networks?

An audience member asked about the potential effect on the epidemic of other kinds of sexual networks, such as networks of men who have sex with men (MSM) that overlap with heterosexual networks. A panelist answered that the empirical evidence on MSM networks is only now being gathered; African behavioral surveys have historically neglected to ask about MSM behavior, so its role in African epidemics is not well understood. Regarding the impact or importance of other types of sexual networks, the panelist cited an example of a sexual network in Thailand. Thailand has the same annual prevalence of concurrency as eastern or southern Africa, but this typically takes the form of a one-off encounter with a sex worker. The panelist compared this type of concurrency as one flip of the coin as opposed to a hundred flips of the coin, which represents the long-term concurrent partnerships seen in parts of eastern and southern Africa. This pattern is one reason why HIV never became a generalized epidemic in Thailand. Another proponent contended that his experiences show that sex work is not a major driver of the epidemic in southern Africa because sex work is much more common in Bangkok, Manila, or even many west African cities than southern African cities like Gaborone. An opponent countered that introducing commercial sex presents additional definitional issues about what constitutes sex work and sex workers as opposed to transactional sex, which the defending panelist conceded is common in southern Africa. The opposing side also felt that anecdotal evidence was insufficient to make declarations about sex work in southern Africa.

Why is HIV prevalence so high in African countries with the lowest burden of other diseases?

An attendee asked why HIV prevalence is highest in African countries with the lowest burden of other diseases, but not as high in such places as the Democratic Republic of Congo (DRC), where there are many types of infectious diseases. One panelist responded that DRC is perplexing and is unsure if there is accurate data from that country. The panelist responded to an earlier comment that schistosomiasis and malaria are not common in southern Africa, asserting schistosomiasis is highly prevalent in the areas where the HIV epidemic started, and malaria is now being seen in areas with high HIV prevalence. The panelist further commented that models should include all health factors, as small differences in some infectious diseases can lead to big outcomes, yet are often very inexpensive to treat. A proponent panelist agreed that infectious diseases may amplify HIV but is unsure how it changes or interacts with the overall epidemiological pattern of HIV. A panelist responded that sexual behavior is important but wants to be sure that other drivers receive some attention. The panelist noted that behavior change communication is useful but message fatigue must be avoided, perhaps by incorporating safer sex into general messages about such health issues as alcohol use and children's well-being.

As the conversation segued into a discussion about prevention messaging, a proponent of the proposition asked the opponents if they opposed messages that warn people about the dangers of being in sexual networks. One panelist responded that warnings about "sexual networks" would fail because of all the

positive associations with the word "networks," such as cell phone networks and networking to get a job. The panelist felt the more appropriate messages would be "care about your loved ones" and "know your status and know your partner's status." Another panelist did not oppose funding research or interventions on concurrency but opposed spending huge amounts of resources on concurrency because it is not clear that it was—or remains—a driver of the epidemic. Another panelist responded that the messages should emphasize reducing numbers of sexual partners and unprotected sexual incidents. The defending side provided examples of the power of effective messaging about sexual networks and concurrency, citing recent experiences from Kenya and Swaziland.

Is there empirical evidence that different ethnic groups and different levels of concurrency correlate to levels of HIV in eastern and southern Africa?

The proponent panelist answered yes, citing wife inheritance practices among the Luo in Nyanza Province of Kenya, which has higher HIV prevalence than the rest of the country (Agot et al. 2010). Data from South Africa also shows higher levels of concurrency among black South Africans (when compared to white and colored South Africans), who are also the most affected by HIV.

How should prevention investments be allocated proportionately among other health concerns?

The final question from the audience asked how to proportionately allocate prevention investments if HIV transmission requires multiple health and behavioral change communication interventions related to schistosomiasis, male circumcision, etc. A panelist supported more scientific research into common infections that may affect HIV transmission, such as more trials on the role of STIs in HIV transmission. Research on ways to protect boys and girls from genital schistosomiasis and to heal genital ulcers would help improve general health status and protect them from HIV. Additional research on the interaction of malaria and HIV is warranted. Other possible cofactor infections such as lymphatic filariasis and other worm infections have received insufficient attention. The panelist said that we should put more money into the medicines we have because treating such cofactors as schistosomiasis, STIs, and nutrition is "so cheap" and allows people who are living with HIV to stay healthier for longer. Antiretroviral therapy (ART) protocols already treat for tuberculosis, often prior to initiation of ART, in order to ensure successful treatment of both diseases. The panelist went on to assert that treatment of schistosomiasis and other co-infections should be included in the ART protocol. The panelist further observed that trials in Kenya had demonstrated that annual deworming with an inexpensive drug (U.S.$0.02) increased CD4 counts in people living with HIV, enabling them to postpone initiation of ART (Walson et al. 2008). Additional research is needed on the extent to which worms increase the likelihood of HIV acquisition and increase risk of HIV transmission from individuals living with HIV to others (through sexual and vertical [e.g., mother-to-child] transmission), as well as the role worm burden plays in HIV and AIDS disease progression.

Another panelist would allocate money for more studies using HIV incidence as an endpoint, reviewing the actual impact of programs in a community to make rational investment decisions. One panelist observed that fellow panelists agreed that multiple partnerships drive the epidemic and that it needs to be determined how to generate messaging. A panelist cautioned that we need to be careful to ensure that the definition of and risks associated with multiple partners (e.g., "it only takes two partners") come through clearly in the messaging.

Next Debate

The next debate will take place on February 14, 2011.

References

Abdool Karim Q., S. S. Abdool Karim, J. A. Frohlich, et al. 2010. Effectiveness and Safety of Tenofovir Gel, An Antiretroviral Microbicide, for the Prevention of HIV Infection in Women. *Science* 329:1168–1174.

Abu-Raddad, L., P. Patnaik, and J. G. Kublin. 2006. Dual Infection with HIV and Malaria Fuels the Spread of Both Diseases in Sub-Saharan Africa. *Science* 314(5805):1603–1606.

Agot, K. E., A. V. Stoep, M. Tracy, et al. 2010. Widow Inheritance and HIV Prevalence in Bondo District, Kenya: Baseline Results from a Prospective Cohort Study. *Public Library of Science ONE* 5(11):e14028.

Attili, V. R., S. Hira, and M. K. Dube. 1983. Schistosomal Genital Granulomas: A Report of 10 Cases. *British Journal of Venereal Disease* 59(4):269–272.

Caraël, M. 1995. "Sexual Behaviour." In *Sexual Behaviour and AIDS in the Developing World*, ed. J. G. Cleland and B. Ferry, 75–123. London: Taylor & Francis, World Health Organization.

Celum, C., A. Wald, J. R. Lingappa, et al. 2010. Acyclovir and Transmission of HIV-1 from Persons Infected with HIV-1 and HSV-2. *New England Journal of Medicine* 362(5):427–439.

Cuadros, D. F., A. J. Branscum, and P. H. Crowley. 2011. HIV-Malaria Co-Infection: Effects of Malaria on the Prevalence of HIV in East sub-Saharan Africa. *International Journal of Epidemiology* 39(6):1–9.

Eaton, J., T. B. Hallett, and G. P. Garnet. 2010. Concurrent Sexual Partnerships and Primary HIV Infection: A Critical Interaction. *AIDS and Behavior* Oct 2 [Epub ahead of print].

Feldmeier, H., G. Poggensee, I. Krantz, et al. 1995. Female Genital Schistosomiasis. New Challenges from a Gender Perspective. *Tropical and Geographical Medicine* 47(2 Suppl):S2–15.

Fideli, U. S., S. A. Allen, R. Musonda, et al. 2001. Virologic and Immunologic Determinants of Heterosexual Transmission of Human Immunodeficiency Virus Type 1 in Africa. *AIDS and Research on Human Retroviruses* 17(10):901–910.

Goodreau, S. M., S. Cassels, D. Kasprzyk, et al. 2010. Concurrent Partnerships, Acute Infection and Epidemic Dynamics in Zimbabwe. *AIDS and Behavior* Dec 20 [Epub ahead of print].

Gregson, S., G. P. Garnett, C. A. Nyamukapa, et al. 2006. HIV Decline Associated with Behavior Change in Eastern Zimbabwe. *Science* 311:664–666.

Guwatudde, D., F. Wabwire-Mangen, L. A. Eller, et al. 2010. Relatively Low HIV Infection Rates in Rural Uganda, but with High Potential for a Rise: A Cohort Study in Kayunga District, Uganda. *Public Library of Science ONE* 4(1):e4145.

Halperin, D. T., O. Mugurungi, T. Hallett, et al. 2011. A Surprising Prevention Success: Why Did the HIV Epidemic Decline in Zimbabwe? *Public Library of Science Medicine* (forthcoming).

Harrison, A., and L. F. O'Sullivan. 2010. In the Absence of Marriage: Long-term Concurrent Partnerships, Pregnancy, and HIV Risk Dynamics among South African Young Adults. *AIDS Behavior* 14:991–1000.

Hoffman, I. F., C. S. Jere, T. E. Taylor, et al. 1999. The Effect of Plasmodium Falciparum Malaria on HIV-1 RNA Blood Plasma Concentration. *AIDS* 13(4):487–494.

Hugonnet, S., F. Mosha, J. Todd, et al. 2002. Incidence of HIV Infection in Stable Sexual Partnerships: A Retrospective Cohort Study of 1802 Couples in Mwanza Region, Tanzania. *Journal of Acquired Immune Deficiency Syndrome* 30(1):73–80.

Jewkes, R. K., K. Dunkle, M. Nduna, et al. 2010. Intimate Partner Violence, Relationship Power Inequity, and Incidence of HIV Infection in Young Women in South Africa: A Cohort Study. *The Lancet* 376(9734):41–48.

Joint U.N. Programme on HIV/AIDS Reference Group on Estimates, Modelling, and Projections: Working Group on Measuring Concurrent Sexual Partnerships. 2010. HIV: Consensus Indicators are Needed for Concurrency. *The Lancet* 375:621–622.

Kjetland, E. F., P. D. Ndhlovu, E. Gorno, et al, 2006. Association Between Genital Schistosomiasis and HIV in Rural Zimbabwean Women. *AIDS* 20(4):593–600.

Kuria, P., H. Ooko, E. Akom, et al. 2010. *Variations in Self-Reported Concurrent Sexual Partnerships Using Two Methodologies*. Presented at the 2010 International AIDS Conference. Vienna, Austria.

Leutscher, P., V. E. Ravaoalimalala, C. Raharisolo, et al. 1998. Clinical Findings in Female Genital Schistosomiasis in Madagascar. *Tropical Medicine and International Health* 3(4):327–32.

Lurie, M. N., B. G. Williams, K. Zuma, et al. 2003. Who Infects Whom? HIV-1 Concordance and Discordance Among Migrant and Non-Migrant Couples in South Africa. *AIDS* 17:2245–2252.

Lurie, M., and S. Rosenthal. 2010. The Concurrency Hypothesis in Sub-Saharan Africa: Convincing Empirical Evidence is Still Lacking. Response to Mah and Halperin, Epstein, and Morris. *AIDS and Behavior* 14(1):34–37.

Lurie, M., S. Rosenthal, and B. Williams. 2009. Concurrency Driving the African HIV Epidemics? Where is the Evidence? *The Lancet* 374(9699):1420.

Mishra, V., and S. Bignami-Van Assche. 2009. Concurrent Sexual Partnerships and HIV Infection: Evidence from National Population Based Surveys. DHS Working Paper 62. Calverton, MD: DHS. Available at http://www.measuredhs.com/pubs/pdf/WP62/WP62.pdf (accessed May 2009)

Morris, M., H. Epstein, and M. Wawer. 2010. Timing is Everything: International Variations in Sexual Partnership Concurrency and HIV Prevalence. *PLoS ONE* 5(11):e14092.

Quinn, T. C., M. J. Wawerm N. Sewankambo, et al. 2000. Viral Load and Heterosexual Transmission of Human Immunodeficiency Virus Type 1. Rakai Project Study Group. *New England Journal of Medicine* 342(13):921–929.

Reniers, G., and S. Watkins. 2009. Polygyny and the Spread of HIV in sub-Saharan Africa: A Case of Benign Concurrency. *AIDS* 24(2):299–307.

Sawers, L., and E. Stillwaggon. 2010. Concurrent Sexual Partnerships Do Not Explain the HIV Epidemics in Africa: A Systematic Review of the Evidence. *Journal of the International AIDS Society* 13(34):1–24.

Soul City Regional Program. 2008. Multiple and Concurrent Sexual Partnerships in Southern Africa: A Ten Country Research Report. Available at http://www.soulcity.org.za/research/research-reports/multiple-and-concurrent-sexual-partnerships-in-southern-africa/view (accessed January 2011)

Tanser, F., T. Barnighausen, N. McGrath, et al. 2009. "Levels of Partnership Concurrency and Risk of HIV Acquisition in a High-Prevalence, Rural South African Population." Presented at The Second International Conference on Infectious Diseases Dynamics, Athens, Greece, December 2-4.

Walson, J. L., P. A. Otieno, M. Mbuchi, et al. 2008. Albendazole Treatment of HIV-1 and Helminth Co-infection: A Randomized, Double-blind, Placebo-controlled Trial. *AIDS* 22:1601–1609.

Wellings, K., M. Collumbien, E. Slaymaker, et al. 2006. Sexual Behaviour in Context: A Global Perspective. *The Lancet* 368:1706–1728.

Whitworth, J., D. Morgan, M. Quigley, et al. 2000. Effect of HIV-1 and Increasing Immunosuppression on Malaria Parasitaemia and Clinical Episodes in Adults in Rural Uganda: A Cohort Study. *The Lancet* 356(9235):1051–1056.

World Health Organization and Department of Measurement and Health Information. 2004. "Global Burden of Disease Estimates, Death and DALY Estimates for 2002 by Cause for WHO Member States, Table 4. Estimated DALYs per 100,000 Population by Cause and Member State 2002." Available at http://www.who.int/healthinfo/global_burden_disease/estimates_2000_2002/en/index.html (accessed February 1, 2011)

Resources

Castor, D., S. Cook, S. Leclerc-Madlala, et al. 2010. Correspondence: Intimate-Partner Violence and HIV in South African Women. *The Lancet* 376(9748):1219.

Eaton, J., T. Hallett, and G. Garnett. 2010. Concurrent Sexual Partnerships and Primary HIV Infection: A Critical Interaction. *AIDS and Behavior* Oct 2 [Epub ahead of print].

Epstein, H. 2010. Correspondence: Intimate-Partner Violence and HIV in South African Women. *The Lancet* 376(9748):1219.

Jewkes, R., and K. Dunkle. 2010. Correspondence: Intimate-Partner Violence and HIV in South African Women – Authors' Reply. *The Lancet* 376(9748):1219–1220.

Johnson, L., R. Dorrington, D. Bradshaw, et al. 2009. Sexual Behaviour Patterns in South Africa and their Association with the Spread of HIV: Insights from a Mathematical Model. *Demographic Research* 21:289–339.

Lurie, M. N., and S. Rosenthal. 2010. Concurrent Partnerships as a Driver of the HIV Epidemic in Sub-Saharan Africa? The Evidence is Limited. *AIDS and Behavior* 14(1):17–24.

Mah, T., and D. Halperin. 2010. The Evidence for the Role of Concurrent Partnerships in Africa's HIV Epidemics: A Response to Lurie and Rosenthal. *AIDS and Behavior* 14(1):25–28.

Morris, M., and M. Kretzschmar. 1997. Concurrent Partnerships and the Spread of HIV. *AIDS* 11:641–648.

Sawers, L., and E. Stillwaggon. 2010. Understanding the Southern African "Anomaly": Poverty, Endemic Disease and HIV. *Development and Change* 14(2):195–224.

Shelton, J. D. 2010. A Tale of Two-Component Generalised HIV Epidemics. *The Lancet* 375(9719):964–966.

Stillwaggon, E. 2008. Race, Sex, and the Neglected Risk for Women and Girls in Sub-Saharan Africa. *Feminist Economics* 14(4):67–86.

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