

FOCUSING HIV PREVENTION ON THOSE MOST LIKELY TO TRANSMIT THE VIRUS

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Despite some success in reducing HIV incidence, the global epidemic continues to grow. For every person with AIDS in developing countries placed on treatment in 2005, many others were newly infected. We need more effective prevention programs that focus interventions on those most at risk for HIV transmission (MART), particularly those with 1) high behavioral risk and 2) high viral loads due to acute or recent infection, co-infections with other diseases, high viral set points, or untreated AIDS. This article provides examples of how prevention programs can incorporate emerging testing technologies and social/behavioral approaches to reach these individuals, their partners, and the social networks where active transmission is occurring.

A quarter century has passed since HIV/AIDS and its potential to become a global pandemic were first recognized. More than 38 million people are now living with HIV, and the virus is still spreading (UNAIDS, 2006). Despite increasing success in providing care and treatment to those infected, for every person receiving antiretroviral therapy in 2006, many more new HIV infections occurred (Global Fund, 2005; UNAIDS, 2006). We desperately need better prevention strategies.

Fortunately, we have some basis for optimism. Over the past decade, HIV testing technologies and sociobehavioral approaches have been undergoing steady refinements (Cates, 2006; Centers for Disease Control and Prevention [CDC], 2000b; Kassler, 1997). New opportunities are emerging for HIV prevention programs to focus interventions on HIV-infected individuals most at risk for transmission (MART), particularly those who have both high viral loads (Pilcher et al., 2002; Quinn, Brookmeyer, et al., 2000; Quinn, Wawer, et al., 2000) and high behavioral risk (Pilcher, Eaton, Kalichman, Bisol, & de Souza Rda, 2006).

HIV prevention programs must plan now to seize opportunities to quickly identify, counsel, and prevent transmission from MART individuals. More important from a public health standpoint, we must rapidly reach their current sexual and needle-sharing partners and others in their high-risk social networks. This article provides examples of how both emerging HIV testing technologies and creative

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sociobehavioral approaches can be integrated into enhanced, highly targeted programs to both locate MART individuals and also intervene rapidly to prevent HIV transmission.

BACKGROUND

How successful have HIV prevention approaches been to date? Evidence indicates that some interventions are effective if implemented well; however, overall, they have not been effective enough. Although infection rates have decreased in some countries (with behavioral changes playing a key role), HIV incidence remains high (UNAIDS, 2006).

One possible reason for limited success has been the focus on populations that pose relatively low risk of spreading the infection. Activities have largely emphasized preventing uninfected individuals from becoming infected and preventing chronically infected individuals from infecting others (Okware, Kinsman, Onyango, Opio, & Kaggwa, 2005). However, individuals who simultaneously have high viral loads (Pilcher, Tien, et al., 2004) and multiple sex or needle-sharing partners disproportionately sustain HIV transmission in communities, not those living with chronic infection and low viral loads.

Three factors fuel the disproportionate contribution to HIV spread: biology; behavior; and involvement in social networks that involve high-risk behaviors, such as multiple, concurrent sex partners and substance use with needle-sharing. Simply stated, MART individuals have high viral loads that make them more infectious (biology); at the same time, they are engaging in high-risk sexual/drug use practices (behavior), and they are involved in social communities with active HIV transmission (networks).

CATEGORIZATION OF THOSE MOST AT RISK FOR HIV TRANSMISSION

From a biological perspective, the conditions of MART individuals can be categorized as follows:

1. *Acute infection*, characterized by very high viral loads, but HIV antibody negativity because exposure just occurred within the past few weeks.
2. *Recent infection*, characterized by declining but still high viral loads in the months following initial infection, but antibody tests are now positive.
3. *Transient spikes in viral load* owing to acute co-infections with sexually transmitted infections (STIs), measles, influenza, malaria, or other infectious diseases (Hewitt, Steketee, Mwapasa, Whitworth, & French, 2006; Kublin et al., 2005).
4. *Persistent high viral loads owing to chronic co-infections or unknown host factors*, lasting for months or years.
5. *Progression to AIDS*, with rising viral loads in the absence of effective treatment.

The degree to which individuals in different MART categories contribute to HIV transmission overall is unknown, and additional studies are needed to establish priorities for prevention. However, individuals with acute or recent infection likely have the highest viral loads (greatly exceeding those with chronic infections), the greatest biological potential to infect others, and substantial behavioral risks (Brenner et al.,

TABLE 1. Overview of HIV diagnostic tests available and performance characteristics*

Type of Test	Name	Estimated Days From Infection Until Test Positive	Sensitivity (%)*	Specificity (%)*	Estimated Cost (U.S. dollars)†	Feasibility‡
Antibody tests						
	Enzyme Immunoassay (EIA) for immunoglobulin G (IgG) detection	21–180	80–100	>98	<1–3	Yes
Viral antigen						
	p24	14	79–87	100	75	Yes
	Ultrasensitive p24	14	46–100	>95	16	Yes
	Qualitative PCR or other amplification system	9	>99	>98	50–100	No
	Quantitative PCR (number of viral copies)	9	>99	98–100	50–100	No

*Diagnostic characteristics vary depending on many host, viral, or assay factors including HIV subtype, prevalence of HIV infection, age of individual, stage of infection, and assay threshold. References for the above table are available upon request to the author. †Costs, rounded to nearest U.S. dollar, are listed as approximate cost per sample tested and do not necessarily include equipment costs or costs of all reagents or supplies. ‡Feasibility refers to feasibility in resource-limited settings and is based on likely availability of equipment, laboratory requirements, and overall costs for test type.

2007; Daar, Moudgil, Meyer, & Ho, 1991; Jacquez, Koopman, Simon, & Longini, 1994; Kublin et al., 2005; Pilcher, Tien, et al., 2004; Quinn, Wawer, et al., 2000; Wawer et al., 2005). For example, among Ugandan discordant couples, the overall rate of HIV transmission was .0012 per coital act (Wawer et al., 2005). In this same report, the authors estimate that transmission risks for individuals with recent infection (within 2.5 months after seroconversion) may have been more than 8 times that of individuals with longer-term infections. Transmission rates during the first month following HIV infection were estimated to be as high as one case per 50 coital acts (Wawer et al., 2005). Further strengthening the evidence, a previous study of discordant couples in Uganda found no instances of transmission where the index partner had a serum HIV RNA level of less than 1,500 copies per milliliter; meanwhile, transmission risks increased with increasing viral load (Quinn, Wawer, et al., 2000).

HIV TESTS TO IDENTIFY MART INDIVIDUALS

Although emerging HIV testing technologies make the identification of MART individuals increasingly possible, determining the best testing strategy—particularly for use in resource-limited settings—requires balancing the advantages and disadvantages of various test attributes, such as availability, cost, feasibility, and rapidity of obtaining results. A summary of available, relevant diagnostic tests are presented in Table 1.

All strategies for detecting MART individuals begin with the use of HIV antibody tests. Newer forms of these tests can detect antibodies as early as 2 to 3 weeks postinfection, that is, during acute infection. However, HIV antibody tests routinely available worldwide (enzyme immune assays or rapid tests) only become highly sensitive several weeks after initial infection. At 6 weeks postinfection they detect about 80% of infections; at 12 weeks, almost 100% (Preiser, 2005). The lower sensitivity of most HIV antibody tests during early infection means that they will miss many acutely infected individuals. But other tests can be coupled with a negative or indeterminate HIV antibody test to identify acute infection.

The viral antigen tests (e.g., p24 antigen) and viral RNA approaches using polymerase chain reaction (PCR) testing or other amplification methods for testing, including the recently FDA-approved APTIMA HIV-1 RNA Qualitative Assay (U.S. Food and Drug Administration, 2006), are the most promising approaches available to detect those with acute HIV infection. They can be used alone or coupled with other approaches to make them more efficient.

COUPLING NEGATIVE HIV ANTIBODY TESTS WITH TESTING FOR PROTEIN 24 CAPSID ANTIGEN (P24)

Standard p24 antigen testing detects a core protein of HIV within 2 weeks of infection and has a specificity of 100%, but its sensitivity is only 79-88% (Daar et al., 2001; Hecht et al., 2002), it is costly (about \$75 per test) (Flanigan & Tashima, 2001), and the degree to which it can detect p24 antigen from all clades of HIV-1, HIV-2, and HIV-1 Group O is unknown.

In contrast to this standard p24 antigen test, an ultrasensitive assay is also available that is both more sensitive (Schupbach et al., 2001) and less expensive (about \$16 per test) (Balakrishnan, Solomon, Kumarasamy, & Mayer, 2005). Levels of plasma HIV p24 measured by the ultrasensitive assay also been shown to correlate well with PCR-measured plasma RNA viral loads, regardless of viral subtype (Ribas, Ondo, Schupbach, van der Groen, & Fransen, 2003).

COUPLING NEGATIVE HIV ANTIBODY TESTS WITH PCR

Extremely sensitive (>99.9%) PCR can directly detect HIV RNA within nine days of infection, further reducing the detection window of p24 antigen assays by several days (Fiebig et al., 2003; Lindback et al., 2000). PCR can be used qualitatively to either identify or rule out infection and quantitatively to measure viral load to evaluate treatment efficacy. Although PCR tests have largely replaced the standard p24 antigen assays, their specificity may be as low as 97.4% (Daar et al., 2001), and they require sophisticated equipment and are too expensive for use in most resource-constrained settings (Fiscus et al., 2006). However, qualitative PCR testing can be made more cost-effective by first pooling HIV antibody-negative sera: if a pooled sample tests positive, ever smaller pools can be tested until the individual samples that test positive can be identified and those with acute infection found (Pilcher et al., 2002; Pilcher et al., 2005; Pilcher, Price, et al., 2004; Quinn, Brookmeyer, et al., 2000). A pooled approach to detecting a specified viral load level (e.g., 1,500 or higher copies per milliliter) also might be feasible for identifying MART individuals. Such an approach could substantially lower overall testing costs. Encouragingly, the newly approved APTIMA Assay (qualitative RNA detection) is more expensive, but may be more feasible than the pooling approach in developing countries.

COUPLING POSITIVE ANTIBODY TESTS WITH PCR

Once HIV antibody tests are positive, the only testing system available to assess viral load is the quantitative PCR. Viral load testing requires access to expensive equipment, is a complicated process and is still expensive, approximately \$50 or more per test, but its potential benefit may outweigh these obstacles.

Other tests for determining acute or recent infection in seropositive individuals may be available in some developing countries but less preferable than PCR for identifying MART individuals. These include the Avidity Index (which detects early infection based on the ease with which early antibody-antigen complexes are disrupted), which can differentiate recent HIV infections from chronic infections (Suligoj et al., 2003) and the BED-CEIA which can distinguish low antibody levels characteristic of recent infection but is not currently recommended for incidence estimation (UNAIDS, 2005).

INTEGRATING TESTS FOR MART INDIVIDUALS INTO HEALTH CARE SYSTEMS

Identifying MART individuals first requires integrating the appropriate tests into health care and other services accessed by individuals at high risk (e.g., voluntary counseling and testing [VCT], STI clinics, and drug treatment services). Such integration has already proved feasible in studies conducted in North Carolina and Malawi, where the pooled PCR technique described above was used to identify (a) individuals with acute HIV infection, (b) health care provider sites with the most acute HIV infections, and (c) sexual networks with active transmission (Hightow et al., 2005; Pilcher et al., 2005; Pilcher, Price, et al., 2004).

To leverage limited resources, a pilot program could initially use the pooled PCR approach at potential sites within a province or country to identify sites with the most MART individuals. The pooled PCR testing could be used to identify those with acute infections who are antibody seronegative and the quantitative PCR for those who are seropositive with a viral load above a specified level relevant to transmission risks.

Prevention programs could be further focused, and overall costs lowered, by using a risk assessment procedure to limit expensive PCR testing to those at highest behavioral risk. This assessment could determine if they have had recent exposure to someone with HIV, multiple sex or substance-using partners, STI or other infectious disease, or activity in social networks with known HIV transmission. Subsequently, MART individuals identified by PCR testing would be prioritized for rapidly delivered HIV prevention interventions.

Testing systems to identify MART individuals will be costly additions to HIV prevention programs. However, they have the potential to be cost-effective, as demonstrated in the pooled PCR pilot project in North Carolina. Preventing just one additional HIV transmission by an acutely infected individual was estimated to save about \$300,000 in lifetime treatment costs, more than the annual cost of the pilot program (Fisher, 2006). Although the financial savings may not be as profound in resource-poor situations in which AIDS treatment is still not widely available, the economic benefit should still be substantial, and the human savings are incalculable in preventing the spread of HIV.

HIV testing technologies that can distinguish MART individuals need to be more reliable and cost-effective than those currently available, and integrating them into existing HIV prevention programs, especially in resource-poor countries, will be challenging and time consuming. Thus, urgent priority should be given to improving their performance, lowering their costs, decreasing time intervals before test results are available, and continuing to assess their feasibility.

LEVERAGING EMERGING SOCIAL/BEHAVIORAL APPROACHES

To be most effective, HIV prevention programs must rapidly identify not only MART individuals but also their sex and substance-using partners who are at high risk of infection. Fortunately, sociobehavioral approaches are available that could locate MART individuals, and deliver prevention interventions and other needed services to them and their at-risk partners. Furthermore, such approaches provide practical ways to obtain additional data on the social context of active HIV transmission. This information would illuminate the social characteristics of the active epidemic, help predict its future spread, and suggest whom else to target for prevention interventions, both within high-risk social networks and the larger community.

Success in preventing HIV spread depends on our capability to intervene at three levels: MART individuals, their sex and substance-using partners, and their high-risk social networks. Such synchronized interventions are likely to be synergistic and should be planned as one coherent, mutually supporting program. Furthermore, if combined with strong monitoring and evaluation efforts, they can be continually refined and better targeted to changing HIV transmission patterns.

INTERVENTIONS FOR MART INDIVIDUALS

Upon identifying recently infected individuals or others with high viral loads, various individual-level interventions can be implemented to bring about substantial, short-term behavior change lasting at least through the period of high transmission risk. Two such interventions are HIV prevention counseling and prevention case management.

HIV Prevention Counseling. MART individuals must immediately adopt safer behaviors. The first opportunity to intervene is when HIV test results are disclosed and prevention counseling provided. Because most MART individuals are probably

highly infectious for only a brief amount of time, their counseling could initially focus on short-term behavior change. Encouragingly, this appears to be an achievable goal: several studies have reported that HIV testing and counseling resulted in short-term reduction of risk behaviors (Cleary et al., 1991; Coates et al., 2000; DiFrancesco, Pinkerton, Dyatlov, & Swain, 2005; Kamenga et al., 1991). Changing short-term behavior of MART individuals to reduce further HIV spread is a priority, but long-term behavior change is still key, particularly for those with persistently high viral loads, those likely to develop co-infections, and those developing AIDS. Additional systems should be supported to provide or refer individuals to drug treatment, support groups, or other services focused on sustaining safe behavior.

Counseling may have an even greater impact on MART individuals' behavior if it emphasizes the immediate danger they pose to their sex and substance-using partners. This emphasis, coupled with creative interventions to reinforce short-term abstinence or consistent condom use, could result in substantial reductions in HIV transmission (Cates, Chesney, & Cohen, 1997; Koopman et al., 1997).

PREVENTION CASE MANAGEMENT

Prevention case management, also called comprehensive risk counseling and services (CRCS), is a more intensive individually focused approach (CDC, 1997, 2006a). It includes extended counseling, support groups, and other outreach interventions. Case management programs for MART individuals reinforce safer behaviors promoted during the posttest counseling session, such as abstinence or consistent condom use. Intensive support could be limited to 3 months (or until viral load has sufficiently declined) or longer for those with long-term transmission risks (e.g., persistent high viral load or untreated AIDS).

INTERVENTIONS FOR PARTNERS OF MART INDIVIDUALS

Partner counseling and referral is a key intervention for sex and substance-using partners of recently-infected individuals (Cates et al., 1997; CDC, 2006a; West & Stark, 1997). Similar practices, used for decades in the United States to identify and treat STIs, have been adapted for notifying, referring, and counseling sex partners of individuals testing positive for HIV (CDC, 1998). Trained counselors (provider referral) or MART individuals (patient referral) notify partners of their exposure to HIV and refer them for testing, counseling, and possibly other health services. Partner referral is especially useful if focused on identifying sex partners of MART individuals who may have recently become HIV infected and thus be particularly infectious. If infected, these partners could be counseled about how to avoid infecting others. Both referral approaches can be effective and should be offered to MART individuals; however, provider referral has reached a larger number of sex partners for STI/HIV testing and other related services (Mathews et al., 2002). Issues of confidentiality remain critical to partner referral, underscoring the need to couple these approaches with increased efforts to reduce HIV stigma. If maintaining confidentiality is a problem or resources to conduct provider referrals are insufficient, patient referral may be preferable (West & Stark, 1997). Partner notification strategies also need to be adapted to address cultural sensitivities. Although this public health approach has not been widely used internationally, it has been implemented in some developing countries, including Vietnam where voluntary counseling and testing counselors in some provinces have been trained to obtain confidential sex partner information and make referrals (G. West, personal communication, June 2006).

INTERVENTIONS FOR MART SOCIAL NETWORKS

More population-level applications of partner notification—approaches informed by social network concepts—may be critical tools for controlling epidemics such as HIV (Friedman, 1996; Potterat, 2003; Rothenberg, 2001, 2002; Rothenberg & Narramore, 1996).

Identifying MART Social Networks. MART individuals and those at imminent risk of infection will not all be found through health care providers. However, they could be located through outreach to high-risk social networks. Two creative methods can be used to identify high-risk social networks: rapid field assessment and social network analysis. This would allow delivery of highly targeted community and network-level prevention interventions.

Rapid Field Assessment Methods. Rapid field assessment methods, such as the PLACE method (Weir & Boerma, 2002), have been developed to locate potential high HIV transmission areas. The PLACE method identifies sites where individuals at high risk of acquiring or transmitting HIV meet or congregate, and then targets these locations for risk reduction activities. This method has effectively identified sites where individuals with high rates of new sexual partner formation meet (Weir et al., 2003) and could be used to potentially identify clusters of recent HIV infection if immediate HIV testing was implemented once locations are identified. In addition, field assessment methods might better identify and assess the locations where active HIV transmission is occurring if it were known where MART individuals met their sex partners.

Social Network Data Collection and Analysis. Collecting and aggregating partner data from MART individuals can also identify sexual networks with active HIV transmission. During counseling, MART individuals should be questioned about where and in what social context they met their recent sex partners (Rothenberg, 2002). Settings of sex partnership formation can be mapped, and over time the context in which people meet sex partners can be identified. This approach can potentially reveal patterns that suggest hubs of active HIV transmission, enabling prevention programs to more quickly identify additional MART individuals and focus the delivery of prevention interventions.

This approach could be further enhanced by adapting a method known as cluster referrals, historically used in syphilis control (CDC, 1992). This approach encourages MART individuals to confidentially refer their friends, associates, noncurrent sex partners, substance-using friends, and other members of their social networks for HIV testing (Rothenberg, 2002; Rothenberg & Narramore, 1996). Such contacts of MART individuals can also be expected to be at heightened risk of HIV infection if they practice high-risk behaviors within the network. If infected, these individuals would be asked to refer *their* sexual partners and other contacts for HIV testing and counseling. Aggregately, community environments where high-risk partnerships are formed can be identified and targeted for prevention interventions.

DELIVERING BEHAVIORAL AND OTHER INTERVENTIONS

Interventions can be delivered at the locations where MART individuals socialize and/or through their social/sexual/substance-using networks (Rothenberg, 2001). Both approaches can reach MART individuals and members of their high-risk social networks. Examples of location-based interventions include on-site HIV prevention education and testing; referral to VCT services offering the new testing technologies for identifying MART individuals; and/or structural interventions, such as making

condoms or needle exchange widely available and accessible and revising policies governing bars or other entertainment locations (Cohen, Wu, & Farley, 2006).

Approaches that focus on sexual/substance-using networks may be similar to risk reduction activities provided at the locations where MART individuals socialize, but these activities specifically target network members. An example includes interventions by peers who are either members of the targeted social network where a MART individual was identified or people who share important personal characteristics with network members (e.g., age, gender, similar risk behaviors, entertainment interests, or residence area). Their peer status allows them to access the social network and to provide education and confidential counseling to those at risk of having sex with MART individuals. Preferably, opinion leaders within networks would be identified and recruited into the program. For example, in a randomized HIV prevention trial in Russia and Bulgaria, HIV prevention education to networks of men who have sex with men by leaders of social networks reduced risky behaviors (Amirkhanian et al., 2005). For greatest impact, techniques used in research—such as respondent driven sampling (Heckathorn, 1997; Heckathorn, 2002; Heckathorn, Broadhead, Anthony, & Weakliem, 1999; Heckathorn, Semaan, Broadhead, & Hughes, 2002)—could be adapted for use by HIV prevention programs. For example, peers from targeted networks would be continually enlisted to provide education and referral services to members, with their productivity monitored. Their success would be evaluated on how well they are able to reach their peers within the targeted networks.

This more focused network-level, peer-driven intervention differs in three essential ways from the traditional, generalized peer outreach and education. First, it targets social networks with documented recent HIV transmission. Second, it recruits only peers who belong to these networks and understand their social context. Third, it closely monitors the productivity of peer counselors in terms of their demonstrated ability to recruit members of the targeted networks into the prevention program (Heckathorn et al., 1999).

The feasibility of using network-level HIV prevention approaches to identify and intervene in networks with high rates of *active HIV* transmission requires empirical evaluation. The experience of the U.S. CDC, with a 2-year HIV network intervention pilot program in nine U.S. cities, provides some encouragement (CDC, 2006a). In this strategy, both HIV-positive and high-risk, HIV-negative persons were asked to refer friends, relatives, and others in their social networks for HIV testing, counseling, and referral. The program substantially increased the rate of new HIV diagnoses. A similar program could focus on MART individuals.

FOCUSING OTHER PREVENTION INTERVENTIONS

Innovative sociobehavioral interventions for MART individuals and their social networks should be implemented in parallel with emerging clinical HIV prevention interventions. The two approaches reinforce each other to reduce transmission risks. Examples of emerging interventions that could be targeted to either MART individuals or individuals in their social or sexual networks include herpes simplex virus (HSV) treatment and prophylaxis (Nagot et al., 2007), HIV preexposure prophylaxis with oral antiretroviral drugs (PrEP) (CDC, 2005b), postexposure prophylaxis (PEP) (CDC, 2001, 2005a; Hecht et al., 2006; Kahn et al., 2001; Kinloch-de Loes, 2006; Peterson et al., in press; Pinkerton et al., 2004; Streeck et al., 2006) and male circumci-

sion (Auvert et al., 2005; National Institute of Allergy and Infectious Diseases [NIAID], 2006; Quinn, 2006).

HSV SUPPRESSION

Co-infection with herpes simplex virus-2 (HSV-2) can increase HIV acquisition and transmission risks as much as fivefold (Corey, Wald, Celum, & Quinn, 2004; Wawer et al., 1999). The impact of HSV suppression on HIV acquisition and transmission is being evaluated. If successful, its impact might be maximized if these and other STI treatment services were targeted to MART individuals and members of their high-risk social networks.

Preexposure Prophylaxis. Clinical trials of the safety and effectiveness of antiretroviral drugs for PrEP for those at high risk of becoming HIV infected are under way. Initial data from West Africa have provided encouragement regarding safety of Tenofovir for PrEP (Peterson et al., 2006; Peterson et al., in press). Should Tenofovir or some combination of drugs eventually be shown effective, PrEP will be yet another tool to reduce HIV acquisition risks in well-defined social networks. Coupled with social/behavioral interventions, such an approach has the potential to help disrupt patterns of HIV transmission (CDC, 2005b), as has expanded treatment services (including preventive treatment coupled with partner referral and treatment) for syphilis outbreaks (Jaffe, Rice, Voigt, Fowler, & St. John, 1979).

Postexposure Prophylaxis. Unprotected sex with MART individuals increases the risk of HIV acquisition. But based on studies of occupational and nonoccupational HIV exposure, this risk of infection may be diminished if the uninfected partner is quickly treated (preferably within 36 to 72 hours of exposure) with antiretroviral drugs (Kahn et al., 2001; CDC, 2001, 2005a; Cohen, Gay, Kashuba, Blower, Paxton, 2007). A program focused on MART individuals likely may frequently identify people eligible for PEP (Hecht et al., 2006; Kinloch-de Loes, 2006; Streeck et al., 2006). The number of identified high-risk exposures to HIV—and thus opportunities to use PEP to block the spread of the virus—may be small, but this limited use of PEP may also help cut chains of transmission.

Male Circumcision. Recently completed clinical trials have shown that male circumcision substantially reduces men's risks of acquiring HIV (Auvert et al., 2005; NIAID, 2006; Quinn, 2006). Social networks with active HIV transmission among uncircumcised men could be targeted and offered safe circumcision services.

CONCLUSION

MART individuals, their sex partners, and their social networks are at the heart of active HIV transmission. To maximize the effectiveness of HIV prevention programs, services must be refocused and activities prioritized to target MART populations. With new diagnostic testing technologies, we have an emerging opportunity to identify MART individuals and to rapidly implement mutually reinforcing sociobehavioral and clinical interventions.

Selected HIV prevention programs have already used new technologies to identify MART individuals and intervene. In the short term, PCR (qualitative and quantitative) and, with further development, a rapid p24 antigen test show promise for identifying, on a larger scale, MART individuals. Meanwhile, development of reliable, low-cost tests must continue so we can expand efforts targeted to MART individuals and their networks.

Most important, proof-of-concept projects to evaluate the operational feasibility of targeting HIV prevention efforts to MART individuals should be launched immediately. The mix of cost-effective HIV-testing algorithms and creative multilevel, multidisciplinary interventions for MART individuals, their sex and substance-using partners, and their social networks need to be rigorously evaluated to determine whether such an approach may further contribute to slowing the HIV pandemic. Several such projects are already under way focusing on acute and recent infections.

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