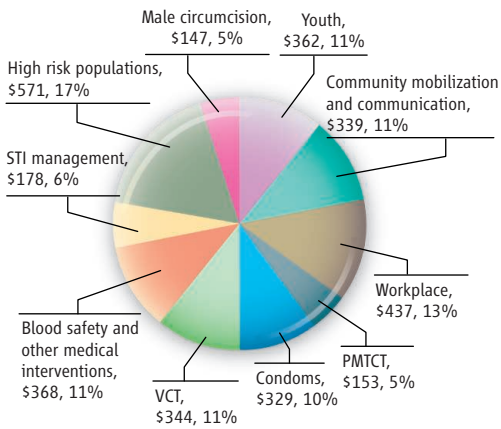
LETTERS

edited by Jennifer Sills

Tailoring AIDS Prevention

I AGREE WITH M. POTTS *ET AL.* ("REASSESSING HIV PREVENTION," Policy Forum, 9 May, p. 749) that HIV prevention efforts should be continually reappraised. Potts *et al.* call attention to the well-recognized limitations of prevention strategies based solely on condom promotion, HIV testing, and sexually transmitted infection (STI) treatment; however, in their eagerness to promote different strategies, namely, addressing concurrent partnerships and male circumcision, they risk replacing one overly narrow prescription with another equally narrow one.

HIV prevention responses need to be tailored to their contexts, and it is unfortunate that Potts *et al*. have chosen to illustrate their argument about generalized HIV epidemics by using a graphic of UNAIDS estimates for global resource needs, which aggregate all low- and middle-income countries, most of which (75%) are experiencing low and concentrated epidemics. It is not surprising that a good proportion of the HIV expenditure is focused on activities addressing the high-risk populations that are the predominant feature of these epidemics.



HIV prevention. This UNAIDS pie chart illustrates the financial resources required to achieve universal access to HIV prevention, treatment, care, and support by 2010, including countries with hyper-endemic and generalized epidemics. Together, resources total U.S. $3.2 billion. Figures shown are millions of U.S. dollars and percentage of total prevention.

For the subset of countries experiencing generalized or hyper-endemic scenarios, UNAIDS estimates of resource needs are very different (see figure) (*1*). There is a strong emphasis on youth (calling for $362 million, or 11% of resources); community mobilization and communication ($339 million, 11% of resources); and workplace interventions ($437 million, 13% of resources), which primarily focus on delaying sexual debut, decreasing multiple partnerships (both concurrent and serial), and promoting condom use in casual sex. In addition, resources are needed to bring about the most rapid feasible increase of male circumcision in young adults (estimated to be 2.5 million circumcisions by the year 2010 in the 12 most highly affected countries). Finally, the importance of HIV testing in generalized epidemics cannot be discounted now that around half of all HIV infections occur between discordant couples.

PAUL R. DE LAY

Department of Evidence, Monitoring and Policy, Joint United Nations Programme on HIV/AIDS (UNAIDS), Geneva, Switzerland. E-mail: delayp@unaids.org

Reference

1. The figure and additional information are available as Supporting Online Material (www.sciencemag.org/cgi/content/full/321/5896/1631a/DC1).

HIV Testing for Whole Populations

THE POLICY FORUM "REASSESSING HIV PREVENTION" (M. POTTS *ET AL*., 9 MAY, P. 749) SUMMARIZES current approaches to control of HIV infections. Although these strategies have shown some reduction in prevalence of HIV infections, they are not fully effective. Clearly, new approaches should be considered.

One approach, first proposed by Montaner *et al*. (*1*), would be to test entire populations for HIV infection using polymerase chain reaction (PCR) and then to treat all positives with antiretroviral therapy (HAART). This may be effective, given that patients with the low viral loads achievable by HAART treatment are generally not infectious by sexual routes (*2*–*4*) or by maternal transmission to newborns (*5*, *6*).

This approach would be expensive. We estimate that application to all 17 sub-Saharan countries with HIV prevalence of >5% would cost an average of about $20 billion per year, assuming that screening of populations would take place every 5 years. This is a very high figure, but it is affordable by the major donor nations and would likely have substantial health benefits.

The approach would face other challenges as well. Extensive training of laboratory and field personnel would be required. Fear of the stigma involved in HIV positivity would have to be addressed by widespread publicity stressing the advantages of HAART for those infected, and for those not yet infected, in the populations screened. This has been effective in Brazil, where 170,000 infected people are already being treated with HAART. This has resulted in stable HIV prevalence (0.6%) since the initiation of widespread screening and treatment in 2000 (*7*).

Such a bold plan would require controlled studies to assure its efficacy, but the benefits would likely outweigh the costs.

ALFRED M. PRINCE

Hepatitis Research Foundation, 349 Stone Hill Road, Pound Ridge, NY 10576, USA.

References

1. J. S. G. Montaner *et al*., *Lancet* **368**, 531 (2006).
2. T. C. Quinn *et al*., *N. Engl. J. Med*. **342**, 921 (2000).
3. J. Castilla *et al*., *J. Acquir. Immune Defic. Syndr*. **40**, 96 (2005).
4. M. S. Cohen *et al*., *J. Clin. Invest*. **118**, 1244 (2008).
5. K. M. De Cock *et al*., *JAMA* **283**, 1175 (2000).
6. J. McIntire, *Curr. Opin. Infect. Dis*. **19**, 33 (2006).
7. S. Okie, *N. Engl. J. Med*. **354**, 1077 (2006).

Published by AAAS

Response

AT THE TIME OF PUBLICATION, WE UNDERstood that only the global funding estimates were available. Now that a separate breakdown for "hyper-endemic and generalized" epidemics has also been made available, we note that the requested funding for these would comprise only a little over 20% of the global total, even though such epidemics account for over two-thirds of all HIV infections worldwide (*1*). Also, although 5% of this funding would be dedicated to circumcision programs, the large majority of resources would continue to be allocated to other interventions, for which the evidence of prevention impact in generalized epidemics is much weaker. Although we hope that some of "youth, community mobilization, communication, and workplace interventions" would focus on decreasing multiple partnerships, past experience suggests that most of the emphasis may be on strategies such as condom promotion, delay/abstinence approaches for youth, and HIV testing (*2*–*4*). Even in this graphic specifically for generalized epidemics, it appears that total funding for circumcision and partner reduction would probably continue to be dwarfed by support for more standard prevention approaches.

Perhaps it is time for major international organizations to reassess whether strategies such as STI treatment and HIV testing and counseling are still "proven approaches" for HIV prevention (*5*). Seven of eight randomized trials of STI treatment had no impact on HIV incidence in Africa (*6*), and a recent workplace-based trial examining the impact of HIV testing and counseling (*7*) found that people randomized to the intensive counseling arm had considerably (although not significantly) higher HIV infection rates and, as in another recent study also from Africa (*8*), the sexual behavior of people testing HIV-negative was evidently riskier than in those not tested.

We have not seen sufficient evidence that HIV testing reduces HIV transmission in serodiscordant couples, nor have we seen evidence that "around half of all HIV infections occur between discordant couples." Recent CDC data from Uganda suggest that most married people who recently acquired HIV were infected by an extramarital partner or by their spouse who had recently acquired HIV from an extramarital partner (*9*). Many of the latter were probably in the brief "acute infection" period, when HIV infectivity is much higher yet undetectable by a standard HIV test (*10*). It is crucial to address the multiple and concurrent partnerships that mainly drive these generalized HIV epidemics (*2*, *3*, *11*).

Published by AAAS

Regarding Prince's bold proposal to test large populations in Africa for HIV infection and treat all who test positive, it is true that others have made similar proposals, and some observational data from Taiwan, British Columbia, and Brazil may suggest an association between the expansion of AIDS treatment and decreased HIV transmission (*12*). Unfortunately, good ideas do not translate into effective public health strategies unless they are feasible. For example, even with considerable public policy support, the adequate identification and treatment of HIV-infected pregnant mothers has still not been attainable in most of sub-Saharan Africa (*1*). In many places the attrition rate of those starting HIV treatment has been distressingly high (*13*), and potential development of resistance to these medications—and consequent resurgence of viral load and thus infectiousness—will remain a concern.

Furthermore, the proposal to test populations every 5 years would miss almost everyone during the period of acute (early) infection, when, as mentioned, a substantial portion of transmission takes place (*10*). Finally, the Brazilian parallel appears unconvincing because HIV prevalence was much lower than in Africa and the medical infrastructure was much stronger; prevalence has also remained stable, during the same period, in almost every other Latin American country, even though most were not providing access to HIV treatment (*1*). Although we agree that novel initiatives are needed, they must first be tested in rigorous, small-scale studies before being considered, at an unprecedented annual cost (over double the current total funding for HIV-AIDS globally), across a continent.

Population-level disease control efforts must be evidence-based, culturally acceptable, and feasible (as male circumcision and partner reduction are). We reaffirm our call for a reassessment and reprioritization of strategies, involving shifting more attention and resources to those approaches most likely to have a population-level impact on reducing HIV transmission and saving human lives, particularly in the hardest-hit regions of Africa. As the head of the Gates Foundation's Global Health Program recently argued, it is time to pursue a truly evidence-based approach, instead of continuing to rely largely on "consensus views" about what works for prevention (*14*).

DANIEL HALPERIN,[1] MALCOLM POTTS,[2] DOUG KIRBY,[3] JEFF KLAUSNER,[4] RICHARD WAMAI,[1] ANN SWIDLER,[5] ELLIOT MARSEILLE,[6] JULIA WALSH,[2] NORMAN HEARST[7]

[1]Harvard University School of Public Health, Boston, MA 02115, USA. [2]School of Public Health, University of California at Berkeley, Berkeley, CA 94720, USA. [3]ETR Associates, Scotts Valley, CA 95066, USA. [4]San Francisco Department of Public Health, San Francisco, CA 94103, USA. [5]Department of Sociology, University of California at Berkeley, Berkeley, CA 94720, USA. [6]Health Strategies International, Walnut Creek, CA 94596, USA. [7]Department of Family and Community Medicine, University of California at San Francisco, San Francisco, CA 94143, USA.

References

1. UNAIDS, the Joint United Nations Programme on HIV/AIDS, *AIDS Epidemic Update* (UNAIDS Publ.UNAIDS/07.27E/JC1322E, UNAIDS, Geneva, 2007); www.unaids.org/en/KnowledgeCentre/HIVData/EpiUpdate/EpiUpdArchive/2007/default.asp.
2. J. D. Shelton, *Lancet* **370**, 1809 (2007).
3. H. Epstein, *The Invisible Cure: Africa, the West and the Fight Against AIDS* (Farrar Straus & Giroux, New York, 2007).
4. D. Wilson, D. T. Halperin, *Lancet* **372**, 423 (2008).
5. Global HIV Prevention Working Group, *Bringing HIV Prevention to Scale: An Urgent Global Priority,* June 2007; www.globalhivprevention.org/pdfs/PWG-HIV_prevention_report_FINAL.pdf.

6. R. H. Gray, M. J. Wawer, *Lancet* **371**, 2064 (2008).
7. E. L. Corbett *et al.*, *AIDS* **21**, 483 (2007).
8. L. Sherr *et al.*, *AIDS* **21**, 851 (2007).
9. R. Bunnell *et al.*, paper presented (#980) at 15th Annual Conference on Retroviruses and Opportunistic Infections, Boston, MA, 3 to 6 February 2008.
10. J. D. Shelton, *Lancet* **372**, 273 (2008).
11. T. Mah, D. T. Halperin, *AIDS Behav.*, 10.1007/s10461-008-9433-x (2008).
12. J. S. G. Montaner *et al.*, *Lancet* **368**, 531 (2006).
13. S. Rosen, M. P. Fox, C. J. Gill, *PLoS Med.* **4**, e298, 10.1371/journal.pmed.0040298 (2007).
14. T. Yamada, *N. Engl. J. Med.* **358**, 1324 (2008).

Effects of Expanded Mosquito Range

THE AGGRESSIVE SPREAD OF *AEDES ALBOPICTUS* as it has leapfrogged across geographic boundaries was well documented by M. Enserink in his News Focus story, "A mosquito goes global" (16 May, p. 864). The impact of *Ae. albopictus* on vector-borne disease transmission dynamics remains unresolved; however, this debate was only portrayed in terms of direct effects. Indirect effects must be considered as well. Larval competition between *Ae. albopictus* and other mosquito species that co-occur in its newly expanded range is well documented (*1*). Laboratory-based competitive experiments revealed that *Ochlerotatus triseriatus* mosquitoes (*2*)—the primary vector for La Crosse virus (LACV) in the United States—develop disseminated LACV infections more often when emerging from containers shared with *Ae. albopictus* (*3*). Alto and colleagues (*4*, *5*) have similarly shown that the indirect effects of larval competition can enhance mosquito susceptibility to dengue and Sindbis viruses. The need for an ecological perspective including both direct and indirect effects when discussing diseases whose transmission includes elements of native species, introduced species, humans, and the transport of goods across the planet is increasingly important in this era of globalization (*6*).

SARAH N. BEVINS

Department of Microbiology, Immunology, and Pathology, Colorado State University, Fort Collins, CO 80523, USA. E-mail: bevins@lamar.colostate.edu

References

1. S. A. Juliano, L. P. Lounibos, *Ecol. Lett.* **8**, 558 (2005).
2. J. F. Reinert, *J. Am. Mosquito Contr.* **16**, 3 (2000).
3. S. N. Bevins, *Biol. Invasions*, in press (available at www.springerlink.com/content).
4. B. W. Alto, L. P. Lounibos, S. Higgs, S. A. Juliano, *Ecology* **86**, 3279 (2005).
5. B. W. Alto, L. P. Lounibos, C. N. Mores, M. H. Reiskind, *Proc. R. Soc. B* **275**, 463 (2008).
6. K. E. Jones *et al.*, *Nature* **451**, 990 (2008).

TECHNICAL COMMENT ABSTRACTS

Comment on "Age and Evolution of the Grand Canyon Revealed by U-Pb Dating of Water Table–Type Speleothems"

Joel Pederson, Richard Young, Ivo Lucchitta, L. Sue Beard, George Billingsley

Polyak *et al.* (Reports, 7 March 2008, p. 1377) reported speleothem data leading to their inference that the western Grand Canyon incised much earlier than previously thought. This contradicts several lines of published geological knowledge in the region, hinges upon unjustified hydrogeological assumptions, and is based on two anomalous data points for which we offer alternative explanations.

Full text at www.sciencemag.org/cgi/content/full/321/5896/1634b

Comment on "Age and Evolution of the Grand Canyon Revealed by U-Pb Dating of Water Table–Type Speleothems"

Philip A. Pearthree, Jon E. Spencer, James E. Faulds, P. Kyle House

Polyak *et al*. (Reports, 7 March 2008, p. 1377) reported that development of the western Grand Canyon began about 17 million years ago. However, their conclusion is based on an inappropriate conflation of Plio-Quaternary incision rates and longer-term rates derived from sites outside the Grand Canyon. Water-table declines at these sites were more likely related to local base-level changes and Miocene regional extensional tectonics.

Full text at www.sciencemag.org/cgi/content/full/321/5896/1634c

Response to Comments on "Age and Evolution of the Grand Canyon Revealed by U-Pb Dating of Water Table–Type Speleothems"

Victor Polyak, Carol Hill, Yemane Asmerom

Pederson *et al*. and Pearthree *et al*. offer critical comments on our study of the age and evolution of the Grand Canyon. Both sets of authors question our use of incision rates from two sample sites located outside the canyon and present alternative interpretations of our data. As we explain, even without the sites in question, our data support a "precursor" western Grand Canyon older than 6 million years.

Full text at www.sciencemag.org/cgi/content/full/321/5896/1634d

Letters to the Editor

Letters (~300 words) discuss material published in *Science* in the previous 3 months or issues of general interest. They can be submitted through the Web (www.submit2science.org) or by regular mail (1200 New York Ave., NW, Washington, DC 20005, USA). Letters are not acknowledged upon receipt, nor are authors generally consulted before publication. Whether published in full or in part, letters are subject to editing for clarity and space.