

Richard P. Keeling, MD prepared this manuscript, *HIV/AIDS: The Once and Future Epidemic* as a “backgrounder” for SENCER (Science Education for New Civic Engagements and Responsibilities), a project of the Association of American Colleges and Universities with sponsorship from the National Science Foundation, in 2003. Intended to support discussions of reform in undergraduate science education and curricular attention to unresolved public health challenges, the manuscript reviews the global impact of the epidemic and its role and status in US higher education. Dr. Keeling suggests ways to engage students and campus communities in addressing the risks and realities of HIV/AIDS through rigorous academic inquiry.

HIV/AIDS: The Once and Future Epidemic

Today’s undergraduate college students of traditional age (18-24 years) can have no memory of a time when the Acquired Immunodeficiency Syndrome (AIDS) did not exist. For them, the Human Immunodeficiency Virus (HIV) has always held the throne as the most feared of sexually transmitted microorganisms; in their experience, sex has always carried the dark undertones of risk and death as well as the exhilarating, alluring, R-rated promise of ecstasy and fulfillment. Mostly, though, they also became conscious of HIV/AIDS after any serious fear of a massive outbreak of HIV in the US was dismissed; in the minds of most students, AIDS is a big and bad, but distinctly distant, problem.

Students entering their first year in college in 2001 will bring with them a complex legacy of HIV education and prevention efforts, from “abstinence-only” curricula in some public school districts and stern public service announcements about the dangers of unprotected intercourse or shared needles to the informal knowledge transmitted among peers, friends, and would-be sexual partners and the examples set by all the characters in the diverse and continuing carnival of televised and filmed entertainment, advertising, and politics. But concerns about sex among most undergraduates are typically relational, rather than medical. In general, they are far more acquainted with the mechanisms and prevention of the transmission of sexually transmitted diseases than they are comfortable with the complexities of relationships, love or intimacy; their knowledge is not so much carnal as it is microbiological—and their experience with HIV is far more theoretical than actual.

A decade ago, HIV and AIDS were hot topics in campus conversations, frequent subjects for peer education programs and visiting speakers, and high priorities on the roster of potential institutional liabilities. There were official task forces, many of them churning out multi-page policies full of algorithmic intentions to balance the personal rights of people with HIV/AIDS with the institution’s risks and obligations. Now, HIV is as ordinary as sex itself; both reassuringly unlikely and ominously possible, it is inarguably the worst outcome in the relatively low stakes game of chance that sex-without-a-condom for most college students has always been. Like a fire in the kitchen, no one can deny its possibility, but the cooking, after all, must go on. The kind of AIDS that destroys entire families, dissolves economies, and unstabilizes the international balance of power, once only the exotic province of imagination or the target for mission work among the few students who dreamt their futures bonded in service to the world’s poor, has become the latest hard management problem in foreign affairs. Students learning about AIDS in 2001 hear a vocabulary different from that used in the classrooms and residence halls of 1991—public policy replacing sexual decision-making, economic disaster instead of sickness and death, national security rather than personal risk.

Only students whose lives bear the weight of greater complexity than most must also look closely at a continuing, uncertain calculation of their personal risks of HIV infection: men who have sex with other men (whatever they consider and name their sexual orientation); students whose primary communities,

personal social networks, residence, and employment are off-campus (especially in urban, commuter settings, and, most especially, among urban students of color and those older than 24); and the vanishingly small fraction of students who use and share needles to inject illicit drugs, including steroids, or are the sexual partners of injection drug users. It is an epidemiological oddity, of course, produced by the well-established patterns of the epidemic here¹—and one particular element of their relative privilege, as well—that US college students of traditional age generally (and, for the most part, safely) view HIV as a threat unlikely to affect them directly.

The frequency of HIV infection among 18-24 year old college students in the US was low (0.2%, or 1 in 500 students) when carefully assessed a decade ago.² The global epidemiological banality of the heterosexual transmission of HIV does not match the predominant patterns of HIV transmission and sexual behavior in Western Europe and the US; so it is that American students comprehend the ordinary reality of HIV as happening mostly elsewhere, and its dangerous, dark, even romantic wild side as happening here. AIDS in Africa is a problem, if the latest and greatest one; AIDS in the US is an extraordinary introduction to difference—in some strange ways, a shocking entertainment. For themselves, students encounter higher personal risks of infection with HIV in direct proportion to the presence of the out-of-the-ordinary in their lives and relationships—their differences.³

AIDS then comes, interestingly, full circle, passing its twentieth anniversary in the world. The “otherizing” of such a startling, frightening infection, so vividly a dominant feature of its infancy (remember the “4-H club”: homosexuals, heroin users, hemophiliacs, and Haitians), returns in new clothing two decades on—other countries, other cultures, other sexual practices, other lifestyles. The intervening years, full of fears that AIDS would somehow “leak” into the “general population” in the US (which, of course, meant people living less extraordinary lives), have virtually vanished in memory; AIDS has settled into its increasingly predictable patterns, and, mostly, we have returned to ours.

No one seriously doubts that AIDS has become a global public health disaster of almost unprecedented scale. But, as has traditionally been true, “public health” primarily means the health problems of the poor—once the poor in growing American cities, now the poor in developing countries. And, as has also usually been true in public health, the appropriation of funds, energy, and focus to develop solutions awaited the accumulation of a death toll far greater than might have been accounted had an effective response come sooner. Nearly 22 million people were dead of AIDS before US pharmaceutical companies agreed to reduce the prices of their antiretroviral drugs in Africa.⁴ Similarly, no one any longer

¹ In the US and Western Europe, the epidemiology of HIV from the beginning was centered in male-to-male sexual transmission (mostly through unprotected anal intercourse) and needle-sharing—but in most other parts of the world, including the developing countries that now account for the overwhelming majority of cases of HIV disease—the transmission of HIV has always been dominantly through male/female sexual contact, almost always unprotected vaginal intercourse. A number of factors—including the prevalence of genital ulcer disease—in developing nations materially facilitate the heterosexual transmission of HIV.

² No nationwide study of the seroprevalence of HIV infection among college and university students has been completed since two back-to-back studies of students in predominantly residential institutions were done by the Centers for Disease Control and Prevention (CDC) in 1989-1991. See: Gayle HD, Keeling RP, Garcia-Tunon M, Kilbourne BW, Narkunas JP, Ingram FP, Rogers MF, Curran JW. Prevalence of HIV infection among college and university students. *N Engl J Med* 1990; 393:1526-1531. Although neither case-finding (including both the results of HIV antibody testing in college health centers) nor the tracking of surrogate markers—other indicators of at-risk sexual behavior, such as rates of other sexually transmitted infections or unwanted pregnancies—suggest that the prevalence of HIV among traditional college students has changed markedly since then, there are no recent specific data.

³ College students no longer represent a narrow demographic category defined by race, sex, or socioeconomic status; to the extent that college students come to be increasingly representative of all 18-24 year olds, their population-based risk of infection with HIV may grow. But, in the US, the association of HIV infection with (a) poverty and (b) being African American or Hispanic is durable and strong in all age groups; as long as poverty is a barrier to college matriculation and African Americans and Hispanics remain underrepresented in college, the net rate of HIV infection among students is likely to remain low. Young gay and bisexual men also remain at increased risk for HIV infection; historically, they have explained the great majority of HIV infections among students. But the seroprevalence studies done a decade ago strongly associate increasing age with HIV infection among single male students; men over 25 had significantly higher rates of infection than younger men. This age association, combined with the relatively small proportion of college age men who have had unprotected anal or oral intercourse with other men, helps explain the paucity of students with HIV infection.

⁴ See Swarns RL. Drug makers drop South Africa suit over AIDS medicine. *The New York Times*. April 20, 2001; A1.

doubts that AIDS threatens the very social, economic, and political fabric of some of Earth's poorest nations. Yet, still, the United Nations' debate this year about a comprehensive international plan to control AIDS stumbled over the same kinds of cultural sensitivities (all of them concerned with people whose lives or behaviors are somehow not entirely ordinary) that delayed effective HIV prevention efforts in the US during the 1980s. Ever the hallmark of our response to AIDS, this painful pattern of assigning AIDS to others and then refusing to engage those others in a serious, humane, or helpful way seems also our destiny.⁵ It is most recently evident in the recurrence, in China, of the same patterns of fear, discrimination, and retributive statutes that characterized the US epidemic in the mid-1980s; in towns and cities across China (including Beijing), new laws restrict the rights of people with HIV, demand that people with HIV/AIDS be identified and reported, and enable the firing of workers who are found to be infected.⁶ What is missing in China today is what was missing in many African countries a decade ago, and in the US in the first years of the epidemic: serious, easily accessible public health education about the actual means of transmission of HIV—with frank advice about its prevention and the unhindered distribution of personal protective supplies, from condoms to clean needles.

Grudging attention to the specific prevention needs of American gay men in 1981-88; too little too late from pharmaceutical companies in 2001. 26 million of the estimated 36.1 million people living with HIV infection worldwide live in Africa; 70% of new infections occur in Africa, where, in some areas, the seroprevalence of HIV is 25%.⁷ And the rapidly approaching acceleration of AIDS in the developing world is, of course, not limited to Africa; 60% of the world's people live in Asia and HIV/AIDS is well established in India and China (the two most populous countries in the world).⁸ Still, it was 20 years into the epidemic before the United Nations General Assembly approved their "sweeping plan to battle the pandemic."⁹ Michael Merson, MD, director of the World Health Organization's Global Programme on AIDS from 1990 to 1995, charges "...the failure to mobilize the international scientific community to develop a safe and effective AIDS vaccine exemplifies the worldwide response to the epidemic itself."¹⁰

Since 1984, when Margaret Heckler, then President Reagan's Secretary of Health and Human Services, famously promised that an "AIDS vaccine" would be developed within two years, the world has awaited a biomedical solution to the problem of AIDS prevention. The story of efforts to create a vaccine to prevent primary infection with HIV is, remarkably, very different from the history of the development of innovative pharmaceuticals to treat HIV infection and its infectious and neoplastic complications. During the first decade of HIV/AIDS, pressure from activist groups, organizations devoted to serving the interests of people living with HIV, and pharmaceutical companies forced a thoroughgoing revision of the Food and Drug Administration's traditional methods (and timetables) for evaluating and approving investigational drugs.¹¹ As Jon Cohen documents in his recent book, *Shots in the Dark: The Wayward Search for an AIDS Vaccine*, no such improvements have adequately affected the process through which vaccine

⁵ Writing in the *New England Journal of Medicine* on the occasion of the 20th anniversary of AIDS, Kent A. Sepkowitz, MD says: "...Improved control of HIV infection in the next decade looms as a daunting task. An effective vaccine is not imminent, and most governments are unlikely to initiate frank public discussions about sexual intercourse and injection-drug users, despite the glaring need." Sepkowitz KA. Special article: AIDS—the first 20 years. *N Engl J Med* 2001;344:1764-72.

⁶ Chang, Leslie. AIDS panic in China leads to Draconian measures. *The New York Times*. March 23, 2001; B1 and B5.

⁷ UNAIDS, World Health Organization. AIDS epidemic update: December, 2000. Joint United Nations Programme on HIV/AIDS, 2000.

⁸ Hwang, Ann. AIDS has arrived in India and China. *World Watch* 14(1), Jan-Feb 2001, 12-21.

⁹ Stephenson, Joan. UN Conference Endorses Battle Plan for HIV/AIDS. *JAMA* 2001; 286(4):405-406.

¹⁰ Merson M. The search for an AIDS vaccine and an effective global response. *N Engl J Med* 2001; 344:1801-1802

¹¹ Arno PS, Feiden K. *Against the Odds: the story of AIDS drug development, politics, and profits*. New York, NY: HarperCollins, 1992.

development occurs—and the calculation of risks and benefits in the search for an AIDS vaccine by pharmaceutical companies is far more complicated than it always has been for drug development.¹²

Here, in the matter of a vaccine, the clash of science, public health, international relations, and the economics of developing countries is, perhaps, the clearest. Without doubt, the greatest need for a vaccine is in the developing countries that are least equipped to distribute it effectively and equitably, manage a systematic national campaign to educate the population and gain their confidence, and, of course, pay for it. How can wealthy countries, like the US, be motivated to exert leadership in vaccine development? How can international cooperation at both governmental and corporate levels be fostered and sustained? What incentives can be offered to pharmaceutical companies to accelerate the pace of vaccine development and trials, when their primary potential customers—developing countries—have struggling economies (ironically, partially because of AIDS itself)? The International AIDS Vaccine Initiative, recognizing these challenges, has suggested that wealthy nations provide targeted tax credits for pharmaceutical companies, coupled with firm commitments from philanthropic organizations to purchase the vaccine once it is developed.¹³

Simmering overseas, AIDS, like the onrushing tide of racial and cultural diversity or the consequences of atmospheric pollution, looms in the American distance. The events on and after September 11, 2001 bring many of our feared horizons closer; things considered unthinkable, if they were considered at all, have now happened here. The President and Secretary of State have pronounced the global epidemic of HIV/AIDS a matter of pressing national concern—a threat to our national security, in fact.¹⁴ Anticipating such an assessment, the Institute of Medicine had called upon the concept of enlightened self-interest as a motive for our involvement (and investment) in the health of other countries:

America has a vital and direct stake in the health of people around the globe, and...this interest derives from both American's long and enduring tradition of humanitarian concern and compelling reasons of enlightened self-interest.¹⁵

Between these lines are two obvious conclusions: first, that AIDS has become a big enough problem to require a more strategic and organized approach than is possible in the traditional informal context of charity and philanthropy, or in the developmental and educational framework of funding for international assistance; and second, that the very nature of the challenge AIDS poses has changed, from an interesting and distant, albeit devastating, public health concern to a quickly emerging political and economic threat to the existing balances of power and wealth around the world. Similarly, when AIDS seemed imminently likely to spin out of control in this country in the late 1980s (the fear being widespread transmission in the “general population,” again), compelling reasons of enlightened self-interest (both personal and national, perhaps) motivated previously recalcitrant politicians and health administrators to address the real social issues raised by the epidemic.

In the coming decade, AIDS—still otherized, and mostly overseas—will emerge as one of the most challenging and difficult problems (not just health problems, or public health problems; AIDS will be one of the most pressing problems of any kind) the world will face. Our new national experiences with terrorism and bioterrorism on US soil will, in the short term, inevitably and appropriately drop the priority with which elected officials, international public health officers, and the foreign service attend to AIDS, but AIDS will be there, still escaping easy solutions, when it once again comes into focus. Students in our colleges and universities will come to know it as a kind of gathering storm; a global crisis already deeply more lethal than any wars have ever been, but one segregated by thousands of miles of oceans, the profoundly

¹² Cohen, Jon. *Shots in the Dark: The Wayward Search for an AIDS Vaccine*. New York, NY: W.W. Norton, 2001.

¹³ Gold, David. Little progress on AIDS (letter to the editor). *The New York Times*. July 28, 2001, A10.

¹⁴ Gellman B. AIDS is declared threat to security: White House fears epidemic could destabilize world. *Washington Post* April 30, 2000, A1.

¹⁵ Institute of Medicine. *America's Vital Interest in Global Health: Protecting Our People, Enhancing Our Economy, and Advancing Our International Interests*. Washington, DC: National Academy Press, 1997.

different flavors of cultures that still seem alien, and billions of dollars of our economic prosperity. Unlike the call for help after an earthquake such as the recent tremor off the coast of Peru, the boiling demand for international assistance, especially in Africa, will become a regular element of policy conversations. Today's students will experience AIDS as an insidious, erosive destroyer of the fragile infrastructure of whole nations—both a replacement for the traditional intensity of civil wars and, should the crumbling continue unabated, the reason for unimaginably desperate new wars within and among stricken countries.

“What to do about AIDS?” then wraps foreign policy, public health, international trade, virology, medicine, and sociology into an uncomfortable package, where the usual epistemologies, methods, rhetoric, strategies, and solutions in each field may be weakened or defeated by the issues familiar in the others. Coping with escalating instability in the economies of at-risk nations in Africa, for example, has generated over time a set of established methods for restoring the integrity of currencies and providing credit from other countries; likewise, there are “best practices,” as it were, for managing HIV prevention as a public health matter. But the principles of infection control, personal risk reduction and community health education, early case identification, counseling and testing, surveillance, and case reporting (all essential elements of this country's attempts to control the epidemic) are not easily materialized in countries as direly short of resources as many sub-Saharan African and Asian nations are, and the macroeconomic, policy-driven solutions deployed to salvage flailing poor economies fail when they meet an economic problem that rests so completely on the most microscopic, intimate, and uncomfortably understood and discussed of human behaviors (sex and drugs, of course).

Concepts of sexual risk reduction and personal protection that have become completely routine in the US as a consequence of the natural alliance of community health and feminism (e.g., the empowerment of women in sexual relationships) cannot all at once overcome—or even adapt to—the prevailing social norms of cultures that have for centuries not understood women's place in the world as a question of “rights,” power, or equity. Perhaps controlling AIDS in Africa (and in some Asian and South American countries) will result, in large part, from nothing less than a thoroughgoing cultural change in attitudes toward women; in that case, one of the great ironies of AIDS in the West, which was the way in which AIDS, through its very deadly endangerment of the lives of gay and bisexual men, strangely contributed to the emergence of “out” gay communities and to the development of far more progressive attitudes about the role and place of homosexual people in society, will have been repeated.¹⁶ As Helen Epstein persuasively has written,

In Uganda, the loyalty and strength of Ugandan families and the perseverance of HIV prevention workers and AIDS treatment advocates are continually undermined by war, corruption, and injustice. HIV struck Europe and the US just as gay men were organizing to confront discrimination against them, and the struggle against AIDS became part of the greater struggle for gay rights. By and large, the people of sub-Saharan Africa have yet to assume their rights. Until the status of women improves, something that is linked to the improvement of rights for all people, regardless of tribe, political connections, or HIV status, the most generous funding for AIDS in Africa will not go nearly far enough.¹⁷

All of this is to say that what college students learn about HIV and AIDS has never been, and will never be, simple or categorical. Ten years gone, we began to emphasize that it would not be enough to have a diligent microbiological, epidemiological, or medical understanding of AIDS; the social and cultural questions that trailed the epidemic as inextricable passengers had to be considered to prevent the

¹⁶ In most sub-Saharan nations, as in China, change in the status of women, though resisted through many layers of society, is far more likely to occur than the development of welcoming or affirming attitudes toward homosexuality. In the United Nations General Assembly's discussions of AIDS this year, most Muslim countries sharply objected to any specific references to sexual orientation. Many scholars, of course, would argue that there are fundamental connections between the issues of women's rights and status in society and those of lesbian, gay, and bisexual citizens. In any event, the climate for homosexual persons is unlikely to improve in any society absent real advances in the treatment of women. Advances in the status of women in the US preceded all formal and structural changes in the rights and status of lesbian, gay, and bisexual Americans.

¹⁷ Epstein, Helen. AIDS: The lesson of Uganda. *The New York Review*. July 5, 2001, pp. 18-23.

unsubtle or wasteful use of purely biomedical tools in addressing what was in reality a human, relational problem.¹⁸ Susan Sontag's pathbreaking book, *AIDS and its Metaphors*, illuminated the social and cultural baggage that so painfully and dreadfully weight down people living with HIV/AIDS;¹⁹ it was—and remains—important for students to learn about HIV/AIDS as a lens through which to regard and address some of our society's most difficult and perplexing human problems. After all, for most college students, HIV/AIDS is and will remain more a vexing social, public, and international problem than a personal or family health issue.

But now, with our students' experience of AIDS relocated predominantly to other countries, filtered through many cultural colanders, and framed in the management language of "enlightened self interest," international relations and world banking, it is equally important to pull their attention toward the science that has so deftly permitted the answering of the epidemic's first and most fundamental questions. HIV is not currency, and AIDS is not like other military, economic, or social reasons for national destabilization; sound public policy, corporate decision-making, and public health planning require a reasonable understanding of the pertinent virological, biomedical, and epidemiological properties of the virus, the disease it causes, and the pandemic that has resulted from its widespread transmission.

Knowing that AIDS is caused by a virus, discovering and characterizing that virus, describing the immunological consequences of HIV infection and the patterns of antibody responses to it, detecting and eliminating HIV-infected blood and blood products, instituting universal precautions to protect health care workers and their patients from accidentally transmitting HIV to each other during procedures, designing treatments that control the replication of HIV and reduce its levels in the blood, developing evidence-based prevention programs solidly rooted in social and cultural studies, and solving the first of the problems inherent in developing an HIV vaccine—these are all scientific accomplishments, without which our understanding of the patterns in the epidemic, the manifestations of the disease, and the possibilities of prevention and treatment would be exceedingly limited. Only the combination of excellent science and political will promises eventual improvement in current projections for the truly horrible impact that AIDS will have in Africa, parts of Asia, and some countries in Central and South America. Gregory K. Folkers and Anthony S. Fauci, who has directed AIDS activities at the National Institutes of Health since the epidemic was new, have written:

Each...global health threat...requires a multifaceted response involving a variety of public health measures, such as surveillance; public education and other prevention efforts; vector control; sanitation; programs to improve nutritional status; and the efficient provision of health services, including available treatments and vaccines. More broadly, alleviation of poverty and economic development are central to improving health since higher income is strongly associated with access to many of the goods and services that promote health.

In addition to these classic public health considerations, critical (but sometimes overlooked) components of any strategic approach to the control of infectious diseases are basic and clinical research efforts to improve the diagnosis, prevention, and treatment of the disease(s) in question...the research effort in AIDS over the past 2 decades serves as a model or paradigm of what can be accomplished when a robust commitment of financial and human resources is applied to a rapidly escalating public health problem of enormous magnitude.²⁰

In the following section, we review in an abbreviated fashion the understanding of HIV and AIDS that has emerged through those two decades of research.

¹⁸ For a detailed and helpful treatment of this approach, see Burns, WD. Learning for Our Common Health: How an Academic Focus on HIV/AIDS Will Improve Education and Health. Program for Health in Higher Education, Association of American Colleges & Universities, 1999.

¹⁹ Sontag S. *AIDS and its Metaphors*. New York: Farrar, Straus, and Giroux, 1989.

²⁰ Folkers GK and Fauci AS. The AIDS research model. Implications for other infectious diseases of global importance. *JAMA* 2001; 286(4): 458-460.

HIV/AIDS: A Brief Summary

Transmission

HIV,²¹ renamed in 1985 after its original description as Human T-Lymphocytotropic Virus, Type III in 1983, can infect humans after exposure to the blood or certain other body fluids of infected persons. Although the virus is also detectable in a number of the body fluids and secretions of infected persons, the transmission of HIV is convincingly associated only with blood (and blood derivatives and products used in health care), semen, vaginal secretions, and breast milk. The epidemic's patterns amply confirm the importance of those fluids for transmitting the infection; people who have been infected with HIV are connected one to another through sexual relationships involving oral, anal, or vaginal intercourse²²; by birth or breast-feeding from a mother who has HIV; by needle-sharing; or by accidents in health care (including the transfusion of infected blood products) or emergency services. After 20 years, no other means of transmitting HIV has been demonstrated. Especially, it is completely clear that any form of casual, ordinary interpersonal contact does not transmit HIV—nor is HIV spread by shared objects (fomites), insects or other vectors, or the air, water, or surfaces in common facilities.

Prevention

To prevent the transmission of HIV:

- Blood and blood products used in medical care must be free of HIV.
- Precautions to avoid the accidental transmission of HIV in health care and emergency services must be carefully implemented and assiduously observed.
- Pregnant women who have HIV should receive appropriate antiretroviral therapy to reduce the probability of transmission of HIV to their babies, and should not breastfeed their infants.
- Injection drug users must use clean needles and should not share their needles or “works” with others.
- Sexually active individuals should reduce or eliminate their risk of infection with HIV by taking reliable precautions appropriate to their personal circumstances.²³

Although the initial response of the blood banking community to HIV/AIDS has been sharply criticized,²⁴ a combination of more stringent regulations, donor good will, at-risk donor self-exclusion, HIV antibody screening, and improvements in clotting factor preparations has rendered the blood supply in the US and most industrialized countries exceedingly safe. The same problems of economics and infrastructure that

²¹ To be completely accurate, we should clarify which type of human immunodeficiency virus we mean; HIV -1, the dominant virus infecting human beings, is the “standard,” or usual, version. Another virus, HIV -2, is described in equatorial Africa. Within the population of HIV -1 viruses, there are also multiple variations of strain, and several groups, or serotypes (clades).

²² In general, vaginal and anal intercourse are more likely to be associated with HIV transmission than oral sex, and the receptive partner (in any kind of intercourse) is at greater risk than the insertive one. Performing fellatio on a man who has HIV—long advocated as an alternative to anal intercourse by non-governmental AIDS service organizations—is not, in fact, risk-free, but from the perspective of harm reduction, it is certainly preferable to receptive anal intercourse.

²³ “One size fits all” prescriptions for sexual risk reduction are ridiculous and offensive. What “works” for a sexually active young White gay man in an urban center may likely be materially different from what helps a Mexican-American woman with small children protect herself (and her future children) against the transmission of HIV, and so on, *ad infinitum*. This is not just a matter of “cultural sensitivity,” though there is nothing wrong with that impulse—and it is certainly not simply “political correctness.” Circumstances, opportunities, and restrictions so extensively vary that sexual risk reduction must literally be tailored, or customized, not only at population and group level, but also for each person.

²⁴ Leveton LB, Sox HC, Stoto MA, editors. HIV and the blood supply: an analysis of crisis decision-making. Washington, DC: National Academy Press, 1995.

plague developing countries in so many ways have, unfortunately, prevented as clear a success for their efforts to make locally collected blood safe for transfusion.²⁵ Similarly interventions to prevent the accidental transmission of HIV in health care—primarily through unintended exposures during invasive procedures, from venipuncture (blood drawing) to surgery—now protect both health care providers and patients in developed countries by a combination of “universal precautions,” advanced personal protective equipment, and new surgical techniques. Those same safeguards are far less accessible and predictable in many other nations. And substantial reductions in maternal-infant transmission of HIV, accomplished in privileged societies by identifying pregnant women with HIV and treating them with antiretroviral drugs, have not yet occurred in a sufficiently widespread way in the developing nations that so desperately need the same success.

In both wealthy and developing countries, the greatest challenge of HIV prevention remains, as it always has been, the need to change some of the most basic, intimate, and complex of human behaviors. Reducing the spread of HIV through needle sharing, for example, though theoretically quite possible (provide treatment on demand for drug users, make clean needles readily available,²⁶ and offer humane and supportive health promotion strategies) has, in practice, proven extremely difficult; although the science of needle exchange is clear, the politics of it has been bellicose, at best—and organizing successful advocacy efforts on behalf of mostly poor, urban drug users remains unlikely. Besides, injection drug use in our culture is interlocked with so many other unsolved social problems, from poverty and unequal access to services to urban decay, that well-organized, comprehensive community development programs must accompany efforts to produce personal behavior change.

And then there is sex. Twenty years on, we have learned (again) that information alone is not sufficient to change behavior; that sustaining safer sexual behaviors is far more difficult than initiating them; that sex, while it may be made “safer,” probably cannot ultimately be made “safe”; that absolutes, whether applied to risk levels (what kinds of sex are safe, or safer, in comparison to others) or behaviors (*always* using a condom) are generally unreliable; that people are more likely to make—and, crucially, maintain—incremental and partial changes than complete, sudden ones; and, perhaps most important, that sex never happens out of context—that sex occurs always within both psychological, social, and cultural frameworks, where its meaning, significance, methods, practices, and outcomes are continually subject to the influence of everything from personal needs and fears to social norms and media images. No theoretical solution—not committed, permanent abstinence; not lifelong monogamy; not safer sex every time with every partner—can be relied on to overcome all of those factors for every person every time.

The problem, of course, is that human beings are, just that, human. We make mistakes; we forget; we substitute hope or denial for precautions.²⁷ And we are parts of societies, families, relationships, and systems that influence our beliefs, actions, and decisions—and, sometimes, our freedom, flexibility, and self-determination. The best HIV prevention efforts do not deny those realities, nor do they scorn human beings for their essential humanness. Instead, they encourage and support safer sexual behaviors that can be sustained and affirmed in each person’s life; they reduce the probability of harm; they recognize and attend to the importance of social and cultural factors in relationships and sexual behavior; and they attempt to link individuals in a community of care and concern. CDC has endorsed, for example, a comprehensive program of HIV prevention for young Americans that includes both abstinence and condom use, rather than restrictive programs that fail to educate sexually active young people about the value of condoms.²⁸ Combative programs that use fear, guilt, or religious faith to exact promises of

²⁵ Consider just this: the enormous challenge of providing sufficient supplies of safe blood in countries where the seroprevalence of HIV approaches 25%!

²⁶ Monterroso ER, Hamburger ME, Vlahov D, et al. Prevention of HIV infection in street-recruited injection drug users: the Collaborative Injection Drug User Study (CIDUS). *J Acquired Immune Deficiency Syndrome* 2000;25:63-70.

²⁷ For a particularly effective and enlightening treatment of these questions, see Andrew Sullivan, *Love Undetectable: Notes on Friendship, Sex, and Survival*. New York, NY: Alfred A. Knopf, 1998.

²⁸ CDC. Fact sheet: comprehensive HIV prevention messages for young people. 1997. See: <http://www.cdc.gov/hiv/pubs/facts/compout.htm>, accessed 10/26/01.

compliance with absolute restrictions are, for the most part, doomed to ultimate failure; life in the global, electronic, and media-saturated village is more complicated, and its opportunities and risks more unpredictable, than those programs can ever imagine. In the US and other developed nations—and, significantly, now in developing countries in Africa, South America, and Asia²⁹--sound sexuality education and prevention efforts, resting on the bedrock of safer sexual behavior through the use of condoms for intercourse, HIV antibody testing and counseling, and community support, have been successful in reducing the sexual transmission of HIV. Even when properly and consistently used, condoms may not provide 100% protection against the transmission of HIV—but, unquestionably, their appropriate use is effective and they remain the most reliable way for sexually active individuals to reduce their risk of acquiring HIV.³⁰ What worked so effectively initially to reduce the spread of HIV in America's urban gay communities in the mid-1980s—condoms, community, and counseling/testing—then still provides a blueprint for progress. Updating proven strategies to keep them effective as the epidemic ages is one of the most important challenges in HIV prevention, no matter what population is of concern.³¹

Epidemiology

In the first two decades, HIV/AIDS killed more than 21 million people, including almost 450,000 in the US; the United Nations estimates that more than 36 million people are now living with HIV/AIDS.³²

As of June, 2000, more than 750,000 cases of AIDS in the US had been reported to the Centers for Disease Control and Prevention (CDC). 83% of the adult and adolescent cases were men, and 17% women. CDC has identified these major trends in the epidemic in this country:

- Prevention efforts, especially among men who have sex with other men, have slowed the growth of the epidemic toward overall stabilization. At the same time, there is need continually to reassess and revitalize prevention efforts in all populations.
- Approximately 40,000 new infections now occur each year.
- Injection drug use is now fueling the major growth of the epidemic among heterosexuals, people of color, and people in poverty.
- AIDS incidence and deaths³³ dropped for the first time in 1996—largely reflecting the influence of better treatment--delaying the progression of HIV infection to AIDS and from AIDS diagnosis to death. Thus, the number of people living with HIV/AIDS in the US is increasing.
- The incidence of AIDS in women of color continues to rise, with heterosexual transmission explaining an increasing proportion of cases among both African American and Hispanic women.

The American experience, though quite parallel to that of other Western countries, is very different from the pattern of AIDS in the rest of the world. The simple fact that 47% of the people with AIDS in the world are women most pertinently illustrates the differences. The association of HIV with men who have sex with men was a phenomenon of specific sexual contact networks and patterns in privileged countries—

²⁹ Celentano DD, Nelson KE, Lyles CM, et al. Decreasing evidence of HIV and sexually transmitted diseases in young Thai men: evidence for success of the HIV/AIDS control and prevention program. *AIDS* 1998; 12:F29-F36.

³⁰ In the US, condoms are considered medical devices and are regulated by the Food and Drug Administration. Their value in preventing the sexual transmission of HIV was established early in the epidemic and has been confirmed many times over. See, for example: CDC. Update: Barrier protection against HIV and other sexually transmitted diseases. *MMWR* 1993;42:589-591,597 and CDC. Condoms for the prevention of sexually transmitted diseases. *MMWR* 1998;37(9):133-137.

³¹ CDC. Fact sheet: need for sustained HIV prevention among men who have sex with men. January 31, 2001. See: <http://www.cdc.gov/hiv/pubs/facts/msm.htm>. Accessed 10/26/01.

³² AIDS epidemic update: December, 2000. Geneva: United Nations Joint Programme on HIV/AIDS, 2000.

³³ N.B., AIDS incidence and deaths means exactly that: the yearly number of new cases of AIDS reported and deaths from AIDS counted. These figures do not incorporate the incidence of HIV infection—the number of people newly infected with HIV.

just as is, paradoxically, the problem of injection drug use. In most of the world, heterosexual transmission explains the overwhelming majority of cases of HIV infection and AIDS, and the ratio of men to women in the caseload is therefore nearly much closer to 1:1 than is true in the US (where that ratio is still > 4:1).

Clinical Patterns in HIV Disease

Clinicians recognize these patterns of HIV disease:

- *Acute retroviral syndrome*: a self-limited but clinically significant illness with protean manifestations, including fever, anorexia (loss of appetite), weight loss, fatigue, and, often, skin rash, occurring in association with initial infection by HIV; the acute retroviral syndrome precedes the development of antibodies to HIV, and therefore antibody tests are useful only in demonstrating seroconversion in relationship to the illness. Once thought to be uncommon, the acute retroviral syndrome is now recognized far more often and seems to occur in the great majority of people infected with HIV. Among young adults, it quite closely resembles infectious mononucleosis in its subjective manifestations. During this illness, blood levels of HIV RNA rise quickly to extreme levels.
- *Asymptomatic HIV infection (“HIV positive”)*: after the acute retroviral syndrome disappears, people infected with HIV typically enter a prolonged, but variable, period characterized by clinical silence and a positive test for antibodies to HIV in the face of insidious immunological decline. Depending on the strain of HIV, the presence and intensity of various protective or negative co-factors, and, probably, certain host features that remain poorly understood,³⁴ this asymptomatic phase may last as little as a year or two or as long as ten or more years, even without treatment. People who know of their infection may, of course, experience a variety of psychological concerns during this time and, eventually, they come to notice symptoms that mark the transition to a symptomatic phase.
- *Chronic symptomatic HIV disease*: long ago called “AIDS Related Complex,” or “ARC,” this pattern of HIV disease is characterized by the occurrence of mild to moderate opportunistic infections—illnesses caused by organisms that take advantage of the suppressed immune system to establish infections that would not occur in the face of normal immunological functions. Although many of the infections are minor, some cause significant discomfort and real disability. People with chronic symptomatic disease may also experience enlarged lymph nodes and constitutional symptoms—fever, night sweats, anorexia, and weight loss.
- *Advanced HIV disease/AIDS*: the development of AIDS is marked by the occurrence of any of the severe manifestations that match the criteria in the case surveillance definition of the CDC³⁵: (1) major, life-threatening opportunistic infections, such as pneumonia caused by the ubiquitous protozoan, *pneumocystis carinii*; (2) certain neoplasms (cancers), including Kaposi’s sarcoma (a fast-growing tumor of skin and mucous membranes), invasive cervical cancer, and aggressive lymphomas (tumors of lymph tissue); (3) pulmonary tuberculosis and certain recurrent bacterial pneumonias; (4) a profound wasting syndrome; and (5) HIV-associated neurological disease, notably including dementia. Most deaths from AIDS result from severe opportunistic infections.

³⁴ Some people infected with HIV, for example, become “long term non-progressors,” with relatively stable HIV RNA levels, helper T cell counts, and immunologic function over many years. There are probably several different explanations for this situation, including HIV strain variations, genetic variations in susceptibility to HIV and unique types of host resistance.

³⁵ 1993 revised classification system for HIV infection and expanded surveillance case definition for AIDS among adolescents and adults. *MMWR—Morbidity and Mortality Weekly Reports* 1992;41(RR-17):1-19.

Without treatment (and, eventually, even with currently available treatments³⁶), virtually all individuals infected with HIV will eventually develop illnesses related to the steadily advancing impoverishment of the capacities of their immune systems. Although HIV disease does not necessarily follow a strictly linear pattern (and its pacing varies enormously from person to person), most people sooner or later have symptoms, marking their transition from HIV infection to HIV disease; when those symptoms show the presence of illnesses that meet the CDC's criteria, HIV disease is called AIDS.³⁷ But these clinical classifications of phases of HIV disease are far less useful in providing medical care to people with HIV/AIDS than are the specific measurements of HIV RNA levels and lymphocyte subpopulation numbers.

Pathogenesis of HIV Disease

HIV is an RNA (ribonucleic acid) human retrovirus (so named because, after infection, its RNA genetic material is converted into DNA—deoxyribonucleic acid—prior to incorporation in human chromosomes; ordinarily, DNA produces RNA, so the conversion of RNA to DNA is “retro”) that causes human cells to manufacture many copies of itself, killing the infected cells in the process. HIV primarily infects certain immunologically competent cells, especially one key subpopulation of T-lymphocytes (T- means thymus-derived), helper T cells, which stimulate production of antibodies and the development of killer T cells (which in turn can destroy HIV-infected cells).

HIV also infects other important cell types—notably a small but critical group of helper T cells called memory cells, and tissue macrophages. Infection of those cell types is usually latent, rather than productive (the viral RNA, once converted to DNA, is integrated in the human host cell's genetic material, but is not activated and does not cause the host cell to make copies of the virus), and latently integrated viral genes are not susceptible to the effects of currently available antiretroviral drugs. Therefore, memory cells and macrophages provide both a safe harbor for HIV and a reservoir of infection that can cause recurrence of disease after apparently effective therapy. This explains the sad clinical reality that discontinuing antiretroviral drug treatments (or the development of resistance to those drugs) is regularly associated with significant elevations in blood levels of HIV RNA; HIV has never, in a practical sense, been eliminated—though it can be controlled for years. The actual elimination of HIV—which would mean a “cure” of HIV disease—is the focus of much continuing research.³⁸

Immediately after infection, the replication of HIV is virtually unopposed; effective humoral (antibody-mediated)³⁹ and cellular (mostly, killer cell-mediated) control mechanisms do not develop for ten days to two weeks. Levels of HIV RNA in the blood accordingly rise quickly to high levels, and numbers of helper T cells likewise fall precipitously. Thereafter, for the rest of the life of an infected person, HIV maintains a very dynamic proliferative pattern, with billions of copies of the virus being made every day—despite the long clinical silence that defines the early stages of HIV infection. The reason for this paradox is that an equally dynamic, aggressive immunological response accompanies HIV infection. Billions of copies of HIV, helper T cells, and killer T cells are produced daily in an extraordinary microscopic battle.⁴⁰ In most

³⁶ As noted earlier, a small category of people with HIV are long-term non-progressors; similarly, some individuals have been able to discontinue drug regimens without experiencing relapses or increases in their measurable levels of HIV RNA.

³⁷ The surveillance definition also admits to the category of having a diagnosis of AIDS people with HIV infection whose helper T cell counts have fallen below 200/mm³. This means that some people who have a diagnosis of AIDS according to CDC criteria are still apparently healthy. Qualifying for a diagnosis of AIDS permits people living with HIV to be eligible for a variety of entitlement benefits.

³⁸ Chun TW, Justement JS, Moir S, et al. Suppression of HIV replication in the resting CD4+ T cell reservoir by autologous CD8+ T cells: implications for the development of therapeutic strategies. *Proc Natl Acad Sci USA* 2001; 98:253-258.

³⁹ The antibodies produced in response to HIV infection are the elements detected in routine “AIDS tests.” In most circumstances, specific HIV antibodies are detectable within 6 weeks of infection. HIV infection can be recognized before antibodies are detectable, though, through measurements of HIV RNA in the blood.

⁴⁰ Ho DD, Neumann AU, Perelson AS, Chen W, Leonard JM, Markowitz M. Rapid turnover of plasma virions and CD4 lymphocytes in HIV-1 infection. *Nature* 1995; 373:123-126.

instances, years pass before the net decline in helper T cells and associated immunological functions is sufficiently severe to produce visible, detectable clinical consequences.

Relationship of Pathogenesis of Disease to Treatment

The goal of today's highly active antiretroviral therapy (HAART) is to prevent that net decline as long as possible.⁴¹ For more than twelve years, researchers and clinicians have debated a core question: at what point to begin such therapy. Theoretically, the sooner the better; therefore, the most aggressive physicians have instituted multidrug treatments immediately after exposure and infection, hoping by acting early to influence the long-term prognosis. Some researchers believe that early aggressive therapy—begun within days of exposure and infection, when blood levels of HIV RNA are in the millions—may affect the ability of the immune system to control HIV in the long term.⁴² More commonly, declines in helper T lymphocyte counts or elevations in the level of HIV RNA detected in the blood have stimulated decisions to treat. But both approaches have encountered the unfortunate and pressing limitations of drug resistance and drug-related toxicity. The longer a person with HIV takes antiretroviral agents, the more likely it is that his or her strain of HIV will become resistant, sequentially, to the available pharmaceuticals—and the more likely that those drugs will cause unacceptable side effects.⁴³

The advantage of HAART is that it materially delays that sequence of events; people who are asymptomatic remain so longer, people who have mild symptoms do not progress as quickly toward serious ones, and people with severe manifestations of disease often improve, regressing, as it were, along the predicted timeline of HIV/AIDS.^{44 45} Because of HAART, death rates are lower; the number of people living with HIV/AIDS in the US continues to rise; dedicated AIDS treatment units in general hospitals have closed; and people who expected to die have often returned to work. But HAART did not alone produce all of the improvements America has witnessed in the past five years. Better treatments for major opportunistic infections, more reliable prophylaxis against those diseases, and greater skill and comfort among physicians in providing care for people living with HIV/AIDS have also been critical factors. Access to these benefits, though, varies in the US by socioeconomic status (class) and race; the same problems that make our health care system unfair in any other context create disparities in our ability to deliver HIV/AIDS-related care and services in an equitable manner.

⁴¹ Key elements of HAART include:

- Beginning therapy before the development of symptoms (but see discussion of the timing of treatment decisions)
- Using several drugs with at least two different mechanisms of action, to improve the effectiveness of the destruction of HIV, minimize side effects from any single drug, and reduce the probability and speed of the development of drug resistance [Most drugs used in the treatment of HIV disease are inhibitors of reverse transcriptase, the enzyme necessary to convert HIV's RNA to DNA or inhibitors of the protease enzyme that segments HIV's gene product into units that become the nuclear material for copies of the virus].
- Using the most effective combinations of drugs currently available
- Administering the maximum tolerated doses of those drugs
- Encouraging and supporting full adherence with drug regimens; involving the families, partners, and supportive friends (with the patient's permission) to make adherence more likely
- Monitoring blood HIV RNA and helper lymphocyte levels to assess the effectiveness of therapy and guide further treatment decisions.

⁴² The Discovery: Some can fight the AIDS virus. *The New York Times*. June 5, 2001, F9.

⁴³ Guidelines for the use of antiretroviral agents in HIV -infected adults and adolescents. *MMWR—Morbidity and Mortality Weekly Reports*. 1998;47(RR-5):43-82. See <http://hivatis.org/trtgdlns.html#adultadolescent> for updates.

⁴⁴ Pallela FJ Jr, Delaney KM, Moorman AC, et al. Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. *N Engl J Med* 1998;338:853-860.

⁴⁵ Steinbrook R. Providing antiretroviral therapy for HIV infection. *N Engl J Med* 2001;344:844-846.

Teaching Through HIV/AIDS: Science and Society

It is not only the inherent complexity, but also the extraordinary interdisciplinarity, of HIV/AIDS that give it such richness in the undergraduate curriculum. Looking backward, only a combination of arts, letters, and sciences can make sense of an epidemic that has so thoroughly challenged the world's social assumptions, economic structures, and health care systems. Looking forward, a similar integration of scientific, social, and humane knowledge will be required to solve the intricate problems HIV/AIDS will continue to present to an increasingly networked, interconnected planet. While many of the most pertinent, difficult, and lingering questions the epidemic creates will arise as debates about public policy, access to pharmaceuticals or health care, the philosophy and deployment of prevention strategies and messages, the obligations of wealthy countries toward poor ones, international public health priorities, and the patterns and character of the human experience with the disease, we will need science (and, many thoughtful observers would argue, carefully organized, systematic science) to help us discover and test meaningful, convincing answers.

Consider just a few of the questions we will face in the coming few years:

- Should health care workers or health sciences professions students who are infected with HIV be permitted to perform invasive clinical procedures on patients? What, if any, restrictions or limitations on their education or practice are reasonable and justifiable?
- What are the most reliable and effective ways to prevent perinatal transmission of HIV in developing countries? How can a system of maternal care that reduces the incidence of new births of babies with HIV be organized and implemented? What new laboratory tests, drugs, drug delivery systems, and treatment monitoring plans are needed?
- To what extent is it necessary, from a public health perspective, for people with HIV/AIDS to relinquish their privacy? Should they be required to give up, to any extraordinary degree, control over their personal behavior, confidential information, medical records, or health-related decisions? What are the ethical and moral dimensions and implications of these questions?
- Should complex, multi-drug treatments for HIV/AIDS be administered to injection drug users? Does the "using" status of the person matter? What should be the relationship between treatment of HIV disease and drug rehabilitation?
- What is the role of needle exchange programs in HIV prevention? Should more cities institute needle exchange programs to reduce the prevalence of HIV among injection drug users and their sexual partners and children?
- What methods of personal risk reduction, on the one hand, and community health education, on the other, most effectively and efficiently reduce the population prevalence of HIV? How do the answers to these questions vary from country to country?
- What are the most useful, economical, and reliable ways to test for HIV infection among people in developing countries? To obtain and distribute antiretroviral medications to their citizens?
- Should individuals who have quite recently had a possible exposure to HIV through unprotected sexual intercourse or needle sharing be offered post-exposure prophylaxis to prevent infection? Is the answer to this question different if the reason for exposure was rape?
- Should our existing restrictions on gay and bisexual men as blood donors be relaxed or revised? Should gay and bisexual men who are "HIV negative" and celibate or monogamous be allowed to donate?

- Assuming that scientists eventually develop a safe, effective HIV vaccine, how should we distribute it? What criteria should determine priority for receiving the vaccine, assuming it is initially in scarce supply?
- Should governments subsidize or otherwise directly support the development of candidate AIDS vaccines, or better pharmaceuticals for the treatment of people with HIV/AIDS?

In every case, answering these questions means engaging a complex welter of medical, social, political, and economic issues. Strong opinions on the central issues in each one are common. But how, without the application of increasingly definitive knowledge, gained through science, can we comfortably and reliably resolve them?

To teach through HIV/AIDS is to ask students to consider these questions, when faced with any of the problems the epidemic creates or highlights:

1. What do we know now that helps us analyze, understand, and resolve this problem?
2. What knowledge do we still need?
3. How can that knowledge be gained?

Take, as an example, the first concern in the list above: Should health care workers or health sciences professions students who are infected with HIV be permitted to perform invasive clinical procedures on patients? What, if any, restrictions or limitations on their education or practice are reasonable and justifiable?

To answer, we need to know:

- Who has HIV/AIDS now? Have health care workers (or health care professions students) had HIV/AIDS? What are the means of transmission of HIV to infected health care workers? Are those means related to their personal behavior (e.g., sexual exposure, injecting drug use) or to the duties they perform in their occupations? Have health care workers acquired HIV from patients? If so, in what circumstances and settings? What are the factors associated with such transmissions?
- Have health care workers who have HIV transmitted the virus to patients? If so, in what circumstances and settings? What are the factors associated with such transmissions? Can those factors be identified and characterized with enough precision to rule out concern about other possibilities?
- Can the transmission of HIV from an infected patient to a health care worker, or from an infected health care worker to a patient, be prevented? What precautions and techniques have been tested? What is their efficacy? What is their cost? Do they create other risks for the patient or the health care provider? Do health care workers comply with relevant guidelines for the use of these precautions? Since these guidelines were mandated, have there been further cases of the accidental transmission of HIV in health care? If so, in what circumstances?
- Is immediate treatment with antiretroviral drugs useful in preventing the development of HIV infection in patients or health care workers who are accidentally exposed to HIV?

Students will find that good research has already provided credible, if sometimes preliminary or tentative, answers to most of those questions: these are things that, largely, we already know. But students would also discover that there are vital things we do not yet know:

- What is the prevalence of HIV infection among health care workers, or health care professions students? Are there any trends in that prevalence over time? What happens to health care

workers who discover they have HIV/AIDS? Do they continue to practice? What is their history and experience? Have they been harmed by the application of existing guidelines for occupational health and safety?

- What specific invasive (surgical) procedures are most associated with the risk of the accidental transmission of HIV? Can new devices, techniques, or procedures reduce the risk?
- What other conditions—medical, psychological, social—might increase or reduce the probability that a health care worker infected with HIV would accidentally transmit the virus to a patient? Can those conditions be clearly identified, recognized, and monitored?
- Are health care workers living with HIV/AIDS compliant with guidelines designed to prevent the accidental transmission of HIV to patients? Are they more or less compliant than other health care workers? What is the overall effectiveness of these precautions, in the specific case of an infected health care worker?
- What impact does antiretroviral therapy have on the probability that an infected health care worker might transmit HIV during an accidental occupational exposure?

In answering our third question—how to find out what we do not know—students will once again encounter the interweaving of science and society; they will discover how scientific epistemology is positioned among other ways of knowing and thinking when the need for solutions has many dimensions. To find out, for instance, how effective precautions to prevent the accidental transmission of HIV to patients are when utilized by health care workers who have HIV, we would have to know how many, and indeed which, health care workers are infected. Is that information of sufficient value and importance to justify the invasion of personal privacy required to obtain it? Would we force health care workers to be tested for HIV so we can know it? How would we protect the rights and interests of the health care workers involved? Is it, instead, adequate to monitor exposure incidents when they occur and test both parties? What frequency of accidental transmission would justify more restrictive policies?

This is but one example, but it illustrates an important point that would equally well be made by many others. Students, as future leaders, health care workers, money managers, decision-makers, traders, determiners of foreign policy, citizens, patients, and voters, need a broad but nuanced understanding of HIV/AIDS as a problem in science and society. Thinking of HIV/AIDS as a scientific, or medical, issue absent its infusion with social and cultural shades and tones is dangerous and inhumane; addressing its social and cultural implications without attending to the scientific, clinical, and epidemiological facts is a barren process.

In the matter of HIV/AIDS, the world can afford neither unsubtle science nor uninformed social action. Avoiding both is both the opportunity and the challenge of higher education.

July 2003