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Applying Public Health Principles to the HIV Epidemic

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Although human immunodeficiency virus (HIV) infection has killed more than half a million people in the United States, a comprehensive public health approach that has stopped other epidemics has not been used to address this one. When HIV infection first emerged among stigmatized populations (homosexual men, injection-drug users, and immigrants from developing countries), the discriminatory responses ranged from descriptions of AIDS as “retribution” to violence and proposals for quarantine, universal mandatory testing, and even tattooing of infected persons. This response led to HIV exceptionalism, an approach that advocated both for special resources and increased funding and against the application of standard methods of disease control.¹ The need for extra resources remains essential, but the failure to apply standard disease-control methods undermines society’s ability and responsibility to control the epidemic.

Now, given the availability of drugs that can effectively treat HIV infection and progress on antidiscrimination initiatives, perhaps society is ready to adopt traditional disease-control principles and proven interventions that can identify infected persons, interrupt transmission, ensure treatment and case management, and monitor infection and control efforts throughout the population (Table 1). Doing so will have political and economic costs. The political costs include offending both sides of the political establishment: conservatives who oppose the implementation of effective prevention programs, including syringe exchange and the widespread availability of condoms, and some HIV activists who oppose expansion of testing, notification of the partners of infected persons (also known as partner counseling and referral services), and what some see as inappropriate “medicalization” of the response to the epidemic. The economic costs, particularly to improve population-wide case management and

notification of partners, would be substantial. But the human and economic costs of failing to adopt a comprehensive public health approach are much higher.

We have identified and elucidated the biology of the virus, established and improved diagnostic tests, and created effective drugs and care systems that have reduced the number of deaths from AIDS in the United States by 70 percent since 1995.² However, 25 years into the epidemic, progress is stalled. The number of deaths among people with AIDS has not declined since 1998, and the number of newly diagnosed cases is rising slightly.² Disease transmission continues at the same or, possibly, a slightly higher rate.³ High-risk behavior remains common and is increasing in some groups. Late diagnosis of infection is common.³ Notification of the partners of infected persons is rare.⁴ Black and Latino patients are less likely than white patients to receive optimal care.⁵ Few patients in care receive counseling about preventing transmission of the virus.⁶ All these trends are apparent in New York City, which is home to one in six of all U.S. patients with AIDS.

CASE FINDING AND SURVEILLANCE

When HIV testing became available 20 years ago in the absence of treatment and in the context of discrimination, the use of prescriptive regulations mandating counseling and separate written consent, based largely on the genetic-counseling model of testing for untreatable conditions, was reasonable. Today, the existence of these regulations and the separation of counseling and testing from routine medical care result in missed opportunities to diagnose, treat, and stop the spread of HIV infection. Nearly half of black men tested in public venues where men who have sex with men congregate (e.g., bars, bathhouses, and parks) in 2004

Table 1. Comparison of Public Health Approach to HIV Infection and Other Infectious Diseases.

| Intervention | Other Infectious Diseases | HIV Infection |
|--|---|--|
| Case finding and surveillance | | |
| Named reporting of all with condition | Standard for all other reportable infectious diseases | Only recently implemented in many areas; still not implemented in some |
| Availability of routine testing in health care settings | Standard for all other reportable infectious diseases | Widely recommended and cost-effective but often not available |
| Notification and testing of partners by public health programs | Standard (e.g., testing and treatment of contacts exposed to <i>Neisseria meningitidis</i> , acute hepatitis B, syphilis, tuberculosis) | Wide variation in proportion of contacts identified, contacted, and tested among jurisdictions |
| Interruption of transmission | | |
| Specific to mode of transmission | Prevention of many transfusion-transmitted and perinatally transmitted pathogens possible; vaccines widely used; condoms underused in prevention of other sexually transmitted infections | Transfusion-related and perinatal transmission largely controlled in the United States; vaccines not available; condoms neither widely available nor use strongly promoted; use of nonsterile needles by most injection-drug users |
| Systematic treatment and case management | | |
| Monitoring by public health agencies to determine whether infected contacts are receiving appropriate care and treatment | Standard (outbreak-control method used for <i>N. meningitidis</i> cases in schools or day care settings, for influenza in other community settings, and for all tuberculosis-infected contacts) | Generally not done |
| Case management by public health departments to ensure effective linkage of affected patients to care | Standard; case manager accountable for patient outcome (e.g., in pregnant women with hepatitis B or patients with tuberculosis) | Rarely done; duplication of services between community-based and government case management |
| Provision of social services to patients | Done as incentive to ensure effective treatment; was essential to control multidrug-resistant tuberculosis | Linkage of social services to care and treatment in few areas |
| Population-based monitoring | | |
| Contact of treating physicians by public health agencies if patients have inadequate response to treatment | Standard for some diseases | Not done; treatment complex and lifelong |
| Monitoring of trends in drug resistance among previously untreated patients | Standard for sexually transmitted diseases, tuberculosis, some bacterial infections | Not routine except on a research basis (mandated recently in New York State) |

and 2005 were HIV-positive, and two thirds of those who were positive were unaware of their status.⁷ Our outdated approach to HIV screening means that we not only fail to identify infected patients promptly and thus allow the epidemic to continue to spread, but we may also perpetuate HIV-related stigma by targeting screening only to those perceived to be at risk. Routine, voluntary HIV testing in health care settings, although ad-

vocated by the Centers for Disease Control and Prevention (CDC) for more than a decade,⁸ widely recommended,⁹ and cost-effective,¹⁰ has not occurred. In New York City in 2002, only one third of adults who had had three or more sex partners in the preceding year — and only half of men who had sex with men who had had three or more partners — had been tested for HIV in the previous 18 months.

Early diagnosis is essential both to link patients to effective care and to prevent the spread of infection. The CDC estimates that more than half of new HIV infections are spread by HIV-positive people who are unaware they are infected.¹¹ In nearly 40 percent of persons who received a diagnosis of HIV infection, AIDS either was concurrently diagnosed or developed within a year.³ They had been infected with HIV for about a decade; health care and other institutions missed many opportunities to diagnose their infection. As a result of delayed diagnosis, such patients are sicker when they begin to receive care and will thus die sooner than those whose infection is diagnosed promptly. Many unwittingly spread HIV to their spouses, partners, and others. Once they know their diagnosis, people infected with HIV reduce their practice of high-risk sex by about half,¹² and the risk of heterosexual transmission, at least, is further reduced by treatment that decreases the viral load to below 1500 copies of HIV type 1 RNA per milliliter.¹³ Voluntary HIV screening and linkage to care should become a normal part of medical practice, similar to screening for other treatable conditions, such as high cholesterol levels, hypertension, diabetes, and breast cancer. Screening and linkage to care are especially important in communities with a high prevalence of HIV infection.

The partners of more than two thirds of people with newly diagnosed HIV infection do not receive organized partner notification, and when contact is attempted, the rate of success varies greatly.⁴ The notification of partners by public health counselors is more effective than notification by individual patients,¹⁴ but this approach is rare in most areas. As a result, most partners are not notified of their exposure or offered testing, contributing to late diagnosis and continued spread of HIV. Of 4312 persons with newly diagnosed HIV infection in New York City in 2003, information on these persons' partners was available for less than a fifth and testing results were confirmed for fewer than 200 partners. In addition, the policy of offering partner notification only at the time of diagnosis ignores the continuing high-risk sexual behavior of many HIV-positive persons. Systematic notification of partners by public health personnel and the use of newer antibody or nucleic acid–amplification tests in addition to traditional methods could identify social networks and acute or early HIV

infections and could potentially stop clusters of transmission.

INTERRUPTING TRANSMISSION

The application of the public health principles of near-universal screening and treatment has all but eliminated transfusion-related and perinatal transmission of HIV.³ Among injection-drug users, syringe-exchange programs and widespread voluntary screening for the virus reduced the rate of transmission by 50 to 80 percent.¹⁵ Further progress in preventing HIV infection is possible — interventions to change behavior work¹⁶⁻¹⁹ — but reducing sexual transmission is challenging. Evidence-based ways to reduce high-risk behavior include promoting the use of condoms and making free condoms widely available,^{16,19} including in schools²⁰; making clean needles readily available to people who inject illicit drugs²¹; and community interventions.¹⁹

Condoms, which can substantially reduce transmission,^{16,22} are not widely available nor is their use strongly promoted, and they are still used infrequently in high-risk sexual encounters.²³ Most injection-drug users in the United States continue to use nonsterile needles.²⁴ Until recently in New York City, condom-distribution programs were limited, even in high-risk settings, and several neighborhoods in need of syringe-exchange services were not served by these programs.

SYSTEMATIC TREATMENT AND CASE MANAGEMENT

Standard public health approaches that have either not been applied or been applied inconsistently to HIV prevention and control efforts include public health monitoring to ensure that all HIV-infected patients receive quality care, providing public health support through referrals and outreach for patients who are not receiving effective treatment, monitoring of CD4 cell counts and viral loads to identify patients who may be candidates for treatment or who are lost to care, and assisting clinicians with outreach and partner notification. Although HIV infection remains incurable, AIDS is now a chronic disease for those fortunate enough to receive effective treatment. The use of effective treatment that incorporates risk-reduction counseling,²⁵ including distribution of condoms, promotion of the use of condoms

and clean needles, and treatment for substance abuse and mental health conditions, would improve individual treatment outcomes and reduce disease transmission, but it is uncommon.⁶

Case management is prominent in the HIV service delivery system, yet few if any jurisdictions ensure that every patient is offered effective treatment and prevention services. Public health interventions to monitor and improve HIV case management can be effective²⁶ but are rare.

POPULATION-BASED MONITORING AND EVALUATION

It took nearly two decades to make HIV reportable throughout the United States, and named reporting is still not universal. Although information on CD4 cell counts and viral loads is collected in most jurisdictions, monitoring these data to determine patients' progress is rare. Surveillance for drug-resistant strains of virus in patients who have never been treated is generally not conducted. Information on viral loads, CD4 cell counts, and drug resistance recently became reportable in New York State, thus making it possible to identify patients who are not receiving effective care, monitor trends in drug resistance, potentially identify clusters of disease, and potentially provide physicians and their patients who are not receiving care with more intensive services. Publicly funded case management, treatment, and service systems are not effectively coordinated to ensure a continuum of care. Effective population-based monitoring and evaluation would track not only the incidence, prevalence, and mortality of HIV infection, but also indicators of the interruption of transmission, such as the use of voluntary testing, proportion of partners notified, linkage to care of those who test positive, and success at reducing viral load when treatment is clinically indicated.

The spread of HIV could be reduced substantially if newly infected people promptly learned of their status, reduced high-risk behaviors, and when clinically indicated, began and continued treatment that suppresses viral replication. But few if any jurisdictions even attempt to monitor whether all HIV-infected people receive effective treatment, let alone intervene to provide additional support when patients do not start, discontinue, or do not respond well to treatment. New York

City, which has one of the nation's strongest case-management infrastructures, has no systematic citywide information available on whether patients have begun, are continuing, or have a virologic response to treatment.

CONCLUSIONS

Proven interventions, such as the use of condoms, clean needles, and expanded voluntary screening, and linkage to care, could prevent most HIV infections.²⁷ Improving community-based efforts and counseling of individual patients to prevent transmission, supporting patients to facilitate their return to care, and improving the availability of effective treatment could further reduce transmission. But 25 years into the epidemic, we do not consistently apply these proven strategies.

Cost-effective programs include mass-media education campaigns, efforts to make condoms widely available, and interventions to change high-risk behavior in groups with a high prevalence of HIV infection.¹⁹ Routine, voluntary screening for HIV is indicated on the basis of clinical efficacy and cost-effectiveness,¹⁰ and the cost is moderate, as compared with that of many other health interventions. Notification of an infected person's partners after counseling and testing prevents infections and probably saves money.²⁸

Using the current CDC estimate of 40,000 new HIV infections per year, the potential to prevent half to two thirds of these infections, and the current average lifetime cost of care for a patient with HIV infection of \$200,000,²⁹ more effective epidemic control would save between \$4 billion and \$5.4 billion per year. Widespread availability of condoms, syringe-exchange programs, public health notification of the partners of infected persons, and improvement of case management and monitoring systems would be unlikely to cost more than an additional \$1 billion to \$2 billion per year nationally — two to three times the current CDC funding for HIV prevention.

Controlling epidemics is a fundamental responsibility of the government, working in concert with physicians, patients, and communities. There is a delicate balance between protecting the public and the individual right to privacy. Until we implement prevention programs with proven efficacy more widely, make voluntary screening and linkage to care a normal part of medical care

and expand screening in community settings, and improve treatment, risk reduction, monitoring, and partner notification, we will continue to miss opportunities to reduce the spread of HIV infection.

Some religious and political groups oppose the use of effective prevention measures. Some advocacy groups oppose expansion of screening and funding of government programs for prevention and control of HIV infection. Some doctors, health care facilities, and organizations will oppose increased monitoring of treatment efficacy; moreover, this cannot be accomplished without additional resources. There are few models for this approach, although Malawi has begun to apply public health principles to testing, treatment, and monitoring.³⁰ Although stigma and discrimination on the basis of sexual orientation continue, advocacy has resulted in substantial progress, including antidiscrimination statutes in many states and increasing numbers of jurisdictions that recognize the rights of domestic partners. The world has changed in the past 25 years, and approaches to HIV prevention must also change. If we fully apply public health principles to the HIV epidemic, we can improve the health of people living with HIV infection and prevent tens of thousands of people in this country from becoming infected with HIV in the next decade.

We are indebted to Drew Blakeman for assistance in the preparation of the manuscript and to Colin McCord and Mark Barnes for helpful comments.

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