Changing Epidemiology of HIV/AIDS in the United States: Implications for Enhancing and Promoting HIV Testing Strategies

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Despite aggressive prevention efforts, >1 million people in the United States are currently estimated to be living with human immunodeficiency virus (HIV) infection, with or without progression to acquired immunodeficiency syndrome (AIDS). Although men who have sex with men remain the group at highest risk, updated prevention strategies need to take into account the changing face of the epidemic, notably, the increasing burden of the disease among African Americans and young people. One of the major obstacles to current efforts in the United States to prevent HIV infection is the high rate of transmission among people who do not know they are infected. Many Americans still receive a diagnosis of advanced HIV disease, including AIDS, ≤1 year after HIV infection is diagnosed, suggesting that they have been HIV positive and unaware of their serostatus for 5–10 years. Promoting access to and receipt of HIV testing is one of the Centers for Disease Control and Prevention's 4 main strategies for advancing efforts to prevent HIV infection. Making HIV testing a routine part of medical care would lead to earlier diagnosis of infection. This would in turn improve the prognosis for the infected individual and reduce the risk of onward transmission, particularly if effective counseling, education, and treatment are provided upon diagnosis. New recommendations aimed at making HIV testing more routine in health care settings should have a substantial impact on these efforts, but it is crucially important that our strategies reflect the changing face of the epidemic.

The prevention of HIV/AIDS requires a dynamic and multidimensional approach to reflect the changing epidemiology, address the social norms of different subgroups of the population, and maximize opportunities derived from evolving technological advances. Chief among this dynamism is the need for HIV prevention strategies that are developed and adapted to address the needs of social, ethnic, and cultural population subgroups that are increasingly affected by this disease. In responding to this need, the United States' Centers for Disease Control and Prevention (CDC) has outlined a strategic framework, Advancing HIV Prevention [1], which includes 4 main pillars of a heightened response to domestic HIV prevention: making HIV testing a routine part of medical care, implementing new models for diagnosing HIV infections outside medical settings, preventing new infections by working with persons diagnosed with HIV and their partners, and further decreasing perinatal HIV transmission. The recent release of the CDC's revised recommendations on HIV testing [2] provides us with yet another opportunity, within the context of this comprehensive prevention approach, to assess how the changing epidemiology of HIV/AIDS in the United States should influence the prioritization and implementation of our prevention efforts in the near future.

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Presented in part: Opportunities for Improving HIV Diagnosis, Prevention & Access to Care in the U.S., Washington, D.C., 29–30 November 2006.

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Clinical Infectious Diseases 2007; 45:S213–20

1058-4838/2007/4512S4-0003
DOI: 10.1086/522615

This article will provide an overview of the current epidemiology of HIV infection and AIDS in the United States, with a particular focus on its impact on racial and ethnic minorities, men who have sex with men (MSM), and young people; summarize some of the major determinants of these disease trends; review the problem of late diagnosis and its impact on the epidemic; and discuss what the CDC is doing to promote early diagnosis.

HIV/AIDS IN THE UNITED STATES: CHANGING EPIDEMIOLOGY

HIV/AIDS in the United States continues to be a persistent and pervasive epidemic. By the end of 2003, >1 million persons were estimated to be living with HIV/AIDS in the United States, approximately a quarter of whom (164,000–312,000 persons) did not know they were infected [3]. An estimated 984,155 cases of AIDS had been cumulatively diagnosed by the end of 2005 (figure 1). Despite substantial reductions in deaths and AIDS diagnoses since the mid-1990s, the US epidemic continues, with an estimated 40,000 new HIV infections occurring each year, many of which occur in MSM and ethnic minority populations [5]. This stable incidence of HIV infection, combined with the population effect of widespread availability and uptake of effective antiretroviral therapy, are resulting in an increasing prevalence of HIV infection, and many infected persons are living much healthier and better quality lives with their disease, compared with persons in whom HIV infection was diagnosed a decade or more ago.

There has been marked geographic heterogeneity in HIV/AIDS rates among adults and adolescents in the United States, with high numbers and rates being seen in the more populous states on the eastern and western seaboards. From 2001 through 2005, the estimated number of AIDS cases increased by 24% in the Midwest, by 9% in the South, and by 2% in the Northeast and decreased by 3% in the West [5]. The estimated rate for adults and adolescents living with AIDS ranged from 2.5 cases per 100,000 population in American Samoa to 2060.9 cases per 100,000 population in the District of Columbia [5].

Impact on racial and ethnic minorities. Until the mid-1990s, gay white men were the group hardest hit by the AIDS epidemic. But HIV infection and AIDS are now increasingly affecting ethnic minorities overall (figure 2), as well as MSM subgroups [3]. Today, African Americans, despite accounting for only 13% of the US population, account for ~47% of the more than one million Americans currently living with HIV infection [6]. More than 50% of new HIV diagnoses reported each year are among African Americans [6]. African American men and women bear higher HIV disease rates than all other ethnic groups. During 2001–2005, estimated numbers of diagnoses, diagnosis rates, and rate ratios were higher among black males and black females than for males and females from all other racial and/or ethnic groups. Although these data were limited to those states with confidential, name-based reporting of HIV/AIDS, the disparate impact of HIV among black persons is stark: the rates of HIV/AIDS among black men and women are 7 and 21 times, respectively, the rates among white men and women [6]. Among black males and females, transmission by sex with a man (i.e., via male-male sex or high-risk heterosexual sex) was the primary mode of HIV infection [6].

Other ethnic groups also bear a disproportionate disease bur-

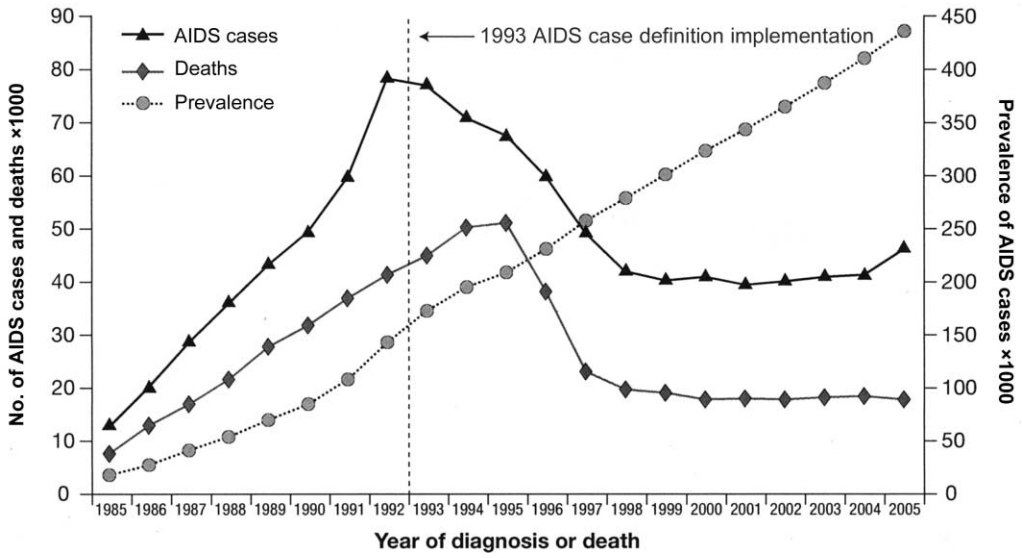

Figure 1. Estimated number of AIDS cases and deaths among adults and adolescents with AIDS during 1985–2005 in the United States and dependent areas. Data are adapted from [4]. Further information about the 1993 AIDS case definition is available at: http://www.cdc.gov/hiv/topics/surveillance/resources/software/apids/manual/section1.htm.

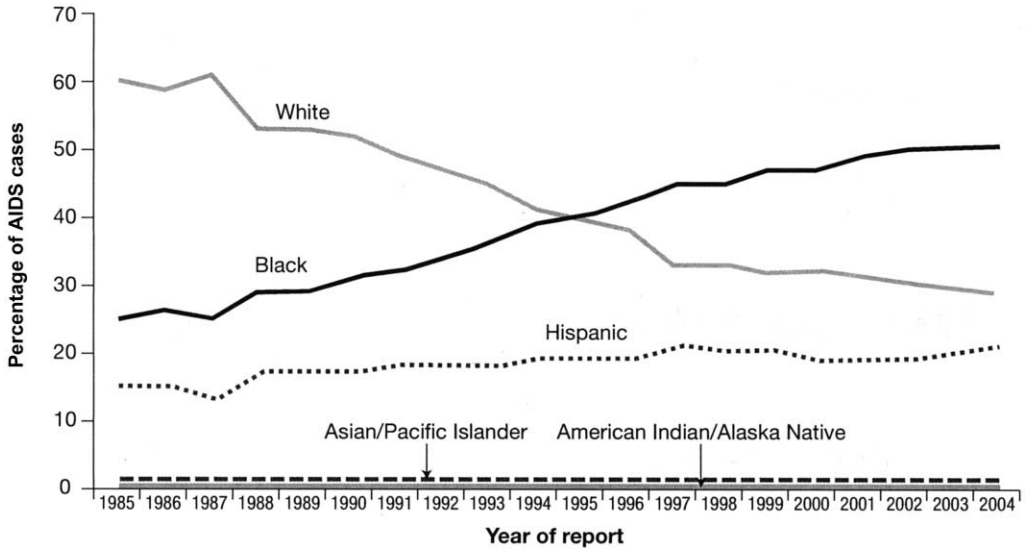

Figure 2. Percentage of AIDS cases among adults and adolescents during 1985–2005 in the United States and dependent areas, by race/ethnicity and year of diagnosis. Data are adapted from [4, 5].

den. In 2002, HIV/AIDS was the third leading cause of death among Hispanic men aged 35–44 years and the fourth leading cause of death among Hispanic women in the same age group [7]. Hispanic individuals received 18% of new diagnoses reported in the 35 areas with long-term, confidential, name-based HIV reporting in the United States [5]. From 2002 through 2004, the number of new diagnoses for Hispanic individuals in the 35 areas stayed at ~7000 per year [5]. Most Hispanic men with HIV/AIDS were exposed to HIV through sexual contact with other men, with injection drug use and heterosexual sex ranking as the second and third most common means of exposure. Most Hispanic women were exposed to HIV through heterosexual contact, with injection drug use ranking second [5]. Asians and Pacific Islanders account for ~1% of the total number of cases of HIV/AIDS in the United States [6]. However, in recent years, the number of AIDS diagnoses in this group has increased steadily. The Asian and Pacific Islander population in the United States is also increasing [8]. At the end of 2005, <1% of the estimated 475,220 persons with HIV/AIDS in the 35 areas with long-term, confidential, name-based reporting of HIV infection were Asians or Pacific Islanders [5].

A complex interplay of factors—historical, structural, environmental, and cultural—including racism and discrimination, poverty, denial, stigma, homophobia, and limited access to health care are believed to make African Americans and other ethnic minorities more vulnerable to HIV infection. Racism, homophobia, incarceration, and stigma are particularly problematic within African American communities [9]. The incarceration of African American men appears to be a significant factor for HIV risk, and it is often linked to substance abuse and high-risk sex [9]. Higher rates of HIV among incarcerated populations may also serve as a link between HIV transmission among MSM and those men who have sex with both men and women [9]. Homophobia among African American and Hispanic communities discourages MSM from identifying themselves as gay or bisexual, and they may miss or not connect with public health messages designed for these groups [6, 9]. Among Hispanic individuals, due consideration should be given to the cultural diversity within this community and the fact that behavioral risk factors for HIV/AIDS may differ by country of birth or heritage. Stigma related to an HIV diagnosis may cause people to avoid getting tested for HIV or to avoid medical care because their HIV infection may become known and lead to rejection by family members, friends, and coworkers. Denial about HIV might be a reason why a large percentage of persons in racial and ethnic minority populations who are infected with HIV do not get tested and thus do not know their HIV serostatus. Persons who do not know that they are HIV-infected are more likely than those with a diagnosis to engage in risky behavior and to unintentionally transmit HIV to others [10]. Other factors, such as a high prevalence of bacterial sexually transmitted diseases (STDs), including gonorrhea, chlamydia, and syphilis, among some racial groups can increase the chances of contracting HIV, and a person who has both HIV and other STDs has a greater chance of spreading HIV to others [10]. Issues such as substance abuse (including injection drug use), mental health problems, childhood sexual abuse, and other psychological stressors may make it difficult for people to protect themselves and their partners [9, 10].

Impact on MSM. The term "MSM" refers to all men who have sex with other men, regardless of their self-described sexual orientation (gay, bisexual, or heterosexual). In the United

States, HIV infection and AIDS have had a tremendous impact on MSM (figure 3). AIDS has been diagnosed for >500,000 MSM, and >300,000 MSM with AIDS have died during the past 20 years [11]. Even though only 5%–7% of male adults and adolescents in the United States identify themselves as MSM [12], MSM still accounted for ~53% of all new reported cases of HIV/AIDS and 71% of all estimated HIV infections among male adults and adolescents in 2005, as revealed by data from 33 areas with long-term, confidential, name-based HIV reporting [5]. In a 2005 study of MSM in 5 cities, 46% of black individuals were infected with HIV, compared with 21% of white individuals and 17% of Hispanic individuals [13].

Numerous factors continue to place MSM at continued and heightened risk of HIV infection [14]. Sexual risk behaviors account for most HIV infections in MSM and involve unprotected sex and transmission of STDs. Not using a condom during anal sex with someone other than a primary HIV-negative partner continues to be a significant threat to the health of HIV-negative MSM. Some MSM continue to engage in behaviors that put others at risk. For example, alcohol and illegal drug use can increase the likelihood of risky sexual behavior as well as the use of shared needles. The use of methamphetamines, or "meth," is a very important public health issue facing MSM [15]. Complacency about risk factors has been identified as another driving factor. Although some MSM have been living with the threat of HIV infection for 25 years, many people believe they are at low risk of becoming infected or infecting their partner. This is especially true of young gay and bisexual men who, unlike older gay and bisexual men, have not experienced the toll of HIV/AIDS. At the same time, belief that the success of new drug treatments decreases the risk of HIV transmission may be contributing to increased risky behaviors among some MSM [16]. Unknown HIV serostatus may also be driving transmission among MSM. In a study of young MSM, 77% who tested positive for HIV mistakenly believed that they were not infected [17]. Young African American MSM in this study were especially likely to be unaware of their HIV infection. Finally, changing social and sexual networks, including the use of the Internet for meeting and acquiring new sex partners, has been another driving factor [18].

Impact on young people. Young people in the United States are at persistent risk for HIV infection. This risk is especially notable for young people from racial and/or ethnic minorities. Data from 35 areas with long-term, confidential, name-based HIV reporting have shown that an estimated 4883 young people received a diagnosis of HIV/AIDS in 2004, representing ~13% of all persons who received a diagnosis during that year [19]. Nationally, reported cases of AIDS among adolescents aged 13–19 years have shown increasing trends over the past decade (figure 4), with >400 such cases reported in 2003 and 2004. Young African Americans were disproportionately affected by

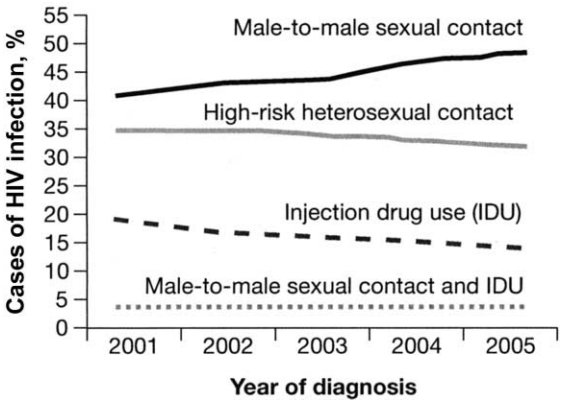

Figure 3. Percentage of cases of HIV infection among adults and adolescents during 2001–2005 in 33 US states, by transmission category. Data are adapted from [4, 5].

HIV infection, accounting for 55% of all HIV infections reported among persons aged 13–24 years [20]. In 2004, seventy percent of new diagnoses of HIV/AIDS in persons aged 13–19 years were in African Americans, 15% were in white individuals, and 13% were in Hispanic individuals [21]. In the 7 cities that participated in CDC's Young Men's Survey during 1994–1998, a total of 14% of African American MSM and 7% of Hispanic MSM aged 15–22 years were infected with HIV [22].

The greater disease burden among males than among females is evidenced among young people, as well as all other age groups. During 2001–2004, in the 33 states with long-term, confidential, name-based HIV reporting, 62% of 17,824 persons aged 13–24 years who received a diagnosis of HIV/AIDS were males, and 38% were females [5]. In 2004, a total of 61% of new diagnoses among persons aged 13–19 years, 70% among persons aged 20–24 years, and 74% among persons aged >25 years were diagnosed in men. Young MSM, especially those of minority races or ethnicities, were at high risk for HIV infection. Among young women, 85% of new infections in those aged 13–19 years and 84% in those aged 20–24 years were transmitted by high-risk heterosexual behavior (defined as heterosexual sex with a person known to have or be at high risk for HIV infection).

A number of factors place young people at increased risk for acquiring HIV infection. Many young people begin having sexual intercourse at early ages: 47% of high school students have had sexual intercourse, and 7.4% of them reported first having sexual intercourse before they were 13 years old [23]. Young women, especially those of minority races or ethnicities, are increasingly at risk for HIV infection through heterosexual sex, because of the biological vulnerability of female genitalia, lack of recognition of their partners' risk factors, inequality in relationships, and having sex with older men, who are more likely to be infected with HIV. STDs facilitate HIV transmission [24], and some of the highest STD rates are among young people,

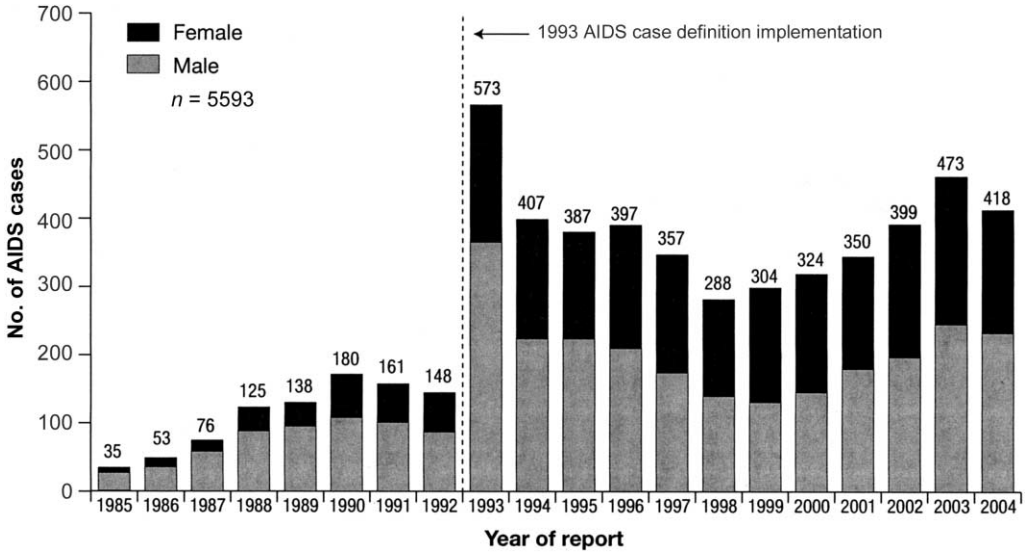

Figure 4. Reported AIDS cases among adolescents aged 13–19 years during 1985–2004 in the United States and dependent areas, by sex. Data are adapted from [4, 5]. Further information about the 1993 AIDS case definition is available at: http://www.cdc.gov/hiv/topics/surveillance/resources/software/apids/manual/section1.htm.

especially young people of minority races and ethnicities. Substance abuse is another driving factor, because both casual and long-term substance users are more likely to engage in high-risk behaviors, such as unprotected sex, when they are under the influence of drugs or alcohol [25]. Runaways and other homeless young people are at high risk for HIV infection, particularly if they are exchanging sex for drugs or money. In addition, lack of awareness or education about HIV and STDs are key driving factors. Finally, the feeling of "invulnerability" typical of adolescent development contributes the belief that "this won't happen to me," and research has in fact shown that many young people are not concerned about becoming infected with HIV [26].

LATE DIAGNOSIS: A CONTINUING OBSTACLE TO PREVENTION

The problem of late diagnosis of HIV infection in the United States is a serious obstacle to HIV prevention efforts in all subpopulations, contributing to the continuing spread of HIV by those who do not know they are infected. In a detailed study involving 16 states, the CDC found that 45% of >4000 individuals with AIDS first received a diagnosis of HIV infection ≤12 months before AIDS was diagnosed [27]. Given the natural history of HIV infection, this suggests that many of these individuals were probably infected with HIV 5–10 years before diagnosis. A comparison of the characteristics of "late testers" (i.e., persons who were tested ≤12 months before receipt of an AIDS diagnosis) with those of "early testers" (i.e., persons in whom HIV infection was diagnosed ≥5 years before receipt of an AIDS diagnosis) revealed that late testers tended to be younger (i.e., 18–29 years old), heterosexual, less educated, and African American or Hispanic [27].

In a population-based prevalence survey of MSM in 5 cities, the CDC found that the prevalence rate of HIV infection was 25% [13]. In this group, 450 of 1767 men tested were HIV positive. Yet 217 (48%) were unaware of their serostatus. Younger men were far more likely than older men to be unaware of their HIV-positive status: 79% of persons aged 18–24 years and 70% of those aged 25–29 years did not know they were infected with HIV, compared with 49% of men aged 30–39 years and 30% of men aged 40–49 years. This survey also demonstrated significant variations across race and ethnic groups. Although only 18% of white men surveyed were unaware of their infection, 67% of African American men and 48% of Hispanic men did not know they were HIV positive [13]. None of the Native American or Alaska-native men were aware that they tested positive for HIV. Many persons with HIV infection visit health care settings in the years before their diagnosis, yet they are infrequently tested for HIV. Late diagnosis is seen not only in the public health care sector but also in settings where people have access to quality private health care. Klein et al. [28] reviewed the medical encounters during the 5-year period before diagnosis of HIV infection for members of the Kaiser Permanente Medical Care Program. In a review of 440 cases, they found that nearly half of patients with newly diagnosed HIV infection had AIDS-defining CD4 cell depletion or another AIDS-defining condition at the time of diagnosis. Disease in 62% of these individuals with a new diagnosis was at a stage in which, according to national guidelines, HAART might be considered appropriate.

Late or delayed diagnosis of HIV infection is epidemiologically significant and likely to be a major contributor to the ongoing domestic epidemic. Marks et al. [29] estimated that ~25% of individuals with undiagnosed HIV infection are responsible for more than half of new HIV infections occurring in the population. These estimates are based partially on a large meta-analysis showing that high-risk sexual behavior was far more common among HIV-positive individuals who were unaware of their infection status than among those who knew they were HIV positive [30]. This team did a meta-analysis of 11 independent studies involving the following 4 large data sets: the Multicenter AIDS Cohort Study (MACS), the HIV Epidemiology Research Study (HERS), the phase 1 Supplement to HIV/AIDS Surveillance (SHAS) (conducted during 1995–2000), and the phase 2 SHAS (conducted during 2000–2003). Six studies compared groups of individuals who were aware of their HIV serostatus with groups who did not know their HIV serostatus, and 5 compared individuals before and after they learned their HIV serostatus. The researchers found that the prevalence of unprotected anal or vaginal intercourse was 53% lower among HIV-positive individuals who knew their serostatus, compared with persons who did not know they were HIV positive. These findings were consistent in all data sets that were analyzed. Knowledge of one's infection also reduces the risk of transmission, because the individual enters the health care system for treatment, which reduces viral load and, therefore, the risk of viral transmission [31–33].

CDC'S EFFORTS TO PROMOTE EARLY DIAGNOSIS

Currently, the CDC has a number of efforts under way to encourage early diagnosis of HIV infection. The Advancing HIV Prevention initiative [1], launched in 2003, reinforces the CDC's evidence-based approach that routine HIV testing implemented in a variety of settings will reduce barriers to HIV testing, improve opportunities for early diagnosis and linkage to prevention and care, and help reduce the number of new infections. The CDC also encourages its funded partners to take HIV testing out into the community by using rapid tests in nontraditional settings and in health care settings that provide episodic care, such as emergency rooms. In addition, the CDC is currently updating guidelines for testing in health care settings in order to make HIV testing more routine. Finally, the President's 2007 budget contains an increase in funding, which, through promotion of rapid testing in areas with a high incidence of HIV infection, is aimed at increasing the number of people who know their HIV serostatus.

The CDC has funded a number of demonstration projects, the results of which are particularly encouraging. One project that used social network strategies to reach persons at high risk for HIV infection in communities of color has demonstrated the feasibility of using these social networks to encourage HIV counseling, testing, and referral services [34]. This strategy has proven to be very successful in reaching persons with undiagnosed HIV infection. A second Advancing HIV Prevention demonstration project, the Antiretroviral Treatment Access Study II (ARTAS II), is examining the effect of linked case management on getting HIV-infected persons into care. In addition, rapid HIV testing is quickly becoming the accepted standard for HIV screening tests, especially in settings such as emergency departments and STD clinics that mainly deliver episodic care and typically do not establish ongoing relationships with patients. The CDC is encouraging its funded partners to use these tests in a variety of settings. Additionally, to reduce barriers to HIV testing and increase the opportunity for early diagnosis, the CDC has recently revised its recommendations for HIV testing of adults, adolescents, and pregnant women in health care settings [2]. Detecting HIV infection earlier through HIV screening (and optimizing opportunities for effective treatment and prevention) has been shown to be cost-effective, even in settings where the prevalence of HIV infection is low. The revised guidelines focus on increasing the number of health care facilities in which screening for HIV is routine, fostering earlier detection of HIV infection, identifying and counseling persons with unrecognized HIV infection and linking them to clinical and prevention services, and further reducing perinatal transmission of HIV in the United States. Another important feature of the recommendations is that screening may be eligible for third-party reimbursement, analogous to other recommended screening tests (such as mammography or cholesterol screening). Routinizing HIV screening eliminates many significant barriers to HIV testing, such as the time needed to perform targeted risk assessments and pretest HIV counseling and the stigma associated with requesting or consenting to an HIV test. The new guidelines recommend routine (or opt-out) HIV screening in health care settings and are intended for use in all health care settings, including hospital emergency departments, urgent care clinics, and primary care settings. The recommendations do not modify existing guidelines on HIV counseling, testing, and referral for high-risk persons who seek or receive HIV testing in nonclinical settings.

Legislative and statutory barriers to early diagnosis exist at the federal, state, and local levels [35]. Some states and local jurisdictions may have statutory or other regulatory impediments prohibiting opt-out screening or may impose other specific requirements for HIV counseling, written informed consent, confirmatory testing, or method for communicating HIV test results. The CDC is working with states to resolve barriers that might conflict with the CDC's current and proposed recommendations. Current federal law also impacts the way counseling and testing services are delivered in federally funded facilities [35].

To further support the goal of diagnosing HIV infections earlier and increasing access to care, the President's 2008 budget included an increase of $60 million for CDC HIV prevention programs. Should these funds become available, the CDC plans to work collaboratively with both the Health Resources and Services Administration and the Substance Abuse and Mental Health Services Administration on these efforts.

CONCLUSIONS

In summary, HIV/AIDS continue to be major public health problems in the United States despite aggressive prevention efforts, some of which have been successful. Although education and prevention programs have reduced the spread of HIV in some populations, the virus has been spreading more rapidly in others. At this point, MSM and African American men and women continue to bear a disproportionate disease burden among the >1 million people in the United States believed to be living with HIV infection.

To be effective, prevention strategies must reflect the ethnic and cultural characteristics of the individual subgroups. For example, prevention and education programs in the African American population must consider the stigma associated with homosexuality and HIV infection in this group; efforts in the Hispanic population should acknowledge the tremendous ethnic and cultural diversities within this broad group. Culturally competent prevention programs are being developed by the CDC and its partners, and resources are being realigned to meet the needs of communities at greatest risk. Overcoming cultural and societal barriers to routine HIV testing is essential in order to increase the number of HIV-infected people for whom the diagnosis is made earlier during the course of infection.

The recent CDC recommendation for making HIV testing more routine in health care settings should help destigmatize HIV testing and safeguard individuals' rights and confidentiality. This routinization of testing may one day put HIV screening in the same category as cholesterol screening and testing for other medical conditions, but much has to be done to achieve this goal. By increasing the number of individuals tested, the aim is to notify individuals about their positive HIV serostatus earlier during the course of infection and to empower these people to reduce their risk of transmitting the disease. Linkage to facilities where the quality of care for HIV infection is high will be crucially important to people who test positive for HIV, so that additional benefits associated with the length and quality of life may be obtained.

Widespread adoption of the CDC's recommendation for opt-out testing will obviously take time, national leadership, and community involvement. There will be many obstacles to overcome. Undoubtedly, our focus should remain on preventing, controlling, and eventually eliminating HIV/AIDS through a combination of evidence-based, comprehensive, and culturally competent approaches.

Acknowledgments

The "Opportunities for Improving HIV Diagnosis, Prevention & Access to Care in the U.S." conference was sponsored by the American Academy of HIV Medicine, amfAR, the Centers for Disease Control and Prevention, the Forum for Collaborative HIV Research, the HIV Medicine Association of the Infectious Diseases Society of America, and the National Institute of Allergy and Infectious Diseases. Funding for the conference was supplied through an unrestricted educational grant from Gilead Sciences, amfAR, GlaxoSmithKline, Pfizer, Abbott Virology, OraSure Technologies, Roche Diagnostics, and Trinity Biotech.

Supplement sponsorship. This article was published as part of a supplement entitled "Opportunities for Improving the Diagnosis of, Prevention of, and Treatment for HIV Infection in the United States," sponsored by the American Academy of HIV Medicine, amfAR, the Centers for Disease Control and Prevention, the Forum for Collaborative HIV Research, the HIV Medicine Association of the Infectious Diseases Society of America, and the National Institute of Allergy and Infectious Diseases.

Potential conflicts of interest. K.A.F.: no conflicts.

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