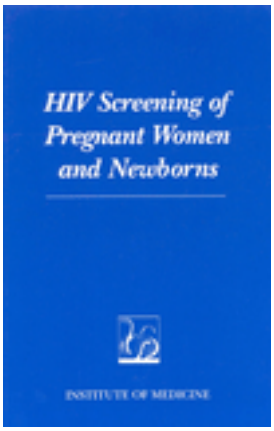

HIV Screening of Pregnant Women and Newborns

Leslie M. Hardy, Editor; Committee on Prenatal and Newborn Screening for HIV Infection, Institute of Medicine

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Institute of Medicine

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The serpent has been a symbol of long life, healing, and knowledge among almost all cultures and religions since the beginning of recorded history. The image adopted as a logotype by the Institute of Medicine is based on a relief carving from ancient Greece, now held by the Staatlichemuseen in Berlin.

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COMMITTEE ON PRENATAL AND NEWBORN SCREENING FOR HIV INFECTION

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PREFACE

Policymakers face special challenges in formulating rational human immunodeficiency virus (HIV) testing and screening policies for women and children. Incomplete data and complex medical, social, and ethical questions confound the decision-making process. Moreover, decisions must be made and policies implemented in a continually changing environment as the epidemic of HIV infection and acquired immune deficiency syndrome (AIDS) evolves and the development and refinement of diagnostic technology and medical therapy proceed apace.

In recent months policymakers have come to appreciate the extent and seriousness of the problem of HIV disease among women and children, and this perception has brought proposals for screening pregnant women and newborns for HIV. The prospect of HIV screening among these populations engenders spirited debate in many arenas. In particular, public policy discussions attempt to grapple with determining what constitutes an acceptable balance between the medical and public health benefits and the consequent personal and societal costs of such screening.

In light of this ongoing debate (and the potential for damaging ad hoc recommendations), the National Institute of Child Health and Human Development and the Centers for Disease Control requested that the Institute of Medicine assemble an expert committee to offer direction to policymakers and to examine the myriad questions that frame the development of sound perinatal HIV screening policy. Specifically, the committee's charge was to assess the appropriateness, at this time, of screening pregnant women and newborns for HIV infection, to consider the criteria that should be satisfied when such screening is introduced, and to reflect on possible advances in treatment and HIV diagnostic capability (particularly for neonates) that might necessitate policy modifications.

As part of its deliberations, the committee convened a public conference on May 14-15, 1990, to explore the salient technical, medical,

legal, and ethical aspects of HIV screening proposals for pregnant women and newborns. Appendix A contains the program of the conference and a summary of its activities. Such a summary cannot, of course, fully capture the richness and breadth of the panelists' presentations and subsequent discussions, but it does provide a synthesis of the major issues raised and the concerns expressed during the conference. It also reflects the subjective views of the speakers, which do not necessarily coincide with the conclusions reached by the committee. These differences of opinion mirror the controversy inherent in perinatal HIV screening policy development and serve as a reminder that many policy decisions in this area are to some extent based on judgment. Indeed, the evolving nature of the HIV epidemic and current gaps in knowledge, as well as changing technology, often require that informed judgment supplement incomplete data.

The conference greatly enriched the committee's deliberations, and committee members and staff extend their thanks both to the speakers, for their informative, provocative presentations, and to those who attended, for their constructive, lively contributions to the discussions. In particular, the committee acknowledges the thoughtful commentary of the final panelists: Neil Holtzman, Edward Connor, Sheldon Landesman, Kristine Gebbie, and Ronald Bayer. Their discussion of the considerations that should inform the development of prenatal and newborn HIV screening policy as well as their policy judgments helped to crystallize the committee's conclusions and recommendations. Because this final panel by design reiterated many of the themes that surfaced throughout the conference, a discrete synopsis of their discussion does not appear in the summary.

This report presents the committee's collective judgment about whether screening pregnant women or newborns for HIV infection is currently appropriate and discusses the process by which screening policy should be developed and implemented. It is intended to offer direction to state policymakers faced with decisions about instituting publicly sponsored prenatal or newborn HIV screening programs and consequently focuses primarily on their design and implementation. All statements and recommendations within the report are specific to the United States. Nevertheless, the guidance provided in the committee's recommendations may also be applicable to other settings in which screening policy might be developed.

Finally, the committee was continually reminded of the broader implications for other population groups (e.g., nonpregnant adolescents and adults) of its recommendations for HIV screening of pregnant women. The committee's charge did not include the examination of HIV screening policy for other individuals of reproductive age who might also benefit from the early diagnosis of infection and medical intervention. The

committee believes, however, that the extension of HIV screening to these other populations should be carefully studied and evaluated.

MARIE C McCORMICK

CHAIR, COMMITTEE ON PRENATAL AND NEWBORN SCREENING FOR HIV INFECTION

LESLIE M. HARDY

PROJECT DIRECTOR

CONTENTS

HIV SCREENING OF PREGNANT WOMEN AND NEWBORNS

EXECUTIVE SUMMARY

- Mandatory HIV testing and screening have not been generally implemented in this country for civilian, noninstitutionalized populations or populations at risk. Such programs have been rejected largely because of the powerful psychological and social impacts (including the threat of discrimination in employment, housing, access to health care, and insurance, as well as stigmatization and ostracism by friends, family, and others) that an antibody-positive test result may produce for an individual.[1] In light of these potentially adverse social consequences, the HIV test (unlike, for example, a complete blood count [CBC]) does not qualify as a benign, routine medical test that may be performed under the conditions of general or presumed consent, which govern many, but not all, tests routinely conducted in medical practice. Thus, **the committee concludes that individuals (or their legally recognized representatives) should have the right to consent to or refuse HIV testing (except when such testing is conducted anonymously for epidemiological purposes**). The committee found no compelling evidence to suggest that women and children should constitute an exception to this principle. (Chapter 3)
- History has revealed that mandatory screening programs are frequently inflexible, often because they are legislated, and that program modification over time proves difficult. Testing and screening policies for HIV infection must be responsive to advances in diagnostic technology, scientific understanding of the disease, and medical therapy. Voluntary HIV screening (with specific informed consent) permits greater flexibility than mandatory screening in accommodating change. **The committee**

[1] Screening in populations with a low prevalence of infection is also likely to yield an increased proportion of false-positive results.

opposes any mandatory newborn or prenatal HIV screening program (other than anonymous screening for surveillance purposes). (Chapter 3)

- **Given present uncertainty regarding the benefits and risks of early therapeutic intervention for asymptomatic HIV-infected infants and the difficulty in distinguishing infants with only maternal HIV antibody from those who are truly infected, the committee concludes that, at present, insufficient medical benefits have been demonstrated from newborn HIV screening to justify its implementation**. All infants at risk of adverse health outcomes because of poverty, social circumstances, or parental risk factors would benefit from comprehensive primary care. The rationale that HIV screening will identify infants for intensive primary care is not sufficient by itself to warrant screening of all newborns. Nevertheless, the committee encourages providers and medical centers to develop an aggressive primary care system for all infants at increased risk of adverse health outcomes. (Chapter 4)
- **The committee endorses the continuation of *anonymous* newborn HIV screening for surveillance purposes**. This approach provides unbiased epidemiological data for monitoring national and local trends in the distribution of HIV infection, particularly among childbearing women. These data are also useful in planning and evaluating public health interventions, targeting community outreach and prevention campaigns, and anticipating health care resource needs. (Chapter 4)
- **The committee concludes that screening pregnant women for the purpose of early diagnosis and treatment is both an achievable and compelling objective**.[2] This conclusion rests on the fact that available therapies for HIV disease, a life-threatening condition, have been shown to delay progression and minimize symptoms of disease in nonpregnant adults. However, current treatment regimens (e.g., zidovudine therapy and *Pneumocystis carinii* pneumonia [PCP] prophylaxis) may need slight modifications for HIV-infected pregnant women. (Chapter 5)
- Concern for potential fetal toxicity has not been absent from discussions of appropriate management and treatment of HIV-infected pregnant women. To date, there are insufficient data on zidovudine therapy during pregnancy to draw conclusions about short-term fetal toxicity or adverse pregnancy outcomes related to such therapy. There is

[2] Specific circumstances under which screening should take place are described in subsequent recommendations.

additional uncertainty regarding zidovudine's long-term effects and potential toxicities for the infant. Similarly, the fetal and neonatal risks associated with trimethoprim-sulfamethoxazole or aerosolized pentamidine therapy (i.e., PCP prophylaxis) during pregnancy have not been delineated. Despite these uncertainties, however, **The committee finds that the health risks inherent in deferring antiretroviral treatment or PCP prophylaxis of severely immunocompromised HIV-infected pregnant women (i.e., those with CD4+ cell counts below 200) outweigh the potential fetal or neonatal risks at this time. Therefore, the committee recommends that HIV-infected pregnant women with severely depressed CD4+ cell counts be offered therapy for which they would otherwise be eligible if they were not pregnant**. The decision to initiate treatment during pregnancy should always be made in concert with the patient, with full disclosure of the associated risks and benefits of therapy. Whether to receive treatment, however, ultimately remains the woman's choice. (Chapter 5)

- Targeting only "at-risk" pregnant women for HIV screening might be perceived as discriminatory and stigmatizing because African-American and Hispanic women and children have been disproportionately affected by the HIV epidemic. **The committee strongly opposes any HIV screening of pregnant women based on racial or ethnic background**. It is also concerned about screening that is narrowly focused on small geographic units. This type of screening could single out areas of highly concentrated HIV infection in women and children, which might engender further discrimination and stigmatization of already disenfranchised or disadvantaged populations. Geographic units selected for screening purposes should be sufficiently large (e.g., states or counties) to limit the opportunity for such discrimination and stigmatization.[3] (Chapter 5)
- A substantial number of HIV-infected women would necessarily be missed if a "selective" approach to prenatal HIV screening (offering testing only to a subset of pregnant women defined by self-acknowledged HIV risk behaviors) were pursued. For that reason, and in view of the favorable cost comparisons between "selective" and "universal" screening, a "universal" approach (offering testing to all pregnant women *within a particular geographic area*) is preferable. Universal prenatal screening would limit further discrimination and stigmatization because HIV testing would be offered to all pregnant women in an area without regard to risk status. Furthermore, it would not require that women disclose socially unaccepted or illicit behavior in advance of testing. **The committee recommends**

[3] See the discussion in Chapter 6.

voluntary HIV screening (with specific informed consent) for all pregnant women in high-prevalence areas.[4] The HIV test should be discussed with and offered to every pregnant woman seeking prenatal care in these areas; written informed consent should be a prerequisite to testing. Women who receive no prenatal care or who have not had an opportunity to be tested prior to delivery should be offered HIV testing at the time of labor and delivery or during the postpartum period. Additionally, in areas where prevalence levels may not warrant prenatal screening of all pregnant women at this time, health care providers should continue to offer voluntary HIV testing to pregnant women who have identified risk factors for HIV infection, in accordance with current HIV testing recommendations (e.g., those of the Centers for Disease Control, the American College of Obstetrics and Gynecology, and other such groups). (Chapter 5)

- **All pregnant women should be informed about HIV infection, its modes of transmission, risk-associated behaviors, and ways of reducing one's personal risk of infection**. (Chapter 5)
- The threshold prevalence approach (discussed in Chapter 6) involves a judgment about what HIV prevalence level among childbearing women must be reached before the yield from screening all pregnant women is considered sufficient to justify the costs of the screening effort. The committee found that data regarding the specific costs and benefits of HIV screening were inadequate to support the choice of one threshold prevalence value for use in all states. Rather, **the committee recommends that individual state (or county) public health authorities be the final judge of whether prenatal screening at various HIV seroprevalence levels is an efficient or appropriate use of resources, particularly in the likely event that other public health programs may be competing for the same pool of limited resources**. In most cases, state (or county) HIV seroprevalence rates among childbearing women *and* the availability of adequate resources for mounting a prenatal screening program should be considered together. (Chapter 6)
- **Formulating HIV screening policy through legislative or regulatory routes does not permit the flexibility and latitude required to respond to new developments in diagnostic technology and medical therapy, as well as to increased understanding of the pathogenesis and natural history of HIV infection in women and children**. Moreover, when screening policy is legislated, the ability to modify policy in response to screening program

[4] High-prevalence areas are defined in Chapter 6.

experience is limited. Therefore, **the committee recommends that prenatal HIV screening policy be implemented as a standard of medical practice, which constitutes a more malleable alternative to legislation or regulation and implies a threat of liability for health care provider noncompliance**. (Chapter 6)

- A thorough examination of the reproductive options available to an HIV-infected pregnant woman is an important task of the posttest counseling session. Traditionally (i.e., in the context of genetic screening), counselors have assumed a nondirective or neutral posture toward re-productive counseling, and the committee found no compelling reason to recommend a change in this stance in the context of HIV screening. **The committee affirms that reproductive counseling should validate the woman's right to make the reproductive choice that conforms to her personal values, beliefs, and desires**. Ultimately, the woman must decide whether to continue or terminate an existing pregnancy in the face of HIV infection. (Chapter 7)
- **In at least one instance, the committee recommends that a woman's HIV test result be shared-with her child's medical caregiver**. This prospect should be discussed with the woman during the informed consent process. The diagnosis of HIV infection in a mother has important implications for the clinical management and appropriate medical follow-up of her child. The mother should be informed, during the pretest counseling session and in advance of any disclosure, of the importance of releasing her HIV test results to the pediatric caregiver, and she should be encouraged to do so to provide more effective medical management of her infant. (Chapter 7)
- **A well-functioning, coordinated voluntary partner notification system should be an integral part of a prenatal HIV screening program and, if not already established, should be developed in parallel with screening**. A major benefit to such a system is that it provides another avenue to engage male partners in counseling and educational efforts connected with prenatal screening, as well as an opportunity to refer them for HIV testing and diagnostic evaluation. (Chapter 7)
- **The committee decries the inherent inadequacies in the current health services delivery and financing system and recognizes that prenatal HIV screening may identify more women and children who need care than the system can currently accommodate**. Nevertheless, it believes that the benefits of screening pregnant women for HIV infection in high-prevalence areas are sufficient to justify proceeding with program implementation,

even though the present health and social services infrastructure may not be completely adequate. (Chapter 7)

- **In mounting a screening program, state public health authorities must be firmly committed to the construction and expansion of health and social services for all HIV-infected women and children *in tandem* with screening program implementation; otherwise the necessary system of follow-up services is unlikely to be developed**. (Chapter 7)
- **The committee deplores discrimination against HIV-infected women and children in the provision of health care services**. State policymakers should assess the extent of such discrimination and develop a mechanism for expeditiously redressing any discriminatory actions. If HIV screening for pregnant women is to achieve its goals, there must be some assurance that identified women and their children will not be denied access to needed health care by virtue of their infected status. (Chapter 7)
- **Health care providers who offer HIV testing to their patients have an obligation to render appropriate treatment or to ensure that a referral is made and that such treatment is ultimately received**. Additionally, it is imperative that when a woman seeks care and is offered an HIV test, the provision of needed health services must not be contingent on submission to testing; that is, if a pregnant woman refuses to be tested, she should still be eligible to receive care. (Chapter 7)
- To fulfill the responsibility of securing a meaningful informed consent for HIV testing and for offering supportive counseling, health care providers will need instruction and training in a variety of areas related to HIV infection and its treatment. **Health care professional societies, training institutions, and public health authorities should cooperate to institute comprehensive HIV education and training, as well as continuing education programs, for the health professions** . (Chapter 7)
- The availability of high-quality laboratory facilities and qualified technicians to perform the HIV serologic test series on collected blood specimens is critical to a successful screening program. **The committee recommends, as part of any state-level screening effort, that states require laboratories to participate in a publicly sponsored (e.g, state or federal)**

quality assurance and performance evaluation program.[5] In addition, sates should be responsible for informing providers of the recommended laboratories to which they should forward their HIV test specimens. (Chapter 7)

- A well-articulated, carefully designed evaluation plan is an essential component of any prenatal HIV screening program and must be an integral part of program planning. A comprehensive evaluation process offers an opportunity to ascertain whether program goals have actually been achieved and whether they need to be modified. This ability to adjust program objectives and design is particularly important for HIV screening, given that diagnostic technology and medical therapy continue to evolve. The committee recognizes the considerable resources, talent, and effort that will be required to plan and conduct a thorough screening program evaluation. **Because prenatal HIV screening programs have national relevance and importance, federal support, in the form of additional funds specifically earmarked for evaluation, is needed to ensure careful monitoring and assessment of program effects**. (Chapter 7)

[5] States may seek guidance in monitoring laboratory quality assurance and performance from CDC's Model Performance Evaluation Program, which was developed to assess and improve the analytic quality of HIV-antibody testing.

1

INTRODUCTION

The changing face of the epidemic of human immunodeficiency virus (HIV) and acquired immune deficiency syndrome (AIDS) has caused policymakers and health planners to look carefully at the growing burden of disease among women and children. Concerns about these populations and the possibility of medical benefit from early identification of infection have led to proposals for prenatal and newborn HIV screening. To assess the appropriateness of such screening, the National Institute of Child Health and Human Development (NICHD) and the Centers for Disease Control (CDC) requested the Institute of Medicine to establish a committee to address this issue in light of both current needs and possible future developments and to offer guidance in the formulation of rational screening policy.

The Committee on Prenatal and Newborn Screening for HIV Infection began its deliberations in January 1989. Its membership included collective expertise in obstetrics, pediatrics, health law and medical ethics, epidemiology, genetic screening, public health, and health policy (see Appendix D). To supplement its expertise, the committee reviewed a variety of scientific, medical, and policy articles (see the list of references) germane to prenatal and newborn HIV screening policy; heard from pediatric and obstetrical experts during its four meetings on the diagnosis, course, and treatment of HIV infection in pregnant women and children; and convened a public conference to provide a broad view of the technical, legal, medical, and ethical questions inherent in screening policy development and implementation. Appendix A contains the program of the conference and a summary of its presentations and discussions.

In the quest for sound, reasonable HIV screening policy for pregnant women and newborns, the committee sought instruction from past experience with mass screening programs (see the discussion "Principles and Pitfalls of Mass Population Screening" in the conference summary in Appendix A). It also explored the general tenets and principles that have

guided program development in genetic screening (Lappé et al., 1972; National Research Council, 1975; President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, 1983) and public health screening (North, 1982). Consideration of the current magnitude of the problem of HIV infection and AIDS among women and children and the distribution of infection (see Chapter 2) provided perspective as the committee reviewed the various prenatal and newborn screening policy options. In addition, current HIV diagnostic capacity (in particular, the reliability and validity of available screening tools) and medical therapy for asymptomatic HIV-infected individuals framed discussions about the possible benefits of neonatal and prenatal screening, as well as their inevitable costs. The committee also evaluated the various forms that screening could take and the relative merits of the different approaches. Chapter 3 discusses the distinction between testing and screening, the technical characteristics (e.g., sensitivity and specificity) of screening tests, an algorithm for HIV testing, and the range of screening formats.

The committee carefully analyzed the potential goals of screening newborns for HIV infection and whether at present they could be accomplished. Several considerations guided this analysis—for example, the difficulty in differentiating (with available HIV-antibody tests) between newborns who are truly infected and those who only carry passively acquired maternal antibody, the uncertain magnitude of medical benefit from early therapeutic intervention and aggressive medical management of asymptomatic HIV-infected infants, and uncertainties regarding long-term therapeutic risks. Anticipating continued technological improvement in the ability to diagnose HIV infection in young infants and to treat asymptomatic infection in early infancy, the committee examined various developments that might lead to a shift in policy. Chapter 4 reviews the possible goals of neonatal HIV screening and includes the committee's judgment of whether these objectives are currently achievable. It also offers direction for future policy should HIV diagnostic technology and treatment for young infants improve.

The committee then assessed the likelihood that the potential goals of screening pregnant women for HIV infection could be achieved at this time. As pan of its assessment, the committee reviewed extant HIV testing recommendations (CDC, 1987a; American Academy of Pediatrics, Task Force on Pediatric AIDS, 1988; American College of Obstetrics and Gynecology, 1988; American Medical Association, 1989) for pregnant women with identified risk factors for infection. It also considered whether there were circumstances that might warrant an extension of these recommendations to all pregnant women in defined geographic areas without regard to risk status for the benefit of early diagnosis and

treatment of infection. Current treatment options and standards of care for HIV-infected nonpregnant adults also provided a framework for evaluating the possible clinical benefits for pregnant HIV-infected women identified through screening. Additionally, the committee was mindful of the need to weigh carefully the benefits and costs of conducting prenatal HIV screening. Apart from the personal costs (i.e., psychological and social ramifications for the individual), there are societal costs that include the possible diversion of resources from other health programs to support the screening effort. Whether limited health care dollars should be spent on HIV disease in preference to other pressing and underfunded health problems is a complex economic, ethical, legal, and political question. Some might interpret the committee's recommendation for prenatal HIV screening as suggesting that this effort should be a preferred use of limited funds. In fact, the committee did not have the resources or the charge to conduct an economic analysis of this issue. Its conclusion, therefore, is unavoidably predicated on untested assumptions about the efficient and fair allocation of health resources. Chapter 5 distills the committee's deliberations on screening pregnant women for HIV infection and presents the resulting conclusions and recommendations.

The epidemiological underpinnings of prenatal screening policy formulation and the committee's suggested methodologies for ascertaining when such screening is epidemiologically justified are discussed in Chapter 6. The chapter also reviews the committee's recommended approach to policy implementation. Chapter 7 lays out the specific components (e.g., education and counseling, partner involvement and notification, services infrastructure for HIV-infected women and children, health care provider education and training, laboratory capacity, and program evaluation) of a prenatal HIV screening program that should be considered before screening is initiated.

Throughout its deliberations, the committee was constantly aware that the conclusions and recommendations it was making would need to be reevaluated in the future. HIV policymaking is by definition a dynamic process that requires diligent attention to technological developments and changing epidemiological trends.

2

DESCRIBING THE EPIDEMIC OF HIV INFECTION AND AIDS AMONG WOMENAND CHILDREN IN THE UNITED STATES

As the epidemic of HIV infection and AIDS in the United States continues, the recent shifts in demographic trends and geographic patterns of HIV disease become more pronounced. The dimensions of HIV infection among women and children in particular now appear in bold relief. Increasingly, policymakers are coming to appreciate the magnitude of the problem of HIV disease in these populations and the disproportionate impact that the epidemic is having on women and children of color. An understanding of the epidemiology of HIV infection and AIDS among women and children and sensitivity regarding the character and needs of the communities most affected are necessary to guide the development of sound perinatal HIV screening policy.

EPIDEMIOLOGY OF HIV INFECTION AND AIDS AMONG WOMEN

Data on AIDS cases and HIV seroprevalence (i.e., prevalence of infection) delineate the epidemiology and scope of HIV disease among women.[1] AIDS case surveillance provides useful information on gross trends in the epidemic, but these data do not fully indicate the current burden of infection among women or possible future epidemic trends. AIDS is the final clinical stage of HIV infection —a disease that has a lengthy incubation period (the estimated median is at least 8 to 9 years) from initial infection to the development of overt illness. HIV seroprevalence data, therefore, more accurately reflect the extent of infection among

[1] This overview of the epidemiology of HIV infection and AIDS among women and children is based on material presented at the conference by Tedd Ellerbrock and Marta Gwinn of the Centers for Disease Control.

women because they capture not only those women who have recently been infected and remain asymptomatic but also those who have symptoms that do not meet the AIDS case definition. AIDS and HIV prevalence data are generally presented by demographic category. Yet it is important to recognize that membership in a particular racial or ethnic group does not in itself constitute a risk factor for HIV infection. Rather, behavioral (e.g., sexual and drug-using practices) and social (e.g., poverty, lack of education) factors contribute to the differential distributions of infection.

In 1989, eight years after the first report of a woman with AIDS, the number of cases of AIDS among women exceeded 10,000, accounting for roughly 9 percent of all reported cases in the United States. In addition, women constituted a growing proportion of all adult AIDS cases during this time period. Prior to 1984, women accounted for only about 7 percent of such cases; in 1989 the percentage had increased to slightly more than 10 percent. Through September 1990, 14,452 cases of AIDS had been reported among women, and approximately one-third of these cases were reported in the previous year (CDC, 1990).

Unlike the majority of cases among men, AIDS among women is inextricably linked to intravenous (IV) drug use. Of the 71 percent of female adult cases associated with IV drug use, 51 percent of these women were IV drug users themselves and 20 percent were sexual partners of IV drug users. Overall, 32 percent of women with AIDS reported sexual contact with high-risk male partners (including IV drug users). The impact of IV drug use can also be seen in the geographic, racial, and age distributions of women with AIDS. In fact, IV drug use may be the principal determinant of the demographic patterns that have been observed thus far. Although states along the Atlantic coast (as well as the District of Columbia and Puerto Rico) still have the highest concentration of AIDS cases among women, current data indicate that such cases are now appearing beyond these boundaries. (In fact, all states except North Dakota have reported cases among women.) Women with AIDS are still found predominantly in large metropolitan areas (populations greater than 1 million), largely because of the connection to drug use; however, small to medium-sized cities (populations between 50,000 and 1 million) and rural or nonmetropolitan areas (populations less than 50,000) are reporting growing proportions of cases.

Women of color have been disproportionately affected by the disease—approximately 52 percent of women with AIDS are black, 20 percent are Hispanic, and 27 percent are white. These proportions have not changed substantially since 1984. As a result, black and Hispanic women have cumulative AIDS incidence rates, respectively, that are 13 and 9 times that of white women.

In contrast to AIDS, specific trends in the prevalence of HIV infection among women are difficult to establish because of limited data. Several cross-sectional, blinded (i.e., anonymous) seroprevalence studies, however, have described general distribution patterns. Surveys of women attending family planning, prenatal, and abortion clinics indicate a median prevalence rate of 0.2 percent (or about 2 infected women per 1,000 women), with a range of 0 to 2.3 percent.[2] Seroprevalence among women seeking clinic services varied markedly by age and race or ethnic group, as well as by geographic location (Sweeney et al., 1990).

Recent surveys of women attending sexually transmitted disease (STD) clinics have found substantially higher seroprevalence rates than were found among family planning, prenatal, and abortion clinics. [3] The median prevalence rate among STD clinics was 0.8 percent (or about 8 infected women per 1,000), with a range of 0 to 13 percent; nearly one-fifth of the clinics had rates of 5 percent or greater. The elevated prevalence of infection among STD clinics is not surprising because many of the individuals attending such clinics are likely to have multiple sexual partners and therefore to be at increased risk for infection (Shapiro et al., 1989).

The highest HIV prevalence rates have been found among women who are IV drug users. Surveys of women who enter drug treatment centers reveal a median prevalence rate of 4.7 percent (i.e., nearly 50 infected women per 1,000), with a range of 0 to 47 percent.[4] Most striking, however, was the wide geographic variation in prevalence observed among these centers. For example, among treatment centers in the northeastern United States, the median prevalence rate was 24 percent; in other parts of the country, the median rate was only 3 percent. Since 1988 CDC has collaborated with state health departments and NICHD to conduct a population-based seroprevalence survey of childbearing women. The survey involves collecting filter-paper blood samples from newborn infants for routine metabolic screening and anonymously testing them for HIV antibodies (Pappaioanou et al., 1990). (Because all infants are born with passively acquired maternal antibodies, anonymous newborn screening is a surrogate measure of maternal infection.) These surveys are unique among large-scale seroprevalence surveys because they provide relatively

[2] As of October 1989, more than 100,000 blood specimens had been tested from 130 clinics in 31 cities.

[3] As of September 1989, more than 80,000 total specimens had been tested from 92 publicly funded STD clinics in 39 metropolitan areas.

[4] This finding is based on blinded testing, since the first quarter of 1988, of approximately 16,000 IV drug users entering 65 treatment centers in 27 metropolitan areas (Allen et al., 1990).

unbiased estimates of HIV prevalence in a well-defined population of women.

These studies have highlighted the concentration of HIV infection among childbearing women along the Atlantic coast. Yet HIV infection among childbearing women has been detected outside the major metropolitan areas and in all regions of the country. In addition, considerable variation in seroprevalence has been observed both among states and within individual states. For instance, the seroprevalence rate among childbearing women in San Francisco during 1989 was 1.3 infected women per 1,000 childbearing women, nearly twice that of the state of California. In Chicago, the seroprevalence rate was 1.6 per 1,000, considerably higher than the state of Illinois' rate of 0.3 per 1,000. In several metropolitan areas along the East Coast, including New York City and Newark, nearly 1 percent of all women delivering infants were HIV positive. This geographic variation in seroprevalence reflects in part the differential distribution of behaviors that place persons at risk for infection—for example, the concentration of IV drug use and related risk behaviors (e.g., sexual contact with IV drug users) in urban centers in the Northeast (Shapiro et al., 1989).

Age-specific data for HIV seroprevalence among women are limited Several studies in the New York City area and studies of military applicants and blood donors have shown that prevalence rates are highest for young adult and middle-aged women (Shapiro et al., 1989). HIV infection and AIDS among women appear to affect predominantly those of reproductive age. In fact, about 85 percent of women with AIDS have been between the ages of 15 and 44 at the time of diagnosis. Consequently, HIV infection and AIDS (grouped collectively for this purpose as HIV disease) have become an important cause of mortality for this group. Although the death rate for most leading causes of mortality among women aged 15 to 44 remained stable over the past decade, the death rate from HIV disease continued to increase and in fact quadrupled between 1985 and 1988. In 1987, HIV disease became the eighth leading cause of death among women of reproductive age. If current trends continue, it is expected to become one of the five leading causes of mortality by 1991 in women of reproductive age (Chu et al., 1990).

The number of AIDS cases among women is likely to continue to increase rapidly, at least for the next few years. Extrapolating from AIDS case surveillance data, it is estimated that 5,000 AIDS cases were diagnosed among women in 1989. In 1991, health officials estimate that 7,000 to 9,000 cases will be diagnosed among women; in 1993, they anticipate between 9,000 and 15,000 cases.

EPIDEMIOLOGY OF HIV INFECTION AND AIDS AMONG CHILDREN

As of 1990, CDC estimated that between 5,000 and 10,000 children in the United States were infected with HIV. Through September 1990, 2,628 cases of AIDS had been reported among children under 13 (roughly 2 percent of all reported cases); about 30 percent of them were reported in the previous year. Of the remaining infected children in the CDC estimate (approximately 2,500 to 7,500), some have continued to be asymptomatic or have died from other causes. Still others have developed HIV-related illness that does not meet the AIDS case definition. Some may have developed AIDS but not yet been reported.

The epidemiology of AIDS among children tends to mirror the larger epidemic in women because most children with AIDS have been infected perinatally. (The risk of exposure to HIV through infected blood or blood products has been largely eliminated.) As of September 1990, more than 80 percent of children with AIDS were reported to have acquired HIV infection perinatally.

Perinatal AIDS cases are still heavily concentrated along the East Coast and in Puerto Rico. To date, however, all but six states have reported at least one case. In 1982, New York, New Jersey, and Florida were the only three states reporting AIDS cases attributable to perinatal transmission. Yet in 1989, these three states accounted for just over half of all perinatal AIDS cases, indicating that the epidemic is clearly spreading beyond these areas.

The AIDS epidemic has affected predominantly children of racial and ethnic minorities. Black children accounted for 58 percent of all perinatally acquired AIDS cases reported in 1989; children of Hispanic origin accounted for 26 percent. Compared with white children, the rate of reported AIDS cases was 16 times higher for black children and 8 times higher for Hispanic children. In addition, children with AIDS are often members of families in which IV drug use is prevalent. Approximately 60 percent of pediatric AIDS cases reported through September 1990 were associated with IV drug use—42 percent of the cases with maternal drug use and 17 percent with maternal sexual contact with an IV drug user.

Although long-term trends in perinatally acquired HIV infection are difficult to predict given current data, some estimates can be made over the short term of the number of infants newly infected with HIV and the number expected to develop AIDS. These estimates are derived from information on HIV seroprevalence among childbearing women, birth

statistics, and the estimated rate of perinatal transmission.[5] Based on seroprevalence data from 25 states,[6] CDC estimates that there were about 1.5 HIV-infected women per 1,000 women delivering live infants in the United States in 1989, which translates to approximately 5,900 births to seropositive women during a 12-month period. Assuming that 25 to 35 percent of these infants were actually infected, an estimated 1,500 to 2,100 new cases of perinatally acquired infection occurred in one year, with the total number probably closer to 1,750 (Gwinn et al., 1990). This figure exceeds the total number of all cases of perinatally acquired AIDS reported from 1981 through 1989. Even if the incidence of perinatal infection remains stable over the next several years, each birth cohort of HIV-infected children will continue to contribute to the number of newly diagnosed AIDS cases for the next several years. Thus, one could expect increasing numbers of children to develop AIDS each year, at least over the short term.

[5] Current estimates of the perinatal transmission rate, which range from 25 to 35 percent (European Collaborative Study, 1988; Italian Multicentre Study, 1988; Blanche et al., 1989), are derived from prospective, follow-up studies of infants born to HIV antibody-positive mothers. Because such studies are difficult to conduct, these estimates are still somewhat uncertain.

[6] These states accounted for about 69 percent of all births in the United States and about 86 percent of all perinatal AIDS cases reported to date. As a result, national estimates have been weighted accordingly.

3

SCREENING FOR HIV INFECTION

The widening epidemic of HIV infection and AIDS among women and children has prompted consideration of various HIV screening proposals for pregnant women and newborns. In any discussion of such screening, it is important to distinguish between what is meant by screening and what is meant by testing. In the public health lexicon, screening generally refers to the application of a test or measurement (in this case an HIV-antibody test) to all individuals in a defined *population* . Most often, screening is instituted for the purpose of identifying a previously unknown or unrecognized condition in apparently healthy or asymptomatic persons and offering presymptomatic treatment to those so identified. Historically, screening has also been implemented for two other purposes: (1) to offer counseling to individuals at reproductive risk for producing affected offspring and (2) to conduct research, including enumeration (i.e., surveillance), natural history studies of a disorder, or recruitment of potential subjects for experimental treatment protocols.[1] Additionally, screening for infectious conditions can provide an opportunity to initiate prevention activities that may limit or reduce the spread of infection. Testing is the application of a test or measurement to selected *individuals*. With regard to HIV, screening means that the HIV-antibody test is offered to all individuals within a defined population. In the case of testing, individuals with clinical findings suggestive of HIV infection or behavioral risk factors for HIV exposure are offered the HIV test. [2]

Before a screening program is undertaken, its goals must be dearly specified and shown to be achievable. For example; if the purpose of

[1] More detailed discussions of the specific goals of screening newborns and pregnant women for HIV infection appear in Chapters 4 and 5, respectively.

[2] The committee recognizes that the concepts of "screening" and "testing" can be somewhat ambiguous. Screening, for example, is ultimately conducted among individuals, and testing, if widely practiced by health care providers, can be indistinguishable from screening.

screening is early diagnosis and treatment of a particular condition, effective therapy must be available for asymptomatic individuals. In addition, there must be a test or measurement that distinguishes those individuals who are likely to have the condition from those who are unlikely to have it.[3] Also to be considered is the availability of resources and facilities to collect and process test specimens, as well as to provide the range of follow-up services for affected individuals identified through screening. Provisions for evaluation must be incorporated into the initial design and development of the program. (See the discussion in Chapter 7 of the elements of a screening program.) Finally, the benefits of identifying and treating individuals early in the course of disease must be carefully weighed against the costs—both personal (e.g., clinical, psychological, and social ramifications for the individual) and societal (e.g., the actual costs of screening and subsequent medical evaluation and treatment, potential consumption or diversion of resources from other public health or social programs).

TECHNICAL CHARACTERISTICS OF A SCREENING TEST AND THE HIV TESTING ALGORITHM

Among the characteristics that must be considered in assessing the performance and utility of a test, particularly for screening purposes, are its sensitivity, specificity, and predictive value. Sensitivity is the ability of a test to detect the condition of interest in those individuals who truly have that condition. **Specificity**, on the other hand, reflects the ability of a test to exclude those who do *not* the condition. In the case of HIV infection, sensitivity refers to the probability that the test will be positive if infection is present; specificity indicates the probability that the test will be negative if infection is absent The predictive value of a test reflects false-positive and false-negative results. The **predictive value** of a positive test is the probability that an individual is infected, given that the test result is positive; the predictive value of a negative test is the probability that an individual is not infected, given that the test is negative. The predictive value of any test will vary according to the prevalence of the condition in the population being studied (Tables 3-1a and 3-1b). For example, the predictive value of a positive test diminishes with declining

[3] A screening tool identifies individuals who are at increased risk of having a particular condition. A positive screening test result, therefore, does not necessarily signify the presence of the condition. Rather, it indicates the need for further evaluation of the individual through available diagnostic techniques.

TABLE 3-1a Predictive Value of a Repeatedly Reactive Screening Test for Asymptomatic HIV Infection with a Prevalence of Infection in the Population of 0.2 Percent

	Actual Condition		Totals		Predictive Value
Test Result	Infected	Not Infected	Number	Percent	(percent)
Reactive	196	998	1,194	1.2	16.4
Nonreactive	4	98,802	98,806	98.8	99.99
Totals	200	99,800	100,000	100.0	

Note: Assumptions-test sensitivity, 98.0 percent; test specificity, 99.0 percent.
SOURCE: Allen (1988:425).

TABLE 3-1b Predictive Value of a Repeatedly Reactive Screening Test for Asymptomatic HIV Infection with a Prevalence of Infection in the Population of 20 Percent

	Actual Condition		Totals		Predictive Value
Test Result	Infected	Not Infected	Number	Percent	(percent)
Reactive	19,600	800	20,400	20.4	96.1
Nonreactive	400	79,200	79,600	79.6	99.5
Totals	20,000	80,000	100,000	100.0	

Note: Assumptions-test sensitivity, 98.0 percent; test specificity, 99.0 percent.
SOURCE: Allen (1988:425).

prevalence; hence, the proportion of positive test results that are liable to be falsely positive is likely to increase.

The serological tests most commonly used to diagnose HIV infection are the Enzyme-linked Immunosorbent Assay (ELISA) in combination with the Western Blot. The ELISA is reliable, relatively inexpensive, and easy to perform—it is therefore appropriate for screening purposes. The Western Blot is used to confirm the results of the ELISA. The ELISA, which detects antibodies to virus antigens (i.e., HIV vital proteins), is first performed on the patient's serum. If the test is positive (i.e., "reactive"), it is repeated on the same blood sample. If positive again, the specimen is referred to as "repeatedly reactive" on the ELISA. Before the test can be considered truly positive, however, the specimen must be subjected to a more specific confirmatory test (usually the Western Blot), which is used to validate the ELISA test result—to determine whether the ELISA reactive

specimen is a true or false-positive result. A repeatedly reactive ELISA test that is confirmed positive by a Western Blot is generally diagnostic of HIV infection and can be reported as positive.

FORMAT OF A SCREENING PROGRAM

Screening programs can take various forms: mandatory, voluntary with fight of refusal, or voluntary with specific informed consent.

- Mandatory screening means that all individuals within a defined population are tested without an opportunity for refusal.
- Voluntary screening with right of refusal means that each individual within a defined population is informed that the test will be performed unless he or she explicitly refuses.
- Voluntary screening with specific informed consent means that each individual within a defined population is informed that the rest is available but that it will be performed only with a person's specific informed consent.

Mandatory HIV testing and screening have not been generally implemented in this country for civilian, noninstitutionalized populations or populations at risk. Such programs have been rejected largely because of the powerful psychological and social impacts (including the threat of discrimination in employment, housing, access to health care, and insurance, as well as stigmatization and ostracism by friends, family, and others) that an antibody-positive test result may produce for an individual.[4] In light of these potentially adverse social consequences, the HIV test (unlike, for example, a complete blood count [CBC]) does not qualify as a benign, routine medical test that may be performed under the conditions of general or presumed consent, which govern many, but not all, tests routinely conducted in medical practice (Livine and Bayer, 1989).[5] Thus, **the committee concludes that individuals (or their legally recognized representatives) should have the right to consent to or refuse HIV testing (except when such testing is conducted anonymously for epidemiological**

[4] Screening in populations with a low prevalence of infection is also likely to yield an increased proportion of false-positive results (see Tables 3-1a and 3-1b).

[5] Presumed consent generally means that when a patient supplies urine or allows blood to be drawn in the medical setting, he or she agrees to the routine testing of these materials (Levine and Bayer, 1989).

purposes).[6] The committee found no compelling evidence to suggest that women and children should constitute an exception to this principle.

History has revealed that mandatory screening programs are frequently inflexible, often because they are legislated, and that program modification over time proves difficult. HIV testing and screening policies must be responsive to advances in diagnostic technology, scientific understanding of the disease, and medical therapy. Voluntary HIV screening (with specific informed consent) permits greater flexibility than mandatory screening in accommodating change.

The committee opposes any mandatory newborn or prenatal HIV screening program (other than anonymous screening for surveillance purposes). The following discussions, therefore, focus primarily on voluntary HIV screening—in particular, whether at this time such screening is warranted for pregnant women or newborns.

[6] There may be rare circumstances in which this right might be overridden, such as in court-ordered testing, for a compelling state interest.

4

NEWBORN SCREENING FOR HIV INFECTION

Proposals for newborn HIV screening have cited several possible goals: (1) identification of potential HIV infection in the neonate in order to provide early therapeutic intervention and more aggressive medical management, (2) modification of routine pediatric immunization practices, (3) prevention of horizontal HIV transmission (from infant to caretaker or medical provider), (4) enhancement of epidemiological research, including surveillance and natural history studies, and (5) identification of maternal infection. The committee carefully examined these goals in the context of the current state of the art in HIV diagnostic technology and medical therapy for HIV-infected infants and children. The following section presents the committee's assessment of and conclusions regarding whether the above goals could reasonably be achieved through neonatal HIV screening

EARLY THERAPEUTIC INTERVENTION FOR ASYMPTOMATIC HIV-INFECTED CHILDREN

The major goal of screening newborns for HIV infection is improvement, through early medical intervention, of the duration or quality of HIV-infected infants' lives. Considerable medical and scientific debate has centered on whether this objective can be realized. The controversy stems from difficulties in quantifying the level of medical benefit associated with early therapeutic intervention (both antiretroviral therapy and prophylaxis against opportunistic infection) for asymptomatic HIV-infected children. Research has shown that zidovudine (AZT) therapy in children with symptomatic HIV infection and AIDS may lead to improvements in weight and growth parameters and in neurological and immunologic function, and

may even prolong life (McKinney et al., 1990; Pizzo, 1990).[1] Zidovudine now constitutes standard therapy for children with AIDS. In addition, clinical trials of zidovudine among asymptomatic HIV-infected adults (with CD4+ cell counts below 500) suggest that early intervention delays the progression of disease (Volberding et al., 1990). Whether such benefits will be found among asymptomatic HIV-infected children, especially newborns, is unknown. The short-or long-term therapeutic risks for infants and children may also be different from those for adults. Similar uncertainty surrounds prophylactic therapy for *Pneumocystis carinii* pneumonia (PCP), one of the most common and devastating opportunistic infections affecting perinatally infected children (Scott, 1989). PCP prophylaxis has been effective for HIV-infected adults (CDC, 1989b) and for pediatric cancer patients (Hughes et al., 1977, 1987); there is reason to believe that HIV-infected children may derive comparable benefits, although this assumption is unconfirmed at this point.

LIMITATIONS IN HIV DIAGNOSTIC TECHNOLOGY FOR INFANTS

Even if early therapeutic intervention confers some benefit to HIV-infected infants, deciding who to treat in early infancy is problematic, HIV-antibody tests are currently the most appropriate instrument for screening purposes, but these tests do not differentiate truly infected neonates from those who are uninfected. (All babies born to HIV-infected mothers carry passively acquired maternal antibodies, which may persist for up to 15 months of age; only about one-third of such infants are actually infected.) Both HIV p24 antigen tests and virus culture have been used to diagnose HIV infection in adults and children; however, their relative insensitivity in young infants makes them inappropriate for use as screening tools.[2] Several other tests are under investigation (e.g., assays for IgM and IgA HIV antibodies, which do not cross the placenta [Weiblen et al., 1990]; in vitro HIV antibody production [Amadori et al., 1988]; polymerase chain reaction [Rogers et al., 1989]) that may eventually be useful in the early diagnosis of HIV infection in infants, but these tests require more extensive development and evaluation before they are ready

[1] In May 1990, the Food and Drug Administration (FDA) granted marketing approval of zidovudine for use in HIV-infected children over three months of age who had HIV-related symptoms or who were asymptomatic with laboratory evidence of significant HIV-related immunosuppression.

[2] The presence of p24 antigen indicates infection with HIV; however, it is not commonly measurable in young infants and therefore is not sufficiently sensitive in neonatal diagnosis. Similarly, although a positive virus culture in infants confirms HIV infection, a negative culture is not sufficient to exclude it (Husson et al., 1990; Pizzo, 1990).

for wide-scale use. In particular, their reliability and validity need to be established, as do guidelines for their interpretation. There are also practical considerations (e.g., cost, specialized laboratory expertise, time required to perform the test) in the wider application of such assays.

In view of the limitations of current serological tests in distinguishing infected infants from those who merely carry maternal antibody, a logical question is, should all HIV-seropositive infants (approximately two-thirds of whom are likely to be uninfected) be treated prophylactically to ensure that those who actually are infected receive early treatment? Many pediatric experts believe that, in the absence of known HIV infection, HIV-antibody-positive infants should not receive antiretroviral therapy or PCP prophylaxis as a matter of course. These therapies are not without toxicity, and prescribing them for all seropositive infants means that uninfected children would be exposed to substantial toxicity without deriving any medical benefits. Moreover, the potential long-term toxicity of such exposure is still uncertain, particularly for infants.

AGGRESSIVE MEDICAL MANAGEMENT OF HIV-SEROPOSITIVE INFANTS

Some experts argue that knowing a child is "potentially" infected (i.e., HIV seropositive) at birth would lead to more aggressive medical management and possibly earlier detection of disease. Part of the support for this view comes from an understanding that subtle indications of progressive immunologic impairment and clinical illness may be present well before more serious symptoms of HIV disease are manifest. For example, although the common wisdom has been that PCP presents as a fulminant, full-blown pneumonia in HIV-infected infants (which may be fatal), recent anecdotal evidence suggests that, in retrospect, many infants who initially developed PCP had early, subtle manifestations of HIV infection, such as neurodevelopmental abnormalities, failure to thrive, and persistent thrush, well before they succumbed to pneumonia (Connor et al., 1990). If seropositive infants are carefully monitored from birth, it is argued, signs and symptoms that may herald the onset of more severe opportunistic infections can be identified early and treated more vigorously. The magnitude of benefit derived from such intensive primary care and early medical intervention is still uncertain. Quality of life may well be improved, but it is unclear whether careful follow-up and aggressive medical management of seropositive children would actually lead to better prognosis for those children who are truly infected. Many, if not most, of these infants are likely to be classified as at risk for reasons other than exposure to HIV (e.g., maternal drug use, socially disadvantaged circumstances); consequently, they should be candidates for intensive primary

care regardless of their HIV-antibody status. It is unclear, therefore, what would be done differently for these infants if HIV infection were suspected.

Given present uncertainty regarding the benefits and risks of early therapeutic intervention for asymptomatic HIV-infected infants and the difficulty in distinguishing infants with only internal HIV antibody from those who are truly infected, the committee concludes that, at present, insufficient medical benefits have been demonstrated from newborn HIV screening to justify its implementation. All infants at risk of adverse health outcomes because of poverty, social circumstances, or parental risk factors would benefit from comprehensive primary care. The rationale that HIV screening will identify infants for intensive primary care is not sufficient by itself to warrant screening of all newborns. Nevertheless, the committee encourages providers and medical centers to develop an aggressive primary care system for all infants at increased risk of adverse health outcomes.

The committee also opposes newborn HIV screening because it is tantamount to involuntary maternal screening in that testing newborns for HIV antibodies reveals their mothers' infection status. Using newborn HIV screening to identify HIV-infected mothers would also mean that postpartum women currently would be the only civilian, noninstitutionalized adult population not given the opportunity to consent to or refuse HIV testing, an outcome that is ethically unacceptable.

OTHER CONSIDERATIONS FOR NEWBORN HIV SCREENING

Three additional arguments for newborn IV screening (secondary to the potential for early therapeutic intervention) have been proposed. First, knowing that a child is "potentially" infected with HIV may trigger modifications in pediatric immunization schedules—for example, administering inactivated poliovirus vaccine rather than oral poliovirus vaccine (OPV). As a justification for screening, this rationale lacks strength: there is little empirical evidence to indicate that the adverse neurological sequelae theoretically associated with the administration of OPV in HIV-immunocompromised children actually occur (CDC, 1986; McLaughlin et al., 1988).[3] Second, identifying neonates at risk of HIV infection may prevent horizontal transmission. Yet transmission of HIV from young children to caretakers is extremely rare (Rogers et al., 1990), and prudent

[3] It is currently recommended that children with known HIV infection receive inactivated poliovirus vaccine because it eliminates the theoretical risks to the child and the possibility of secondary vaccine virus spread to immunocompromised family members (CDC, 1989a).

use of infection control techniques in handling blood and body fluids from *all* patients (CDC, 1987b) would further minimize the risk of transmission in the health care setting. Finally, neonatal HIV screening could enhance the conduct of natural history studies of perinatally acquired HIV infection and the follow-up of seropositive but uninfected infants for evidence of any long-term adverse effects of perinatal HIV exposure. None of these reasons are sufficient to justify screening newborns for HIV infection at this time, particularly in the absence of clearly safe, effective early therapeutic intervention for HIV-infected infants.

Yet despite the committee's objections to newborn HIV screening at this time, it recognizes that there may be circumstances warranting *individual* HIV testing of a newborn for medical reasons. For example, when a health care provider has reason to suspect that an infant is at increased risk of infection but the infant's mother is not competent or available to consent to testing for herself, HIV-antibody testing of the infant may be indicated to manage the infant's care more effectively. In this case, the decision to test should be based on the provider's clinical judgment and assessment of the infant's overall medical condition. As is generally the case, someone who is authorized to speak for the child must consent to testing or treatment, unless there is a medical emergency. If a parent is unable to consent to necessary medical care, an alternate guardian should be sought.

Finally, **the committee endorses the continuation of *anonymous* newborn HIV screening for surveillance purposes**. This approach provides unbiased epidemiological data for monitoring national and local trends in the distribution of HIV infection, particularly among childbearing women. These data are also useful in planning and evaluating public health interventions, targeting community outreach and prevention campaigns, and anticipating health care resource needs.

REEVALUATING NEWBORN HIV SCREENING POLICY

In light of evolving HIV diagnostic technology and medical therapy, it is clear that current recommendations regarding newborn HIV screening should be periodically reevaluated. In anticipation of such a need, the committee considered several possible developments that might lead to modification of its present conclusions.

If safe, effective antiretroviral therapy or prophylactic treatment for opportunistic infection *and* a definitive diagnostic screening tool for newborns were available, the argument for voluntary newborn HIV screening with "fight of refusal," to ensure that all infants who would benefit from early intervention were identified and treated, would be

compelling. In such circumstances, the parent or legal guardian would be informed that, unless he or she expressly refused, the newborn would be tested; effective treatment for the infant would also be offered. This scenario is consistent with the long tradition of voluntary screening with "right of refusal" for devastating neonatal conditions for which effective therapy is available (e.g., phenylketonuria). [4]

A definitive diagnostic test for neonatal HIV infection, in the absence of additional therapeutic advances, might also change the current situation dramatically. A valid, reliable screening test would make the requirements for therapeutic efficacy less stringent because the risk of exposing uninfected infants to potentially toxic therapy would be diminished. For instance, even if available drug therapy proved only moderately effective, voluntary newborn HIV screening (with specific informed consent from the parent or legal guardian) might be appropriate because infants who would benefit from early treatment could be precisely identified in the first few days or weeks of life.

In the absence of a definitive diagnostic screening tool, however, voluntary newborn HIV screening might also be justified by the availability of safe, effective treatment that cured infection. In eliciting parental informed consent for newborn testing, it would be important to discuss the inherent limitations in neonatal diagnosis (i.e., that testing the newborn reveals maternal infection but does not confirm neonatal infection). Moreover, whether to expose potentially uninfected infants to unknown therapeutic risks in order to derive therapeutic benefits for truly infected infants is a question that must be weighed carefully. For example, if such therapy were relatively benign, more benefit might be derived from administering it uniformly to all seropositive infants to ensure that those who were truly infected received early treatment. Above all, the providers decision to treat a seropositive infant (without known infection) should be made in concert with the parent or parents and include complete disclosure of the known risks and benefits of such therapy.

Without a precise diagnostic screening tool, voluntary newborn HIV screening might also be warranted if early therapeutic intervention (e.g., antiretroviral therapy that delayed the progression of infection or extended the lives of asymptomatic children, or effective prophylaxis against opportunistic infection) was shown to provide clear medical benefit to HIV-infected infants. The same information described above regarding the limitations in neonatal diagnosis should be conveyed to the parents. In addition, because it is likely that any effective drug therapy (whether curative, as in the earlier scenario, or ameliorative) would be sufficiently

[4] For a detailed review of state newborn screening programs and the laws and regulations governing such programs, see Andrews (1985).

toxic to warrant caution in prescribing it for all HIV-seropositive infants, the risks and benefits of treating versus not treating should be weighed individually in consultation with the parent or parents. The potential unknown long-term toxicity of such therapy should also be considered. Finally, decisions regarding initiation of therapy should take into account the heterogeneity of the clinical course of HIV disease in perinatally infected infants—for instance, most infants will develop symptoms within the first year or two of life, whereas some will remain asymptomatic for a number of years.

5

PRENATAL SCREENING FOR HIV INFECTION

There are several possible goals of an HIV screening program for pregnant women: (1) prevention of vertical and horizontal transmission of HIV infection, (2) a more informed basis for reproductive decision making, (3) early diagnosis and treatment of HIV infection in women and their children, and (4) enhancement of epidemiological and treatment research among HIV-infected women and children. Whether any or all of these goals can be accomplished through prenatal HIV screening is a central question in the development of screening policy. To understand what can realistically be expected from such a program and to assess its appropriateness require close scrutiny of the potential objectives of prenatal HIV screening. This chapter offers the committee's judgment on the likelihood that these goals currently could be achieved through HIV screening of pregnant women and the consequent recommendations.

EFFECTS ON VERTICAL HIV TRANSMISSION

Preventing vertical transmission of HIV infection from mother to infant appears to be a desirable objective of prenatal HIV screening. Yet the limited studies to date offer little evidence to suggest that knowledge of HIV infection status significantly affects women's decisions regarding continuation of a pregnancy or future childbearing (Barbacci et al., 1989b; Kaplan et al., 1989; Schneck et al., 1989; Selwyn et al., 1989a; Johnstone et al., 1990; Sunderland, 1990). The relationships among knowledge of infection, perceived risk of perinatal transmission, and reproductive behavior are not simple ones. Personal, familial, and cultural values and beliefs often shape perceptions of individual risk, and these forces tend to influence reproductive decision making more than abstract notions of probabilities. Some HIV-infected women may view a roughly 25 to 35

percent chance of transmitting the virus to their infant as an acceptable risk and choose to become pregnant or continue an existing pregnancy. Counselors and researchers have also observed that some HIV-infected women may, in fact, deny their illness and the possible impact it may have on their pregnancy and their child (Wofsy, 1987; Sunderland, 1990). Still another possibility is that some women, confronted with the reality of progressive HIV infection and their own mortality, may consider a child to be their final legacy (Selwyn et al., 1989a; Sunderland, 1990). In light of the apparently limited influence that knowledge of HIV infection has on current and future childbearing decisions, a substantial reduction in vertical transmission of HIV is not likely to be accomplished through prenatal screening. Therefore, the argument that screening could reduce vertical transmission does not by itself constitute sufficient justification for instituting HIV screening of pregnant women at this time. If successful chemoprophylaxis or immunotherapy to prevent perinatal HIV transmission becomes available in the future, the prevention of vertical transmission might then be an achievable goal of prenatal screening.

EFFECTS ON HORIZONTAL HIV TRANSMISSION

Screening pregnant women for HIV infection may play a role in decreasing horizontal transmission of HIV to their partners. Yet here again the connection between an awareness of HIV infection status and behavioral change is unclear, in part because of insufficient data from which to draw conclusions about this relation. In specific populations, there is some evidence to suggest that HIV-antibody testing and counseling may be useful in facilitating change in certain risk-associated behaviors (Coates et al., 1988; Turner et at., 1989). Most of the available studies, however, have been conducted among homosexual and bisexual men and, in a few instances, intravenous drug users. Among the latter, greater change has been observed in high-risk drug use practices than in sexual behavior (Turner et al., 1989; de la Fuente et al., 1990). Whether knowledge of infection will necessarily promote the adoption of less risky behavior (e.g., safer sexual practices) among heterosexual women and men remains uncertain.[1] Prenatal HIV screening, therefore, may not substan

[1] Inconsistent condom use has been reported among female IV drug users and female sexual partners of infected or at-risk individuals, despite a dear perception of risk (Miller et al., 1990). For example, one study of female sexual partners of HIV-seropositive hemophilic men found that fewer than 50 percent of female partners reported that they always used condoms and nearly 20 percent reported no condom use, despite an awareness of their partner's infection (Price et al., 1989). Among a group of Rwandan women, however, HIV

tially affect horizontal HIV transmission. In light of these uncertainties, reducing horizontal transmission of infection seems a desirable but not necessarily achievable goal of prenatal screening at this time.

The committee recognizes that public policy on HIV testing has often been founded on the hope that testing and counseling will have some positive impact on behavioral change. Other benefits associated with testing and counseling may include the possibility of reaching seronegative women (who continue to be at risk of infection) with HIV education and support to help them guard against the acquisition of infection. Further studies are clearly needed to evaluate ways to enhance change in high-risk sexual or drug-using practices, particularly among heterosexual couples. Once effective behavioral interventions have been identified, limiting horizontal transmission of infection may become a more potent rationale for prenatal screening.

INFORMED REPRODUCTIVE DECISION MAKING

Although knowledge of HIV infection status alone may not fundamentally alter fertility-related behavior, this information must still be regarded as germane to reproductive counseling and planning. Hence, another goal of screening pregnant women for HIV infection is to offer them a more informed basis for making reproductive decisions. A woman's knowledge of her own HIV infection may be a potentially empowering tool in evaluating her current and future reproductive options, even if such knowledge does not change her final decision. As more information accumulates regarding the effect of pregnancy on maternal disease progression and the impact of HIV infection on pregnancy outcome, learning of one's infection may become increasingly important for women facing reproductive decisions.

EARLY DIAGNOSIS OF HIV INFECTION AND THERAPEUTIC INTERVENTION DURING PREGNANCY

Another goal of screening pregnant women for HIV infection is to afford them an opportunity for early diagnosis, subsequent medical monitoring, and therapeutic intervention. If HIV infection has been diagnosed in a pregnant woman, her prenatal caregiver (and perhaps other

education and testing appeared to be important in fostering safer sexual practices (Lindan et al., 1990).

specialists) can provide careful surveillance of immunologic function and the signs or symptoms indicative of HIV-related opportunistic infection, both of which facilitate optimal management of her pregnancy and her own medical care (Minkoff et al., 1990). **The committee concludes that screening pregnant women for the purpose of early diagnosis and treatment is both an achievable and compelling objective**.[2] This conclusion rests on the fact that available therapies for HIV disease, a life-threatening condition, have been shown to delay progression and minimize symptoms of disease in nonpregnant adults. However, treatment regimens (*e.g.*, zidovudine therapy and PCP prophylaxis) may need slight modifications for HIV-infected pregnant women.

Traditionally, caregivers use caution in prescribing drug therapy during pregnancy because of possible teratogenesis or unknown fetal toxicities associated with a particular therapeutic agent. For example, in regard to PCP prophylaxis, the Public Health Service has warned that "since neither aerosol pentamidine nor oral trimethoprim-sulfamethoxazole (TMP-SMX) prophylaxis is known to be safe in association with pregnancy, it is inadvisable to give either agent to HIV-infected pregnant women. Rather, such women should be monitored carefully for symptoms, signs, or laboratory abnormalities suggestive of PCP. Prophylaxis can then be considered for use in the postpartum period" (CDC, 1989b:6).

No doubt, historical precedent served as a guide in making this recommendation, but its appropriateness, given current conditions, has generated some debate among obstetricians. Many obstetrical experts contend that the standard of care for HIV-infected nonpregnant adults should also apply to HIV-infected pregnant women, based on careful monitoring of immunologic function through serial CD4+ cell counts. Asymptomatic nonpregnant adults with CD4+ cell counts of 200 or less are at significantly greater risk of *Pneumocystis* pneumonia than those with higher counts; the presence independently of thrush or persistent fever enhances this risk (CDC, 1989b; Phair et al., 1990). Extrapolating from data in nonpregnant adults, it has been estimated that pregnant women with CD4+ cell counts below 200 may face roughly a 20 percent (or greater, if fever or thrush is present) chance of developing PCP during pregnancy. Primary prophylaxis against PCP is currently recommended for HIV-infected nonpregnant adults with CD4+ cell counts of less than 200 (CDC, 1989b), and most obstetrical experts argue that such therapy should also be offered to HIV-infected pregnant women with this same level of immune deficiency. Zidovudine therapy currently is also recommended for

[2] Specific circumstances under which screening should take place are described in subsequent recommendations.

both symptomatic and asymptomatic HIV-infected nonpregnant adults with CD4 + cell counts below 500 (NIAID, 1990). Because HIV-infected pregnant women with CD4+ cell counts below 200 are at greatest risk of clinical deterioration, most obstetrical experts concur that administering zidovudine to these women during pregnancy is probably appropriate and may prevent further disease progression.

There is much less consensus on whether zidovudine should be administered to HIV-infected pregnant women with moderately diminished CD4+ cells (i.e., CD4+ cell counts between 200 and 500). In this case, it is considered prudent to postpone antiretroviral therapy until the postpartum period. These women should, nevertheless, be carefully followed during pregnancy for evidence of further CD4+ cell depletion that would warrant more aggressive therapeutic intervention.

Concern for potential fetal toxicity has not been absent from discussions of appropriate management and treatment of HIV-infected pregnant women. To date, there are insufficient data on zidovudine therapy during pregnancy to draw conclusions about short-term fetal toxicity or adverse pregnancy outcomes related to such therapy. There is additional uncertainty regarding zidovudine's long-term effects and potential toxicities for the infant. Similarly, the fetal and neonatal risks associated with trimethoprim-sulfamethoxazole or aerosolized pentamidine therapy during pregnancy have not been delineated.

Sulfa drug therapy in newborns has been associated with the displacement of bilirubin from its protein-binding sites, leading to increased blood levels of free bilirubin that can penetrate the brain and cause severe neurological damage. Because trimethoprim-sulfamethoxazole readily crosses the placenta, there is a theoretical risk of fetal or neonatal harm, although congenital abnormalities or adverse consequences in infants as a result of maternal trimethoprim-sulfamethoxazole therapy appear to be rare (Minkoff and Feinkind, 1989). However, TMP-SMX therapy during pregnancy and its effects on infant outcome have not been extensively studied. (Studies of another form of sulfonamide therapy during pregnancy concluded that the risk of bilirubin displacement in the newborn would not be increased as a result of such therapy [Jarnerot et al., 1981a,b; Esbjorner et al., 1987].) Aerosolized pentamidine has little systemic absorption (Montgomery et al., 1987) and therefore would be expected to have minimal effects on the fetus or infant, although its use during pregnancy has received little study.

As a result, despite these uncertainties, **the committee finds that the health risks inherent in deferring antiretroviral treatment. or PCP prophylaxis of severely immunocompromised HIV-infected pregnant women (i.e., those with CD4+ cell counts below 200) outweigh the potential fetal or neonatal risks at this time. Therefore, the committee recommends that**

HIV-infected pregnant women with severely depressed CD4+ cell counts be offered therapy for which they would otherwise be eligible if they were not pregnant. The decision to initiate treatment during pregnancy should always be made in concert with the patient, with full disclosure of the associated risks and benefits of therapy. Whether to receive treatment, however, ultimately remains the woman's choice.

There is a clear need to continue surveillance and assessment of fetal toxicities and adverse pregnancy outcomes that may be associated with antiretroviral therapy or PCP prophylaxis. Obstetricians who are treating their HIV-infected patients with these therapies (*e.g* ., zidovudine, aerosolized pentamidine, or trimethoprim-sulfamethoxazole) should be advised to report any adverse side effects or outcomes to the pharmaceutical companies.[3] In particular, infants born to mothers who received antiretroviral therapy or PCP prophylaxis (especially trimethoprim-sulfamethoxazole) during pregnancy should be carefully monitored for any evidence of untoward effects.

ADDITIONAL BENEFITS OF PRENATAL HIV SCREENING

In addition to the maternal benefits that may be derived from identification of HIV infection during pregnancy, there are potential collateral benefits for the infant. For instance, infants born to mothers who are known to be HIV infected could be closely followed from birth for evidence of immunologic impairment and other signs and symptoms of HIV infection, so that appropriate treatment can be administered when it is clinically indicated. As holed earlier, however, the magnitude of benefit to the infant that is associated with such careful pediatric follow-up and comprehensive care remains uncertain and thus in itself does not constitute sufficient justification for screening newborns. [4]

[3] Burroughs Wellcome Company has established a registry to collect observational, nonexperimental data on exposure to zidovudine during pregnancy. Physicians who are administering zidovudine therapy to their pregnant HIV-infected patients can contact the registry at (919) 248-8465 or (800) 722-9292, extension 8465.

[4] The mother can also be offered counseling regarding breast feeding. Several cases of postnatal HIV transmission to infants through breast feeding have been documented, although the absolute risk of infection by this route is unclear (Oxtoby, 1988). In addition, HIV has been isolated from breast milk. These findings (as well as the availability of safe and effective alternatives to infant nutrition, that is, human milk substitutes) prompted the current recommendation in the United States that HIV-infected women be advised against breast feeding to avoid postnatal HIV transmission to infants who may not already be infected (CDC, 1985).

An ancillary benefit to prenatal screening is that prospective follow-up of identified HIV-infected women and their children could advance epidemiological research regarding the natural history of HIV infection in women, particularly pregnant women, and their offspring. Prenatal HIV screening could also identify HIV-infected women Who might be eligible to participate in research protocols to study the effects of treatment (e.g., zidovudine therapy) during pregnancy on maternal disease progression and pregnancy outcome, as well as the impact of antiretroviral therapy on perinatal transmission.[5]

UNIVERSAL VERSUS SELECTIVE PRENATAL HIV SCREENING

The committee, having concluded that the advantages associated with early detection of HIV infection and medical intervention provide the most compelling argument for screening pregnant women, then considered whether screening should be "universal" or "selective"; that is, should all pregnant women *within a particular geographic area* be offered HIV testing ("universal" screening), or should testing be offered only to a subset of pregnant women defined by self-acknowledged HIV risk behaviors, based on prior risk assessment ("selective" screening)?

Risk factor assessment as an indicator for HIV testing in pregnant women has been an insensitive predictor of HIV infection. Many women are unaware they are at risk; others are unwilling to admit their involvement in high-risk sexual or drug-using practices and thus deny their risk (Landesman et al, 1987; Krasinksi et al., 1988; Barbacci et al., 1989a; Lindsay et al, 1989; Sperling et al., 1989). To restrict offers of HIV testing to pregnant women who disclose a prior risk history is therefore likely to miss a substantial number of HIV-infected women who could benefit from early diagnosis and medical intervention. Moreover, targeting only "at-risk" pregnant women for HIV screening might be perceived as discriminatory and stigmatizing because African-American and Hispanic women and children have been disproportionately affected by the HIV epidemic. **The committee strongly opposes any HIV screening of pregnant women based on racial or ethnic background**. It is also concerned about screening that is narrowly focused on small geographic units. This type of screening could single out areas of highly concentrated HIV infection in women and children, which might engender further discrimination and

[5] For further information regarding studies of maternal chemoprophylaxis currently under development and other possible strategies to reduce perinatal transmission, see the discussion "Medical Management of HIV-Infected Pregnant Women" in the conference summary in Appendix A.

stigmatization of already disenfranchised or disadvantaged populations. Geographic units selected for screening purposes should be sufficiently large (e.g., states or counties) to limit the opportunity for such discrimination and stigmatization (see the discussion in Chapter 6).

Cost can be a factor in deciding between universal and selective screening. The most costly component of screening is not the actual HIV-antibody test but the labor-intensive counseling that should accompany the communication of test results. From an economic perspective, selective screening of pregnant women based on prior risk factor assessment (with posttest counseling of all women screened) appears to be no more costly, in terms of the cost per HIV-infected woman identified, than universal screening of pregnant women (with posttest counseling reserved for HIV-positive women only). (See the discus ion "A Cost-Effectiveness Analysis of Prenatal HIV Screening" in the conference summary in Appendix A. A comparison of the cost per HIV-infected woman identified through selective versus universal screening appears in Table A-1.) In the latter case, however, an opportunity would be missed to provide education and counseling support to seronegative women. Such counseling might help these women take measures to reduce their risk of infection and thereby maintain their HIV-negative status.

Because a substantial number of HIV-infected women would necessarily be missed if a selective approach to prenatal HIV. screening were pursued, and in view of the favorable cost comparisons between selective and universal screening, a universal approach to screening pregnant women for HIV infection is preferable. Universal prenatal screening would limit further discrimination and stigmatization because HIV testing would be offered to all pregnant women, within a particular geographic area, without regard to risk status. Furthermore, it would not require that women disclose socially unaccepted or illicit behavior in advance of testing. **The committee recommends voluntary HIV screening (with specific informed consent) for all pregnant women in high-prevalence areas**.[6] The HIV test should be discussed with and offered to every pregnant woman seeking prenatal care in these areas; written informed consent should be a prerequisite to testing. Women who receive no prenatal care or who have not had an opportunity to be tested prior to delivery should be offered HIV testing at the time of labor and delivery or during the postpartum period. Additionally, in areas where prevalence levels may not warrant prenatal screening of all pregnant women at this time, health care providers should continue to offer voluntary HIV testing to pregnant women who have identified risk factors for HIV infection, in accordance

[6] High-prevalence areas are defined in Chapter 6.

with current HIV testing recommendations (CDC, 1987a; American Academy of Pediatrics, Task Force on Pediatric AIDS, 1988; American College of Obstetrics and Gynecology, 1988; American Medical Association, 1989). **The committee recommends that all pregnant women be informed about HIV infection, its modes of transmission, risk-associated behaviors, and ways of reducing one's personal risk of infection**.

The committee recognizes the profound psychological and social ramifications that a diagnosis of HIV infection can have for an individual Nevertheless, it believes that the benefits that have been shown to result from early diagnosis of infection and subsequent treatment counterbalance the potential risks. In addition, unlike other adult civilian, noninstitutionalized populations at risk of infection who could also benefit from early diagnosis and treatment, pregnant women can be reached relatively easily and offered screening services. Pregnant women generally come into predictable contact with the health care system through obstetrical care. Consequently, obstetrical settings offer a unique opportunity to provide HIV counseling, testing, and treatment to women who may be at increased risk of infection.

6

FORMULATING PRENATAL HIV SCREENING POLICY

Although the committee concluded that the overall goal of prenatal HIV screening should be the identification and treatment of all HIV-infected pregnant women, it does not at this time recommend screening for all pregnant women in the United States, particularly given the wide variation across states in HIV seroprevalence rates among childbearing women. Development of screening policy should be founded on sound epidemiological data, such as estimates. of the frequency and distribution of the condition (i.e., HIV infection) in the population for which screening is proposed (Allen, 1988). The committee selected the prevalence of HIV infection (i.e., HIV seroprevalence) among childbearing women as a useful guide to determining when to institute prenatal screening.[1] The evolution of prenatal HIV screening policy ultimately should be responsive to shifts in the prevalence of infection in this population. There has been considerable discussion in many quarters of the threshold seroprevalence level that should trigger screening. The committee chose not to specify an absolute seroprevalence level but rather to identify two general means by which individual states could establish an informed foundation for prenatal screening.

ESTABLISHING AN EPIDEMIOLOGICAL BASIS FOR PRENATAL SCREENING

The first, or "majority-of cases," approach is to first identify those jurisdictions that account for a high proportion of cases of HIV infection among childbearing women and then institute screening. The second, or

[1] Most states now routinely conduct anonymous HIV screening of all newborns for surveillance purposes, which provides information on the overall prevalence of infection among childbearing women, as well as on the relative distribution of infection within the state.

"threshold prevalence," approach is to specify a threshold prevalence of HIV infection among childbearing women above which screening would be considered appropriate in light of available health care resources, and initiate screening in those areas that exceed this threshold.

The majority-of-cases method can be applied from a national perspective. By examining the distribution of infection among childbearing women across states, one could identify those states that account for approximately 80 to 85 percent of the total cases of HIV infection among these women in the United States. ("The committee used the 80 to 85 percent limit as an arbitrary target for identifying states with relatively high seroprevalence rates among childbearing women.) Implementing screening in the states identified by this method would make the service available to the majority of HIV-infected pregnant women in the country.

Similarly, this method could also be applied within individual states. In this case, the "catchment" area for screening within a state would be defined as the cumulative counties that accounted for approximately 80 to 85 percent of the total cases of HIV infection among childbearing women (without specifying an absolute seroprevalence level). The committee selected counties as the most useful geographic units because in most states HIV seroprevalence data are easier to analyze by county or aggregate counties than by some smaller geographic unit, such as individual cities. A cutoff lower than 80 to 85 percent could also be used, but its limitation must be acknowledged: namely, that a substantial number of HIV-infected pregnant women who could benefit from screening might be missed as a result.

The threshold prevalence approach involves a judgment about what HIV prevalence level among childbearing women must be reached before the yield from screening all pregnant women is considered sufficient to justify the costs of the screening effort. The committee found that data regarding the specific costs and benefits of HIV screening were inadequate to support the choice of one threshold prevalence value for use in all states. Rather, **the committee recommends that individual state (or county) public health authorities be the final judge of whether prenatal screening at various HIV seroprevalence levels is an efficient or appropriate use of resources, particularly in the likely event that other public health programs may be competing for the same pool of limited resources**. In most cases, state (or county) HIV seroprevalence rates among childbearing women *and* the availability of adequate resources for mounting a prenatal screening program should be considered together, For example, at a particular HIV seroprevalence level, a state could estimate the number of HIV-infected childbearing women in the state, the proportion of these women expected to be identified through prenatal screening, and the approximate counseling and testing costs associated with

case identification (i.e., the costs per case identified; see Table A-1, Appendix A). In addition to the costs of counseling and testing, a state could examine some of the other costs that might be associated with a screening program—medical monitoring and treatment of individuals identified through the screening program, health care provider and counselor education and training, public education campaigns, laboratory performance evaluation and quality control, and epidemiological surveillance and data collection activities. (Appendix C includes several tables that may serve as a guide to examining the costs associated with a prenatal HIV screening program. These tables provide examples and offer crude estimates of overall screening program costs but are by no means comprehensive or definitive.)

Given the underlying premise that HIV-infected women identified through prenatal screening will benefit clinically from such identification, the committee expects that most, if not all, jurisdictions with HIV seroprevalence among childbearing women of 1 infected woman per 100 will find it appropriate to implement prenatal screening Furthermore, it is expected that many jurisdictions with seroprevalence between 1 per 100 and 1 per 1,000 will consider prenatal HIV screening to be an appropriate expenditure of health resources. As noted earlier, in jurisdictions where seroprevalence may not currently warrant prenatal screening, existing HIV testing recommendations for individuals with identifiable risks for HIV infection should be observed. The threshold seroprevalence level at which jurisdictions generally institute prenatal HIV screening is likely to decline as the benefits from early identification of HIV infection become clearer.

PILOT STUDIES OF NEW SCREENING PROGRAMS

In general, all new screening programs at the outset contain unique or innovative components for which preexisting data are lacking. Therefore, before wide-scale screening is undertaken, pilot phases or projects (i.e., small-scale experiments) ideally should be conducted (Lappé et al., 1972; National Research Council, 1975; President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, 1983). Previous experience with mass screening has commonly uncovered, in retrospect, unanticipated effects or negative outcomes of the program— problems that might have been minimized had pilot projects been conducted in advance.[2] Pilot studies permit an assessment of the resources needed to support screening and can identify critical program elements

[2] See the discussion "Principles and Pitfalls of Mass Screening" in the conference summary in Appendix A.

(e.g., laboratory capacity, counseling and follow-up services, provider training) that require further development or expansion. They can also reveal unexpected or adverse outcomes associated with screening. In situations where exigent need precludes the conduct of such pilot projects, new screening programs must still include an ongoing evaluation component to assess whether program objectives are being met and to identify untoward or unanticipated consequences of screening. (See the discussion of program evaluation in Chapter 7.)

IMPLEMENTATION OF PRENATAL HIV SCREENING POLICY

Several options are available to states as they move to implement prenatal HIV screening policy. Policy could be established in the form of legislation, regulation, or standards of medical practice. **The committee finds that formulating HIV screening policy through legislative or regulatory routes does not permit the flexibility and latitude required to respond to new developments in diagnostic technology and medical therapy, as well as to increased understanding of the pathogenesis and natural history of HIV infection in women and children**. Moreover, when screening policy is legislated, the ability to modify policy in response to screening program experience is limited. Therefore, **the committee recommends that prenatal HIV screening policy be implemented as a standard of medical practice, which constitutes a more malleable alternative to legislation or regulation and implies a threat of liability for health care provider noncompliance**. In choosing to execute prenatal HIV screening policy through changes in medical practice guidelines,[3] state public health authorities should include a broad representation of expertise and interests in the guidelines development process—for example, representatives from state medical professional societies (particularly obstetrical and pediatric societies), health facility and hospital administrators, relevant health care practitioners, experts in health law and medical ethics, consumer representatives, and patient advocates. In collaboration with state obstetrical and pediatric medical professional societies, states should also be prepared to implement and disseminate the new practice guidelines. This can be accomplished, for example, through letters from the state health department to individual practitioners or through technical bulletins from state professional medical societies. As part of this dissemination effort, states

[3] For further details regarding medical practice guidelines development, see Field and Lohr (1990). In addition, the discussion "HIV Screening Policy Implementation" in the conference summary in Appendix A includes a description of New Jersey's experience in developing and implementing prenatal HIV screening policy as a standard of medical practice.

should conduct a broad-based public information and education campaign to alert women—and men—of reproductive age to the new screening policy. Components of such a campaign might include general information about HIV infection, its modes of transmission, and behavioral risk reduction, and specific details about the proposed prenatal HIV screening program (e.g., the rationale for and importance of the program, plans for its implementation, and its expected impact).

7

ELEMENTS OF A PRENATAL HIV SCREENING PROGRAM

The translation of prenatal HIV screening policy into a specific screening program for pregnant women requires thoughtful consideration of the key elements of such a program. The general prerequisites of screening program design and implementation have been reviewed elsewhere (Lappé al., 1972; National Research Council, 1975; President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, 1983).[1] Therefore, the following discussion does not provide an exhaustive review of screening program components but instead highlights those elements the committee judges to be of particular relevance and importance in prenatal HIV screening implementation.

EDUCATION AND COUNSELING

Education and counseling before and after the administration of an HIV test should be regarded as essential components of a prenatal screening program,[2] The pretest counseling session provides the foundation for an individual's informed consent, which, as noted earlier, should be secured in writing before testing is initiated. To facilitate informed decision making and to permit careful weighing of the risks and benefits associated with HIV testing, a range of information should be reviewed with the woman at this time. Topics to be addressed include the spectrum of HIV disease; modes of transmission; risk reduction behaviors; the purpose of an HIV-antibody test and the clinical meaning of a positive or negative test result; the importance of the woman knowing her HIV-

[1] These publications focus specifically on genetic screening program development; however, the guidance they offer is generally applicable to prenatal HIV screening programs as well.

[2] For a more detailed discussion of the key elements of prenatal HIV counseling, see Holman and colleagues (1989).

antibody status for the effective medical management of her pregnancy and her own health care, as well as for the careful monitoring of her child's condition; the treatment options currently available to her and her infant; and the potential untoward social consequences that may result from being identified as HIV positive. In addition, the woman should be informed of the current availability of follow-up services and be forewarned of the possible barriers she may encounter in gaining access to them. (See the later discussion of the development of services for HIV-infected women and children.)

A variety of approaches can be used to present the above material—for example, educational brochures, videotapes, face-to-face dialogue, or some combination of these methods. At a minimum, however, some individual face-to-face counseling should precede the test, in particular to assess the woman's emotional and psychological readiness to cope with a positive result and to answer any questions or concerns the woman may have about the test and its clinical and psychosocial implications.

HIV test results should be communicated to the individual during a face-to-face discussion. This posttest encounter also permits whoever is performing the counseling to reinforce any HIV risk reduction and prevention messages presented earlier. The extent and length of such posttest counseling for seronegative pregnant women may be tailored to their risk status and emotional state. For instance, women at increased risk of infection may require more extensive counseling and educational reinforcement. At a minimum, however, seronegative women should receive a brief personal communication of their test results and additional written information (e.g., pamphlets and brochures) about HIV infection and its prevention (including risk-associated behaviors and ways of reducing the risk of becoming infected).

Individual posttest counseling for a seropositive pregnant woman is crucial, not only to discuss her test results and their meaning but also to give her emotional and psychological support as she assimilates this information and faces potentially difficult reproductive decisions. During such counseling, the counselor has an opportunity to review the implications of HIV infection for her pregnancy, including the risks of transmitting the virus to her child and what is known about the possible effects of pregnancy on disease progression. Thorough examination of the reproductive options available to an HIV-infected pregnant woman is an important task of the posttest counseling session. Traditionally (i.e., in the context of genetic screening), counselors have assumed a nondirective or neutral posture toward reproductive counseling, and the committee found no compelling reason to recommend a change in this stance in the context of HIV screening. **The committee affirms that reproductive counseling should validate the woman's right to make the reproductive choice that**

conforms to her personal values, beliefs, and desires. Ultimately, the woman must decide whether to continue or terminate an existing pregnancy in the face of HIV infection. Regardless of her choice, she should be supported in her decision and receive or be referred for medical evaluation, follow-up care, and counseling as necessary. In particular, if she elects to continue her pregnancy, arrangements should be made for appropriate pediatric care.

PARTNER INVOLVEMENT

A recurring and fundamentally important theme during the committee's deliberations centered on the involvement of male partners in the HIV education and counseling process associated with prenatal screening. Changes in heterosexual couples' sexual practices and, in particular, condom use ultimately require the assent and cooperation of the male partner. In some instances, if a woman insists on condom use or other modifications in sexual practices, she may risk physical abuse, ostracism, or even dissolution of the relationship (which may also mean loss of financial security, if the woman is dependent on her partner for support). For many women, the threat of personal violence or the potential destruction of a relationship present formidable barriers to the implementation of behavioral changes. Therefore, the committee believes that without the participation of male partners in the HIV education and counseling process, the likelihood of fostering behavioral change in women and their partners will be greatly diminished. Of course, such involvement of the partner cannot be initiated without the woman's permission. Women should be actively encouraged to invite their partner to participate in the information and counseling sessions. When they request it, male partners should also be referred for individual counseling and testing.

CONFIDENTIALITY

Assurance of patient confidentiality should be a central feature of any HIV screening program, as should protection against unauthorized disclosure of test results. In the event that the result of a woman's test is to be documented in her medical record, she must be alerted to this fact before testing occurs. A woman should also be informed of those individuals in the medical setting who may have legitimate access to her records and thus become aware of her HIV infection status. (It should be noted, however, that providers may decide to keep test results separate from general medical records to safeguard confidentiality.) **In at least one**

instance, however, the committee recommends that a woman's HIV test result be shared-with her child's medical caregiver. This prospect should be discussed with the woman during the informed consent process. The diagnosis of HIV infection in a mother has important implications for the clinical management and appropriate medical follow-up of her child. The mother should be informed, during the pretest counseling session and in advance of any disclosure, of the importance of releasing her HIV test results to the pediatric caregiver, and she should be encouraged to do so to provide more effective medical management of her infant.

PARTNER NOTIFICATION

The counseling session that follows testing offers an opportunity to discuss partner notification with the HIV-infected woman and advise her on informing her sexual or drug use partner(s) of her infected status. Some women may be reluctant, afraid, or embarrassed to share this information. In this case, health care providers should offer partner notification assistance by ensuring that the woman receives help from local public health officials in notifying her partner(s).

Partner notification, as described by Toomey and Gates (1989), encompasses two approaches: *patient* referral and *provider* referral With the first approach, the infected individual is encouraged to inform her partner(s) directly, without the intervention of the provider. In the second approach, health department personnel (with the woman's consent) directly notify individuals who unknowingly have been exposed to infection or disease, so that they may be referred for medical evaluation and treatment. Notification is carried out without revealing the identity of the infected person, thereby preserving client confidentiality. This process is fundamentally voluntary in that it relies on infected individuals to divulge the names of their partners voluntarily.[3]

Although historically partner notification has been a useful public health tool for curtailing the spread of infectious disease, recently the

[3] Another situation arises when the health care provider knows the identity of the infected woman's partner and is aware that she has refused to notify her partner, even after repeated counseling and offers of assistance. Considerable debate has centered on whether, in such a situation, a provider has a duty to warn third parties known to be at risk of exposure to infection. Currently, many states have chosen to leave the responsibility for the choice of whether such third parties are informed with the provider, without specifically indicating the basis on which this choice should be made (Edgar and Sandomire, 1990). As noted by Gostin (1989:1628), "by giving the [provider] a power to exercise his or her discretion, instead of a duty, it shields the [provider] from liability and does not require breaches of confidence that would discourage testing and counseling."

argument has been made that, in areas of highly concentrated HIV infection, the substantial staff and counseling resources needed for such programs could be used more effectively in other HIV education and prevention efforts. Despite these reservations, **the committee recommends that a well-functioning, coordinated voluntary partner notification system be an integral part of a prenatal HIV screening program and, if not already established, be developed in parallel with screening.** A major benefit to such a system is that it provides another avenue to engage male partners in counseling and educational efforts connected with prenatal screening, as well as an opportunity to refer them for HIV testing and diagnostic evaluation.

SERVICES FOR HIV-INFECTED WOMEN AND CHILDREN

A central tenet of screening is that, before such a program is introduced, resources should be available for the medical evaluation, management, and treatment of affected individuals identified through screening. Because the early diagnosis and treatment of maternal HIV infection (and perhaps, ultimately, of pediatric infection) are considered the primary objectives of prenatal HIV screening, a question arises of whether it is ethical to implement screening if the full array of medical and social services for HIV-infected women and their children is not in place.

Constructing such a network of coordinated, integrated, family-oriented medical and psychosocial support services can be a major challenge. To satisfy the myriad health and social needs of HIV-infected women and children requires a range of multidisciplinary medical care and social services: routine ambulatory care, such as immunologic surveillance and medical monitoring associated with antiretroviral therapy or prophylaxis against opportunistic infection; inpatient care; reproductive health care; day care; home care; substance abuse treatment; psychological support services; a variety of social services; and sometimes even housing and income support. These services are often provided at multiple sites of care and by numerous providers. Because the lives of HIV-infected women and their children are so often characterized by social chaos, poverty, substance abuse, and eventually deteriorating health, they generally need assistance in navigating this fragmented delivery system and in obtaining the necessary services. Moreover, they typically depend on the public sector for the provision and financing of their care. In many areas (particularly those with a high prevalence of HIV infection) the public health care system may already be overburdened and underfinanced, creating additional problems in ensuring that families affected by HIV disease receive appro

priate care. In some cases, the full complement of services is available but not readily accessible, perhaps because of location or cost, a poorly coordinated and inefficient referral network, or the lack of adequate insurance coverage and consequent inability to pay for care.

The committee decries the inherent inadequacies in the current health services delivery and financing system and recognizes that prenatal HIV screening may identify more women and children who need care than the system can currently accommodate. Nevertheless, it believes that the benefits of screening pregnant women for HIV infection in high-prevalence areas are sufficient to justify proceeding with program implementation, even though the present health and social services infrastructure may not be completely adequate. Some health officials suggest that screening can be used to reveal unmet need and create a demand for the necessary services, thereby forcing the development of an adequate system of follow-up care. **The committee concludes, however, that in mounting a screening program, state public health authorities must be firmly committed to the construction and expansion of health and social services for all HIV-infected women and children *in tandem* with screening program implementation; otherwise the necessary system of follow-up services is unlikely to be developed.**

Yet before screening is initially introduced, some level of HIV-related treatment services for women and children should be in place. For example, resources (e.g., qualified laboratory facilities to perform CD4+ cell counts) should be adequate to provide further medical evaluation and monitoring of immunologic function in HIV-infected women identified through screening. Women should also have access to antiretroviral therapy or prophylaxis against opportunistic infection when medically indicated. Because HIV infection in women is so often inextricably tied to substance abuse, particular attention should be paid to resolving the current problems women, and particularly pregnant women, face in receiving substance abuse treatment.[4] There should also be some mechanism, preferably one coordinated and integrated with maternal health care, for pediatric follow-up and medical surveillance of children born to HIV-infected mothers.

As state public health authorities move to institute screening, they incur an obligation to build a coordinated, integrated system of care for women and children who are identified and to remedy the current impediments to access. Developing the network of integrated services that will ultimately be required to support prenatal HIV screening may involve

[4] For example, one survey of drug treatment programs in New York City revealed that 54 percent of such programs categorically excluded pregnant women (Chavkin, 1990).

the regionalization of HIV-related services, the creation of appropriate referral linkages with other maternal and child health and social services programs, and the development of some mechanism (e.g., case management) to coordinate care and ensure that HIV-infected women and children have access to and receive appropriate follow-up services. The committee recognizes that prenatal HIV screening efforts constitute yet another compelling argument to ensure all individuals in this country access to needed health care.

States that attempt to ensure adequate care for HIV-infected women, however, may find their efforts thwarted by the discrimination some of these women face in gaining access to needed services. In fact, this is one of the most troubling barriers to care. The committee was greatly disturbed by accounts of the systematic exclusion of HIV-infected women from care—in particular, from reproductive health care. For example, HIV-infected pregnant women who elect to terminate their pregnancies may discover that their access to abortion services is restricted. Some areas report outright exclusion of HIV-infected women by abortion clinics (New York City Commission on Human Rights, AIDS Discrimination Division, 1990). Such exclusion only serves to limit further the reproductive options available to HIV-infected pregnant women, as well as the opportunities for reducing perinatal transmission. It also compounds the stigmatization and isolation that many women confront in dealing with their own HIV infection.

The committee deplores discrimination against HIV-infected women and children in the provision of health care services. State policymakers should assess the extent of such discrimination and develop a mechanism for expeditiously redressing any discriminatory actions. If HIV screening for pregnant women is to achieve its goals, there must be some assurance that identified women and their children will not be denied access to needed health care by virtue of their infected status. **The committee concludes that health care providers who offer HIV testing to thew patients have an obligation to render appropriate treatment or to ensure that a referral is made and that such treatment is ultimately received.** Additionally, it is imperative that when a woman seeks care and is offered an HIV test, the provision of needed health services must not be contingent on submission to testing; that is, if a pregnant woman refuses to be tested, she should still be eligible to receive care.

HEALTH CARE PROVIDER EDUCATION AND TRAINING

The successful implementation of prenatal HIV screening policy as a standard of medical practice will require a well-organized, structured HIV

education and training component for health care providers. Education and training are needed not only to improve compliance but also to ensure that providers (particularly primary, obstetrical, and family care providers) are adequately prepared to counsel women about HIV infection and its attendant ramifications and to handle their medical care effectively. In some large medical centers or practices, it may be possible to engage specifically trained HIV counselors in the prenatal screening program. The committee recognizes the current shortage of trained counselors and therefore believes that efforts should be redoubled to recruit and train individuals to become HIV counselors. In many cases, however, the primary caregiver (e.g., the obstetrician, the family practitioner) will be responsible for securing a meaningful informed consent for testing and for offering supportive, sensitive counseling.

To fulfill this responsibility, health care providers will need instruction and training in a variety of areas: the changing intricacies of HIV infection and the spectrum of disease, modes of transmission, risk behaviors, HIV serologic tests and the interpretation of test results, current therapy and treatment options (for women and children), and the special considerations that emerge when counseling HIV-infected women about their reproductive options. Admittedly, ignorance and a lack of understanding on the part of providers often reinforce feelings of discomfort and inadequacy in discussing some of the sensitive topics relating to HIV infection, such as sexual practices and illicit drug use. Specific training in this regard can alleviate the awkwardness many providers experience in broaching these subjects with their patients. **The committee recommends that health care professional societies, training institutions, and public health authorities cooperate to institute comprehensive HIV education and training, as well as continuing education programs, for the health professions**. Because such programs are likely to require substantial resources and technical expertise, public funding and technical assistance may be necessary to facilitate and support these training efforts.

LABORATORY SERVICES

The availability of high-quality laboratory facilities and qualified technicians to perform the HIV serologic test series on collected blood specimens is critical to a successful screening program. Standardized quality assurance in laboratory performance is particularly important to ensure testing accuracy, that is, to minimize false-positive and false-negative test results, as well as to resolve indeterminate test outcomes. Laboratory capacity should also be sufficient to accommodate the increased level of blood specimen testing that will be required once a screening

program is instituted. In addition, a well-orchestrated system is needed to obtain blood specimens from patients, label specimens, and transport them to accredited laboratories for swift processing. Timely and accurate reporting of test results to individual care providers, along with appropriate instruction for interpreting results, should also be ensured. **The committee recommends, as part of any state-level screening effort, that states require laboratories to participate in a publicly sponsored (e.g., state or federal) quality assurance and performance evaluation program.**[5] States should also be responsible for informing providers of the recommended laboratories to which they should forward their HIV test specimens. States may wish to consider using their own or regional laboratory facilities (rather than smaller commercial laboratories) to process specimens collected through the prenatal screening program. The generally high HIV test volume in these labs is likely to minimize test costs.

PROGRAM EVALUATION

A well-articulated, carefully designed evaluation plan is an essential component of any prenatal HIV screening program and must be an integral part of program planning. Such a plan requires that program goals be clearly specified prior to the program's inception. Provisions must also be made from the outset to monitor program performance and to identify flaws in design or implementation, as well as to evaluate the program's overall impact and detect any unanticipated consequences or adverse effects. A comprehensive evaluation process offers an opportunity to ascertain whether program goals have actually been achieved and whether they need to be modified. This ability to adjust program objectives and design is particularly important for HIV screening, given that diagnostic technology and medical therapy continue to evolve.

A thorough review of program evaluation design and methodology is beyond the scope of this report[6] Rather, the committee has chosen to highlight several aspects of evaluation and to identify the screening program elements that it deemed important to consider when planning and

[5] States may seek guidance in monitoring laboratory quality assurance and performance from CDC's Model Performance Evaluation Program, which was developed to assess and improve the analytic quality of HIV-antibody testing. (See Valdiserri and colleagues [1990] for further details about the program.)

[6] A more detailed discussion of process and outcome evaluation, as well as approaches and methodologies to evaluate AIDS intervention programs, is included in Coyle and colleagues (1991). Although this publication does not deal specifically with the evaluation of HIV screening programs, it offers information and guidance that may be useful in developing an evaluation plan.

performing an evaluation. There are two stages of evaluation (usually conducted periodically) that can take place once a program has been implemented. The first —*process evaluation*—assess whether the program was implemented as planned. For HIV screening programs, this type of evaluation determines whether the program infrastructure is in place and whether the services (e.g., counseling, screening, follow-up care) are being delivered as intended. Information gathered through such an assessment can be used to revise program objectives, modify implementation strategies, and, ultimately, improve program operation. The second stage—*outcome evaluation*—assesses the overall impact of the program, for example, whether program objectives have been achieved, whether there have been any unexpected negative (or positive) program effects, and its relative success or failure.

The committee identified several elements or aspects of HIV screening programs it viewed as important to examine during the course of both process and outcome evaluations. These items are listed below.

- The number of women tested, the number of HIV-infected women identified, and the proportion of these women (and their children) who are receiving appropriate medical monitoring and treatment Seroprevalence data for childbearing women can provide an estimate of the number of infected women that are expected to be reached through screening. A comparison of these figures with the number of seropositive women identified through the program indicates the acceptance and use of the program by the population of interest (i.e., pregnant women, particularly those at risk).
- Examination of various aspects of pre-and posttest counseling. These could include an assessment of (1) the extent and quality of information presented during the pretest session, as well as the most appropriate or effective methods (e.g., pamphlets, videotapes, face-to-face dialogue) of delivering this information; (2) the adequacy of the informed consent process—for example, whether appropriate informed consent is elicited in advance of testing and whether excessive or inappropriate numbers of refusals of testing are occurring; (3) the overall effectiveness of pretest education and counseling—for instance, how well-informed women are with regard to HIV infection, risk behaviors, and the antibody test and its clinical and social implications; (4) the psychological and behavioral impacts of HIV testing and counseling (particularly posttest counseling), for example, whether knowledge of infection status influences

subsequent behavior,[7] as well as the most appropriate and effective means of counseling seropositive women in the posttest context.

- Availability of needed follow-up services for HIV-infected women and children, including identification of gaps in the services delivery and financing system and unresolved barriers to access; also, the extent of HIV-related discrimination (e.g., the systematic exclusion of HIV-infected persons from care) in the health care system and its effect on women's ability to gain access to care.
- Possible adverse effects associated with therapeutic intervention for HIV-infected pregnant women and children—for example, evidence of fetal or neonatal harm or poor pregnancy outcomes as a result of maternal therapy.
- Assessment of reproductive outcomes among HIV-infected pregnant women (e.g., the frequency of pregnancy continuation or termination).
- Incidence of discrimination and stigmatization (e.g., loss of employment, housing, or insurance, and ostracism or violence by friends and family) as a result of screening, as well as unauthorized or unwarranted disclosures of infection status. For example, women who have been screened could be surveyed to determine whether they have suffered discrimination or whether their infection status has been disclosed without their consent.
- Effect of the screening program on the delivery of other health services or programs—for instance, whether funds to support screening have been reprogrammed or diverted from other needed service programs, producing a deleterious impact on them.
- Extent of health care provider compliance with the HIV screening standard of medical practice (i.e., prenatal HIV screening recommendations). For example, provider surveys could be conducted to discover how many caregivers are actually following the practice guidelines for screening pregnant women and to assess the adequacy of their knowledge and skills in counseling and treating HIV-infected women.
- Adequacy of laboratory capacity to process blood specimens collected through screening in a timely fashion, as well as the quality and accuracy of overall laboratory performance.

[7] Although behavioral change is not a primary goal of prenatal HIV screening, it would still be important to assess whether screening has had an impact on women's behavior that might subsequently affect horizontal or vertical transmission of infection. There should also be an assessment of which methods of counseling and education are most effective in helping seronegative women adopt self-protective behaviors. (This could be accomplished through randomized field experiments, as described in Chapter 5 of Coyle and colleagues [1991].)

Although the prevalence of infection among childbearing women (and of perinatal infection) should continue to be monitored for epidemiological purposes, trends in seroprevalence should not be used as markers or indicators of screening program success or failure; in fact, these data may reveal very little about the overall impact of the program. Because reductions in vertical or horizontal transmission are not seen as currently achievable goals of prenatal HIV screening, measuring the relative success of the program by changes (or the lack thereof) in seroprevalence is inappropriate, particularly over the short term. Moreover, many factors influence seroprevalence (e.g., the prevalence of sexually transmitted diseases; substance abuse; seroprevalence among heterosexual men, particularly IV drug users; other HIV prevention efforts); any alteration observed in the prevalence of infection cannot necessarily be attributed to the screening program itself.

The committee recognizes the considerable resources, talent, and effort that will be required to plan and conduct a thorough screening program evaluation. **Because prenatal HIV screening programs have national relevance and importance, the committee concludes that federal support, in the form of additional funds specifically earmarked for evaluation, is needed to ensure careful monitoring and assessment of program effects.** These funds, by definition, would be used only for evaluation and not for program operations.

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APPENDIX A

THE CONFERENCE: PROGRAM AND SUMMARY

Appendix A contains, first, the program of the conference, "Prenatal and Newborn Screening for HIV Infection: Opportunities for Prevention and Treatment?" The second part of the appendix is a summary of the conference presentations and discussions. It is not intended to present a consensus of opinion on the range of issues pertinent to the development of perinatal HIV screening policy. Rather, the views expressed here are those of the speakers and do not necessarily correspond to the conclusions and judgments reached by the IOM committee. Because the committee drew on the conference presentations during its deliberations and the preparation of its report, portions of this summary may overlap with material covered in the main body of the report.

The speakers who presented the material on which the summary is based are listed below by individual conference section.

HIV Infection and AIDS in Women and Children: Diagnosis and Treatment —Alfred Saah, Marta Gwinn, James Oleske, and Rhoda Sperling

Principles and Pitfalls of Mass Population Screening—Norman Fost and George Cunningham

Who Should be Screened?—Larry Wissow, Howard Minkoff, and Claire Brindis

Consent and Counseling—Ruth laden, Ann Sunderland, John Arras, and George Annas

HIV Screening Policy Implementation—Hermann Mendez, Christine Grant, and Richard Schwarz

Economic Considerations in Screening for Perinatal HIV Infection—Jesse Green, Peter Arno, and Sara Rosenbaum

Evaluating the Effectiveness of HIV Screening—Milton Weinstein, Renata Kiefer, and Donald Francis

The Advocates' Voices: Thoughts on Prenatal and Newborn HIV Screening —Milagros Davila, Dazon Dixon, and Sallie Perryman

HIV Screening: Are Human Rights Threatened?—Larry Gostin, Katherine Franke, and Patricia King

CONFERENCE PROGRAM

Auditorium, National Academy of Sciences
2101 Constitution Avenue, N.W., Washington, D.C.
May 14-15, 1990

Monday, May 14

8:25 Welcome and Opening Remarks

- Marie McCormick, Associate Professor of Pediatrics, Joint Program in Neonatology, Harvard Medical School and Chair, IOM Committee on Prenatal and Newborn Screening for HIV Infection

8:30 HIV Infection and AIDS in Women and Children

Moderator: Kathleen Nolan, Associate for Medicine, The Hastings Center

HIV Infection and AIDS in Women: Magnitude of the Problem

- Tedd Ellerbrock, Medical Epidemiologist, Pediatric and Family Studies Section, Epidemiology Branch, Division of HIV/AIDS, Centers for Disease Control

HIV Infection in Infants and Children: Magnitude of the Problem

- Marta Gwinn, Medical Epidemiologist, Population Studies Section, HIV Seroepidemiology Branch, Division of HIV/AIDS, Centers for Disease Control

HIV Diagnostic Technology: How Good Are the Tests?

- Alfred Saab, Associate Professor of Epidemiology, Johns Hopkins University School of Hygiene and Public Health

	Medical Management of HIV Infection in Children: How Good Is the Treatment?
	- James Oleske, Professor of Pediatrics, New Jersey Medical School and Medical Director, Children's Hospital of New Jersey AIDS Program
	Medical Management of HIV Infection in Pregnancy
	- Rhoda Sperling, Director of Obstetrics and Gynecology-Infectious Diseases, Mount Sinai Medical Center
9:55	General Discussion
10:45	Principles and Pitfalls of Mass Population Screening
	- Norman Fost, Professor and Vice Chairman, Department of Pediatrics, University of Wisconsin
11:15	Discussant
	- George Cunningham, Chief, Genetic Disease Branch, California State Department of Health Services
11:30	General Discussion
11:50	Who Should be Tested? What Could be Achieved?
	Moderator: James Curran, Director, AIDS Program, Centers for Disease Control
	Screening Newborns
	- Larry Wissow, Assistant Professor of Pediatrics, Johns Hopkins University School of Medicine
	Screening Pregnant Women
	- Howard Minkoff, Professor and Director, Division of Obstetrics and Maternal-Fetal Medicine, State University of New York Health Science Center at Brooklyn
	Screening Women of Childbearing Age
	- Claire Brindis, Co-director, Center for Reproductive Health Policy Research, University of California at San Francisco
12:45	General Discussion

2:15	Consent and Counseling
	Moderator: Peter Selwyn, Assistant Professor of Epidemiology and Social Medicine, Albert Einstein College of Medicine
	Means and Ends of Informed Consent
	- Ruth Faden, Director, Program in Law, Ethics, and Health, and Professor of Health Policy and Management, Johns Hopkins University School of Hygiene and Public Health
	One HIV Counseling Program for Women of Reproductive Age
	- Ann Sunderland, Social Worker, HIV Perinatal Transmission Study, State University of New York Health Science Center at Brooklyn
	Directive vs. Nondirective Counseling
	- John Arras, Philosopher in Residence, Department of Epidemiology and Social Medicine, Albert Einstein College of Medicine
	- George Annas, Professor of Health Law and Director, Law, Medicine, and Ethics Program, Boston University Schools of Medicine and Public Health
3:25	General Discussion
4:10	HIV Screening Program Implementation: Providing the Services
	Moderator: Reed Tuckson, Senior Vice President for Programs, March of Dimes
	Providing Follow-Up Care for Women and Children with HIV Disease
	- Hermann Mendez, Assistant Professor of Pediatrics, State University of New York Health Science Center at Brooklyn
	Implementing an HIV Screening Program: New Jersey's Experience
	- Christine Grant, Deputy Commissioner of Health, New Jersey State Department of Health

	Professional Education and Standards of Care in Obstetrics
	- Richard Schwarz, Provost and Vice President for Clinical Affairs, State University of New York Health Science Center at Brooklyn
5:05	General Discussion
Tuesday, May 15	
8:20	Economic Considerations in Screening for Perinatal HIV Infection
	Moderator: Molly Coye, Head, Division of Public Health Practice, Department of Health Policy and Management, Johns Hopkins University School of Hygiene and Public Health
	Current Costs and Services Utilization Associated with Pediatric AIDS
	- Jesse Green, Director for Health Policy Research, New York University Medical Center
	Economic Implications of Early Intervention in Women and Children
	- Peter Arno, Assistant Professor of Epidemiology and Social Medicine, Albert Einstein College of Medicine
	Financing Strategies for Screening and Follow-Up Care
	- Sara Rosenbaum, Director of Programs and Policy, Children's Defense Fund
9:15	General Discussion
10:00	Evaluating the Effectiveness of HIV Screening
	Moderator: Sandy Schwartz, Executive Director, Leonard Davis Institute of Health Economics, University of Pennsylvania
	Program Evaluation: Process and Outcomes
	- Donald Francis, Centers for Disease Control Regional AIDS Consultant, California State Department of Health Services

	Cost-Effectiveness Analysis of Prenatal and Newborn HIV
	Screening: Methodologic Issues and Data Needs
	- Milton Weinstein, Henry J. Kaiser Professor of Health Policy and Management, Harvard School of Public Health
	A Cost-Effectiveness Analysis of Prenatal HIV Screening
	- Renata Kiefer, Fellow, Center for AIDS Prevention Studies, University of California at San Francisco
10:55	General Discussion
11:30	The Advocates' Voices: Thoughts on Prenatal and Newborn HIV Screening
	Moderator: Janet Mitchell, Chief of Perinatology, Department of Obstetrics and Gynecology, Harlem Hospital Center
	- Milagros Davila, Coordinator, Prenatal Care Guidance Program, Department of Health Services, San Diego County
	- Dazon Dixon, Director, Sister Love Women's AIDS Project
	- Sallie Perryman, Special Assistant to the Director of Policy, New York AIDS Institute
12:30	General Discussion
2:00	HIV Screening: Are Human Rights Threatened?
	Moderator: Carol Levine, Executive Director, Citizens Commission on AIDS for New York City and Northern New Jersey
	Confidentiality, Disclosure, and Discrimination
	- Larry Gostin, Executive Director, American Society of Law and Medicine
	Discrimination in Access to Reproductive Health Services
	- Katherine Franke, Supervising Attorney, Fair Housing and Public Accommodations Division, New York City Commission on Human Rights

	Judicial Intervention in Obstetrical Medicine
	- Patricia King, Professor of Law, Georgetown University Law Center
2:55	General Discussion
3:45	Developing Policy: Moving Toward Consensus
	Moderator: Neil A. Holtzman, Professor of Pediatrics, Johns Hopkins University School of Medicine
	- Edward Connor, Associate Director, Division of Allergy, Immunology, and Infectious Diseases, Children's Hospital of New Jersey
	- Sheldon Landesman, Associate Professor of Medicine and Director, AIDS Study Group, State University of New York Health Science Center at Brooklyn
	- Kristine Gebbie, Secretary, Department of Health, State of Washington
	- Ronald Bayer, Associate Professor, Department of Sociomedical Sciences, School of Public Health, Columbia University
5:30	Summary and Closing Remarks
	- Neil A. Holtzman, Professor of Pediatrics, Johns Hopkins University School of Medicine

CONFERENCE SUMMARY PRENATAL AND NEWBORN SCREENING FOR HIV INFECTION:OPPORTUNITIES FOR PREVENTION AND TREATMENT?

HIV INFECTION AND AIDS IN WOMEN AND CHILDREN: DIAGNOSIS AND TREATMENT

Assessment of proposals for HIV screening of pregnant women and newborns requires an examination of thc technology currently available to diagnose HIV infection in women and children. It also requires consideration of the treatment options and possible drug therapy that can be offered to those in whom infection is identified. Part of the challenge of developing rational perinatal HIV screening policy lies in the fact that HIV diagnostic technology and medical therapy are evolving. Therefore, present screening policies need to be flexible to respond to future technological developments.

HIV Diagnostic Technology

The serological tests most commonly used for the diagnosis of HIV infection are the Enzyme-linked Immunosorbent Assay (ELISA) combined with the Western Blot. The ELISA is reliable, relatively inexpensive, easy to perform—and therefore appropriate for screening purposes. The Western Blot is used to confirm the results of the ELISA. The ELISA, which detects antibodies to virus antigens (i.e., HIV viral proteins), is performed first on the patient's serum specimen. If the test is positive, it is repeated on the same blood sample. If positive again, the specimen is referred to as "repeatedly reactive" on the ELISA. This test should not be considered (or be reported as) truly positive, however, until the specimen is subjected to a more specific confirmatory test (usually the Western Blot), which is used to validate the ELISA result (i.e., to determine whether the ELISA-reactive specimen is a true or false-positive result). A "repeatedly reactive" ELISA test that is confirmed positive by a Western Blot is generally diagnostic of HIV infection and can be reported as positive.

In some cases, the Western Blot results will be "indeterminate" or considered nondiagnostic of infection. This nonspecificity can be reduced

to a minimum by using more robust Western Blot interpretive criteria, such as those currently recommended by the Association of State and Territorial Public Health Lab Directors or the American Red Cross. In many cases, indeterminate Western Blot results can be resolved by additional antibody tests, particularly the new assays that employ recombinant or synthetic peptide HIV antigens. These assays could be inserted in the current ELISA/Western Blot algorithm either before or after the Western Blot.

Although these HIV antibody tests are useful in screening pregnant women for HIV infection, they are not diagnostic of infection in newborns; that is, they are unable to distinguish between infected and uninfected infants. (All babies are born with passively acquired maternal antibodies, which may persist for up to 15 months; consequently, all infants born to HIV-infected mothers will test HIV-antibody positive at birth using these serological tests.) Several tests (e.g., assays for IgM and IgA HIV antibodies, which do not cross the placenta and therefore reflect infant status; in vitro antibody production; polymerase chain reaction) currently under development may prove useful in the diagnosis of infection in young infants. The polymerase chain reaction (PCR) in particular appears promising. To enhance the ability to detect the virus, PCP, amplifies specific viral nucleic acid sequences (e.g., HIV proviral DNA) in an individual's peripheral blood mononuclear cells, a capability of particular interest in neonates, given the difficulty of distinguishing infants who are infected rather than merely seropositive. Because of PCR's high level of technical sensitivity, however, inadvertent laboratory contamination or presence of maternal cells can lead to false-positive results. Moreover, the technique's sensitivity and specificity in diagnosing infection in young infants have yet to be determined. For the moment, it appears that it is not sufficiently sensitive to diagnose infection in infants who do not develop AIDS within the first year of life. PCR requires further evaluation before wide-scale use is considered and should, at this point, be regarded as a research rather than a diagnostic tool.

Medical Management and Treatment of HIV Infection in Children

The manifestations and course of HIV disease in children are distinct from those in adults. For example, the tempo of disease progression from asymptomatic infection to AIDS is generally more rapid: children with perinatally acquired infection most often develop signs and symptoms of disease within the first year of life, although the true median age at diagnosis is probably closer to two years. (Overall, about half of all

pediatric AIDS cases reported to date were diagnosed before their first birthday; some children, however, did not develop HIV-related conditions until they were seven, eight, nine, or even ten years of age.) Infants diagnosed within the first year of life tend to have the poorest prognosis: fewer than half survive for 12 months. In contrast, about two-thirds of children diagnosed at one year of age or older were still alive 12 months after diagnosis.

HIV infection in children is a multisystem disease, characterized by progressive immunologic deterioration and thus susceptibility to opportunistic infections and other HIV-related illnesses. The most common opportunistic infection among perinatally infected children is *Peneumocystis carinii* pneumonia (PCP), which usually appears in the first year of life and is associated with a grim prognosis. Other common HIV-associated conditions or infections include failure to thrive, recurrent bacterial infections, persistent oral thrush, and lymphoid interstitial pneumonia. In addition, the majority of infected children experience some degree of neurodevelopmental delay, and some will ultimately develop progressive encephalopathy.

Because the manifestations of HIV infection in children are many and varied, the medical management and treatment of these children are fairly complicated. Such care can include multiple therapeutic interventions, nutritional and psychosocial support, and even pain management. Early identification of infected children allows anticipatory management and the consequent vigorous treatment of bacterial infections and other opportunistic diseases. In addition, it permits modification of routine pediatric vaccination practices—for example, inactivated rather than oral poliovirus vaccine can be administered. Early identification of children who are at risk for infection but have not yet been diagnosed as infected allows medical caregivers to carefully monitor the child's condition for evidence of immunologic impairment and signs and symptoms of HIV disease.

Despite the apparent rationality of these approaches, there is little evidence to confirm that such aggressive care and management makes a difference over the course of the disease. As a result, some pediatric experts question whether these treatment and care measures actually prolong life. Others speculate that quality of life may be improved, but this, too, is unsubstantiated by anything except anecdotal evidence. Notwithstanding this uncertainty regarding the benefits of intervention, the tendency of most caregivers has been to assume that early recognition of infection in children can lead to more effective medical management and treatment.

As noted earlier, perinatally infected children often present with symptomatic disease within the first year of life, and they frequently experience an accelerated decline. This rapid progression creates a narrow

"window" of opportunity for early therapeutic intervention—for example, antiretroviral therapy and prophylaxis against opportunistic infection. Yet the effectiveness of primary PCP prophylaxis in HIV-infected infants is uncertain. Clinical experience with HIV-infected children seems to suggest that it may be beneficial in preventing pneumonia and may even help prevent other bacterial infections. Nevertheless, most pediatric experts agree that PCP prophylactic therapy should not be administered to all seropositive infants. This regimen should still be reserved for children with known HIV infection.

Questions also remain regarding early intervention with antiretroviral therapy such as zidovudine. Evidence suggests that zidovudine therapy in children with symptomatic HIV infection or AIDS leads to improvements in neurological function and weight and growth parameters, and may even prolong life. Some clinicians argue that early intervention with antiretroviral therapy may help reverse or prevent the neurodevelopmental deterioration commonly seen among HIV-infected children. It is as yet unclear, however, whether such therapy will ultimately be of benefit to asymptomatic HIV-infected children.

Medical Management of HIV-Infected Pregnant Women

Appropriate prenatal management of HIV-infected pregnant women includes assessing maternal immunologic function, treating HIV-related complications and infections, and safeguarding and monitoring the intrauterine environment. Some guidance in the management of HIV-infected pregnant women can be gleaned from experience in the management of HIV-infected nonpregnant adults.

For example, among HIV-infected nonpregnant adults, immunologic function is now generally monitored through serial CD4+ cell counts to predict disease progression and indicate when to initiate antiretroviral therapy and prophylaxis against opportunistic infection. There is good evidence of effectiveness of such regimens among nonpregnant infected adults: trials of zidovudine in nonpregnant adults (with CD4+ cell counts of less than 200 and counts between 200 and 500) have demonstrated its effectiveness in delaying the progression of disease, and PCP prophylaxis has been successful in delaying or preventing the onset of *Pneumocystis* pneumonia (one of the most common HIV-related opportunistic infections) in nonpregnant adults with CD4+ cell counts below 200.

Many obstetrical experts concur that zidovudine therapy should be administered to those pregnant women who are at highest risk of disease progression (i.e., those with CD4+ cell counts of less than 200). Although the safety of zidovudine therapy during pregnancy is still relatively

unconfirmed, its use among these women is supported by arguments that the maternal benefits outweigh potential fetal risks and that it is unethical to deny pregnant women a standard of care that would be considered life-prolonging if they were not pregnant. For pregnant women with CD4+ cell counts of between 200 and 500, the benefits associated with antiretroviral therapy are less dear, and many practitioners would defer therapy in this group until the postpartum period. Obstetrical experts believe that, in all cases, the maternal benefits should be weighed against the possible fetal risks, and decisions regarding initiation of therapy should be made in concert with the patient.

Because infected pregnant women with CD4+ cell counts of less than 200 are at greatest risk of developing PCP, many experts believe that administering prophylactic therapy to this group is appropriate. The most common therapies now in use are trimethoprim-sulfamethoxazole (TMP-SMX) and aerosolized pentamidine. TMP-SMX therapy during pregnancy raises some concern because the drug readily crosses the placenta. Sulfonamide therapy has been associated with displacement of bilirubin from its protein-binding site, resulting in increased circulating unconjugated bilirubin, which moves easily across the placental barrier. However, unconjugated bilirubin would be cleared in the maternal circulation, and hence the fetal risks of such therapy appear to be minimal. In neonates, high levels of unconjugated bilirubin have been associated with kernicterus (i.e., the accumulation of bilirubin in the brain, which can lead to severe neurological damage). To date, there have been no reports of increased incidence of newborn kernicterus following maternal sulfonamide therapy; nevertheless, infants born to mothers who have received TMP-SMX therapy during pregnancy should be carefully monitored. There has been little study of the use of aerosolized pentamidine among pregnant HIV-infected women. However, because it has little systemic absorption, one would expect little effect on the fetus or neonate.

Pregnancy also brings special considerations to the treatment of other infectious complications associated with HIV infection, including tuberculosis, fungal disease, herpes simplex, and syphilis. Also germane to the management of pregnant HIV-infected women are the potential effects of pregnancy itself on maternal disease progression. In the case of "normal" pregnancies (i.e., among uninfected individuals), the body experiences immunologic adaptations (reductions in lymphocyte function and in CD4+ cell counts) to prevent maternal rejection of the fetus as a foreign graft. Additionally, during pregnancy women can be prone to increased morbidity from a number of vital illnesses. Specific concern about HIV-infected pregnant women has focused on whether pregnancy accelerates HIV-induced depletion of CD4+ cells and enhances the risk of developing AIDS.

Unfortunately, few studies have examined the impact Of pregnancy on the progression of maternal HIV disease. One recent study compared changes in T-lymphocytes in 102 pregnant women (39 of whom were HIV positive and 63 of whom were HIV negative) during pregnancy and 12 months postpartum.[1] Among the HIV-infected women, the researchers observed a steady decrease in CD4+ cell levels throughout and following pregnancy, although the rate of CD4+ cell decline during pregnancy appeared to be steeper than during the postpartum period. These data have several limitations, however. No statistical approach was used to compare the slope of changes in CD4+ cell levels before and after delivery. Moreover, the clinical significance of the above observation is unclear because control or comparison data from nonpregnant HIV-infected women are lacking. The authors noted that the rate of CD4+ cell decline in the HIV-infected pregnant women was somewhat faster than that in HIV-infected homosexual men or hemophiliacs over the same time period. They concluded that pregnancy may be an important determinant in the further destruction of CD4+ cells. However, further studies are needed to compare the rate of CD4+ cell loss among HIV-infected pregnant women with that of infected nonpregnant women.

Another area of research interest is the potential interruption of vertical transmission through maternal chemoprophylaxis. Studies of maternal therapy to reduce the risk of perinatal transmission are currently under development. One such study protocol, which is being revised to incorporate suggestions from the Food and Drug Administration's Antiviral Drugs Advisory Committee, is a randomized, controlled trial of zidovudine therapy among HIV-infected pregnant women (perhaps beginning as early as the second trimester) followed by newborn treatment during the first weeks of life.

Other strategies to prevent perinatal transmission are also under consideration. These include giving mothers purified human immunoglobulin containing high titers of antibodies to HIV structural proteins (e.g., gp120), which are capable of crossing the placenta beginning in the late second trimester. The rationale for this approach stems from recent reports suggesting that the absence of certain maternal antibodies (i.e., anti-gp120 antibodies) appears to be correlated with vertical transmission of infection.

In sum, many obstetrical experts agree that therapies should not be withheld from pregnant women unless there are known adverse fetal or neonatal effects that outweigh maternal therapeutic benefits. In addition,

[1] R. J. Biggar, S. Pahwa, H. Minkoff, H. Mendes *[sic]*, A. Willoughby, S. Landesman, and J. J. Goedert, "Immunosuppression in Pregnant Women Infected with Human Immunodeficiency Virus, "*American Journal of Obstetrics and Gynecology* 161 (1989):1239-1244.

they maintain that guidelines for treatment during pregnancy should be based on a standard of care for HIV-infected pregnant women that has first been proven effective in nonpregnant adults. Any decisions regarding therapy and acceptable maternal and fetal risks should be made in concert with the patient.

PRINCIPLES AND PITFALLS OF MASS POPULATION SCREENING

In the search for an acceptable public policy on prenatal and neonatal HIV screening, it is helpful to look to past experience with mass screening programs. By examining problems in previous screening programs from an historical perspective, and ascertaining the extent to which these problems have relevance to proposals for perinatal HIV screening, it may be possible to avoid repeating mistakes.

Screening programs typically have served three major purposes. The first is to identify presymptomatic individuals so that disease can be treated or prevented. The second is to counsel individuals of reproductive age who are making family planning decisions. (Both of these purposes are partially motivated by public health concerns about horizontal and vertical transmission of an infectious disease.) The third is research, including enumeration, natural history studies, and recruitment for experimental treatment protocols.

Whether screening programs should be implemented at all, and whether they should be mandatory or voluntary, depends in part on the extent to which these goals are achievable. Implementation depends as well on ethical concerns about the relative balance of benefit and harm. Many who either oppose mandatory screening or urge extreme caution before implementing a mass screening program refer to the harm caused by therapeutic misadventures of the past, all of which were premature attempts to screen for "urgent" conditions that could "obviously" benefit from treatment.

The best-documented mass newborn screening for purposes of treatment is screening for phenylketonuria (PKU). When first introduced, this mandatory screening program was based on two ultimately flawed assumptions. First, it was expected that most infants with high blood phenylalanine were destined to be retarded; in fact, many had normal intelligence. The second problem was a failure to appreciate the toxicity of a low phenylalanine diet. The consequences of these mistaken premises were twofold. First, because many children who were destined to be of normal intelligence were recruited into trials investigating the effects of low phenylalanine diets, it appeared that the diet had been effective in

preventing retardation. Second, and perhaps more important, the toxicity of the diet itself caused retardation and some deaths, not just among infants with PKU but for some normal children. The problems of specificity in newborn screening for PKU have since been resolved.[2] This program is now considered w be successful at identifying those infants who will ultimately benefit from therapy.

The PKU experience highlights several recurring themes in mass screening for the purpose of treatment. First, when the manifestations of a disorder are heterogeneous, there will be uncertainty with respect to benefit and risk. Just as some children with elevated blood phenylalanine are destined to be normal, so, too, most newborns with HIV antibodies are in fact uninfected. Even if truly infected newborns could be identified, they are a heterogeneous population with respect to their prognosis. Some may die within the first year of life, and others may live a decade or longer before symptoms develop. A second aspect of the PKU experience is that it was instituted without adequate pilot studies. Because the benefits and risks of HIV screening are not yet fully understood, some would argue that HIV screening programs should be treated as experiments and subjected to peer and institutional review board evaluation as well as stringent criteria for informed consent. Others maintain that, given a substantial medical benefit that appears to outweigh harm, screening programs may be implemented but should be carefully monitored. A third lesson of the PKU program is to avoid mandating screening programs by law before their adverse consequences are identified and minimized. It is difficult to build into law the flexibility required for midcourse correction.

The most instructive historical example of the potential pitfalls of screening for purposes of reproductive counseling is that of sickle-cell *trait* (to be distinguished from more recent advances achieved through newborn screening for sickle-cell *disense*). The goal of sickle-cell trait screening was to identify individuals who were carriers of the trait, thus providing them with additional information on which to base their reproductive decisions. In retrospect, reproductive choices were often made based on inaccurate

[2] With the use of additional tests, it is now possible to distinguish children with true PKU from those with benign forms of hyperphenylalaninemia, as well as other variations that cause retardation but may not respond to simple phenylalanine restriction. Other problems with the PKU program are more complex and difficult to resolve. Women who were successfully treated for PKU in childhood continue to have high blood phenylalanine levels if they consume a normal diet. Maternal hyperphenylalaninemia is one of the most potent human teratogens. The vast majority of newborns who are exposed in utero have severe malformations and mental retardation. Because a low PKU diet is extremely unpalatable, and prevention of fetal damage may require beginning a low phenylalanine diet before conception, this problem is more difficult to resolve. This situation illustrates the need to monitor treatment programs for long-term effects.

assumptions (e.g., the belief that sickle-cell trait itself was a disease), resulting in irrational decisions. For example, some couples chose to forego procreation altogether based on a false belief that they were at risk. Also present was the risk of stigmatization, that is, the unwelcome or adverse social consequences of *accurate* information. In the case of sickle-cell trait, which appears predominantly among Afro-Americans, stigmatization on the basis of trait status resulted in reduced eligibility for marriage and reproduction and led to discrimination in insurance and employment. Like the earlier example of PKU screening for the purpose of offering treatment, screening with the goal of informing reproductive counseling has at times been accompanied by substantial risks (generally psychosocial rather than medical) that were unanticipated at the outset of the program.

There are several lessons from the sickle-cell experience that may be applicable to HIV screening. The first is the danger of discrimination when a screening program or disorder targets racial groups. Because the prevalence of HIV infection is increasing among blacks and Hispanics (groups already disadvantaged with respect to obtaining insurance, employment, and health care), policies formulated by the white majority to identify infected persons may be viewed by these groups with suspicion and concern. A second, related lesson is that medical and political motivations are often difficult to separate. If public monies are devoted to HIV screening for political reasons, then HIV screening will occur regardless of whether medical benefit has been demonstrated. Third, if reproductive choices are to be made individually, based on personal values and beliefs,[3] then counseling and education needs to precede and follow screening.

As a result of previous experience with screening programs, the National Research Council,[4] the Hastings Center,[5] and the President's Commission for the Study of Ethical Problems in Medicine and Biomedical

[3] In the case of sickle-cell screening, several reproductive options were available to individuals to prevent affected offspring: they could decide to have no children, they could consider adoption of healthy children, or they could pursue impregnation by another partner, either informally or through the use of new reproductive technologies (e.g., artificial insemination by a donor who had been screened and found not to be a carrier). They could also, being aware of the risks, decide to have a child.

[4] National Research Council *Genetic Screening: Programs, Principles, and Research*, Report of the Committee for the Study of Inborn Errors of Metabolism, Division of Medical Sciences, Assembly of Life Sciences (Washington, D.C.: National Academy of Sciences, 1975).

[5] M. Lappé, J. M. Gustafson, and R. Roblin (co-chairmen), Research Group on Ethical, Social and Legal Issues in Genetic Counseling and Genetic Engineering of the Institute of Society, Ethics and the Life Sciences, "Ethical and Social Issues in Screening for Genetic Disease," *New England Journal of Medicine* 286(1972):1129-1132.

and Behavioral Research[6] independently developed criteria for ethically and socially acceptable mass screening. Several themes seem to have attracted consensus. First, the goals should be carefully defined and shown to be achievable. Second, if reproductive planning is the purpose of the screening, education should be shown to be effective. Third, informed consent should be feasible in terms of the capacity of those being screened to understand the benefits and risks of the proposed tests. Fourth, if the goal of screening is treatment, services should be available. Fifth, quality control needs to be ensured. Finally, the costs should be acceptable.

Several problems are evident when these criteria are applied to newborn HIV screening. First, newborn screening is, de facto, maternal screening. If one of the achievable goals of newborn screening is to identify maternal infection and provide voluntary counseling and treatment to the woman, it would be more justifiable ethically to screen the woman herself. Second, a major goal of neonatal screening is likely to be early recognition of infection and subsequent therapeutic intervention (e.g., antiretroviral therapy or prophylaxis against opportunistic infection). It is currently unclear, however, just how great a benefit may be derived from treatment of newborns. This problem is compounded by the difficulty in distinguishing truly infected infants from those who are seropositive as a result of passive transfer of maternal antibodies. Third, even if these interventions are shown to be beneficial the relative weight of benefits and burdens to be derived from screening for any given infant is a judgment that is traditionally made by the infants parents. Some refusals of standard, established treatment constitute neglect. If a parent were negligent in refusing to allow his or her infant to be tested for a therapeutic intervention with known benefit, established mechanisms for authorizing treatment could be utilized.

A fourth problem is the difficulty in obtaining services, for financial and clinical reasons. There is unpublished evidence that health care professionals may change their treatment decisions (e.g., forego aggressive measures, such as surgery, if life-threatening complications arise) if they believe a baby is HIV-antibody positive. Finally, in addition to the problems encountered in meeting these criteria, there are questions regarding the accuracy of the screening tests now available (especially for newborns), stigmatization of newborns and their mothers, concerns about discrimination, and uncertain cost-effectiveness.

Because the benefits of HIV screening are unproven and the risks of psychosocial injury substantial, most health experts argue that it is

[6] President's Commission for the Study of Ethical Problems in Medicine and Biomedical and Behavioral Research, *Screening and Counseling for Genetic Conditions* (Washington, D.C.: Government Printing Office, 1983).

particularly important to pay strict attention to the ethical and legal duty to secure an informed consent from an individual before proceeding with HIV testing. Indirect maternal screening (i.e., through the newborn) without consent subjects the woman to a range of potentially serious harms, and there is evidence that concern about these harms may deter some women from seeking health care. Consequently, newborn HIV screening does not qualify as a routine procedure for which consent may be presumed or inferred. Yet informed consent may not always be feasible. Parental involvement in these cases is often limited because of the mother's poor health and sometimes poor mental status. If a parent is absent or legally incompetent, the child needs a guardian appointed who can make reasonable judgments about the child's care, including participation in treatment or research protocols.

Although such problems are acknowledged by proponents of mass screening, they argue that, if well organized, screening can be one of the most important, cost-effective contributions to the nation's health that health agencies provide. Under the direction of skilled public health screening specialists, with careful program design, a flexible implementation mechanism, and broad-based input in the form of public scrutiny and debate, many of the pitfalls of screening can be avoided. Well-organized mass screening can also permit large-scale collaborative studies that help identify and resolve program flaws or unanticipated side effects more quickly than small-scale programs. Critics of mass screening emphasize that the first moral responsibility is to do no harm (nonmaleficence); supporters, on the other hand, claim that, if screening is to be performed at all, the ethical mandate is to do good (beneficence) and to do it for the greatest number (utility). They argue that harm is done by omission as well as commission.

When the state mandates screening, it incurs moral obligations. First, the state must provide the means to comply with the screening mandate. Second, it must ensure the protection of privacy and confidentiality. Third, it must provide access to appropriate prevention or treatment services. Some experts hold the controversial view that people should be screened, a need identified, and demand created so that appropriate treatment or prevention services will then be made available.

Some supporters of universal screening point to the program of the California Department of Health Services' Genetic Disease Branch as exemplifying the benefits such screening can offer. Advocates of the program believe that confidentiality of test results and medical records can be effectively provided. Some argue that such universal programs may be better able than selective screening programs to protect the privacy of those screened because screening is offered to everyone regardless of risk history. Furthermore, universal screening is likely to identify cases in so-

called low-risk groups, which may dilute some of the stigma attached to positive test results by demonstrating that the problem is not restricted to a small segment of the population.

Before (widespread perinatal or any other type of) HIV screening is undertaken, goals need to be clearly defined, and they must be achievable. In addition, attention must be paid to the risks involved such as the potential for stigmatization, deterrence from seeking health care, and limited access to services. Finally, standards of informed consent should be observed (see the later discussion on consent and counseling).

WHO SHOULD BE SCREENED?

Screening programs typically have three common characteristics. First, they share the goal of identifying persons in the early, presymptomatic stages of an illness so that some action can be taken to favorably alter the course of the illness, an action that would not be as effective if one waited until the disease manifested itself overtly. Second is the existence of some proper authority for conducting the screening, either the consent of the Persons being screened or some public mandate. Third is the requirement that the process be efficient in both human and economic terms (i.e., the benefits of early identification and treatment should exceed the Personal and societal costs associated with screening).

The first and most compelling goal of neonatal HIV screening is to provide potential benefits to the child. These benefits include, most notably, prevention of *Pneumocystis* pneumonia, as well as early detection and prevention of other HIV-associated illnesses; changes in pediatric management, such as substitution of an inactivated for a live poliovirus vaccine; and early intervention to ameliorate some of the social disruption that occurs in families stricken with HIV disease. A second but less important goal involves case-finding, including the infant's parents or siblings. (The presumption is that early detection and treatment would be beneficial to all of the individuals identified.) A third goal is prevention of secondary transmission. Although available data overwhelmingly suggest that there is little risk of casual transmission of HIV infection without direct mucous membrane or wound contact with contaminated body fluids, in some select cases there may be a reason to let caretakers know that a child is infected.

Whether these goals can be achieved by newborn HIV screening depends on the epidemiology, natural history, and nature of transmission of HIV infection in children, and the effectiveness of HIV screening tools and medical interventions. It is likely that the prevalence of HIV infection among newborns will continue to be highest among disadvantaged

populations, but indications are that a growing number of cases may be found outside of the most common risk groups and geographic areas. In addition, there will continue to be a range of expression of perinatally acquired HIV infection from severe manifestations with early mortality to increasing numbers of infected children living to school age and beyond. In all probability, zidovudine will show promise for treating asymptomatic children who are infected; however, given the difficulties of diagnosing infection in infants, uncertainties will remain about when such therapy should begin. Consequently, at least in the first few months of life, there will continue to be a risk of treating infants who are, in fact, not infected.

HIV screening programs for any group must continue to consider the problem of discrimination. Although the stigmatizing effect of HIV infection can be eased through intensive counseling and support services, it may remain a significant deterrent to individuals who might otherwise wish to know their own or their child's HIV-antibody status. By the same token, medical and public health authorities are likely to consider any sort of mandatory HIV screening as a major imposition that could only be justified by much larger and more concrete benefits than have been demonstrated to this point.

With respect to vertical transmission, about 25 to 35 percent of children born to HIV-positive mothers will ultimately be infected themselves. Some experts believe that a medical approach to prevent vertical transmission is unlikely in the near future, although the avoidance of breast feeding may come to be advocated more strongly (particularly in countries where safe alternatives to breast milk exist). Behavioral change will remain the only effective means of preventing viral transmission. Finally, it is unlikely that the discovery of new tests to allow earlier and more precise identification of infection in infants will completely solve the problem of determining, in the first days or weeks of life, which infants are truly infected.

Although conventional HIV-antibody tests are not specific enough to identify truly infected infants and interventions do not yet exist to prevent transmission or cure HIV infection, potential changes in medical management might justify neonatal screening even with the current limitations in the state of knowledge. For example, close medical follow-up of seropositive infants may allow early identification of symptomatic infants who are likely to benefit from intervention.

Of the three major interventions that seem most practical—PCP prophylaxis, the alteration of immunization schedules, and close medical follow-up—the first and third present certain risks for those who prove ultimately not to be infected. PCP prophylaxis for these children exposes them to therapeutic risks without accompanying medical benefits. Close medical follow-up may subject infants to iatrogenic risks either through

excessive interventions for benign illness or participation in experimental protocols. The medical risks should be minimal, however, if HIV-specific interventions such as zidovudine are reserved for infants who develop symptoms and if presymptomatic treatment is confined to nutritional support and prompt treatment of intercurrent infections.

Close follow-up may also have the effect of labeling infants as HIV infected, a label that will be difficult to remove even though later definitive testing shows no infection. Avoiding such a label could well spare a child the burdens of discrimination in early child care programs. These risks might be justified if they were balanced by improvements in the quality of medical and social support. The benefits of prophylaxis and early treatment may, indeed, outweigh the social and medical risks inherent in case identification. However, establishing the necessary service network to deliver those benefits remains the most significant barrier to the accomplishment of screening goals.

Once the benefits of screening and the likelihood of their effectiveness are established, a decision must be made whether to target screening or make it universal. There is a compelling rationale for geographically targeted newborn screening so that limited resources are not used inefficiently and medical attention is not diverted from other important concerns. Yet there are epidemiological and sociological arguments against geographic targeting that are at least as compelling. For example, as HIV infection spreads among the heterosexual population, it will also spread in the pediatric population. In fact, almost every state now has at least some pediatric AIDS cases. Another concern about geographic targeting is that, because HIV infection currently is most prevalent among minority populations, targeting might subtly reinforce discrimination.

The next question is whether there can or should be targeting at the individual level. A logical approach would be one that combined several strategies. For example, the prevalence in different geographic regions could determine the aggressiveness with which prenatal HIV screening is carried out and individual risk factors are considered. Prevalence of infection in a locale (determined with the use of methodologically sound population estimates) of less than 1 infected woman per 1,000 women, would be considered "low." To apply such a threshold, it would be necessary to determine how such geographic boundaries were to be defined. Whereas it might be most efficient for public health authorities to implement a program at the state level, clinically it might be more meaningful to develop screening programs based on prevalence in specific communities.

Some experts believe newborn HIV screening should be universally offered but voluntary, because it is still questionable whether its goals can be achieved. (The thoroughness with which parents are approached should

be dictated by the extent of prenatal HIV screening, local seroprevalence, and the existence of specific individual risk factors.) Advances in diagnostic technology, presymptomatic treatment, and social safeguards will further strengthen the case for neonatal HIV screening. There is some consensus, likewise, regarding the routine offering of HIV screening to pregnant women in all communities regardless of prevalence. (In higher prevalence communities, such screening might be accompanied by the recommendation that women be specifically encouraged to take the test.) Such a policy of universal *voluntary* prenatal screening has several justifications. First, the autonomous decisions of competent adults should be respected. Moreover, it is arguably the case that prenatal screening, no matter how forcefully or mandatorily it is implemented, will not substantively change the epidemiology of HIV disease in the next generation. There are several lessons to be learned in this regard from the public health system's experience with syphilis, a sexually transmitted disease that is highly correlated with HIV infection. Despite the implementation of mandatory prenatal screening and treatment for syphilis, as well as the availability of a curative agent, syphilis in the United States is now occurring in epidemic proportions. In the case of HIV, identifying infected women is an important task and potentially beneficial, but screening carried out in health care settings will in fact identify only a small proportion of those infected because the women at greatest risk are the ones who do not receive health care. The use of crack cocaine (which may increase a woman's risk of becoming infected because of the bartering of sexual favors for money to obtain the drug) is a major barrier to identification because of its association with decreased health-seeking behavior. Pregnant women who do not receive care until the time they give birth are far more likely than women who do receive prenatal care to be users of crack cocaine—and to be HIV positive. Thus, testing conducted only in prenatal clinics will never identify the majority of pregnant women who are infected with HIV.

There are other barriers as well to the identification of infected women. Social factors such as a loss of status in the community, stigmatization, and a loss of social supports may deter some women from undergoing testing; inadequate insurance coverage that limits access to treatment can discourage others. A barrier to identification may also result from a reliance on self-reported risk factors to determine who will be offered testing. Some research has shown that a substantial percentage of women who are HIV positive acknowledge no risk factors. In some cases, women may be reluctant to disclose the drug use or sexual behaviors that place them at risk; in other cases, they may simply be unaware of their risk. One cause of this lack of patient awareness may be dishonesty

on the pan of male partners (in an attempt to "make a good impression") regarding their sexual history and past or present drug use.

Another barrier to identification may stem from the ignorance of physicians regarding HIV (and risk-associated behaviors) and their fear of finding a case of infection. It is sometimes difficult for clinicians to confront their own inadequacies regarding the detection and treatment of HIV infection; in addition, the referral networks that exist for other diseases are not yet firmly established for HIV. Obstetricians in particular often experience painful conflicts: society appears to be asking them to become champions for the needs of and benefits to the child, when their traditional, and to them, appropriate, focus has been the needs of the mother (although not to the exclusion of considerations for the child).

Even if these barriers to diagnosing HIV infection can be overcome and women can obtain testing, the number of women who are actually tested will still vary among programs. The best predictor of how many women will be tested in a given setting is the type of program there. Some evidence suggests that if the test is *selectively* offered (on the basis of risk factors), about 10 percent of women will be tested. If the test is *universally* offered, using a neutral (nondirective) counseling model, about 40 percent of women will take the test. If the test is universally *recommended* (i.e., a more directive approach is used), 70 to 80 percent of women will be tested. Finally, if a screening program ostensibly gives the woman the right to refuse the test but does not inform her that she has that right, it is indistinguishable from a mandatory program and virtually 100 percent of women will be tested.

Many experts agree that screening all women of reproductive age for the purpose of identifying and treating HIV-infected women does not appear to be an efficient use of limited resources. As indicated earlier, even when testing is widely available, not all women who are at risk will benefit from such testing or even avail themselves of the service. HIV screening instituted for the purpose of changing behavior is also of uncertain merit. Experience has shown that it is very difficult to change risk-taking and sexual behaviors, even among HIV-seropositive individuals. Indeed, large proportions of adolescents and adult women, both infected and uninfected, experience difficulties with contraceptive use, as well as with planning their pregnancies. The results of several studies of pregnant and nonpregnant HIV-infected women's behavioral response to knowledge of their HIV infection indicated that approximately 20 to 25 percent chose abstinence, 30 to 40 percent practiced fairly reliable safer sex techniques, and another third or more continued their sexual practices unchanged. Even within a relatively empowered group of educated individuals, knowledge of the risks of HIV infection in many cases does not produce behavioral change.

Knowledge of HIV-antibody status does not seem to affect pregnancy termination decisions any more strongly than it affects contraceptive behavior. One study in New York found that HIV-positive women do not choose to terminate their pregnancies more frequently than seronegative women[7] Neither the perceived personal risk of perinatal HIV transmission nor the presence of concern about AIDS appeared to be associated with an increased rate of pregnancy termination. Decisions to terminate were best predicted by whether the pregnancy was unplanned and whether the woman reported feeling upset, sad, or frightened when she first learned about it.

Some health officials contend that networks already exist within the United States where women of reproductive age have access to HIV testing services. These experts argue that, rather than funding wide-scale screening, confidential, voluntary testing services should be made available in a number of sites serving women, such as family planning clinics, prenatal care clinics, sexually transmitted disease clinics, substance abuse treatment centers, or alternative testing sites. Neutral counseling and education provided in such settings can facilitate informed reproductive decision making by seropositive women (and, where appropriate, their partners). Counseling regarding the use of condoms for purposes of both contraception and prevention of transmission of infection is also likely to be offered. Even in these already established settings, however, substantial resources are required to provide appropriate, effective counseling and testing and the social support and health care services needed for both infected women and their children.

CONSENT AND COUNSELING

Creating an adequate informed consent process for HIV screening can be guided by knowledge of informed consent generally. Information about the status of informed consent in clinical medicine, how consent requirements shift as one moves from a clinical to a public health perspective, and alternative models for consent in the context of screening programs will contribute to formulating an appropriate informed consent process for prenatal HIV screening.

[7] P. A. Selwyn, R. J. Carter, E. E. Schoenbaum, V. J. Robertson, R. S. Klein, and M. F. Rogers, "Knowledge of HIV Antibody Status and Decisions to Continue or Terminate Pregnancy Among Intravenous Drug Users," *Journal of the American Medical. Association* 261(1989):3567-3571.

Informed consent is not something one gives to a patient, nor is it something one does to a patient. Rather, a consent is something one gets from a patient. Sometimes, in the context of research, consent is merely a permission that satisfies the operative institutional or legal rules, most classically, a signature on a form. Informed consent, however, has been taken to mean much more, both in law and in medical ethics, than a signature on a form.

An informed consent is an autonomous action by a subject or patient that authorizes a professional to initiate a specific research intervention or therapeutic medical plan or to withdraw treatment. Conversely, an informed refusal would be the autonomous act of refusing or withholding such authorization. Informed consents and refusals are two sides of the same coin. Indeed, there is no point in having an informed consent policy if there is no simultaneous commitment to respect refusals. Informed consent need not be *fully* autonomous as long as the person makes a decision based on a substantially accurate understanding of what is at stake and makes that choice reasonably free of constraint by others. Underlying the concept of informed consent are the principles of respect for autonomy and respect for privacy.

Informed consent is a relatively new tradition, the theory and rhetoric of which has gained rapid acceptance in the medical community. There are grave questions, however, about whether the theory, rhetoric, and formality of informed consent procedures have any meaning in practice or whether they have changed the fundamental character of the physician-patient relationship. The lines of authority and control seem roughly to be what they have always been. Patients routinely acquiesce to medical interventions rather than autonomously authorizing them.

Patient acquiescence is not a problem for many circumstances in clinical medicine (e.g., noninvasive interventions that pose literally no risk) in which proceeding without specific patient authorization can be plausibly defended. Committing the necessary staff resources to obtain informed consent for these interventions would entail shifting resources from other competing needs and interests, such as other educational efforts. The use of such resources to obtain informed consent is not justified, either from an efficiency or a justice standpoint. At the other extreme are experimental interventions, which always require informed consent.

The general problem in the area of consent is what to do with the medical interventions that fall in between these polar extremes. The challenge in clinical medicine is to distinguish the conditions under which it is inappropriate for a clinician to proceed without the express authorization of a patient from those situations in which the clinician may proceed on his or her own initiative. Specifically, it must be determined where HIV-antibody testing fits on this continuum.

The extent to which resources are devoted to a meaningful informed consent requirement turns, in part, on whether HIV testing during pregnancy is framed as a public health issue or an issue in clinical medicine. Insofar as public good motivates the screening, considerations for informed consent will be somewhat different than if the motivation is clinical—that is, to provide benefits to the individual pregnant woman. The question becomes whether the autonomy interests of pregnant women are, in this instance, validly overridden by the interests of society in controlling the epidemic.

This question cannot be answered without examining the extent to which screening of pregnant women would contribute to furthering society's interests. Moreover, various screening models require examination to determine the extent to which they must be mandatory to serve the public good. Different screening approaches range from voluntary with specific informed consent, to voluntary with right of refusal, to mandatory. In practice, it is difficult to maintain these distinctions in such a way that one type of program does not fold into another. If there is a policy of informed consent but the educational process that must accompany it is nonexistent, there will be no difference between a policy of informed consent and a policy of voluntary screening with the fight to refuse. The latter policy will shade into a mandatory policy to the extent that no attention is paid to notifying or educating women that testing is going to take place. Even some mandatory policies, which are those regulated by law, have allowed women to opt out of the test for reasons of conscientious objection or specific religious beliefs.

Some argue that mandatory screening programs actually hurt rather than promote the public good. A screening policy that requires informed consent can be defended, not only on the grounds of protecting individual women's rights but also on the grounds that mandatory programs have the potential to create social divisiveness and both gender and ethnic discrimination. A final consideration in screening policy is the extent to which the consent that a patient signs limits disclosure to third parties, thereby maintaining confidentiality.

Once a program establishes that informed consent is required for screening, the elements of pretest counseling, during which consent is either given or refused, must be set in place. Pretest counseling should be viewed as an opportunity for education regardless of the patient's decision about testing. In one successful program, pretest counseling consists of two pans: information and assessment. The information (education) component of this program includes discussion of such topics as the spectrum of HIV infection, modes of transmission, and risk reduction practices (e.g., condom use). This information can be imparted using a mix of methods depending on the particular setting, its resources,

and the patients being counseled. Another useful feature of the education component is a discussion of the importance of involving the partner in testing and counseling.

Assessment is more difficult and resource intensive, for it involves a determination of the patient's coping mechanisms, suicide risk, psychiatric problems, and support network. One of the major benefits of assessment is that it helps to provide a more meaningful informed consent. Moreover, discussion of support networks offers another opportunity to introduce the notion of including the partner in the process of HIV testing and counseling.

In the program noted above, posttest counseling begins immediately after blood is drawn (because some people will decide that they do not want to learn their results). The actual communication of test results always occurs in person. Negative results are accompanied by reinforcement of education regarding how to stay negative. Positive results are offered by two people, one of whom was responsible for conducting the pretest counseling. Result sessions are scheduled early in the week so there is adequate time for follow-up.

Posttest discussions in this program include the distinction between HIV infection and AIDS, the impact of HIV infection on the pregnancy and the pregnancy's impact on the woman's disease progression, the risk-benefit ratio of various treatments and the impact that treatment could have, and the option of pregnancy termination if the woman is early enough in her pregnancy. If abortion is an option, the counselor helps the woman explore her feelings about the pregnancy, recognizing that many HIV-infected women choose not to abort. Partner notification is discussed, and assistance in telling the woman's partner is offered. Literature is provided so that women who have been unable to absorb what is being said can have something to read when they go home and something to share with their families. Referrals for abortion or prenatal care, medical evaluation of the woman, assessment for other family members, and appropriate pediatric care are arranged, as well as follow-up counseling sessions with the woman. Although these components of counseling have contributed to this particular program's success, clinicians need to determine the model that works best in their own settings with their own resources. Whatever model is chosen, it should be culturally sensitive and mindful of the social realities (including poverty, lack of access to services, and drug addiction) facing HIV-infected women who are pregnant or considering pregnancy.

Once a woman has decided to be tested and is identified as seropositive, posttest counseling must focus not only on anxiety and coping skills but also on reproductive decisions. Often, because treatment is not always offered to pregnant women, a woman must choose between her own health

and remaining pregnant. Increasingly in the near future, she may be asked to decide between the risk of perinatal transmission and the possible fetotoxic risk of antiretroviral therapies intended to reduce the risk of transmission. There is considerable controversy over the degree to which counseling regarding these issues is and should be nondirective (as in the value-neutral genetic counseling model) or directive (which, in theory, can be subtle but more often tends to be overtly coercive).[8] Several arguments in favor of directive counseling have been put forth. First is the lack of capacity for reasoned decision making in some women by virtue of immaturity, drug use, or other forms of incompetence. The argument is that an objective third party may be better positioned to ascertain what is in the best interests of such a person. Second is the high risk of great harm to the child. If the case could be made that being born with HIV infection would be "a wrongful life," it can be distinguished from many genetic diseases that present children with a burdened life but by no means one that is not worth living. A third justification for directive counseling focuses on social burden. Because many HIV-positive women will not be able to assume responsibility for their choices, in particular, the continuation of their pregnancies, some have questioned whether it is fair for society to pay the already substantial—and escalating—costs of treatment, social services, and foster care. The final argument is that nondirective counseling seems to be failing in altering the behavior of infected women—either not to reproduce in the first place or to abort if pregnant.

Although proponents of directive counseling acknowledge that such counseling for abortion is more difficult to defend than counseling for contraception, they argue that one form of directive counseling, called negotiated directive counseling, can be entirely noncoercive and respectful of reproductive rights. The claim is made that such a counseling model, by permitting the counselor to recommend a particular course of action only with the prior consent of the woman, poses the least threat to her autonomy. Although the vulnerability of the group singled out for such counseling raises questions about whether their choice would, indeed, be autonomous, requiring their consent would respect moral concerns about equal protection. Moreover, such a model would help to redress the power imbalance that characterizes many clinical encounters. Experimenting with different types of negotiated directive counseling, such as peer counseling, would allow assessment of the effectiveness of such a model.

Opponents of directive counseling for HIV-infected women likewise offer several reasons for their position, many of which are grounded in concerns about women's rights. They argue, first, that women are the

[8] This controversy is relevant to pre- as well as posttest counseling—that is, not only for a woman's reproductive decisions but also for her decision about whether to be tested at all.

most neglected group of all HIV-infected individuals. Second, pregnant women, unless they abort, are often systematically deprived of state-of-the-art treatment. Third, the women in question are already discriminated against because of their gender, race, poverty, and drug addiction, and opponents of directive counseling consider it politically and morally unacceptable to single out this group for any kind of counseling innovation without helping them with their other problems (e.g., homelessness, drug addiction). Moreover, to apply concerns about wrongful life more equitably, the same type of counseling would have to be implemented with any genetic disease that has an equivalent level of risk. Fourth, it is argued that the entire concept of a maternal-fetal conflict is flawed. The conflict is not between the mother and fetus but between the mother and someone else in a position of authority who thinks they know what is best for her baby. In this view, it is justifiable for a doctor to give advice when it is sought but not to imply that there are no other options.

Those who defend nondirective counseling base their arguments on the notion of reproductive liberty wherein only individual women and not their physicians or the government have the right to determine whether a pregnancy is continued. Caution is urged in regard to the slippery slope between directive counseling for abortion and mandatory sterilization. Proponents also assert that no directive counseling was never intended to alter behavior and therefore cannot be criticized for failing to do so. What is important in a pregnant woman's self-determined decision making is not what decision she makes but whether it is informed, and whether it is the right decision for her.

Opponents of directive counseling offer practical as well as moral arguments. They maintain that such counseling cannot possibly work in the current health care system because most women are not going to be seen in time to counsel them about abortion. Their primary claim is that efforts at prevention have been misdirected. Instead of targeting the population of women who are already HIV infected, efforts should be directed toward drug-addicted women and teenagers. In addition, they argue, work should continue toward developing some kind of nationally financed system with universal access to health care.

In determining the appropriate approach to reproductive counseling, several temptations must be resisted. The first is the tendency to view counseling as taking one form or the other. In reality, counseling combines directive and nondirective approaches because it is a human communication process that involves both speech and subtle nonverbal cues. Second is the tendency to superimpose the goals of public health, an area where recommendations for medical care are made so as to reduce morbidity, onto reproductive goals. It is easy to see why this confusion occurs in the context of HIV infection. Currently, vertical transmission

can only be interrupted (a public health goal) if the woman avoids having a child. In this case, the disease comes "attached" to something that the woman might want very much, namely, a child—a crucial difference between perinatal HIV infection and other diseases for which preventive health measures are available. Finally, reproductive decision making is one form of clinical decision making, and it is important to distinguish the general clinical context from the public health context. Goals that may be appropriate in the public health context, for example, discouraging HIV-infected women *as a group* from reproducing, may not be appropriate in the individual encounter.

HIV SCREENING POLICY IMPLEMENTATION

Perinatal HIV disease occurs predominantly in milieus characterized by a lack of material and personal resources, social disorganization, and drug use. Women and children in these environments often are not in contact with the health care system; when they are, their care tends to be underfinanced, crisis oriented, and fragmented because there is virtually no coordination of health and human services. In addition, care is often available only at sites located some distance away from the families' own communities.

Any policy of prenatal or neonatal HIV screening must consider the extent to which necessary follow-up services are available and accessible. In addition, it must be determined whether such services can be organized and delivered in a family-oriented, community-based fashion, with a regionalized network of referrals and linkages with other maternal and child health programs. Such a system requires that health professionals involved in the care of infected women and children collectively come to an understanding of what it takes to test, care for, and treat *families* with HIV infection (rather than focusing exclusively on women, children, or male drug users). It is likely that changes in practice standards will be necessary and that they will involve modifications in professional education for all primary care specialties including obstetrics, pediatrics, internal medicine, and family practice.

Optimal care of families with HIV infection is founded on the health care practitioner's knowledge of the family's HIV infection status and on his or her understanding of the course of the disease and the requirements of infected persons. Care of the HIV-positive pregnant woman and her partner requires close medical supervision and a range of psychosocial interventions. A child born to an HIV-seropositive mother, in addition to routine pediatric visits, requires careful medical and immunologic surveillance for signs and symptoms of HIV infection. Early detection of

severe immune deficiency will justify the offering, either singly or in combination, of prophylaxis against opportunistic infection, antiretroviral therapy, and participation in clinical trials. Because many of these children are also at risk for developmental disabilities, they may require formal evaluation and referral for early developmental intervention.

These families need, at the very minimum, a general, family-oriented physician and a case manager to coordinate services. In addition to providing medical services and counseling, these providers should be part of a network for consultation and referral. They should have ready access to the full range of human services providers required to meet the family's needs for housing, transportation, income, food, home care, visiting nurses, drugs and medical equipment, respite care, foster care, day care, drug treatment programs, and individual and group counseling. In this ideal multidisciplinary-team approach to care, obstetricians, pediatricians, family planning specialists, internists, psychiatrists, social workers, nurses, and human resource specialists would work together simultaneously at the same site.

Whether in an inner-city or rural area, such an arrangement could be based in a family care facility or in a clinic attached to a tertiary care center close to the patient's home. A program like this could function both in high-and low-prevalence areas and be incorporated into already existing programs for maternal and child health, programs to reduce infant mortality, and drug treatment programs. Ideally, the system of care for the HIV-infected family should be regionalized. Its design, financing, and implementation should be seen as the responsibility of the entire society carried out as a joint effort by representatives of both the public and private sectors.

One state (New Jersey) has approached prenatal and newborn HIV screening by developing a policy of universal HIV education about the virus and its transmission, risk reduction counseling on drug use and sexual behavior, and voluntary testing for all pregnant women and all women contemplating pregnancy. Other relevant New Jersey policies include AIDS prevention and control programs that involve men, and a partner notification program, wherein all persons, male or female, who are found to be HIV positive are counseled concerning partner notification and offered assistance in notifying their sexual or drug use partners of their infected status. Implied but not stated in the prenatal screening policy is also the recommendation that parents of newborns whose mothers have not been screened should be counseled and advised to consent to HIV testing. Specific written, informed consent or refusal is a cornerstone of this testing policy.

The service system in place in New Jersey to implement the screening policy includes a network of 16 free, anonymous counseling and testing

sites that regularly accept all people seeking an HIV test, all Health Start (a prenatal program in New Jersey) providers, family planning clinics, and maternal and child health clinics. All are expected to meet the standard of practice requirements for counseling and for offering the test. For women and infants found to be HIV positive, there are five federally funded programs that not only provide pediatric care but case managers as well, who routinely assess the mother's needs and access to care. The special child health services program has a home health Medicaid waiver program, a demonstration perinatal program, and a clinical trial at a major teaching hospital. In addition, a demonstration early intervention program was recently launched in five of the state's largest infectious disease hospitals. There are four pediatric residences in the state, one hospital is planning a home for mothers and children, and a pediatric nursing home now has beds for children with HIV disease.

Implementing the screening policy as a statewide standard of medical practice rather than by statute or regulatory requirement was considered most likely to achieve the goals of screening without the divisiveness—and extended time—of a legislative struggle. Therefore, the policy was intentionally couched as a strongly recommended standard of medical practice and sent to all licensed physicians, certified nurse-midwives, directors of obstetric and pediatric services, and health care facility administrators. Simultaneously, with the health department's support, New Jersey passed legislation regarding confidentiality. If the policy does not achieve its goals as a standard of care, the state may consider implementing the same approach but in more forceful terms (i.e., as a statute or regulation). Before any changes are made, however, evaluation is necessary to determine whether in its current form the policy is having the desired effects. New Jersey will soon begin a process-oriented, three-phase evaluation to make that determination. In the first phase, a formal questionnaire will be administered to directors of publicly funded clinics to ascertain if they are aware of the policy and adhering to it. Phase 2 will investigate basic knowledge and program implementation among a larger sample of providers including private individual and group obstetrics practices. The third phase will survey counselors to obtain information on the qualitative content of counseling and any concerns raised by the public.

New Jerseys policy analysis and choice of options were driven by both epidemiological findings from state seroprevalence data on childbearing women and the state's assessment of the proportion of infected women who were actually receiving care. Blinded seroprevalence data in 1989 showed that there were approximately 600 HIV-positive women in the state (a seroprevalence rate of 0.52 percent), but only about 25 percent of them were, in fact, receiving care. New Jersey health officials made the case that both the unacceptably high rate of infection and the lack of

identification and referral of infected patients for care indicated the need to introduce some statewide approach to screening.

The perspectives of several parties were included in the development of the screening policy. There was consensus, among a group composed of pediatricians with expertise in HIV infection, nurse clinicians, ethicists, and a pediatric society representative, that counseling and testing should occur prenatally, not after birth. The state also consulted community groups: the Women in AIDS Network, a New Jersey advocacy group that includes lawyers, the American Civil Liberties Union, a state public advocate, a psychotherapist, and family planning associations, as well as individual women, some of whom have AIDS. The main argument against the policy being formulated as a standard of practice was put forward by groups of obstetricians and regional American College of Obstetrics and Gynecology (ACOG) representatives, who were afraid that office-based physicians would not comply without a mandatory testing law. Indeed, the greatest challenge in implementing this policy is to help the office-based obstetrician and pediatrician counsel HIV-infected persons and secure informed consent. New Jersey has developed a clinical protocol, including a draft informed consent form, for the identification and management of asymptomatic pregnant women and children, which can be incorporated into office-based practice. In addition, a series of roving symposia for office-based practitioners are being planned. State health officials hope that the potential for lack of compliance will be overcome by making physicians feel somewhat at risk of the "threat" of liability if they fail to follow the protocol and miss an HIV-positive patient as a result. The Department of Health and the Women in AIDS Network are also developing several brochures to ensure that the information given to women is adequate, readable, and supportive of informed consent.

Although a statewide approach led by the state health department is one way to implement policy, there are other means that deserve consideration. Physician groups, university medical centers, local health departments, clinics, or group practices could also develop and implement policy. Many would argue that professional societies are best suited for this task, and in fact some have begun such efforts, although most have limitations. For example, current practice guidelines of the American College of Obstetrics and Gynecology[9] and the American Academy of Pediatrics[10] recommend HIV counseling and testing but only for those

[9] American College of Obstetrics and Gynecology, *Human Immune Deficiency Virus Infections*, Technical Bulletin, No. 123 (New York: American College of Obstetrics and Gynecology, December 1988).

[10] American Academy of Pediatrics, Task Force on Pediatric AIDS, "Perinatal Human Immunodeficiency Virus Infection," *Pediartics* 82(1988):941-944.

individuals who are identified as being at risk. ACOG's most recent standards suggest history-taking at the initial prenatal visit as a way of identifying risk behaviors but do not specifically mention HIV. ACOG is also preparing a statement on physician responsibility in the area of HIV infection, including the obstetrician's need to be knowledgeable about HIV and to provide appropriate, current information to patients in a way that respects individual reproductive choice. The statement, however, does not indicate who should be counseled or tested. Although the Public Health Service[11] expert panel on the content of prenatal care recommended that HIV testing be offered to all patients before conception and advised practitioners to counsel their patients concerning drug use and safer sexual practices, preconception counseling is clearly not yet the accepted standard of practice in this country. Even if it were, no standards for the content of such counseling have been set. Moreover, it is questionable whether the ACOG recommendation for *selective* counseling and testing is being observed.

If the standard of practice is to be changed from selective to universal counseling and voluntary testing of prenatal or preconception patients, the prevention and treatment services that are now available will have to be expanded. In addition, physicians will need considerable guidance regarding methods for eliciting key information and for securing informed consent. Unless they feel competent to carry them out, physicians are unlikely to comply with practice guidelines. Yet even if compliance with counseling and testing standards could be ensured by legislating the standards and establishing sanctions for noncompliance, the *quality* of patient counseling, and therefore the rational and appropriate basis for patient choices, could not be ensured without provider education and support, Regulation or legislation could, in fact, result in universal testing with perfunctory or no counseling at all.

Part of the solution to this problem depends on the involvement of professional medical societies. These organizations can play a primary role in educating and training providers so they can inform and advise their patients about HIV infection and its ramifications. Provider education can take a number of forms ranging from written publications to video and audio tapes to seminars and postgraduate courses. Training in counseling skills could also be offered; one effective technique for building confidence in such skills is the range of interactive methods that involve role-playing.

[11] Public Health Service, *Caring for Our Future: The Content of Prenatal Care*, A Report of the Public Health Service Expert Panel on the Content of Prenatal Care (Washington, D.C.: Department of Health and Human Services, 1989).

These techniques, however, are time-consuming and instructor intensive, and they must be brought to the providers in their practice settings. For a variety of reasons—resource intensity, training needs, and quality of counseling—other health care workers may be better suited than physicians to counsel patients about HIV. Such counselors might include nurses, nurse practitioners, social workers, and retrained genetics counselors. Nevertheless, the primary providers of maternity services still require a thorough working knowledge of HIV infection and its perinatal implications. Under certain circumstances, physicians will have to be prepared to enter the educational and counseling process.

Professional societies will require financial assistance to mount such an educational effort. The grants that are now in place for supporting the education of health professionals about HIV infection will need to be expanded and focused more on the problems of women and children. Professional societies can be powerful advocates for the development and allocation of sufficient resources to train and educate their members in the care of HIV-infected women and children.

ECONOMIC CONSIDERATIONS IN SCREENING FOR PERINATAL HIV INFECTION

There are three economic aspects of perinatal HIV disease whose examination may inform the development of screening policy for pregnant women and newborns. First, to provide an economic context for the design and implementation of screening programs and early intervention schemes, it is necessary to consider the current costs of pediatric AIDS care, the patterns of health services utilization (particularly inpatient care), and the predominant sources of payment for such care. Second, to determine the magnitude of financial investment required to mount an early intervention program for HIV-infected children, estimates (albeit tentative) are needed of the costs of providing early intervention services (e.g., medical surveillance and early therapeutic intervention) for these children. Third, and perhaps most important, there is the challenge of paying for these services (and ensuring access to appropriate care), given currently available health care financing mechanisms and the possible development of innovative payment strategies in the future.

Current Costs of Pediatric AIDS Care

A complete picture of the economic impact of pediatric AIDS is difficult to discern because studies of the costs of care for children with

symptomatic HIV infection and AIDS are limited. Most studies to date have been confined to hospitalization costs, which do not fully represent the range of costs associated with comprehensive pediatric AIDS care. Despite this limitation, these studies do offer some insight into hospital utilization rates and associated costs among children with HIV disease. In particular, average length of hospital stay is examined because it contributes substantially to the overall costs of medical care.

One 1987 study of 37 children with AIDS at Harlem Hospital reported a mean length of hospital stay of 164 days, with an average length of stay (ALOS) of 43 days per hospitalization.[12] These estimates are derived from a small sample with widely varying lengths of stay (the range was 2 to 659 days). The estimated average lifetime inpatient cost per child was $90,347 (with a range of about $7,000 to $184,000). (This estimate was based on medical expenses incurred by nine children who died and who had received all of their treatment at Harlem Hospital.) Most experts now agree that the above estimated cost is probably too high, particularly given the wide range of lifetime costs presented. The researchers in this study also investigated the factors that might explain the considerable variation observed in length of stay. They found that the primary predictors of length of stay were maternal drug use and boarder baby status. Moreover, a substantial proportion of the hospital days used by these children were for social rather than medical reasons. That is, many of the children were medically eligible for discharge, but because they lacked homes, they could not be released from the hospital Overall, social factors were responsible for one-third of all hospital days used by these children and 20 percent of total costs.

Another 1987 study of 34 HIV-infected children at Yale-New Haven Hospital discovered that about 54 percent of their hospital days were medically unnecessary.[13] Again, this unnecessary inpatient care was most often associated with difficulties in finding suitable residential alternatives for these children. The authors noted, however, that the rate of unnecessary days had declined from 64 percent of all hospital days in 1983 and 1984 to 30 percent in 1987, largely because of improved outpatient care and access to foster care placement.

More recently, several studies have examined the average length of stay for pediatric AIDS hospitalizations, as well as the average per diem

[12] J. D. Hegarty, E. J. Abrams, V. E. Hutchinson, S. W. Nicholas, M. S. Suarez, and M. C. Heagarty, "The Medical Care Costs of Human Immunodeficiency Virus-Infected Children in Harlem," *Journal of the American Medical Association* 260(1988):1901-1905.

[13] K. Kemper and B. Forsyth, "Medically Unnecessary Hospital Use in Children Seropositive for Human Immunodeficiency Virus," *Journal of the American Medical Association* 260(1988):1906-1909.

costs and payment sources for such care. One study reviewed pediatric HIV-related discharge data from 43 member hospitals of the National Perinatal Information Center, a nonprofit hospital membership organization and health services research center.[14] The investigators found that the average length of stay for pediatric AIDS discharges was 12.5 days, with an average per diem cost of $955. They also noted that more than 75 percent of funds to pay for inpatient care of children with AIDS came from public sources, primarily Medicaid.

Another study collected survey data from 45 member hospitals of the National Association of Children's Hospitals and Related Institutions, a national voluntary association of children's hospitals in the United States and Canada.[15] Although the average length of stay reported in this study was slightly higher (ranging from 16.3 to 17.6 days) than that in the study noted above, the average cost per day was comparable—about $900, with average charges of about $1,200. This study also found that Medicaid was the primary source of payment for pediatric AIDS inpatient care (i.e., 45 percent of all admissions were covered by Medicaid).

Currently, Jesse Green and his colleagues at New York University are conducting an investigation of hospital utilization patterns among children with AIDS. Using hospital discharge data bases maintained by the states of New York, California, and Florida on all hospitalizations in short-term general hospitals, they extracted all pediatric AIDS cases reported in the period 1983-1986. Surprisingly, they found that, for this four-year period, children with AIDS had an average length of hospital stay in both California and New York that was lower than that for adults. In New York, for example, ALOS for children with AIDS was 12.5 days; it was 21.3 days for adults with AIDS. However, the length-of-stay data for children included some very short (e.g., 1 day) and long (e.g., more than 30 days) hospital stays, which skewed the data. When one-day stays are removed, the average length of stay for children with AIDS rises to 26.6 days in New York. In addition, children under one year of age have longer average hospital stays (i.e., about 40 days) than older children.

The data from New York and California also indicate that the number of hospitalizations for pediatric AIDS have increased substantially from 1983 to 1986. Similar trends have been observed in San Francisco and

[14] S. Allison-Cooke, "Cost and Utilization of Inpatient Services for Pediatric AIDS," *Challenges for Public Health Statistics in the 1990s. Proceedings of the 1989 Public Health Conference on Records and Statistics July 17-19, 1989*. (Hyattsville, Md.: National Center for Health Statistics, 1990).

[15] D. P. Andrulis, V. B. Weslowski, E. Hintz, R. H. Parrot, and M. Brady, *Pediatric AIDS and Hospital Care in the U.S.: Report on the 1987 U.S. Hospital Pediatric AIDS Survey* (Washington, D.C.: National Public Health and Hospital Institute, 1990).

Los Angeles. Most notable, however, is the comparison of hospitalizations in California and New York. In 1986, there were 126 hospitalizations for children with AIDS in California but nearly 10 times that number in New York. Over the four years combined, the number of hospitalizations for children with AIDS in New York were also approximately 10 times higher than in California. Pediatric AIDS cases constituted just slightly more than 1 percent of all AIDS hospitalizations in California, whereas in New York they accounted for more than 8 percent.

Additionally, the hospitalizations of children with AIDS are not evenly distributed throughout the hospital system but are highly concentrated in a few hospitals—quite often, public hospitals. This is due in part to the insurance status of many of the children. In both California and New York, Medicaid pays for a substantial proportion of care. Eighty-one percent of children (as compared with 43 percent of adults) hospitalized with AIDS in New York were covered by Medicaid; an additional 5 percent lacked insurance altogether. In California, 27 percent of children hospitalized with AIDS had Medicaid coverage.

Because children with AIDS rely heavily on the public sector for insurance coverage, their care is generally provided in public hospitals. In New York City, for example, public hospitals provide a disproportionate share of services to children with AIDS: although they account for only 20 percent of all hospital beds in the city, they provide nearly 50 percent of all bed days for children with AIDS.

Developing Early Medical Intervention Services for HIV-Infected Children

The reliance on the public health care delivery and financing system noted above underscores the socioeconomic realities of pediatric HIV infection that make the development of early intervention services for children a demanding task. Other factors that complicate the development of a successful early treatment program for HIV-infected children include difficulties in diagnosing infection in young infants, variability in the natural history of infection, the limited armamentarium of medical therapies, and the almost uniform economic privations that characterize the lives of HIV-infected women and their children. The diagnostic technology and therapeutics required for an effective early intervention program are likely to improve substantially in the future; the social and organizational impediments to such a program may be more difficult to overcome.

Whether it is possible to mount an early medical intervention program for HIV-infected children remains to be determined. The first step toward

this goal is an assessment of the magnitude of the costs of providing early intervention services to the pediatric population. To develop such an assessment, one must first determine the size of the treatment population. In one preliminary model that has been offered, it is assumed that 5,000 to 10,000 children are infected with HIV and that 2,500 have been either diagnosed with AIDS or have died (and thus are subtracted from the number of infected children). Using the Centers for Disease Control (CDC) estimate of approximately 1,700 new cases of HIV infection in children per year (which is added to the above range of total infected children) results in a potential treatment population of 4,200 to 9,200 cases of pediatric HIV infection in the United States.

Next, one must estimate the annual early intervention treatment costs per child. To derive this estimate, an assumption has been made that 25 percent of infected children will be treated with zidovudine in their first year of life and 75 percent will be treated in their second year. The estimate also includes costs for other drugs and dosage schedules, medical monitoring, and primary medical care; it does not include hospitalizations. The estimated cost per child per year for pharmaceuticals is $1,583 (55 percent of total costs); ambulatory care costs total $1,319 (45 percent of total costs).[16] Total estimated early intervention treatment costs per child per year are $2,902. This estimate should be regarded only as a baseline figure, however, because it does not include hospitalizations. A richer picture of the economic burden of pediatric HIV disease would include not only hospital length-of-stay data but an assessment of the fiscal repercussions for the foster care system and other social service and housing providers.

Combining the estimates of the population eligible for intervention and the annual treatment costs allows construction of a national costing model for early medical intervention among HIV-infected infants and young children. For example, using a midrange estimate of the number of infected children in the United States (i.e., 6,700), the cost of early intervention, if 50 percent of this population were in treatment, is $9.7 million; if 100 percent of children were in treatment, the figure would rise to $19.4 million. Even given a high-range estimate of the number of infected children (i.e., 9,200), the cost of early treatment of 100 percent of the pediatric population is $26.7 million—still less than 1 percent of total national expenditures for AIDS treatment.

[16] Because of the need to monitor infants closely, their primary care coats are relatively higher than those of adults.

Paying for Services for HIV-Infected Children

Despite what appears to be a relatively small financial investment for the provision of early medical intervention services for HIV-infected children, delivering and paying for such services in the context of the current health care delivery and financing system remain a challenge. Pediatric HIV disease has underscored the existing limitations and inadequacies of this system, particularly for children with chronic illnesses. Providing and financing comprehensive, long-term care for chronic conditions have always been problematic in this country, a situation certainly not unique to AIDS, although the difficulties involved may be more severe for families affected by HIV than for those affected by other chronic diseases. Chronically ill children have often relied on their families to provide the needed home care, custodial care (as well as room and board), informal nursing care, and other services that are not covered under insurance plans. In the context of HIV infection, family-provided care may not be generally available because many families affected by this disease often live under conditions of social disorganization, poverty, and substance abuse, as well as homelessness in some instances.

Another problem is the economic burden that women and children with HIV infection represent for state Medicaid programs. As noted earlier, Medicaid is likely to be the primary source of health insurance for these individuals. Poor pregnant women in particular are the population most likely to be insured through Medicaid as a result of changes in eligibility criteria. In all states, pregnant women are currently eligible for Medicaid if their family incomes are no higher than 133 percent of the federal poverty level, which is about $13,000 per year for a family of three. (In some states, they remain eligible if their incomes are as high as 185 percent of the poverty level.) Medicaid eligibility for these women concludes at 60 days postpartum, however, leaving many of them without insurance altogether unless they continue to qualify on another basis (e.g., eligibility for Aid to Families with Dependent Children [AFDC] through which a woman automatically qualifies for Medicaid coverage).[17]

Medicaid eligibility criteria for children also vary widely across states. For infants, eligibility now ranges from 133 percent to 185 percent of the federal poverty level, depending on the state of residence. In all states,

[17] Some children cannot reside with their mother because of her illness or inability to provide adequate care. This raises the question of whether states should continue to consider these children dependents (despite the fact that they are not living with their mother) and whether the mother should be eligible for AFDC payments.

Medicaid coverage is extended to children up to age six in families with incomes of up to 133 percent of the poverty level.

One mechanism that may prove useful for providing and paying for the care of HIV-infected children (and young mothers under age 21) is the Early and Periodic Screening, Diagnosis, and Treatment (EPSDT) program, a mandatory service under Medicaid that is best known for its preventive orientation. The EPSDT program provides preventive care and treatment for low-income, Medicaid-eligible children through age 21 and covers periodic evaluation of the child's health, developmental, and nutritional status; it also offers vision, dental, and hearing care as well as treatment for basic acute and chronic problems. There is no requirement in the program, however, that treatment be provided only for basic needs.

Congress recently modified and expanded the EPSDT program through amendments to the Omnibus Budget Reconciliation Act of 1989. These amendments mandate state reimbursement for interperiodic screenings and for vision, hearing, and dental services, whenever they are medically necessary to identify or diagnose a suspected illness or condition. In addition, once a condition or illness is discovered, states must provide any medically necessary follow-up, diagnostic, or treatment services reimbursable under Medicaid, even if the state plan does not otherwise cover such services. These program changes became effective April 1, 1990; it will be some time before their impact can be assessed.

The expansion of EPSDT may offer the most logical source of financing for pediatric HIV-related care; however, several other programs may also provide some assistance. For example, the Title V Maternal and Child Health Block Grant program (which allocates funds directly to states for various services for pregnant women, infants, and children) could be used to finance services for HIV-infected women and children. The Community and Migrant Health Centers program may offer another financing stream. This program funds primary health care clinics in medically underserved urban and rural areas, and many of these clinics, by virtue of their location, can be found in areas of highly concentrated HIV infection. Over the past several years, these clinics have been recognized as logical providers of HIV-related care and have begun to receive supplemental perinatal grants and funds for the development of programs for persons with HIV infection. Both the Title V and the Community Health Centers programs are in urgent need of additional resources, however, because general funding levels for these programs have been tapering off during the past decade.

Despite Medicaid coverage for many HIV-infected women and children, the access of these groups to appropriate care is not ensured. Many pregnant women, as noted earlier, may lose their coverage 60 days after delivery; in some states, coverage for children beyond the age of six is not

guaranteed. Moreover, Medicaid reimbursement rates may be inadequate, and as a result health care providers and institutions may be reluctant to accept Medicaid patients.

Medicaid is inherently a disease-neutral program (i.e., specific diseases are not targeted for preferential consideration), and many experts argue that such disease neutrality should be sustained in the development of remedies to the above problems. One approach has been to use home-and community-based waivers, which allow states to cover various outpatient and community-based services under Medicaid for individuals (including persons with AIDS) who would otherwise require institutional or inpatient care. In addition, some experts suggest looking to other programs, such as Supplemental Security Income (SSI) and AFDC, as possible sources of funding for care, particularly custodial care. In short, a single solution to the problem of adequate financing of care for HIV-infected women and children is unlikely. Instead, a consortium of approaches may be necessary to address the inadequacies that exist in the current system of delivering and paying for care and, in particular, chronic and long-term services.

EVALUATING THE EFFECTIVENESS OF HIV SCREENING

In the current environment of limited health care resources and fiscal restraint, policymakers must make difficult decisions regarding the prudent allocation of resources among various health programs. Whether HIV screening of pregnant women and newborns constitutes an efficient, appropriate use of resources must be determined in light of other competing interests and programs, quite often in the absence of complete data. Once a screening program is in place, evaluation is necessary to determine its effectiveness. Thus, before screening is introduced, a well-articulated evaluation component must be incorporated into the program's design to monitor its effects and assess whether program objectives have been achieved.

Methodological Issues in Cost-Effectiveness Analysis of Prenatal and Newborn HIV Screening

An often useful economic tool in making resource allocation decisions is cost-effectiveness analysis, which measures how well a particular program uses health resources to improve health or extend life. The cost-effectiveness ratio is the yardstick for cost-effectiveness analysis. This ratio compares the net burden of the program on health resources (i.e., its cost)

with some measure of its health impact—for example, years of life saved or quality-adjusted years of life saved[18] as a result of the program. Drummond and colleagues[19] have developed a helpful framework for designing a cost-effectiveness evaluation of a health program, which comprises the following steps:

- Identify the alternative policy strategies.
- Specify the viewpoint of the evaluation.
- Review the evidence of program effectiveness.
- Identify the health consequences and costs of the program.
- Define the units for counting up these consequences and costs.
- Specify the valuation scheme (or weighing) of health consequences and costs.
- Discount future costs and health consequences to present value.
- Compare incremental costs and health consequences of competing alternatives to derive a cost-effectiveness ratio.
- Perform sensitivity analyses with respect to uncertain parameters, costs, and valuations.
- Consider other issues of concern to decision makers that lie outside the scope of the analysis.

The application of this model to HIV screening and early intervention programs for pregnant women and newborns, although complex, offers some direction for the types of data required to conduct a cost-effectiveness analysis.

Three policy alternatives are currently under consideration. The first is to screen pregnant women for HIV. Infected women are then counseled about the implications of this diagnosis for their own health and that of their infants, the possible impact of pregnancy on disease progression, and reproductive options. Next, the infected woman and her caregiver must decide whether to initiate antiretroviral therapy or prophylaxis against opportunistic infection. If the mother does not elect to terminate her pregnancy, a decision must be made regarding treatment of the newborn, that is, whether to begin antiretroviral or prophylactic therapy in the neonatal period or to follow the infant closely with the intent to treat once HIV infection can be confirmed. A second strategy would be to test the newborn and not the mother. If this alternative were selected, the above considerations regarding treatment of the infant (and mother) would

[18] This measure attempts to reflect the quality of the years of life saved-that is, the health status or quality of life of an individual during the years of extended life.

[19] M. F. Drummond, G. L. Stoddart, and G. W. Torrance, *Methods for the Economic Evaluation of Health Care Programmes* (New York: Oxford University Press, 1987).

apply. A third strategy, of course, would be to test neither the pregnant woman nor the newborn.

In conducting a cost-effectiveness analysis of prenatal or newborn HIV screening, assessment of the evidence of program effectiveness involves an examination of HIV diagnostic capacity in women and infants and consideration of the interventions that are possible for these populations. The HIV testing algorithm—composed of the ELISA and Western Blot tests—is highly sensitive and specific in adult populations, although the predictive value of a positive test (i.e., the probability that an individual with a positive test result is, indeed, infected) diminishes as the prevalence of infection in the population declines. In newborns, however, conventional HIV antibody tests cannot differentiate those who are truly infected from those who carry passively acquired maternal antibody.

Several aspects of intervention for HIV-infected pregnant women should be considered. Whether a woman's knowledge of her infection will necessarily promote the adoption of less risky behaviors is unclear, although the possibility exists that some women may alter their sexual or drug-using practices in light of their infected status. However, a substantial reduction in horizontal transmission of infection is unlikely to result from prenatal HIV screening at this time. Therapeutic interventions (e.g., zidovudine therapy and PCP prophylaxis) among HIV-infected pregnant women with severe immune deficiency are likely to be effective in delaying progression and minimizing symptoms of disease, given the evidence of effectiveness of these regimens for nonpregnant adults. The potential effectiveness of maternal chemoprophylaxis or immunotherapy to prevent perinatal HIV transmission, however, remains an empirical question. There is also the possibility of teratogenicity of maternal therapy, although the maternal risks from deferring therapeutic intervention would seem to outweigh the potential fetal risks at this time.

The effectiveness of therapeutic intervention among HIV-positive infants is still open to question. Because about two-thirds of these infants are likely to be uninfected, administering therapy to all seropositive infants means that uninfected infants would be exposed to substantial toxicity without deriving any medical benefit. Hence, most pediatric experts generally agree that such therapy should be reserved for children with known HIV infection. Delaying treatment of the infant until infection is confirmed, however, risks the loss of the child to follow-up care. Even when infection has been confirmed, the medical benefit associated with early therapeutic intervention for asymptomatic HIV-infected children is still uncertain.

The costs associated with prenatal HIV screening, subsequent follow-up, and medical intervention are varied. There are the costs of identifying the target population for screening, which may include outreach costs; the

costs of HIV-antibody testing itself; and the costs of contacting and notifying the pregnant woman of her test results. Therapeutic abortion costs, should that option be elected by the woman, must also be considered. In addition, there are the costs of medical surveillance and care, as well as antiretroviral therapy and PCP prophylaxis (which should actually be calculated as the difference between the costs of early treatment and the costs of delayed treatment—that is, the net costs or savings of early treatment versus later treatment). Also to be included are the costs associated with the follow-up of infants born to HIV-infected mothers and subsequent therapeutic interventions for these infants, again, measured as the difference between the costs of early treatment versus later treatment.

Consideration of the costs of possible adverse effects, such as drug toxicities in the mother or child, is another aspect of calculating cost-effectiveness. Additionally, one might wish to include the costs of medical care that would be incurred during the years of life added by early intervention for the mother or child. If affected infants were aborted, there might also be savings of the costs associated with treating and caring for these children—both the health care costs and the costs to the parent or government of custodial and long-term care.

In determining the cost-effectiveness of a screening program, these program costs would be measured in current dollars, with future costs corrected for inflation. Nevertheless, some outstanding questions remain. Should health care cost savings as a result of elective abortion be included in the analysis? Should the health care costs arising from life extensions be included and added to the costs attributable to this early intervention program?

The health consequences of the program can be assessed from the viewpoint of the woman, the child, the potential contacts of the woman, and other interested parties, such as insurance companies and society at large. Health outcomes for the woman might include gains in life expectancy as a result of early medical intervention and improved quality of life arising from the avoidance, delay, or amelioration of HIV-related symptoms. There may, however, be losses in quality of life because of the toxicity of treatments. Although difficult to value in such an analysis, there is also the psychological impact of learning of one's HIV infection (and of possible pregnancy termination).

Two aspects of the program's health consequences for the child require examination. First, treatment of the pregnant woman may result in major gains in life expectancy and quality of life for her child, if chemoprophylaxis were, indeed, successful in interrupting perinatal HIV transmission. Yet, as noted earlier, this is still only a theoretical possibility. There may also be possible losses of life expectancy or quality of life for the child as a result of potential teratogenic effects of maternal therapy. Second, early

therapeutic intervention for the HIV-infected child may prolong or improve the quality of his or her life, although whether such an improvement is, indeed, the case remains unconfirmed at this point. Alternatively, possible toxicities associated with treatment may negatively affect quality of life.

Other individuals that may be affected by this program include the woman's potential sexual and needle-sharing partner(s). They might gain life expectancy or quality of life as a result of the avoidance of HIV infection or as a result of early medical intervention made possible through partner notification. There may also be psychological effects of the knowledge of one's own or one's partner's HIV infection.

These health consequences (for the woman, child, and others) can be measured in terms of the number of years of life gained, improvements in health status or quality of life (e.g., physical and social functioning, physical, psychological, and emotional symptoms), and the number of abortions that might be performed as a result of the program. Valuation of these health consequences is problematic, however. For example, how does one value an extension of the life of a child, from what would have been the child's life expectancy with untreated HIV infection to the potential life expectancy if the HIV-infected child were treated early? How does one weigh the health consequences for the mother against the possible health consequences for the child and others, particularly when these consequences may be in conflict? What value should be assigned to an aborted HIV-affected fetus? Is this a benefit? Is life with HIV infection worse than no life at all? What value or disvalue does one assign to an aborted fetus that would not have been infected?

Sensitivity analyses provide a means to address the uncertainties inherent in a cost-effectiveness analysis of a prenatal or newborn HIV screening program. Aspects of such sensitivity analyses are listed below:

- effects of zidovudine on the interruption of perinatal HIV transmission;
- effects of early treatment on the survival and quality of life of the HIV-infected mother and infant;
- toxicity of zidovudine in infants;
- probability that a woman would elect an abortion, given knowledge of her HIV infection;
- probability that a woman might change her behavior, which might affect subsequent HIV transmission;
- probability of HIV infection in a woman, given her risk status;
- possibility of new, effective treatments, after the child has been kept alive;

- probability of the loss of the child to follow-up care, if the mother is not screened prenatally; and
- future costs of zidovudine and other therapeutic agents.

Finally, there are a number of concerns that emerge when prenatal and newborn HIV screening are considered, but incorporating them directly into the cost-effectiveness analysis may not be possible. Decision makers must nevertheless be mindful of these issues—the psychological effects of knowledge of one's infection status, ethical questions that arise when high-risk pregnant women (which might translate into minority pregnant women) are targeted for screening, concerns about confidentiality, and the ethical status of abortion.

A Cost-Effectiveness Analysis of Prenatal HIV Screening

Renata Kiefer and colleagues at the Center for AIDS Prevention Studies, University of California, San Francisco, have conducted a cost-effectiveness analysis of voluntary (with informed consent), confidential prenatal HIV screening, comparing maternal and infant outcomes and the costs of alternative, prenatal HIV-antibody screening strategies. The analysis examines three strategies: (1) universal screening (HIV testing is offered to *all* pregnant women regardless of risk status) with posttest counseling for all women screened; (2) universal screening with posttest counseling for HIV-infected women only; and (3) selective screening (HIV testing is offered only to women with self-identified risk factors, based on prior risk assessment) with posttest counseling for all women screened.

The outcomes and costs considered in the analysis are the number of HIV-infected women identified through the screening program, the cost per identified woman, the number of infants detected who are at risk for infection, the number of averted births of infected infants if the women elect to terminate their pregnancies after learning of their infected status, the number of pregnancies with uninfected fetuses that would be terminated, and the cost per averted birth of an HIV-infected infant. The probabilities used in the decision analysis include estimates of several possible prevalence levels, ranging from high to low. For the HIV testing sequence (i.e., the ELISA and Western Blot tests), a sensitivity of 0.99 and specificity of 0.99999 were chosen.[20] A perinatal HIV transmission rate

[20] These figures are consistent with false-positive and false-negative rates reported in CDC publications and those documented by reference laboratories and the military screening program.

of 35 percent was selected, although current estimates range from 25 to 35 percent. Other variables are as follows:

- The prevalence of risk factors in the pregnant population—that is, an estimate of the distribution of (rather than actually acknowledged) risk factors.
- The probability that HIV-infected women will be tested, which depends on the overall acceptance of testing. If HIV testing is offered to all women (universal screening), an estimated 95 percent of infected women might accept testing. If, however, testing is offered only to women with acknowledged risk factors, an estimated 50 percent of infected women might accept testing. (This latter probability is the product of two other probabilities—that of detecting risk factors through pretest risk assessment and of acceptance of testing, given the identification of risk.)
- The probability of pregnancy termination in light of HIV infection. This probability, estimated at 30 percent, is also the product of two probabilities—the probability that a woman will seek prenatal care early enough for pregnancy termination to be an option and the probability that she will elect termination on learning of her infection.

The cost assumptions used for this cost-effectiveness analysis are detailed in Appendix B.

The results of the analysis indicate that universal screening identifies almost twice as many HIV-infected women as selective screening (Table A-1). This is an important consideration if the goal of the screening program is ultimately to identify all infected pregnant women for the purpose of early intervention. As expected, the table shows that the cost per HIV-infected woman identified declines with increasing prevalence of infection. Additionally, the costs of universal screening with posttest counseling for only HIV-positive women compare favorably with the costs of selective screening with posttest counseling for all women. Universal screening with posttest counseling for all women is considerably more expensive.

The infant outcomes for each screening strategy (assuming a pregnancy termination rate of 30 percent and a perinatal transmission rate of 35 percent) are presented in Table A-2. In short, two uninfected infants would be lost for each HIV-infected infant. With universal screening, twice as many births of infected infants would be averted as with selective screening.

The cost per averted birth of an HIV-infected infant is shown in Table A-3. The cost-effectiveness of all screening strategies improves as HIV prevalence levels increase. Universal screening with posttest counseling for HIV-infected women only offers the lowest cost per averted birth of an

TABLE A-1 Number of HIV-Infected Pregnant Women Identified (per 100,000 pregnant women) and Cost per HIV-Infected Woman Identified Using Selective or Universal Screening at Various Prevalence Levels and with Two Counseling Scenarios

		Selective Screening		Universal Screening		
Estimated Prevalence	Total No. of Infected Pregnant Women	No. Detected	Cost for Counseling All	No. Detected	Cost for Counseling All	Cost for Counseling HIV-Infected Women Only
0.02	2,000	1,000	$ 300	1,900	$ 700	$ 300
0.01	1,000	500	600	950	1,400	600
0.002	200	100	2,700	190	6,600	2,600
0.001	100	50	5,400	95	13,100	5,100
0.0002	20	10	26,600	196	5,100	25,100
0.0001	10	5	53,100	9.5	130,100	50,100

Note: Calculations prepared by R. Kiefer, E. Washington, N. Hearst, and S. Hulley, adapted from their study, "Costs and Benefits of Prenatal HIV Screening," presented at the Sixth International Conference on AIDS, San Francisco, California, June 20-24, 1990. The authors are affiliated with the Center for AIDS Prevention Studies, University of California, San Francisco.

TABLE A-2 Infant Outcomes (per 100,000 pregnant women) for Universal, Selective, and No Screening Strategies at Various Prevalence Levels

Prevalence and Strategy	Number of Infants at Risk	Number of Infants at Risk Identified	Number of Averted Births of Infected Infants	Number of Pregnancies with Noninfected Infant Terminated
0.02				
Universal	2,000	1,900	200	371
Selective	2,000	1,000	105	195
No Screening	2,000	0	0	0
0.002				
Universal	200	190	20	37
Selective	200	100	10	20
No Screening	200	0	0	0
0.0002				
Universal	20	19	2	4
Selective	20	10	1	2
No Screening	20	0	0	0

TABLE A-3 Cost per Averted Birth of an HIV-Infected Infant Using Selective or Universal Screening at Various Prevalence Levels and with Two Counseling Scenarios

		Universal Screening	
Prevalence	Selective Screening with Counseling for All	Counseling for All	Counseling for HIV-Infected Women Only
0.02	$ 3,300	$ 7,000	$ 3,300
0.002	26,000	62,700	24,700
0.0002	253,200	619,800	239,000

infected infant. If the lifetime cost of HIV-related care for an infected infant were $50,000, then both selective screening and universal screening with counseling for infected women only would result in a net gain at an overall HIV prevalence of 2 infected women per 1,000 women. If counseling costs were to increase beyond the conservative estimates used in this analysis, however, then all screening strategies would be more costly than under the current assumptions.

Other outcomes of prenatal HIV screening that should be considered when selecting a particular screening strategy are the possibility of reduced maternal and infant morbidity as a result of early diagnosis and treatment, facilitation of health resources planning, potential reduction of vertical HIV transmission, and possible reduction of horizontal HIV transmission to partners (which will depend to some extent on the capacity of the program to identify and counsel infected women). Additional benefits can be pursued by counseling seronegative women who continue to be at risk for infection, particularly women in selective screening programs. Policymakers must decide the most efficient use of resources. In areas of high prevalence, universal screening with posttest counseling for all women screened may be the most appropriate option.

Program Design and Evaluation

The design of a screening program and its evaluation require that the program's overall goals be clearly defined at the outset. (For example, the objectives of a prenatal HIV screening program might be to prolong, through early medical intervention, the productive lives of infected individuals identified by screening, to prevent further (vertical or horizontal)

transmission of HIV, and to minimize the social costs of HIV disease.) Decisions must also be made regarding the target population to be screened and the site(s) at which such screening is to be conducted. If a majority of infected pregnant women are to be identified and offered treatment, it may be most appropriate to offer voluntary HIV testing to all pregnant women prenatally or at the time of delivery, in a given geographic area. Reaching women at increased risk for infection means that HIV testing services need to be available in settings where these women frequently receive care—prenatal, family planning, and sexually transmitted disease clinics, as well as substance abuse treatment centers. As mentioned earlier, HIV screening confined to the prenatal care setting may miss a substantial proportion of at-risk pregnant women because those women who receive little or no prenatal care are often at greatest risk of infection.

Consideration must also be given to the development of a follow-up system of care for infected individuals who are identified through screening. Indeed, some health officials have questioned the wisdom of instituting screening in the absence of an adequate system of follow-up services for infected women and their children. Others have suggested that only when infected individuals are identified through screening will the necessary services be developed.

Once an individual has been identified as infected, there should be a two-stage system of early intervention. The first stage would be oriented toward prevention and would include behavioral intervention, adequate psychosocial support services to minimize the social disorder that accompanies the lives of many HIV-infected women, and couple (or partner) counseling. Such intervention may facilitate behavioral change to limit further HIV transmission. (Prevention efforts can also be targeted at the community level in areas where HIV infection is highly concentrated.) The second stage would focus on early medical intervention—for example, continuing medical surveillance, drug therapies, acute hospitalization (if necessary), community-based care, and substance abuse treatment (if needed), as well as clinical, psychosocial, and practical support services.

Any HIV screening effort relies heavily on laboratory services, and as a result laboratory quality assurance and performance evaluation are critical components of a screening program. Considerable variation across laboratories in the costs of test performance is an important factor in selecting laboratories to process specimens collected through the screening program. Other crucial elements of screening programs are a mechanism for contacting and notifying individuals of their test results and posttest counseling services (particularly for HIV-infected individuals).

In developing and performing an evaluation of a prenatal HIV screening program, several aspects of the program may be assessed. For example, one can evaluate whether the program has been implemented as intended and whether program components are in place. To assess the acceptance and use of screening services among pregnant women, one might compare the estimated number of infected women expected to be reached through screening with the number of seropositive women actually identified. Examination of the proportion of these women who are receiving appropriate medical monitoring, treatment, and other support services can also provide some sense of the adequacy and accessibility of the system of follow-up care. Evaluation of prenatal HIV screening will undoubtedly present a challenge, in part because the HIV epidemic continues to evolve and new information continues to accumulate regarding the effectiveness of therapy. Ongoing evaluation will therefore be necessary to assess program effectiveness and to adjust program design in response to evaluation findings and technological developments.

THE ADVOCATES' VOICES: THOUGHTS ON PRENATAL AND NEWBORN HIV SCREENING

The epidemic of HIV infection and AIDS among women (and children) has disproportionately affected minority populations, particularly those in large urban areas of the United States. In developing prenatal HIV screening policy with the goal of early identification and treatment of infected women, this fact—and the implications it brings—must be taken into consideration. Screening policy cannot be developed in a vacuum, that is, without reference to the populations it is meant to serve. In the case of HIV, the social circumstances, culture, and character of these populations will shape their members' acceptance of and degree of participation in the screening process.

Screening policy development must consider variations among ethnic communities as well as among individuals with respect to educational level, prior experience with the health care system, attitudes, values, and fears, and the extent to which there are social and familial support systems. For example, women in different areas of the country may have received varying levels of information about HIV infection and testing, depending on whether the area has a high or low prevalence of infection. A woman's level of awareness about HIV may affect what she understands during the informed consent procedure and how much information must be provided by the counselor to secure an informed consent. Eliciting informed consent may be particularly problematic with women who have limited education or who are functionally illiterate and to whom the meaning and

intent of the forms and, indeed, the whole process may be unclear and confusing.

Diversity with respect to previous experience with the health care system may affect the way women respond to offers of HIV testing. Pregnant women who have had experience with preventive or prenatal care are familiar with medical testing. They may not necessarily understand the specific details of such testing, but they believe the tests are being performed for the benefit of their unborn child. Many minority women, however, have had little contact with the health care system. For example, about 20 percent of Latinos nationally lack a regular source of health care. In 1988, at least 12 percent of all Latino mothers received late or no prenatal care, compared with 4 percent of white mothers.[21] At the same time, the birth rate was 24.1 births per 1,000 persons for Latinos and 15.7 per 1,000 for non-Latinos.[22]

Latinos as a population appear to be relatively unfamiliar with the health care system, for reasons that go beyond the lack of available services or accessibility of care. Some individuals, for example, recent immigrants, are concerned about their legal status and the effect that use of the system may have on them and their families (e.g., the potential for deportation). Others may be unaware of existing resources. Even when it is known that services are available, people may be reluctant to enter a system that is unfamiliar, intimidating, and characterized by long waits for care and overcrowded, understaffed facilities. This relative lack of use of health care resources is an important factor that must be considered when formulating policy that will ultimately be implemented in physicians' offices and prenatal care facilities.

Policymakers also need to recognize the diversity of values, cultures, and social circumstances among individuals within a minority group as well as among minority groups. For example, there is a wide range of opinion among minority women about whether screening should be mandatory. There are contextual differences among women as well. Some pregnant women face drug abuse problems, some are coping with the effects of poverty, and some have empowerment concerns. Some women, in fact, confront all of these issues. The implications of a positive HIV test result may differ depending on the particular individual involved. A woman's reality is not limited to the medical facts of her situation, which may or may not be fully understood. It also includes psychological and social components often associated with unemployment, undermined self-esteem, perceptions of locus of control, poverty, and drug addiction. HIV

[21] In 1988, 11 percent of black mothers received late or no prenatal care.

[22] National Center for Health Statistics, "Advance Report of Final Natality Statistics, 1988," *Monthly Vital Statistics Report* 39(1990):1-48.

infection often compounds these existing problems. Moreover, adequate support mechanisms may simply not be available for many women. Will the institution of a screening policy lead to immediate and long-term emotional and practical support? Will it assist in the implementation of support systems that will facilitate behavioral change? (These range from additional treatment slots for intravenous drug users to child care.)

Additionally, the counseling that accompanies HIV testing should be sensitive to differences among the women participating in the screening program and the varying cultural contexts of their lives, especially the way that context may shape their perceptions of risk and their ultimate decisions or behavior. For example, women who live in a high-risk environment may not view a roughly 30 percent perinatal HIV transmission rate as high. Those who begin life with very little must take risks to survive; to them, a 70 percent chance of having a healthy baby may seem to be a reasonable risk.

In many ethnic communities, particularly the Latino community, the family is extremely important, and decisions are often discussed with family members. For example, before signing a consent form, a woman might want an opportunity to confer with her family and other members of her support system about HIV testing and its ramifications. Any attempt to deal with the management of HIV infection and its prevention should integrate the family in that process and use it as an emotional resource. Male partners of infected women should be involved in any behavioral change efforts. Indeed, because economic and social dependence on men is largely responsible for the lack of empowerment many minority women experience, the successful implementation of behavioral changes depends on the involvement of men.

Reaching minority pregnant women to encourage them to enter care (providing services are actually available) is another consideration in the development of screening policy. Prenatal HIV screening programs must find a way to identify women early in their pregnancy, which is not an easy task. In addition to the difficulties presented by early identification, some of these women will not enroll in prenatal care, some will discontinue care, and others, such as the substance abuser who is afraid that her child will be taken away from her, will only receive care in the emergency or delivery room.

An HIV screening program must also facilitate and support the reproductive choices a woman makes after being informed she is HIV-antibody positive. Contraception, sterilization, and abortion may have different meanings to different women—and different meanings to health care providers. Many women are afraid that screening will be used to subtly convince or pressure them to be sterilized after delivery. Mandatory

or recommended HIV testing may, in fact, deter women from much needed prenatal services.

Other factors affecting a woman's reproductive decisions are the relevance that this pregnancy or this child may have for that woman, her religions and spiritual beliefs, and her sense of empowerment. Issues of empowerment and self-esteem have a substantial impact on why some women choose to participate in risky behavior and on their inability to extricate themselves from their predicaments. Some have questioned whether positive attitudes about wellness and disease prevention can exist among individuals (e.g., poor women of color) whose energies must be devoted to confronting the exigencies of a marginalized existence.

An important concern in prenatal HIV screening is whether health practitioners are aware of their own feelings and attitudes about minority patients. Some practitioners may have formed judgments and developed biases about pregnancy and HIV infection in the ethnic patient. Prejudice among practitioners, however, is only part of a much broader problem of racism. Unlike prejudice, racism is systematic, and to the extent that it is part of U.S. society, it will also be part of the nation's medical centers.

Finally, although funding for AIDS is a politically sensitive issue, for the black and Hispanic community to embrace HIV disease as a political issue is problematic for two reasons. One is the potential for discrimination and stigmatization of the communities involved. The other is that when funding requests are issue specific, a certain amount of money is allocated for that particular issue but other, interconnected problems are ignored. Advocates for women of color fully support HIV screening but not at the expense of other programs and only if it is part of a long-term process to provide pregnant women with services and support that will help improve their lives and the lives of their children.

HIV SCREENING: ARE HUMAN RIGHTS THREATENED?

Concerns about discrimination in the context of the AIDS epidemic have centered around employment, insurance, and housing, as well as social ostracism by friends and family. The potential for discrimination within the health care system itself is another area of particular concern, especially for pregnant HIV-infected women.[23] Such discrimination can

[23] L. O. Gostin, "The AIDS Litigation Project: A National Review of Court and Human Rights Commission Decisions, Part 1, The Social Impact of AIDS," *Journal of the American Medical Association* 263(1990):1961-1970, and L. O. Gostin, "The AIDS Litigation Project: A National Review of Court and Human Rights Commission Decisions, Part 2, Discrimination," *Journal of the American Medical Association* 263 (1990):2086-2093.

be relatively direct—a physician's reluctance to provide treatment—or subtle—a decision made by a health care provider to refer all cases of HIV infection to other practitioners because of insufficient expertise or resources. Infected persons may also experience problems gaining access to nursing care, foster care, and adoption services.

To avoid such discrimination, some pregnant women refuse to be tested, a decision that raises the questions of a woman's rights versus her obligations toward others who have an "interest" in her pregnancy, that is, her sexual partner, her health care practitioner, and her baby. In terms of her own interests, the most compelling rationale for testing is that, if a woman is found to be infected, she may have access to medical care, such as monitoring of CD4+ cell counts, prophylaxis for PCP, and antiretroviral medication. Neither Medicaid coverage nor any other kind of support, however, can guarantee that she will actually obtain such care because services may simply not be available or they may be inaccessible w pregnant women. Moreover, for many women, the negative effects of being identified as HIV infected may appear to outweigh any benefits that might accrue to the early identification of future illness. (Such effects may include the immediate costs of violence, which can ensue when a woman's sexual partner discovers her infection or when she tries to make changes in their sexual practices; the loss of a husband or boyfriend; and ostracism by family and friends.)

Once a woman is known to be infected, the question of disclosing that knowledge to various parties, in particular, her sexual partner or partners, is raised. Some women may prefer not to disclose such information (for the reasons noted above, among others), but health care professionals have certain legal and ethical responsibilities to warn third parties at risk. Doing so without the woman's permission, however, may in fact generate other public health risks. For example, a major public health goal is to ensure that pregnant women seek prenatal care. Actual or perceived breaches of confidentiality by a woman's obstetrician may cause her to lose trust in that caregiver (and sometimes in all such caregivers), with the result that she will not continue to seek care.

The case has been made that health care providers have a right to know the infection status of their patients to protect themselves from transmission of the virus. Yet the bulk of this type of infection risk can be virtually eliminated by strict adherence to universal infection control procedures. Because the risk of transmission in the health care setting is relatively low, many believe that there is little justification for compelling a woman to disclose her infection status to the health care practitioner treating her.

With regard to the interests of the baby, the lack of clear medical benefit to be gained from neonatal testing—and the difficulty in distinguish

ing those babies who are actually infected—argue against coercion of either testing (of mother or infant) or a woman's reproductive choices. Many pregnant women believe that their baby's best interests are served by being born and nurtured, despite their own potential disability. In such cases, fundamental constitutional rights to privacy and reproductive choice make it difficult, both ethically and legally, to authorize the state to unduly influence a pregnant woman's decision either to continue or terminate the pregnancy. Moreover, the U.S. tradition of parental authority gives mothers the right to make decisions about their babies' health care—unless such a decision would harm the child. Thus, if a reliable HIV test that could detect infection in neonates were developed, and if treatment were shown to be effective, available, and of benefit to the child, the state would have the right to mandate HIV testing of children, regardless of the mother's choice. Absent these conditions, the mother's decisions regarding her baby's welfare must be respected.

A related issue involves the discrimination some HIV-infected women experience in attempting to gain access to reproductive health care. One attempt to document the degree to which HIV-infected women were discriminated against in gaining access to abortions revealed that two-thirds of the abortion facilities contacted in the study canceled appointments made by allegedly HIV-infected women once their infection status was disclosed. Some of the facilities attempted a plausible response, such as their inability to handle that type of procedure. Others changed the vacation schedules of the physicians or quoted inflated prices for abortion services to discourage those seeking care. Still others openly reported that their staff refused to care for HIV-infected patients. These types of action by caregiving facilities may be actionable under law as discriminatory, and civil sanctions could be applied in most states under handicap legislation.

There are problems, however, in invoking the legal system and filing lawsuits against such offenders. A victory in a discrimination case of this kind may force certain medical professionals to treat people they do not want to treat, but it does not ensure good care. Only a minority of the problems faced by HIV-infected women seeking reproductive health care can be addressed by antidiscrimination laws because such laws cannot check the social forces of prejudice that leave infected persons vulnerable to discrimination. These laws are based on neutral principles of fairness that presuppose an homogenization of experience and culture rather than acknowledge the diversity that actually exists. Perhaps a more productive approach to antidiscrimination would be to work with city and state health departments to inform reproductive health care providers that these practices run contrary to current medical knowledge and violate federal and local civil rights laws. Peer education, not litigation, is most likely to

be effective in improving the quality of reproductive health care provided to HIV-infected women.

Identification of a woman as HIV positive puts her at risk not only of discrimination but of coercion by the judicial system. The proclivity to view women as either "vectors or vessels" is reflected in the increasing tendency to arrest women who use drugs during pregnancy and to seek so-called judicial interventions into obstetrical medicine (e.g., forced cesarean section, sterilization). An analysis of precedents in this area sheds some light on the degree to which these practices would be constitutionally permissible and judicially sanctioned for HIV-infected women.

In *Buck* v. *Bell* (1927), the Supreme Court upheld the right of the state to require that some citizens be forcibly sterilized. One justification for requiring this "sacrifice" was the state's concern about the costs of caring for institutionalized children. Beginning in the 1950s, attention was directed toward women on welfare. Legislation was introduced to require sterilization in situations where the state did not want to pay for the rearing of children born to parents who could not take care of them. Although this legislation was not passed, many women on welfare were in fact sterilized without their consent. Therefore, at several points in U.S. history, public opinion has coalesced around solutions to prevent society from caring for children born to parents who are deemed unworthy. These parents were all too often the economically disadvantaged and, in many instances, racial and ethnic minority women.

Counteracting such discriminatory laws are laws that protect the right to privacy. *Griswold* v. *Connecticut,* although currently being challenged, suggests a legal basis for a fundamental right to make individual reproductive decisions.[24] These cases, however, deal with the right *not* to have a child, that is, to use contraception or abortion. Whether the Court would deem sterilization unconstitutional because of a right to procreate is more controversial.[25] Moreover, the "image" of sterilization is changing, at least among middle-class couples, for whom it is becoming a preferred method of birth control, and this change may soften the abhorrence of coerced sterilization that has developed over the past few decades. If coerced sterilization remains constitutional, it will be very difficult to mount a constitutional argument against mandating long-term, possibly injectable contraceptives that will have the same result.

[24] *Griswold* v. *Connecticut* held that a couple has a constitutional right to access to contraceptives, which stems from their right to privacy in making reproductive decisions.

[25] Many believe that there is stronger protection of the right to have children than there is of the right *not* to have children. Thus, forced sterilization would be unconstitutional even if abortion were no longer considered to be constitutionally protected.

The recent precedent of coerced cesarean sections raises the question of whether maternal treatment (e.g., therapy to prevent perinatal transmission) could be forced on an infected woman to benefit her infant. Recent legal trends lean toward ensuring benefit to the fetus and may require some women to act in a manner that they perceive as disadvantageous to them. Ways must be found to limit coercion and ensure protection of the rights of HIV-infected women as well as those of their infants.

APPENDIX B

COST AND PROBABILITY ASSUMPTIONS USED IN COST-EFFECTIVENESS ANALYSIS OF PRENATAL HIV SCREENING

Category	HIV Negative on ELISA Test	HIV Positive or Indeterminate on ELISA Test
Laboratory		
First ELISA	$5	
Three ELISA tests		$10
Western Blot		$35
Risk assessment[a]	$2	$ 2
Counseling		
Pretest	$7	$ 7
Posttest	$1	$45

[a] For selective screening only.

COST ASSUMPTIONS

1. All cost figures are estimates of *average* costs, in 1989 dollars, per person screened.
2. The column "HIV Negative on ELISA Test" shows average costs for individuals screened who are negative on the ELISA and require no confirmatory Western Blot testing. This includes HIV-negative individuals who test negative on the first ELISA (the majority) and require no further testing. It also includes HIV-negative persons whose first ELISA is borderline reactive but whose two repeat ELISA tests run in duplicate on the same blood specimen are clearly negative.

According to blood donor screening data, about two-thirds of all initially positive ELISA results are negative on repeat.[1]

It is assumed that the blood sample for the HIV test is drawn with the standard prenatal panel after informed consent has been obtained. The average cost of $5 per person screened includes the estimated cost of the laboratory test and the cost of providing information that is sufficient for informed consent concerning the purpose, benefits, and risks of the HIV test.

3. The column "HIV Positive or Indeterminate on ELISA Test" shows the average cost for individuals screened who require Western Blot testing. This includes those individuals who test positive on the first and two repeat ELISA tests. It also includes those who test positive on the first and one of the two repeat ELISA tests; some of these will yield a positive Western Blot result. Some will have a negative or indeterminate Western Blot and require further testing with additional blood specimens. The blood donor screening studies cited earlier have shown that about one-third of those testing positive on the first ELISA were persistently positive on the repeat ELISA, and 10 percent were also positive on the Western Blot. Of those repeatedly but weakly positive on the ELISA, only about 1 percent were positive on Western Blot testing.
4. To estimate the *average laboratory cost* a telephone survey was conducted of manufacturers of the reagents and of several commercial and public laboratories in the San Francisco Bay area. Average cost estimates are based on information provided by large public laboratories where economies of scale occur both in terms of manufacturer discounts and in processing the specimens with adequate quality control.
5. In selective screening, a *risk assessment cost* will be incurred for all women who present for prenatal care. It is assumed that risk assessment consists of a written instrument that will be part of an intake questionnaire. For most individuals this will be sufficient, although some women with risk factors may need further explanation in the course of the intake visit; the estimate is for average cost.

[1] R. S. Eisenstaedt and T. F.. Getzen, "Screening Blood Donors for Human Immunodeficiency Virus Antibody: Cost-Benefit Analysis," *American Journal of Public Health* 78(1988):450-454; Irwin Memorial Blood Bank, unpublished data, 1989.

6. Under all screening strategies, universal as well as selective, *all women who test HIV positive will receive specific HIV-related counseling.* In *selective screening, all women will receive specific HIV-related counseling*, even if they test HIV negative, because all women screened have risk factors.

   In *universal screening*, the cost implications of providing specific HIV-related counseling to HIV-positive women only are compared with the costs of providing such counseling to all women screened.

7. The lowest basic *cost estimates for counseling* have been used in the analysis because counseling is by far the most expensive item in the screening program cost. It was assumed that specific HIV-related *pretest counseling* would be added on to general pregnancy-related health counseling and would require a minimal marginal cost for most women who do not have risk factors. On the other hand, for some women with risk factors, the HIV-specific additional counseling would be more intensive. The analysis includes an estimated average pretest counseling cost of $7 per woman screened. It was also assumed that *posttest counseling for HIV-negative women* would consist of handing out an informative pamphlet about HIV prevention, which would be sufficient for most women. Some women who have known risk factors, however, may require specific information concerning risk reduction in their particular circumstances.

   Counseling for HIV-positive women is assumed to involve intensive posttest counseling, including information on the risk of transmission, prevention, and health care and reproductive options. The average cost of counseling has been estimated at $53; in the case of screening programs with counseling for all, this would include an average cost of $7 for pretest counseling.

PROBABILITY ASSUMPTIONS

1. $p(D/NoRF) = 0$

   i.e., the probability of disease, given that there are no risk factors, is equal to 0; all HIV infection occurs in women with risk factors only.

   If, on the other hand, there is a nonzero background rate in women without risk factors, then selective screening will miss more than the assumed 50 percent of HIV-positive women.

   For example, if the background rate in women without risk factors is 0.0001 (the estimated probability of HIV infection in a U.S. adult without risk factors), then selective screening will miss about 6 HIV-

positive women per 100,000 women. At low overall prevalences, this means that selective screening can at best pick up only about a quarter of HIV-positive women rather than one-half.

2. To calculate the prevalence of HIV infection among women with risk factors, the following identity has been used:

$$p(D) = p(D/RF) \times p(RF) + p(D/NoRF) \times p(NoRF),$$

where

$p(D)$	=	the overall regional prevalence among childbearing women (from newborn screening data)
$p(D/RF)$	=	the conditional probability of disease given risk factor(s)
$p(RF)$	=	the estimated regional prevalence of risk factors among childbearing women (estimated to be 0.10 at baseline)
$p(D/NoRF)$	=	the conditional probability of disease given no risk factor (estimated to be 0 in the present analysis, or 0.0001 in sensitivity analysis)
$p(NoRF)$	=	1 minus the estimated regional prevalence of risk factors among childbearing women (estimated to be 0.90 at baseline)

3. $p(TEST) = p(TEST/HIV+)$

i.e., the probability of testing is equal to the probability of testing HIV-positive women.

This is a severe restriction that tends to underestimate the cost of selective screening and overestimate the cost of universal screening:

a. For selective screening, this means that 50 percent of HIV-positive women are identified when only 50 percent of the women with risk factors are tested.

In reality, considerably more than 50 percent of the women may need to be tested in order to detect 50 percent of HIV-positive women. Thus, the cost per HIV-positive woman identified is considerably higher, as shown by sensitivity analysis.

b. For universal screening, this means that 95 percent of pregnant women would need to be tested in order to detect 95 percent of HIV-positive women.

In reality, a much smaller proportion of the pregnant population may need to be tested. In some low-prevalence regions, many women may correctly assess themselves as having no risk, so that little is lost if they refuse testing.

N.B.: If the goal is not only to detect the maximum number of HIV-positive women but also to counsel the maximum number of women at risk who are not yet infected, then the assumption concerning the prevalence of risk factors becomes crucial. Depending on that prevalence, universal screening with counseling for all may be advantageous even at a relatively low rate of infection in the region.

APPENDIX C

COST ESTIMATES: EARLY INTERVENTION FOR HIV INFECTION

The following tables offer crude estimates of HIV screening program costs. Part 1 provides estimates of the costs per intervention, which include counseling, testing, and partner notification (Table C-1) and subsequent medical surveillance, prophylaxis, and treatment (Table C-2). Part 2 (Tables C-3 and C-4) includes cost estimates for a program. Table C-3 provides estimates of the counseling, testing, and partner notification costs per 1,000 HIV-positive individuals identified and, using the state of New Jersey as an example, estimates of total counseling and testing costs if all HIV-infected individuals in the state were identified. Table C-4 presents rough estimates of the costs of medical surveillance, prophylaxis, and treatment per 1,000 HIV-positive individuals identified across four different treatment categories (based on CD4+ cell counts). Also using New Jersey as an example, it provides estimates of the costs of early medical intervention for all HIV-infected individuals in the state.

These tables are by no means comprehensive, nor do they provide definitive cost estimates. State policymakers may find the cost estimates per 1,000 HIV-positive individuals (see Tables C-3a and C-4a) helpful in calculating the potential costs of a screening program for their state. They can estimate the number of HIV-infected childbearing women in their state and apply the cost figures per 1,000 HIV-positive individuals to arrive at an approximation of prenatal screening program costs.

PART 1: COST ESTIMATES PER INTERVENTION

Counseling and Testing

Cost estimates for counseling and testing are provided by the Centers for Disease Control (March 1990). Estimates for the costs associated with HIV testing and counseling were prepared by the Division of Sexually Transmitted Diseases, based on a survey of approximately 15 states providing these services. The estimates include personnel fringe benefits and current overhead rates. Laboratory cost estimates were prepared by the Public Health Practice Program Office, based on a routinely conducted CDC survey of state health department laboratories and selected private laboratories.

Table C-1 Cost Estimates Per Intervention: Counseling and Testing

Item	HIV (-)	HIV (+)	Assumptions
LABORATORY			
Kit (ELISA)	S1.75 (1x)	$ 5.25 (3x)	
Lab time	0.43	1.28	$21,428 average lab tech annual salary; 50,400 tests/ year
Personnel fringe benefits	0.11	0.33	25.5%
Overhead	1.15	3.43	50% of labor and kits
Subtotal	3.44	10.29	
Kit (Western Blot)		20.00	
Lab time		2.48	8,640 tests/year
Personnel fringe benefits		0.63	
Overhead		11.56	
Subtotal		34.67	
COUNSELING			
Pretest: 15 minutes counseling plus 15 minutes preparation and processing			
Counselor	$ 6.78	$ 6.78	$26,029 (average annual salary)
Supervisor	1.36	1.36	$31,229 (average annual salary)
Clerical	0.78	0.78	$17,986 (average annual salary)
Personnel fringe benefits	2.27	2.27	25.5%
Overhead	4.48	4.48	40% of personnel
Subtotal	15.67	15.67	

Item	HIV (-)	HIV (+)	Assumptions
Posttest: HIV (-): 30 minutes counseling plus 15 minutes processing HIV (+): 90 minutes counseling plus 15 minutes processing			
Time	15.67 (30 min.)	47.01 (90 min.)	
	7.84 (15 min.)	7.84 (15 min.)	
Total	42.62	115.48	
PARTNER NOTIFICATION			
Time 1 Partner Notified		$ 24.41	2 hrs., $23,430 (average annual salary for disease intervention specialist)
Personnel fringe benefits		6.22	
Overhead		12.25	40% of personnel
Subtotal		42.88	
Total		158.36	

Medical Surveillance, Prophylaxis, and Treatment

Cost estimates are given for four treatment categories of asymptomatic HIV infection:

1 CD4+ cells > 500	Medical monitoring
2 CD4+ cells 200-500	Treatment with zidovudine
3 CD4+ cells < 200	Treatment with zidovudine, prophylaxis with trimethoprim-sulfamethoxazole
4 CD4+ cells < 200	Treatment with zidovudine, prophylaxis with aerosolized pentamidine

Three sources of cost estimates were used:

1. P. S. Arno, D. Shenson, N. F. Siegel, P. Franks, and P. R. Lee, "Economic and Policy Implications of Early Intervention in HIV Disease," *Journal of the American Medical Association* 262 (1989):1493-1498.

   The authors distinguish two treatment categories for purposes of cost estimation: 1 (CD4+ cells > 500), and 2-4 (CD4+ cells < 500).

The cost estimates reproduced in Table C-2 are mid-range figures from this paper.

2. New Jersey Department of Health (NJ DOH): (a) Department of Health document prepared for the Office of Management and Budget, Department of the Treasury, State of New Jersey: Plan for Early Intervention Services for HIV-Infected Persons, June 1989; (b) Department of Health letter to Donald S. Goldman, member of the National Commission on AIDS, reporting on initial implementation and preliminary costs of the state early intervention plan, prepared by Christine Grant, J.D., M.B.A., Deputy Commissioner of Health, January 18, 1990. The New Jersey Department of Health specifies services and provides cost estimates for each of the four treatment categories, which are summarized in Table C-2. The source for the department's estimates is Jersey City Medical Center reported costs for the first three months (October-December 1989) of the New Jersey early intervention (TAP) program.
3. AIDS Service, The Johns Hopkins School of Medicine and The Johns Hopkins Hospital (Baltimore, Md.); information provided by Mark D. Smith, M.D., Associate Director, AIDS Service, August 1990. The Johns Hopkins cost estimates are for services provided in accordance with National Institute of Allergy and Infectious Diseases treatment recommendations, which are summarized in Table C-2. The source of the AIDS Service cost estimates is per-item charges applied to the treatment protocol. The amount of actual reimbursement received by health services providers depends on the payer; Medicaid, Blue Cross, and commercial insurers each pay varying proportions of these charges.

Note: All estimates include the cost of pharmaceuticals when indicated for that treatment category, pharmaceuticals represent the predominant cost factor in treatment categories 2, 3, and 4.

TABLE C-2 Cost Estimates Per Intervention: Medical Surveillance, Prophylaxis, and Treatment

Source for Cost Estimate	Annual Services[a]	Annual Coat
Treatment Category 1: CD4+ Cells > 500		
(1) Arno et al.	4 physician visits, 4 CD4 panels, 4 counseling visits	$ 854
(2) NJ DOH	Physician visits: initial, 1-2 wk. follow-up, then every 4 mos.; x-ray and lab includes VDRL, PPD, CBC with differential, platelets, CD4, HBsAg/Ab, gonococcal culture, Pap smear, chlamydia; case mgmt., nutrition, assess., educ./counseling each visit (visits every 4-8 wks. if CD4 count drops)	1,676
(3) Johns Hopkins	Physician visits: initial, 1-2 wk. follow-up, then every 3-6 mos. with CD4; initial lab includes CBC with differential, CD4, HBsAg/Ab, RPR, PPD, influenza, pneumococcal, hepatitis B virus vaccine	775
Treatment Category 2: CD4+ Cells 200 - 500, with Zidovudine		
(1) Arno et al.	6-12 physician visits; 6-12 counseling visits; 6-12 CD4 panels	9,637[b]
(2) NJ DOH	As for Category 1, plus: physician visits every 2 wks. for 3 mos., then every 1-2 mos.; zidovudine; lab includes CBC with differential, hematocrit, CD4, platelets every visit	6,146
(3) Johns Hopkins	As for Category 1, plus: physician visits every month for 3 mos., then every 3 mos. with CBC with differential, CD4; zidovudine	3,620

Source for Cost Estimate	Annual Services[a]	Annual Cost
Treatment Category 3: CD4+ Cells < 200, with Zidovudine + trimethoprim-sulfamethoxazole (TMP-SMX)		
(1) Arno et al.	6-12 physician visits; 6-12 counseling visits; 6-12 CD4 panels	9,637[b]
(2) NJ DOH	As for Category 2, plus: physician visits every 2 wks. for 2 mos., then every 1-2 mos.; TMP-SMX; lab includes creatinine	6,097
(3) Johns Hopkins	As for Category 2, plus: physician visits every 2-3 mos. with CBC, SMA-12; TMP-SMX	3,736
Treatment Category 4: CD4+ Cells < 200, with zidovudine + aerosolized pentamidine		
(1) Arno et al.	6-12 physician visits; 6-12 counseling visits; 6-12 CD4 panels	9,637[b]
(2) NJ DOH	As for Category 2, plus: physician visits every 3 mos.; pentamidine every month; CD4 tests every 6 mos.	7,304
(3) Johns Hopkins	As for Category 2, plus: physician visits every 2-3 mos. with CBC, SMA-12; pentamidine every month	6,532

[a] VDRL, a serologic test for syphilis; PPD, purified protein derivative, a skin test for tuberculosis; CBC, complete blood count; HBsAg, hepatitis B surface antigen; HBAb, hepatitis B antibody; RPR, a serologic test for syphilis; SMA-12, 12 blood chemistry tests.

[b] This figure also includes costs of zidovudine therapy and primary PCP prophylaxis with aerosolized pentamidine or trimethoprim-sulfamethoxazole.

PART 2: PROGRAM COST ESTIMATES

TABLE C-3a Program Cost Estimates per 1,000 Infected Persons Detected: Counseling and Testing (using CDC cost estimates)

Cost per 1,000 HIV (+) Persons Detected	
Counseling and testing for HIV (+) individuals (1,000 x $115)	$115,000
Partner notification for 1 contact per HIV (+) index case (1,000 x $43)	43,000
Counseling and testing for HIV (-) individuals[a] (7,333 x $43)	315,319
Total	473,319

TABLE C-3b Program Cost Estimates for One State: Counseling and Testing (using CDC cost estimate)

Cost in One State: New Jersey[b]	
Counseling and testing for all HIV (+) individuals (70,000 x $115)	$ 8,050,000
Partner notification for 1 contact per HIV (+) index case (70,000 x $43)	3,010,000
Counseling and testing for HIV (-) individuals[a] (513,300 x $43)	22,071,900
Total	33,031,900

[a] The ratio of HIV (-) individuals tested to HIV (+) individuals varies greatly by background infection rates, intensity of outreach and testing efforts, and other factors. As a greater proportion of HIV (+) individuals in one area are identified, the number of HIV (-) tests required to find each HIV (+) individual will increase. In New Jersey in 1988-1989, that ratio in publicly funded testing programs was 100:12. Using this ratio, a total of 8,333 individuals would have to be tested to identify 1,000 HIV (+) individuals, yielding 7,333 HIV (-) individuals.

[b] population of the state = 7.8 million; estimated number of HIV-infected individuals = 70,000.

TABLE C-4a Program Cost Estimates: Annual Costs per 1,000 HIV (+) Patients by Treatment Category (using New Jersey Department of Health and Johns Hopkins cost estimates) for Medical Surveillance, Prophylaxis, and Treatment

		New Jersey Dept. of Health		Johns Hopkins	
Treatment Category[a]	Number of Patients/1,000 Patients[b]	Annual Cost/ patient	Total	Annual Cost/ Patient	Total
1	500	$1,6%	$ 838,000	$ 775	$ 387,500
2	300	6,146	1,843,800	3,620	1,086,000
3	150	6,097	914,550	3,736	560,400
4	50	7,304	365,200	6,532	326,600
Total (1,000)			3,961,550		2,360,500

[a] Treatment categories: 1, CD4+ cells >500-medical monitoring; 2, CD4+ cells 200-500-treatment with zidovudine; 3, CD4+ cells < 200-treatment with zidovudine, prophylaxis with trimethoprim-sulfamethoxazole; 4, CD4+ cells < 200-treatment with zidovudine, prophylaxis with aerosolized pentamidine.

[b] Distribution of HIV (+) individuals among treatment categories. This proportion is derived from the New Jersey data but is consistent with the Johns Hopkins AIDS Service experience for all adult patients. HIV (+) women may be disproportionately represented in the earlier treatment categories.

TABLE C-4b Program Cost Estimates: Annual Costs for All HIV (+) Individuals in New Jersey (using New Jersey Department of Health and Johns Hopkins cost estimates) for Medical Surveillance, Prophylaxis, and Treatment

		New Jersey Dept. of Health		Johns Hopkins	
Treatment Category	Total Patients	Annual Cost/ Patient	Total (in millions)	Annual Cost/ Patient	Total (in millions)
1	35,000	$1,676	$ 58,660	$ 775	$ 27,125
2	21,000	6,146	129,066	3,620	76,020
3	10,500	6,097	64,019	3,736	39,228
4	3,500	7,304	25,564	6,532	22,862
Total	70,000		277,309		165,235

APPENDIX D

COMMITTEE BIOGRAPHICAL NOTES

Lori B. Andrews, J.D., a research fellow at the American Bar Foundation and a senior scholar at the Center for Clinical Ethics at the University of Chicago, is the author of numerous articles and books including *Legal Liability and Quality Assurance in Newborn Screening (1985*) and *Medical Genetics: A Legal Frontier* (1987). She has written extensively on issues related to newborn screening and genetic technologies and has lectured widely on the legal and ethical issues involved in HIV screening of pregnant women and newborns.

Molly J. Coye, M.D., M.P.H., M.A., is currently chair of the Division of Public Health Practice at the Johns Hopkins School of Hygiene and Public Health. She completed her term as commissioner of the New Jersey Department of Health in December 1989. Prior to joining the New Jersey Department of Health, Dr. Coye served as special adviser for health planning to Governor Thomas Kean's Office of Policy and Planning. In that capacity, she developed programs to address state health problems in three areas: maternal and child health, indigent care and hospital reimbursement, and occupational and environmental hazards. She has been chair of the Executive Board of the American Public Health Association and is affiliated with the Maryland Public Health Association, the American College of Preventive Medicine, the Society for Occupational and Environmental Health, and the National Association for Public Health Policy.

Robert A. Derzon, M.B.A., joined Lewin/ICF as vice president in 1980 and in 1984 opened the firm's San Francisco office, which he now directs. He also directs the Lewin/ICF institutional health care practice. Mr. Derzon has more than two decades of experience in administering public and private teaching hospitals and in public service and education. He was the first administrator of the Health Care Financing Administration, the

agency responsible for administering the Medicare program and the federal government's participation in Medicaid and other health financing programs. From 1970 to 1977, he directed the University of California, San Francisco, hospital and clinics. He also served as first deputy commissioner of hospitals in New York City and as associate administrator of the New York University Medical Center. He is an elected member of the Institute of Medicine of the National Academy of Sciences and is currently chairman of the board of the Dartmouth-Hitchcock Medical Center.

Norman C. Fost, M.D., is professor and vice chairman of pediatrics and director of the Program in Medical Ethics at the University of Wisconsin School of Medicine. He is also chairman of the American Academy of Pediatrics' Committee on Bioethics. At Wisconsin, he directs the Residency Training Program, coordinates the Child Protection Team, and serves as chairman of the Hospital Ethics Committee and the Institutional Review Board. He is the author of numerous publications on ethical and legal issues in health care, particularly those involving children, and was a consultant to the National Academy of Sciences/National Research Council Committee on Screening for Inborn Errors of Metabolism, whose report (*Genetic Screening: Programs, Principles, and Research*) was published in 1975.

Laurence R. Foster, M.D., M.S., M.P.H**,** is state epidemiologist for the Oregon Health Division. He received his medical training at the University of Oregon Medical School and his M.P.H. and M.S. degrees in epidemiology from the Harvard University School of Public Health. He has served as a local public health officer and has thirteen years of experience in public health epidemiology at the state level. He managed the development of Oregon's HIV prevention program. Since 1985 he has served on numerous national HIV policy and guideline-setting panels. He is president-elect of the Council of State and Territorial Epidemiologists and the AIDS representative of that organization.

Rodney Hoff, D.Sc., M.P.H., is currently chief of the Pediatric and Family Section in the Epidemiology Branch of the Division of AIDS of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health (NIH). Prior to joining NIH in April 1990, Dr. Hoff was assistant director of the New England Regional Newborn Screening Program at the Massachusetts Public Health Laboratory and associate professor of community health at Tufts University School of Medicine in Boston. Dr. Hoff's research interests include the epidemiology of perinatally acquired HIV infection and the development of methods for the diagnosis of HIV infection in infants. Dr. Hoff's group at the Massachu

setts Public Health Laboratory developed the methodology for estimating the seroprevalence of HIV among childbearing women by testing anonymous samples of blood collected for routine newborn screening tests.

Michael M. Kaback, M.D., is professor and chairman of the Department of Pediatrics at the University of California, San Diego, and pediatrician-in-chief at the Children's Hospital of San Diego. He also serves as director of the State of California's Tay-Sachs Disease Prevention Program and as director of the International Center for Tay-Sachs Disease Quality Control and Data Collection. Dr. Kaback is currently editor for North America for the international journal *Prenatal Diagnosis* and is president-elect of the American Society of Human Genetics. He is the author of numerous scientific and medical publications and is a member of the American Academy of Pediatrics, the American Pediatric Society, the Society of Pediatric Research, and the American Federation for Clinical Research. Dr. Kaback's major research interests include the application of biochemical and molecular methods to the delineation and detection of genetic disease and the psychosocial implications of applying genetic technology to large populations.

Marie C. McCormick, M.D., Sc.D., is currently associate professor of pediatrics at the Harvard Medical School and a member of the Joint Program in Neonatology, where she is director of the Infant Follow-Up Program. Her training at Johns Hopkins University included the Clinical Scholars Program in which she combined a residency in pediatrics with a doctoral degree in health program evaluation. Since then, Dr. McCormick has conducted several large-sole program evaluations and assessed perinatal programs among disadvantaged women. In addition, she is a nationally recognized expert in approaches to defining appropriate infant/child outcomes. Her research interests have continued in this area with a primary focus on the effect of perinatal and neonatal health services in improving the health of high-risk infants. Dr. McCormick was a member of the previous IOM Committee to Study the Prevention of Low Birthweight and also contributed to the work of the IOM Committee to Study Outreach for Prenatal Care.

Barbara J. Sabol, R.N., M.A., is currently administrator/commissioner of the New York City Human Resources Administration. Prior to this appointment, she served as executive deputy commissioner of the New York State Department of Social Services. From 1983 until 1987, Ms. Sabol served as secretary of the Kansas Department of Health and Environment. During the Carter administration, she administered the Title XX program in the Department of Health and Human Services (DHHS)

and directed the ten regional offices of the Office of Human Development Services. Following her tenure at DHHS, Ms. Sabol remained in Washington as director of the Office of Policy and Planning for the District of Columbia's Department of Human Services.

A. Eugene Washington, M.D., M.P.H., M.Sc., is co-director of the Center for Reproductive Health Policy Research, School of Medicine, University of California, San Francisco. He is an attending physician in obstetrics and gynecology at San Francisco General Hospital and holds appointments in the Departments of Obstetrics, Gynecology and Reproductive Sciences, and Epidemiology and Biostatistics, and the Institute for Health Policy Studies. HIS research focuses on the prevention of diseases in women, cost-effectiveness of medical practices and public health programs, and development of health policy. He is recognized internationally for his work on prevention and treatment policy for sexually transmitted diseases.