Chapter 5. Cost-Effectiveness of Prevention, Screening, and Treatment of Disease Among Inmates

This chapter assesses whether it would be cost effective for correctional systems to implement interventions for preventing, screening for, and treating selected communicable and chronic diseases. The chapter concludes that a number of interventions would be cost effective and, in several cases, save money. Although clinical guidelines are available for certain mental illnesses, such as major affective disorder (depression and bipolar disorder) and schizophrenia,[1] insufficient data are available to analyze the cost implications of following these guidelines for corrections.[2]

Cost-Effectiveness of Prevention, Screening, and Treatment

The project considered whether it would be cost effective or a cost saving to prevent, screen for, and treat selected diseases. (See "The Differences Between Cost Effective and a Cost Saving".) For each disease, the discussion below (1) summarizes the results of the cost-effectiveness and cost-saving analysis, (2) describes briefly the analytic methodology used, and (3) reviews the findings. "Summary of Cost-Effectiveness and Cost-Savings Estimates" provides an overview of the project's conclusions regarding the cost-effectiveness and the cost saving of the interventions.

Communicable Disease

The discussion below examines whether it would be cost effective and a cost saving to screen for and treat three sexually transmitted diseases (STDs) (syphilis, gonorrhea, and chlamydia), tuberculosis (TB), and human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). The analysis frequently makes the case for cost-effectiveness or a cost saving, assuming that a minimum level of infection is present among the inmates in a correctional system. Whether and to what extent an intervention for a specific disease is cost effective or a cost saving depends on each correctional system's prevalence infection rate for the disease. The higher the rate, the greater the intervention's cost-effectiveness and cost savings will be.

Syphilis, gonorrhea, and chlamydia

Summary. It would be cost effective to screen routinely for syphilis, gonorrhea, and chlamydia in

The Differences Between Cost Effective and a Cost Saving

A cost-saving intervention saves more money in averted medical costs than is needed to implement the intervention. A program does not have to save costs to be a worthwhile investment. If the reduction in adverse health consequences is judged to be worth the cost of the program, the program is still cost effective. A cost-effective intervention means that the benefits the intervention will achieve are worth the costs even if the intervention costs more than the money that is saved as a result of averted illness or death. Clearly, any intervention that is cost saving is also cost effective, but not all cost-effective interventions save money.*

*A cost-effectiveness analysis compares the cost of incremental interventions with the financial value of the effect or intended outcome. The outcome may be expressed in terms of dollars expended per case (or complication avoided), as it is for sexually transmitted diseases in this report. Cost-effectiveness ratios can be calculated for the incremental prices (as in dollars per year or dollars per quality-adjusted year of life expectancy [QALY]). In this report, ratios of this type are used to evaluate chronic disease interventions. See M.R. Gold, J.E. Siegel, L.B. Russell, and M.C. Weinstein, *Cost-Effectiveness in Health and Medicine,* New York, New York: Oxford University Press, 1996; and A.C. Haddix, S.M. Teutsch, P.A. Shaffer, and D.O. Dunet, Prevention Effectiveness: *A Guide to Decision Analysis and Economic Evaluation,* New York, New York: Oxford University Press, 1996.

prisons and jails. It would be a cost saving to screen routinely for syphilis in prisons and jails. The methodology and findings presented below are based on the paper "Cost-Effectiveness of Routine Screening for Sexually Transmitted Disease in Inmates of U.S. Correctional Facilities," by Julie R. Kraut, Anne Haddix, Vilma Carande-Kulis, and Robert B. Greifinger, in volume 2 of this report.

Methodology. The method of estimating the cost-effectiveness of preventing and treating these three STDs considers the number of new individuals whom inmates leaving prison or jail with these diseases are likely to infect and the averted costs of treating these new cases. To make this calculation, the analysis makes assumptions regarding the prevalence of infection among inmates. The analysis for syphilis makes the following additional assumptions:

- The average number of people an infected person further infects in a susceptible population.
- The probability of transmitting the disease from an infected person to someone else.
- The length of time during which the person with the disease remains infectious.
- The average number of new people with whom the infected person will have sexual contact over a given period of time.

Findings. The findings are largely similar for the three sexually transmitted diseases but at different levels of prevalence.

- *Syphilis.* Routine syphilis screening on intake to prisons or jails would be a cost saving (and therefore cost effective) if at least 1 percent of inmates were infected. In a hypothetical cohort of 10,000 inmates, screening would identify and make it possible to treat 234 individuals before they could transmit the disease to others. By interrupting

Summary of Cost-Effectiveness and Cost-Savings Estimates

Condition	Intervention	Cost Effective	Where	Cost Saving	Where
Syphilis	universal screening	yes, if >1%	prisons and jails	yes, if >1%	prisons and jails
Gonorrhea	universal screening	yes	prisons and jails	no (men), yes, if prevalence is >8% (women)	prisons and jails*
Chlamydia	universal screening	yes	prisons and jails	no (men), yes, if prevalence is >9% (women)	prisons and jails*
HIV Infection	counseling and testing	yes	prisons	yes	prisons
Tuberculosis Infection	universal screening	yes	prisons	yes, if >3% of HIV-infected inmates have TB infection	prisons
Hypertension	universal screening	yes	prisons and jails	no	N/A
Diabetes	universal screening	yes	prisons and jails	no	N/A

*For jail inmates, to be a cost saving, at least 85 percent of diagnosed women would need to be treated.

transmission of the disease, this would prevent at least 186 new cases of syphilis in sexual partners of inmates. The public health benefits would probably be even greater, as the analysis could not estimate the total number of cases detected resulting from interrupting transmission in the community. Routine screening for syphilis would also prevent 10 new cases of HIV infection because the risk of HIV transmission is increased in persons with both HIV and syphilis infection. Routine screening for syphilis would save almost $1.6 million in future treatment costs for every 10,000 inmates screened, excluding any savings associated with HIV prevention.

- *Gonorrhea*. Routine screening for gonorrhea for men in prisons and jails would be cost effective but not a cost saving. Because women face more and costlier complications related to the disease, the concern is that undiagnosed men may transmit the disease to women. Screening men would prevent a substantial number of undiagnosed cases of gonorrhea, decreasing transmission rates. For a hypothetical cohort of 10,000 male prison inmates, at least 6 percent of whom were infected, routine screening would prevent 296 cases of untreated or undiagnosed gonorrhea. It would cost only $267 to prevent a case of undiagnosed gonorrhea, an acceptable cost-effectiveness ratio. This probably underestimates the cost-effectiveness of screening because some averted HIV treatment costs were excluded from the analysis.

  As with men, routine screening for gonorrhea for women in prisons and jails would be cost effective because it would prevent many cases of gonorrhea and avert the development of complications associated with the disease. Routine screening may also be considered cost effective because it would cost the health care system only $585 to $3,638, depending on the setting, to avert a single case of pelvic inflammatory disease (PID).[3] Routine screening for women would be a cost saving in prisons if at least 8 percent of female inmates had gonorrhea. To be a cost saving for a cohort of the same size in a jail, the prevalence of gonorrhea would also have to be at least 8 percent, and at least 85 percent of diagnosed women would have to be available to be treated.

- *Chlamydia*. Routine screening at intake for chlamydia for men in prisons and jails would be cost effective. Screening would detect a substantial number of undiagnosed cases and decrease transmission from men to women. It would cost only $198 in prisons and about $1,100 in jails to prevent one case of chlamydia, an acceptable cost-effectiveness ratio. Screening would not be a cost saving for men in prisons and jails.

Routine screening of female inmates for chlamydia in prisons and jails would be cost effective. Screening would substantially reduce the number of PID cases and untreated or undiagnosed cases of chlamydia in prisons. It would cost only $198 to prevent each case of PID in prisons, and the cost per case of PID averted would be about $2,450. These are acceptable cost-effectiveness ratios. The results probably underestimate the cost-effectiveness of screening because, as with gonorrhea, some averted treatment costs were excluded from the analysis. Screening for chlamydia would be a cost saving for female prison inmates only if at least 9 percent of women were infected. To be a cost saving for a cohort of the same size in a jail, the prevalence of chlamydia would also have to be at least 9 percent, and at least 85 percent of diagnosed women would have to be treated.

HIV

Summary. HIV counseling and testing in prisons would be cost effective and a cost saving. The methodology and findings presented below are based on the paper, "Cost-Effectiveness of HIV Counseling and Testing in U.S. Prisons," by Beena Varghese, in volume 2 of this report.

Methodology. This analysis examined the cost-effectiveness of HIV counseling and testing (not treatment) of prison inmates in preventing future HIV infection. The analysis included all societal costs and benefits of a prevention program, including personnel and laboratory costs for counseling and testing, and averted lifetime treatment costs of HIV (excluding the costs and benefits of identifying and treating HIV-infected inmates).[4]

Findings. As an HIV-prevention program, voluntary counseling and testing in prisons would be cost

effective and a cost saving. Offering counseling and testing to 10,000 prison inmates would prevent three future cases of HIV if 60 percent of the inmates agreed to be counseled and tested. Preventing these future cases would save $410,000—almost $137,000 per future case of HIV prevented.[5] For correctional systems with HIV prevalence rates as low as 1.5 percent, offering counseling and testing to 10,000 inmates would cost the prison system about $117,000, or approximately $39,000 per case of HIV prevented. As the prevalence of HIV, transmission rate, and effectiveness of counseling increased, counseling and testing would become more cost effective. The cost drops to $28,000 per case of HIV prevented when HIV prevalence among inmates increases to 3 percent or more—the current percentage in most State prisons in the Northeast and some in the South.[6]

Tuberculosis

Summary. Screening all prison inmates for TB at intake would be cost effective and, in certain circumstances, cost saving. The methodology and findings presented below are based on the presentation, "The Cost-Effectiveness of Preventing Tuberculosis in Prison Populations," by Zachary Taylor and Cristy Nguyen, in volume 2 of this report.

Methodology. This analysis takes into consideration a range of prevalence estimates for latent TB infection, screening costs, the health effects of latent TB infection and active TB disease, the effectiveness of screening for prison inmates, and the effectiveness of preventive therapy (90 percent in HIV-negative patients, 73 percent in HIV-positive patients).

Findings. Screening for latent TB infection in prisons would be cost effective. For every 100,000 prison inmates tested and with treatment of those who are found to have latent TB infection,[7] 989 cases of active TB would be prevented each year. With a high-risk group, such as HIV-infected inmates, the number of TB cases prevented would increase according to the rate of HIV infection. The estimate of 989 cases that would be prevented per 100,000 screened inmates assumes that 2.3 percent of inmates are HIV positive—the percentage infected in the Nation's prisons and jails as a whole. The number of TB cases prevented would increase to 1,336 cases for prisons with HIV infection rates of 5 percent and to 1,704 cases prevented for prisons with an HIV infection rate of 7.85 percent.

Screening for latent TB infection in prisons would be cost saving if the prevalence were more than 3 percent *among HIV-infected inmates*. The 989 cases of active TB that would be prevented per 100,000 screened inmates, assuming that 2.3 percent of inmates are HIV positive, would save $7,174,509, or $7,254 per case prevented.

This cost-effectiveness analysis is limited to prisons. Because the short stays and rapid turnover of jail inmates present serious challenges to screening for latent TB infection, jails are not included. In the jail setting, the highest priority should be placed on screening incoming inmates for active TB disease so that any contagious individuals are properly isolated.

Chronic Disease

Summary. Universal screening and treatment in prisons and jails for hypertension and diabetes would be cost effective but not cost saving. The methodology and findings presented below are based on "Cost-Effectiveness Analysis of Annual Screening and Intensive Treatment for Hypertension and Diabetes Mellitus Among Prisoners in the United States," by Donna M. Tomlinson and Clyde B. Schechter, in volume 2 of this report.

Methodology.[8] A simulation was constructed that projected the 20-year economic and health consequences of initiating annual screening and intensive treatment for hypertension and diabetes. The occurrence of complications in a cohort of released inmates was then predicted using the results of three epidemiological studies of heart disease and diabetes.[9] The average per-inmate annual cost of screening and confirmatory tests for both diseases was estimated at about $15. Assuming that the least expensive generic brands of drugs were used, and assuming five physician checkups per year, the annual per-inmate cost of treating inmates with hypertension would be approximately $388.[10] The average increased costs associated with aggressive diabetic treatment were estimated to be $1,983 per year per diabetic. The analysis factored in the number of years of less-than-ideal quality of life that infected inmates would avoid if treated aggressively.

Findings. Universal screening for hypertension and diabetes would be cost effective because of the added years that inmates with these diseases could expect to live and the reduced number of medical complications they could be expected to experience. Over 20 years of followup, in the absence of screening and treatment, the 1,599,409 individuals incarcerated in 1998 could be expected to live 7,616,668 years in prison and another 22,567,690 years outside prison. With aggressive screening and treatment, and assuming 100 percent compliance, they could be expected to live another estimated 386,108 years, 3,768 years in prison and 382,340 years (more than 99 percent of the total) outside prison. The cost to achieve this improved survival would be $131.71 per inmate per year, about 5 percent of current average correctional health care budgets.

There would be large public benefits to this investment. In addition to increased survival, investment in screening and treatment would result in reductions of:

- 31,697 years of blindness (94.1 percent outside prison).
- 61,021 episodes of coronary heart disease (91.7 percent outside prison).
- 31,555 years of congestive heart failure (89.25 percent outside prison).
- 44,400 strokes (more than 90 percent outside prison).
- 15,395 years of terminal kidney disease (94.6 percent outside prison).

Moving Beyond Cost-Effectiveness

The discussion above demonstrates that it would be cost effective and, in some cases, save money for prisons and jails to introduce or expand prevention, screening, and treatment interventions targeting communicable and chronic disease. There are issues to consider beyond that of cost-effectiveness—in particular, identifying specific interventions that have been shown scientifically to prevent and reduce these diseases among inmates. Only those interventions that are known to work will be cost effective. The discussion below examines scientifically tested interventions that correctional agencies can introduce to target selected diseases and chronic diseases. These interventions would address three public health goals:

- Decrease the likelihood of infection being transmitted from an infected person to an uninfected person.
- Reduce the time period during which the infected person can transmit the disease to others.
- Reduce the number of contacts the infected person has with uninfected persons.

Scientifically tested interventions addressing communicable disease

A complete discussion of most of the scientifically tested interventions that prisons and jails can implement to reduce the prevalence of communicable disease among inmates may be found in the paper, "Communicable Diseases in Inmates: Public Health Opportunities," by Jonathan Shuter, in volume 2 of this report. See "Summary of Scientifically Tested Interventions Correctional Agencies Can Implement to Reduce Communicable Disease" for a list of these interventions.

Sexually transmitted diseases. Syphilis, gonorrhea, and chlamydia are highly prevalent in correctional populations. Correctional agencies can introduce a variety of proven approaches to preventing, screening for, or treating these diseases.

Reducing the likelihood of transmission per contact. In addition to screening and treating current infection, the ideal approach to reducing the likelihood of transmission of all three STDs would include multiple culturally appropriate educational sessions led by peer counselors who would teach the dangers of unsafe sexual practices, the importance and proper use of barrier protection, and techniques to encourage safer sexual practices. These approaches have demonstrated effectiveness.[11]

Reducing the duration of infectiousness. Reducing the length of time during which an inmate is infectious depends on timely screening and prompt treatment. The following screening and treatment methods would reduce the period of infectiousness:

- *Syphilis.* Rapid screening and treatment can be done at little cost in jails and prisons.[12] Rapid screening techniques reduce the time lag from

Summary of Scientifically Tested Interventions Correctional Agencies Can Implement to Reduce Communicable Disease

Sexually transmitted diseases

- Offer educational interventions regarding the dangers of sexual contact with multiple partners.
- Offer peer-led educational sessions addressing safer sexual practices.
- Provide rapid screening and treatment of syphilis.
- Screen for and treat gonorrhea and chlamydia in correctional systems with high rates of these infections.

HIV/AIDS

- Aggressively market confidential counseling and testing so that all inmates with risk factors accept these interventions.
- Provide educational programs to help inmates reduce their risk of acquiring or transmitting HIV infection.
- Offer treatment to all inmates with HIV disease who qualify under current guidelines.

Tuberculosis

- Ventilate high-population areas adequately.
- Train correctional staff to be alert for inmates with TB symptoms.
- Screen all new admissions for latent TB infection and treat as appropriate; test current inmates and all staff annually.
- Provide access to negative pressure isolation rooms.
- Provide prompt and effective treatment under direct observation.
- Provide for followup in the community when release precedes completion of treatment.
- Identify all contacts of inmates newly discovered to be infected.
- Coordinate all TB control activities with local or State departments of health.

Hepatitis B and C

- Routinely vaccinate all inmates, or susceptible inmates, against hepatitis B.
- Consider screening before vaccinating in systems with high rates of hepatitis B.
- Offer educational sessions to encourage steps to avoid acquiring or transmitting hepatitis B and C.

testing to start of treatment, increasing the likelihood that the infected patient will be treated before being released. All new admissions to jails and prisons should be tested, and infected inmates should be treated on the same day.

- *Gonorrhea*. Every correctional system should screen new admissions for gonorrhea infection. New screening methods for gonorrhea are very accurate and less uncomfortable than traditional methods. A urine screening test (Ligase Chain Reaction) already in wide use is much less invasive and less uncomfortable for the patient, and requires less staff time, than traditional culture methods. Inmates diagnosed with gonorrhea should receive medication that can be taken in a single dose. Staff can observe inmates taking single doses, increasing the certainty of treatment and reducing the chance that drug resistance may develop from partial treatment.
- *Chlamydia*. Every correctional system should screen new admissions for chlamydia infection. Urine screening is a viable alternative to the traditional culture method, which requires an uncomfortable vaginal examination for women. Inmates testing positive for chlamydia infection should receive a single dose of azithromycin, even though other medications that require multiple administrations cost less. The single-dose treatment is more reliable and therefore more effective. Correctional systems in which more than 20 percent of the entire inmate population—or 20 percent of identifiable subgroups of inmates—have chlamydia infection might consider immediate treatment for every inmate in the risk group without waiting for laboratory confirmation.

Reducing the number of new contacts. Educational interventions that heighten awareness of the dangers of having sexual contact with numerous partners—a form of "harm-reduction strategy"—appear to be effective with inner-city patients with STDs.[13] Culturally appropriate messages delivered by respected personalities or peers are most likely to be effective.[14] Patients diagnosed with any STD should be referred for immediate HIV testing.

HIV/AIDS. Three interventions hold promise for preventing HIV and AIDS among inmates: testing, education, and treatment.

HIV testing. Correctional systems should incorporate easy, convenient, and voluntary HIV testing into the intake procedure for all inmates who are not already known to be HIV infected. Because new medications have reduced mortality in recent years, correctional systems should encourage all incoming inmates with HIV risk factors who have not knowingly tested positive for HIV to receive counseling and testing. Alternatively, routine testing of incoming inmates with risk factors might be considered. The United States military is already using testing programs of this magnitude efficiently and affordably at a cost of approximately $2.50 per test.[15] Because pretest counseling sessions and drawing blood require many staff, larger correctional systems should consider innovative approaches to enhance efficiency, such as showing videotaped pretest counseling sessions (instead of using live counselors) and using fingerstick blood or oral fluid samples for testing purposes. Correctional systems should maintain logs of inmates who choose not to be tested at intake and recontact these individuals periodically during their incarceration. Results of HIV tests should be confidential and available in a timely fashion. Correctional systems should coordinate with local health departments to ensure that test results are communicated to inmates who have been released from prison or jail before testing is complete or before the test results are known. Inmates must be informed of their test results in a method that assures confidentiality. A few departments of corrections have systems of anonymous testing in which, for example, inmates are given a toll-free telephone number and a password to obtain their test results.

Harm-reduction training. All correctional systems should offer educational programs aimed at helping inmates reduce their risk of acquiring or transmitting HIV, including discussions of condom usage and safer injection practices. Correctional institutions might consider inviting respected members of the community to talk with groups of inmates at highest risk of acquiring HIV infection or transmitting it to others, such as inmates with active STDs, sex workers, and active injection drug users.

Treatment of HIV disease. Prisons and jails should offer comprehensive therapy to inmates with HIV infection, including standard diagnostic testing and antiretroviral medications as appropriate to each

patient. HIV treatment regimens require that medications be taken on a strict schedule. Therefore, many correctional systems distribute a full day's medication each morning in "day packs" to improve the inmate's ability to take his or her medications at the proper times. Systems might consider increasing the flexibility in their medication or meal distribution schedules to accommodate these and other requirements of treating HIV-infected inmates. Some regimens require that medications be taken on an empty stomach or after a full meal, or that patients have free access to fluids. Inmates in all systems housing HIV-infected individuals should have access to consultation with an infectious-disease or HIV specialist.

Tuberculosis. In considering interventions for tuberculosis, it is important to keep in mind the distinction between latent TB infection and active TB disease explained in chapter 4: Active TB is a contagious and progressive disease, but individuals with latent TB infection are free of symptoms and therefore cannot spread the disease. Individuals with latent TB infection, however, have a 10 percent chance of developing active TB disease in their lifetimes. Among HIV-infected persons, the risk goes up to 10 percent per year. Nevertheless, correctional systems can implement clinically tested steps to reduce both latent TB infection and active TB disease.

Reducing the likelihood of disease transmission. Areas within prisons and jails that house large numbers of inmates for substantial periods of time should be well ventilated. Initial intake areas and sick-call clinics with poor ventilation should be evaluated for additional measures, such as high-efficiency particulate air (HEPA) filtration and ultraviolet radiation (which kills microbes). Dormitories and infirmaries that house inmates with weakened immune systems, such as AIDS patients, should be particularly stringent in screening current and prospective admissions for active TB because TB can spread extremely rapidly through these populations.[16] Correctional systems should train all staff to be attuned to the prevalence and nature of TB and to be alert for inmates with persistent coughs, sputum production, chronic fever, or unexplained weight loss. Staff should encourage inmates who are coughing to cover their mouths with their hands or with tissues until medical evaluation is complete.

Reducing the duration of infectiousness. Correctional systems should take advantage of three approaches to reducing the duration of infectiousness of active TB cases.

- *Timely diagnosis.* All correctional systems should have formal programs to screen new admissions for latent TB infection and active TB disease, and to test all staff and inmates annually for latent TB infection. These programs should include a history and physical examination by a qualified health care provider and tuberculin skin testing. For inmates with a history of old or recently active TB, the facility should check with the local health department for treatment information. Each facility should, in cooperation with local public health agencies, adjust the intensity of these efforts to reflect the prevalence of TB in the surrounding community.
- *Respiratory isolation.* All correctional systems should have access to appropriate negative pressure isolation rooms either onsite or at a local hospital. Patients should remain in isolation until there is no risk of transmitting TB to others.
- *Prompt and effective treatment.* Patients without drug-resistant tuberculosis rapidly become noncontagious with appropriate medical therapy.[17] Correctional staff should directly observe all inmates being treated for active TB to make sure patients swallow their medication.[18] Followup in the community with local public health authorities should be arranged for inmates released before their course of treatment has ended.

Reducing the number of new contacts. Many of the measures outlined above will reduce the number of new contacts as well as the likelihood that individuals infected with TB will transmit the disease to others. The occasional inmate with TB who ends up in the general inmate population despite existing screening practices is least likely to infect other inmates and staff in a facility that is not overcrowded and where staff are sensitive to the symptoms and signs of disease.

Miscellaneous measures. At least two other components are required for an effective TB control program in correctional systems.

- When an inmate housed in the general inmate living area develops active TB, every correctional facility should be able to conduct a thorough investigation to identify all individuals with whom the infected person has come in contact. Because newly infected individuals are at high risk of progression to active TB, health care staff should screen and evaluate inmates with recent close contact with a patient with active TB for signs of new infection.[19] Some groups, such as HIV-infected patients, are at such high risk of becoming infected through contact that TB preventive therapy should begin as soon as possible after it becomes known that the individual has had close contact with a contagious inmate.[20]
- All TB control activities in jails and prisons should be performed in concert with local or State health departments. Access to county and city department of health registries is invaluable in identifying patients who may fail to report their diagnosis at intake.[21] These agencies may also help ensure followup of inmates after release and help track epidemiological trends pertaining to TB both inside and outside the facility.

Hepatitis B and C. As explained in chapter 4, hepatitis B and C are both bloodborne infections affecting the liver. Hepatitis C, however, is responsible for about five times as many deaths each year as hepatitis B. A vaccine protects against hepatitis B but not hepatitis C. Nevertheless, prisons and jails can implement proven interventions that will reduce the spread of both hepatitis B and C.

Reducing the likelihood of disease transmission. Because inmates are such a high-risk group for future hepatitis B infection, the Centers for Disease Control and Prevention recommends one of two options: (1) routine vaccination against hepatitis B for all new prison and jail inmates or (2) screening all new inmates for the infection. The rationale for not routinely vaccinating all incoming inmates is that up to 80 percent of some groups of inmates in some facilities (e.g., injection drug users) may show evidence upon screening of prior hepatitis B infection.[22] Inmates with prior infection would not benefit from vaccination. In these high-prevalence populations it may be more cost effective to screen prior to vaccination than to immunize every inmate. This will avoid the expense of immunizing large numbers of inmates for whom the vaccine will be of no benefit. Health care staff can vaccinate only those inmates who screening shows are not yet infected with hepatitis B because these individuals are highly susceptible to the infection.

A complete hepatitis B vaccination series requires three injections administered over 6 months. Although inmates who will be incarcerated for less than 6 months are unlikely to complete the series after release, an incomplete series of injections can still be beneficial. The first dose of vaccine confers immunity in up to 50 percent of patients, and the second dose yields an immunity rate of up to 85 percent.[23] Although the three-dose series, which immunizes 95 percent of patients, is best, the rates of immunity conferred with fewer doses remain high enough to merit recommendation.

Other methods to reduce the likelihood that infected inmates will acquire or transmit hepatitis B or C include harm reduction messages identical to those recommended for HIV. It is important to inform inmates that hepatitis B and C are both serious threats separate from the risk of HIV and that safer drug injection and sexual practices are necessary even when individuals have tested negative for HIV. Hepatitis B is generally more easily transmitted than HIV, and hepatitis C is more easily spread through needle use than HIV.

Improved and early diagnosis may reduce the transmission of hepatitis B and C by making it possible to treat selected infected inmates with antiviral agents. Although antiviral treatment is currently controversial because it is not always effective, it cures 35–45 percent of patients.[24] Even among patients it does not cure, antiviral treatment may reduce the amount of the virus in the body and therefore reduce transmissibility.[25]

Reducing the number of new contacts. As with HIV prevention, harm-reduction counseling and behavior modification techniques may decrease the number of contacts that infected individuals have with susceptible other people.

Minimum Standards for Care of Chronic Disease in Prison (evidence based on current, nationally accepted guidelines—January 25, 2000)

Parameter	Diabetes Types 1 & 2[1,2]	Asthma[3]	Hypertension[4]	HIV[5,6]
Definition	untreated preprandial blood glucose >125 mg/dL	on or should be on medication; ≥1 ß-agonist inhaler/month	systolic >140 or diastolic >90 mm Hg or on Rx (130/85 for diabetics)	known infection
Applies	all diabetics, both insulin- & non-insulin-dependent	limited to moderate, persistent, and severe persistent	all risk groups	all; asymptomatic and symptomatic
Initial history	complete, including nutrition, medications, monitoring, known complications	complete, including triggers, medications, use of PEFR	complete, including nutrition, medications, known complications, smoking, alcohol	complete, including nutrition, medications, TB infection status, STD status, known complications
Admission physical examination	complete, including BP, EKG, cardiovascular, dilated retinal referral and foot	complete, including peak flow measure	complete, including BP, weight, EKG fundoscopy	complete, all systems
Physician, NP or PA visits (controlled disease)	at least quarterly until controlled, then at least every 6 months	at least quarterly until controlled, then at least every 6 months	at least quarterly until controlled, then at least every 6 months	3 mos CD4+ <500 6 mos CD4+ >500
Office procedure each visit	foot exam including monofilament testing, weight, annual EKG	peak flow measure (PEFR)	blood pressure, weight, annual EKG	system review, weight
Laboratory, initial every 3 months, until controlled, then at least every 6 mos.	glycated hemoglobin, fasting glucose	theophylline level (if on)		CD4+ & RNA viral load
Laboratory, initial and annual for controlled disease	fasting lipid, urinary microalbumin		fasting lipid, urine protein	RPR & GC & Chlamydia screen, Pap (6 months)
Vaccine	annual influenza, 1 pneumococcal	annual influenza, 1 pneumococcal		annual influenza, 1 pneumococcal
Medication as appropriate	insulin, oral hypoglycemics, aspirin	inhaled steroid if on ≥1 ß-agonist inhaler/month	ß-blocker, diuretic, add appropriate ACE inhibitor, Ca+ blocker, etc., aspirin	as appropriate for viral load & trend; OI prophy <500 CD4+
Routine referral	annual dilated retinal exam by eye care specialist			HIV knowledgeable physician
Special needs	daily access to glucose monitor, exercise, diet, insulin timed with meals	daily access to peak flow monitoring, environmental control	exercise, diet	diet, exercise, appropriately timed medications

Note: Clinical guidelines are time sensitive; they may be outdated by the time they are published. Guidelines should be updated at least every 2 years and as often as every 6 months for diseases such as HIV infection for which therapies change rapidly.

1. American Diabetes Association, "Clinical Practice Recommendations 2000: Standards of Medical Care for Patients With Diabetes Mellitus," *Diabetes Care* 23 (supp. 1) (2000): 1–23.
2. American Diabetes Association, "Clinical Practice Recommendations 1998: Management of Diabetes in Correctional Institutions," *Diabetes Care* 21 (supp. 1) (1998): S80–S81.
3. "National Asthma Education and Prevention Program, Expert Panel Report 2: Guidelines for the Diagnosis and Management of Asthma," Washington, D.C.: National Institutes of Health, National Heart, Blood, and Lung Institute, February 1997.
4. "The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure," Washington, D.C.: National Institutes of Health, National Heart, Blood, and Lung Institute, November 1997.
5. "Report of the NIH Panel to Define Principles of Therapy of HIV Infection and Guidelines for the Use of Antiretroviral Agents in HIV-Infected Adults and Adolescents" (updated May 5, 1999).
6. Centers for Disease Control and Prevention, "1999 USPHS/IDSA Guidelines for the Prevention of Opportunistic Infections in Persons Infected With Human Immunodeficiency Virus," *Morbidity and Mortality Weekly Report* 48 (RR–10) (August 20, 1999): 1–59.

Source: Robert B. Greifinger, Principal Investigator

Scientifically tested interventions addressing chronic disease

There is sound clinical evidence that certain interventions are effective in interrupting the progression of certain common chronic diseases or in reducing or delaying their complications or symptoms. Appendix D, "Sample Draft Clinical Guidelines," illustrates clinical guidelines for the screening and treatment of four diseases—asthma, diabetes, hypertension, and HIV. The guidelines are examples of empirically based interventions that, if applied by correctional systems, are known to reduce illness and death associated with the four chronic diseases.

"Minimum Standards for Care of Chronic Disease in Prison," abstracts various aspects of four clinical guidelines discussed in detail in appendix D. Each of the recommendations (elaborated fully in the appendix) is based on the nationally accepted guidelines that are referenced to the text. The recommendations are designed to guide the clinician in areas where scientific evidence of the value of selected interventions exists. The recommendations constitute a set of definitions and abbreviated "decision trees" for the diagnosis and management of various chronic diseases and conditions.

The definition specifies the point at which a person has a diagnosis assigned for the purposes of the guideline. The guideline may apply to all patients with the diagnosis (e.g., diabetes, hypertension, HIV), or only to some of those with the diagnosis (e.g., asthma).

The sections on initial history and admission physical examination present the specific areas of clinical inquiry that should be pursued and documented. This is the area where risk factors are identified and physiologic baselines are established. The next rows describe the expected frequency of visits, depending on how well the patient's condition is controlled. The rows describe the expectations for physical examination and laboratory examination. The guidelines present the expected preventive interventions, such as vaccinations to prevent diseases for which the patient is at especially high risk, medications to treat the illness, and the threshold for referral by the primary care practitioner to the specialist. Finally, the guidelines describe the special needs of the patient, especially as these needs are unique to corrections.

Conclusion

This chapter has demonstrated that a number of interventions for preventing, screening for, and treating several communicable and chronic diseases can be cost effective and, in some cases, can even save the community money. The chapter has also presented a number of prevention, screening, and treatment interventions that correctional systems can introduce that have been shown scientifically to be effective in preventing or reducing these diseases. The recommendations for addressing communicable and chronic diseases discussed above illustrate some of the empirically proven interventions that provide the scientific basis for the more general policy recommendations presented in chapter 7.

Introducing or expanding these interventions will be difficult for many correctional administrators. The following chapter identifies some of the barriers correctional systems may encounter—and, in many cases, have already encountered—in trying to expand or improve health care services to inmates. The chapter also suggests how some prisons and jails have overcome these barriers.

Notes

1. See Agency for Health Care Policy Research, "Depression in Primary Care," Clinical Practice Guideline, vols. 1 and 2, Washington, DC: U.S. Government Printing Office, April 1993.

2. The literature reports a wide range of direct cost estimates for mental illness, in large part because of differences in the types of costs that have been measured and in the types of mental illness on which the cost estimates have been based. The even larger range of estimates for the indirect costs of mental illness in the available studies makes them impossible to use in a cost-effectiveness analysis. The difficulties involved in estimating the cost-effectiveness of screening for and treating mental disorders are elaborated in White, A., L. Hatt, K. Reszek, and T. M. Hammett, "The Feasibility of Using Published Estimates of the Costs of Chronic Diseases and Mental Illness to Conduct Cost-Benefit Analyses of Prevention and Early Intervention," paper prepared for the National Commission on Correctional Health Care, Chicago, IL, February 1999.

3. Pelvic inflammatory disease (PID) is a bacterial infection of the female upper genital tract, including the uterus, fallopian tubes, and ovaries. Complications of PID can include abscesses, chronic pelvic pain, infertility, and, occasionally, death.

4. The cost estimates for counseling and testing services are based on estimates collected from HIV/STD clinics at the Michigan Department of Community Health, with time estimates and lifetime treatment costs from the literature. All cost figures are expressed in 1997 dollars.

5. The estimate assumes that, without HIV counseling and testing, 7 percent of infected inmates would transmit HIV to an uninfected partner (De Vincenci, I., "A Longitudinal Study of Human Immunodeficiency Virus Transmission by Heterosexual Partners," *New England Journal of Medicine* 331 (6) (1994): 341–346) and 0.35 percent of uninfected inmates would acquire HIV infection within 12 months (Kamb, M.L., M. Fishbein, J.M. Douglas, F. Rhodes, J. Rogers, G. Bolan, J. Zenilman, T. Hoxworth, C.K. Malotte, M. Iatesta, C. Kent, A. Lentz, S. Graziano, R.H. Byers, and T.A. Peterman, "Efficacy of Risk-Reduction Counseling to Prevent Human Immunodeficiency Virus and Sexually Transmitted Diseases: A Randomized Controlled Trial," *Journal of the American Medical Association* 280 (1998): 1161–1167). The analysis assumes that HIV counseling and testing reduces the risk of transmission from infected inmates to uninfected partners by 25 percent (from 7 percent to 5.2 percent) and the risk of acquiring infection from uninfected inmates by 10 percent (from 0.35 percent to 0.31 percent) (Kamb et al., "Efficacy of Risk-Reduction Counseling"; McKay, N.L., and K.M. Phillips, "An Economic Evaluation of Mandatory Premarital Testing for HIV," *Inquiry* 28 (1991): 236–248; Holtgrave, D.R., R.O. Valdiserri, A.R. Gerber, and A.R. Hinman, "Human Immunodeficiency Virus Counseling, Testing, Referral, and Partner Notification Services: A Cost-Benefit Analysis," *Archives of Internal Medicine* 153 (1993): 1225–1230). The study estimated that offering HIV counseling and testing to 10,000 inmates would have averted more than three future infections. Each averted infection saves almost $175,000, while the counseling and testing program would cost only $117,000. Offering HIV counseling and testing programs to 10,000 inmates would result in societal savings of almost $410,000 ($175,000 x 3 - $117,000).

6. Hammett, T.M., P. Harmon, and W. Rhodes, "The Burden of Infectious Disease Among Inmates and Releasees From Correctional Facilities," paper prepared for the National Commission on Correctional Health Care, Chicago, IL, October 1999. (Copy in volume 2 of this report.) A case for the cost-effectiveness of providing treatment to inmates with HIV can be based on the speculation that, if HIV virus circulating in the blood is reduced to undetectable levels, an HIV-positive individual's chances of transmitting the disease to others may be reduced. R.B. Greifinger, personal communication, January 26, 2000.

7. American Thoracic Society and the Centers for Disease Control and Prevention, "Targeted Tuberculin Testing and Treatment of Latent Tuberculosis Infection," *American Journal of Respiratory and Critical Care Medicine* 161 (2000): 221S–247S; American Thoracic Society and the Centers for Disease Control and Prevention, "Diagnostic Standards and Classification of Tuberculosis in Adults and Children," *American Journal of Respiratory and Critical Care Medicine* 161 (2000): 1376–1395.

8. The economic calculations for communicable disease and chronic disease were estimated in different ways. Rates of communicable disease vary widely across regions of the Nation. TB is more prevalent in urban areas in the Northeast and along the coasts than in the rest of the Nation. Sexually transmitted diseases are most prevalent in the Southeast. Both TB and STDs are more prevalent in areas where there are high rates of HIV infection. Because of these variations, the economists who modeled communicable diseases (see the papers in volume 2) used sensitivity analysis. This model assumes a variety of underlying prevalence rates and reports quantitatively on the cost-effectiveness or cost-saving potential at varying prevalence rates. Areas with high prevalence of the underlying condition would demonstrate more favorable ratios than areas with low prevalence. Modeling that uses sensitivity analysis is a useful tool for local decisionmaking where the underlying rates of disease vary considerably. Cost-effectiveness analyses were also done for hypertension and diabetes. Although the rates of these diseases vary with gender, race, and age, they have little geographic variation, so there is less value in performing a sensitivity analysis in the modeling. Consequently, the cost-effectiveness study used the National Commission on Correctional Health Care data set for the correction population (see Hornung, C.A. R.B. Greifinger, and S. Gadre, "A Projection Model of the Prevalence of Selected Chronic Diseases in the Inmate Population," in volume 2 of this report). This data set is based on the National Health and Nutrition Examination Study (NHANES–III), adjusted to reflect the gender, race, and age mix of the correctional population in 1996. The question for this simulation was, given this sample population, "Would it be cost effective to provide diagnosis and treatment?"

9. The three studies used are the Diabetes Control and Complications Trial, the Wisconsin Epidemiologic Study of Diabetic Retinopathy, and the Framingham Heart Study.

10. Pearce, K.A., C. Furberg, B.M. Psaty, and J. Kirk, "Cost-Minimization and the Number Needed to Treat in Uncomplicated Hypertension," *American Journal of Hypertension* 11 (1998): 618–629.

11. Ngugi, E.N., D. Wilson, J. Sebstad, F.A. Plummer, and S. Moses, "Focused Peer-Mediated Educational Programs Among Female Sex Workers to Reduce Sexually Transmitted Disease and Human Immunodeficiency Virus Transmission in Kenya and Zimbabwe," *Journal of Infectious Disease* (174) (1996): S240–247; DiClemente, R.J. and G.M. Wingood, "A Randomized Controlled Trial of an HIV Sexual Risk-Reduction Intervention for Young African-American Women," *Journal of the American Medical Association* 274 (1995): 1271–1276.

12. Centers for Disease Control and Prevention, "Syphilis Screening Among Women Arrestees at the Cook County Jail—Chicago, 1996," *Morbidity and Mortality Weekly Report* 147 (1998): 432–433; Blank, S., D.D. McDonnell, S.R. Rubin, J.J. Neal, M.W. Brome, M.B. Masterson, and J.R. Greenspan, "New Approaches to Syphilis Control: Finding Opportunities for Syphilis Treatment and Congenital Syphilis Prevention in a Women's Correctional Setting," *Sexually Transmitted Diseases* 24 (1997): 218–228.

13. "Community-Level Prevention of Human Immunodeficiency Virus Infection Among High-Risk Populations: The AIDS Community Demonstration Projects," *Morbidity and Mortality Weekly Report* 45 (RR–6) (1996): 1–24; Wiebel, W.W., A. Jimenez, W. Johnson, L. Ouellet, B. Jovanovic, T. Lampinen, J. Murray, and M.U. O'Brien, "Risk Behavior and HIV Seroincidence Among Out-of-Treatment Injection Drug Users: A Four-Year Prospective Study," *Journal of AIDS* 12 (1996): 282–289.

14. Hammett, T.M., P. Harmon, and L. Maruschak, *1996–1997 Update: HIV/AIDS, STDs, and TB in Correctional Facilities,* Washington, DC: U.S. Department of Justice, National Institute of Justice, Centers for Disease Control and Prevention, and Bureau of Justice Statistics, 1999, NCJ 176344: 33–44; Grinstead, O., B. Faigeles, and B. Zack, "The Effectiveness of Peer HIV Education for Male Inmates Entering State Prison," *Journal of Health Education* 28 (November–December, 1997, Supplement): S31–S37; Kelly, J.A., J.S. St. Lawrence, Y.E. Diaz, L.Y. Stevenson, A.C. Hauth., T.L. Brasfield, S.C. Kalichman, J.E. Smith, and M.E. Andrew, "HIV Risk Behavior Reduction Following Intervention With Key Opinion Leaders of Population: An Experimental Analysis," *American Journal of Public Health* 81 (1991): 168–171; DiClemente and Wingood, "A Randomized Controlled Trial" (see note 11); Wiebel, Jimenez, Johnson, et al., "Risk Behavior and HIV Seroincidence" (see note 13); "Sexual Risk Behaviors of STD Clinic Patients Before and After Earvin 'Magic' Johnson's HIV-Infection Announcement—Maryland," *Morbidity and Mortality Weekly Report* 42 (1993): 45–48.

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