

GAO

Report to the Ranking Minority Member,  
Committee on Commerce, House of  
Representatives

March 1995

TUBERCULOSIS

Costly and Preventable  
Cases Continue in Five  
Cities



563039

Health, Education, and  
Human Services Division

B-251306

March 16, 1995

The Honorable John D. Dingell  
Ranking Minority Member  
Committee on Commerce  
House of Representatives

Dear Mr. Dingell:

After a period of substantial decline, the incidence of tuberculosis (TB) has risen in the United States. An estimated 10 to 15 million Americans are currently infected with tuberculosis.<sup>1</sup> In 90 percent of these persons, the infection will remain latent, or inactive, for life, and they will never develop TB. In the remaining 10 percent of cases, those infected are at risk of developing active TB sometime in their life. For those living in crowded and unhealthy conditions and those more susceptible to disease due to age or illness, the risk of reactivation may be significantly higher.

Since 1985, the number of new TB cases reported annually has risen to over 25,000, with much of this increase occurring between 1990 and 1992. The national case rate is now almost 10 per 100,000 persons. In some cities the case rate is higher. For example, in 1992 in Newark, Chicago, and Los Angeles, some neighborhood case rates were from 10 to 15 times the national average.

Concerned about containing the spread of TB, you asked us to assess the ability of public health authorities to do so. This report discusses (1) the TB epidemic, nationally and in five hard-hit cities; (2) the ability of local TB control programs to contain and reverse rising TB rates; (3) federal efforts to aid state and local TB control programs; and (4) the budgetary implications for the federal government of a continuing TB problem.

## Results in Brief

Costly and preventable TB cases are occurring across the nation. Although the disease is found in all parts of society, it is predominantly impacting the poor and urban racial and ethnic minorities. In the cities we visited—Atlanta, Chicago, El Paso, Los Angeles, and Newark—TB rates are higher than the national average, and TB cases are growing most rapidly among these vulnerable populations, who often lack access to health services.

<sup>1</sup>The cause of TB is a bacterium known as *Mycobacterium tuberculosis*.

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The Centers for Disease Control and Prevention (CDC) and other TB experts attribute recent TB case increases to more frequent transmission in settings with inadequate infection control measures, the effects of human immunodeficiency virus (HIV) infection, and the introduction of TB infection and cases by persons from countries with high TB rates. In the cities we visited, high TB rates also result from problems ensuring that TB patients complete a full course of appropriate treatment and problems identifying those who have had contact with TB patients.

Although the federal government has increased its assistance to states and localities, state and local budgets for TB control have not increased at the same rate as the federal contribution. Total funding per TB case in constant dollars has generally declined in each of the cities we visited.

In addition to funding problems, a weakened TB control infrastructure in health departments has reduced the ability of local TB programs to find infected persons and successfully treat those with active TB so that they do not spread the disease to others.

While TB cases are growing most rapidly among vulnerable populations, the health of the general population will continue to be compromised by additional TB cases and drug-resistant TB infections. We estimate that, unless control efforts are improved, the total national resources for treating TB annually could more than double to \$1.5 billion by the year 2000.

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## Background

Tuberculosis was once considered a disease that could be eliminated in the United States. After the discovery of antibiotics that could kill the bacterium causing TB, the incidence of the disease markedly declined. Improvements in working conditions, housing, nutrition, and sanitation also may have contributed to this decline. As a result, in the 1960s, the Public Health Service recommended that states and local communities close their sanatoria and treat TB patients in outpatient clinics. Today, state and local health departments are primarily responsible for designing and implementing TB control services.

Almost every TB case results from contact with a person with active, contagious TB,<sup>2</sup> especially when such a person coughs; however, once infection occurs, infection usually remains inactive for some time.<sup>3</sup> During

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<sup>2</sup>TB disease is demonstrated by clinical, bacteriologic, or radiographic evidence.

<sup>3</sup>The immune system of a normally healthy person will usually prevent the development of active TB.

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this latent period, infected persons do not develop the active disease and cannot spread TB to others. Most healthy persons infected with this bacterium will not develop active, contagious TB; however, others may later do so if their bodies do not successfully suppress the infection and they do not get treatment.

Active TB can affect various parts of the human body. In its most common form, it causes progressive damage to lung tissue. The symptoms include persistent cough, night sweats, fever, and fatigue. Until recently, it was estimated that 90 percent of current TB cases resulted from the reactivation of infection that occurred years or decades ago. However, recent research indicates that a higher proportion, one-third or more, of new TB cases in two U.S. cities may have resulted from recent contact with a person with contagious TB.<sup>4</sup> Immunosuppressed persons, such as those with acquired human immunodeficiency syndrome (AIDS), are at particularly high risk for developing active disease soon after contact with a contagious person.

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### First Priority: Detect and Treat Active TB

According to CDC, the first and highest priority of a TB control program is to detect persons with active disease and treat them with antibiotic drugs. Treatment plans usually include periodic examinations and at least 6 to 9 months of daily or twice or three times weekly treatment with multiple antibiotics.<sup>5</sup> If the disease is sufficiently advanced before detection, the patient may require hospitalization. In some cases, health care workers must watch, or directly observe, TB patients take their medication to ensure that the antibiotics are taken as instructed. If a patient takes the medication for the full period, the disease is generally cured and should not recur.

When a patient with active TB does not get adequate treatment, serious problems, including continuing transmission of infection, increasing disability, and death, can result. In addition, the infecting TB bacterium can become resistant to the misused or discontinued drugs. The resulting

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<sup>4</sup>David Alland and others, "Transmission of Tuberculosis in New York City—An Analysis by DNA Fingerprinting and Conventional Epidemiologic Methods," *New England Journal of Medicine*, Vol. 330 (1994), pp. 1710-1716 and Peter Small and others, "The Epidemiology of Tuberculosis in San Francisco—A Population-Based Study Using Conventional and Molecular Methods," *New England Journal of Medicine*, Vol. 330 (1994), pp. 1703-1709.

<sup>5</sup>Commonly used antituberculosis drugs include the antibiotics rifampin (RIF), isoniazid (INH), ethambutol, pyrazinamide, and streptomycin.

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single or multiple drug-resistant tuberculosis (MDR-TB) can be transmitted directly to others and is much more difficult and costly to treat.<sup>6</sup>

MDR-TB treatment consists of at least 18 months of medication, which includes a minimum of four drugs. Lengthy and costly hospital stays can be necessary and in some cases death can ensue. According to CDC, in nine MDR-TB outbreaks, from 43 percent to 93 percent of the patients died. The direct cost of treating a person with MDR-TB has been estimated to be about 5 to 10 times that of treating a person with nondrug-resistant TB. The estimated cost of treating MDR patients at a U.S. hospital that specializes in treating such cases ranges from \$100,000 to \$200,000 per patient.<sup>7</sup>

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## Second Priority: TB Prevention

Timely and successful treatment of contagious TB patients is critical to decreasing TB transmission and containing the spread of TB. Identifying those with latent TB infection and giving them preventive therapy when indicated is also very important.<sup>8</sup> Contact screening is one method used to identify infected persons. In this type of screening, TB “contacts”—individuals who have been exposed to persons known to have active, contagious TB—are approached and encouraged to have a skin test to determine whether they have been infected. TB control programs can also use screening techniques to identify infected persons among high-risk populations.

Once identified, infected persons may be given preventive therapy,<sup>9</sup> generally 6 to 12 months of daily treatment with INH. Patients who take the medication for the required period are unlikely to later develop active TB that could be spread to others. The cost of treating a person who is infected but without disease is estimated to be significantly lower than the cost of treating a person with contagious disease. For example, a recent

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<sup>6</sup>Transmission of MDR-TB has occurred in settings ranging from hospitals to correctional facilities, with active TB diagnosed for patients, prisoners, and health care workers. In November 1993, we reported that the failure of a Veterans Affairs medical center to consistently isolate TB patients, poor enforcement of isolation requirements, and inadequate isolation rooms contributed to an outbreak of MDR-TB at New Jersey’s East Orange Medical Center between 1990 and 1992. *VA Health Care: Tuberculosis Controls Receiving Greater Emphasis at VA Medical Centers* (GAO/HRD-94-5, Nov. 9, 1993).

<sup>7</sup>Barry R. Bloom and Christopher J.L. Murray, “Tuberculosis: Commentary on a Reemergent Killer,” *Science*, Vol. 257 (1992), p. 1063.

<sup>8</sup>A positive reaction to a tuberculin skin test is the standard method used to identify infected persons. In some cases this test is inadequate and a chest X ray is used.

<sup>9</sup>CDC criteria for preventive treatment relate to the age of the patient, the size of the skin reaction, and the presence of risk factors such as HIV infection, recent contact with an infected person, medically underserved or low-income status, or intravenous drug use.

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CDC study estimated that costs associated with preventive therapy totaled about \$150 per person, while costs associated with outpatient treatment for drug-susceptible cases equaled about \$2,000 per person.<sup>10</sup> Another 1993 study of the economic impact of TB in New York City concluded that \$179 million was spent for TB-related hospitalizations in 1990 and noted that hospitalizations associated with TB/HIV coinfection are 50 percent longer than those associated with TB alone. The study also concluded that inpatient TB care could have severe economic consequences for New York City.<sup>11</sup>

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### Other TB Control Program Objectives

Other TB control objectives include monitoring and evaluating the progress made toward eliminating TB. These activities include ensuring that health care providers report cases of TB to local or state health departments and that TB patients receive appropriate treatment. In addition, TB programs should maintain surveillance data on the occurrence and distribution of TB cases and evaluate the outcomes of treatment and prevention activities, such as monitoring the number of TB patients who have completed treatment.

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### CDC Provides Leadership and Assistance to Local Public Health Efforts

At the federal level, CDC is charged with protecting the public health of the nation by leading and directing the prevention and control of diseases and preventable conditions. State and local public health agencies are primarily responsible, however, for developing and delivering TB control and prevention services. In most cases, state and local laws and regulations specify a range of TB control activities and legal procedures that can be used to prevent TB transmission.

One of CDC's primary methods of assisting state and local TB control programs is a cooperative agreement program that provides federal funds to state and local TB control programs. These agreements require substantial cooperation between CDC and state and local governments, and they are intended to accomplish shared TB prevention and control objectives. The funds can only be used for specified activities, including (1) hiring staff to provide directly observed therapy, (2) collecting data on TB incidence, and (3) purchasing some equipment and supplies. These funds cannot be used to (1) supplant state or local funds, (2) provide

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<sup>10</sup>“Estimate of Identifiable Direct Costs of Tuberculosis in the United States in 1991,” prepared for the Centers for Disease Control and Prevention by Battelle Medical Technology Assessment and Policy Research Center (Washington, D.C.: 1993), p. v.

<sup>11</sup>Peter Arno and others, “The Economic Impact of Tuberculosis in Hospitals in New York City: A Preliminary Analysis,” *The Journal of Law, Medicine and Ethics*, Vol. 21 (1993), p. 321.

inpatient care, (3) construct or renovate facilities, or (4) purchase medications except on an exception basis.

CDC cooperative agreements allow CDC public health advisers (PHA) to be assigned to areas with high TB incidence or unique and complicated problems such as MDR-TB.<sup>12</sup> These PHAs provide health departments with expertise in program operations and epidemiologic skills. As of March 1995, 45 PHAs and four medical officers were assigned to state and local programs.

CDC has also participated in developing a national plan for eliminating TB. In 1989, this effort resulted in a report titled, A Strategic Plan for the Elimination of Tuberculosis in the United States. The plan called for a decrease in the incidence of TB in the United States to less than one case per million population and outlined a three-step action plan to accomplish that objective by 2010. The strategy was intended to stimulate positive and constructive discussion and action by the public and within the medical community. CDC also coordinated a National Tuberculosis Training Initiative to inform public health officials of the strategic plan and improve the quality of care available from public health agencies.

Three years later, when CDC believed that the increase in MDR-TB outbreaks and other changes in the incidence of TB were jeopardizing the Strategic Plan goals, the agency developed a National Action Plan to Combat Multidrug-Resistant Tuberculosis.<sup>13</sup> The plan relates MDR-TB to serious problems in the health care infrastructure and outlines steps that should be taken at the national level to meet the threat of TB.

The implementation and success of these plans depend on the cooperation and commitment of local and state public health agencies as well as the effectiveness of CDC's leadership and technical assistance. Although the federal government can guide the recommended steps, the decisions and actions required to improve treatment and prevention activities are made by state and local public health officials.

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<sup>12</sup>PHAs are CDC staff involved in preventing and controlling many public health problems, from the traditional areas of infectious disease to refugee programs, environmental catastrophes, and chronic disease programs.

<sup>13</sup>The Strategic Plan for the Elimination of Tuberculosis in the United States was developed with input from many experts from within and outside the Department of Health and Human Services. The National Action Plan to Combat Multidrug-Resistant Tuberculosis was developed by a task force of representatives from many federal agencies.

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CDC has also issued specific guidelines and recommendations to improve local TB control efforts. Most of these are issued jointly with the American Thoracic Society or as statements from the Advisory Council for Elimination of Tuberculosis. Several of these focus on TB services for high-risk groups, such as migrant farmworkers, the homeless, and at-risk racial and ethnic minority populations. Others provide direction on preventing the transmission of TB in health-care settings, with a special emphasis on HIV-related issues. In addition, CDC maintains a national data system that tracks the incidence of TB over time and in specific geographic locations. CDC also responds to public health emergencies and provides technical assistance to states and localities.

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## Scope and Methodology

To characterize the TB epidemic nationally and in five hard-hit cities, we reviewed national and local TB epidemiologic data from 1980 to 1993, interviewed TB control officials, and visited TB control programs in Los Angeles, Chicago, Newark, Atlanta, and El Paso.<sup>14</sup> To assess these cities' ability to contain and reverse rising TB rates, we identified pertinent TB control activities and the impact of these activities using management reports and CDC data. Outcome measures included the number of patients completing TB treatment and the number of contacts identified for individuals with active TB. We examined local and state fiscal year budgetary and expenditure data to determine how funding levels were adjusted to changes in TB rates.<sup>15</sup> In addition, we reviewed CDC data on federal contributions to local and state budgets.

To determine the budgetary implications for state, local, and federal governments of a continuing TB problem, we estimated future TB program expenditures if current TB case rates and costs continue to grow at the same annual rate as they grew from 1988 to 1991.

Our work was performed between June 1993 and January 1995 in accordance with generally accepted government auditing standards.

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<sup>14</sup>This nonrandom, judgmental sample of U.S. cities was chosen because it represents cities that (1) had high TB rates or large numbers of TB cases compared to other U.S. cities of their size and (2) received CDC funds for TB control activities. The cities also represented diverse populations at high risk for TB infection and diverse geographic areas.

<sup>15</sup>Unless otherwise specified, in the case of Los Angeles, Los Angeles County data have been used to characterize population changes, TB incidence, and TB control and prevention activities. In the case of Atlanta, Fulton County, Georgia, data have been used to characterize TB control and prevention activities. Budget data were used to characterize state and local funding when expenditure data were unavailable.

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## Return of TB Across Nation and in Localities

A steady three-decade decline in TB in the United States came to a halt in the mid-1980s. New TB cases rose by 20 percent between 1985 and 1992. This trend resulted in over 51,000 more TB cases than expected by CDC given earlier decreases. From 1992 to 1993, the incidence declined by 5 percent; however, it remains uncertain whether this decline has resulted from improvements in TB control activities or recent changes in TB reporting procedures and the AIDS surveillance case definition.

CDC attributes the recent increases in TB to several factors, including outbreaks in institutional settings with inadequate infection control measures, the increased risk of disease among HIV-positive persons, and the introduction of additional TB infection by those from countries with high TB rates. It has been estimated that the direct treatment costs associated with additional cases since 1985 resulting from increased active transmission equal \$340 million.<sup>16</sup>

Each of the cities we visited had increases in TB cases between 1985 and 1992 (see table 1). This increase ranged from 10 percent to 71 percent (see fig. 1). All five locations have had TB case rates, the number of TB cases per 100,000 persons, that are far higher than the national average. In 1992, TB case rates ranged from 18.6 in El Paso to 78.2 cases per 100,000 persons in Atlanta (see fig. 2).

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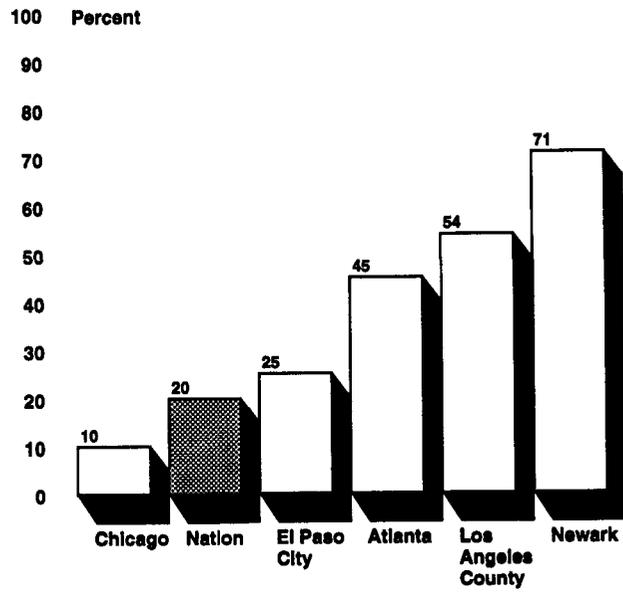
<sup>16</sup>Bloom and Murray, p. 1061.

**Table 1: Number of Newly Reported Active TB Cases for Five Communities and the Nation From 1980 to 1992**

<b>Year</b>	<b>Los Angeles County</b>	<b>Chicago</b>	<b>Newark</b>	<b>Atlanta</b>	<b>EI Paso City</b>	<b>United States</b>
1980	1,426	762	148	190	89	27,749
1981	1,824	922	135	234	73	27,373
1982	1,423	1,069	145	219	76	25,520
1983	1,423	871	159	191	66	23,846
1984	1,289	752	141	177	63	22,255
1985	1,512	724	108	212	81	22,201
1986	1,426	716	118	196	71	22,768
1987	1,498	649	124	210	39	22,517
1988	1,335	682	154	196	82	22,436
1989	1,817	684	208	259	85	23,495
1990	2,074	705	188	203	101	25,701
1991	2,241	751	196	301	136	26,283
1992	2,325	795	185	308	101	26,673

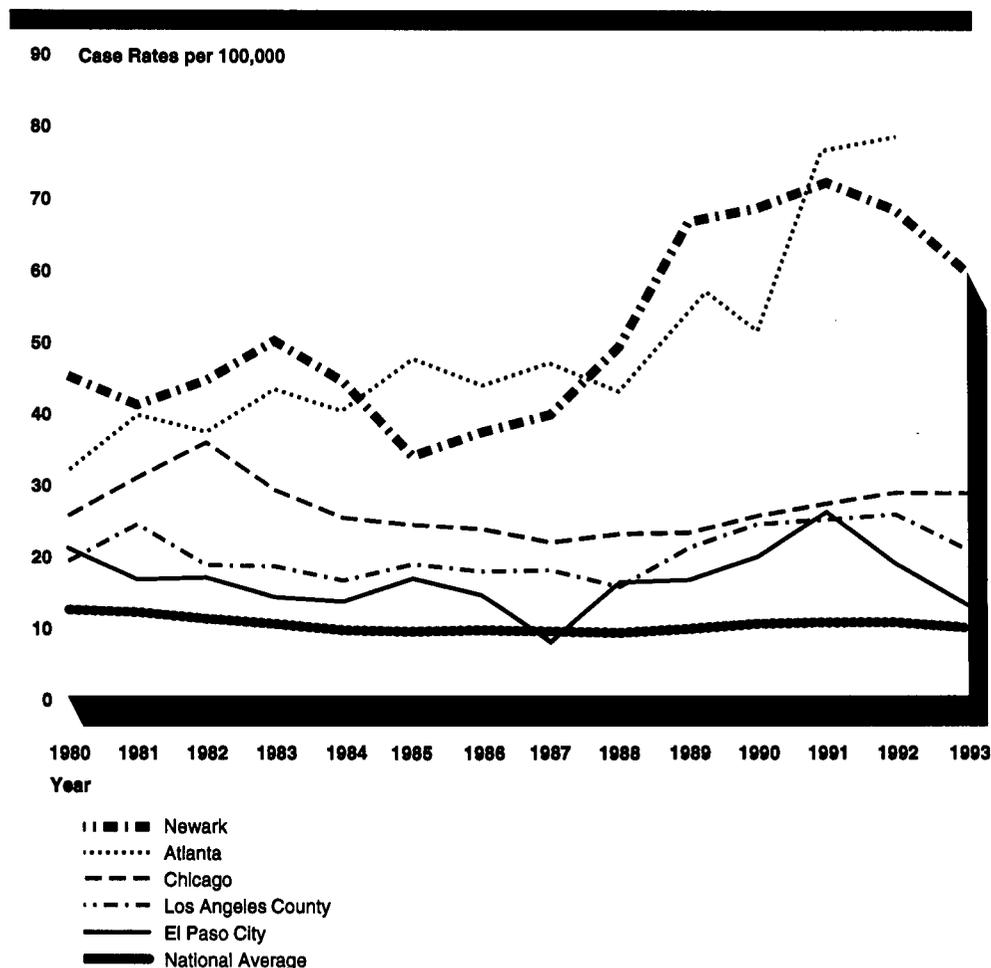
Source: CDC and state and local TB control program data. Los Angeles County TB case totals include cases in Long Beach and Pasadena per CDC definition.

**Figure 1: Percent Increase in New TB Cases From 1985 to 1992**



Note: Los Angeles County TB case totals include cases in Long Beach and Pasadena per CDC definition.

**Figure 2: Case Rate Comparison, Nation and Five Communities From 1980 to 1993**



Note: Atlanta 1993 data were unavailable.

**Growth in TB Cases Higher Among Vulnerable Populations**

Although TB can be found in every segment of society, the disease is growing most rapidly among the nation's more vulnerable populations—the poor, the HIV positive, those living in substandard housing, injection drug users, inmates in correctional facilities, and those lacking access to health care services.

Racial and ethnic minorities are often overrepresented in these vulnerable populations. In the cities we visited, the racial and ethnic minority groups reflected this growth in TB. For example, in Atlanta, the number of cases

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among African Americans almost doubled between 1980 and 1992, while the number of cases among whites decreased by 26 percent. In Los Angeles, the number of Hispanic cases grew by 73 percent between 1985 and 1992, while the number of cases among whites grew by 11 percent.

Much of the recent increase in TB is among individuals with latent TB infection who are more vulnerable to developing active TB due to HIV infection. For this reason, according to one TB expert, future trends in new TB cases will be strongly linked to changes in HIV incidence. Because HIV and AIDS weaken the immune system, HIV-infected persons are at a greatly increased risk of developing active TB once infected. CDC national data on the number of individuals coinfecting with HIV and TB in 1993, the first year this information was collected, are still incomplete. However, Los Angeles reported that in 1992 about 12 percent of TB cases were among HIV-infected persons. The Fulton County, Georgia, TB program reported that 40 percent of its TB cases are HIV positive.

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### Social Factors Contribute to TB Spread

Other groups are at high risk of developing TB because of factors that relate to poor health status or living conditions. For example, individuals who abuse substances such as alcohol and drugs often have health problems or unstable living conditions that may place them at higher risk of developing active TB if infected. CDC estimates from 1993, the first year data on patient characteristics were available, showed that substance abuse was a factor in almost 14 percent of TB cases.<sup>17</sup> Chicago health officials reported that substance abuse has been historically associated with at least 10 percent, if not more, of the city's TB cases.

TB is also a problem among the homeless and those who spend time in correctional facilities. For example, Los Angeles health officials estimate that about 12 percent of their 1992 TB cases occurred among homeless persons. CDC survey data indicate that TB incidence among inmates is at least three times higher than that among the general adult population.

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### High TB Rates in Other Countries Contribute to U.S. TB Problem

Another group at risk for TB are foreign-born individuals who come from countries where TB is more prevalent than it is in the United States. According to CDC data, these individuals accounted for 27 percent of all new U.S. TB cases in 1992, and legal immigrants accounted for 60 percent of the rise in TB cases from 1986 through 1992. The states with the highest

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<sup>17</sup>CDC data are based on 17 reporting areas with data on patient characteristics for at least 75 percent of its cases. Substance abuse includes injection and noninjection drug use and excessive alcohol use.

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increases in new TB cases were New York, California, Florida, Texas, and New Jersey. These states were also listed as the intended residence of 70 percent of the legal immigrants entering the United States in 1992. Three of the cities we visited are located in these states, and in one of these cities, Los Angeles, foreign-born individuals currently comprise about 66 percent of new TB cases.

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### General Population May Also Be at Risk

Although TB is growing most rapidly among the nation's more vulnerable populations, it could spread to the general population. For example, federal health officials recently reported that the rates of TB infection among airline crew members who had flown for 3 months with a flight attendant with undiagnosed active TB was 16 times higher than the rate of infection among a similar group who had not flown with that flight attendant. In March 1995, federal officials reported for the first time a case of TB transmission from one passenger to others aboard a commercial airliner. While on a flight, an ill passenger infected four passengers seated nearby. The ill passenger died shortly after the flight.<sup>18</sup> In the cities we visited, the potential spread of TB was evident. For example, students tested in one Chicago high school revealed an infection rate of approximately 30 percent among those tested after a fellow student was diagnosed with contagious TB. A similar situation developed in a suburban county outside Los Angeles, where eight students contracted dangerous MDR-TB from one other student. (See app. I for a more detailed description of how cities' TB activities are addressing TB demographics and vulnerable populations.)

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### Local Programs Struggle to Control Spread of Active TB

None of the TB control programs in the cities we visited can ensure that all of their TB patients complete appropriate treatment. The programs also have problems finding and screening all persons who have been in contact with TB patients; some of these unscreened persons are likely to develop TB in the future, continuing the cycle of disease. As a result, residents of the cities we visited continue to be at risk for TB infection. In some cases, this infection can be drug resistant and therefore more costly and difficult to treat. Recent federal monies support directly observed therapy, outreach workers, and incentives to encourage patients to comply with their treatment regimens.

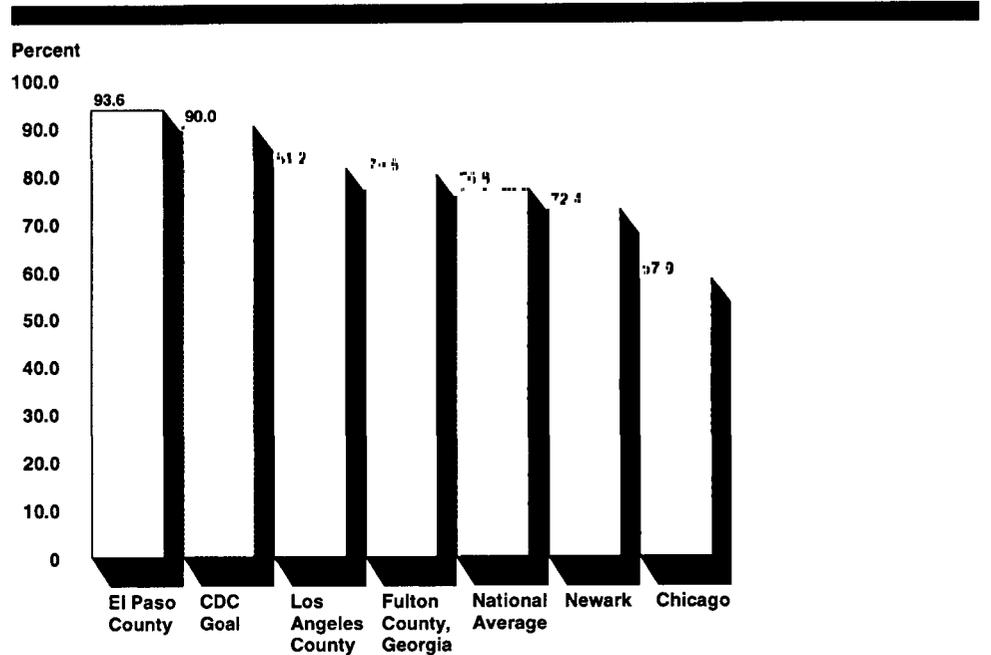
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<sup>18</sup>Cynthia Driver and others, "Transmission of Mycobacterium Tuberculosis Associated With Air Travel," *Journal of the American Medical Association*, Vol. 272, No. 13 (1994), pp. 1031-1035 and "Exposure of Passengers and Flight Crew to Mycobacterium Tuberculosis on Commercial Aircraft, 1992-1995, in *Morbidity and Mortality Weekly Report*, Vol. 44, No. 8, CDC (Mar. 1995), pp. 137-40.

### Local Treatment Completion Rates Fall Below CDC's Goal

Although CDC gives treatment completion its highest priority, U.S. TB control programs have difficulty ensuring that their patients complete treatment. According to CDC data, approximately one-fourth of the TB patients in treatment in the United States between 1986 and 1992 did not finish their medication in recommended time frames. TB control officials in each of the cities agreed that successful treatment completion is crucial to containing TB and that they have given their highest priority to finding and treating active cases. However, in 1992, only one of the five cities, El Paso, met CDC's objective of a 90-percent completion rate.<sup>19</sup> Treatment completion rates in the remaining four cities ranged from 58 percent in Chicago to 81 percent in Los Angeles (see fig. 3).

**Figure 3: Index of Treatment Completion During 1992**



Note: CDC's provisional national average represents completion rates from 75 reporting areas.

Some TB control officials in the cities we visited attributed low completion rates to patient characteristics as well as resource-related problems. For many patients, a variety of health and socioeconomic problems, such as

<sup>19</sup>This 90-percent goal is included as a national objective in CDC's guidance to localities for applying for cooperative agreement grants.

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low income, homelessness, poor access to health care, language barriers, and substance abuse, may limit their ability to adhere to a structured treatment plan. Newark, for example, attributed its low completion rates to the difficulties of providing treatment to persons with these problems. A Chicago TB official cited problems locating and treating some patients, such as substance abusers, who may purposely evade TB control efforts out of fear of contact with local authorities. Officials also cited staffing problems as another factor contributing to low completion rates.

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### Treatment Failure Exposes Public to More Serious Disease and Infection

When TB control programs cannot ensure that patients complete appropriate treatment, the risk of MDR-TB is high. This condition can be hard to control, and it is more dangerous than drug-susceptible TB. For example, drugs used to treat MDR-TB may be more likely to lead to serious toxic effects. MDR-TB also generally requires long periods of hospitalization and more extensive laboratory monitoring. When treatment with antibiotics is ineffective, surgery to remove infected lung tissue may be needed. According to CDC data, the proportion of cases tested that indicated resistance to INH and RIF in Newark, Los Angeles, and Chicago in the first quarter of 1992 were 9.5, 3.3, and 1.6 percent, respectively. The Fulton County, Georgia, Health Department estimated that 2 to 3 percent of its cases are resistant to INH and RIF. According to one El Paso health official, in 1993 approximately 4 percent of El Paso's cases were resistant to one or more drugs.

Newark health officials reported that MDR-TB is likely to increase due to their city's historically low treatment completion rates. An El Paso health official told us that, although El Paso's percentage of TB cases with MDR-TB is similar to that of the rest of Texas, the potential for an MDR-TB outbreak exists due to El Paso's proximity to the Mexican border city of Juarez. In November 1993, 44 percent of the TB cases seen in the Juntos clinics in Juarez were resistant to one or more drugs, and three-fourths of the resistant cases were MDR-TB.<sup>20</sup>

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### Directly Observed Therapy and Incentives Are Used to Improve Treatment Completion Rates

TB control programs have used recent increases in their cooperative agreement funds to hire more staff to locate patients and provide them with their daily TB medications. As a result, cities we visited have been able to place more patients on directly observed therapy. For example, since this increase in federal assistance, Chicago's Department of Health

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<sup>20</sup>However, the possibility of an MDR-TB outbreak may be mitigated by new funding for the Juntos project, a special TB control project allowing TB officials in El Paso to work with TB control officials in Juarez on issues that affect TB control practices in both cities. (See app. II for more details.)

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has raised the percentage of patients on directly observed therapy at its clinics from approximately 19 percent to approximately 70 percent. Similarly, El Paso has used federal funds to hire outreach workers to provide directly observed therapy to inmates of a local correctional facility.

CDC also suggests that communities use grant funds to implement innovative strategies, including “enablers and incentives,” to encourage patients to comply with their treatment regimens. These can include gifts, such as money, or assistance, such as tokens. Four of the five TB programs we visited were using federal and local funds or funds provided by community organizations in this manner. Chicago; Fulton County, Georgia; Los Angeles; and Newark provided patients with incentives such as bus tokens, food vouchers, dietary supplements, or personal hygiene products to persuade patients to appear regularly for treatment. Chicago TB officials report that cash incentives have been effective with their TB patients.

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## Local Programs Struggle to Prevent Future TB Cases

Prompt and effective treatment of contagious TB patients is critical to containing TB. For this reason, all of the TB control programs we visited focus their efforts on treating active TB patients, leaving fewer resources than needed for other TB prevention efforts. Although those who have been in close contact with contagious TB patients have the highest risk of developing infection, TB control programs frequently cannot identify these persons. Efforts to screen and preventively treat other high-risk individuals are also limited, and almost 34 percent of those who begin preventive therapy—6 to 12 months of daily treatment with INH—do not complete their treatment. Consequently, TB infection continues and cases develop among some who are infected.

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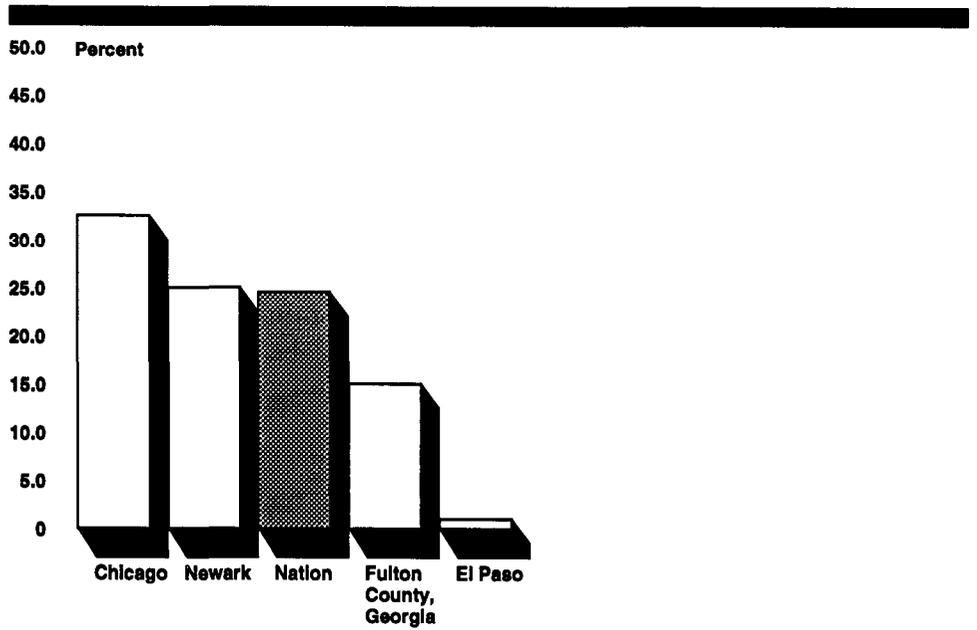
## Contact Investigation Problems Hinder Disease Prevention

According to CDC, detecting infected persons is crucial to TB elimination efforts. However, national data for 1992 indicate that program staff have trouble identifying people who have had recent contact with active TB patients. Ideally, all those who have had close contact with an individual who has contagious TB should be identified and screened for TB infection. However, data indicate that TB control staff could not identify any contacts for 36.2 percent of active U.S. TB cases in 1992.

TB control officials in all of the cities we visited agreed that their highest prevention priority after treating TB patients is identifying, examining, and treating contacts of active TB cases. Yet in Chicago the percentage of cases

with no contacts identified in 1992 exceeded the national average (see fig. 4). Although Los Angeles did not have any data for 1992 or prior years, the percentage of cases with no contacts identified exceeded 50 percent during the first half of 1993. A Los Angeles County TB control official reported that public health nurses in the 40 county public health centers providing TB prevention services are not dedicated solely to TB prevention. Nurses are often responsible for activities in several different public health programs. As a result, nurses have limited time available for crucial TB control activities such as patient follow-up and identifying and examining TB contacts.

**Figure 4: Percentage of TB Cases With No Contacts Identified During 1992**



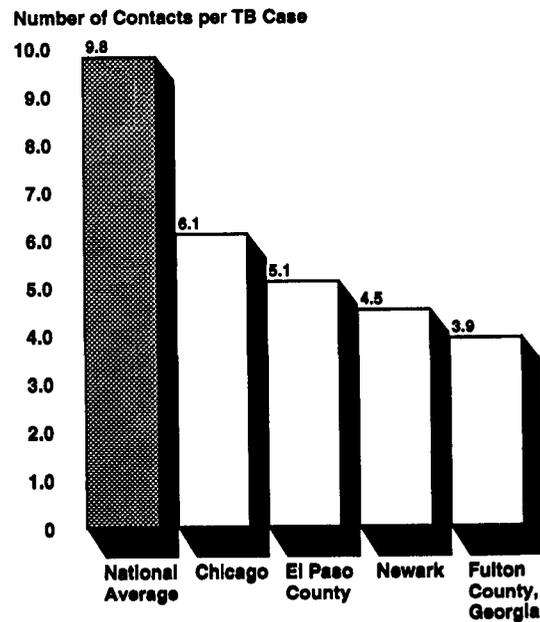
Notes: Los Angeles data not available.

National average based upon 84 reporting areas.

When TB control programs did find contacts, the number of contacts they found was often well below the national average. For example, in 1992 the national average was 9.8 contacts for each active TB patient identified. However, the number of contacts found in 1992 in the cities we visited

ranged from 3.9 contacts per case in Fulton County, Georgia, to 6.1 contacts per case in Chicago (see fig. 5).

Figure 5: Number of Contacts Identified per TB Case During 1992



Notes: Data not available for the Los Angeles County Health Department.  
National average based upon 84 reporting areas.

### Local TB Programs' Screening Efforts Are Limited

CDC encourages state and local health departments to conduct TB screening programs targeted at high-risk groups, such as the foreign born, the HIV positive, and medically underserved or low-income racial and ethnic minority populations. However, health officials in all of the cities we visited told us that they cannot screen as much as they believe is necessary because treatment of active cases is a higher priority.

In all of the cities we visited, TB or local public health clinics provided skin tests and subsequent preventive therapy to the general public. However, targeted programs to high-risk populations, excluding contacts and those infected with HIV, were limited. For example, in Atlanta, African Americans are over-represented among TB cases. While they constituted over 67 percent of Atlanta's population, in 1990 African Americans accounted

for 89 percent of TB cases.<sup>21</sup> Yet Fulton County, Georgia, did not have any systematic screening programs targeted to this high-risk group.

In Los Angeles County, foreign-born individuals accounted for 33 percent of the city's population and 62 percent of the TB cases in 1990.<sup>22</sup> However, one TB official estimated that screening as many as 150,000 legal immigrants a year, and providing preventive therapy to the estimated 50 percent of these immigrants who might need it, would overwhelm the county's health system. Even a pilot TB screening program working with adult "English as a Second Language" schools was limited by the resources of Los Angeles County; therefore, screening services are only provided on a limited basis. Data suggest, however, that individuals in these schools are at an exceptionally high risk for TB disease, as indicated by a 61-percent rate of latent TB infection and the identification of three cases of active TB disease. According to one Los Angeles TB official, the program can only screen 2 to 3 percent of those who need it.

Some cities tried to screen individuals in high-risk settings, such as local jails, drug treatment centers, and homeless shelters. Although these efforts can often uncover relatively high rates of infection, the difficulty of maintaining contact with screened individuals can hamper effective screening and prevention efforts. For example, Fulton County, Georgia, TB staff reported that, in 1993, Fulton County jail screened a total of 8,104 inmates. Skin tests for 90 percent of those tested revealed that 13.5 percent had a positive reaction.<sup>23</sup> According to a jail official, about 982 inmates were placed on preventive treatment in 1993. Data on the number that completed preventive treatment were unavailable because the average jail stay is about 2 weeks. Although a Fulton County TB outreach worker is assigned to the jail, the county's clinic has no mechanism to ensure that inmates continue preventive treatment after their release.

## Preventive Treatment Failures Expose Public to Continuing Risk for TB

Both nationally and in the cities we visited, preventive efforts often fail because persons on preventive therapy do not complete it. National data indicate that in 1992 almost 34 percent of the 150,287 persons on preventive therapy did not complete their treatment.<sup>24</sup> Despite the priority

<sup>21</sup>Based upon 1990 census data.

<sup>22</sup>Based upon 1990 census data.

<sup>23</sup>Generally, skin tests should be evaluated within 3 days.

<sup>24</sup>CDC's total excludes those who were diagnosed with active TB disease, died during the period, moved and transferred records, or were discontinued by a physician due to an adverse reaction.

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given to identifying and treating persons who have been in close contact with TB patients, 31 percent of the 24,429 infected contacts placed on preventive therapy did not complete their treatment.

The cities we visited also had this problem. Two of the TB programs, in Chicago and Los Angeles, reported that they cannot maintain data on preventive therapy completion because they lack the resources needed to monitor the number of persons they place on preventive therapy. In El Paso, Fulton County, and Newark, where data are collected, the percentage of all persons who did not complete preventive therapy ranged from about 36 percent in El Paso to 60 percent in Newark.

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## Local Funding Shortfalls Lead to Increasing Dependence on Federal Resources

TB programs have had difficulty fulfilling their TB control responsibilities as state and local financial resources failed to keep up with the need for TB services. As a result, federal funding has become an important factor in the ability of the local health departments we visited to prevent and control TB.

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## Federal Government Provides Assistance to State and Local Programs

CDC provides federal TB control funds to state and local public health departments through cooperative agreements.<sup>25</sup> Between fiscal years 1982 and 1993, appropriations for CDC cooperative agreements grew from \$1 million to over \$34 million. This amount was augmented in 1993 by an additional appropriation of \$39 million in emergency funds for six states and seven cities in which rising TB rates were having a severe impact. In fiscal year 1994, grant appropriations more than tripled from original 1993 appropriations, reaching \$111.5 million.<sup>26</sup>

Recent CDC funding increases expanded surveillance, prevention, and control activities, including the hiring of additional staff, primarily outreach workers, the purchase of equipment to improve TB case reporting, and upgrading state laboratories to improve the speed and accuracy of TB diagnosis.

Two of the cities we visited, Los Angeles and Chicago, receive cooperative agreement funds directly. The other three cities, Newark, Atlanta, and El

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<sup>25</sup>Nine cities receive these funds directly from CDC. Other cities receive them through their state governments.

<sup>26</sup>A portion of CDC's \$25.5 million TB/HIV appropriation has also been used by CDC to supplement cooperative agreement monies.

Paso, receive their funds through statewide cooperative agreements. In Atlanta, Chicago, and Los Angeles, CDC staff have or are holding managerial positions in local TB control programs. All of the cities are located in states that have received funds for laboratory upgrades. In addition, El Paso receives CDC support for binational TB control, and Newark receives support for model TB programs.

In all of the cities we visited, cooperative agreement funds have been generally increasing while TB rates have risen. Table 2 shows the level of CDC funding received by these cities from 1983 to 1994. CDC has also provided technical assistance to three of the cities we visited.

In a discussion with CDC officials, they told us that it takes 2 years for funding increases to show results. This is because of government funding cycles as well as the long-term nature of TB treatment.

**Table 2: CDC Cooperative Agreement Awards to Five Communities From 1983 to 1993**

In dollars not adjusted for inflation					
Year	Los Angeles County	Chicago	Newark <sup>a</sup>	Fulton County, Georgia	El Paso County <sup>b</sup>
1983	334,099	210,698	48,078	109,000	0
1984	399,523	235,563	54,824	134,098	0
1985	431,661	245,498	56,642	150,912	0
1986	426,591	228,599	58,391	115,700	0
1987	484,816	275,038	58,632	122,000	0
1988	556,393	307,146	61,038	126,000	20,819
1989	736,869	469,465	82,530	291,742	19,619
1990	819,504	572,199	69,942	260,000	189,056
1991	860,526	742,216	85,585	290,000	193,576
1992	1,937,031	848,704	182,093	385,462	188,587
1993	5,312,049	2,019,657	976,592	760,149	209,927
1994	6,739,865	2,760,138	1,011,904	2,213,570	368,547

<sup>a</sup>In 1994, Newark also received \$2,347,003 from CDC for its model TB program.

<sup>b</sup>According to an El Paso public health official, \$134,000 of the \$189,056 awarded to the city in 1990 was used to support TB binational control activities in Juarez. In subsequent years, approximately \$90,000 of the funds awarded to El Paso were used for these activities.

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## State and Local Funding Has Not Kept Pace With the Need for TB Services

While TB rates were rising in these cities, state and local resources targeted to TB control activities did not keep pace with the need for treatment and preventive services. Our analysis of the five cities' total TB expenditures<sup>27</sup> determined that, for four of the TB programs, state and local funding in constant dollars remained fairly even or declined during periods when case rates were increasing (see fig. 6). A similar pattern exists for dollars expended or budgeted per case (see fig. 7). For example, while case rates increased in Newark between 1986 and 1990, total nonfederal funding in constant dollars decreased by more than 47 percent—from \$199,100 to \$103,800. In the fifth city, Los Angeles, state and local funding generally increased until 1992, but not at the same pace as the increase in TB case rates.<sup>28</sup>

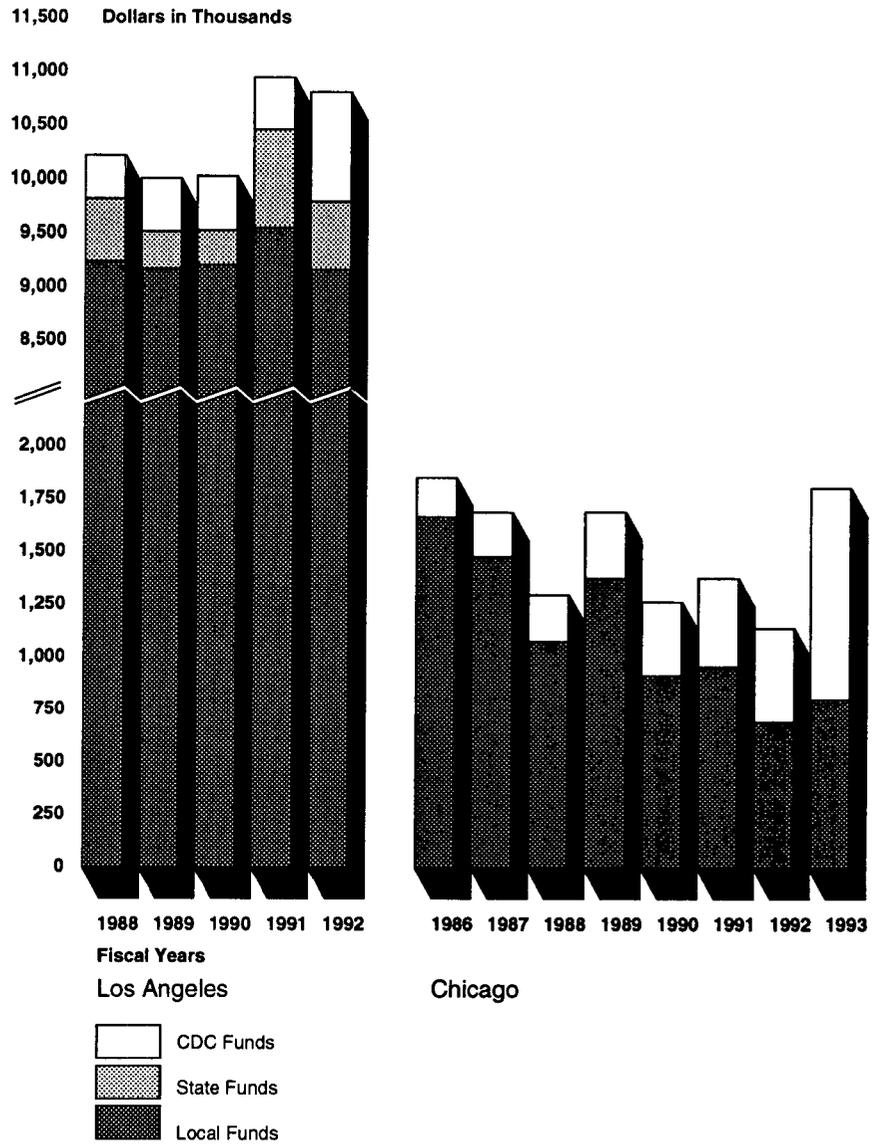
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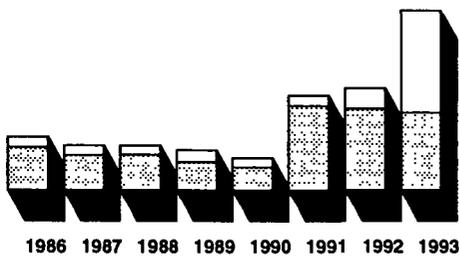
<sup>27</sup>TB budget data are presented in constant 1983 dollars. In cases where expenditure data were unavailable, budget data were used. Years indicated are fiscal years. Years included correspond to years for which data are available at each location.

<sup>28</sup>Los Angeles data are only available for 1988 to 1992.

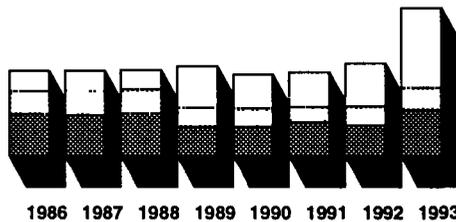


**Figure 6: Source of TB Control Funds by Location**

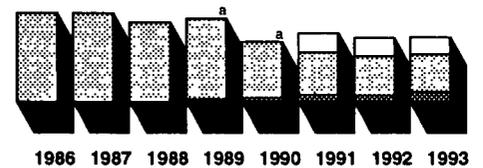




Newark



Fulton County



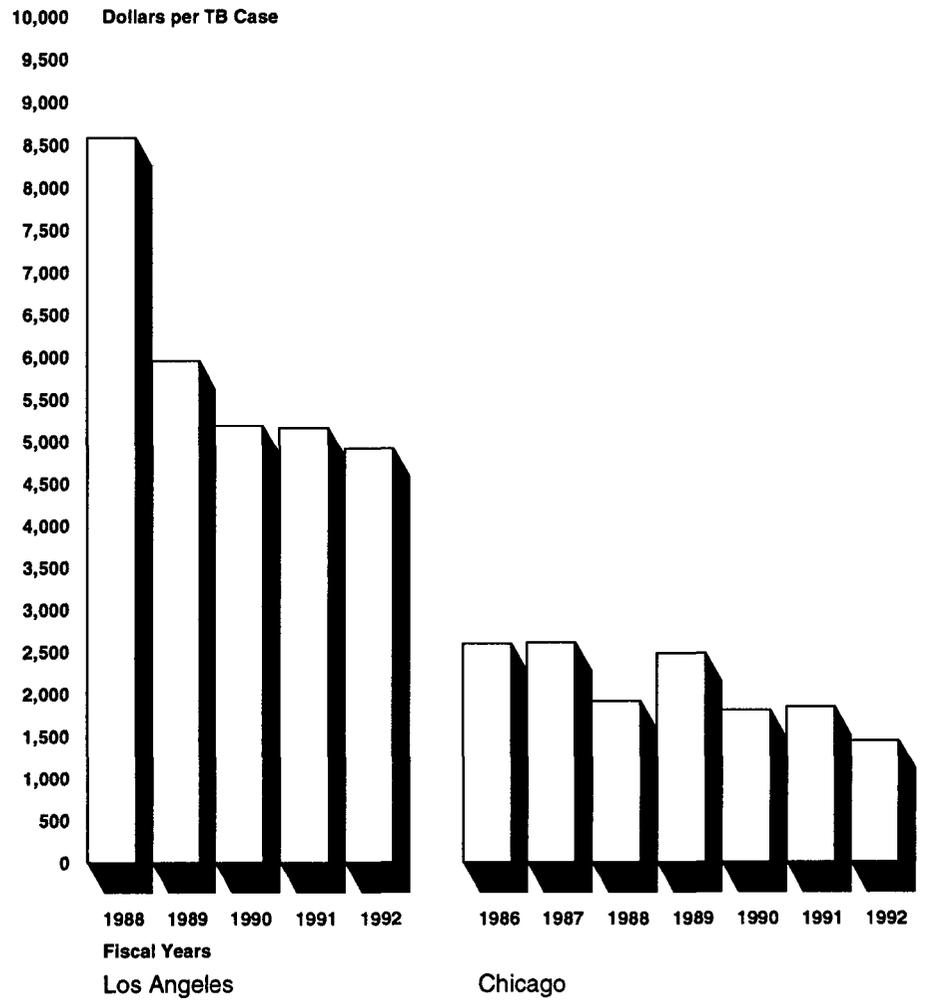
El Paso

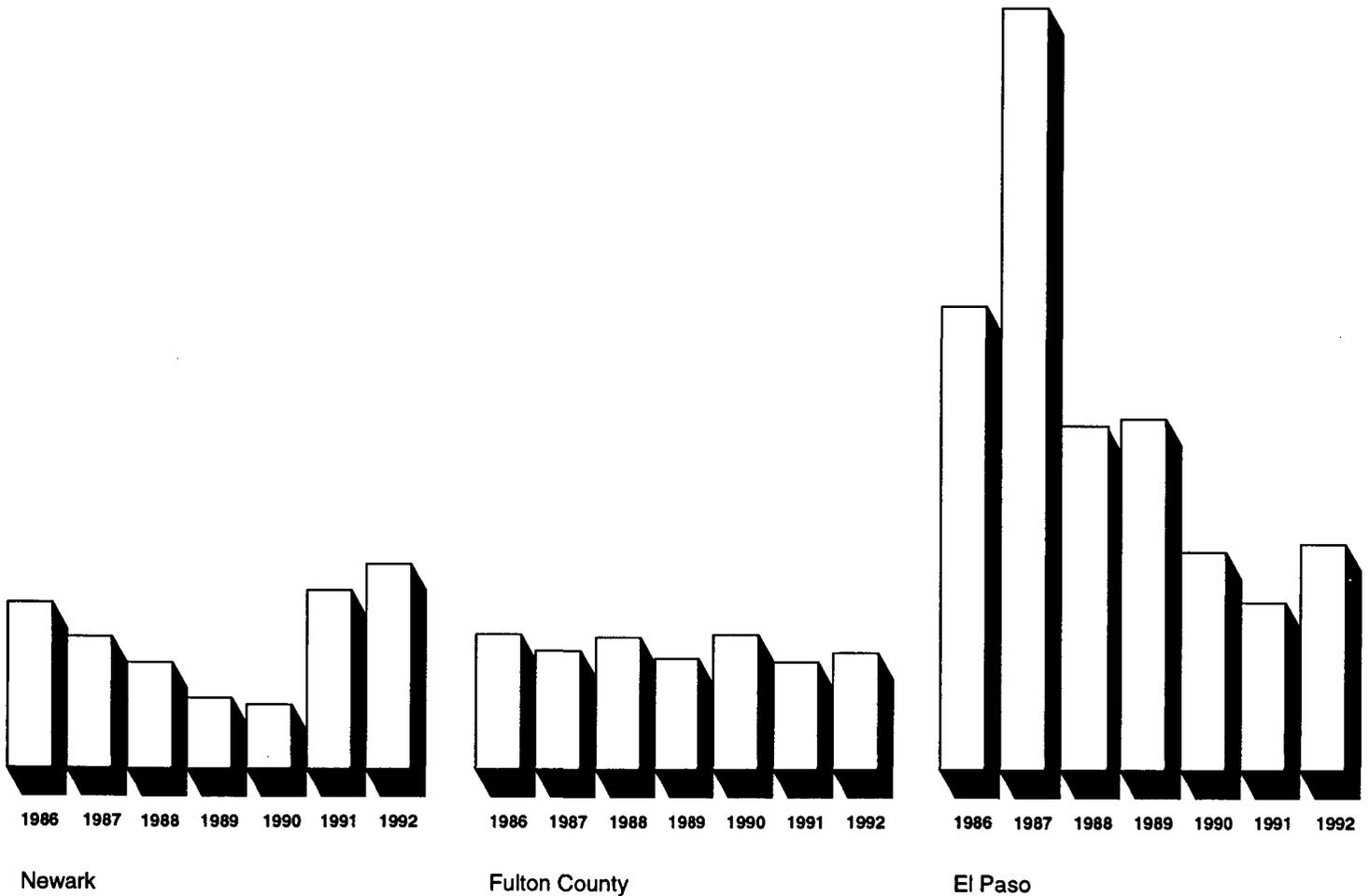
Notes: CDC funds are based on CDC data and include current awards plus past unobligated funds. State funds are based on budget data for Los Angeles County and El Paso and on expenditure data for Newark and Fulton County. For Chicago, no state funds were received. Local funds are based on budget data for Chicago and El Paso, on expenditure data for Fulton County, and on budget and expenditure data for Los Angeles County. For Newark, the state and CDC provides almost 100 percent of TB funds.

All dollars adjusted for inflation to 1983 dollars and years indicated are fiscal years.

<sup>a</sup>In 1989 and 1990, El Paso received some funding from CDC.

**Figure 7: Dollars Expended or Budgeted Per Case by Location**





Notes: Dollars expended or budgeted per case per location are based on more than one funding source. CDC funds are based on CDC data and include current awards plus past unobligated funds. State funds are based on budget data for Los Angeles County and El Paso and on expenditure data for Newark and Fulton County. For Chicago, no state funds were received. Local funds are based on budget data for Chicago and El Paso, on expenditure data for Fulton County, and on budget and expenditure data for Los Angeles County. For Newark, the state and CDC provides almost 100 percent of TB funds.

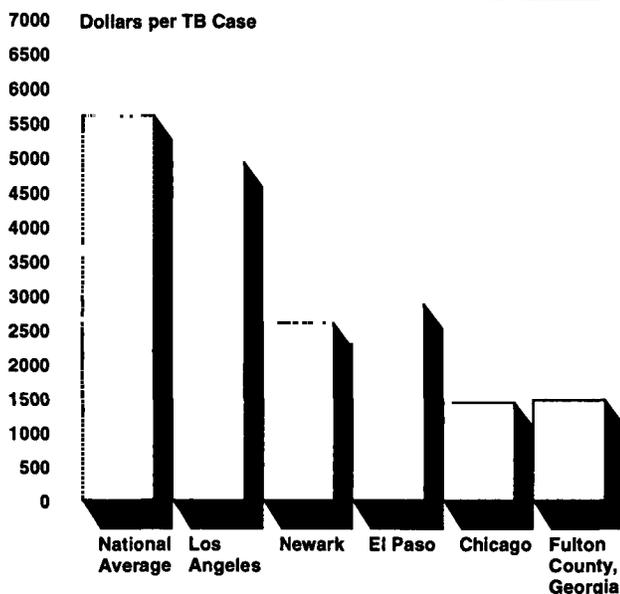
All dollars adjusted for inflation to 1983 dollars and years indicated are fiscal years.

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While state and local resources were lagging behind rising case rates, the TB programs in these cities relied on federal funding for an increasing portion of their total TB budgets. For example, in Chicago local funds accounted for almost 83 percent of the TB budget in 1988, and federal funds accounted for 17 percent. By 1992, the local portion had dropped to 61 percent, while the federal portion had increased to 39 percent. During this period, TB caseloads increased by 17 percent. TB officials in four of the cities we visited believe that local and state governments will not be the source of major increases in TB funding in these cities. In the fifth city, El Paso, officials believe that additional resources may be available from the state but not from local government.

Despite increases in federal funding, total funding per TB case in constant dollars in these cities has generally declined, even when the number of cases was rising. For example, in Los Angeles funding per case in constant dollars declined from \$8,583 in 1988 to \$4,915 in 1992. During this period, the number of TB cases rose from 1,190 to 2,198, and federal funding increased from \$556,393 to \$1,937,031. In 1992, these expenditures per case in the cities we visited ranged from \$4,915 per case in Los Angeles to \$1,432 per case in Chicago (see fig. 8).

**Figure 8: Dollars Expended or Budgeted Per TB Case, 1992**



Notes: Dollars expended or budgeted per case per location are based on more than one funding source. CDC funds are based on CDC data and include current awards plus past unobligated funds. State funds are based on budget data for Los Angeles County and El Paso and on expenditure data for Newark and Fulton County. For Chicago, no state funds were received. Local funds are based on budget data for Chicago and El Paso, on expenditure data for Fulton County, and on budget and expenditure data for Los Angeles County. For Newark, the state and CDC provides almost 100 percent of TB funds.

All dollars for fiscal year 1992 are adjusted to 1983 dollars.

## Weaknesses in Public Health Infrastructure Hamper TB Control Efforts

TB officials in four of the cities we visited reported that staffing shortages caused by hiring freezes, attrition, competing priorities, and resource limitations have affected their ability to supply TB services. For example, TB control officials in Chicago indicated that staffing limitations have hindered their ability to follow up on patients and ensure that they complete their treatment. TB control officials in Los Angeles reported that competing duties have limited the availability of staff to perform TB control and prevention services. In addition, some programs have had difficulties attracting physicians and staff with the necessary skills to manage TB programs.

TB control officials and program reviews also cited several problems with equipment and facilities. For example, Fulton County, Georgia, TB officials indicated that until recently, the county TB clinic used a World War II-era

X ray machine. In the El Paso TB clinic and one of Chicago's TB clinics, patients of the HIV/AIDS clinic and the TB clinic share the same waiting room. Officials in Los Angeles, Chicago, and Fulton County also indicated that inadequate records and information technology limit their ability to monitor TB patients in their cities. (See app. II for a discussion of how infrastructure problems hinder TB control efforts in the cities we visited).

## TB Costs Could Grow Significantly Given Current Trends

The cost of TB will continue to grow if current epidemiologic trends and TB control practices continue. In 1991, total expenditures for TB prevention, including both inpatient and outpatient TB treatment amounted to over \$700 million, according to CDC estimates. If medical costs and TB case rates continue to follow recent trends, we expect that total expenditures (in 1991 dollars) will exceed \$1 billion in 1995. By 1999, the resources required for the treatment of TB could range from \$1.2 to \$1.5 billion—close to double what they were in 1991.<sup>29,30</sup>

Approximately two-thirds of these costs result from inpatient hospitalization expenditures. We estimate that these expenditures (measured in 1991 constant dollars) could increase by 126 percent between 1991 and 1999 to equal \$983 million if current trends continue.<sup>31</sup> Survey data indicate that more than 55 percent of these costs may be borne by the federal government under the Medicaid and Medicare programs. These data also indicate that the Medicaid program currently bears the largest burden of these costs. (See app. III.)

The remaining one-third of costs result largely from outpatient TB expenditures for services such as those provided by local TB control programs. These are generally borne by state and local governments. We

<sup>29</sup>We used the CDC estimates of costs in 1991 as the basis of our cost projections. Our analysis assumes that caseloads will grow at the same annual rate as active reported cases from 1988 to 1991, an average of 5.5 percent. In this analysis, costs for inpatient care grow at the 1980 to 1991 average annual rate of growth for total hospital costs, after controlling for inflation. We assume that costs per case for outpatient care will grow at the average rate of growth for the medical care consumer price index from 1980 to 1991 after adjusting for inflation. We assume that the CDC budget will grow at the same rate as outpatient costs per case. Expenditures are stated in 1991 dollars unless otherwise noted.

<sup>30</sup>Because TB caseloads grew less rapidly in 1992 and declined in 1993, we also prepared our projections using the average annual rate of caseload growth from 1988 to 1993. The average rate of growth fell from an average of 5.5 percent per year to 2.5 percent. Projected spending fell from \$1.5 billion to \$1.2 billion in 1999 under these assumptions. Because of the rapid rise in the cost of treating an individual case, TB spending would rise under our assumptions even if the number of new cases were constant. Our estimates show that TB expenditures would rise to \$990 million if the number of new TB cases were constant at 1991 levels.

<sup>31</sup>Even if the number of new TB cases is constant at 1991 levels, inpatient expenditures would grow by 47 percent to \$640 million as the cost of treating a case rises.

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estimate that national outpatient expenditures (measured in 1991 dollars) could grow 101 percent between 1991 and 1999. In some of the nation's hard-hit cities, these expenditures may grow even faster.

The size of costs for controlling TB, and related expenditures, will depend on the effectiveness of TB control programs. For instance, effective identification and treatment of infected persons could prevent many TB cases, while improvements in treatment completion among active TB patients could decrease hospitalization costs. These improvements would also decrease the risk of rising MDR-TB cases and their significantly higher costs.

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## CDC Has Started to Improve Oversight of TB Control Activities

CDC has begun initiatives intended to improve federal oversight of TB control activities as well as local management of TB control. For example, the agency began to improve national surveillance of TB cases when, in January 1993, it distributed a new, more detailed case reporting form to public health departments. As a result, CDC has begun to capture national data on drug susceptibility, HIV status, and directly observed therapy use. CDC also implemented a computerized surveillance system to facilitate data entry and transfer from state and local health departments to CDC.

A second information system, the Tuberculosis Information Management System (TIMS) is designed to serve the information needs of TB clinics and state and local health departments as well as CDC. According to CDC, TIMS will help TB control programs manage individual patients, contacts, and persons receiving preventive therapy. It will also help state and local managers evaluate their progress toward meeting TB elimination objectives and identify obstacles to meeting these objectives.

CDC has also stressed the importance of program improvement. In an October 1993 memo to state and large city TB control officials, the Director of CDC's Division of Tuberculosis Elimination noted that almost no improvement has occurred in program performance in the last 3 years. The memo also encouraged these officials to identify significant changes or deficiencies in their areas so that program changes could be made to correct these problems. A year later, a second memo from the Director re-emphasized the importance of program objectives and informed TB field staff that the Director intended to recommend that future TB cooperative agreement funding decisions be influenced by applicants' progress in managing their programs and meeting the TB control objectives specified in their funding applications.

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## Conclusions

In five of the nation's hardest hit cities, TB control programs have had difficulty responding to the resurgence of tuberculosis. In many instances, these programs could not ensure that TB patients would complete the recommended full course of treatment. Such failures increase the risk of TB infection as well as TB cases. Screening and prevention efforts were also hindered by the need to focus TB control efforts on identifying and treating active TB patients.

The response of local and state governments to the TB problem in these cities has been limited. State and local contributions have fluctuated, declined, or grown slowly in constant dollars; and local TB officials do not expect increased assistance from these sources. As a result, local TB officials are wary of MDR-TB outbreaks in their cities and uncertain that local resources will be adequate to combat such emergencies.

Recent increases in CDC cooperative agreements account for most of the growth in TB funding. Federal funding for TB control began to rise dramatically in 1993, with appropriations more than tripling between 1993 and 1994. These increases are helping to improve the number of patients who complete their full course of treatment by expanding the use of directly observed therapy. They are also helping to improve case reporting, laboratory capability, and the speed and accuracy of TB diagnosis. In addition, CDC has implemented two new information systems that will provide better information on the spread of TB and help programs better manage TB patients, contacts, and individuals receiving preventive therapy.

It is clear from our work that the problem of tuberculosis is severe in certain communities. Recent funding increases and CDC's attempts to better monitor TB activities are promising and may improve TB control. We encourage CDC in these efforts. Through vigilant monitoring, CDC will be better positioned to provide prompt and effective assistance to hard-hit cities such as those we visited.

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## Agency and Other Comments

The Department of Health and Human Services and TB control officials in Atlanta, Chicago, El Paso, Los Angeles, and the state of New Jersey reviewed a draft of this and agreed it is an accurate presentation of TB control efforts. We incorporated their technical comments as well as those from four experts in TB control as appropriate. (See app. IV for a copy of the agency comments.)

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days after its issue date. At that time, we will send copies to others on request. If you have any questions about this report, please call me at (202) 512-7119. Other major contributors are listed in appendix V.

Sincerely yours,



Mark V. Nadel  
Associate Director  
National and Public Health Issues

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**Abbreviations**

AIDS	acquired human immunodeficiency syndrome
CDC	Centers for Disease Control and Prevention
CDOH	Chicago Department of Health
CPI	consumer price index
CPI-U	consumer price index-urban
HIV	human immunodeficiency virus
INH	isoniazid
MDR	multiple drug resistant
MDR-TB	multiple drug-resistant tuberculosis
PHA	public health adviser
RIF	rifampin
TB	tuberculosis
TIMS	Tuberculosis Information Management System

# Demographic and Health Factors Increase TB Rates and Challenge TB Service Delivery

Treating persons with tuberculosis is often complicated by conditions such as poverty, AIDS, and substance abuse. Consequently, TB control programs have the difficult task of developing and implementing programs that take into account the social and economic conditions that coincide with the TB epidemic in their locations.

## TB Grows Among the Poor and Minority Populations

Tuberculosis is an increasing public health problem among America's racial and ethnic minorities. In all the cities we visited, TB cases have been rising rapidly among these populations, who are also more likely to be poor and experience barriers to obtaining health care services.

This growth was most evident among African Americans in Los Angeles, Newark, and Atlanta and among Hispanics in El Paso. The growth in TB cases among African Americans in Los Angeles, Newark, and Atlanta was more than twice the national growth rate. Table I.1 shows the growth of TB cases by race and ethnicity.

**Table I.1: Percentage Growth Rates in Reported Tuberculosis Cases, United States and Five Communities From 1985 to 1992**

Race/ethnicity	United States	Los Angeles County	Chicago	Newark	Atlanta	El Paso City
African American	27	76	20	59	59	0
Hispanic	75	73	33	113	0	37
Asian	46	41	6	300	0	0

The number of cases is also concentrated among racial and ethnic minorities in all of these cities. In 1992, almost 80 percent of Chicago's TB cases were among either Hispanic or African American people. In Los Angeles, about 70 percent of the TB cases were among either Hispanic or Asian people. TB cases in El Paso and Newark have been concentrated in a single racial or ethnic minority group for several years. In 1992, 80 percent of Newark's cases were among African Americans and 91 percent of El Paso's cases were among Hispanics. Table I.2 shows the 1992 racial and ethnic distribution of TB in these communities.

**Table I.2: Percentage of Tuberculosis Cases Occurring Among Ethnic and Racial Minorities, United States and Five Communities, 1992**

Race/ethnicity	United States	Los Angeles County	Chicago	Newark	Atlanta	El Paso City
African American	36	17	61	79	87	0
Hispanic	20	45	16	9	.3	91
Asian	14	26	9	2	1	0

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**CDC Urges  
Responsiveness to  
Community Needs**

CDC urges cities with cases concentrated in specific geographic locations or socioeconomic groups to develop services that are responsive to community needs. For example, CDC suggests that screening and prevention programs be specifically adjusted to such communities' needs. It also urges communities to use outreach workers with appropriate cultural and linguistic skills to locate patients, perform directly observed therapy, locate and examine contacts, and educate patients on the importance of treatment adherence.

**Case Example: Atlanta  
Struggles to Provide Services to  
High-Risk Residents**

In Atlanta, the TB case rates have exceeded the national average for over two decades. Atlanta led the nation's cities with a population over 250,000 in the number of TB cases in 1992. Its case rate was 78.2 per 100,000 population. TB infection continues to be endemic, particularly among African Americans, who comprised 74 percent of the cases in 1980 and 87 percent of the cases in 1992. This group also accounted for 84 percent of those living below the poverty level in 1979 and 87 percent in 1989.

This situation has significantly burdened the Fulton County, Georgia, Health Department, which provides public health services to most of the city of Atlanta. Among the TB cases seen at the county's single outpatient TB clinic (about 92 percent of the cases in the county), approximately 40 percent of the people are HIV positive and at least 10 percent are homeless.

According to the TB control officials that we interviewed, systematic screening and preventive therapy for Atlanta's large at-risk population is beyond the means of the Fulton County Public Health Department. Like most TB control programs, this program must focus its limited screening and prevention activities on identifying contacts of new cases. In addition, the program uses both skin tests and X rays to evaluate all HIV-positive individuals identified at Atlanta's largest HIV testing site. With its remaining resources, it provides walk-in screening at neighborhood clinics and technical assistance to other groups, such as Fulton County jail staff, who screen inmates. They also provide testing materials to a group that screens homeless people.

Although TB control officials believe that they are making headway in Atlanta, they are concerned about their inability to mount an organized prevention program to diminish the large number of TB-infected individuals.

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**Case Example: Socioeconomic  
Conditions Exacerbate  
Newark's TB Case Rate**

In Newark, poverty and high numbers of injection drug users, AIDS patients, and homeless people contribute to high TB case rates. Moreover, TB control officials believe that the city's poor treatment completion rates are related to the socioeconomic and behavioral problems seen among Newark's TB patients, many of whom are high-risk and poor minority individuals. Between 1988 to 1991, close to half of TB patients did not complete their treatment within desired time frames. Although 1992 saw some improvement when this figure declined to 27.6 percent, TB officials and physicians remain wary. According to one official, it is still difficult to detain or commit those who refuse therapy.

Low treatment completion rates also add to Newark's multiple drug-resistant (MDR) TB rates, according to officials. During the first quarter of 1991, 13.2 percent of the TB cases tested for MDR in Newark were resistant to isoniazid and rifampin. Tests performed during this same period in 1992 indicated that 9.5 percent of the cases tested were similarly resistant. According to an official, who believes that a large enough MDR outbreak could 'wipe out' the TB clinic's resources, "MDR-TB will remain a problem until all patients receive [directly observed therapy]."

TB control officials are also concerned about the spread of MDR-TB to New Jersey from New York City, where MDR-TB rates are even higher. Because of this, the state supplied Newark almost \$700,000 in additional funding for drugs and outreach workers in 1991. Since then, Newark's treatment completion rate has improved, but it is still well below CDC's goal of 90 percent.

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**TB Estimates Among  
the Homeless Far  
Exceed the National  
Average**

Since the turn of the century, TB has been recognized as a public health problem among the homeless. Today, the high incidence of TB among the homeless can be attributed to medical and socioeconomic factors such as poor nutrition, alcoholism, and overcrowding in poorly ventilated shelters. For many homeless persons, substance abuse and HIV infection increase the risk of developing active TB. Treating infected homeless individuals is particularly important since they are commonly not discovered until they arrive in hospitals with advanced TB disease that already may have spread to others.

Although national data are not available, screening activities at selected shelters and clinics have identified active TB symptoms among 1.6 to 6.8 percent of the persons tested. In addition to high disease rates, screening activities have also found that between 18 and 51 percent of

those tested were infected with TB. These high levels of infection suggest that, without intervention, cases of tuberculosis will continue to develop.

The spread of tuberculosis among the homeless was a problem in all of the cities we visited. In Los Angeles, about 12 percent of the TB patients treated were homeless in 1992. Similarly, Fulton County, Georgia, TB officials estimate that about 10 percent of their TB cases occur among the homeless. Chicago TB officials estimate that the homeless comprise about 5 percent of their TB cases.

CDC has indicated that TB treatment is likely to be more successful if homeless patients have a reliable source of food and shelter. CDC also notes that, when appropriate shelter is unavailable, hospitalization in an acute care facility may be needed. In addition, CDC encourages the screening of homeless people when it is likely that they will cooperate with screening efforts and complete preventive therapy if needed.

All of the cities we visited have provided some TB services to the homeless. For example, Fulton County, Georgia, has used state funds to maintain 15 beds in the Walton House (a single-room occupancy home for the homeless) for noncontagious homeless TB patients. Similarly, in Chicago, the Chicago Department of Health (CDOH) has contracted with an agency that has provided health care to the city's homeless population for several years to provide TB screening and preventive services. In Newark, a Homeless Health Care Program operated by the city's Community Health Division supplies TB screening services.

**Case Example: Los Angeles  
Model Program Suggests That  
Homeless Clients Respond Well  
to Treatment Incentives**

Homeless patients often suffer from physical and mental illness, addiction, and associated problems that place them at high risk of developing TB and make successful treatment difficult. Los Angeles County currently provides TB services to homeless persons in Central Los Angeles through a model program operating from the city's skid row TB clinic. As part of the clinic activities in this location, TB control staff provide directly observed therapy and incentives, such as housing and meal vouchers, to homeless patients to help them comply with their TB treatment plans. The housing voucher for a single-room occupancy hotel in skid row is provided at a cost of \$15 per day. Up to three hot meals a day at a skid row cafeteria are provided at a cost of \$3 per meal. The total cost per day is about \$24. The overall cost of the county-funded program is \$400,000.

According to Los Angeles County, 95 percent of the 108 homeless patients participating have either remained compliant with supervised drug therapy

or successfully completed their treatment. The program is considered successful by Los Angeles TB officials, considering the difficulty in treating homeless TB patients. According to one official, more single-room occupancy hotels rooms are needed to expand this program and meet the needs of homeless TB patients.

**Case Example: Transient Behavior Frustrates Chicago's Efforts to Screen the Homeless**

In 1992, the CDOH used CDC cooperative agreement funds to implement a pilot screening and prevention program at 12 homeless shelters that the department believed might be housing some clients with active TB. For several years, through a contract with Chicago Health Outreach, Inc., clients have been tested for TB within 2 weeks of arriving at 21 of Chicago's homeless shelters. Clients are also given information about the purpose of the tests and the importance of follow-up and preventive therapy.

Clients with positive skin tests are referred to one of the CDOH TB clinics for further evaluation if they show evidence of active TB. TB-infected clients are also provided culturally sensitive HIV pretest counseling and HIV antibody testing. Often, a nurse transports the client to the clinic for the evaluations.

CDOH TB officials also conducted a one-day screening program aimed at homeless shelter clients and staff in 1993. Over 2,405 clients and shelter staff were screened at 68 percent of Chicago area shelters. However, over half of those screened did not return to have their tests read. CDOH staff reported that one of the reasons for this poor participation was the inherent transiency of the shelter population.

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**Substance Abusers at Higher Risk of TB Infection Than Others**

Substance abusers are also at high risk for tuberculosis infection due to their poor and often crowded living conditions, high rate of homelessness, and frequent use of drugs in crowded and poorly ventilated areas. Once infected, drug-dependent persons may also be more likely to develop TB than those who are not drug dependent. This higher risk has been attributed to factors, such as HIV infection, that are often prevalent in drug-dependent populations.

Three of the cities we visited indicated that substance abuse was an important factor in their TB caseload. Chicago officials estimate that almost 10 percent of their cases are among those with chronic substance abuse problems. Fulton County officials reported that cocaine usage was a problem among many of their TB patients; and TB officials in New Jersey

**Case Example: Despite Federal Requirement, Some TB-Infected Substance Abusers in Los Angeles Are Not Receiving Preventive Therapy**

included injecting drug use among the societal problems contributing to high TB rates in Newark.

In March 1993, the Secretary of the Department of Health and Human Services required treatment centers receiving funding from the substance abuse prevention and treatment block grant to refer their clients to TB services. However, this requirement appears to have had limited impact in Los Angeles. Most of those found to be infected with TB are referred to the county health centers because the drug treatment facilities do not have sufficient resources to provide preventive therapy. However, no mechanism exists to ensure that these individuals follow up on their referral, and those who do sometimes wait weeks for their appointments.

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**TB Treatment and Prevention Services Needed in Correctional Facilities**

TB remains a public health problem in correctional facilities, where overcrowding and high levels of TB infection can increase the risk of TB transmission. According to one CDC survey, based on data collected between 1984 and 1985, the incidence of TB in correctional facilities was more than three times higher than it was among persons between the ages of 15 and 64 living outside of correctional facilities.

Jail inmates, many of whom are high-risk minorities, HIV infected, or substance abusers, are at extremely high risk for TB and can pose difficulties for their communities. For instance, according to the public health commissioner of El Paso, Texas, El Paso could face a TB epidemic or MDR-TB outbreak because of the high number of HIV-positive and MDR-TB-infected detainees who pass through the El Paso immigration and naturalization facility.

For these reasons, CDC urges public health departments to maintain records on TB cases that have been identified in correctional facilities in their area. CDC also urges public health departments to work with correctional staff to arrange continuing TB treatment and preventive therapy for released inmates.

All of the cities we visited have correctional facilities in their areas. In two of the cities, Los Angeles and Chicago, county jail health service staff provide treatment services. TB screening occurs in jails in these communities; and the facilities in Los Angeles and Chicago have been leaders in using X rays to quickly identify active TB cases.

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**Case Example: Chicago Is Addressing Problems With Coordination Through Cooperative Effort**

Between 1986 and 1991, TB screening activities at Cook County Jail identified 96 inmates with active TB. While in jail, these patients received treatment from Cook County's Cermak Health Services, which provides medical services at the jail. Upon their release, inmates were instructed to go to the nearest CDOH clinic for further treatment. In 1990, CDOH TB clinics questioned its patients about confinement in the Cook County Jail. Over 21 percent of the TB patients questioned in 1990 indicated that they had at one time or other been confined in Cook County Jail.

Until recently, CDOH and Cermak Health Services faced difficulties coordinating their activities. In some instances, the jail released inmates without notifying either Cermak Health Services or CDOH of their action. Without this notification, it was difficult for CDOH to perform the follow-up needed to ensure that released inmates received treatment. In other instances, follow-up by CDOH was difficult because inmates used pseudonyms or incorrect addresses. Cermak Health Services also reported difficulty referring released inmates with TB infection to CDOH for preventive therapy.

CDOH and the jail have recently improved the follow-up problem through assignment of two outreach workers to the jail's health services. The outreach workers, supported through CDC cooperative agreement funds, will identify and test contacts of the TB cases and ensure follow-up treatment for inmates who are released from jail. In addition, follow-up of active TB cases has also improved with the advent of the city's computerized TB network. Now, upon an inmate's release, Cermak notifies CDOH's TB office and other providers by entering release data into the network. Also, Cermak schedules an appointment at one of the TB clinics for the released inmate and in some cases provides a \$10 incentive to the inmate upon arrival at the clinic for treatment.

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**Cases of TB Among Foreign Born Reflect Major Global Problem**

The presence of a large foreign-born population in a community can significantly influence TB incidence when many of these individuals come from countries with high TB rates. Foreign-born individuals can arrive in the United States already infected with TB or with TB that has been inadequately treated, in which case they are at risk of developing drug-resistant disease. For this and other reasons, foreign-born individuals today account for more than one-fourth of U.S. TB cases. Those with tuberculosis infection or clinical disease who illegally enter the country pose another, even more difficult problem. No mechanism exists for screening these persons for TB before they enter the United States, and

they are likely to avoid official public agencies once they are in the country because of fear of deportation.

High TB rates in other nations are particularly affecting TB control activities in three of the cities we visited. Although the number of new TB cases in the foreign-born population decreased by 59 percent from 1982 to 1990 in Chicago, this trend has reversed, and in 1992, foreign-born cases comprised 16.4 percent of Chicago's cases. Over one-third of these persons were from Mexico, the Philippines, Poland, India, Vietnam, and Korea—parts of the world where TB is endemic. All the cities we visited have foreign-born populations, but the high rates of TB in other countries has affected El Paso and Los Angeles most dramatically.

**Case Example: International  
Cooperation May Improve El  
Paso's TB Problems on the  
U.S.-Mexico Border**

El Paso is particularly vulnerable to TB infection through unidentified contagious TB cases residing across the border. Seventy-five percent of El Paso's newly diagnosed patients identify contacts in Juarez, and 80 percent of the pediatric cases diagnosed in El Paso were linked to TB cases in Mexico. Since 1985, approximately 40 to 50 percent of El Paso's TB patients are foreign born, coming mainly from Mexico.

According to the World Health Organization, TB rates in Mexico are currently 110 per 100,000, compared with 10 per 100,000 in the United States. Studies of undocumented Mexican and Central American aliens since 1974 produced similar numbers. As noted in a document prepared by the El Paso City-County Health District, this ratio suggested the possibility of 635 individuals in Juarez with active TB.

Drug-resistant TB is also a problem in Mexico, and, according to one El Paso health official, it is "impossible to keep this problem on one side of the border." A binational strategy has been developed that may mitigate many of the difficulties faced by El Paso's TB control program. Known as the Juntos project, funded by CDC, and coordinated by the Pan American Health Organization, this program is intended to help El Paso and be a model for other U.S. border towns and cities that must deal with the influx of TB cases from Mexico. The underlying premise of the project is that TB eradication cannot succeed in the United States without effective prevention and control efforts in high-incidence areas such as the U.S.-Mexico border.

Juntos program activities include case finding, screening, treatment, case management, follow-up, and prevention education. According to a 1993 program review of this binational project, much progress has been made

toward implementing a program for treating active TB patients in the Ciudad Juarez health centers. Moreover, this binational effort has improved the access and continuity of care of TB cases as those infected cross between the two nations. Recommendations for improvements include more complete daily supervision of patients receiving directly observed therapy and developing a TB case registry that includes the same data for TB cases in both nations.

### Case Example: Sheer Volume of Foreign Born Overwhelms Los Angeles' System

In 1992, about 92,000 legal immigrants came into Los Angeles from many countries. Local doctors, designated by U.S. embassies and consulates, screen these persons for active TB with chest X rays before they arrive in this country. Skin tests are usually not required, and TB infection without active disease is not grounds for denying legal entrance into the United States.<sup>32</sup> Consequently, Los Angeles TB control officials do not know the extent of TB infection among foreign-born individuals in Los Angeles. However, a Los Angeles TB control official estimated that about half of the legal immigrants who enter Los Angeles County are infected with TB.

According to one TB control official, incidents of fake X rays and poor-quality X rays, which are impossible to read, have occurred. Ideally, according to one TB control official, the Immigration and Naturalization Service could assist the TB control program in its efforts to identify individuals from countries with endemic TB. He added, "Of course, if all legal immigrants were referred to the county for screening and preventive treatment, the system would collapse under the strain."

Expansion of TB screening at "English as a Second Language Schools" in 1995 will help this problem, although it will only reach a fraction of these students in Los Angeles.

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### HIV Is a Major Factor in Rising Number of TB Cases

The rapid spread of HIV and AIDS during the 1980s is generally cited as a major factor in the increase of TB in the United States. According to CDC, approximately 10 percent of the estimated 1 million HIV-positive people in the United States are also infected with TB. While HIV does not seem to increase the risk of infection, it does appear to accelerate the progression from infection to active disease. For this reason, the risk of coinfecting people developing TB is estimated at about 8 percent per year. The risk among HIV-negative persons is estimated at about 5 to 10 percent during their lifetime.

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<sup>32</sup>Skin tests, however, are required if the person in question is under 15 years of age and ill or in close contact with a family member with suspected tuberculosis.

The association between TB and HIV creates several problems for local health departments. TB diagnosis is more difficult, and the longer time frames needed to identify drug-resistant patients have contributed to unusually high mortality rates among HIV-positive patients in MDR-TB outbreaks in institutional settings. CDC has reported that nine MDR-TB outbreaks in hospitals and correctional facilities have resulted in direct transmission of MDR-TB to other patients and health care workers. In eight of these outbreaks, 82 to 100 percent of the patients were HIV infected. Mortality in these eight outbreaks was extremely high, ranging from 72 percent to 93 percent, and the median interval until death was 4 weeks at six of the locations.

TB control officials we interviewed expressed concern about the relationship between HIV and tuberculosis in their cities. In Fulton County, 40 percent of persons with TB are HIV positive, and officials predict a continued increase in TB rates "given the hidden factor of HIV." In Newark, TB officials believe that rates will continue to climb due in part to the city's high prevalence of HIV. Although city statistics are unavailable, New Jersey officials suspect that coinfection in Newark is at or above the estimated statewide rate of 12 to 15 percent. Officials in El Paso were also concerned about the growth of the HIV-TB coinfecting population, with coinfection rates in the county continuing to rise from less than 1 percent of total cases in 1986 to almost 17 percent for the first 9 months of 1993. Although the 1992 estimated coinfection rate in Los Angeles was lower at 12.4 percent, the city had 273 coinfecting cases.

**Case Example: Despite HIV Activities, Los Angeles Reaches Only a Fraction of Its Overall HIV Population**

Los Angeles County's TB control program devotes staff to working with HIV/AIDS service providers, jails, shelters, and hospices. The county TB control program employs two public health nurses full time to work with HIV/AIDS service providers to offer appropriate TB services for their patients. These providers include the county's 16 HIV Early Intervention Clinics funded by federal Title I Ryan White funds and AIDS shelters and hospices. These two nurses also work with the county's health centers to encourage testing for both HIV and TB infection. The Los Angeles County jail now has a skin testing program for prisoners who are HIV positive. However, problems have included the release of prisoners before skin tests can be read and the refusal of others to comply with preventive therapy. For other prisoners, skin tests are not done because most prisoners are not around long enough to determine the results, let alone to preventively treat them for TB infection for 6 months. The TB control office also works with 30 AIDS shelters and hospices to ensure that these facilities screen for TB and that those with infectious TB do not reside in these settings. At

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**Appendix I  
Demographic and Health Factors Increase  
TB Rates and Challenge TB Service Delivery**

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these AIDS shelters and hospices, those with nonactive TB are also monitored to make sure that they stay on their medication to remain noninfectious.

Beginning in June of 1992, the TB control office began to work with HIV Early Intervention Clinics to screen for TB. However, even with this program, a TB official noted that most individuals coming to these clinics are not "early" in the progression of their disease and estimate that they are only reaching a fraction of the HIV-positive population living in Los Angeles County. According to this official, another problem is that despite CDC recommendations, private doctors at these early intervention clinics will not begin these patients on preventive therapy without a positive skin test reaction.

# Infrastructure Issues Affect TB Control Efforts

Effective TB control throughout the United States requires an investment in human resources, facilities, and information systems. An adequate number of staff is critical for ensuring that programs provide screening, prevention, and treatment services. TB services should be readily accessible and provided in facilities that minimize the potential for transmitting the disease. Lastly, information systems are essential for monitoring and evaluating TB efforts.

The five TB programs we visited faced problems maintaining an infrastructure for effective TB control. Infrastructure problems ranged from inadequate staffing levels to outdated equipment. We observed many of these problems in our visits to TB clinics, and TB control officials noted many of the same problems during our interviews. In addition, evaluations of the TB programs over the years have also cited infrastructure problems. Although TB programs may have addressed some of these problems, we include them to illustrate the difficulties TB control programs have had responding to the rise in tuberculosis.

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## Staff Shortages Hinder Programs' Ability to Respond to Rising TB Rates

Most of the communities reported that staffing shortages have affected their ability to respond to the TB epidemic. Factors influencing staff shortages include hiring freezes and attrition. In addition, TB program officials reported that the traditionally low salaries of public health departments have limited their ability to hire staff. Officials also cited difficulties recruiting staff with necessary management skills. Consequently, staff shortages, in part, affected the TB programs' ability to coordinate with other TB providers. Lastly, competing public health priorities affected the availability of staff to provide TB services.

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## Hiring Freezes, Attrition, and Low Salaries Contribute to Staffing Shortages

Some of the communities we visited experienced hiring freezes, which affected their TB programs. For example, in April 1992, Los Angeles County imposed a hiring freeze on all positions, including federally funded ones. As a result, the TB office was prevented from using over \$1 million in federal funds for hiring critical staff for the health centers that provided TB services.

In December 1992, the hiring ban was lifted but reinstated the following April. This time, federally funded positions were exempted from the freeze; however, the TB program was still affected. In 1993, a Blue Ribbon Panel convened by the director of the Los Angeles County Department of Health Services concluded, "dealing with hiring freezes. . .has taken time

and energy from important (TB) control work; contributed to the underutilization of federal funds; and (led to) diminished morale.”

The panel noted that between April 1, 1992, and January 31, 1993, \$1,128,583 in federal tuberculosis funds were not spent; \$673,027 were rolled forward and thus available in 1993-1994, still leaving an estimated \$455,556 unused. According to CDC, in such cases, these funds are not lost: a grantee can request approval for using the funds for TB-related activities. If CDC receives no such request from the grantee, it uses the funds to offset next year’s award.

Attrition is another staffing issue that may compromise the ability of TB control programs to respond to the increased incidence of TB. For example, when we visited one Chicago TB clinic, only one doctor was available to treat all TB patients because the second one had resigned earlier that year and had not yet been replaced. This situation resulted in a heavy patient caseload, which placed demands upon the staff and patients alike. For example, on peak days, this one physician often evaluated from 30 to 40 patients; nurses often worked through their lunch hours to assist with patient care; and patients may have waited several hours to see the physician.

Lastly, TB control officials in Fulton County and Newark stated that the low salaries in public health departments limit their ability to hire qualified staff. For example, Fulton County’s TB director said that the county and the state of Georgia have difficulty recruiting public health professionals, specifically physicians, due to low salaries.

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### **TB Programs Have Difficulty Finding Staff With Program Management Experience**

Some of the TB programs we visited also had difficulty attracting staff with the skills necessary to manage TB control programs. In instances such as these, CDC assigns public health advisers (PHA), CDC staff with expertise in program operations and epidemiological skills, to health departments in need of such expertise. Three of the TB programs we visited currently have PHAs assigned. In Chicago and Los Angeles, PHAs hold senior managerial positions in the local TB control programs and have held those positions for several years. For example, Chicago’s TB director is a CDC employee who has managed the Chicago Department of Health’s (CDOH) TB program for more than 10 years. In 1992, a PHA was assigned to Fulton County Health Department. Since she was appointed in November 1992, she has supervised 14 outreach workers who identify contacts, make sure patients

keep their appointments, and provide directly observed therapy to the same patients.

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### Staffing Shortages Affect Coordination Among TB Providers

Staff shortages can also affect coordination among service providers. Treatment is provided in a variety of settings, such as hospitals, correctional facilities, and clinics. Several of the TB programs we visited had difficulty coordinating TB services among the various health care providers and settings in their communities.

In Chicago, for example, the CDOH TB program is responsible for protecting people from the effects of TB. In 1992, 65 local hospitals and private physicians diagnosed 88 percent of the city's TB patients and treated about two-thirds. Chicago area health officials reported that some patients with TB may be lost in this maze of health care providers and may not complete treatment within recommended time frames. Although CDOH maintains a citywide surveillance network and central TB case registry, a CDOH official reported that due to staff shortages and time constraints CDOH does not always follow up to ensure that patients receive and complete treatment. This is one of the factors contributing to Chicago's historically low treatment completion rates.

### TB Programs Often Compete With Other Health Programs for Staff

Competing health department priorities often affect the availability of TB staff. In both Chicago and Los Angeles, TB staff may also provide other health services. For example, in the 41 Los Angeles County health clinics and subcenters, public health staff are responsible for many different disease programs, including TB, and staff are not dedicated to TB alone. As cited in Los Angeles County's cooperative agreement application, "although not intended . . . this has resulted in a reduction in the extent and quality of tuberculosis program activities and . . . in a stringency of TB expertise at the health center level."

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### Inadequate Facilities and Equipment Hamper TB Control Efforts

Health care facilities where those with infectious disease are likely to be seen must have adequate ventilation as well as appropriate space and equipment to provide safe and effective TB care. Several of the TB control programs we visited could not ensure, however, that their facilities were designed and maintained to minimize TB transmission. For example, in El Paso three program employees in the past year who had had a negative TB skin test tested positive, indicating recent TB infection. These three test results indicate that TB transmission may have occurred at work. A recent

environmental assessment also produced 14 recommendations for improvements in air quality control at the city's TB clinic. A program review of Los Angeles County's TB control program also cited inadequate ventilation in some outpatient clinics.

Ensuring a safe environment for TB treatment is particularly important for patients with a weakened immune system. In both the El Paso TB clinic and one of Chicago's TB clinics, patients of the HIV/AIDS and TB clinics share the same waiting room. This situation is of concern because HIV infection is the strongest risk factor for progression from TB infection to active TB disease.

In addition to inadequate ventilation and isolation, some of the TB clinics also lacked modern equipment. Diagnostic X ray equipment is critical in detecting cases of active TB and in following response to treatment. However, two of the communities we visited at one time lacked adequate or modern X ray machines. For example, until a few years ago, Fulton County TB clinic's sole X ray machine was a World War II-era machine. The machine was so antiquated that younger technicians did not know how to operate it. An evaluation of the Los Angeles County TB program cited nonfunctioning X ray machines at some clinics and recommended that they be replaced.

CDC requirements for a "model TB center" state that TB services should be readily accessible to persons with TB. In both Fulton County and El Paso, only one health department clinic provided treatment to patients with active TB. Although Chicago has three clinics for treating active cases, it may take a patient over 2 hours to get to a clinic by public transportation.

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## **TB Surveillance and Monitoring Activities Minimized by Outdated Information Systems**

An essential function of all TB control programs is the assessment, surveillance, and monitoring of TB cases and contacts. Effective information systems are necessary for maintaining TB case registries, generating program management data, and tracking TB cases and contacts. Several of the TB programs we visited did not have efficient information systems. For example, in El Paso, when we requested information on patient demographics, staff had to sort through the patient records and hand count and tally the information.

The Fulton County TB program relies on a 1960s mainframe computer to update patient information every 6 weeks. A 1991 evaluation found that the system does not allow the TB program to monitor delinquent

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**Appendix II  
Infrastructure Issues Affect TB Control  
Efforts**

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appointments or analyze TB trends. Fulton County TB officials referred us to the state of Georgia's TB control program for trend data. Similarly, a program review of Los Angeles County's TB program reported that the program's mainframe system was inflexible, slow, and expensive to alter and contained incomplete data. The review reported that, as a result, Los Angeles County TB officials lack important management data for evaluating and planning program activities.

# Methodology Used to Estimate TB Expenditures Through 1999

One goal of this review was to estimate expenditures for TB treatment for 1995 through 1999. To accomplish this goal, we identified baseline data for TB expenditures, simulated TB expenditure growth under a variety of assumptions, and examined the sensitivity of our results to the choice of assumptions. Our simulations show that TB spending could double from 1991 levels if current trends continue.

We used CDC estimates of costs in 1991 as a baseline for treatment expenditures. In a report prepared for the CDC, Battelle Medical Technology Assessment and Policy Research Center estimated the direct costs of treating TB in 1991.<sup>33</sup> This report included the following direct costs: CDC surveillance and outbreak control; screening and follow-up examinations; contact investigations; preventive treatment; outpatient treatment for suspected cases, drug-susceptible cases, multiple drug-resistant (MDR) cases and other drug-resistant cases; and inpatient hospitalization treatment with related physician services. Indirect costs (such as productivity losses due to death and disability) as well as research and capital expenditures were not included. Inpatient care accounted for much of the costs of TB treatment and were estimated using a 16-state data set of all payers and all discharges from short-stay hospitals for a principal diagnosis of TB. Battelle extrapolated these results to the total U.S. population.

To project these costs into the future, we made the following assumptions:

- Caseloads will grow at the same annual rate as active reported cases from 1988 to 1991, an average annual rate of 5.5 percent.<sup>34</sup>
- Costs per case for outpatient and preventive services will rise at the average rate of growth for the medical care consumer price index (CPI) from 1980 to 1991, less the average annual consumer price index-urban (CPI-U) growth rate for the same period. This calculation gives the rate of medical cost growth above the general inflation rate in the economy as a whole. The medical CPI average growth rate was 8.13 percent for 1980 to 1991, while the CPI-U grew at an annual rate of 4.67 percent. Our annual rate of medical cost growth, above the general inflation rate, is 3.46 percent.

<sup>33</sup>“Estimate of Identifiable Direct Costs of Tuberculosis in the United States in 1991,” prepared for the Centers for Disease Control and Prevention by Battelle Medical Technology Assessment and Policy Research Center (Washington, D.C.: 1993), p. v.

<sup>34</sup>Other growth rates in this analysis were computed for 1980 to 1991. We excluded caseload growth rates for 1980 to 1987 because cases were steady or declining. Recent trends better reflect the recent resurgence in TB growth and are, therefore, better indicators of future growth. Because we are interested in the consequences of rising caseloads, we calculated the trend based on 1988-91 data.

**Appendix III  
Methodology Used to Estimate TB  
Expenditures Through 1999**

- Costs per case for inpatient care will grow at the 1980-91 average annual rate of growth for total hospital costs, adjusted for inflation. That rate was 5 percent per year.
- The CDC budget for TB will grow at the same annual rate as the cost per case for outpatient and preventive services.
- Federal, state, and local governments will continue to share the same proportion of inpatient costs as the 1990 data used by CDC.<sup>35</sup>

The results of our simulations are summarized in table I.1. Under these assumptions, total expenditures will grow from about \$700 million in 1991 (the baseline estimate Battelle reported to CDC) to over \$1.5 billion by 1999 (in 1991 dollars). Inpatient expenditures will account for most of the spending, totaling over \$982 million in 1999.

**Table III.1: Expenditure Projections for TB Treatment**

In millions of 1991 dollars						
	1991	1995	1996	1997	1998	1999
CDC TB budget	\$6.3	\$7.2	\$7.5	\$7.7	\$8.0	\$8.3
Prevention	78.4	111.3	121.4	132.5	144.7	157.9
Outpatient care	182.1	258.4	282.0	307.8	335.9	366.7
Inpatient care	434.9	653.6	723.7	801.3	887.2	982.3
<b>Total</b>	<b>\$701.7</b>	<b>\$1,030.5</b>	<b>\$1,134.6</b>	<b>\$1,249.4</b>	<b>\$1,375.8</b>	<b>\$1,515.2</b>

To test the sensitivity of our results and to account for a recent decline in the number of active TB cases reported, we altered our first assumption and allowed caseloads to grow at the same annual rate as active reported cases from 1988 to 1993. This allowed us to incorporate 2 additional years of actual experience into our forecast. Based on this new assumption, the average annual caseload growth rate declined from 5.5 to 2.5 percent, but projected 1999 expenditures only declined from \$1.5 to \$1.2 billion.

<sup>35</sup>Battelle, p. C-8.

# Comments From the Public Health Service



DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Rockville MD 20857

FEB 14 1995

Ms. Sarah F. Jaggar  
Director, Health Financing  
and Policy Issues  
Health, Education and Human Services Division  
General Accounting Office  
Washington, D.C. 20548

Dear Ms. Jaggar:

The Public Health Service has reviewed the General Accounting Office (GAO) draft report, Tuberculosis: Costly and Preventable Cases Continue in Five Cities, and finds it to be generally accurate in its presentation of efforts to control tuberculosis in the United States.

The Centers for Disease Control and Prevention is addressing the issues of identification of active disease and antimicrobial resistance through applied research activities to improve the technology, and by providing financial and technical assistance to State public health laboratories through cooperative agreements.

We appreciate the opportunity to review the GAO draft report. Attached are technical comments which we offer for your consideration.

Sincerely yours,

John C. West  
Director  
Office of Resource Management, OM

Attachment

# GAO Contacts and Staff Acknowledgments

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## GAO Contacts

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