

TB Elimination



The Federal Funding Gap

National Coalition for the Elimination of Tuberculosis

Founded in 1991, the National Coalition for the Elimination of Tuberculosis (NCET) is a coalition of national, state and local public health, medical professional, health care and service organizations.

Members include:

AIDS Action Council	Association of State and Territorial Directors of Nursing
AIDS-SidAlert International	Association of State and Territorial Health Officials
American Academy of Family Physicians	Charles P. Felton Model Tuberculosis Center
American Academy of Pediatrics	College of American Pathologists
American Association for Continuity of Care	Congress of National Black Churches
American Association for Respiratory Care	East Coast Migrant Health Project
American Association for World Health	Francis J. Curry National Tuberculosis Center
American College of Chest Physicians	Infectious Diseases Society of America
American College of International Physicians, Inc.	Migrant Clinicians Network
American College of Physicians	National Association of Community Health Centers, Inc
American College of Preventive Medicine	National Association of County Health Officials
American Correctional Health Services Association	National Black Nurses' Association
American Federation of State, County and Municipal Employees	National Coalition for the Homeless
American Health Care Association	National Commission on Correctional Health Care
American Hospital Association	National Council of La Raza
American Jail Association	National Foundation for Infectious Diseases
American Lung Association	National Health Care for the Homeless Council
American Medical Association	National Leadership Coalition on AIDS
American Nurses Association	National Minority AIDS Council
American Public Health Association	National Public Health Information Coalition
American Society for Microbiology	National Rural Health Association
American Thoracic Society	National Tuberculosis Controllers Association
Asian American and Pacific Islander Health Forum	National Tuberculosis Nurse Consultant Coalition
Association for Professionals in Infection Control and Epidemiology	Pan American Health Organization
Association of Asian Pacific Community Health Organizations	Project HOPE
Association of Community Health Nursing Educators	Society for Hospital Epidemiology of America, Inc.

TB Elimination: The Federal Funding Gap

A Report to Congress from the National Coalition for the Elimination of Tuberculosis

EXECUTIVE SUMMARY

“Tuberculosis can be extinguished as a public health problem. . .If the opportunity to end tuberculosis is not seized now, it may be lost indefinitely.”

These words appeared more than 40 years ago in a report from the 1959 Arden House Conference organized by the U.S. Public Health Service (PHS) and the National Tuberculosis Association (now the American Lung Association). The conference was organized to advise the PHS on how to use available resources to accelerate the decline of tuberculosis in the U.S. The conferees had every reason to forecast the demise of the disease in this country. They were buoyed by the evident success of the (then) new combination drug therapy, rapidly declining tuberculosis morbidity and mortality, and categorical funding for tuberculosis prevention and control activity.

What the conferees could not foresee were events that would make their forecast appear, in hindsight, to be very optimistic indeed. They did not anticipate the elimination of categorical funding for tuberculosis control; the emergence of HIV/AIDS; and a host of socioeconomic problems, including increases in homelessness, injection drug use and increasing rates of incarceration. These events created fertile ground for the re-emergence of tuberculosis as a serious public health threat in the U.S. In the mid-1980s, the trend toward elimination was reversed and the nation experienced a resurgence of tuberculosis for several years, with a 20% increase in reported cases between 1985 and 1992.

The federal response to this emergency was seriously hampered because the public health

infrastructure was allowed to crumble during the nearly 10-year period when categorical funding for tuberculosis control was zero. The U.S. lacked the trained professionals, laboratories and organizational capacity needed to respond swiftly, the same factors critical for preparedness against bioterrorism. By the late 1980s, what had been complacency was clearly neglect. Significant federal resources were necessary to regain control of tuberculosis—more than \$1 billion in New York City alone (Figure 1).

In 1992, with control re-established, rates again began declining at approximately 6% to 7% each year. Since then, the decline has been almost 40%, from 26,673 cases in 1992 to 15,991 cases in 2001. However, the rate of decline in 2001, based on provisional data, once again slowed alarmingly, to only 2%.

We have two choices in the United States. We can continue the path toward neglect and experience another unnecessary, expensive resurgence of tuberculosis. Or we can take the necessary steps to continue progress toward tuberculosis elimination. Choosing the path of elimination – ending neglect – represents not only sound public health policy but good fiscal policy as well.

*– David Satcher, M.D.
Former U.S. Surgeon General*

The Division of Tuberculosis Elimination

The federal responsibility for tuberculosis control resides within the Division of Tuberculosis Elimination (DTBE), a division of the National Center for HIV, STD, and TB Prevention within the Centers for Disease Control and Prevention. The DTBE – in collaboration with the National Center for Infectious Diseases, the Public Health Practice Program Office, and the National Institute of Occupational Safety and Health – is, in effect, the U.S. national tuberculosis program. It is charged with providing leadership and resources to control, prevent and eventually eliminate tuberculosis in the U.S.

Approximately 90% (\$110 million in FY 2002) of the Division's budget is sent to 68 jurisdictions through cooperative agreements. This includes all 50 states, the District of Columbia, 9 large cities such as New York City, Puerto Rico, and 7 other jurisdictions such as Guam and the Virgin Islands (Figure 2). These funds are used to support local tuberculosis control programs, a network of public health laboratories, and three Model Tuberculosis Centers in New York City, Newark and San Francisco. Additional funds from CDC support applied and operational research projects at sites throughout the country.

The majority of the funds awarded through the cooperative agreement process support the core activities of tuberculosis. These include identifying and treating cases of active tuberculosis and performing investigations to identify, evaluate and treat individuals who may have been infected by a new case.

Approximately 10% (\$13 million in FY 2002) of the budget of the Division of Tuberculosis Elimination is used by the Division to:

- collect, summarize and analyze disease

surveillance information; this information is crucial not only for controlling and preventing tuberculosis but also in ensuring the most efficient use of resources,

- sustain a public health workforce to develop treatment and program performance guidelines, provide technical assistance including personnel during tuberculosis outbreaks, produce education and training materials, conduct applied research and clinical trials, and
- support a reference laboratory to identify TB germs and perform DNA fingerprinting and drug-susceptibility studies.

While tuberculosis is a shared federal, state, and local responsibility, federal dollars are an integral part of tuberculosis control in every state and local government. Tuberculosis control would collapse in most jurisdictions and would be severely damaged in the remainder if federal funding were decreased.

Ending Neglect: The Elimination of Tuberculosis in the United States

The dismal history of tuberculosis control in the U.S. between the late 1960s and 1990s was detailed in an Institute of Medicine (IOM) report, *Ending Neglect: The Elimination of Tuberculosis in the United States*. Published in 2000, the report contains recommendations in five categories to reaffirm the nation's commitment to eliminating tuberculosis:

- Maintaining control of tuberculosis while adapting to a declining incidence of disease and changing systems of health care financing and management;
- Speeding the decline of tuberculosis and

advancing toward the elimination of tuberculosis through increased efforts for targeted tuberculin skin testing and treatment of latent infection;

- Developing the tools needed for ultimate elimination of tuberculosis – new diagnostic tests, particularly for diagnosis of infection; new treatments and an effective vaccine;
- Increasing U.S. engagement in global efforts to control tuberculosis; and
- Mobilizing support for tuberculosis elimination and regularly measuring progress toward that goal.

Serious Problems Remain

Federal funding for tuberculosis control activities, in adjusted dollars, has not kept pace with inflation for the past six years (Figure 3). The infrastructure needed to eliminate tuberculosis is beginning to deteriorate once again. In the face of declining funding, tuberculosis control programs are struggling to maintain their core control and prevention activities, let alone implement the IOM recommendations.

The situation in the U.S. today is precisely what it was in 1959. The number of cases of tuberculosis is declining steadily, and once again the goal of eliminating tuberculosis in the U.S. appears within our reach. There are ominous signs, however, that this nation has yet to conquer this ancient disease. Twenty states reported more new tuberculosis cases in 2001 than in 2000. There remain persistent, unacceptable disparities in case rates across racial and ethnic lines, a critical concern in the southeastern states.

Moreover, the 15,991 reported cases of tuberculosis in 2001 are just the tip of the iceberg

(Figure 4). Ten million to 15 million people in the U.S. have latent tuberculosis infection. They have been infected with the TB germ, but have no symptoms and cannot spread the disease to others. However, a substantial proportion will eventually develop active tuberculosis unless they are treated. Some populations are at higher risk. For example, individuals who are co-infected with both the TB germ and HIV are as much as 800 times more likely to progress to active tuberculosis. If left untreated, people with latent tuberculosis infection represent more than one million future tuberculosis cases.

NCET Recommendation

It has been estimated that \$528 million annually is need to fully implement the recommendations of the Institute of Medicine. Given the slowing trend in the rate of decline in cases of tuberculosis in 2001, the National Coalition for the Elimination of Tuberculosis recommends doubling of project funding to \$265 million for CDC's Division of Tuberculosis Elimination in FY 03. This funding should then be doubled once again in FY 04 to reach the estimates needed to progress toward tuberculosis elimination. In FY 03 the funds would be used to:

- Intensify efforts to prevent and control tuberculosis in high incidence areas;
- Implement initiatives for preventing tuberculosis among foreign-born people in the U.S.;
- Intensify tuberculosis control activities along the U.S.-Mexico border;
- Support applied research conducted by the Tuberculosis Epidemiologic Studies Consortium to refine the approach to tuberculosis control and prevention, including the elimination of tuberculosis in children;

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- Support clinical trials of new drug regimens by the Tuberculosis Trials Consortium;
 - Develop regional capacity to respond to tuberculosis outbreaks; and
 - Develop and implement strategies for erasing ethnic and racial disparities in tuberculosis, particularly in the southeastern U.S. where these disparities are most marked.

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The CDC, TB controllers and public health advocates are working diligently but tuberculosis elimination cannot be achieved without additional efforts. Resurgence is again a threat. Given the huge resources required to re-establish control in the 1990s, the prudent action now is to provide the funding needed to accelerate progress toward eliminating tuberculosis in the United States. The alternative is to allow people in this country and around the world to suffer unnecessarily from this terrible, yet preventable and treatable, disease.

ENDING NEGLECT by Maintaining Control

What does this mean? To maintain control of tuberculosis, a successful program must identify and treat individuals with active tuberculosis; and find and test individuals who may have had contact with tuberculosis patients to determine whether they, too, are infected. If so, they must be provided appropriate treatment.

To meet these goals, TB controllers must first determine whether a person who has symptoms of tuberculosis actually has tuberculosis. This typically requires a tuberculin skin test, a chest X-ray, collection of sputum for microscopic analysis, culturing of sputum to determine whether the TB germ is present and, where appropriate, culturing the isolated bacteria to determine whether they are drug-resistant. DNA fingerprinting also is often performed to identify the particular strain of the TB germ growing in the patient.

If a diagnosis of TB is confirmed, then TB controllers must develop an acknowledged patient-centered treatment plan to ensure the completion of therapy. This approach typically involves 6 to 9 months of directly observed therapy in which an outreach worker actually watches as the patient takes each and every dose of medication. If medication is not taken properly, the patient is at risk of developing multi-drug-resistant tuberculosis (MDR-TB). Directly observed therapy is critical in preventing MDR-TB.

A contact investigation begins with an interview of the patient to identify exposed persons and is followed by tuberculin skin testing of the contacts, such as family members and co-workers. Some contacts will test negative, others positive. Individuals with recent contact may have to be re-tested after several weeks. Individuals who have a positive skin test are candidates for follow-up tests – chest X-ray, etc. – to determine

whether they, too, have active tuberculosis. All individuals with a positive skin test are further evaluated for appropriate therapy, whether for latent infection or active disease.

This scenario played out more than 16,000 times in the U.S. in 2000. It requires a robust infrastructure that has:

- Healthcare workers with appropriate technical training and, increasingly, with cross-cultural training to provide directly observed therapy to foreign-born patients;
- A network of laboratories with the technical staff and equipment needed to provide timely, accurate results;
- An information management system that enables timely reporting of case, the management of individual cases and contact investigations, and the evaluation of program performance; and
- Educational and training materials for healthcare providers, patients and the community at large.

The infrastructure that supports these core programs throughout the nation is supported largely with funds from the CDC's Division of Tuberculosis Elimination. While most public health jurisdictions have the capacity to perform the core activities, often they cannot handle unusual situations such as an outbreak of drug resistant disease. In such cases, the division also sends an outbreak response team to advise, and assist, local controllers.

How well is the U.S. doing?

The nation, as a whole, is maintaining control.

Since the peak in 1992, the number of cases in the U.S. has declined every year, decreasing almost 40% from 26,673 cases in 1992 to 15,991 cases in 2001 (Figure 5). Numerous studies have shown this steady decrease to be the result of a revitalized public health infrastructure for combating tuberculosis.

However, there are troubling signs. For example, 20 states reported more cases in 2001 than in 2000. Thirteen states – Arizona, Colorado, Connecticut, Delaware, Hawaii, Michigan, Minnesota, Nebraska, New Mexico, North Dakota, Oklahoma, Rhode Island and Vermont – saw increases of more than 10%. Many of these states are so-called “low incidence states” with relatively low rates of tuberculosis. The increase in TB in low-incidence states underscores the importance of controlling and preventing tuberculosis in *all* states, even those with a relatively low number of cases.

Who are the men, women and children who made up the 15,991 TB cases in 2000? The answer depends on where you look. In many states, more than half of the reported TB cases occur among foreign-born people (Figure 6 provides foreign-born data for 2000, the most current data available). However, in 2000, in the southeastern United States, the vast majority (85%) of cases were among U.S.-born people.

The higher incidence of tuberculosis in the southeastern states is due, in part, to health disparities among various ethnic and racial groups. Such disparities are clearly evident not only in the southeast but in the United States as a whole. For example, the rate of tuberculosis in 2000 was eight times greater among black, non-Hispanic people than it was among white, non-Hispanic people.

The impact of limited resources

A situation in Seattle/King County in 2001 is a

good example of the sometimes tragic consequences of limited resources for TB control.

An adult in Seattle/King County with newly diagnosed tuberculosis denied having contact with any children. However, several months later a child who was hospitalized for what turned out to be pulmonary tuberculosis, was found to be one of this adult’s three children. A second child had sub-clinical pulmonary tuberculosis. A third child had latent tuberculosis infection. Adequate resources for appropriate contact investigation, including a home visit by an outreach worker, would have revealed earlier that this man had children who needed to be screened. Treatment could then have prevented the two cases of tuberculosis in the children.

The sheer magnitude of some contact investigations makes it impossible for local health departments to meet their goals without outside help. A recent TB outbreak in homeless shelters in Minnesota led to the identification of more than 1,800 contacts. While perhaps extreme, this example illustrates the difficult and labor-intensive effort required to control tuberculosis.

Cross-cultural issues

The proportion of TB occurring in foreign-born people in the United States has increased steadily in the last decade, from 27% of all cases in 1992 to 50% of all cases in 2001. Given the flow of immigrants and refugees into the U.S. from countries with a high burden of TB, it is only reasonable to assume that this trend will continue.

Preventing and controlling tuberculosis in foreign-born people requires special resources. In Fairfax County, Virginia, public health workers employ 32 languages when talking with residents about tuberculosis. Serving foreign-born patients also requires healthcare workers with cross-cultural training who can work effectively with patients and their families and with community-

based organizations that address the medical and other needs of immigrant and refugees. Health-care workers also should be able to address issues around homelessness, substance abuse and a variety of lifestyles that will allow them to interact effectively with high-risk groups.

Tuberculosis Epidemiologic Studies Consortium

The Tuberculosis Epidemiologic Studies Consortium (TBESC) conducts epidemiologic, behavioral, economic, laboratory and operational research – all designed to provide the knowledge base for more effective and efficient control.

This new initiative in the CDC’s Division of Tuberculosis Elimination is a collaboration of investigators based at the CDC and 22 state and city health departments and academic institutions (Figure 7). This collaboration will bring together two exceptional pools of talent – TB controllers and academic scientists – whose training and experience will complement each other. The work of the TBESC will address significant questions in TB control and prevention while building local capacities for epidemiologic research in participating state and metropolitan TB control programs and academic institutions.

The consortium’s first study will evaluate immunogenetic and immunologic markers in humans that can be used to predict the susceptibility of

individuals to TB infection and for progression from latent to active TB. Such markers could be used to identify individuals who should be targeted for treatment of latent TB infection. These markers could also target a new vaccine to prevent TB.

A second TBESC study will help tuberculosis programs improve their performance in identifying children who have been exposed to tuberculosis. The very existence of tuberculosis in a child indicates recent transmission of the disease. TB in an adult could be the result of a long-standing latent infection that has progressed to active disease. However, children with latent tuberculosis infection or even tuberculosis disease are too often not detected through traditional public health interventions. The TBESC will identify ways to improve contact investigations for children.

A third study will provide improved tuberculosis diagnostic and treatment services to HIV-infected contacts of people with active tuberculosis. HIV infection is the greatest known risk factor for progression from latent TB infection to active TB. However, in the past, a lack of knowledge of contacts’ HIV status has hindered the efforts to provide appropriate diagnostic and treatment services. This TBESC study will examine ways to incorporate HIV counseling, testing and referral into TB contact investigations.

ENDING NEGLECT by Speeding the Decline

An estimated 10 million to 15 million people in the U.S. have latent TB infection. They have been infected with the TB germ at some point in their lives but have no symptoms and cannot spread the disease to others. However, a substantial proportion of them will eventually develop active TB. The proportion that will develop active disease depends on a number of risk factors. For example, individu-

als who are co-infected with both the TB germ and HIV are as much as 800 times more likely to progress to active TB.

Treating persons with latent TB infection can reduce the risk of developing active disease by about 90%. Without treatment, the 10 million to 15 million people in the U.S. with latent TB

represent more than a million future cases of active TB – themselves and others whom they will infect after developing active disease. In other words, the 15,991 reported cases of active TB in the U.S. in 2001 were just the tip of an iceberg.

The IOM report argued that the United States can speed its progress toward eliminating tuberculosis in the U.S. by identifying and treating individuals who have latent tuberculosis infection. However, given the tools currently available to diagnose and treat latent tuberculosis infection, it is not cost-effective to screen everyone. Thus, the IOM recommended targeted testing and treatment of only those groups identified as high-incidence. Examples include immigrants and refugees from countries with a high incidence of tuberculosis, HIV-infected individuals, homeless people, inmates in correctional facilities and other groups identified by local epidemiologic studies.

Realistically, most state and local TB control programs lack the resources to fully implement this crucial, far-reaching IOM recommendation. The result will be more tuberculosis in the future and a much longer time until we eliminate the disease in the U.S.

(No longer) missed opportunities in Alaska

Alaska provides a good example of how limited funding has, until recently, made it impossible to properly identify and treat individuals with latent tuberculosis infection.

More than 90% of Alaska Native people 55 years and older have latent tuberculosis infection. Thus, Alaska has a large pool of people at risk for developing active tuberculosis as they age. Because Alaska has lacked the resources needed to screen for and treat latent infection, it has had to deal instead with outbreaks of active TB. One recent outbreak resulted in 27 cases in 9 villages. This outbreak and others could be limited and

even prevented through an ongoing program of screening and treatment for latent infection.

Tuberculosis controllers in Alaska annually provide medications to 500 to 700 people with latent TB. The drugs are typically self-administered because the state lacks the resources to provide directly observed therapy for patients with latent TB infection. Patients too often do not complete their treatment. Thus, the full potential of this type of intervention is not realized.

Increased federal funding, recently available, will more than double the budget for tuberculosis control and prevention in Alaska, TB personnel will be able to implement an intensified program to treat latent TB.

A missed opportunity in Mississippi

Before completing treatment for latent TB infection, an inmate was released from a correctional facility in Mississippi. The inmate subsequently progressed to active tuberculosis and infected his girlfriend and her children. One child progressed rapidly from infection to disease and died.

Inmates and staff of correctional facilities are high-risk groups for tuberculosis infection. Due to the high rate of turnover of inmates and staff and a lack of trained correctional staff to perform appropriate intake screening, exposure to TB in a correctional facility can be extremely difficult to manage. Even when an exposure is verified, most of the exposed inmates will have already been released. Many inmates who have latent tuberculosis, including the one in Mississippi, are released before they complete treatment and often do not complete their treatment regimen once released.

State and local health departments need substantial increases in funding from the CDC in order to test and treat for latent TB infection. Targeted testing and treatment prevent future cases of TB and will, in the long run, save money.

ENDING THE NEGLECT by Developing New Tools

If the United States is to eliminate TB, it will need a coordinated strategy to end the cycle of neglect that has unnecessarily slowed progress toward achieving that goal. An important part of that strategy is a research agenda that will provide new tools for preventing and controlling the disease.

TB research ground nearly to a halt from 1970-90. There was little interest in TB and little funding available for basic or applied research. Few young scientists were trained to be TB researchers. The result was not only little progress in understanding of this disease but also a crumbling of the scientific infrastructure needed to do TB research. In the past 10 years, increased funding to the CDC and National Institutes of Health has helped redevelop the relevant infrastructure and research strategies. The momentum must now be sustained.

In its 2000 report, the Institute of Medicine identified several key research areas and placed the highest priority on new diagnostic tools to identify people with latent tuberculosis. Scientists at the CDC, in collaboration with the private sector, have already reported progress on this highest priority. Their research describes a new diagnostic test for tuberculosis infection that has several advantages over the current, nearly century-old tuberculin skin test. The new test, the whole blood interferon gamma assay, offers higher specificity and requires only contact between a patient and a healthcare provider.

The IOM also named the following as high priority areas for research: methods to identify those infected people at highest risk for progressing from latent infection to active disease; new tools to prevent or treat tuberculosis, including vaccines and drugs; and behavioral and social science research to improve patient adherence to

treatment regimens. The report also recommended that at least some of research should occur in the international arena and involve collaboration among the CDC, NIH, U.S. Agency for International Development and international partners.

The CDC budget supports several applied research programs that address the recommendations of the IOM report. These include the Tuberculosis Trials Consortium (TBTC), the Tuberculosis Epidemiologic Studies Consortium (TBESC), applied research done in the Tuberculosis/Mycobacteriology Branch Laboratory in the CDC's National Center for Infectious Diseases, and other applied research done by CDC scientists, much of it in collaboration with scientists outside the CDC. All these efforts take advantage of the CDC's well-recognized expertise in doing population-based research.

Tuberculosis Trials Consortium

For more than 40 years, the CDC has been responsible for conducting clinical trials to evaluate new drug regimens for preventing and treating TB. Ongoing clinical trials are currently being done by the Tuberculosis Trails Consortium (TBTC), a consortium of 23 sites, including 13 academic clinical centers and 10 Veterans Administration medical centers (Figure 8). Consortium members work closely with local public health departments to recruit and manage patients enrolled in the clinical trials. Thus, the consortium is both doing research and sustaining scientific infrastructure at sites around the country.

One of the TBTC's new projects is Study 26, a Phase III clinical trial that will compare the effectiveness and tolerability of two regimens for treating latent tuberculosis infection. In one regimen patients will take isoniazid – currently the most commonly used treatment for latent tuberculosis infection – daily for 9 months, self-

supervised. Patients treated with the other regimen will take a combination of isoniazid and rifapentine once weekly for 3 months, administered under direct observation.

If the rifapentine/isoniazid combination is found to be as good as, or better than, isoniazid alone, the duration of treatment of latent TB infection could be reduced from 9 months to 3 months.

Study 26 will enroll approximately 8,000 patients over the course of the trial. Enrollment has begun at several sites, but at current funding levels (\$5 million annually), it will take many years to enroll the required number of patients. With increased funding, investigators could accelerate enrollment and complete the study in a more timely manner.

Mycobacteriology/TB Branch Laboratory

This laboratory in the National Center for Infectious Diseases supports state and local TB control programs and performs applied research.

Program support activities include funding (about \$10 million per year) and technical advice to public health laboratories to help them improve their ability to provide a laboratory confirmation of TB and to perform drug susceptibility tests; directing the Tuberculosis Genotyping and Surveillance Network for strain typing at regional public health laboratories; and functioning as a reference laboratory to analyze bacteria collected during TB outbreaks.

Through its applied research activities, the laboratory is identifying better ways to perform DNA fingerprinting, quicker methods for assessing drug-resistance, and methods for determining the molecular basis for virulence in the tuberculosis germ and the immunologic response of humans to infection. The goal is

to provide more timely information when TB outbreaks occur and identify markers to diagnose latent TB infection.

Information technology and TB control

In response to pointed criticism in the Institute of Medicine report, the Division of Tuberculosis Elimination is taking steps to improve its information management system. The existing system – the Tuberculosis Information Management System (TIMS) – has worked reasonably well as a surveillance tool that enables the CDC to collect information about active cases of TB from public health departments throughout the nation. Although TIMS contains a module that captures several kinds of information about specific patients – the results of chest X-rays and drug-susceptibility testing; contacts identified; a full record of the medications taken; and the names of health care providers who worked with the patient – it has not been widely adopted and has failed as a TB case management system.

In consultation with the National Tuberculosis Controller’s Association, the CDC’s Division of Tuberculosis Elimination is planning to develop software standards and web-enabled data entry modules for TB surveillance and case management that will be compatible with National Electronic Disease Surveillance System (NEDSS).

NEDSS was launched by the CDC in FY 2000 to use information gathered by local health departments to identify emerging disease threats. NEDSS will permit users to enter, view and manage data via a web browser and will provide a base platform upon which other modules, for example, TB surveillance and case management, can be built. The NEDSS architecture will also support data entry from hand-held electronic devices, the import of DNA fingerprinting data, and the import of data from other applications used by some state and local health departments.

The CDC currently lacks the resources to support the existing TIMS application and the development of modules that can be used with NEDSS.

Putting new tools to work:

Molecular epidemiology

When confronted with a new case of active tuberculosis, public health officials must identify other individuals who have had close contact with the infected person. Because tuberculosis is infectious, contacts must be tested to determine whether they too are infected. The goal is to identify all people at risk and to offer them treatment. In this way, an outbreak can be limited and prevented from spreading.

For decades, contact investigations have been based on a patient's response to a set of standard questions: Who do you live with? Work with? Socialize with? The answers provided TB controllers with names of people who would then be tested. This approach has its limitations, however, primarily because individuals may not identify all their contacts. Contact tracing by this traditional "shoe-leather" approach is especially difficult when working with mobile populations such as the homeless, who move from shelter to shelter, county to county or even state to state.

The tool of DNA fingerprinting is now helping TB controllers identify links between TB cases, even when they are widely separated in time and/or place. Just as the DNA molecules of individual humans differ from each other in slight but detectable ways, the DNA molecules in different strains of the TB germ can be distinguished through DNA fingerprinting. Thus, if two individuals are infected with TB germs that have identical DNA fingerprints, one can tentatively conclude that the two individuals are linked to each other in a chain of transmission. TB controllers can use molecular epidemiology to study the TB transmission pattern within their communities.

The power of DNA fingerprinting has been demonstrated in both urban and rural environments. In San Francisco, for example, DNA fingerprinting showed that 191 cases of TB in a two-year period were linked to one other case, with one cluster involving 29 cases. Conventional "shoe-leather" contact investigations connected only 19 (less than 10%) of the 191 cases. As a result of their molecular epidemiologic study, TB controllers concluded that a single infectious patient (identified as a result of links to many other cases) can infect a large number of people and that treatment of those individuals must be prompt and effective to prevent further spread of the disease.

DNA fingerprinting was also crucial in identifying a cluster of related cases of TB in rural Alabama. TB germs from 25 cases in 10 counties were found to have identical DNA fingerprints. Subsequent follow-up interviews showed them to be linked via facilities in three counties: a correctional facility and two homeless shelters. Molecular epidemiology revealed a statewide TB outbreak that health officials had not previously recognized.

DNA fingerprinting of TB germs is done at six regional laboratories supported by the CDC – in Alabama, Arkansas, California, Michigan, New York, and Texas – and at a handful of state public health laboratories. Staff at the Division of Tuberculosis Elimination and in public health offices around the country would like to use this tool more often. A single test costs only \$50 to \$75, but limited resources, especially a lack of trained staff and analytical equipment in the laboratories, prevent them from taking full advantage of this powerful tool. Additional resources are needed to develop software that can quickly compare the DNA fingerprint of a new case of tuberculosis with the thousands of fingerprints already stored in a national database.

ENDING THE NEGLECT by Engaging in Global TB Control

The IOM report recommended that the U.S. continue to play a significant role in global tuberculosis control. The report argued that the United States has a moral obligation to provide technical advice and other resources to help countries and organizations address the global tuberculosis epidemic. It also described the impact of the global epidemic on the U.S.

This impact can be seen most clearly in the rising proportion of reported cases of tuberculosis in the U.S. among foreign-born people. This proportion has increased steadily in recent years, from 27% of all cases in 1992 to 46% of all cases in 2000. In 20 states in 2000, more than half of the reported tuberculosis cases were among foreign-born people. In five states – California, Hawaii, Massachusetts, Minnesota, and New Hampshire – more than 70% of the cases occurred among foreign-born people. Given the scale of global migration and international travel in the 21st century, tuberculosis will not be eliminated in the U.S. until the incidence of tuberculosis is reduced elsewhere in the world.

The global epidemic is enormous. About one-third of the world's population – 2 billion people – are infected with the TB germ (they have latent tuberculosis infection). Each year there are about 8 million new cases of active tuberculosis and 2 million deaths from the disease. Tuberculosis is the leading cause of death for people with AIDS and is the leading cause of maternal mortality.

With its technical expertise, the CDC's Division of Tuberculosis Elimination plays an important role in the U.S. response to the global epidemic. Given the scale of the global epidemic, however, the DTBE must make difficult decisions about how best to use its resources outside the U.S. Guided by a strategic plan, the CDC has targeted funds to seven countries with special needs:

- Mexico, the Philippines, and Vietnam – the largest numbers of foreign-born tuberculosis cases in the U.S. occur in people who come from these countries
- India – a country with the highest tuberculosis burden in the world (nearly 25% of the world's cases)
- Botswana – a country with co-epidemics of tuberculosis and HIV
- Latvia and Russia – countries with high burdens of multi-drug resistant tuberculosis (MDR-TB)

By supporting tuberculosis control efforts in these countries, the CDC is also learning how to control and prevent tuberculosis in special situations. In Latvia, for example, in a project also supported in part by funds from USAID, the CDC and the Latvian government have established a training center to help other countries cope with MDR-TB. In Botswana, where about 80% of TB cases are also infected with the virus that causes AIDS, the CDC is not only helping local health officials cope with co-epidemics of TB and HIV but is also learning more about the dynamics of tuberculosis infection in a population with a high prevalence of HIV infection.

The answers to questions being asked in countries like Latvia and Botswana will have huge implications for tuberculosis control and prevention throughout the world, including the United States.

U.S.-Mexico binational tuberculosis control

More than 11 million people live along the nearly 2,000-mile U.S.-Mexico border. An additional 400 million travel back and forth across the

border every year. Of the 7,554 cases of tuberculosis in foreign-born people in the U.S. in 2000, 23% (1,773 cases) were among people born in Mexico. Most of the cases occurred in the four states that border Mexico – California (820 cases), Texas (364 cases), Arizona (67 cases) and New Mexico (17 cases). As a result of migration, 16 other states had at least 10 cases among Mexican-born people.

It is obvious that tuberculosis control and elimination in the United States will not be achieved without meaningful cooperation between this country and Mexico. CDC funding helps support the development of binational tuberculosis projects in several sister cities along the U.S.-Mexico border of Texas (El Paso/Juarez, Laredo/Nuevo Laredo, McAllen/Reynosa, Brownsville/Matamoros) and Arizona (Nogales/Nogales, Douglas/Agua Prieta, and Yuma/San Luis Rio Colorado). These projects focus on the management of persons with tuberculosis who cross the border frequently. Working with Mexico, the CDC also will provide funding to develop the *Binational Referral System*. This project will expand the tracking and referral system currently provided by two existing projects, CURE-TB (based in San Diego and operated by the San Diego County Division of Tuberculosis Control) and TB Net (based in Texas) and operated by the Migrant Clinicians Network.

The goal of CURE-TB and TB Net – and now of the Binational Referral System – is to ensure completion of treatment for active and latent tuberculosis in this mobile population. The Binational Referral System will be launched at four pilot sites: the sister cities of El Paso/Ciudad Juarez, San Diego/Tijuana, and Chicago/Jalisco; and an INS detention center in El Paso.

The CDC also supports other binational projects

along the Texas-Mexico border. These projects provide funds to diagnose and treat tuberculosis, including multi-drug-resistant tuberculosis; provide outreach workers to deliver directly observed therapy; develop educational materials; and provide laboratory training.

Given the scale of immigration from Mexico, the human traffic across the U.S.-Mexico border, and the higher incidence of both latent and active tuberculosis in Mexico, tuberculosis control efforts along the border should be strengthened. Such efforts require additional funding.

The global epidemic on the doorstep: TB in Seattle/King County

Seattle/King County in Washington State provides a good example of how the global tuberculosis epidemic affects tuberculosis control in the United States.

Of the 127 cases of TB reported in Seattle/King County in 2000, 100 (78.8%) occurred among foreign-born people. These immigrants were from 27 countries, including Vietnam (16 cases), the Philippines (13 cases), Ethiopia (13 cases), Mexico (7 cases) and China (5 cases).

Preventing and controlling tuberculosis in foreign-born people requires special resources. Included are the obvious need for language translation but also the need for healthcare workers with cross-cultural training who can work effectively with patients, families and the community-based organizations that serve immigrants and refugees.

The Tuberculosis Clinic in Seattle-King County is a nationally recognized leader in developing strategies for preventing and controlling tuberculosis in immigrant communities. With assistance from foundations, academic centers, governmental organizations and non-governmental organizations, the clinic has assembled

and trained a culturally diverse staff that speaks at least 15 languages. As a result, the clinic has been able to work effectively with community organizations that address the special needs of immigrants.

An estimated 100,000 people in the Seattle/King County area, many of them foreign-born, have latent tuberculosis infection. This large group of infected people, which is being continually being augmented with newly arriving immigrants and refugees, is believed to be the primary source of the rising number of cases of tuberculosis in the area. To identify and treat people with latent tuberculosis infection in its immigrant communities, the tuberculosis clinic began in 1999 a refugee-screening program targeting new refugees from Somalia and the countries of the former Republic of Yugoslavia and the Soviet Union. Despite the success of this pilot program, it has been discontinued for lack of funding.

The result will certainly be more future cases of tuberculosis within these groups.

The Seattle/King County Tuberculosis Clinic also identified other access points to its high-risk immigrant communities. They include entry-level workers in health-care facilities such as nursing homes, hospitals, and day-care centers; schools with a large proportion of newly arrived immigrant students; local industries, such as fishing and food-processing, that employ large numbers of newly arrived immigrants; groups of physicians, many of them foreign-born, who primarily serve immigrant communities; and neighborhoods, identified by case addresses, with particularly high TB rates. However, even though the clinic has found individuals in these settings who would like to participate in expanded targeted testing and treatment for latent TB infection, both the clinic and its partners lack the resources to fully implement such a program.

ENDING NEGLECT by Mobilizing Support for TB Elimination

Many people believe that tuberculosis, like smallpox, is a disease of the past. It is not. They are surprised to learn that tuberculosis still exists in the U.S and that a tuberculosis epidemic is ravaging many countries around the world. There is a good reason why tuberculosis has become invisible to most Americans; this nation is experiencing an all-time low in the number of new cases.

However, now is not the time for complacency but for taking steps to ensure that the success in reducing the incidence of tuberculosis in the U.S. does not lead to another cycle of neglect. To take these steps, the country will need effective leadership to develop the political will required to eliminate tuberculosis here and to tackle the global epidemic.

State and city TB controllers have a crucial responsibility for mobilizing their local communities. In Texas, for example, TB controllers have working alliances with a rich mix of organizations: the American Lung Association of Texas, Mexican Public Health System, RESULTS International, Rotary International, Ten Against TB, Texas Medical Association, Texas TB Coalition, Texas TB Researchers, and the US-Mexico Border Health Commission. Tuberculosis control and prevention will increasingly involve working coalitions like these.

City and state TB controllers in many locales need increased staff and other resources to train and educate their own staff; to educate other healthcare providers in their communities, including private providers; to work with community

groups, especially those among the foreign-born; and to educate the general public to secure and sustain public understanding and support of tuberculosis control in their communities.

Good TB programs are not run by poorly trained personnel

To eliminate TB in the United States and contribute to global TB control, the U.S. also will need to recruit, train and maintain a professional cadre of dedicated public health practitioners. Educational materials and training programs will be needed for nurses, physicians, outreach workers and program managers, among others.

The Division of Tuberculosis Elimination,

through its Communications & Education Branch, has provided national leadership in the development of materials for education and training of healthcare workers, community leaders and people with, or at risk for, tuberculosis. The materials include the *Core Curriculum on Tuberculosis: What the Clinician Should Know*, The TB Information Guide CD-ROM and the Self-Study Modules on Tuberculosis. Additional materials have been produced by the three CDC-funded Model Tuberculosis Centers: the Francis J. Curry National Tuberculosis Center (San Francisco), the Charles P. Felton National Tuberculosis Center at Harlem Hospital (New York City), and the New Jersey Medical School National Tuberculosis Center (Newark, NJ).

Figure 1

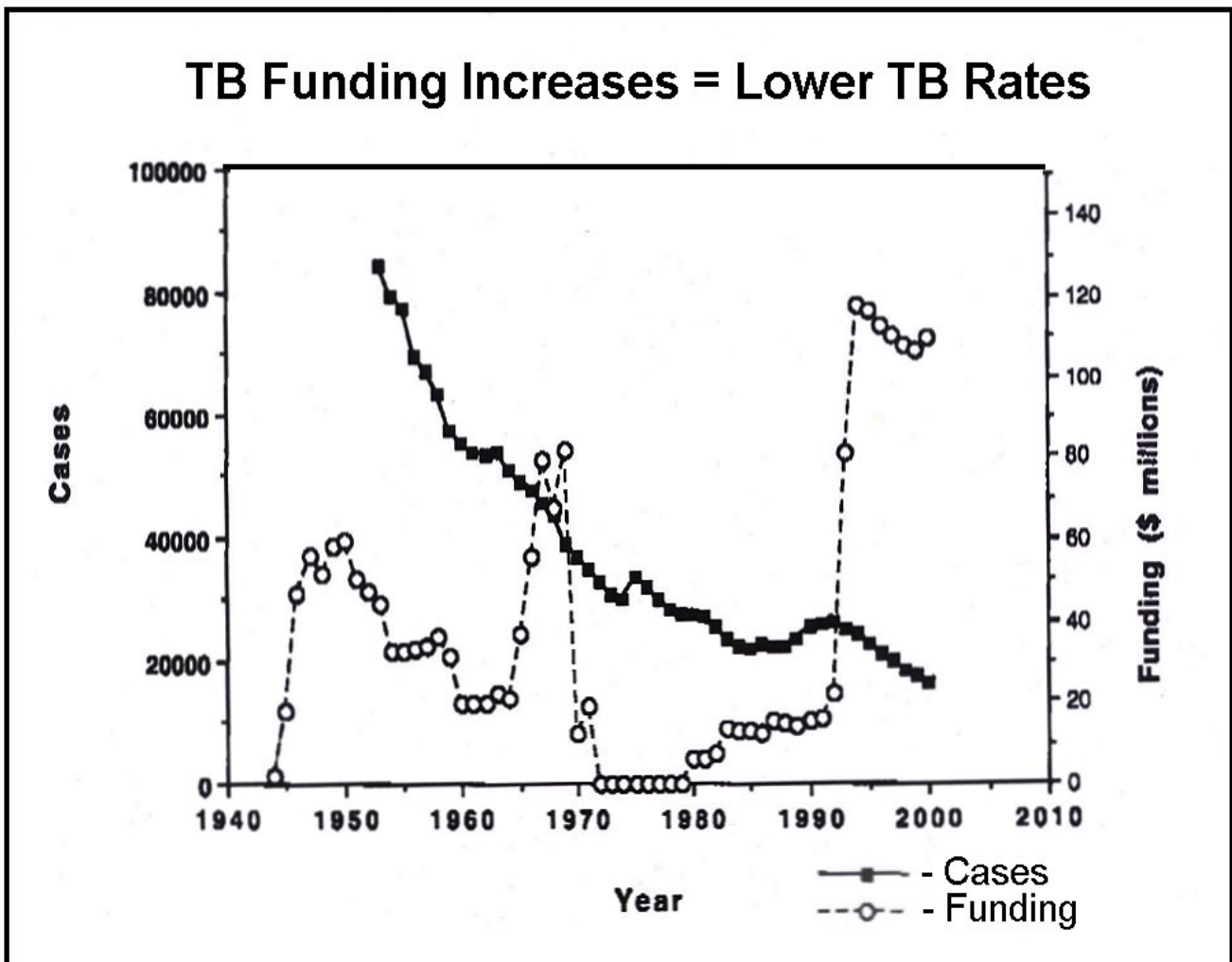


Figure 2

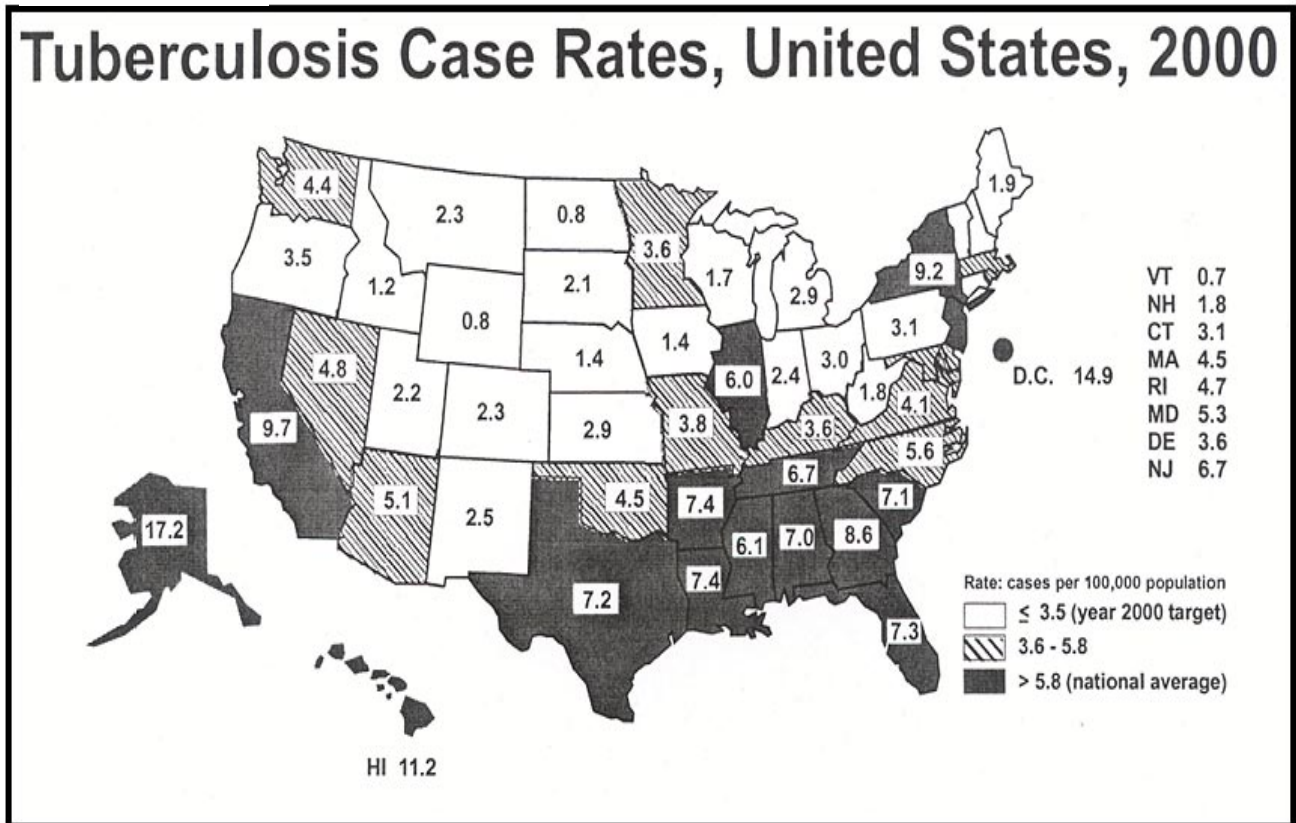


Figure 3

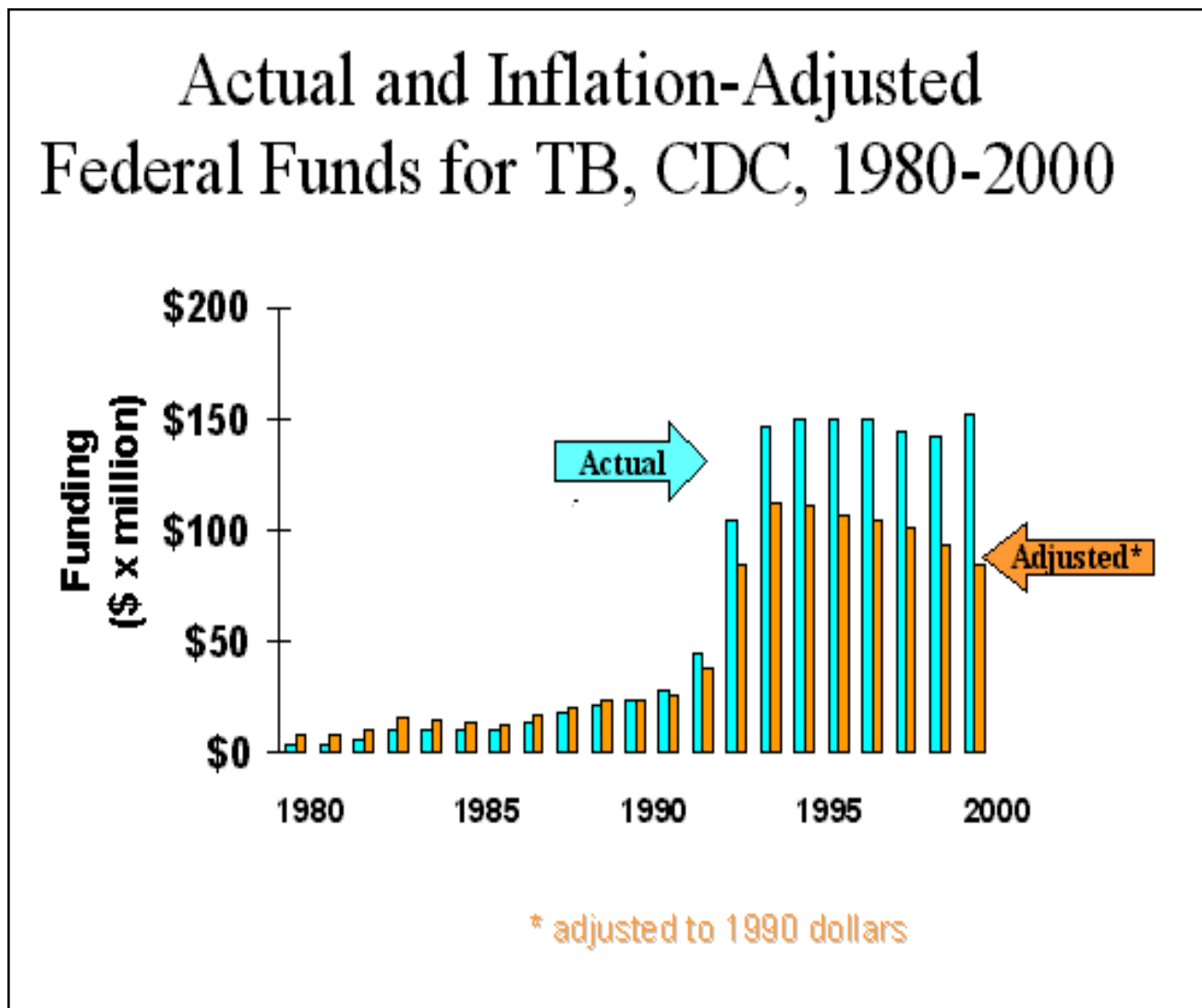


Figure 4

FY 2002 CDC TB Grants

Total: \$110,986,401

Alabama \$1,384,672	Idaho \$149,011	Montana \$150,000	Puerto Rico \$873,712
Alaska \$951,280	Illinois \$986,811	N. Marianas \$320,850	Rhode Island \$482,515
Arizona \$956,158	Indiana \$723,186	Nebraska \$182,898	Samoa \$61,402
Arkansas \$979,008	Iowa \$482,720	Nevada \$427,881	San Diego \$2,329,961
Baltimore \$878,171	Kansas \$353,665	New Hampshire \$322,244	San Francisco \$4,075,480
California \$7,970,768	Kentucky \$1,076,274	New Jersey \$5,810,360	South Carolina \$1,237,184
Chicago \$2,871,933	Los Angeles \$5,985,637	New Mexico \$402,756	South Dakota \$221,106
Colorado \$443,168	Louisiana \$1,368,383	New York City \$18,976,020	Tennessee \$1,519,896
Connecticut \$931,064	Maine \$176,295	New York State \$4,896,007	Texas \$6,111,767
District of Columbia \$1,100,049	Marshall Islands \$50,713	North Carolina \$1,828,880	Utah \$366,940
Delaware \$364,766	Maryland \$1,575,892	North Dakota \$153,210	Vermont \$101,174
Detroit \$610,359	Massachusetts \$2,221,611	Ohio \$1,128,620	Virgin Islands \$70,610
Florida \$6,414,683	Michigan \$1,013,384	Oklahoma \$722,124	Virginia \$1,339,323
Georgia \$2,600,697	Micronesia \$154,623	Oregon \$697,299	Washington \$1,499,082
Guam \$381,487	Minnesota \$761,273	Palau \$97,838	West Virginia \$329,560
Hawaii \$1,272,068	Mississippi \$1,014,814	Pennsylvania \$788,355	Wisconsin \$337,641
Houston \$2,729,239	Missouri \$745,553	Philadelphia \$1,280,318	Wyoming \$163,971

Figure 5

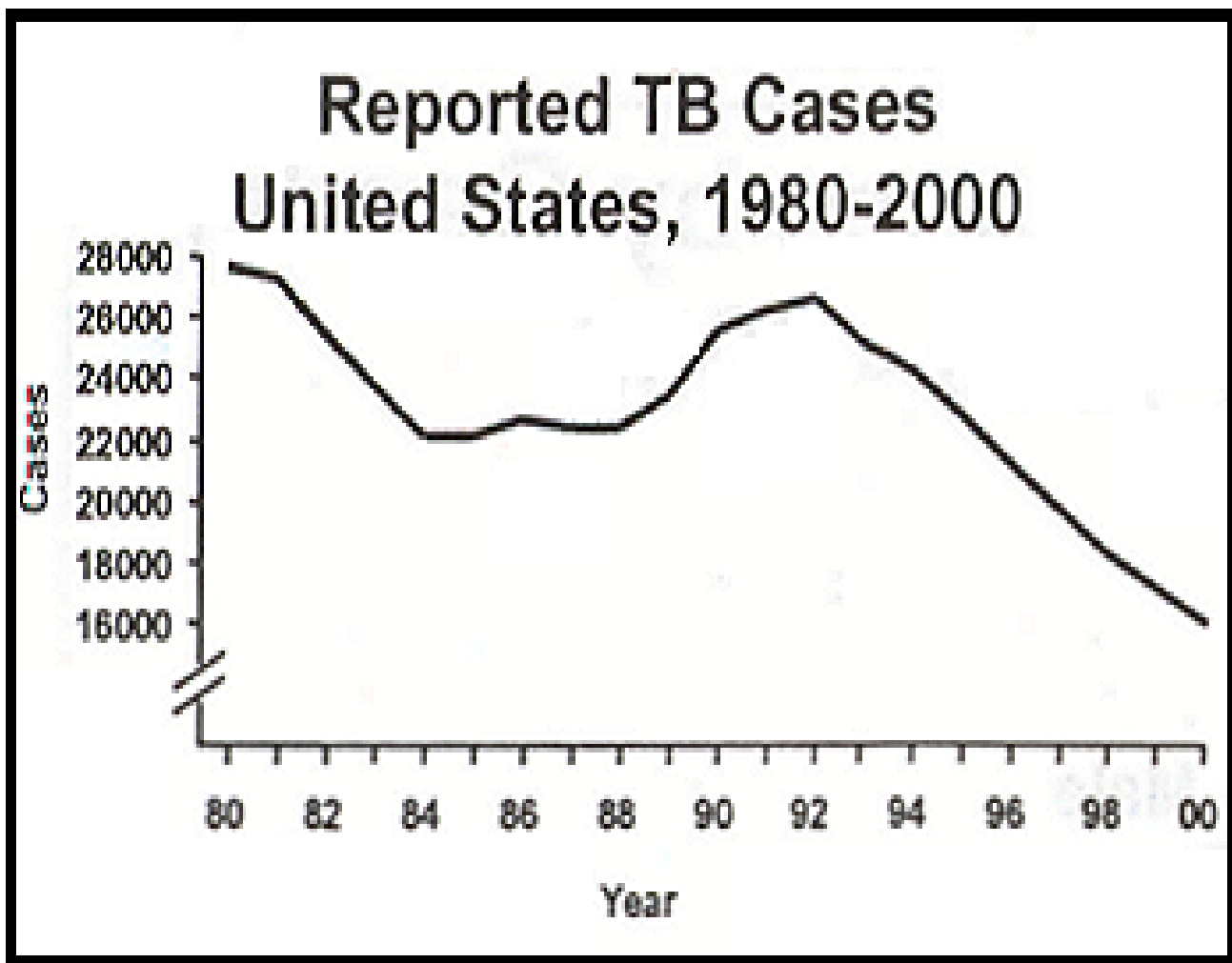


Figure 7

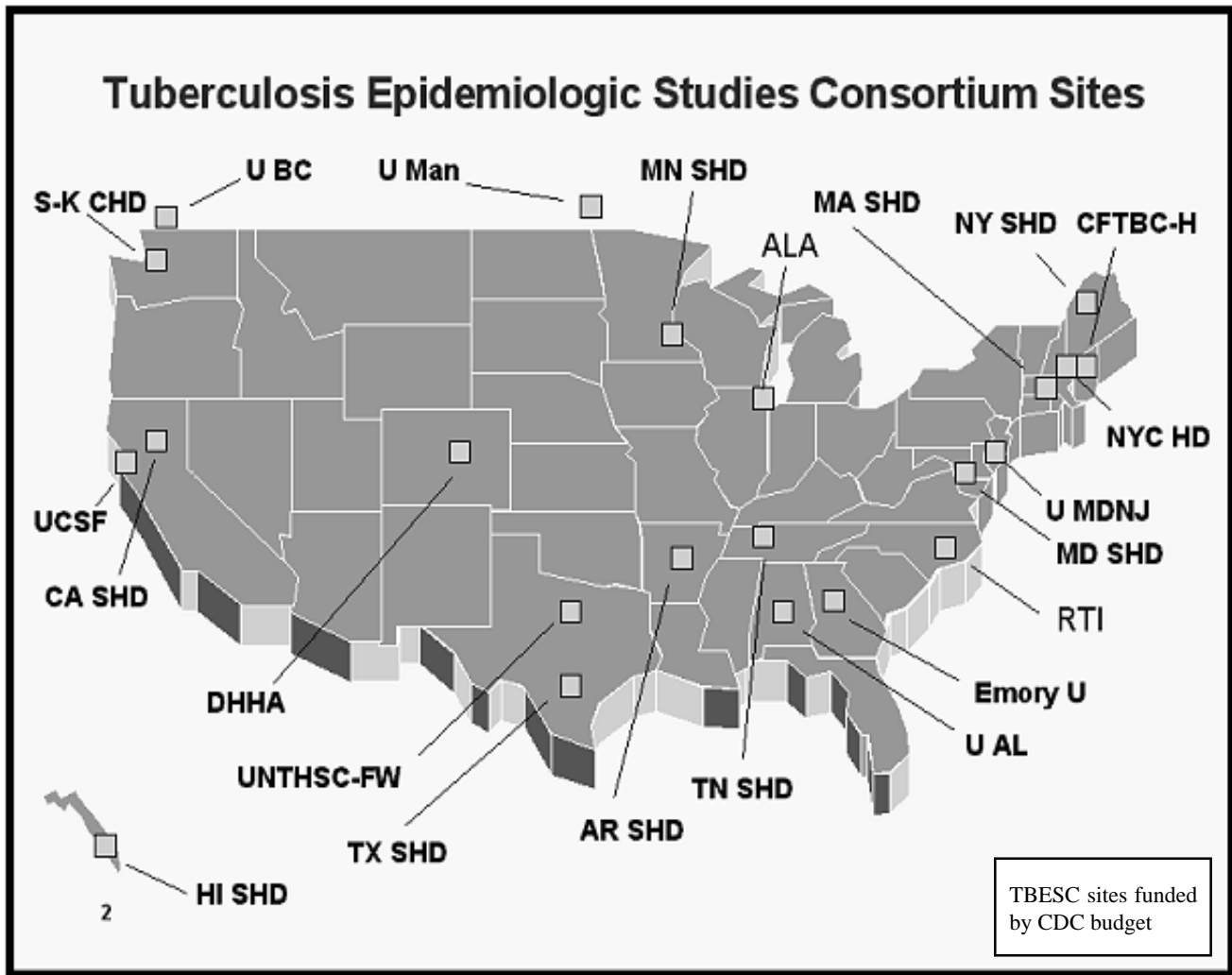
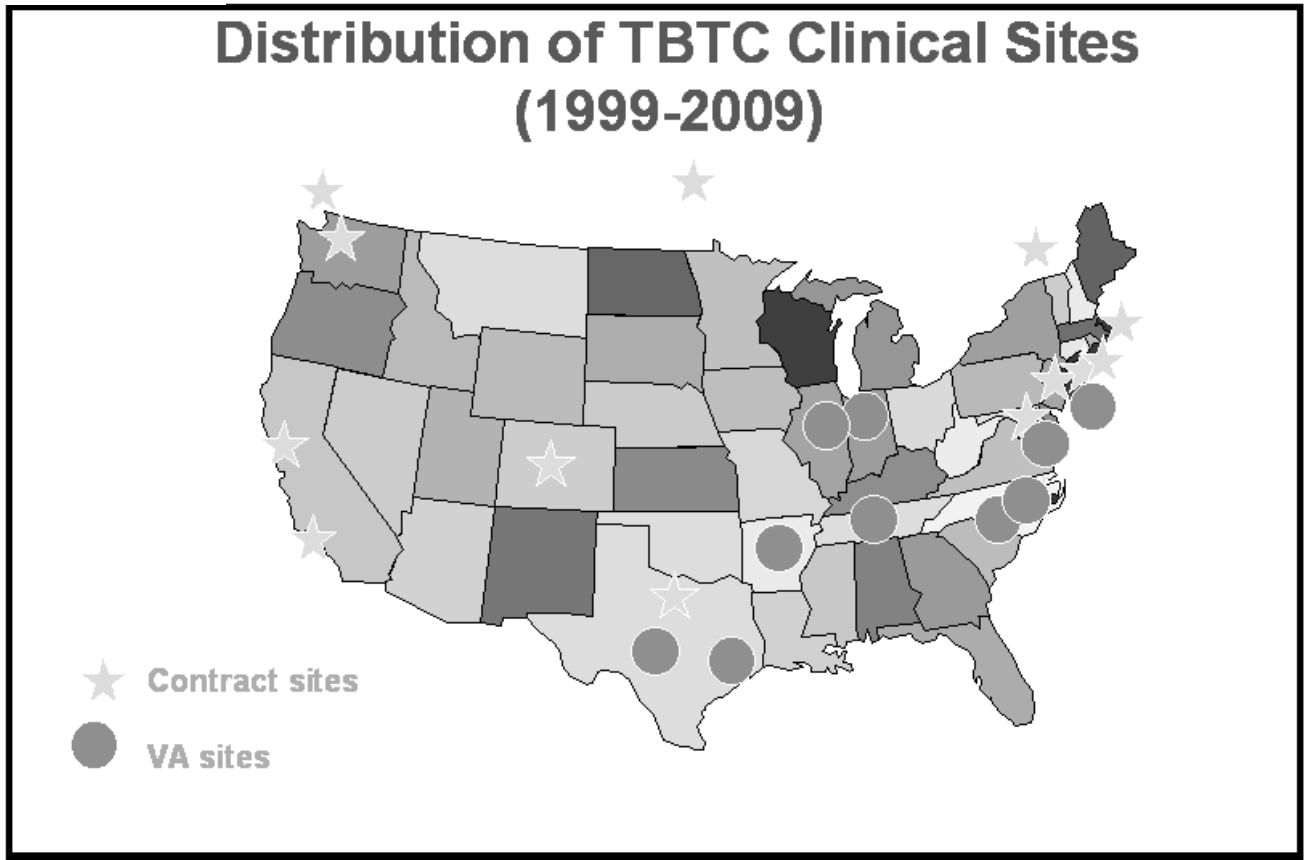


Figure 8



For more information on this report:

National Coalition for the Elimination of Tuberculosis

c/o American Lung Association

1726 M Street, NW, Suite 902

Washington DC 20036-4502

(202) 785-3355

<http://www.lungusa.org/diseases>

For more information on tuberculosis:

Division of Tuberculosis Elimination

National Center for HIV, STD and TB Prevention

U.S. Centers for Disease Control and Prevention

<http://www.cdc.gov/nchstp/tb>

World Health Organization

<http://www.who.int/gtb/>