• Questionnaire data should not be collected over the telephone nor by giving the participants a form to fill out by themselves. Data need to be acquired by personal contact between the participant and program staff. Only after 5 or 6 weeks into the program were participants able to fill out the self-monitoring information accurately.
• Many of the participants in the study were on hypertension medication. For most of them, the medication required included a beta blocker which made the cardiovascular step test data invalid. In addition, the step test for large obese participants proved painful and resulted in incomplete test results.

Fourth, oversubscribing is needed for beginning a program of this type. Out of a total of 209 persons who responded to program advertisements, 70 persons actually attended the intervention program. However, since the first two interventions, the program has been oversubscribed with more than 400 additional persons having participated in this nutrition exercise program (the program has been repeated 9 times).

Finally, CHAPP was designed to produce a change in health attitudes and behavior in a population at high risk for cardiovascular problems, yet typically resistant to interventions associated with health promotion. Rather than being imposed on the community from the outside, the impetus for this intervention came from the targeted community and its members, who formed a community coalition. The coalition members studied the actual and perceived social and health problems existing in the target community and selected cardiovascular disease as its focus because it is the leading health problem in the area.

They determined that there was a need for programs to educate and assist people in their community to alter their nutrition and exercise patterns. Working with a committed coalition, the CHAPP staff developed a culturally sensitive intervention that incorporated techniques to minimize attrition. This step not only resulted in high participation rates, but also it resulted in significant reductions in blood pressure and weight. This finding should provide encouragement to public health workers seeking to bring about similar behavior change in the community where such changes can have a significant impact on health.

Tuberculosis: an Increasing Problem Among Minorities in the United States

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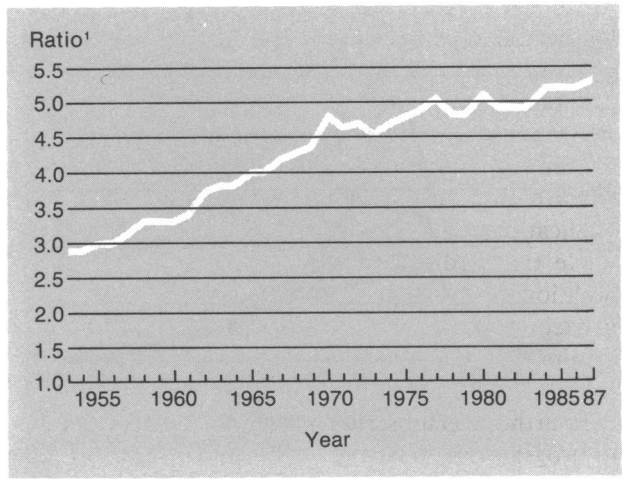
Synopsis

Although the number of tuberculosis cases reported annually in the United States has decreased markedly during the past three and a half decades, the decrease among whites has been considerably greater than among nonwhites. As a result of this widening gap, nearly two-thirds of the cases reported in 1987 occurred in minority populations and, for the first time in history, the number of cases among blacks exceeded the number of cases among non-Hispanic whites. From 1985 to 1987, tuberculosis among blacks increased 6.3 percent and among Hispanics, by 12.7 percent, but it decreased 4.8 percent among non-Hispanic whites. Much of the increase appears attributable to tuberculosis occurring among persons infected with the human immunodeficiency virus (HIV). Although there are many obstacles to the elimination of the disease in minority populations, numerous strategies have been developed and are being implemented to address this situation.

THE NUMBER OF REPORTED tuberculosis cases in the United States has decreased from 84,304 in 1953 (when uniform national reporting of tuberculosis was initiated) to 22,517 in 1987—a reduction of 73.3 percent. Over the same period, the annual risk of tuberculosis decreased from a case rate of 53.0 per 100,000 population to 9.3 per 100,000—a reduction of 82.5 percent. However, the decrease has been considerably greater among whites than nonwhites. As a result, the ratio of the annual risk of tuberculosis (TB) among nonwhites to the risk among whites has risen from 2.9 in 1953 to 5.3 in 1987 (fig. 1). The purpose of this report is to describe the current trends and epidemiology of tuberculosis in minority populations in the United States, as well as the efforts and resources being used to address this problem.

Figure 1. Ratio of reported tuberculosis case rates, nonwhite to white, United States, 1953–87



[1] Rate per 100,000 population.

Recent Trends

From 1981 through 1984, the number of persons reported with tuberculosis declined by an average of 1,706 cases (or 6.7 percent) per year, from 27,373 cases in 1981 to 22,255 cases in 1984. Beginning in 1985 this pattern changed. The decline was only 0.2 percent in 1985 to 22,201 cases; in 1986, there was a 2.6 percent increase to 22,768 cases; in 1987, the decline was 1.1 percent to 22,517 cases, a rate of 9.3 per 100,000 population. Use of the trend for 1981–84 to calculate expected cases yields an estimate of more than 9,000 excess cases in the United States during 1985–87.

From 1985 to 1987, increases in tuberculosis cases occurred among blacks (6.3 percent) and Hispanics (12.7 percent), but there was a 4.8 percent decrease in non-Hispanic whites. Increases in blacks and Hispanics were largest in the 25- to 44-year age group (17 percent and 27 percent, respectively).

Although increases in tuberculosis cases have been reported from several areas, the largest increase has occurred in New York City where, from 1980 to 1987, the number of persons reported with tuberculosis has increased by 45 percent. Increases have been most pronounced in blacks (79 percent) and in Hispanics (115 percent), especially in the 25- to 44-year age group where increases of 152 percent in blacks and 216 percent in Hispanics have been observed. Figure 2 depicts the trend among blacks. In contrast, there was a marked decline in cases among non-Hispanic whites (40 percent), except in the 25- to 44-year age group where a 37 percent increase was observed.

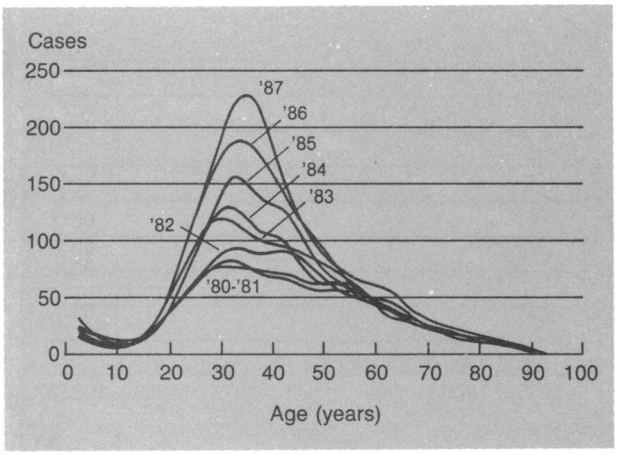
As previously reported (*1*), there is evidence that the human immunodeficiency virus (HIV) epidemic is the major factor causing the recent change in tuberculosis morbidity trends. Immunosuppression resulting from HIV infection allows latent tuberculous infection to progress to clinical disease. Because the prevalence of latent tuberculous infection is higher in minorities than among non-Hispanic whites (*2*), clinical tuberculosis is likely to be more common among HIV-infected minority populations than among HIV-infected non-Hispanic whites.

Tuberculosis in Minorities—1987

Of the 22,517 cases of tuberculosis reported in the United States in 1987, 22,453 cases were in persons of known age and race; in only 64 cases was the age or race of the patient not known (table 1). Of these, 51 percent were white (including white Hispanics) and 49 percent were nonwhite (8,207 blacks, 2,476 Asians and Pacific Islanders, and 317 American Indians and Alaskan Natives) (*3*). The overall case rate for whites was 5.7 per 100,000 population, and for nonwhites it was 29.3 per 100,000 population. If the nonwhite population had experienced the same age-specific morbidity rates as the white population, there would have been only 1,638 tuberculosis cases among nonwhites in 1987 instead of the observed 11,000. Thus 9,362, or 85.1 percent, of the reported cases in nonwhites can be considered excess cases.

Among 22,394 tuberculosis cases with the patient's race and ethnicity known, 35.9 percent (8,048) occurred among non-Hispanic whites, and

Figure 2. Reported tuberculosis cases in blacks, New York City, 1980-87



64.1 percent (14,346) occurred among racial and ethnic minorities. The distribution by minority group is shown in table 2. The overall risk of tuberculosis (compared with the case rate of 4.3 per 100,000 population among non-Hispanic whites) was 11.2 times larger for Asians and Pacific Islanders, 6.4 times larger for non-Hispanic blacks, 4.7 times higher for American Indians and Alaskan Natives, and 4.3 times higher for Hispanics (table 2).

The age distribution of patients with tuberculosis reported in 1987 differed markedly between minorities and non-Hispanic whites. Among non-Hispanic whites, the peak age group was 70 to 74 years, while in minorities the peak age group was 30 to 34. The median age of non-Hispanic white patients was 62 compared to 39 for minorities.

Specific Minority Populations

Non-Hispanic blacks. Of the 14,346 cases among minorities, 56.2 percent were in non-Hispanic black patients. In 1987, for the first time, cases in blacks exceeded the number in non-Hispanic whites. Sixty-eight percent of the cases in blacks were in males. The largest number of cases occurred in the 35- to 39-year age group, and the median age was 41 years.

Thirty-five percent of blacks with tuberculosis were less than 35 years old, the age group for which isoniazid preventive therapy is routinely recommended for persons with asymptomatic tuberculous infection. Assuming that most of these persons had been infected for a period of years before the onset of illness, most of these cases were potentially preventable if the patients had been identified as infected and given preventive therapy.

Cases in blacks were reported from 26 percent of the nation's 3,138 counties, primarily on the eastern seaboard, in the southeastern States, and California (fig. 3). Nine States reported nearly two-thirds of the tuberculosis cases in blacks: New York (18 percent), Florida (10 percent), Georgia (7 percent), California (6 percent), Illinois (6 percent), Texas (6 percent), New Jersey (4 percent), South Carolina (4 percent), and North Carolina (4 percent) (*3*).

Hispanics. Of the 14,346 tuberculosis cases among racial and ethnic minorities, 24.3 percent were in Hispanic patients, and 67 percent of these patients were males. The median age of the Hispanic patients was 35 years, the age group for whom preventive therapy is routinely recommended for persons with tuberculous infection. Thus, half may have been potentially preventable. Tuberculosis cases among the Hispanics were reported from 12 percent of the nation's counties (fig. 3). Seventy-six percent were reported from three States: California (39 percent), Texas (19 percent), and New York (18 percent) (*3*).

Forty-seven percent of the Hispanic patients were born in the United States or its Territories, 52 percent were foreign-born, and for 1 percent there was no information on place of birth. Among the foreign-born Hispanic patients with country of origin known, 65 percent were from Mexico, 6 percent were from El Salvador, 5 percent were from Cuba, and 24 percent were from 30 other countries. Among Hispanics born in the United States or its Territories, 14.3 percent were from Puerto Rico. Of the foreign-born Hispanic patients, 20 percent developed tuberculosis within the first year of arrival in the United States. An additional 8 percent developed tuberculosis within the second year after arrival.

Fifty percent of all the Hispanic patients were younger than 35 years at the time of case report. Among the foreign-born Hispanics, 57 percent were less than 35 years old at the time of case report, and an additional 20 percent who were 35 or older at the time that the disease was reported were under 35 on arrival in the United States. Thus, 77 percent of the foreign-born Hispanics were under 35 at entry into the United States, and their cases were potentially preventable.

Asians and Pacific Islanders. Seventeen percent of the cases in minorities were in Asians and Pacific Islanders. Fifty-six percent were in males, and 13

Table 1. Reported tuberculosis cases and cases rates in whites and nonwhites and estimated excess tuberculosis morbidity in nonwhites, by age, United States, 1987

Age group (years)	White [1]		Nonwhite [1]				Excess cases [5]	
	Reported cases	Case rate [2]	Reported cases	Case rate [2]	Rate ratio [3]	Expected cases [4]	Number	Percent
0–4	318	2.2	355	10.2	4.6	77	278	78.3
5–14	225	0.8	276	4.1	5.1	53	223	80.8
15–24	788	2.5	983	14.3	5.7	172	811	82.5
25–44	3,029	4.6	4,517	38.5	8.4	540	3,977	88.0
45–64	3,041	6.7	2,787	47.7	7.1	392	2,395	85.9
65 or older	4,052	13.6	2,082	70.1	5.2	404	1,678	80.6
Total	11,453	5.7	11,000	29.3	5.1	1,638	9,362	85.1

[1] White includes Hispanic whites. Nonwhite includes blacks, Asians and Pacific Islanders, and American Indians and Alaskan Natives. Sixty-four cases with race or age or both unknown were excluded from this analysis.
[2] Cases per 100,000 population.
[3] Nonwhite rate to white rate.
[4] Age-specific rates for whites multiplied by the 1987 population estimates (Bureau of the Census) for nonwhites in corresponding age groups. Total expected cases is the sum of expected cases in each age group.
[5] Reported cases minus expected cases.

percent were in persons in the 25- to 29-year age group. The median age was 38 years. Cases were reported from 11 percent of the nation's counties, primarily from the West Coast and the Northeast (fig. 3). Sixty-six percent of the cases were reported from five States: California (43 percent), Hawaii (7 percent), New York (6 percent), Texas (5 percent), and Illinois (5 percent) (*3*).

Ninety-three percent of the cases were among Asians and Pacific Islanders who were foreign-born. Of these, 30 percent were from Cambodia, Laos, and Vietnam; 27 percent were from the Philippines; 13 percent were from the Republic of Korea; 10 percent were from the People's Republic of China; and 20 percent were from 45 other countries. Of the foreign-born Asian and Pacific Islander patients, tuberculosis developed within the first year of arrival in the United States in 34 percent. An additional 9 percent developed disease within the second year.

Among the foreign-born Asian and Pacific Islander patients, 44 percent were less than 35 years old at the time of case report. An additional 14 percent who were 35 or older at the time of reported disease were younger than 35 on arrival in the United States. Thus, 58 percent of foreign-born Asian-Pacific Islander patients were less than 35 years at entry into the United States, and their illness was potentially preventable.

American Indians and Alaskan Natives. Three-hundred and seventeen (2.2 percent) of the cases in minorities were in American Indians and Alaskan Natives. The median age of the American Indian and Alaskan Native patients was 47 years and, for the 30 percent who were under 35, their disease was potentially preventable. Fifty-seven percent of the cases were in males. Ninety-seven percent of the cases were reported from 25 States with reservations, but from only 4 percent of the nation's counties (fig. 3). Seven States reported 72 percent of the cases: Arizona (19 percent), Oklahoma (12 percent), Alaska (11 percent), Washington (9 percent), New Mexico (8 percent), California (7 percent), and South Dakota (6 percent) (*3*).

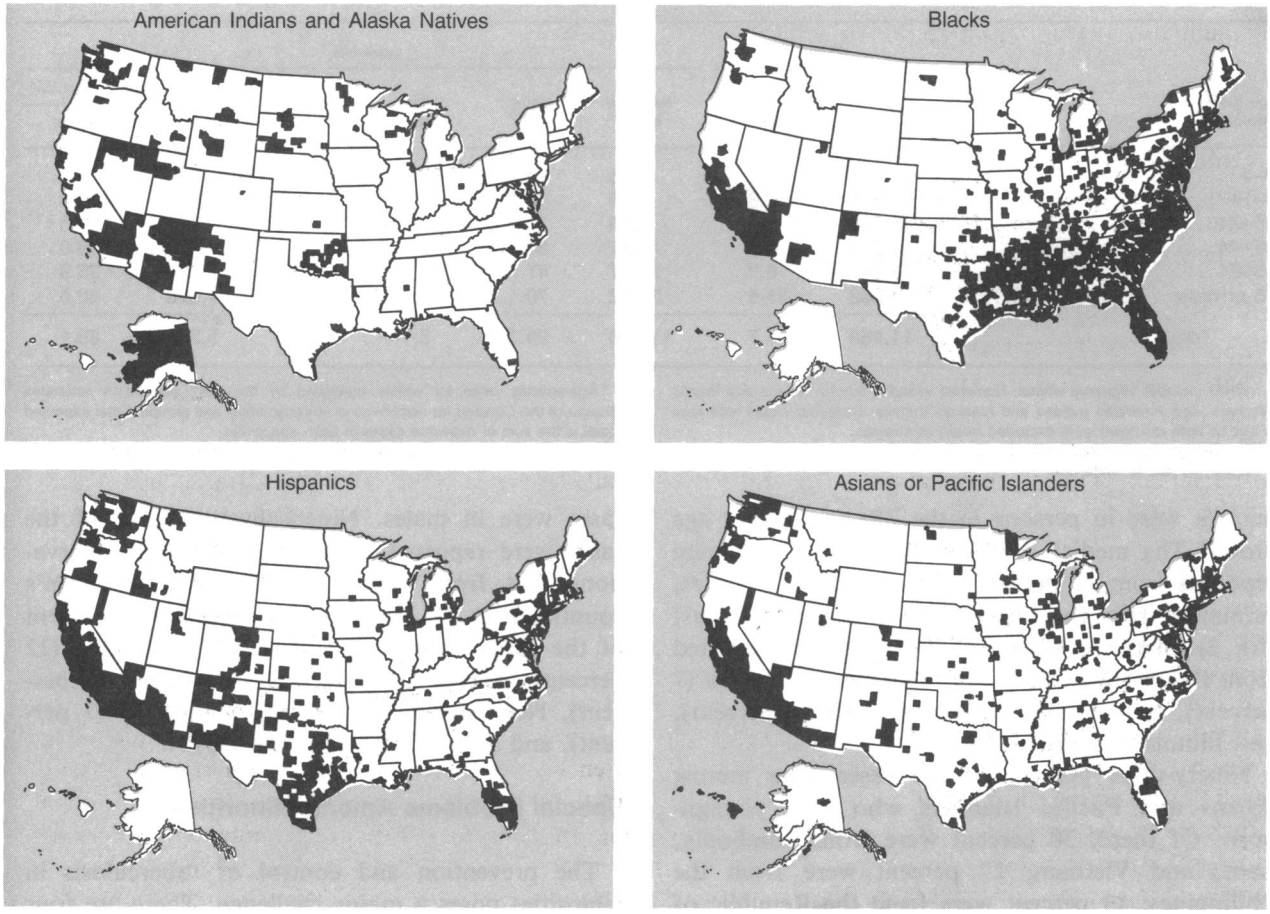
Special Problems Among Minorities

The prevention and control of tuberculosis in minorities poses a major challenge. There are four special problems that we want to address: noncompliance, intravenous drug use, HIV infection, and tuberculosis in correctional institutions.

Noncompliance. In all racial-ethnic groups, patient noncompliance with therapy is a major issue. Although no data are available for specific race-ethnic groups, overall, less than 62 percent of tuberculosis patients reported with positive sputum convert to negative within 6 months (unpublished data, Centers for Disease Control (CDC)). With modern treatment regimens, this percentage should be close to 95 percent. Only 75 percent of patients started on chemotherapy actually complete it within a 24-month period (unpublished data, CDC). Less than 71 percent of infected contacts placed on preventive therapy complete the prescribed course of treatment (unpublished data, CDC).

There are many reasons for patient noncompliance. Many tuberculosis patients are poor, and a great deal of their time and effort must be devoted to meeting day-to-day economic needs and to satisfying basic priorities such as food, shelter, and safety. If the health and welfare system can assist

Figure 3. United States counties reporting tuberculosis cases in minorities, 1987



patients with these problems, successful treatment of tuberculosis disease and infection is more likely.

Intravenous drug use and HIV infection. Intravenous drug users (IVDUs) require special consideration because they are at high risk for tuberculous as well as HIV infection. Tuberculin skin test surveys among heroin addicts in New York City showed that the prevalence of tuberculous infection in this population was considerably higher than in the city-wide population, even after adjustment for age, race, and economic status (*4*). Even before the HIV epidemic, opiate-dependent patients in New York City had a higher prevalence of tuberculosis than did nondependent patients (*5*).

HIV infection among IVDUs appears to be responsible for much of the recent increase in tuberculosis in New York City and New Jersey. Matching tuberculosis and AIDS registries in New York City revealed that 57 percent of the patients with both tuberculosis and AIDS were IVDUs (*6*). HIV infection among this group is the most likely reason for the rapid increase of tuberculosis in New York City where 50 percent to 60 percent of the IVDUs are HIV seropositive (*7*), and 20 percent to 30 percent of minority IVDUs have tuberculous infection (*2*).

Tuberculosis in correctional facilities. Inmates in correctional facilities have disproportionately high tuberculosis case rates and, in some areas, the rates have recently been increasing (*8,9*) and unpublished data of CDC. Survey data reveal that prison and jail inmates have TB case rates averaging nearly four times the rate among nonincarcerated adults ages 15–64 years (unpublished data, CDC). These high tuberculosis rates are attributable to several factors: (*a*) the higher proportion of minorities within correctional facilities, (*b*) the high proportion of inmates with a history of intravenous drug use, (*c*) the high proportion of inmates with HIV infection, and (*d*) transmission of tuberculosis within correctional facilities. Because a large number of inmates are released from correctional facil-

ities each year, tuberculosis transmission within correctional facilities represents a problem for the community as well as the correctional facility (*10*).

Strategies and Resources

Resources allocated to the control and elimination of tuberculosis in minorities depend primarily on State and local taxes. However, Federal dollars have become increasingly important, especially for dealing with tuberculosis in minority populations.

In 1988 Federal funds totaling more than $7 million were awarded to 35 State, 10 major metropolitan, and 2 Territorial health departments. These funds were used to hire outreach workers who have greatly enhanced tuberculosis control efforts among minority populations. Working under the supervision of health professionals, outreach workers have served a twofold purpose. In the field, they have acted as extensions of the clinician and nurse, locating TB patients, reminding them of appointments, resolving basic life problems, encouraging compliance, delivering medication, observing its ingestion, and identifying, tracing, and examining contacts. In the clinic setting, outreach workers have served as a liaison between the clinic staff and the patient, helping to bridge cultural and language gaps and educating patients.

In most areas outreach workers have been recruited from the specific patient population group targeted for service. By 1988 a total of 215 outreach workers had been hired using Federal funds. Of these, 127 (59 percent) were from minority groups; 29 percent were black, 19 percent were Hispanic, 9 percent were Asians or Pacific Islanders, and 1 percent were American Indians. Approximately 38 percent of these persons were bilingual. Their language skills included Spanish, Vietnamese, Creole (Haitian), Cambodian, Laotian, Chinese, Korean, Filipino, and several other languages.

The availability of outreach workers has made it possible to extend the use of directly observed therapy (DOT) to enhance patient compliance. DOT is especially useful if the patient cannot or will not take medicine as prescribed because of lifestyle. In these situations, an outreach worker is assigned the responsibility of delivering the medication and watching the patient take the prescribed dose for that day. Often meetings are arranged at sites and times convenient for the patient. Job sites, street corners, bars, and rescue missions are frequent meeting places. Through the use of outreach workers and DOT, we estimate that spending $7 million in Federal funds has saved $28 million in long-term hospitalization costs. At any given time about 10 percent of tuberculosis patients are being treated with DOT (unpublished data, CDC).

Table 2. Reported tuberculosis cases and case rates, by race, ethnicity, United States, 1987

Race, ethnicity [1]	Number	Percent	Case rate [2]
White, non-Hispanic	8,048	35.9	4.3
Black, non-Hispanic	8,067	36.0	27.6
Hispanic	3,485	15.6	18.7
Asian, Pacific Islander	2,477	11.1	48.1
American Indian, Alaska Native	317	1.4	20.0
Total	22,394	100.0	...

[1] Rate per 100,000 population. Based on 1985 population estimate.
[2] Excludes 123 cases with race or ethnicity of patient unknown.

Outreach workers have come up with other innovative ways of encouraging patient compliance. They have recruited other persons within the community, such as bartenders, policemen, and so forth, to assist them in locating and motivating difficult patients.

Outreach workers have also used incentives to improve patient compliance. These incentives are often food, clothing, or tokens for transportation, but they may also include services (such as storytelling or babysitting) or special remembrances (such as a birthday cake or flowers). Money for these incentives has sometimes come from the outreach worker's pocket, but increasingly, constituents and affiliates of the American Lung Association (ALA) have been providing support.

The ALA continues to work with health department tuberculosis control programs in States and cities throughout the country as advocates of adequate resources for tuberculosis control and as sponsors of public and professional education programs. The ALA is increasingly involving members of minority population groups in its activities. For example, in Los Angeles radio and television public service announcements and talk shows are targeted to, and in the language and cultural traditions of, minority populations.

The Centers for Disease Control is also funding programs targeted to special minority populations, especially intravenous drug users. Because many drug treatment programs require repeated (often daily) contact with clients for extended periods, there is a unique opportunity for drug treatment program staff to prevent tuberculosis by providing directly observed preventive therapy. Correctional facilities offer similar opportunities for providing directly observed preventive therapy to high-risk

clients. In FY 1989, CDC awarded $3,500,000 to fund these programs.

Programs for immigrants and refugees. In FY 1987, foreign-born persons in the United States had an estimated tuberculosis case rate of 120 per 100,000 population, a 13-fold higher risk than the general population (unpublished data, CDC). Immigrants and refugees coming to the United States currently must undergo a physical and mental examination abroad. These examinations are performed by local physicians designated by Embassies and Consulates of the U.S. Department of State. The medical examinations are performed to identify, for the Department of State and the Immigration and Naturalization Service, applicants for admission with excludable mental and physical conditions, as specified in the Immigration and Nationality Act. "Active tuberculosis" is one of these conditions.

Examining physicians follow a detailed medical examination manual prepared by the Centers for Disease Control's Division of Quarantine. Any excludable or nonexcludable medical condition which is suspected or detected as a result of the screening examination may require a more comprehensive medical evaluation and may necessitate hospitalization or treatment before a visa is issued.

In addition, refugees entering the country from southeast Asia are examined abroad by the Intergovernmental Committee for Migration (ICM), under the auspices of CDC (*11*). Persons identified with tuberculosis are placed on an intensive 4-drug, 6-month chemotherapy regimen before they depart for the United States. During FYs 1984–88 more than 2,200 refugees completed the therapy regimen.

Additionally, more than 2,800 close family contacts of persons with active tuberculosis were started on preventive therapy. These measures have reduced tuberculosis morbidity and the workload of State and local health departments in the United States.

CDC reviews the medical screening examinations provided to refugees in Vietnam who are bound for the United States under the Orderly Departure Program. Refugees arriving in Bangkok under this program are given a medical examination by the ICM within 24 hours after their arrival. This rescreening program ensures that current medical information is available before these refugees proceed to either a refugee processing center or directly to the United States.

In FY 1988 CDC awarded $4,200,000 in refugee grants to State and local health departments to conduct health assessments and to provide necessary therapy for refugees with tuberculosis disease or infection.

Future Directions

To address tuberculosis more effectively among minority populations in the future, staff of health department tuberculosis control programs must establish closer working relationships with specific minority populations, for example, by involving them in the planning and implementation of tuberculosis control services. Programs must be designed to meet the sometimes unique needs and demands of minority patients. Health department staff must be willing to modify, as necessary, methods of delivering services so that services are readily available, accessible, and acceptable to the patients for whom they are intended. This may, for example, necessitate providing translators, patient advocates, evening or weekend clinics, and holding clinics where minorities reside.

Another key element is the "empowerment" of minorities in the community. This step begins with public education. It is important for members of minority populations to understand tuberculosis; its impact on the community; how it is diagnosed, treated, and prevented; and what services are available to them. It is crucial that minority populations be given some control over the programs and resources which will be used to eliminate tuberculosis in their communities.

A discussion of the adequacy of resources for tuberculosis prevention and control efforts is beyond the scope of this article. However, it is clear that to achieve the Department's goal of the elimination of tuberculosis in the United States by the year 2010 (*12*), additional resources must be located and applied to the prevention of tuberculosis among latently infected persons while maintaining current efforts to detect and treat persons who already have clinical disease. It is clear that the primary focus of these preventive and curative interventions must be minority populations.

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Tuberculosis Among American Indians of the Contiguous United States

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Synopsis

Paleopathologic findings provide strong evidence for the existence of tuberculosis in Andean populations of pre-Columbian America. Indirect evidence is available also to suggest its possible endemicity among some American Indian tribes who lived within the present-day contiguous United States before the arrival of Europeans. The available data suggest that tuberculosis became a major health problem in some tribes with increased population density and cultural changes after increased contact with European civilization, paralleling the deterioration in living conditions after relocation of the tribes to reservations.

By 1900, tuberculosis had become one of the most serious health problems among North American Indians. Tuberculosis control was hampered by the lack of a specific treatment, and only the advent of specific chemotherapy in an ambulatory setting brought a breakthrough. Mortality, morbidity, and risk of infection have all sharply decreased over the past three decades. However, tuberculosis incidence rates among American Indians remain well above rates in the white population. An intensified effort to identify those with tuberculosis and those at risk of tuberculosis as well as to develop compliance-enhancing strategies with treatment regimens will be necessary to eliminate tuberculosis from Indian reservations.

THE ADVISORY COMMITTEE for the Elimination of Tuberculosis in the United States has called for a fresh assault on the tubercle bacillus (*1*). The Indian Health Service, represented on the Committee, has developed specific guidelines for the elimination of tuberculosis from Indian reservations (*2*). The purpose of this review is to add some background information on the history of tuberculosis among Indian tribes of the contiguous United States. The history of the disease among Alaskan Natives has been described elsewhere in detail and was excluded from this review (*3-5*).

Epidemiology

Tuberculosis in pre-Columbian America. Tuberculosis in human beings has existed for at least 6,000 years (*6*). Acid-fast bacilli (AFB) have been documented in an Egyptian mummy with signs of spinal and pulmonary tuberculosis (*7*). Tuberculosis is