BUREAU OF TUBERCULOSIS CONTROL
NEW YORK CITY DEPARTMENT OF HEALTH

866

INFORMATION SUMMARY

HIGHLIGHTS

1. In 1998, 1,558 new cases of tuberculosis were reported in New York City, a 9.9% decrease from the 1,730 cases reported in 1997 and a 59.1% decrease from the 3,811 cases reported in 1992, the peak of the current epidemic. New York City's tuberculosis rate in 1998 was 21.3 cases per 100,000 persons, compared with 23.6 in 1997 and 52.0 in 1992.
2. Despite recent progress, New York City's 1998 tuberculosis rate is still more than three times the national rate of 6.8 per 100,000, and is higher than any other jurisdiction reporting more than 1,000 cases. The city's rate remains far above the national goal established for tuberculosis control by the year 2000, of 3.5 cases per 100,000 persons.
3. In 1998, 38 of New York City's tuberculosis patients had strains of *Mycobacterium tuberculosis* that were resistant to at least isoniazid and rifampin (the two most important medications available to treat tuberculosis), a 32.1% decrease from the 56 cases reported in 1997 and a 91.4% decrease from the 441 cases reported in 1992.
4. Directly observed therapy (DOT) and intensive case management continue to result in high rates of completion of therapy: of the cohort of patients diagnosed in 1997, who remained alive to complete treatment and did not move out of New York City, 1,327 (94.0%) have completed treatment. The index of completion increases to 95.4% if patients with multidrug-resistant tuberculosis, who require extended therapy, are excluded from the calculation.
5. Improved case management and infection control procedures have reduced transmission of infectious tuberculosis and led to decreases in the diagnosis of active tuberculosis in settings where it was flourishing in 1992: homeless shelters, prisons and hospitals. As the epidemic has been brought under better control among persons born in the United States, an increase has been observed in the proportion of total cases which are foreign-born. The trend toward a predominance of foreign-born cases has continued in 1998: 846 of 1998 cases were foreign-born (54.7%) and 700 U.S.-born (45.3%). In contrast, in 1992, only 17.7% of tuberculosis cases diagnosed in New York City were foreign-born. The increasing proportion of foreign-born cases may be at least in part responsible for the slight increase in the number of cases reported in the borough of Queens, and an increase in the number of cases aged 20 through 24 years.
6. The proportion of total cases that are infected with the human immunodeficiency virus (HIV) continued to decrease in 1998: 346 (22.2%) of 1998 cases were known to be HIV positive, compared with 448 (25.9%) of 1997 cases.
7. To reduce the burden of tuberculosis on future generations of New Yorkers, the Department of Health and the medical community must place greater emphasis on ensuring that persons infected with *Mycobacterium tuberculosis* complete a course of treatment for latent infection, especially if they are recently infected contacts to active cases or otherwise at high risk of progression to active disease. In 1997, 12,615 individuals started taking treatment for latent tuberculosis infection; 9,169 (72.7%) individuals received some or all of their care from Department of Health chest clinics.

Public health law mandates that health care providers report two groups of patients to the New York City Department of Health within 24 hours of detection:

1. All suspected and confirmed tuberculosis cases:
   - A smear (from any anatomic site) is positive for acid-fast bacilli
   - A nucleic acid amplification test (e.g., Amplicor®, Genprobe®)* result suggests *Mycobacterium tuberculosis*
   - A culture is positive for *Mycobacterium tuberculosis*
   - The individual has been started on two or more anti-tuberculosis medications for treatment of suspected or confirmed active tuberculosis
2. All children younger than 5 years with positive tuberculin skin tests

Mycobacteriology and pathology laboratories are required to report to the New York City Department of Health any bacteriologic findings which suggest or confirm tuberculosis:

- Acid-fast bacilli positive smears
- Cultures positive for Mycobacterium tuberculosis
- A nucleic acid amplification test (e.g., Amplicor®, Genprobe®)* result suggests *Mycobacterium tuberculosis*
- Results of susceptibility tests performed on *Mycobacterium tuberculosis* cultures
- Pathology findings consistent with tuberculosis, including the presence of AFB and granulomata

Information on ordering reporting forms is on the inside back cover.

*Product names are provided for identification purposes only, their use does not imply endorsement by the New York City Department of Health

NEW YORK CITY DEPARTMENT OF HEALTH
BUREAU OF TUBERCULOSIS CONTROL

INFORMATION SUMMARY: 1998

MISSION STATEMENT

The mission of the Bureau of Tuberculosis Control is to prevent the spread of tuberculosis and eliminate it as a public health problem in New York City. The goals of the tuberculosis control program are:

1 To identify all individuals with suspected or confirmed tuberculosis disease and ensure their appropriate treatment, ideally on a regimen of directly observed therapy.

2 To ensure that individuals who are at high risk for progression from infection to active disease (e.g., contacts of active cases, immunocompromised individuals, recent immigrants from areas where tuberculosis is widespread) receive preventive treatment and do not develop disease.

The Bureau achieves its goals through direct patient care, education, surveillance and outreach. Its mandated activities include the following:

1 Ensuring that suspected and confirmed cases of tuberculosis identified in all facilities in New York City are reported to the Bureau and documented on the computerized, confidential tuberculosis disease registry;

2 Conducting intensive case interviews and maintaining an effective outreach program so that tuberculosis cases remain under medical supervision until completion of a full course of treatment and identified contacts receive appropriate medical care;

3 Monitoring and documenting the treatment status of all patients with active tuberculosis;

4 Setting standards and guidelines, and providing consultation, on the prevention, diagnosis, and treatment of tuberculosis infection and disease in New York City, at no cost to the patient;

5 Operating clinical sites throughout New York City to provide state-of-the-art care for persons with suspected or confirmed tuberculosis disease and their close contacts, at no cost to the patient;

6 Ensuring care for persons who have or are suspected of having active tuberculosis disease, in accordance with New York State Public Health Law 2202, Article 22, Title 1, at no cost to the patient.

OVERVIEW OF ACTIVITIES
BUREAU OF TUBERCULOSIS CONTROL

The Bureau of Tuberculosis Control operates a multifaceted program that integrates clinical services, outreach services, case management, directly observed therapy, epidemiology and surveillance, and education and training of staff and providers. To ensure that treatment for tuberculosis meets acceptable standards, the Bureau monitors care received by every patient diagnosed with active tuberculosis in New York City, regardless of whether or not the patient receives treatment in a Department of Health clinic. The Bureau's activities are directed toward meeting objectives established by the Centers for Disease Control and Prevention for treatment of patients with tuberculosis and prevention of tuberculosis in persons infected with the causative organism, *Mycobacterium tuberculosis*; (see Appendix 1 for a list of these objectives). Program monitoring and evaluation are critical components of the Bureau's activities. Internal reports monitor trends and identify problems on a timely basis. Bureau staff use Continuous Quality Improvement, breakthrough projects and audits to review problems, propose changes for improvement, and monitor progress following the implementation of changes.

Directly Observed Therapy

Directly observed therapy (DOT) is a program in which individuals with active tuberculosis ingest their medication under the direct observation of a trained health care worker. This program ensures that persons with active disease receive individual attention and optimal medical supervision through their entire course of treatment. DOT is provided through Department of Health (DOH) clinics and outreach services, and private health-care providers funded by the New York State Department of Health, Medicaid and Ryan White Care Act Funds. Although it is labor intensive, DOT reduces hospitalizations, decreases the costs of medical care, and increases the number of individuals completing a full course of anti-tuberculosis treatment. DOT is now the standard of care for individuals with tuberculosis.

Clinical Services

The Clinical Services Unit operates nine chest clinics located throughout the City (see inside back cover). These clinics provide specialty care, including DOT, for individuals with active tuberculosis. The clinics also provide treatment for latent infection, especially to individuals at high risk for developing tuberculosis. Services include tuberculin skin testing, chest x-rays, sputum induction, blood tests, medical and nursing care, medications, social services, and HIV counseling and testing. All care is confidential, state-of-the-art, and free of charge for the patient.

In 1998, the Bureau's chest clinics provided care to 1,650 patients with confirmed or suspected tuberculosis. Of 1,558 patients who were diagnosed with tuberculosis in 1998, 614 (39.4%) received some or all of their care in the Bureau's chest clinics. These clinics provided care to a high proportion of patients with multidrug-resistant tuberculosis: of the 70 cases with multidrug-resistant tuberculosis on treatment in December 1998, 29 (41.4%) had received some or all of their treatment at Bureau chest clinics. The Bureau has led the drive to implement effective treatment programs for persons infected with tuberculosis in New York City: 78.1% (7,609/9,737) of all persons known to have started treatment for latent infection in 1998 did so at Department of Health Chest Clinics. A large proportion of patients served by these clinics were foreign born or uninsured. In 1998, 65% of patients receiving treatment for latent infection at one of the Bureau's chest clinics did not have Medicaid; therefore, the Department of Health was unable to receive reimbursement for their care.

Outreach Services

The Bureau's outreach workers educate, interview, and monitor hospitalized patients and outpatients; evaluate contacts of individuals with tuberculosis disease and ensure appropriate medical follow-up of contacts; and update patient information on the Bureau's city-wide tuberculosis registry. By law, the Bureau's outreach workers have the right to review in-patient and out-patient medical records of persons with suspected or confirmed tuberculosis. Outreach staff provide medical case management, locate and return patients to medical care, travel throughout the city to observe individuals as they ingest their medication, and test contacts of individuals with tuberculosis. Specialized outreach groups offer tuberculosis control services at the 30th Street Shelter, at Rikers Island

Correctional Facility, and at single occupancy hotels in Manhattan and the Bronx. The city operates a controlled treatment center at Goldwater Memorial Hospital for use when all other efforts have been exhausted, so that the most difficult-to-treat patients can complete a full course of treatment while the public health is safeguarded.

In 1998, outreach workers were responsible for providing DOT in the residences, places of employment or other meeting places of 681 tuberculosis patients who could not attend clinic on a regular schedule, and for returning to clinical care an average of 65 patients per month who had become non-adherent to therapy or who missed clinic appointments. Bureau outreach workers are playing an important role in efforts to increase completion of treatment for latent infection among patients at high risk for disease progression. They are instrumental both in interviewing patients to elicit the names of contacts, and in ensuring that contacts are appropriately evaluated and referred for medical care, if indicated. In 1998, 6,125 contacts received tuberculin skin testing by outreach staff.

The magnitude of the effort required to evaluate contacts to all potentially infectious tuberculosis cases is not captured by considering only confirmed tuberculosis cases: outreach workers must interview every patient who is initially reported to the Department of Health with a sputum smear positive for acid-fast bacilli (AFB). In 1998, 41.2% (391/949) of the patients initially reported to the New York City Department of Health with AFB-positive sputum smears and therefore assigned to outreach workers for interviews, were eventually found not to have tuberculosis.

Epidemiology and Surveillance

Surveillance and Central Registry staff ensure that all data reported to the Bureau are entered into a computerized tuberculosis registry. In addition to entering demographic and clinical data for the 1,558 confirmed cases reported in 1998, Central Registry staff entered data for 3,415 persons with suspected tuberculosis who were never confirmed as cases. Surveillance staff review the medical records of individuals with suspected tuberculosis and no bacteriologic evidence of disease to help determine whether or not such persons should be considered confirmed cases on the basis of clinical or radiographic findings: in 1998, surveillance workers reviewed medical records for 1,797 suspected cases, and their efforts contributed to the confirmation of tuberculosis disease in 214 patients who had no bacteriologic evidence of tuberculosis. Surveillance staff have placed special emphasis on identifying and reviewing the medical records of suspected cases whose only evidence of tuberculosis has been obtained through biopsy or autopsy, as a substantial proportion of cases confirmed on the basis of pathology findings may otherwise escape identification. Surveillance staff also encourage timely and thorough reporting by auditing laboratories throughout the City, and they help investigate possible instances of laboratory contamination.

Registry data are routinely analyzed by the Surveillance and Epidemiology staff to identify outbreaks, trends, and instances of possible laboratory contamination, and to research issues of clinical and operational importance. Surveillance staff identified 36 patients whose positive *Mycobacterium tuberculosis* cultures had resulted from laboratory contamination, and informed the medical providers of those patients that further evaluation was warranted and that medical treatment for tuberculosis might be unnecessary.

The epidemiology staff provides epidemiologic consultation to each of the five regions. The staff review all pulmonary culture positive cases to provide assistance in making assessment of the likelihood of transmission to the closest contacts and to evaluate the need to expand the concentric circle and test additional contacts in congregate settings. In 1998, epidemiology staff conducted 20 investigations to determine whether or not infectious tuberculosis patients had infected contacts in schools or workplaces. The unit conducts research on the epidemiology of tuberculosis disease and infection in New York City. The findings of this research are applied to modify clinical practices of the Bureau.

Education and Training

In addition to conducting orientation and ongoing in-service training for DOH staff and non-DOH professionals, the Education and Training Unit educates the public about tuberculosis. During 1998, the unit provided 160 training sessions for DOH staff; 10 semi-

nars and conferences for 615 non-DOH professionals; educational sessions for 3,600 members of the general public; and 2,100 responses to telephone inquiries. The unit also develops and distributes educational brochures, flyers, posters, publications, videos, and technical articles in English and various foreign languages: in 1998, 300,000 such publications and materials were distributed. In 1997, the New York City DOH developed a web site, http://www.ci.nyc.ny.us/health. The Bureau offers a large volume of material on the site, from clinic addresses and hours of services, to informational brochures for the general public, to information for health care providers, including the TB Fact Sheets, which highlights key topics on tuberculosis treatment and control, and a clinical policies and procedures manual, which details the standards for treatment of tuberculosis disease and infection.

Methods

Case Counting

Cases counted in 1998 were those verified during that year and reported to the Centers for Disease Control and Prevention (CDC) as confirmed cases. Only clinical and demographic characteristics of cases are reported to the CDC: no case identifiers are provided.

Some 1998 cases were first suspected of having disease in 1997; likewise, some individuals first suspected of having tuberculosis in late 1998 will be counted in 1999 if active tuberculosis is confirmed in 1999. Individuals who submitted a specimen for mycobacteriology culture in late 1998 were included in the 1998 count if their culture was reported to be positive for any species in the *Mycobacterium tuberculosis* complex (*M. tuberculosis*, *M. bovis*, *M. africanum*, *M. microti*) by January 31, 1999. A certain proportion of each year's counted cases are not culture confirmed. These cases never had a positive culture for *Mycobacterium tuberculosis* and were instead verified because their clinical symptoms and/or radiographic signs improved while they were on anti-tuberculosis medications. More complete verification of culture-negative cases by the Bureau of Tuberculosis Control in recent years has led to some surveillance artifact when longitudinal trends are considered: this is especially true of tuberculosis cases in children, who tend to have negative cultures. It is expected that cases that are counted and reported to the CDC on the basis of a rapid diagnostic test (e.g., *Mycobacterium tuberculosis* direct tests such as Genprobe Amplified *Mycobacterium tuberculosis* Direct Test® or Roche Amplicor® *Mycobacterium tuberculosis* [PCR] test) will be confirmed by a positive *Mycobacterium tuberculosis* culture. If after investigation, cases without bacteriologic confirmation are found to have no clinical or radiographic evidence of tuberculosis disease, they are removed from the list of cases reported for the year.

Rate Calculation

This report uses 1990 census figures for New York City to calculate case rates per 100,000 population. Case rates from years before 1991 were based on the 1980 census. Rates for racial/ethnic and age groups are based on numbers given in the census. According to the 1990 census, the total New York City population of 'Asians and other' is 528,879 and includes 18,924 persons of 'other' race/ethnicity; in reports published by the Bureau of Tuberculosis Control since 1991, the figure of 528,879 is used to calculate rates among Asians in New York City.

Age-adjusted case rates are provided in the section of the report on the geographic distribution of cases. Age standardization is a numerical technique that adjusts age-specific observed rates in population groups to a standard population age distribution so that different populations can be compared. Age standardization of the rates removes age differences between populations as a possible explanation for the differences in rates.

Since denominators used to calculate rates are derived from the 1990 census, rates included here do not reflect the significant numbers of immigrants who have entered New York City since 1990. Therefore, whenever possible, absolute numbers as well as crude and/or age-adjusted rates are compared.

In comparisons of U.S.-born cases with foreign-born cases, persons from Puerto Rico, the U.S. Virgin Islands, and all U.S. territories are considered U.S. born. Ascertainment and reporting of place of birth have improved in the past three years, accounting for part of the increase in reported foreign-born cases since 1990.

Analysis by Race/Ethnicity

Race/ethnicity is based on patient self-report and categorized as White, Black, Hispanic and Asian. In the past, collecting information on race/ethnicity facilitated the identification of increasing tuberculosis trends among Asians and alerted the Bureau of Tuberculosis Control of the need for intensified outreach in this community. Analyzing information on race/ethnicity also helps identify obstacles in access to services and document the need for staff who speak languages other than English.

Analysis by Geographic Area

The Bureau of Tuberculosis Control occasionally receives requests from other health agencies and community-based organizations for data aggregated by geographic areas other than health districts. In the text of this report, data are presented by health districts; included in Appendix 2 is a table presenting 1998 cases by zip codes, which may be aggregated to yield numbers of cases for United Hospital Fund neighborhoods and other geographic areas. Data for zip codes with fewer than five cases are excluded from the table.

Reporting Requirements

It is the timely and complete reporting of cases by medical providers throughout the city that makes it possible for the Bureau of Tuberculosis Control to analyze trends and improve case management. New York City Health Code section 11.03 (a) requires written reports to the New York City Department of Health, within 24 hours, of all clinically suspected and confirmed cases of tuberculosis; of children under five years with positive tuberculin skin tests; and of the results of bacteriology or pathology studies that suggest or confirm tuberculosis.

Physicians are also required to test (or refer to the Department for testing) household contacts of infectious cases and to notify the Department of the test results or referral. Furthermore, the Department may require household and non-household contacts to be tested and re-examined as needed. Physicians are also required to report when a "case" ceases to receive anti-tuberculosis treatment and the reason for the cessation, as well as any other information required by the Department for the control of tuberculosis. Information on ordering reporting forms is included on the back cover of this report.

Introduction

(Table 1, Figure 1)

This report presents information on the demographic and clinical characteristics of tuberculosis cases confirmed in New York City in 1998 as well as on efforts to increase completion of treatment for latent infection by persons infected with the organism that causes tuberculosis.

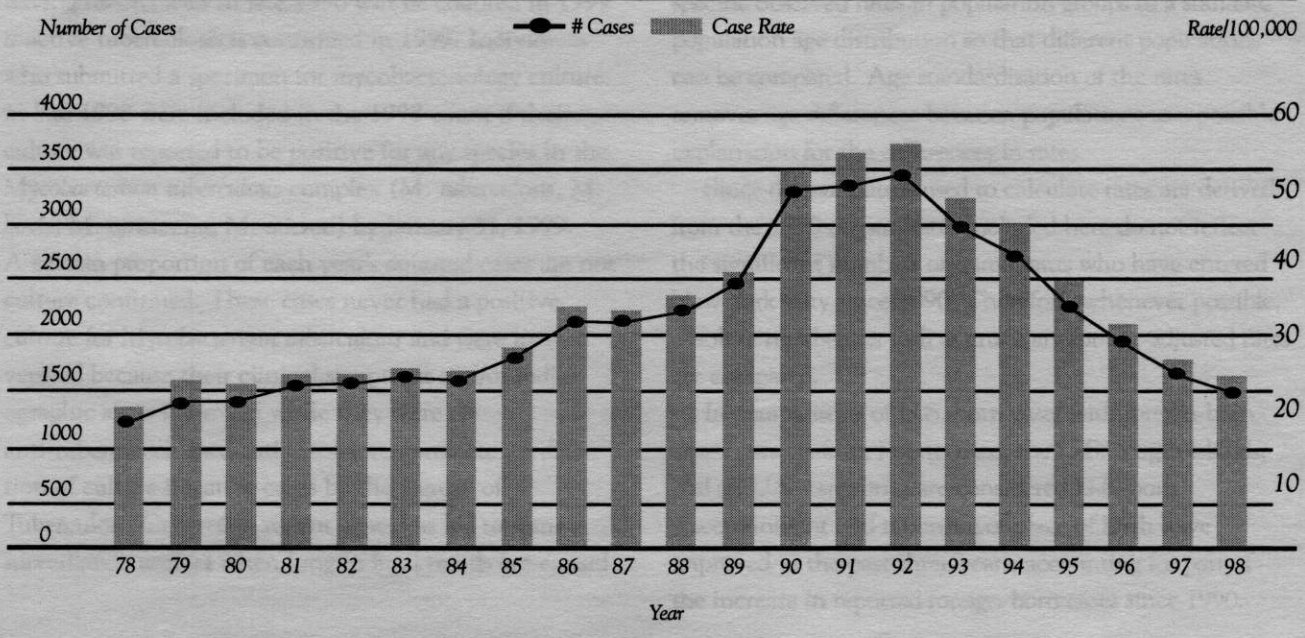
In 1998, the number of tuberculosis cases confirmed in New York City declined for the sixth consecutive year, to a total of 1,558. This is a 9.9% decrease from the 1,730 cases reported in 1997. Using the population recorded in the 1990 census as a denominator, the city's 1998 tuberculosis case rate is 21.3 tuberculosis cases per 100,000 persons, compared with a rate of 23.6 recorded in 1997. Using an estimate of the city's 1998 population did not change the overall rate.

The lowest number of tuberculosis cases ever recorded in New York City (1,307) was in 1978, when there was a case rate of 17.2 per 100,000. For 14 years after 1978, the number of cases rose fairly steadily, to peak in 1992 at 3,811 cases and a rate of 52.0 per 100,000. The number of cases reported in 1998 is 59.1% lower than the number reported in 1992. The drop in culture-confirmed cases between 1992 and 1998 is greater: the number of culture-confirmed cases reported in 1998 (1,255) is 63.5% lower than the number reported in 1992 (3,442).

New York City's recent tuberculosis epidemic started approximately six years before the nation-wide epidemic. Fueled by increasing numbers of tuberculosis cases in New York City and other major urban centers, the national epidemic started in 1986 and peaked at 26,673 cases in 1992, yielding a national case rate of 10.5 per 100,000 population. Between 1992 and 1998, the number of cases nationally decreased by 8,302, to 18,371 cases in 1998. With 2,253 fewer cases in 1998 than in 1992, New York City contributed 27.1% to the national decrease in tuberculosis between those years.

While New York City has made great progress in its struggle against tuberculosis over the past six years, the number of cases reported in the city in 1998 is still 19.2% higher than the number reported in 1978. New York City's 1998 rate of 21.3 tuberculosis cases per 100,000 population is 3.1 times the national rate of 6.8 per 100,000, higher than that of any other jurisdiction reporting more than 1,000 cases. In 1998, New York City contributed 8.5% of the nation's total 18,371 reported

Figure 1
Tuberculosis Cases and Rates
New York City, 1978 - 1998



tuberculosis cases. In order for the nation as a whole to reach the goal set for tuberculosis control by the year 2000 (3.5 cases per 100,000 population), the campaign against tuberculosis must be maintained, especially by New York City and other major urban centers.

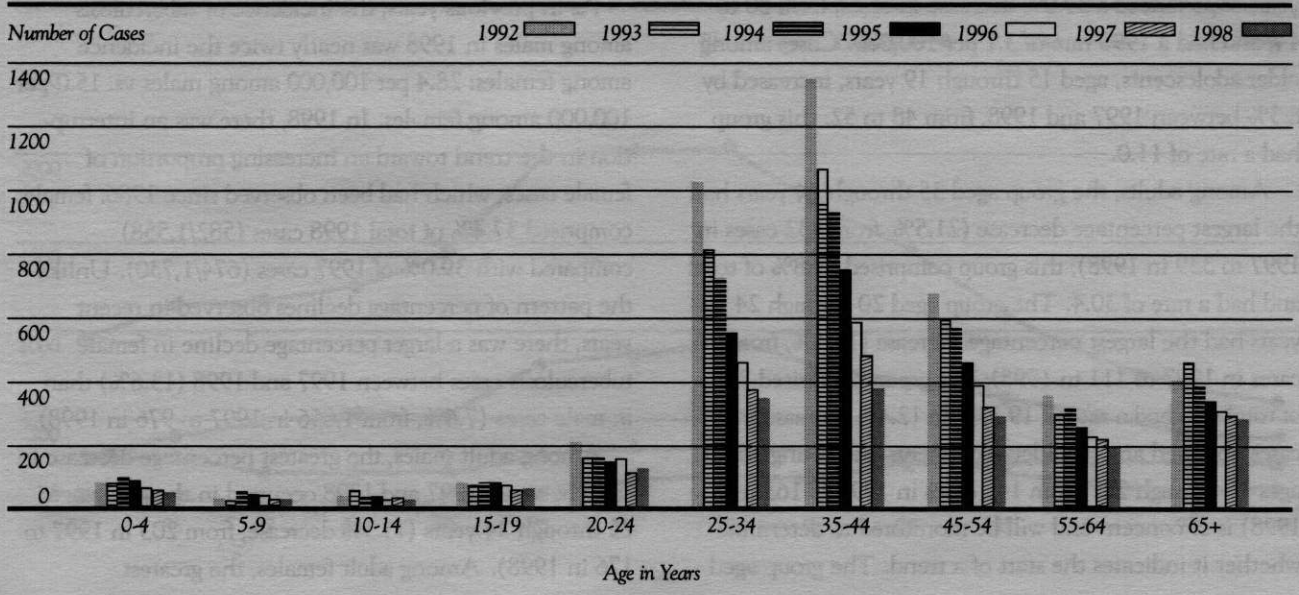
New York City has in recent years essentially experienced two tuberculosis epidemics, one among persons born in the United States, among whom infection with human immunodeficiency virus (HIV) and various social problems have been important contributing factors, and the other among foreign-born persons who come to the United States from countries with high rates of tuberculosis. In 1997, for the first time since information about the HIV status of tuberculosis cases was collected, the proportion of tuberculosis cases known to be HIV infected was notably lower than that recorded in previous years: the proportion of HIV-infected tuberculosis cases continued to decline slightly in 1998, to 22.2%. The proportion of tuberculosis cases who were foreign born increased in 1998 slightly over that recorded in 1997 (54.3% vs. 51.9%). In 1998, the trend toward an increasing proportion of female cases, which had been observed since 1986, was interrupted: the proportion of female cases declined slightly, to 37.4%, compared with 39.0% in 1997.

The first step in controlling the tuberculosis epidemic—ensuring the complete treatment of infectious cases—has been taken. If the city is to further reduce the burden of tuberculosis for future New Yorkers, it is important to offer treatment for latent infection to persons who became infected with *Mycobacterium tuberculosis* through their exposure to active cases during the recent epidemic, and to others who are infected with *Mycobacterium tuberculosis* and at high risk for progression to active disease. The final section of this report analyzes the status of programs for treatment of latent infection in New York City in 1998.

Age Distribution
(Table 2, Figure 2)

In 1998, people with active tuberculosis ranged in age from less than one year to 97 years old. Tuberculosis case rates were highest in the group aged 45 through 54 years (33.5 per 100,000). Case rates were lowest in the group aged 10 through 14 years (3.1 per 100,000). Except for the group aged 15 through 24 years, there were fewer tuberculosis cases in all remaining age groups in 1998 than in 1997. Figure 2 presents a description of cases by age group since 1992. Table 2 presents cases and case rates by age group, race/ethnicity, and sex in 1998.

Figure 2
Tuberculosis Cases by Age
New York City, 1992 - 1998



In areas where tuberculosis is well controlled, the highest proportion of cases tend to be elderly. Whenever an increase in the proportion of younger cases is observed, it suggests that tuberculosis control efforts may be disintegrating. In New York City, the proportion of tuberculosis cases aged younger than 65 years increased from 78.9% in 1978 to 90.4% in 1992, as overall tuberculosis rates rose from 17.2 per 100,000 in 1978 to 52.0 cases per 100,000 in 1992. After 1992, as tuberculosis control efforts in New York City were strengthened and the city's cases overall decreased, the proportion of cases in the group aged younger than 65 years fell to a 1998 level of 84.0%.

The 56 cases that occurred in 1998 among children younger than 10 years represent 3.6% of total cases, similar to 3.8% recorded in 1997, and a decline of 15.2% from the 66 cases recorded in this age group in 1997. The rate in this age group was 5.8 per 100,000 in 1998, compared with 6.8 per 100,000 in 1997. Within the past four years, surveillance to identify culture-negative pediatric tuberculosis cases has increased in New York City. Young children with tuberculosis are regarded as sentinal cases: thus, the low rates of tuberculosis in this age group, as recorded in 1997 and 1998, are encouraging, as they suggest a decline in recent transmission of the disease.

Children aged 10 through 14 years, once infected with tuberculosis, are especially vulnerable to progression to active disease, as are children younger than five years: between 1997 and 1998, the group aged 10 thorough 14 years experienced a 30.0% decrease in cases, from 20 to 14, and had a 1998 rate of 3.1 per 100,000. Cases among older adolescents, aged 15 through 19 years, increased by 8.3% between 1997 and 1998, from 48 to 52; this group had a rate of 11.0.

Among adults, the group aged 35 through 44 years had the largest percentage decrease (21.5%, from 432 cases in 1997 to 339 in 1998); this group comprised 21.8% of total and had a rate of 30.4. The group aged 20 through 24 years had the largest percentage increase (14.4%, from 97 cases in 1997 to 111 in 1998), this group comprised 7.1% of total and had a rate of 19.3. The 12.4% increase in cases observed among older adolescents and young adults, ages 15 through 24, (from 145 cases in 1997 to 163 in 1998) is of concern and will be monitored to determine whether it indicates the start of a trend. The group aged 45 through 54 years experienced an 8.8% decrease in cases from 284 to 259; this group had a case rate of 33.5 per 100,000 and comprised 16.7% of the total cases in 1998. Among other adult age groups, the incidence of tuberculosis and percent changes between 1997 and 1998 were as follows: the group aged 25 through 34 comprised 20.2% of total and had a case rate of 23.0 and a 7.4% decrease between 1997 and 1998 (from 340 to 315 incident cases); the group aged 55 through 64 comprised 10.4% of total and had a case rate of 25.1 and a decrease of 8.8% between 1997 and 1998 (from 184 to 162 incident cases); and those 65 years and older comprised 16.0% of the total and had a case rate of 26.2 and experienced a 3.5% decrease between 1997 and 1998 (from 259 to 250 incident cases). Tuberculosis incidence was least changed among this latter group of those 65 years and older.

The age distribution of the 846 foreign-born cases resembled that seen among U.S.-born cases: 722 (85.3%) of foreign-born cases were younger than 65 years and 124 (14.7%) were 65 years and older, compared with 576 (82.3%) of U.S.-born cases younger than 65 years and 124 (17.7%) 65 and older. Of foreign-born cases, the largest proportion was in the group aged 25 through 34 years (24.0%, 203 cases) and of U.S.-born cases the largest proportion was in the group aged 35 through 44 years (25.0%, 175 cases).

Distribution by Sex (Table 2)

As in previous years, the incidence of tuberculosis among males in 1998 was nearly twice the incidence among females: 28.4 per 100,000 among males vs. 15.0 per 100,000 among females. In 1998 there was an interruption in the trend toward an increasing proportion of female cases, which had been observed since 1986: females comprised 37.4% of total 1998 cases (582/1,558) compared with 39.0% of 1997 cases (674/1,730). Unlike the pattern of percentage declines observed in recent years, there was a larger percentage decline in female tuberculosis cases between 1997 and 1998 (13.6%) than in male cases (7.6%, from 1,056 in 1997 to 976 in 1998).

Among adult males, the greatest percentage decrease in cases between 1997 and 1998 occurred in the group aged 25 through 34 years (13.3% decrease, from 203 in 1997 to 176 in 1998). Among adult females, the greatest

percentage decrease in cases occurred in the group aged 35 through 44 years (36.6% decrease, from 164 in 1997 to 104 in 1998). Among males, those aged 20 through 24 years had a substantial increase, 48 in 1997 to 64 in 1998. Among females, no age group had a significant increase.

While case rates were similar for males and females in all age groups younger than 25 years, rates were substantially higher among males in all older age groups. The greatest difference between rates for males and females occurred in the 45 through 54 year age group (51.2 per 100,000 for males vs. 18.3 for females).

Racial/Ethnic Distribution (Table 2, Figure 3)

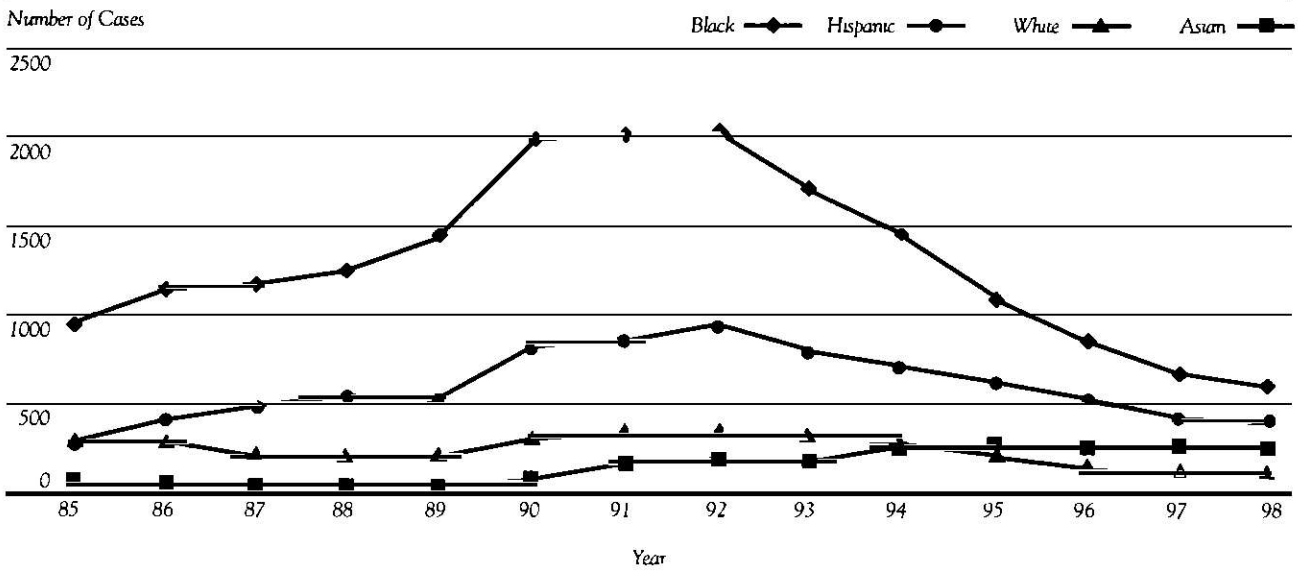
Please see Table 2 for the distribution of 1998 tuberculosis cases by race/ethnicity and age among males and females. Racial/ethnic distributions for males and females were fairly similar with two exceptions. Case rates among Asian females exceeded those of Asian males for age groups 0 through 4 years (16.4 for females compared to 5.1 for males) and 15 through 19 years (55.2 for females compared to 21.1 for males). Between 1997 and 1998, tuberculosis cases decreased among all racial/ethnic groups, with the largest decrease being among Whites (12.5%) and the smallest among Asians (4.7%).

As in previous years, Blacks comprised the highest proportion of 1998 tuberculosis cases (41.1%). The 641 cases reported among Blacks in 1998 gave this group a case rate of 34.7 per 100,000, second only to that for Asians (61.6 per 100,000). The number of tuberculosis cases who are black decreased by 11.1% from the 721 recorded in 1997. Age-specific incidence rates in 1998 peaked in the 45 through 54 year age group for Black males (99.4 per 100,000) and the 65 and older group for Black females (37.3 per 100,000).

The 430 Hispanic cases represented 27.6% of total 1998 tuberculosis cases. Hispanics had a case rate of 24.1 per 100,000. The number of tuberculosis patients who are Hispanic decreased by 11.0% from the 483 recorded in 1997. Age-specific incidence rates in 1998 peaked in the 45 through 54 year age group for Hispanic males (61.8 per 100,000) and Hispanic females (25.2 per 100,000).

The 326 cases among Asians accounted for 20.9% of the 1998 total. Asians had a case rate of 61.6, higher than that for any other racial/ethnic group. The number of cases recorded among Asians in 1998 decreased 4.7% from that reported in 1997 (342). Among Asian males and females, the highest tuberculosis rates in 1998 were observed among those aged 65 years and older (233.4 per

Figure 3
Tuberculosis Cases by Race/Ethnicity
New York City, 1985 - 1998



100,000 among males and 100.8 per 100,000 among females). The rate among elderly Asian males exceeded that of all other racial/ethnic age groups. It should be noted, however, that denominators for these groups are relatively small.

The 161 cases among Whites accounted for 10.3% of the 1998 total. Whites had a case rate of 5.1 per 100,000, lower than that for any other racial/ethnic group. Age-specific incidence rates in 1998 peaked in the 45 through 54 age group for White males (15.1 per 100,000) and the 65 years and older age group for White females (8.2 per 100,000).

Geographic Distribution (Table 3, Figures 4-5)

Incidence rates by health district of residence were calculated for 1998; age-adjusted and crude rates are presented in Table 3. Figure 4 displays a map of health districts.

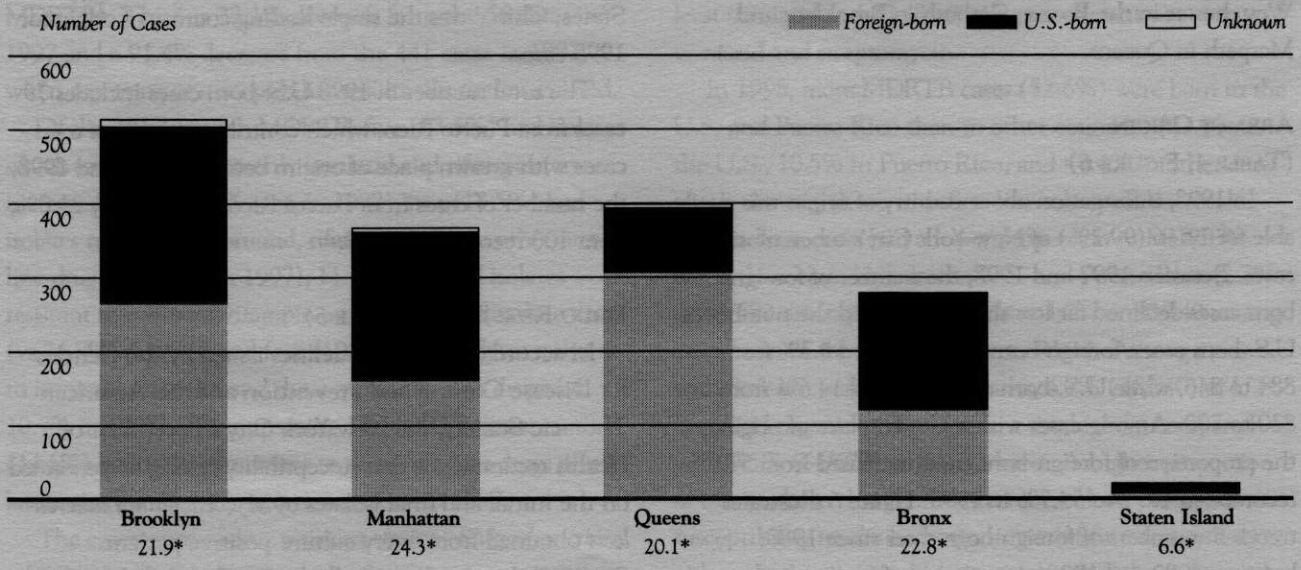
Figure 5 illustrates the number of tuberculosis cases contributed by each borough, and the proportion of foreign-born cases in each borough. The boroughs that contributed the largest proportions of total New York City cases were Brooklyn, Manhattan and Queens. Between 1997 and 1998, the number of new tuberculosis cases decreased in all boroughs except for Queens. In Queens, the number of tuberculosis cases increased by 0.8%, from 390 in 1997 to 393 in 1998. Brooklyn's cases decreased by 12.3% (from 575 cases in 1997 to 504 in 1998) and Manhattan's decreased by 19.0% (from 447 cases in 1997 to 362 in 1998). Between 1997 and 1998, the number of foreign-born cases decreased in all boroughs except Queens and the Bronx, which experienced a 1.3% increase from 299 in 1997 to 303 in 1998 and a 6.3% increase from 112 in 1997 to 119 in 1998 respectively. Queens had the largest number of foreign-born cases in 1998, 303 cases (77.1% of Queens' cases).

The three districts with the highest age-adjusted case rates in 1998 were Central Harlem, Morrisania and Bedford. In 1997, for the first time, the age-adjusted tuberculosis case rate for Central Harlem, which has consistently had the city's highest case rate, fell below 100 per 100,000, to 61.6; however, in 1998, Central Harlem's case rate increased, to 63.7. Decreases in age-adjusted case rates between 1997 and 1998 were observed in the two other health districts with the highest age-adjusted tuberculosis rates in 1998 (11.6% in Morrisania and 13.7% in Bedford). Other districts that experienced substantial decreases in age-adjusted tuberculosis rates between 1997 and 1998 were East Harlem, Riverside, the Lower West Side and the Lower East Side in Manhattan; Mott Haven and Tremont in the Bronx; Red Hook and Williamsburg-Greenpoint in Brooklyn; and Staten Island.

Two health districts had substantial increases in their age-adjusted case rates since 1997: Fordham-Riverdale in the Bronx and Corona in Queens. In Fordham-Riverdale, the increase was driven by an increase among the U.S. born (25.2% in 1997 to 47.8% in 1998) and in Corona by the increase among the foreign born (85.1% to 90.2%). In the remaining six districts that did not experience a significant increase, twice as many health districts experienced increases among the foreign born than among those born in the United States.

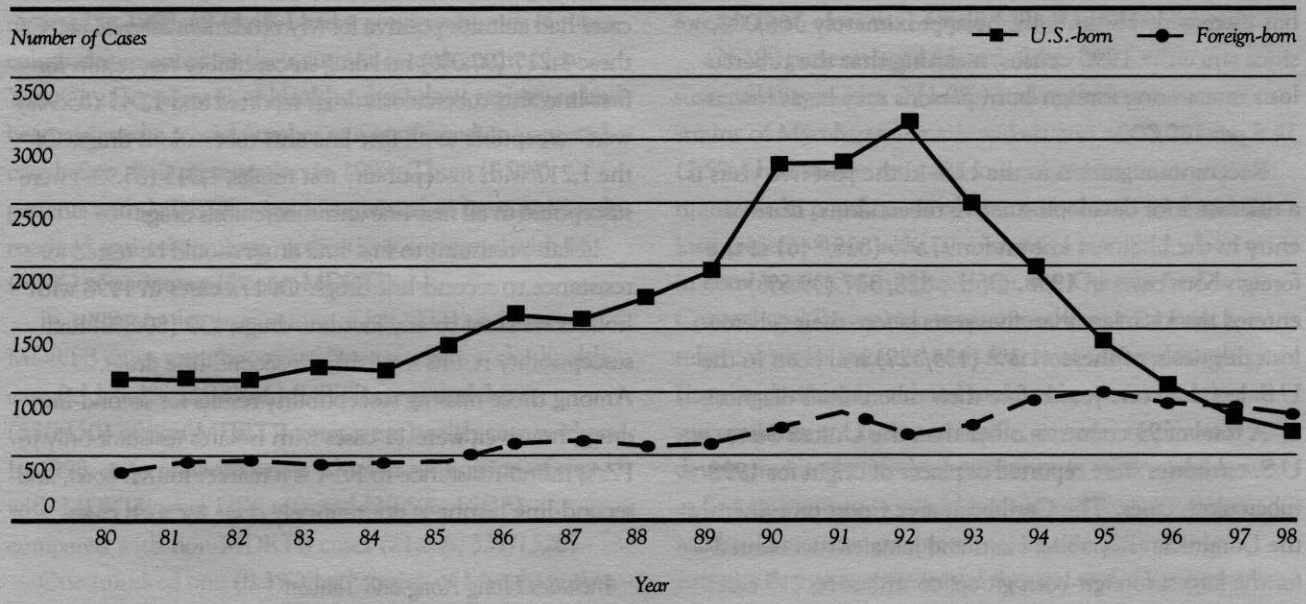
Figure 4
Health Center Districts, New York City

FIGURE 5
TUBERCULOSIS CASES BY PLACE OF BIRTH AND BOROUGH
NEW YORK CITY, 1998



* *Rate per 100,000 population*

FIGURE 6
U.S. AND FOREIGN-BORN CASES*
NEW YORK CITY, 1980–1998



**Starting in 1991, Puerto Rico and U.S. Virgin Islands included as U.S.-born*

Despite overall decreases in age-adjusted case rates from 1997 to 1998, increases among the foreign born were seen in East Harlem in Manhattan; Morrisania and Westchester in the Bronx; Flatbush in Brooklyn; and Maspeth in Queens.

Area of Origin (Table 4, Figure 6)

In 1998, information about country of origin was available for 1,546 (99.2%) of New York City's tuberculosis cases. Between 1997 and 1998, the number of foreign-born cases declined far less sharply than did the number of U.S.-born cases: foreign-born cases dropped 4.3% from 884 to 846, while U.S.-born cases dropped 14.6% from 820 to 700. Among cases with a known place of origin the proportion of foreign-born cases increased from 51.9% recorded in 1997 to 54.7% in 1998. Figure 6 illustrates trends in numbers of foreign-born cases since 1980: between 1980 and 1998, the number of foreign-born tuberculosis cases more than doubled.

In 1998, the rate among foreign-born persons in New York City was 40.6 cases per 100,000, compared with 13.4 per 100,000 among U.S.-born persons; however, the number of foreign-born persons in New York City has increased substantially, by approximately 366,000, since since the 1990 census, meaning that the tuberculosis rate among foreign-born persons may be as low as 34.5 per 100,000.

Recent immigration to the U.S. in the past five years is a risk factor for developing active tuberculosis. Date of entry in the U.S. was known for 97.9% (828/846) of the foreign-born cases in 1998. Of the 828, 327 (39.5%) entered the U.S. less than five years before their tuberculosis diagnosis; of these 41.3% (135/327) had been in the U.S. less than one year before their tuberculosis diagnosis.

A total of 91 countries other than the United States or U.S. territories were reported as places of origin for 1998 tuberculosis cases. The Caribbean area (most prominently, the Dominican Republic, Haiti and Jamaica) accounted for the largest foreign-born group, contributing 215 cases (13.9% of cases with known place of origin). The second largest foreign-born group (201 cases, 13.0% of total cases with known place of origin) came from Central America (most prominently Ecuador and Mexico). The third largest foreign-born group (148 cases, 9.6% of total cases with known country of origin) came from Far East Asia (most prominently, China[1]). Aside from the United States, China[1] was the single leading country of origin for 1998 cases.

The total number of 1998 U.S.-born cases includes 79 cases from Puerto Rico, which contributed 5.1% of total cases with known place of origin; between 1997 and 1998, the number of cases from Puerto Rico decreased by 21.0%, from 100 recorded in 1997.

Drug Resistance (Table 5)

In accordance with guidelines issued by the Centers for Disease Control and Prevention and the American Thoracic Society, the New York City Department of Health recommends that susceptibility testing be performed on the initial and final isolates of *Mycobacterium tuberculosis* obtained from every culture-positive patient. Susceptibility results must be reported to the New York City Department of Health as per the New York City Health Code Sections 11.03(b) and 11.05(c). Isolates with any resistance to first-line anti-tuberculosis drugs should have susceptibility testing to second-line drugs.

During 1998, 1,255 (80.5%) of the city's tuberculosis cases had cultures positive for *Mycobacterium tuberculosis*. Of these 1,217 (97.0%) had drug susceptibility test results for first-line anti-tuberculosis drugs reported and 1,045 (85.9%) were susceptible to all first-line anti-tuberculosis drugs. Of the 1,217 with susceptibility test results, 1,045 (85.9%) were susceptible to all first-line anti-tuberculosis drugs.

Isolates resistant to first-line drugs should be tested for resistance to second-line drugs. Of 172 cases in 1998 with isolates resistant to any first-line drugs, 139 (80.8%) had susceptibility results available for second line drugs. Among those missing susceptibility results for second-line drugs, however, were 11 cases with isolates resistant only to PZA; mono-resistance to PZA is a marker for *M. bovis*, and second-line testing is not routinely done for such cases.

[1] *Includes Hong Kong and Taiwan*

[2] *First-line anti-tuberculosis drugs include isoniazid, rifampin, ethambutol, pyrazinamide, and streptomycin.*

[3] *Second-line anti-tuberculosis drugs include all anti-tuberculosis drugs other than those listed under footnote 2.*

In 1998, among 1,217 individuals with susceptibility results, 38 (3.1%) had multidrug-resistant strains (i.e., they had isolates resistant to at least isoniazid and rifampin MDRTB). This is a 32.1% decrease from the 56 cases in 1997 and a 91.4% decrease from the 441 cases in 1992, when reporting of susceptibility results was first mandated.

Of the 38 cases with MDRTB, five (13.5%) had isolates which were resistant to only isoniazid and rifampin (an increase from the 8.9% seen in 1997); five (13.5%) had isolates resistant to isoniazid, rifampin and one other first-line drug (vs 21.4% in 1997); 11 (28.9%) had isolates resistant to isoniazid, rifampin and two other first-line drugs (vs 26.8% in 1997); and four (10.5%) had isolates resistant to isoniazid, rifampin and three other first-line drugs (vs 10.7% in 1997). The remaining 13 MDRTB patients (34.1%) had isolates resistant to most first-line drugs plus kanamycin, a similar proportion as seen in 1997.

The emergence of drug resistant strains of *Mycobacterium tuberculosis* is fostered by the lack of adequate resources to ensure appropriate and complete treatment of tuberculosis patients. Incomplete or inadequate treatment for an earlier episode of tuberculosis increases the risk that the *Mycobacterium tuberculosis* organisms harbored in a patient will develop drug resistance. Of the 1,558 tuberculosis cases reported in 1998, 69 (4.4%) had a previous history of tuberculosis documented on their current records in the New York City Department of Health tuberculosis registry or had been assigned a record number as a confirmed or suspected case before their presentation in 1998. Three (7.9%) patients with MDRTB were documented to have previously received anti-tuberculosis medications compared with 66 (4.3%) of patients with non-MDRTB.

In 1998, similar proportions of MDRTB and non-MDRTB cases were known to have worked in the health care field; 5.3% (2/38) of MDRTB cases and 3.8% (55/1450) of non-MDRTB cases were health care workers. In 1998, as in previous years, a higher proportion of cases with MDRTB were HIV infected (39.5%, 15/38) compared with non-MDRTB cases (21.8%, 331/1520).

One hundred one (8.3%) had strains of *Mycobacterium tuberculosis* resistant to a single first-line drug; of these, 45 (44.6%) had isolates resistant to isoniazid alone, 30 (29.7%) to streptomycin alone, and 13 (12.9%) to rifampin alone. Thirty-three 1998 cases (2.7% of all those with susceptibility results available) had isolates resistant to two or more first-line drugs but were not classified as MDRTB; all but two of these (93.9%) were resistant to at least isoniazid and 27 (81.8%) were resistant to at least isoniazid and streptomycin.

In 1998, more MDRTB cases (52.6%) were born in the U.S. and Puerto Rico than in other countries (42.1% in the U.S., 10.5% in Puerto Rico, and 47.4% in other countries). Among those with first-line susceptibility results, foreign-born cases had a lower proportion of MDRTB cases, than cases born in the U.S. and Puerto Rico (2.7% or 18/672 among foreign-born and 3.7% or 20/540 among cases born in the U.S. and Puerto Rico). Among cases with first-line susceptibility results, 6.7% (36/540) of U.S.-born had organisms resistant to a single drug, compared with 9.5% (64/672) of foreign born. A higher proportion of foreign-born than U.S.-born tuberculosis cases with susceptibility results had organisms resistant to isoniazid, either alone or in combination with other drugs, but still sensitive to rifampin: 7.9% (53/672) among foreign-born cases vs. 4.3% (23/540) among U.S.-born cases. Foreign-born cases were more likely than U.S.-born cases to have isolates resistant to two or more anti-tuberculosis drugs but not classifiable as multidrug-resistant (3.6% [24/672] of foreign-born cases vs. 1.5% [8/549] of U.S.-born cases).

Of 199 patients aged 65 and older with first-line susceptibility results, 2 (1.0%) had multidrug-resistant strains of *Mycobacterium tuberculosis* and an additional 7 (3.5%) had strains resistant to isoniazid but susceptible to rifampin. In populations where more than 3% of tuberculosis patients have isolates resistant to isoniazid, alone or in combination with other drugs, the Centers for Disease Control and Prevention recommend that treatment for tuberculosis be initiated with four anti-tuberculosis drugs (isoniazid, rifampin, ethambutol, and pyrazinamide) until susceptibility results are available, in order to prevent development of multidrug-resistance in strains which are at first resistant to isoniazid but susceptible to rifampin. Medical practitioners sometimes assume that elderly patients do not require initial therapy with four anti-tuberculosis drugs. In New York City, unless susceptibility results are known for a given patient from the outset of treatment, all patients should initially be started on four drugs, regardless of age.

Sociomedical Factors

(Table 6)

Information about such social factors as use of injection and non-injection drugs and alcohol, incarceration, homelessness and occupation is important for effective tuberculosis control. The presence of these factors may predict poor adherence to recommended therapy and increase likelihood of adverse reactions to anti-tuberculosis medications or suggest a high risk for infection with the human immunodeficiency virus. A history of homelessness or work in certain fields (e.g., health care) may predict difficulties in assuring patient adherence to therapy or suggest possible sites where the infection may have been contracted.

It is frequently difficult to elicit information about substance abuse and occupation from patients. Nevertheless, with more intensive efforts over the past three years to interview patients and enter information about social variables into the tuberculosis registry, the proportion of cases missing information about social variables has decreased. In 1998, no more than 3.3% of patients were missing information about any one social variable. Among those with available information, 3.3% (49/1,507) had used illegal injectable drugs, 7.0% (106/1,509) had used illegal non-injectable drugs, and 11.2% (169/1509) had abused alcohol in the 12 months prior to treatment for tuberculosis. These proportions are slightly lower than those recorded in 1997, when 4.9% of tuberculosis patients had used illegal injectable drugs, 11.8% used illegal non-injectable drugs, and 12.4% abused alcohol in the 12 months prior to treatment.

All 1998 cases had information available on incarceration: 43 (2.8%) had been incarcerated at the time of diagnosis, compared with 2.5% (44/1,730) in 1997. Of the 1,488 cases with information available on occupation in 1998 (95.5% of total), 57 (3.9%) had worked in the health care field or as correctional employees, compared with 59 of 1,578 cases with this information recorded in 1997 (3.7%). All 1998 cases had information available on homelessness, and 92 (5.9%) had been homeless at diagnosis or at some point during their treatment; of the 1,730 cases recorded in 1997, 79 (4.6%) had been homeless at diagnosis or at some point during their treatment.

Mortality

(Table 7)

Mortality figures presented in this year's report are based on statistics issued by the Bureau of Health Statistics and Analysis of the New York City Department of Health. In 1998, there were 53 deaths in New York City with tuberculosis listed as the underlying cause of death on the death certificate. The crude tuberculosis mortality rate for 1998 was 0.7 per 100,000. There were an additional 69 deaths for which tuberculosis was listed as a secondary cause. Of these deaths, 36 (52.2%) listed acquired immune deficiency syndrome (AIDS) or HIV infection as the underlying cause of death.

Tuberculosis and HIV Infection

(Tables 8-9)

Since 1990, the Department of Health has collected information on the HIV status of individuals with active tuberculosis. This information is necessary for the public health control of tuberculosis and for management of individual patients (e.g., to guard against adverse interactions between anti-tuberculosis and anti-HIV drugs).

Table 8 presents the reported HIV status of individuals with active tuberculosis by age and sex. Since not all individuals with tuberculosis undergo testing for HIV, and since not all known HIV test results are reported to the Bureau of Tuberculosis Control, the proportion of HIV-positive cases reported in this table is a minimum estimate of the actual proportion of tuberculosis cases who are HIV infected.

In 1998, 72.3% (1,126/1,558) of New York City tuberculosis cases had a known and reported HIV status, a decrease from 73.5% (1,272/1,730) in 1997. Males and females were equally as likely to have a known HIV status (71.3% of females compared to 72.8% of males). HIV status was more likely to be known for U.S.-born cases than for foreign-born cases: 76.3% (534/700) of U.S.-born cases had a known HIV status vs. 69.5% (588/846) of foreign-born cases. As the HIV epidemic makes inroads into regions outside the United States that are increasingly represented among countries of birth of New York City cases, it is important that efforts be made to increase the proportion of foreign-born cases who are tested and to report these test results to the Department of Health; even though HIV seropositivity precludes legal immigration to

the United States, undocumented immigrants are not likely to have been tested.

In 1998, for the second consecutive year, the proportion of tuberculosis cases who were recorded as HIV infected was below 30% of total cases: of 1998 tuberculosis cases 22.2% (346) were reported as HIV positive and 50.1% (780) were reported as HIV negative. In 1997, 25.9% (448) were reported as HIV positive and 47.6% (824) were reported as HIV negative. Among the 1,126 cases with a known HIV status, 346 (30.7%) were HIV positive and 780 (69.3%) were HIV negative. In 1998, among both male and female tuberculosis cases, the highest proportions of HIV-infected cases were recorded in the group aged 35 through 44 years.

Table 9 presents the distribution of HIV infection by sex from 1992 through 1998. On the whole, proportions of tuberculosis patients who were HIV positive remained fairly constant before 1997. The decline in the proportion of HIV-infected cases since 1996 has been greater among males than among females.

When only U.S.-born cases are considered, the proportion of cases recorded as HIV positive decreased from 39.4% (323/820) in 1997 to 35.7% (250/700) in 1998. Foreign-born patients are much less likely to be HIV positive than are U.S.-born cases; between 1997 and 1998, the proportion of foreign-born cases who were HIV positive decreased slightly from 13.8% in 1997 to 11.3% in 1998.

HIV-infected cases are more likely to have MDRTB than are uninfected cases. In 1998, 15 of the 346 cases who were known to be HIV infected had MDRTB (4.3%), compared with 23 of the 1,212 cases with unknown or negative HIV status (1.9%).

Treatment of tuberculosis can be complicated by the use of two new classes of antiretroviral agents, protease inhibitors (PIs) and non-nucleoside reverse transcriptase inhibitors (NNRTIs). The use of a rifamycin (e.g., rifampin or rifabutin), an important component of a standard antituberculosis regimen, is contraindicated with many of the PIs and NNRTIs. Rifamycin-containing regimens are of a shorter duration (6-9 vs. 18-24 months), have faster sputum conversion rates, higher cure rates, and lower relapse rates. Rifabutin can be substituted for rifampin with certain PIs and NNRTIs. Of the 346 HIV-positive cases, 162 (46.8%) were on rifabutin at some time in their tuberculosis treatment.

Directly Observed Therapy (DOT) and Completion of Therapy

(Table 10, Figures 7-9)

Figure 7 illustrates the proportion of tuberculosis patients counted in a given year who were on directly observed therapy during some or all of the year in which they were counted, among all those counted in the year who were eligible for DOT (i.e., patients who were diagnosed while alive and had the opportunity to receive some or all of their therapy as outpatients). The proportion of patients on DOT has increased steadily from very low levels in the mid 1980s and early 1990s (e.g., from 4.8% in 1987 to 72.3% in 1998). Although the number of cases on DOT has decreased since 1994, reflecting the declining prevalence of patients with active tuberculosis, the proportion of eligible patients who were on DOT increased fairly steadily, from 56.4% in 1994 to 72.3% in 1998. The proportion of patients on DOT is higher among those who receive treatment in Department of Health chest clinics, where DOT is considered the standard of care: of the 611 eligible patients confirmed in 1998 who received some or all treatment to date in DOH chest clinics, 85.9% were on DOT for some or all of their therapy; of the 756 eligible patients confirmed in 1998 who received none of their treatment in DOH chest clinics, 61.2% were on DOT for some or all of their therapy (Figure 8). Patients with infectious and/or multidrug-resistant tuberculosis are at especially high priority for DOT. Of patients confirmed in 1998, 80.4% (422/525) of eligible patients with pulmonary tuberculosis and positive respiratory smears received DOT compared with 67.2% (566/842) of those without positive respiratory smears; 79.3% (23/29) of MDRTB patients received DOT compared with 72.1% (965/1,338) of non-MDRTB patients. In 1998, 73.7% of U.S.-born patients (425/577) received DOT compared with 71.4% of foreign-born patients (558/782).

Figure 9 shows the distribution of patients on DOT as of December 31, 1998, by type of provider. It should be noted that prevalence figures for a given year include patients reported before and during that year, as well as patients who were strongly suspected of having tuberculosis but not confirmed. Non-Department of Health facilities, which are funded by the New York State Department of Health, Medicaid, and Ryan White Care Act Funds, provided DOT to 285 (36.8%) of the 774

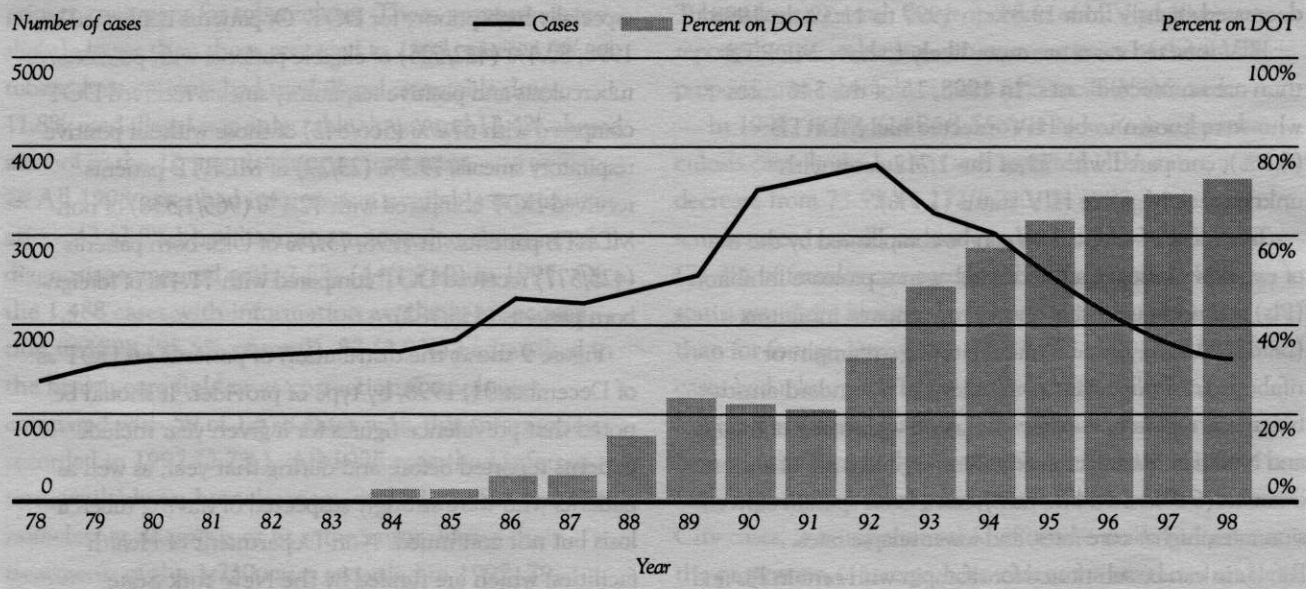
cases who were receiving DOT at that point. Department of Health Clinics and Outreach provided DOT to 226 (29.2%) cases and 208 (26.9%) cases respectively.

According to guidelines issued by the Centers for Disease Control Prevention and American Thoracic Society, patients with confirmed or suspected tuberculosis should receive an initial regimen consisting of four drugs (isoniazid, rifampin, ethambutol and pyrazinamide), unless susceptibilities of their *Mycobacterium tuberculosis* isolates are known from the start of therapy or unless there are justified medical contraindications. Among patients with confirmed tuberculosis in 1998 who were started on anti-tuberculosis therapy and survived for at least two weeks following the start of therapy, 85.6% (1,234/1,441) were started on these four drugs within two weeks of the start of therapy.

The effectiveness of DOT and intensive case management in increasing completion of therapy among patients diagnosed with tuberculosis in 1997 is illustrated in Table 10. Completion data are presented for 1997 instead of 1998 in order to allow enough time for patients who require a year of treatment to complete therapy. In order to remain consistent with data presented in past years, the formula used to calculate the completion index for this table is the same as that which has been used in the Bureau's previous Information Summaries. According to this formula, of the cohort of 1,411 patients diagnosed in 1997 who remained alive during treatment and did not move out of New York City, 1,327 (94.0%) completed treatment. The completion index increases to 95.4% if patients with multidrug-resistant tuberculosis, who require extended therapy, are excluded from the index.

In an effort to improve the continuity of treatment and to increase accountability for tuberculosis patients who complete their treatment outside New York City, the case completion index for 1997 has also been calculated by a more rigorous formula. Excluded from the index are any cases with a form of tuberculosis that requires more than 12 months of treatment (meningeal cases, children with bone or joint tuberculosis, and cases whose isolates are resistant to rifampin), along with cases reported at death, cases who died during therapy, and cases who never started therapy. The following are classified as "treatment not complete" and included in the denominator: cases who should have

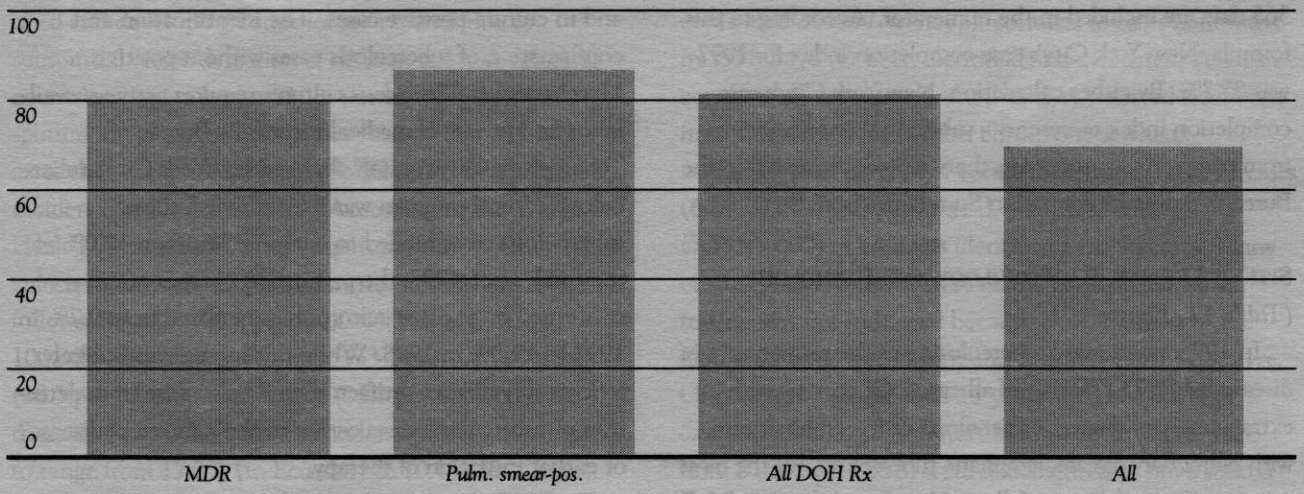
FIGURE 7
TUBERCULOSIS CASES ON DIRECTLY OBSERVED THERAPY*
NEW YORK CITY, 1978–1998**



* *Of those who were diagnosed while alive and received some treatment on an outpatient basis.*

** *Before 1995, cases on DOT are of cases still known to have had tuberculosis.*

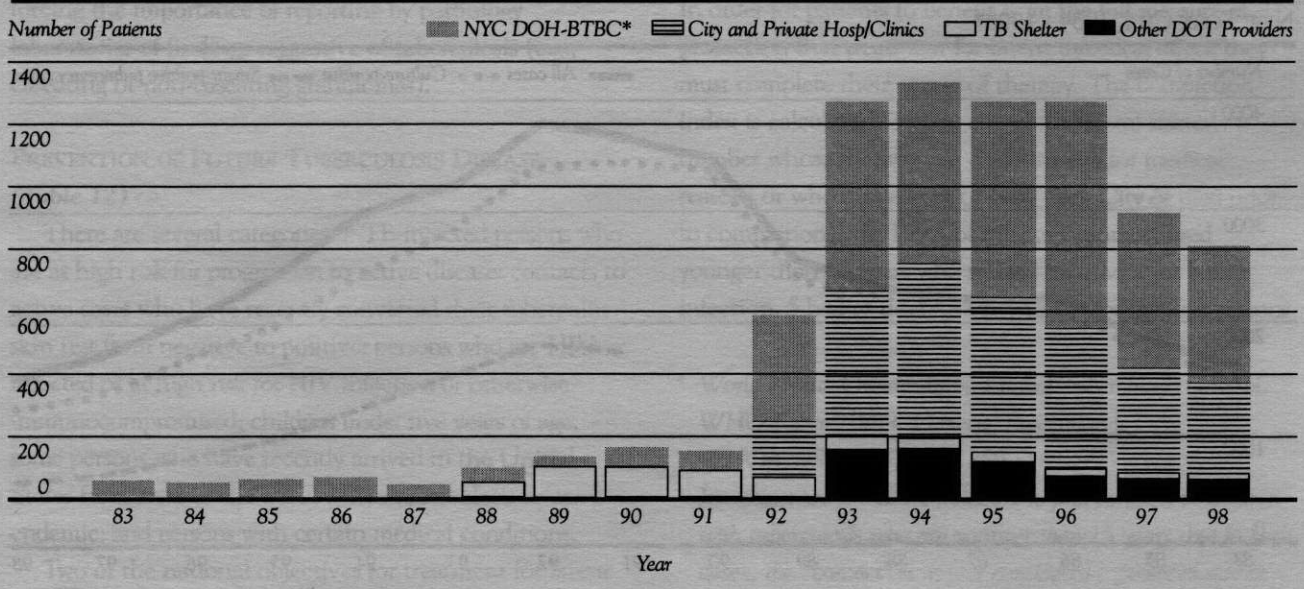
FIGURE 8
PERCENT ELIGIBLE* TUBERCULOSIS PATIENTS ON DOT**
NEW YORK CITY, 1998



* *Eligible patients were those diagnosed while alive and who received some treatment on an outpatient basis*

** *Cases ever on DOT in the year when counted*

FIGURE 9
TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY AS OF DECEMBER 31 BY TYPE OF PROVIDER
NEW YORK CITY, 1983–1998



* *New York City Department of Health, Bureau of Tuberculosis Control*

completed therapy within a year but were treated longer than 365 days; cases who moved (and whose status with regard to completion of treatment is unknown); cases who were lost to follow up; and cases who refused to complete therapy. Only cases who completed their treatment within 365 days are included in the numerator. According to this formula, New York City's case completion index for 1997 was 85.7%. By either calculation, New York City's case completion index represents a substantial improvement from completion rates of less than 70% documented in the Bureau's Annual Information Summaries from the 1980s.

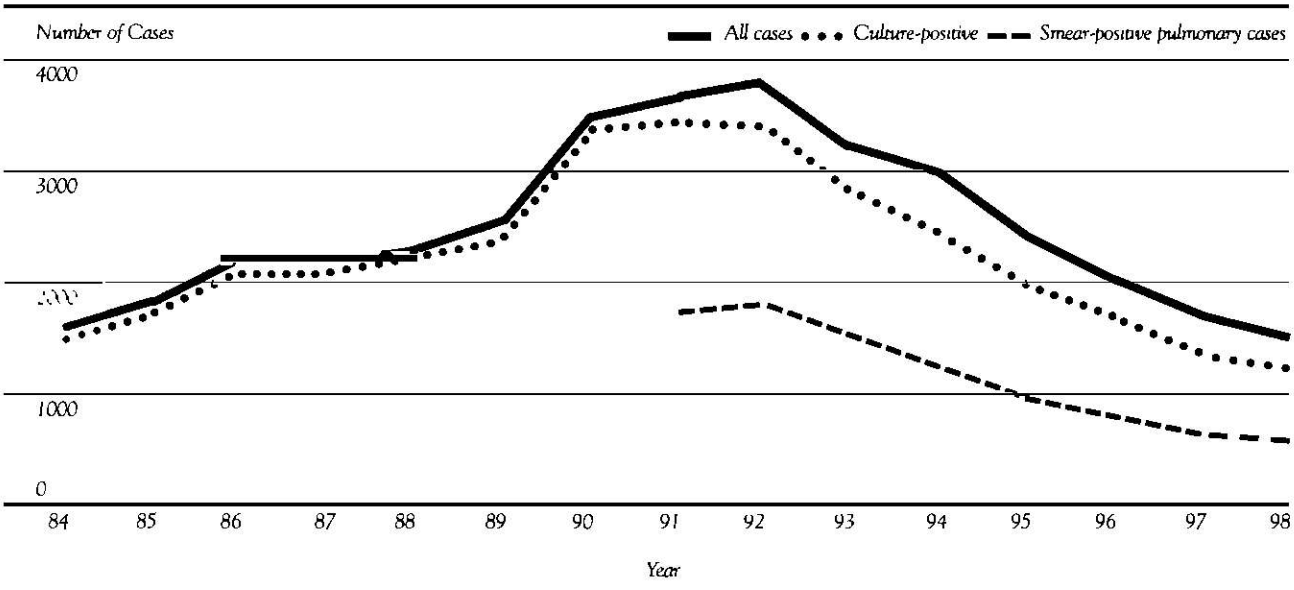
Site of Disease, Bacteriology and Pathology *(Table 11, Figure 10)*

In 1998, pulmonary tuberculosis was the primary site of disease for 1,173 (75.3%) of all cases. Of persons with extrapulmonary disease, either alone or in combination with pulmonary disease, lymphatic tuberculosis was the most common form of disease, followed by pleural disease. Of all cases reported in 1998, 172 (11.0%) had both pulmonary and extrapulmonary disease. Of 1,173 cases with pulmonary disease, 558 (47.6%) had a positive smear for acid-fast bacilli (AFB) from either sputum or another respiratory specimen.

Of the 1,558 tuberculosis cases verified in 1998, 303 (19.4%) had no positive bacteriologic culture for *Mycobacterium tuberculosis*. These cases were determined to have tuberculosis because of their clinical and/or radiologic improvement while on anti-tuberculosis medications. Figure 10 illustrates trends, since 1984, in all verified cases and in culture-positive cases. The identification and confirmation of tuberculosis cases without positive *Mycobacterium tuberculosis* cultures requires active surveillance and review of medical records by Bureau of Tuberculosis Control staff. Before New York City's tuberculosis control program was strengthened, these tuberculosis cases tended to comprise less than 10.0% of the total; since 1992, the proportion of cases not confirmed by positive cultures has increased from 9.7% in 1992 to 19.0% in 1998. While this increase most likely reflects surveillance artifact, it could also arise from detection of tuberculosis cases earlier in their course of disease or earlier initiation of therapy.

Figure 10 also shows trends in the number of tuberculosis patients with sputum smears positive for AFB. In developing countries, where facilities for cultures are frequently lacking, tuberculosis is often diagnosed only through sputum microscopy. Therefore, to increase comparability between numbers of AFB smear-positive

Figure 10
Trend of Tuberculosis Cases
New York City, 1984 - 1998*



* *Data on smear-positive pulmonary cases not available before 1991*

cases in New York City and developing countries, only smears from sputum are included in the figure, not smears from all respiratory specimens; also, positive sputum smears are included regardless of the patient's culture results. Comparisons between tuberculosis rates in developed and developing countries are tenuous due to substantial under-detection of cases in many developing countries, but are best made in terms of incidence of sputum smear-positive pulmonary cases. The 545 such cases that occurred in New York City in 1998 yielded an incidence of 7.4 per 100,000. According to the World Health Organization, rates of sputum smear-positive tuberculosis in some developing countries in 1997 are as follows: Ecuador (61.4 per 100,000), Nepal (50.1 per 100,000), Dominican Republic (33.1 per 100,000), India (28.5 per 100,000) and China (15.2 per 100,000)[4]. In these countries, the extent of under-reporting is estimated to range from 17.0% (in Ecuador) to 70.1% (in China).

Of the 1,558 tuberculosis cases recorded in New York City in 1998, 417 are recorded in the Department of Health tuberculosis registry as having had tissue biopsies. Most of these cases (71.0%, [296/417]) had bacteriologic findings (from either the specimen which was biopsied or another specimen) that suggested or confirmed tuberculosis, 21.8% (91/417) of cases with biopsies, however, had only pathology findings suggestive of tuberculosis, reinforcing the importance of reporting by pathology laboratories of findings suggestive of tuberculosis (e.g., caseating or non-caseating granulomas).

Prevention of Future Tuberculosis Disease *(Table 12)*

There are several categories of TB-infected persons who are at high risk for progression to active disease: contacts to active cases who have recently converted their tuberculin skin test from negative to positive; persons who are HIV infected or at high risk for HIV infection or otherwise immunocompromised; children under five years of age; some persons who have recently arrived in the United States from areas of the world where tuberculosis remains endemic; and persons with certain medical conditions.

Two of the national objectives for treatment for latent infection concern contacts to infectious tuberculosis cases (Appendix 1). The Bureau of Tuberculosis Control has expanded its efforts to ensure that all contacts to patients 15 years and older[5] with culture-confirmed pulmonary or laryngeal disease are evaluated, and that contacts found eligible for treatment for latent infection receive it. The following discussion refers only to contacts of cases confirmed in 1997, as not all contacts to cases confirmed in 1998 have yet been identified and evaluated. Also, all contacts are considered, whether they received treatment from Department of Health clinics or elsewhere.

Eighty-nine percent of contacts identified to 1997 cases (6,173/6,964) were examined, compared with 84.4% (7,595/9,000) of contacts identified to 1996 cases. Many of those not examined were casual contacts for whom testing was not indicated because close contacts to the identified cases were tuberculin skin test (TST) negative. Of contacts younger than 15 years and deemed, after examination, eligible to start treatment for latent infection, 81.8% (211/258) were documented to have started treatment for latent infection; of contacts 15 years and older who were eligible to start treatment for latent infection, 59.9% (1,136/1,898) were documented to have started treatment for latent infection.

Starting a patient on treatment for latent infection is only the beginning of the drive to increase levels of treatment for latent infection; treatment for latent infection lasts from six to nine months, depending on a patient's age. In order for patients to benefit from the full measure of protection that treatment for latent infection offers, they must complete their course of therapy. The completion index is calculated as [total completed/(total started - number whose therapy was discontinued for medical reasons or who moved out of New York City or died prior to completion)]. In 1997, of infected contacts aged younger than 15 years who started treatment for latent infection, 5 had to discontinue therapy for medical reasons

[4] *World Health Organization. Global Tuberculosis Control. WHO Report 1999. Geneva, Switzerland, WHO/CDS/CPC/TB/99.259.*

[5] *Investigations are also conducted to find contacts to children with tuberculosis who are younger than 15 years, but in such cases, the "contact" is in fact considered a potential source case, i.e., a person with active tuberculosis who may have infected the child.*

or moved or died prior to completion; of those remaining, 61.2% (126/206) completed at least six months of treatment for latent infection; the 1996 treatment for latent infection completion index for infected contacts younger than 15 years was 72.1%. Among infected contacts aged 15 years or older, 44 had to discontinue treatment for latent infection for medical reasons or moved or died prior to completion; of those remaining, 53.8% (587/1,092) completed at least six months of treatment for latent infection; the 1996 treatment for latent infection completion index for infected contacts 15 years or older was 60.6%.

An Expanded Contact Investigation (ECI) Unit was created in October 1995 within the Bureau of Tuberculosis Control to allow rapid evaluation of possible transmission of tuberculosis by infectious patients in congregate settings (e.g., within schools or other institutions, or within worksites). When indicated, mass skin testing and effective education about tuberculosis are provided. In 1998, 20 epidemiologic investigations were conducted as a result of an exposure to a person with infectious tuberculosis in a congregate setting: 17 were school or workplace exposures, 2 were source case investigations in day care centers, and 1 was an evaluation of a cluster of tuberculosis cases in a single-room occupancy hotel (Table 12).

In all 17 of the school and workplace exposures, the person with infectious tuberculosis was older than 12 years and had pulmonary disease. In 15 of these investigations, the index case was both smear-positive for AFB and culture-positive for *Mycobacterium tuberculosis*; 7 (41%) of the index cases had cavitation on their chest radiograph. Seven of the investigations were conducted in schools or day care centers and one was an aircraft exposure.

Results of the school and workplace investigations were classified according to the likelihood of tuberculosis transmission to contacts in the congregate setting; transmission was considered unlikely in 12 (71%) of these investigations; possible in 1 (6%); and probable in 4 (24%). The total number of contacts tested in these investigations was 618; 104 (17%) of those tested were found to be infected and were referred for medical evaluation. In addition, 738 persons with no known exposure to the index case requested testing; 44 (6%) of these were infected and were referred for medical evaluation.

A cluster of mono-rifampin resistant TB cases was identified in a single-room occupancy hotel. Eight confirmed cases of tuberculosis were identified since 1995. Among the 69 residents evaluated, 2 additional cases were identified. Evaluation is ongoing.

The Department of Health has been leading efforts to increase treatment for latent infection among contacts to active cases and others at high risk for progression to active disease. Some of the CDC objectives on treatment for latent infection concern program-supported treatment services which are offered in Department of Health chest clinics: these objectives apply to all persons, contacts and others, who are evaluated for treatment for latent infection in Department of Health chest clinics. During 1997, of the 12,615 individuals who started treatment for latent infection, 790 moved or died, and 6,539 completed therapy, for an overall completion index of 55.3%. The 1996 overall treatment for latent infection completion index was 51.3%; of the 11,989 individuals who started treatment for latent infection in that year, 704 moved or died, and 5,788 completed therapy. Efforts to ensure completion of treatment for latent infection in DOH chest clinics vary in intensity depending on the patient's risk of developing active disease. Therefore, completion rates for patients treated at DOH chest clinics vary for different groups. Those the Bureau considered at high risk (contacts, immunocompromised, recent converters, persons with radiographic evidence of tuberculosis in the past, and children under five years) had a 1997 completion index of 65.4%. In order to assure higher levels of completion of treatment for latent infection, the Bureau of Tuberculosis Control has adopted a case management approach for those at highest risk of progression to active disease that is similar to the way patients with active disease are managed (e.g., patients are assigned to a case manager who helps to remind the patients to take their medication and the status of patients whose treatment for latent infection is directly observed is reviewed on a quarterly basis).

Through continued emphasis on complete treatment of patients with active tuberculosis and with additional emphasis on preventive therapy, the New York City Department of Health, in cooperation with providers throughout New York City, will continue to reduce the city's burden of tuberculosis.

TABLES

TABLE 1
TUBERCULOSIS INCIDENCE
NEW YORK CITY, 1920 - 1998

Year	Number*	Rate Per 100,000**	Culture-Positive Cases	Smear-Positive Pulmonary Cases+ (Rate Per 100,000)	Multidrug-resistant Cases++
1920	14,035	246 9			
1930	11,821	170.2			
1940	8,212	110 0			
1950	6,518	98 0			
1960	4,699	60 4			
1970	2,590	32.8			
1971	2,572	32.6			
1972	2,275	28.8			
1973	2,101	26.6			
1974	2,022	25.6			
1975	2,151	27.2			
1976	2,151	27.2			
1977	1,605	21.1			
1978‡	1,307	17.2			
1979	1,530	20 1			
1980	1,514	19 9			
1981	1,582	22 4			
1982	1,594	22.5			
1983	1,651	23.4			
1984	1,629	23 0	1,527		
1985	1,843	26.0	1,785		
1986	2,223	31.4	2,181		
1987	2,197	31.1	2,157		
1988	2,317	32.8	2,241		
1989	2,545	36.0	2,405		
1990	3,520	49.8	3,372		
1991	3,673	50.2	3,484	,747 (23.9)	366
1992	3,811	52 0	3,442	1,791 (24.5)‡‡	441
1993	3,235	44.2	2,854	1,506 (20.6)	296
1994	2,995	40 9	2,479	1,242 (17 0)	176
1995	2,445	33.4	2,014	962 (13 1)	109
1996	2,053	28.0	1,721	820 (11.2)	84
1997	1,730	23.6	1,401	652 (8 9)	56
1998	1,558	21.3	1,255	545 (7.4)	38

* *For "phthisis," or pulmonary cases, 1920-1940; thereafter, all forms of tuberculosis.*

** *Population based on census data for each decade*

\+ *Patients with a sputum smear positive for acid-fast bacilli regardless of culture result*

++ *Resistant to at least isoniazid and rifampin Drug susceptibility made mandatorily reportable during 1991; figure from that year is not complete. Number for 1998 is preliminary because drug susceptibility tests have not yet been performed and results reported on some patients' isolates.*

‡ *Case definition revised in 1978 to include persons who had verified disease in the past and were discharged or lost to supervision for more than 12 months and had verified disease again*

‡‡ *This information was estimated for 1992, exact figures not available*

TABLE 2
TUBERCULOSIS INCIDENCE (RATES PER 100,000) BY RACE/ETHNICITY, SEX, AND AGE IN YEARS
NEW YORK CITY 1998

	Age Group *N* *Rate*										
Race/Sex	*0–4*	*5–9*	*10–14*	*15–19*	*20–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65+*	*Total*
White, total	2 1.3	0 0 0	0 0.0	1 0.7	4 1.9	19 3.3	17 3.5	31 9 0	18 5.2	69 10.6	**161** **5.1**
Males	1 1 3	0 0 0	0 0.0	1 1.4	2 1.9	9 3.1	11 4.5	25 15.1	12 7.5	36 14.6	**97** **6.5**
Females	1 1 3	0 0 0	0 0.0	0 0 0	2 1.8	10 3 5	6 2.5	6 3 4	6 3 3	33 8.2	**64** **3.8**
Black, total	19 12.5	7 4 9	3 2 1	14 9.6	30 19.5	123 37 0	172 63 1	113 56 8	68 47 7	92 57.7	**641** **34.7**
Males	10 13 0	3 4 1	1 1.4	8 11 1	15 21.1	66 44.4	115 97 9	83 99 4	43 74.3	53 96 4	**397** **48.0**
Females	9 11 9	4 5 6	2 2.7	6 8.1	15 18.1	57 31.0	57 36.7	30 26 0	25 29.5	39 37.3	**244** **23.9**
Hispanic, total	14 8 4	7 4.7	4 2.8	23 15.8	42 25 2	95 27.5	96 36.8	73 41.8	42 34.8	34 31 3	**430** **24.1**
Males	10 11.8	6 7 9	1 1.4	14 18 8	28 33 5	52 31.1	68 56.5	49 61 8	28 53.9	19 48.2	**275** **32.3**
Females	4 4.9	1 1.4	3 4.2	9 12.6	14 16 9	43 24 1	28 20.0	24 25.1	14 20.4	15 21.7	**155** **16.6**
Asian, total	4 10.5	3 9.2	7 21.1	14 37.3	35 79.7	78 65 0	54 56 7	42 74 4	34 89.9	55 160.5	**326** **61.6**
Males	1 5.05	2 11 8	4 23.7	4 21 1	19 87.2	49 79 8	41 83 2	26 89 7	25 136.6	36 233.4	**207** **77.3**
Females	3 16.4	1 6.3	3 18.5	10 55 2	16 72.2	29 49 4	13 28.3	16 58 3	9 46.1	19 100.8	**119** **45.6**
TOTAL	**39** **7.7**	**17** **3.7**	**14** **3.1**	**52** **11.0**	**111** **19.3**	**315** **23.0**	**339** **30.4**	**259** **33.54**	**162** **25.1**	**250** **26.2**	**1558** **21.3**
Males	**22** **8.5**	**11** **4.7**	**6** **2.6**	**27** **11.4**	**64** **22.8**	**176** **26.5**	**235** **44.2**	**183** **51.2**	**108** **37.5**	**144** **40.3**	**976** **28.4**
Females	**17** **6.8**	**6** **2.7**	**8** **3.6**	**25** **10.7**	**47** **15.9**	**139** **19.7**	**104** **17.8**	**76** **18.3**	**54** **15.1**	**106** **17.8**	**582** **15.0**

TABLE 3
CRUDE AND AGE-ADJUSTED TUBERCULOSIS RATES
NEW YORK CITY, 1992–1998

Borough	*Health District*	*Cases*	*Rates per 100,000 population*							
			1998 Crude+	*1998 Age-Adjusted**	*1997 Age-Adjusted**	*1996 Age-Adjusted**	*1995 Age-Adjusted**	*1994 Age-Adjusted**	*1993 Age-Adjusted**	*1992 Age-Adjusted**
Manhattan	Central Harlem	70	60.6	63 7	61 6	113.2	115.3	121.6	181.7	240.2
	East Harlem	35	27.5	28 3	35.2	45.4	60.3	71.5	73.1	95.8
	Kips Bay-Yorkville	26	11.0	11 1	10.3	9.3	10.9	14.8	14 4	19 1
	Lower East Side	79	33.0	30 4	40.0	45.7	51.3	74.8	69.5	101 5
	Lower West Side	49	16.6	15 0	22.7	33 3	29.9	45 9	44.8	77.9
	Riverside	25	12.0	10.5	21.4	21.8	32 90	41 1	59.0	72.1
	Washington Heights	78	29.3	31.0	31 7	51.4	36.6	49 1	52.9	60 9
	Total Manhattan	**362**	**24.3**							
Bronx	Fordham-Riverdale	67	27.3	28.2	18.1	29.0	24.5	34.6	27.5	37.8
	Morrisania	52	35.9	41.9	47.4	35.7	75 4	74.4	109.3	96.5
	Mott Haven	38	29.3	33.9	47.7	61.9	61 3	87.7	107.8	168.2
	Pelham Bay	28	12.8	12.3	13.1	8.1	13.3	21.1	20.1	20.3
	Tremont	52	27.2	33 4	45.2	47.6	56.7	88.5	76 0	105.8
	Westchester	37	13.4	13.5	13.9	16.7	26.0	19.8	34.0	35.8
	Total Bronx	**274**	**22.8**							
Brooklyn	Bay Ridge	36	15.1	15 3	13.5	12.8	20.2	18.6	20.1	15.9
	Bedford	87	37.4	41.6	48.2	54.8	68.4	82.3	89 1	107 5
	Brownsville	72	25.9	28.0	32 0	33.4	51.8	58 9	54.2	71.6
	Bushwick	41	22.5	26 8	29.1	45.8	61.1	72.8	83.3	83.1
	Flatbush	104	20.7	20.6	23.0	22.5	32 1	36	39.2	36.6
	Fort Greene	46	30.6	33.3	32.6	37 5	57.9	88.5	110 3	120.1
	Gravesend	45	15.8	14 9	18 5	14.3	20.2	23 6	21.9	20.4
	Red Hook-Gowanus	14	13.2	14.3	22.1	25.0	25.7	34 3	49 6	48.7
	Sunset Park	40	23.5	24.7	23.1	24.7	31.1	29 3	29.8	27.7
	W'burg-Grnpt.	19	12.2	13.7	23.1	24.0	30.3	45 6	52.2	59.3
	Total Brooklyn	**504**	**21.9**							
Queens	Astoria-LI C.	68	28.8	27.5	27.2	24 7	32.8	38.7	29.5	35.3
	Corona	102	35.1	34.0	29	42.6	45.3	39.5	44.5	56.3
	Flushing	70	15.3	15.1	18.9	16.4	19.9	18.4	17.3	14.6
	Jamaica East	57	16.9	16.8	18.1	28.3	28.7	35.9	33.7	34
	Jamaica West	64	17.7	18 0	13.9	18.7	23.5	26.2	25.2	21.5
	Maspeth-Forest Hills	32	11.9	11.7	12.5	12.3	10.6	20.4	18.5	12.3
	Total Queens	**393**	**20.1**							
Staten Island		25	6.6	6 6	8 7	7.7	10 4	17.7	15.3	17.8
TOTAL NYC		**1558**	**21.3**	**23.6**	**23.6**	**28**	**33.4**	**40.9**	**44.2**	**52**

\+ *1997 crude rates are based on the 1990 Census for New York City*
* *1992-1997 age-adjusted rates are based on the New York City 1990 Census by the method of direct adjustment.*

TABLE 4
TUBERCULOSIS CASES BY AGE IN YEARS AND AREA OF BIRTH
NEW YORK CITY 1998

	Age Groups										
Area of Birth	*0–4*	*5–9*	*10–14*	*15–19*	*20–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65+*	***Total***
Africa[1]	1	0	2	2	5	19	12	8	3	0	**52**
Far East Asia[2]	1	0	1	2	14	32	24	12	18	36	**148**
Canada	0	0	0	0	1	0	0	0	0	0	**1**
Caribbean[3]	2	3	2	8	21	46	53	39	14	27	**215**
Central/S Amer[4]	2	3	3	15	29	51	37	31	14	16	**201**
Europe[5]	0	0	0	0	3	8	3	8	8	26	**56**
Indo/Pakistan[6]	1	1	0	9	15	32	15	16	10	8	**107**
Middle East[7]	1	0	1	1	1	2	5	0	2	0	**13**
Southeast Asia[8]	0	0	0	3	6	13	10	12	5	11	**60**
Oceania	0	0	1	0	0	0	0	0	0	0	1
TOTAL NON -USA	**8**	**7**	**10**	**40**	**95**	**203**	**159**	**126**	**74**	**124**	**846**
USA*	30	10	4	11	16	106	159	111	85	109	**621**
Puerto Rico	0	1	0	1	0	6	16	20	22	15	**79**
Total USA	**30**	**11**	**4**	**12**	**16**	**112**	**175**	**131**	**87**	**124**	**700**
Unknown	**1**	**0**	**0**	**1**	**0**	**0**	**5**	**2**	**1**	**2**	**12**
Total	**39**	**17**	**14**	**52**	**111**	**315**	**339**	**259**	**162**	**250**	**1558**

* *Includes the U.S. Virgin Islands (3)*

[1] Guinea (11), The Gambia (5), Ivory Coast (5), Senegal (1), Other (30)
[2] China (107), Korea (25), Taiwan (6), Other (2)
[3] Dominican Republic (87), Haiti (67), Jamaica (29), Trinidad & Tobago (12), Cuba (9), Barbados (6), Other (5)
[4] Ecuador (64), Mexico (40), Guyana (19), Peru (14), Honduras (12), Colombia (13), Guatemala (12), Other (29)
[5] Former Soviet Union (8), Poland (8), Romania (8), Greece (6), Other (26)
[6] India (45), Pakistan (23), Bangladesh (21), Nepal (14), Other (4)
[7] Yemen (5), Turkey (3), Saudi Arabia (2), Other (3)
[8] Philippines (32), Vietnam (16), Other (12)

TABLE 5
DRUG RESISTANCE BY PLACE OF BIRTH

	N (%)			
SusceptibilitiesTotal	*Total*	*U S -born**	*Foreign-born*	*Unknown*
Tested for susceptibility to first-line drugs of those with positivecultures	1217	540 (95.9)	672 (97.8)	5 (100.0)
Multidrug-resistant (isoniazid & rifampin resistant)	38	20 (3.7)	18 (2.7)	0 (0.0)
Isoniazid-resistant and rifampin-susceptible	53	23 (4 3)	53 (7.9)	0 (0 0)
Resistant to first-line drugs other than isoniazid & rifampin	45	14 (2 6)	30 (4 5)	1 (20.0)
Resistant to rifampin only	13	7 (1.3)	6 (0 9)	0 (0 0)
Susceptible to all first-line drugs	1045	476 (88.1)	565 (84.1)	4 (80.0)

* *Includes Puerto Rico*

TABLE 6
SOCIAL CHARACTERISTICS OF TUBERCULOSIS CASES
NEW YORK CITY, 1998

*Social characteristic**	*# (%) of total cases for whom information is available*	*# reporting characteristic (% of cases with available information)*
Injection drug use in 12 months before diagnosis	1507 (96.7)	49 (3.3)
Non-injection drug use in 12 months before diagnosis	1509 (96.9)	106 (7.0)
Alcohol abuse in 12 months before diagnosis	1509 (96.9)	169 (11.2)
Homeless at diagnosis or any time during treatment	1558 (100.0)	92 (5.9)
Resident of correctional facility at time of diagnosis	1558 (100.0)	43 (2.8)
Resident of long-term care facility at time of diagnosis	1558 (100.0)	26 (1.7)
Health care or correctional facility worker in 24 months before diagnosis	1450 (93.1)	57 (3.9)

* *Categories not mutually exclusive*

TABLE 7
TUBERCULOSIS DEATHS AND RATE (PER 100,000)
NEW YORK CITY, 1910–1998

Year	*# Deaths*	*Rate*
1910	8,832	197.5
1920	7,915	144.1
1930	4,574	68.2
1940	3,680	50.0
1950	2,173	27.4
1960	824	10.6
1970	432	5.5
1980	143	2.0
1981	155	2.2
1982	168	2.4
1983	151	2.1
1984	168	2.4
1985	155	2.2
1986	186	2.6
1987	219	3.1
1988	247	3.5
1989	233	3.3
1990	250	3.5
1991	241	3.3
1992	199	2.7
1993	166	2.3
1994	129	1.8
1995	94	1.3
1996	67	0.9
1997	55	0.8
1998	53	0.7

TABLE 8
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1998

	N (%)								
	Females			Males			Total		
Age	HIV(+)	HIV(–)	NA*	HIV(+)	HIV(–)	NA	HIV(+)	HIV(–)	NA
0-4	1 (5.9)	8 (47.1)	8 (47.1)	0 (0.0)	9 (40.9)	13 (59.1)	1 (2.6)	17 (43.6)	21 (53 8)
5-9	0 (0.0)	3 (50.0)	3 (50.0)	0 (0.0)	7 (63.6)	4 (36.4)	0 (0 0)	10 (58.8)	7 (41.2)
10-14	0 (0.0)	5 (62.5)	3 (37.5)	0 (0.0)	5 (71.4)	2 (28 6)	0 (0 0)	8 (57.1)	6 (42 9)
15-19	0 (4 3)	11 (65.2)	14 (30 4)	0 (0.0)	16 (64 0)	11 (36.0)	0 (0.0)	27 (51 9)	25 (48.1)
20-24	5 (10.6)	34 (72 3)	8 (17.0)	2 (3.1)	45 (70 3)	17 (26.6)	11 (6 3)	79 (71.2)	25 (22.5)
25-34	31 (22.3)	85 (61.2)	23 (16.5)	42 (23.9)	105 (59 7)	29 (16.5)	73 (23.2)	190 (60.3)	52 (16.5)
35-44	47 (45.2)	44 (42.3)	13 (12.5)	97 (41.3)	101 (43 0)	37 (15 7)	144 (42.5)	145 (42 8)	50 (11.6)
45-54	19 (25.0)	38 (50.0)	19 (25.0)	67 (36 6)	77 (42.1)	39 (21 3)	86 (33.2)	115 (44.4)	58 (22.4)
55-64	5 (9.3)	33 (61.1)	16 (29.6)	19 (17 6)	47 (43 5)	42 (43.5)	24 (14.8)	80 (49 4)	58 (35 8)
65+	0 (0.0)	46 (43.4)	60 (56.6)	11 (7 6)	63 (43 8)	70 (48.6)	11 (4.4)	109 (43 6)	130 (52 0)
TOTAL	**108 (18.6)**	**307 (52.7)**	**167 (28.7)**	**238 (24.4)**	**473 (48.5)**	**265 (27.2)**	**346 (22.2)**	**780 (50.1)**	**432 (27.7)**

* *Not available*
** *Due to rounding error, percentages do not total to 100%*

TABLE 9
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1992–1998

	N (%)					
	Females		Males		Total	
Year	HIV (+)		HIV (+)		HIV (+)	
1992	297	(25 1)	983	(37 4)	1281	(33 6)
1993	308	(27.5)	760	(35 9)	1068	(33.0)
1994	244	(23.5)	767	(39.2)	1011	(33 8)
1995	226	(25.4)	575	(37 0)	801	(32 8)
1996	204	(26.0)	429	(33.8)	633	(30 8)
1997	147	(21.8)	301	(28.5)	448	(25 9)
1998	108	(18.6)	238	(24 4)	346	(22.2)

TABLE 10
COMPLETION INDEX FOR ACTIVE CASES DIAGNOSED IN 1997

	N=1,659*			
Outcome	*Number of Cases*	*Percent*	*Completion Index***	*Completion Index without MDR Cases*
Completed Therapy	1,327	80.0	94 0	95 4
Died prior to completing treatment	196	11.8		
Prolonged Therapy	52	3.1		
Refused/Stopped Therapy	8	0 5		
Lost	23	1.4		
Moved+	52	3 1		

* *Excludes patients found not to have TB and those who were reported at death*
** *Completion Index = Number Completed/(Total Number–Number Moved–Number Died)*
\+ *Patients are categorized as moved only if their transfer to another jurisdiction is confirmed*

TABLE 11
TUBERCULOSIS CASES BY PRIMARY SITE OF DISEASE
NEW YORK CITY, 1998

	Number of Cases	*(%)*
Pulmonary	1,173	(75 3)
Lymphatic	130	(8.3)
Bone/Joint	49	(3 1)
Pleural	62	(4 0)
Miliary	51	(3 3)
Meningeal	19	(1.2)
Genitourinary	29	(1 9)
Peritoneal	13	(0 8)
Other	32	(2.1)
Total	**1,558**	**(100.0)**
Both Pulmonary and Extrapulmonary	**172**	**(11.0)**

TABLE 12
EPIDEMIOLOGIC INVESTIGATIONS OF TB EXPOSURE IN CONGREGATE SETTINGS
NEW YORK CITY, 1998

Site	N = 17*										Transmission
	Close Contacts			Casual Contacts				Self-Referred			
	Identified #	Tested #	(%)	Positive #	(%)	Identified #	Tested #	(%)	Positive #	(%)	Tested #	Positive #	(%)	
School														
Intermediate School A	29	28	(97)	8	(28)	22	17	(77)	2	(12)	28	2	(7)	Probable
High School A	20	17	(85)	6	(35)	135	14	(10)	0	(0)	29	1	(3)	Probable
High School B	25	20	(80)	0	(0)	167	44	(26)	1	(2)	191	12	(6)	Unlikely
High School C	8	7	(88)	0	(0)	204	0	(0)	0	(0)	8	1	(13)	Unlikely
Day Care Center C	76	48	(63)	1	(2)						0	0	(0)	Unlikely
High School D	13	9	(69)	1	(11)	170	83	(49)	11	(13)	49	1	(2)	Unlikely
Intermediate School B	35	28	(80)	2	(7)						244	6	(2)	Unlikely
Worksite														
College	10	9	(90)	2	(22)	15	5	(33)	1	(20)	1	0	(0)	Unlikely
Airline	9	5	(56)	5	(100)	20	10	(50)	1	(20)	1	0	(0)	Unlikely
Retail Store	2	1	(50)	0	(0)	20	13	(65)	0	(0)	2	1	(33)	Unlikely
NYPD	157	112	(71)	12	(11)						176	19	(11)	Unlikely
School Cafeteria	6	6	(100)	0	(0)									Unlikely
Diplomatic Mission	7	6	(86)	4	(67)						2	0	(0)	Unlikely
Bank	7	7	(100)	0	(0)	3	3	(100)	0	(0)	3	1	(33)	Unlikely
Architecture Firm	90	71	(79)	28	(39)						3	0	(0)	Probable
Pastry Shop	13	12	(100)	9	(69)	3	2	(67)	0	(0)	0	0	(0)	Unlikely
Hotel	25	25	(100)	9	(36)	15	15	(100)	1	(7)	0	0	(0)	Unlikely
Total	**532**	**412**	**(77)**	**87**	**(21)**	**774**	**206**	**(27)**	**17**	**(8)**	**738**	**44**	**(6)**	

APPENDICES

APPENDIX 1

The CDC's objectives for tuberculosis control programs nationwide may be categorized as pertaining to surveillance, case management and prevention. These objectives are as follow:

Management and Surveillance of active tuberculosis cases

1. At least 90% of newly diagnosed tuberculosis cases will complete a course of therapy recommended by the American Thoracic Society/CDC.
2. For at least 95% of tuberculosis cases, all information requested in the national reporting form (the expanded Report of a Verified Case of Tuberculosis) will be available.
3. The impact of multidrug-resistant tuberculosis will be measured and documented.
4. Drug susceptibility testing will be performed routinely and in a timely fashion on at least the initial isolate from 90% of tuberculosis cases.
5. A system will be developed to accurately measure outcomes of MDRTB surveillance, case management and contact investigation.

Prevention

1. At least 95% of close contacts of infectious tuberculosis cases will be examined, with at least 95% of infected contacts younger than age 15 years and at least 75% of infected contacts age 15 years and older starting treatment for latent infection.
2. At least 90% of infected contacts younger than age 15 years who start treatment for latent infection and at least 75% of infected contacts age 15 years and older who start treatment for latent infection will complete a minimum of 6 continuos months of treatment for latent infection.
3. At least 95% of tuberculin skin test (TST)-positive persons identified through program-supported screening will be clinically evaluated for tuberculosis within 2 weeks of TST.
4. At least 90% of persons with tuberculosis infection identified through program-supported screening who have no evidence of clinical tuberculosis or medical contraindications will start treatment for latent infection.
5. At least 75% of persons with tuberculosis infection identified through program-supported screening who start treatment for latent infection will complete a minimum of 6 months of treatment for latent infection.

APPENDIX 2

TUBERCULOSIS CASES BY UNITED HOSPITAL FUND NEIGHBORHOOD AND ZIP CODE: NEW YORK CITY, 1998*

UHF Neighborhood	*Zip Code*	*1998 TB*
MANHATTAN		
Washington Heights	10032	24
	10033	14
	10034	7
	10040	8
Cent. Harlem Morningside Hghts	10026	18
	10027	19
	10030	9
	10031	24
	10039	18
East Harlem	10029	24
	10035	18
	10037	6
Upper West Side	10023	8
	10024	5
	10025	13
Upper East Side	10021	5
	10028	-
	10044	-
	10128	-
Chelsea-Clinton	10001	-
	10011	-
	10018	-
	10019	13
	10020	-
	10036	-
Gramercy Park	10010	-
	10016	15
	10017	6
	10022	-
Greenwich Village	10012	-
	10013	5
	10014	-
Union Square	10002	41
	10003	10
	10009	12
Lower Manhattan	10004	-
	10005	-
	10006	-
	10007	-
	10038	5
	10280	-
BRONX		
Kingsbridge-Riverdale	10463	6
	10471	-
Northeast Bronx	10464	-
	10466	10
	10469	7
	10470	-
	10475	-
Fordham-Bronx Park	10458	17
	10467	29
	10468	28
Pelham-Throgs Neck	10461	-
	10462	8
	10465	-
	10472	13
	10473	7
Crotona-Tremont	10453	17
	10457	16
	10460	11

UHF Neighborhood	*Zip Code*	*1998 TB*
BRONX (continued)		
High Bridge-Morrisania	10451	15
	10452	16
	10456	27
Hunts Point-Mott Haven	10454	6
	10455	-
	10459	13
	10474	-
BROOKLYN		
Greenpoint	11206	10
	11211	9
	11222	5
	11237	10
Downtown-Heights-Slope	11201	9
	11205	7
	11215	6
	11217	8
	11231	-
Bedford Stuyvesant-Crown Hts.	11212	29
	11213	25
	11216	24
	11221	25
	11225	12
	11233	23
	11238	27
East New York	11207	17
	11208	18
	11239	-
Sunset Park	11220	23
	11232	-
Borough Park	11204	18
	11218	20
	11219	17
East Flatbush-Flatbush	11203	21
	11210	-
	11226	36
	11230	13
Canarsie-Flatlands	11234	7
	11236	17
Bensonhurst-Bay Ridge	11209	10
	11214	6
	11228	5
Coney Island, Sheepshead Bay	11223	8
	11224	6
	11229	6
	11235	16
QUEENS		
Long Island-Astoria	11101	9
	11102	12
	11103	6
	11104	10
	11105	7
	11106	10
West Queens	11368	28
	11369	5
	11370	15
	11371	-
	11372	22
	11373	32
	11377	26
	11378	-

UHF Neighborhhod	*Zip Code*	*1998 TB*
QUEENS (continued)		
Flushing-Clearview	11354	16
	11355	27
	11356	-
	11357	-
	11358	-
	11359	-
	11360	-
Bayside-Little Neck	11361	-
	11362	-
	11363	-
	11364	-
Ridgewood-Forest Hills	11374	7
	11375	9
	11379	-
	11385	10
Fresh Meadows	11365	-
	11366	-
	11367	-
Southwest Queens	11414	5
	11415	-
	11416	-
	11417	5
	11418	7
	11419	-
	11420	10
	11421	6
Jamaica	11412	6
	11423	10
	11430	-
	11432	13
	11433	-
	11434	7
	11435	11
	11436	-
Southeast Queens	11001	-
	11004	-
	11411	-
	11413	5
	11422	-
	11426	-
	11427	-
	11428	-
	11429	6
Rockaway	11691	7
	11692	-
	11693	-
	11694	-
	11697	-
STATEN ISLAND		
Port Richmond	10302	-
	10303	-
	10310	-
Stapleton	10301	6
	10304	5
	10305	-
Willowbrook	10314	-
South Beach	10306	-
	10307	-
	10308	-
	10309	-
	10312	-
OTHER		-

**Zip codes with less than 5 cases are not reported*

To order copies of the TB76, laboratory/pathology report forms or report of patient services forms call or mail the enclosed order form to:

Elizabeth Valerio
Bureau of Tuberculosis Control
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-9771
Fax: (212) 442-9996

To order copies of the TB78 (preventive therapy) report forms, call or mail the enclosed order form to:

Marcia Hampton
Bureau of Tuberculosis Control
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-9968
Fax: (212) 442-9998

TB CHEST CLINICS:

BRONX

Morrisania Chest Center
1309 Fulton Ave., Room 255
Bronx, NY 10456
Tel. (718) 901-6537/8

BROOKLYN

Bedford Chest Clinic
485 Throop Ave., Room 208A
Brooklyn, NY 11221
Tel. (718) 574-2462/3

Brownsville Chest Clinic
259 Bristol Street, Room 239
Brooklyn, NY 11212
Tel. (718) 495-7256/7/8

Bushwick Chest Clinic
335 Central Ave.
Brooklyn, NY 11221
Tel. (718) 573-4886/91/89

Fort Greene Chest Clinic
295 Flatbush Ave. Ext.,
Room 222
Brooklyn, NY 11201
Tel. (718) 643-8357/6551

MANHATTAN

Chelsea Chest Clinic
303 Ninth Avenue
New York, NY 10031
Tel. (212) 239-1758/49

Washington Heights Chest Center
600 West 168th St., Third Floor
New York, NY 10032
Tel. (212) 304-5420/1

QUEENS

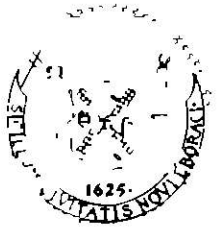
Corona Chest Clinic
34-33 Junction Blvd., Room 120
Queens, NY 11372
Tel. (718) 476-7635/36/37

Far Rockaway Chest Clinic
67-10 Rockaway Beach Blvd.,
Room 201
Queens, NY 11692
Tel. (718) 474-2100/1

STATEN ISLAND

Richmond Chest Clinic
51 Stuyvesant Place, Room 408
Staten Island, NY 10301
Tel. (718) 983-4525/26

RETURN TO
MARIE DESSOUREE



THE CITY OF NEW YORK
DEPARTMENT OF HEALTH

Rudolph W. Giuliani
Mayor

Neal L. Cohen, M.D.
Commissioner of Health