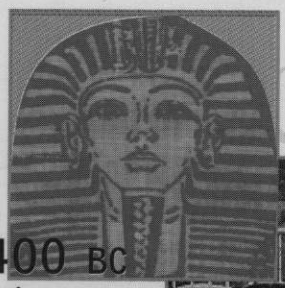
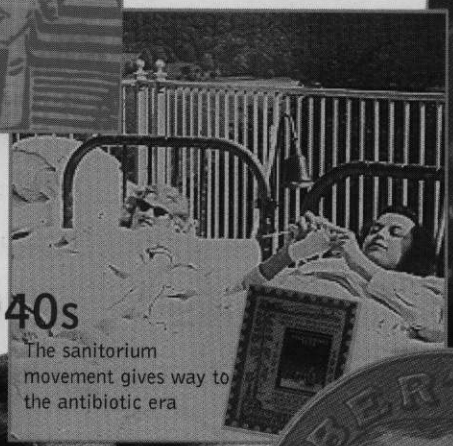
1999

Tuberculosis Control Program
New York City Department of Health
INFORMATION SUMMARY

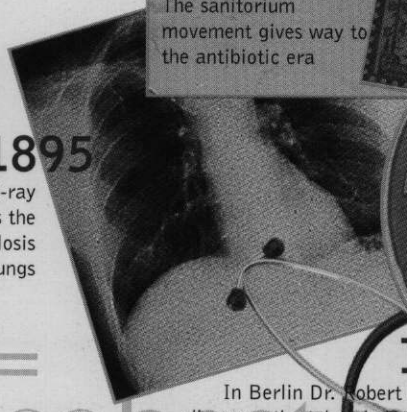


2400 BC
Evidence of tuberculosis found in Egyptian mummies



1940s
The sanitorium movement gives way to the antibiotic era

1944
Tubercle bacillus is successfully treated by the discovery of streptomycin



1895
Invention of X-ray photography allows the diagnosis of tuberculosis in the lungs

1882
In Berlin Dr. Robert Koch discovers the tubercle bacillus

1990s
Advocacy increases awareness that tuberculosis is curable today

consumption

tb = mycobacterium tuberculosis

phthisis

Tuberculosis through the years

MISSION STATEMENT

The mission of the Tuberculosis Control Program is to prevent the spread of tuberculosis (TB) and eliminate it as a public health problem in New York City.

The goals of the TB Control Program are:

1. To identify all individuals with suspected or confirmed TB 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 latent infection to active disease (e.g., contacts of active cases, immunocompromised individuals, recent immigrants from areas where TB is widespread) receive treatment for latent TB infection and do not develop disease.

The Program 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 TB identified in all facilities in New York City are reported to the Program and documented on the computerized confidential TB disease registry.
2. Conducting intensive case interviews and maintaining an effective outreach program so that TB 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 TB.
4. Setting standards and guidelines and providing consultation on the prevention, diagnosis, and treatment of latent TB infection and disease in New York City, at no cost to the patient.
5. Operating clinical sites throughout New York City that provide state-of-the-art care for persons with suspected or confirmed TB disease and their close contacts, at no cost to the patient.
6. Ensuring care for persons who have or are suspected of having active TB disease, in accordance with New York State Public Health Law §2202, Article 22, Title I, at no cost to the patient.

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 which have:
   - A smear (from any anatomic site) positive for acid-fast bacilli (AFB);
   - A nucleic acid amplification test (e.g., Amplicor®, GenProbe®) result suggesting *Mycobacterium tuberculosis*;
   - A culture positive for *Mycobacterium tuberculosis*, or
   - Started on two or more antituberculosis 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 all laboratory findings which suggest or confirm tuberculosis:

- AFB positive smears
- Cultures positive for *Mycobacterium tuberculosis*
- Rapid diagnostic results that identify *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 information purposes only and do not imply endorsement by the New York City Department of Health.

NEW YORK CITY DEPARTMENT OF HEALTH
TUBERCULOSIS CONTROL PROGRAM

INFORMATION SUMMARY: 1999

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HIGHLIGHTS

1. In 1999, 1,460 new cases of tuberculosis were reported in New York City, a 6.3% decrease from the 1,558 cases reported in 1998 and a 61.7% decrease from the 3,811 cases reported in 1992, the peak of the current epidemic. New York City's tuberculosis rate in 1999 was 19.9 cases per 100,000 persons, compared with 21.3 in 1998 and 52.0 in 1992.

2. Despite several years of progress, New York City's 1999 tuberculosis rate is still more than three times the national rate of 6.4 per 100,000, and is higher than any other jurisdiction reporting more than 100 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 1999, 31 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), an 18.4% decrease from the 38 cases reported in 1998 and a 93.0% 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 eligible patients diagnosed in 1998, 1,154 (88.5%) completed treatment within 365 days. Excluded from this index are patients found not to have tuberculosis, those who died, those who never started anti-tuberculosis therapy, those less than 21 years of age with bone, miliary, or meningeal tuberculosis, and those with *Mycobacterium tuberculosis* isolates initially resistant to rifampin.

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 continued for the third consecutive year in 1999: 834 of 1999 cases were foreign born (57.1%), 605 were U.S. born (41.4%), and 21 (1.4%) had an unknown country of origin. In contrast, in 1992, only 17.7% of tuberculosis cases diagnosed in New York City were foreign born. Increases in foreign-born cases in Queens and Staten Island are in part responsible for the increases in the total number of cases reported in these boroughs and the increase in the number of cases aged 35 through 44 years.

6. The proportion of total cases known to be infected with the human immunodeficiency virus (HIV) in 1999 (22.0%, 321 cases) was similar to the percent known to be HIV-positive in 1998 (22.2%, 346 cases).

7. To reduce the future burden of tuberculosis in New York City, greater emphasis has been placed 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 1998, 11,830 individuals started taking treatment for latent tuberculosis infection; 513 discontinued treatment for medical reasons or died during treatment and 6,434 (56.9%) of the remaining 11,317 completed treatment. Of those starting treatment for latent tuberculosis infection, 8,384 (70.9%) started receiving their care at Department of Health chest clinics.

OVERVIEW OF ACTIVITIES

Tuberculosis Control Program

The Tuberculosis Control Program is multifaceted and integrates clinical services, field services, case management, directly observed therapy, epidemiology, surveillance, and education and training of staff and providers. The Program employs multi-lingual and culturally-sensitive staff to facilitate communication with New York City's diverse population. To ensure that treatment for tuberculosis meets acceptable standards, the Program 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 Program'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 Program's activities. Internal reports monitor trends and identify problems on a timely basis. Program staff use Continuous Quality Improvement, breakthrough projects and audits to identify problems, propose changes for improvement, and monitor progress following the implementation of changes. Essential to the day-to-day activities of the Program is the Operations Unit which ensures the appropriate allocation of program funds, materials, and equipment; coordinates and monitors all contracts; and enables the program to be staffed with qualified employees.

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 and public healthcare 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 ten chest clinics (Bushwick Chest Clinic will be opened in late 2000) located throughout the City (see inside back cover). These clinics are staffed with internal medicine, pulmonary medicine, and infectious disease board-certified physicians who also provide expert consultation to other providers throughout the city. The clinics provide specialty care, including care for difficult to treat patients and DOT for individuals with active tuberculosis. The clinics also provide treatment for latent tuberculosis infection (LTBI), especially to individuals at high risk for developing tuberculosis. Services include tuberculin skin testing, chest x-rays, sputum induction, blood tests (including drug level testing), medical and nursing care, medications, social services, and human immunodeficiency virus (HIV) counseling and testing. All care is confidential, state-of-the-art, and free of charge for the patient.

The Program increased the community utilization of its clinical services unit in 1999. This unit collaborated with several community-based organizations to provide targeted testing and treatment for LTBI to high risk groups. Clinic hours were extended to accommodate these groups of patients whose work schedules prohibited appointments during normal clinic hours. The schedule for the Corona Chest Clinic located in Queens was changed to include two late evening clinic sessions per month.

In 1999, the Program's chest clinics provided care to 1,757 patients with confirmed or suspected tuberculosis. Of 1,460 patients who were diagnosed with tuberculosis in 1999, 587 (40.2%) received some or all of their care in the Program's chest clinics. These clinics provide care to a high proportion of patients with multidrug-resistant tuberculosis: in December 1999, 53.0% (35/66) of the prevalent multidrug-resistant tuberculosis cases eligible for DOT were cared for at the Program's chest clinics.

The chest clinics recorded 143,420 patient visits in 1999. This represents a 1.8% increase from the 140,851 visits in 1998. The highest number of patient visits to a

DOH clinic in 1999 was recorded at the Corona Chest Clinic in Queens, with 38,090 or 26.6% of the total patient visits, an 18.2% increase from 1998. The increase in clinic visits can be attributed to the following factors: more referrals from community-based organizations, such as the New York Task Force on Immigrant Health, a greater incidence of tuberculosis disease in Queens, and increased referrals from targeted testing for LTBI citywide. Preliminary figures for 1999 indicate that 8,203 patients started treatment for LTBI in DOH New York City chest clinics.

A large proportion of patients served by these clinics were foreign born or uninsured. In 1999, 67.6% of patients receiving treatment for latent infection at one of the Program's chest clinics did not have medicaid or other insurance, therefore, the Department of Health was unable to receive reimbursement for their care.

Outreach Services

The Program's outreach workers educate, interview, and case manage hospitalized patients and outpatients, locate and return patients to medical care, travel throughout the city to observe individuals as they ingest their medication, evaluate contacts of individuals with tuberculosis, assure appropriate medical follow-up of contacts, and update patient information on the Program's citywide tuberculosis registry. According to the New York City Health Code, Program outreach workers have the right to review inpatient and outpatient medical records of persons with suspected or confirmed tuberculosis. Additionally, Program physicians review the treatment regimens of all confirmed tuberculosis cases in the City and provide recommendations and consultations to treating physicians based on national and New York City clinical guidelines. Specialized outreach groups offer tuberculosis control services to patients incarcerated at the Rikers Island Correctional Facility, the 30th Street Shelter, 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, including Commissioner's Orders for directly observed therapy, 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 1999, outreach workers were responsible for providing DOT in the residences, places of employment or other meeting places of 715 tuberculosis patients who could not attend clinic on a regular schedule, and for returning to clinical care an average of 34 patients per month who had become non-adherent to therapy or who had missed clinic appointments. Program 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 1999, 4,539 contacts received tuberculin skin testing by outreach staff with 1,572 of 1,783 (88.2%) eligible contacts also receiving the necessary post-window tuberculin test.

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 1999, 489 patients reported to the New York City Department of Health had an AFB-positive smear and therefore were assigned to outreach workers for interviews, but were eventually found not to have tuberculosis. Before these patients were determined not to have tuberculosis, 3,392 of their contacts were evaluated.

Surveillance

Surveillance and Central Registry staff ensure that data reported to the Program are entered into a computerized tuberculosis registry. In addition to entering demographic and clinical data for the 1,460 confirmed cases reported in 1999, Central Registry staff entered data for 3,392 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 1999, surveillance workers reviewed medical records for 1,545 suspected cases, and their efforts contributed to the confirmation of

tuberculosis disease in 317 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 investigate possible instances of laboratory contamination.

Registry data are routinely analyzed by 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 21 patients thought to have tuberculosis in 1999 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.

Epidemiology

The Epidemiology staff provides epidemiologic consultation to each of five regions. The staff review all pulmonary culture-positive cases to provide assistance in making an 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 1999, 1,077 cases were reviewed by epidemiologists. Epidemiology staff conducted 15 expanded investigations to determine whether or not infectious tuberculosis patients had infected contacts in schools, workplaces, or residences. In congregate sites where less than 15 contacts are identified, the investigation of contacts is performed by case managers.

The Epidemiology 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 Program. For example, an increase of tuberculosis cases among Tibetans was investigated to assess whether the increase was due to disease transmission within the community in New York City or as a result of reactivation of infection acquired in the country of origin. On-going surveillance by patients' address of residence is conducted by region-based epidemiologists. Twice each year, the epidemiologists create frequency tables by patients' address of residence utilizing tuberculosis registry data from the previous four years. New clusters of tuberculosis cases are referred to the Expanded Contact Investigation Unit for evaluation and investigation. Active surveillance of health care workers is conducted to monitor trends of disease in this group, facilitate early identification of clusters, and to improve communication about tuberculosis exposures with health care facilities.

Education and Training

In addition to conducting orientation and in-service training for DOH staff and non-DOH professionals, the Education and Training Unit educates the public about tuberculosis. During 1999, the unit provided 140 training sessions for DOH staff; 10 seminars and conferences for 835 DOH and non-DOH health care professionals, educational sessions for 8,500 members of the general public; and 1,800 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 1999, 260,000 such publications and materials were distributed. In 1997, the New York City DOH developed a web site, http://www.nyclink.org/health. The Tuberculosis Control Program offers a large volume of material on the site, including clinic addresses, hours of service, and informational brochures for the general public. Publications targeted to health care providers are also available on the site, including TB Fact Sheets which highlight key topics on tuberculosis treatment and control, and the Clinical Policies and Procedures manual which details the standards for diagnosis and treatment of tuberculosis disease and infection in the chest clinics.

Methods

Case Counting

Cases counted in 1999 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 1999 cases were first suspected of having disease in 1998, likewise, some individuals first suspected of having tuberculosis in late 1999 will be counted in 2000 if active tuberculosis is confirmed in 2000. Individuals who submitted a specimen for mycobacteriology culture in late 1999 were included in the 1999 count if their culture was reported to be positive for any species in the *Mycobacterium tuberculosis* complex (*Mycobacterium tuberculosis*, *Mycobacterium bovis*, *Mycobacterium africanum*, *Mycobacterium microti*) by January 31, 2000. A certain proportion of each year's counted 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 Tuberculosis Control Program 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 the 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 cohort of cases counted 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 Tuberculosis Control Program 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 six 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 non-Hispanic White, non-Hispanic Black, Hispanic and Asian. In the past, collecting information on race/ethnicity facilitated the identification of increasing tuberculosis trends among Asians and alerted the Tuberculosis Control Program 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 Tuberculosis Control Program 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 1999 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 Tuberculosis Control Program 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 (DOH) within 24 hours, of all clinically suspected and confirmed cases of tuberculosis; of children less than five years old 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 DOH for testing) household contacts of infectious cases and to notify the DOH of the test results or referral. Furthermore, the DOH may require household and non-household contacts to be tested and reexamined as needed. Physicians are also required to report when a patient ceases to receive anti-tuberculosis treatment and the reason for the cessation, as well as any other information required by the DOH for the control of tuberculosis. Information on ordering reporting forms is included on the back cover of this report.

INTRODUCTION

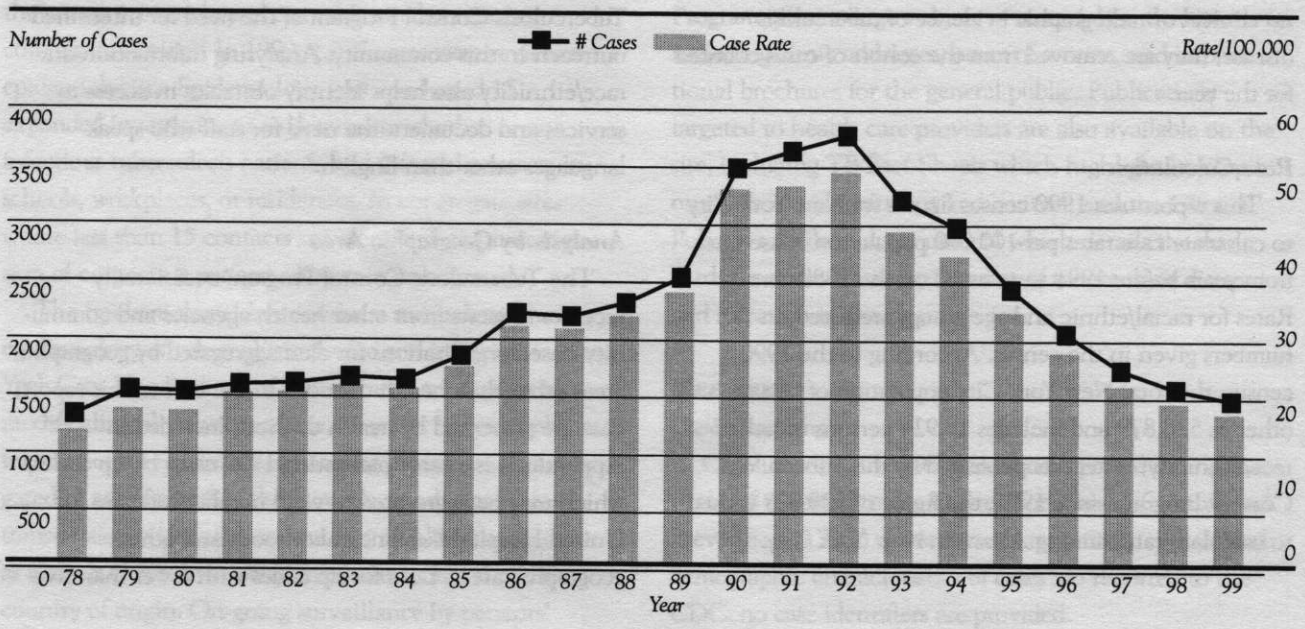
(Table 1, Figure 1)

This report presents information on the demographic and clinical characteristics of tuberculosis cases confirmed in New York City in 1999 as well as on efforts to increase completion of treatment for latent infection by persons infected with the organism that causes tuberculosis.

In 1999, the number of confirmed tuberculosis cases in New York City declined for the seventh consecutive year, to a total of 1,460. This is a 6.3% decrease from the 1,558 cases reported in 1998. Using the population recorded in the 1990 census as a denominator, the City's 1999 tuberculosis case rate is 19.9 tuberculosis cases per 100,000 persons, compared with a rate of 21.3 recorded in 1998. Using an estimate of the City's 1999 population the overall rate decreased to 19.7.

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 a peak in 1992 of 3,811 cases and a rate of 52.0 per 100,000. The number of cases reported in 1999 is 61.7% lower than the number reported in 1992. The drop in culture-confirmed cases

FIGURE 1
TUBERCULOSIS CASES AND RATES
NEW YORK CITY, 1978 - 1999



between 1992 and 1999 is greater: the number of culture-confirmed cases reported in 1999 (1,143) is 66.8% lower than the number reported in 1992 (3,442).

New York City's recent tuberculosis epidemic started approximately six years before the nationwide 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 1999, the number of cases nationally decreased by 9,145, to 17,528 cases in 1999. With 2,351 fewer cases in 1999 than in 1992, New York City contributed 25.7% 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 seven years, the number of cases reported in the city in 1999 is still 11.7% higher than the number reported in 1978. New York City's 1999 rate of 19.9 tuberculosis cases per 100,000 population is 3.1 times the national rate of 6.4 per 100,000, higher than that of any other jurisdiction reporting more than 100 cases. In 1999, New York City contributed 8.3% of the nation's total 17,528 reported tuberculosis cases. The goal for tuberculosis control for the year 2000, set by the Centers for Disease Control and Prevention, was a national rate of 3.5 cases per 100,000 persons. The national rate of 6.4 is 1.8 times higher than the year 2000 goal. Therefore 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 the *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*. Since 1997, the proportion of tuberculosis cases known to be HIV-infected has been notably lower than that recorded in previous years: the proportion of HIV-infected tuberculosis cases continued to decline in 1999, to 22.0%. The proportion of tuberculosis cases who were foreign born increased in 1999 over that recorded in 1998 (57.1% vs. 54.3%). In 1999, the trend toward an increasing proportion of female cases, which had been observed since 1986 and was interrupted in 1998, continued: the proportion of female cases increased slightly, to 38.2%, compared with 37.4% in 1998 but did not exceed the 1997 proportion of 39.0%.

The first step in controlling the tuberculosis epidemic--ensuring the complete treatment of infectious cases--has been taken. However, if the City is to further reduce the burden of tuberculosis for future New Yorkers, it is important to treat latent infection in 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 1999.

Age Distribution

(Table 2, Figure 2)

In 1999, people with active tuberculosis ranged in age from less than 1 year to 96 years old. Tuberculosis case rates were highest in the group aged 35 through 44 years (31.9 per 100,000). Case rates were lowest in the group aged 5 through 9 years (3.3 per 100,000). There were fewer tuberculosis cases in all age groups in 1999 than in 1998, except for the groups aged 10 through 14 (50.0% increase), 25 through 34 (0.3% increase), and 35 through 44 years (5.0% increase). 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 1999.

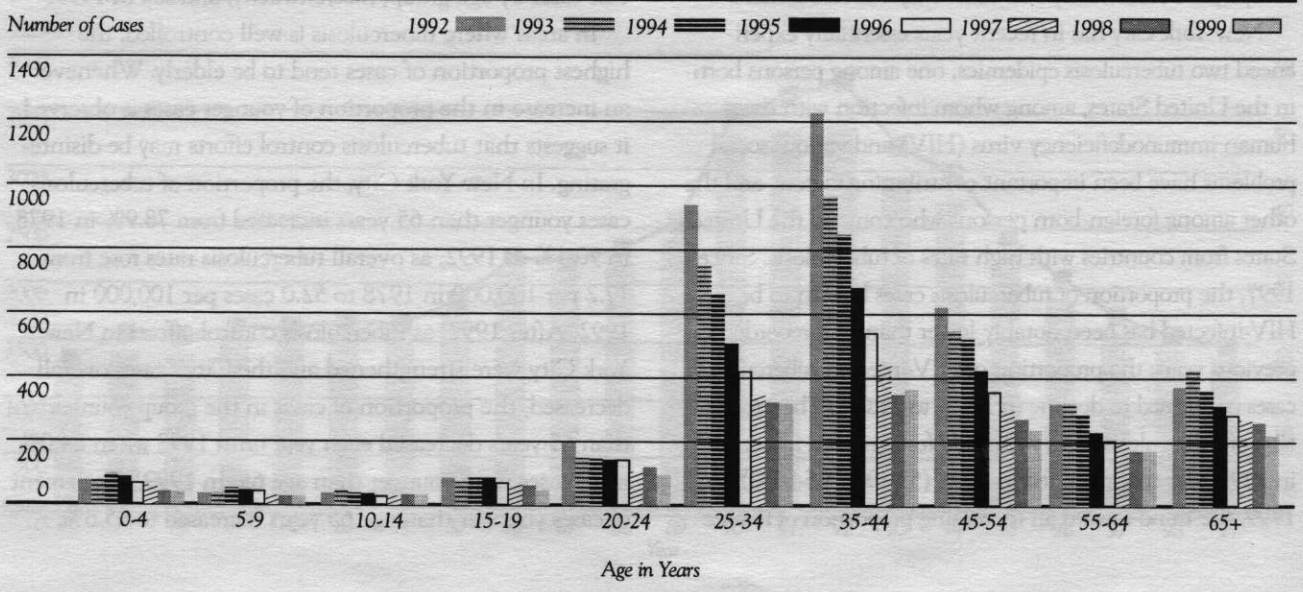
In areas where tuberculosis is well controlled, the highest proportion of cases tend to be elderly. Whenever an increase in the proportion of younger cases is observed, it suggests that tuberculosis control efforts may be disintegrating. In New York City, the proportion of tuberculosis cases younger 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 younger than 65 years decreased each year until 1998 when 84.0% of all cases were younger than age 65. In 1999, the percent of cases younger than age 65 years increased to 85.6%.

The 47 cases that occurred in 1999 among children younger than 10 years old represent 3.2% of total cases, which is less than the 3.6% recorded in 1998, and a decline of 16.1% from the 56 cases recorded in this age group in 1998. The rate in this age group was 4.9 per 100,000 in 1999, compared with 5.8 per 100,000 in 1998. 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 sentinel cases. Thus, the low rates of tuberculosis in this age group, as recorded in 1998 and 1999, 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 5 years. Between 1998 and 1999, the group aged 10 thorough 14 years experienced a 50.0% increase in cases, from 14 to 21, and had a 1999 rate of 4.7 per 100,000. This increase was concerning and therefore was investigated. Cases were found not to be clustered by region or country of origin. The rate for this age group will be closely monitored to determine whether this indicates the start of a trend. The largest decrease (34.6%), from 52 cases in 1998 to 34 cases in 1999, was among older adolescents, aged 15 through 19 years; this group had a rate of 7.2.

Among adults, the group aged 20 through 24 years had the largest percentage decrease (20.7%, from 111 cases in 1998 to 88 in 1999); this group comprised 6.0% of total cases and had a rate of 15.3. The group aged 35 through 44 years had the largest percentage increase among adults (5.0%, from 339 cases in 1998 to 356 in 1999); this group comprised 24.4% of total cases and had a rate of 31.9. The 12.4% increase in cases observed from 1997 to 1998 among older adolescents and young adults, ages 15 through 24 years, did not persist in 1999 as a 25.2% decrease in this group was seen (163 cases in 1998 to 122 cases in 1999). The group aged 45 through 54 years experienced a 12.4% decrease in cases from 259 to 227; this group had a case rate of 29.3 per 100,000 and comprised 15.5% of the total cases in 1999. Among other adult age groups, the incidence of tuberculosis and percent changes between 1998 and 1999 were as follows: the group aged 25 through 34 years comprised 21.6% of the total and had a case rate of 23.1 and a 0.3% increase between 1998 and 1999 (from 315 to 316 incident cases); the group aged 55 through 64 years comprised 11.0% of the total and had a case rate of 25.0 and a decrease of 0.6% between 1998 and

FIGURE 2
TUBERCULOSIS CASES BY AGE
NEW YORK CITY, 1992 - 1999



1999 (from 162 to 161 incident cases); and those 65 years and older comprised 14.4% of the total and had a case rate of 22.0 and experienced a 16.0% decrease between 1998 and 1999 (from 250 to 210 incident cases).

The age distribution of the 834 foreign-born cases resembled that seen among U.S.-born cases: 722 (86.6%) of foreign-born cases were younger than 65 years and 112 (13.4%) were 65 years and older, compared with 511 (84.5%) U.S.-born cases younger than 65 years and 94 (15.5%) 65 and older. As in 1998, among foreign-born cases, the largest proportion was in the group aged 25 through 34 years (27.8%, 232 cases) and among U.S.-born cases the largest proportion was in the group aged 35 through 44 years (28.6%, 173 cases).

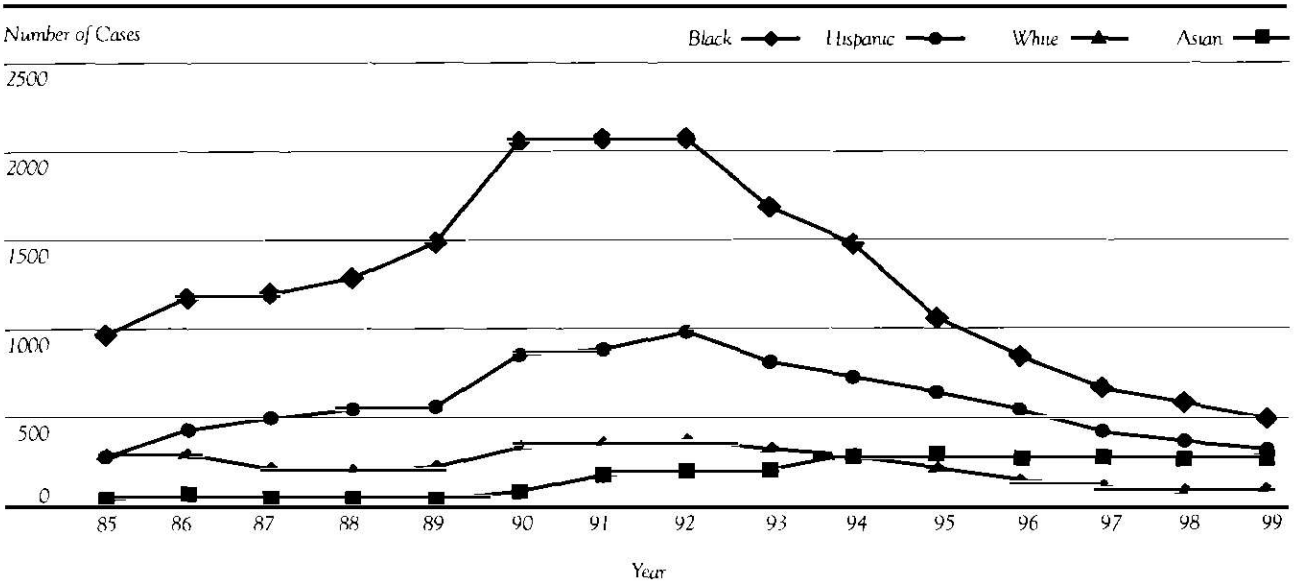
Distribution by Sex (Table 2)

As in previous years, the incidence of tuberculosis among males in 1999 was nearly twice the incidence among females. 26.3 per 100,000 among males vs. 14.3 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. In 1999, the proportion of female cases increased slightly (38.2%; 557/1,460 cases) compared to 1998 (37.4%; 582/1,558 cases) but did not reach the 1997 proportion of 39.0%. There was a larger percentage decline in male tuberculosis cases between 1998 and 1999 (7.5%, from 976 in 1998 to 903 in 1999) than in female cases (4.3%, from 582 in 1998 to 557 in 1999).

Among adult males, the greatest percentage decrease in cases between 1998 and 1999 occurred in the group aged more than 65 years (22.9% decrease, from 144 in 1998 to 111 in 1999). Among adult females, the greatest percentage decrease in cases occurred in the group aged 20 through 24 years (29.8% decrease, from 47 in 1998 to 33 in 1999). Among adult males, only those aged 25 through 34 years experienced an increase (4.0%, from 176 in 1998 to 183 in 1999). Among adult females, only those aged 35 through 44 years had an increase (16.3%, 104 in 1998 to 121 in 1999). All remaining adult male and female age groups experienced no change or a decrease in the number of cases from 1998 to 1999.

While case rates were similar for males and females in all age groups younger than 20 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 (46.2 for males vs. 14.9 for females).

Figure 3
Tuberculosis Cases by Race/Ethnicity
New York City, 1985 - 1999



Racial/Ethnic Distribution (Table 2, Figure 3)

Racial/ethnic distribution for males and females in 1999 was fairly similar with a few notable exceptions. Case rates of females exceeded those of males among Asians aged 10 through 14 years (18.5 for females compared to 0.0 for males) and 25 through 34 years (88.6 for females compared to 74.9 for males) and among Blacks aged 10 through 14 years (11.0 for females and 4.2 for males) and 15 through 19 years (10.8 for females and 5.6 for males). Between 1998 and 1999, tuberculosis cases decreased among non-Hispanic Blacks and Hispanics. However, cases increased among non-Hispanic Whites and Asians.

As in previous years, non-Hispanic Blacks comprised the highest proportion of 1999 tuberculosis cases (37.9%). The 553 cases reported among non-Hispanic Blacks in 1999 gave this group a case rate of 29.9 per 100,000, second only to that for Asians (66.6 per 100,000). The number of tuberculosis cases who are non-Hispanic Black decreased by 13.7% from the 641 recorded in 1998. Age-specific incidence rates in 1999 peaked in the 45 through 54 year age-group for non-Hispanic Black males (105.4 per 100,000) and the 35 through 44 year age group for non-Hispanic Black females (38.0 per 100,000).

The 386 Hispanic cases represented 26.4% of total 1999 tuberculosis cases. Hispanics had a case rate of 21.6 per 100,000. The number of tuberculosis patients who are Hispanic decreased by 10.2% from the 430 recorded in 1998. Age-specific incidence rates in 1999 peaked in the 35 through 44 year age-group for Hispanic males (53.2 per 100,000) and the 65 years and older age group for Hispanic females (30.3 per 100,000).

The 352 cases among Asians accounted for 24.1% of the 1999 cases. Asians had a case rate of 66.6, higher than that for any other racial/ethnic group. The number of cases recorded among Asians in 1999 increased 8.0% from that reported in 1998 (326). As in 1998, the highest tuberculosis rates among Asian males and females in 1999 were observed among those aged 65 years and older (304.8 per 100,000 among males and 116.7 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.

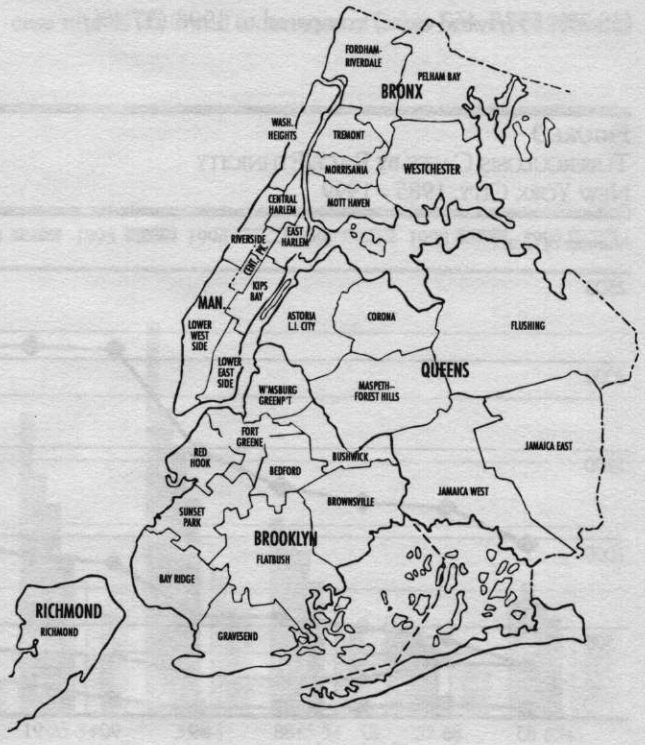
The 169 cases among non-Hispanic Whites accounted for 11.6% of the 1999 total. Non-Hispanic Whites had a case rate of 5.3 per 100,000, lower than that for any other racial/ethnic group. The number of cases among non-Hispanic Whites increased 5.0% in 1999 compared to 1998 (161). Age-specific incidence rates in 1999 peaked in the 45 through 54 age group for non-Hispanic White males (13.9 per 100,000) and the 65 years and older age group for non-Hispanic White females (5.7 per 100,000).

Geographic Distribution
(Table 3, Figures 4-5)

Incidence rates by health district of residence were calculated for 1999; 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

Figure 4
Health Center Districts, New York City



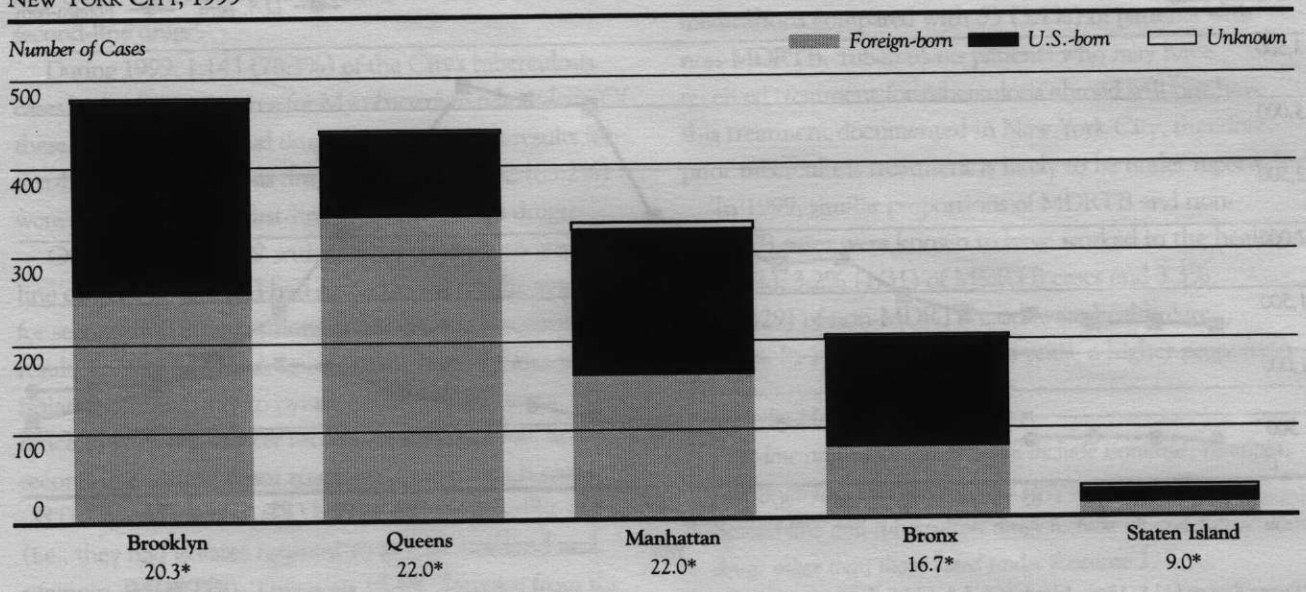
cases were Brooklyn, Queens, and Manhattan. Between 1998 and 1999, the number of new tuberculosis cases decreased in the boroughs of the Bronx, Manhattan, and Brooklyn and increased in Queens and Staten Island. In Queens, the number of tuberculosis cases increased by 9.4%, from 393 in 1998 to 430 in 1999. Cases in Staten Island increased from 25 in 1998 to 34 in 1999, an increase of 36.0%. In both Staten Island and Queens, the observed increases in 1999 cases are likely due to recent influxes of new immigrants from countries where tuberculosis is endemic into these boroughs. In the Bronx, cases decreased by 26.6% (from 274 cases in 1998 to 201 cases in 1999), Manhattan cases decreased by 9.4% (from 362 cases in 1998 to 328 in 1999), and Brooklyn cases decreased by 7.3% (from 504 cases in 1998 to 467 in 1999). Between 1998 and 1999, the number of foreign-born cases decreased or remained unchanged in all boroughs except Queens and Staten Island, which experienced a 10.2% increase from 303 in 1998 to 334 in 1999 and a 75.0% increase from 8 in 1998 to 14 in 1999 respectively. Queens had the largest number of foreign-born cases in 1999, 334 cases (77.7% of Queens' cases).

The three districts with the highest age-adjusted case rates in 1999 were Central Harlem, Corona, 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; after a slight increase in 1998 to 63.7, this downward trend returned in 1999 as Central Harlem's case rate decreased by 31.6% to 43.6. A decrease in age-adjusted case rates between 1998 and 1999 was observed in Bedford (18.4%). Other districts that experienced substantial decreases in age-adjusted tuberculosis rates between 1998 and 1999 were East Harlem, Kips Bay-Yorkville, and Washington Heights in Manhattan; all districts in the Bronx; Brownsville, Fort Greene, and Sunset Park in Brooklyn; and Jamaica West in Queens (the only district to experience a decrease in Queens).

Despite overall decreases in age-adjusted case rates from 1998 to 1999, increases in foreign-born cases were seen in Central Harlem, the Lower East Side, and the Lower West Side in Manhattan, and Bedford and Gravesend in Brooklyn.

Four health districts in Brooklyn and Manhattan had substantial increases in their age-adjusted case rates since 1998: Riverside in Manhattan, and Bay Ridge, Red Hook-Gowanus, and Williamsburg-Greenpoint in Brooklyn. In all four districts, increases in cases were seen both among

FIGURE 5
TUBERCULOSIS CASES BY PLACE OF BIRTH AND BOROUGH
NEW YORK CITY, 1999



* *Rate per 100,000 population*

of foreign-born, 77.8% increase in Riverside from 9 in 1998 to 16 in 1999, 23.3% increase in Bay Ridge from 30 in 1998 to 37 in 1999, 66.7% increase in Red Hook-Gowanus from 3 in 1998 to 5 in 1999, and a 28.6% increase in Williamsburg-Greenpoint from 7 in 1998 to 9 in 1999), and among the U.S.-born (46.7% increase in Riverside from 15 in 1998 to 22 in 1999, 100.0% increase in Bay Ridge from 5 in 1998 to 10 in 1999, 18.2% increase in Red Hook-Gowanus from 11 in 1998 to 13 in 1999, and a 50.0% increase in Williamsburg-Greenpoint from 12 in 1998 to 18 in 1999). With the exception of Jamaica West, the 1999 age-adjusted case rates increased or remained unchanged in every health district in Queens, including an increase of 18.8% in Corona, the health district with the second highest age-adjusted tuberculosis rate.

Area of Origin
(Table 4, Figure 6)

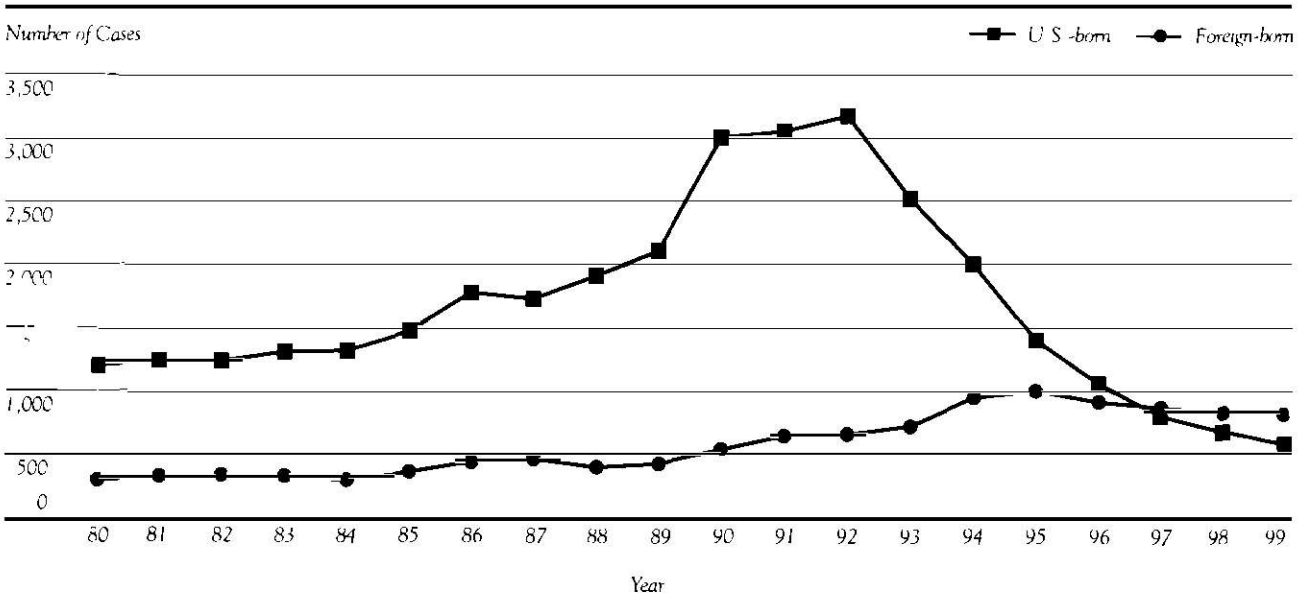
In 1999, information about country of origin was available for 1,439 (98.6%) cases. Between 1998 and 1999, the number of foreign-born cases declined far less sharply than did the number of United States (U.S.)-born cases: foreign-born cases dropped 1.4% from 846 to 834, while U.S.-born cases dropped 13.6% from 700 to 605. Among cases with a known place of origin, the proportion of foreign-born cases increased from 54.7% recorded in 1998 to 58.0% in 1999. Figure 6 illustrates trends in numbers of foreign-born cases since 1980: between 1980 and 1999, the number of foreign-born tuberculosis cases more than doubled.

In 1999, the rate among foreign-born persons in New York City was 40.0 cases per 100,000, compared with 11.5 per 100,000 among U.S.-born persons; however, the number of foreign-born persons in New York City has increased substantially, by approximately 417,000 since the 1990 census, meaning that the tuberculosis rate among foreign-born persons may be as low as 33.4 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 96.3% (803/834) of the foreign-born cases in 1999. Of the 803, 350 (43.6%) entered the U.S. less than five years before their tuberculosis diagnosis; of these 40.0% (140/350) had been in the U.S. less than one year before their tuberculosis diagnosis.

A total of 96 countries other than the United States or U.S. territories were reported as places of origin for 1999 tuberculosis cases. Central and South America (most

Figure 6
U.S. and Foreign-Born Cases*
New York City, 1980–1999



*Puerto Rico and U.S. Virgin Islands included as U.S.-born

prominently, Ecuador and Mexico) accounted for the largest foreign-born group, contributing 191 cases (13.3% of cases with known place of origin). The second largest foreign-born group (163 cases, 11.3% of total cases with known place of origin) came from the Caribbean area (most prominently the Dominican Republic and Haiti). The third largest foreign-born group (142 cases, 9.9% 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 leading country of origin for 1999 cases.

The total number of 1999 U.S.-born cases includes 66 cases from Puerto Rico, which contributed 4.6% of total cases with known place of origin; between 1998 and 1999, the number of cases from Puerto Rico decreased by 16.5%, from 79 recorded in 1998.

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 (DOH) recommends that susceptibility testing be performed on the initial isolates of *Mycobacterium tuberculosis* obtained from every culture-positive patient. Susceptibility results must be reported to the New York City DOH as per the New York City Health Code Sections 11.03(b) and 11.05(c). New York State mandates that isolates with any resistance to first-line anti-tuberculosis drugs[2] should have susceptibility testing to second-line drugs[3].

During 1999, 1,143 (78.3%) of the City's tuberculosis cases had cultures positive for *Mycobacterium tuberculosis*. Of these, 1,106 (96.8%) had drug susceptibility test results for first-line anti-tuberculosis drugs reported and 942 (85.2%) were susceptible to all first-line anti-tuberculosis drugs.

Of 164 cases in 1999 with isolates resistant to any first-line drugs, 140 (85.4%) had susceptibility results available for second-line drugs. Among those missing susceptibility results for second-line drugs, however, were 7 cases with isolates resistant only to pyrazinamide (PZA); mono-resistance to PZA is a marker for *Mycobacterium bovis*, and second-line testing is not routinely done for such cases.

Thirty-one cases (2.8%) had multidrug-resistant strains (i.e., they had isolates resistant to at least isoniazid and rifampin, [MDRTB]). This is an 18.4% decrease from the 38 cases in 1998 and a 93.0% decrease from the 441 MDRTB cases in 1992, when reporting of susceptibility results was first mandated. Of the 31 cases with MDRTB, 2 (6.5%) had isolates which were resistant to only isoniazid and rifampin (a decrease from the 13.5% seen in 1998), 4 (12.9%) had isolates resistant to isoniazid, rifampin and one other first-line drug (compared with 13.5% in 1998); 10 (32.3%) had isolates resistant to isoniazid, rifampin and two other first-line drugs (an increase from the 28.9% seen in 1998); and 5 (16.1%) had isolates resistant to isoniazid, rifampin and three other first-line drugs (vs. 10.5% in 1998). The remaining 10 MDRTB patients (32.3%) had isolates resistant to most first-line drugs plus kanamycin (compared with 34.1% in 1998).

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 1,460 tuberculosis cases reported in 1999, 56 (3.8%) had a previous history of tuberculosis documented on their current records in the New York City DOH tuberculosis registry or had been assigned a record number as a confirmed or suspected case before their presentation in 1999. Three (9.7%) patients with MDRTB were documented to have previously received anti-tuberculosis medications compared with 53 (3.7%) of patients with non-MDRTB. Tuberculosis patients who may have received treatment for tuberculosis abroad will not have this treatment documented in New York City; therefore, prior tuberculosis treatment is likely to be under reported.

In 1999, similar proportions of MDRTB and non-MDRTB cases were known to have worked in the health care field; 3.2% (1/31) of MDRTB cases and 3.3% (47/1,429) of non-MDRTB cases were health care workers. In 1999, as in previous years, a higher proportion

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[1] *Includes Hong Kong and Taiwan*

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

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

of cases with MDRTB were HIV-infected (25.8%, 8/31) compared with non-MDRTB cases (21.9%, 313/1,429)

Ninety-eight 1999 cases (8.9%) had strains of *Mycobacterium tuberculosis* resistant to a single first-line drug; of these, 49 (50.0%) had isolates resistant to isoniazid alone, 29 (29.6%) to streptomycin alone, and 7 (7.1%) to rifampin alone. Thirty-five 1999 cases (3.2% 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 three of these (91.4%) were resistant to at least isoniazid and 28 (80.0%) were resistant to at least isoniazid and streptomycin.

Drug resistance by place of origin

In 1999, for the first time since 1991, when data started to be systematically collected on drug susceptibilities, more multidrug-resistant tuberculosis (MDRTB) cases were born in other countries than in the United States (U.S.) and Puerto Rico (54.8% in other countries, 45.2% in the U.S. and Puerto Rico) 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 17/641 among foreign-born and 3.1% or 14/451 among cases born in the U.S and Puerto Rico). Among cases with first-line susceptibility results, 6.2% (28/451) of U.S.-born had organisms resistant to a single drug, compared with 10.8% (69/641) 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: 9.8% (63/641) among foreign-born cases vs. 3.5% (16/451) 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 (4.4% [28/641] of foreign-born cases vs. 1.3% [6/451] of U.S.-born cases).

Drug resistance by age

Of 175 patients aged 65 years and older with first-line susceptibility results, 3 (1.7%) had multidrug-resistant strains of *Mycobacterium tuberculosis* and an additional 10 (5.7%) 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 [illegible].

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 the likelihood of adverse reactions to anti-tuberculosis medications or suggest a high risk for infection with the human immunodeficiency virus (HIV). 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 four 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 1999, no more than 4.9% of patients were missing information about any one social variable. Among those with available information, 3.3% (47/1,416) had used illegal injectable drugs, 8.8% (124/1,416) had used illegal non-injectable drugs, and 13.1% (186/1,419) had abused alcohol in the 12 months prior to treatment for tuberculosis. These proportions are slightly higher than those recorded in 1998, when 3.3% of tuberculosis patients had used illegal injectable drugs, 7.0% had used illegal non-injectable drugs, and 11.2% had

abused alcohol in the 12 months prior to treatment.

All 1999 cases had information available on incarceration. 3.1% (45/1,460) had been incarcerated at the time of diagnosis, compared with 2.8% (43/1,558) in 1998. Of the 1,389 cases with information available on occupation in 1999 (95.1% of total), 3.6% (50/1,389) had worked in the health care field or as correctional employees, compared with 3.9% (57/1,450) of cases with this information recorded in 1998. All 1999 cases had information available on homelessness, and 5.3% (77) had been homeless at diagnosis or at some point during their treatment; of the 1,558 cases recorded in 1998, 5.9% (92) 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 1999, there were 49 deaths in New York City with tuberculosis listed as the underlying cause of death on the death certificate. The crude tuberculosis mortality rate for 1999 was 0.7 per 100,000. There were an additional 59 deaths for which tuberculosis was listed as a secondary cause. Of these deaths, 29 (49.2%) listed acquired immune deficiency syndrome (AIDS) or human immunodeficiency virus infection (HIV) as the underlying cause of death.

Tuberculosis and Human Immunodeficiency Virus (HIV) Infection (Tables 8-9)

Since 1990, the Department of Health (DOH) 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 Tuberculosis Control Program, 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 1999, 72.7% (1,061/1,460) of New York City tuberculosis cases had a known and reported HIV status, a slight increase from 72.3% (1,126/1,558) in 1998. Females were less likely to have a known HIV status (68.8% of females compared to 75.1% of males). HIV status was more likely to be known for United States (U.S.)-born cases than for foreign-born cases: 77.9% (471/605) of U.S.-born cases had a known HIV status vs. 70.1% (585/834) 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 DOH, even though HIV seropositivity precludes legal immigration to the United States, undocumented immigrants and individuals with student visas are not likely to have been tested.

In 1999, for the second consecutive year, the proportion of tuberculosis cases who were recorded as HIV infected was less than 25% of total cases: of 1999 tuberculosis cases, 22.0% (321) were reported as HIV positive and 50.7% (740) were reported as HIV negative. In 1998, 22.2% (346) were reported as HIV positive and 50.1% (780) were reported as HIV negative. Among the 1,061 cases in 1999 with a known HIV status, 30.3% were HIV positive and 69.7% were HIV negative. In 1999, among both male and female tuberculosis cases, the highest proportions of HIV-infected cases were recorded in the groups aged 35 through 44 years.

Table 9 presents the distribution of HIV infection by sex from 1992 through 1999. 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 was unchanged from 35.7% (250/700) in 1998 to 35.7% (216/605) in 1999. Foreign-born patients are much less likely to be HIV positive than are U.S.-born cases; between 1998 and 1999, the proportion of foreign-born cases who were HIV positive increased slightly from 11.3% (96/846) in 1998 to 12.2% (102/834) in 1999.

HIV-infected cases are more likely to have multidrug-resistant tuberculosis (MDRTB) than are uninfected cases.

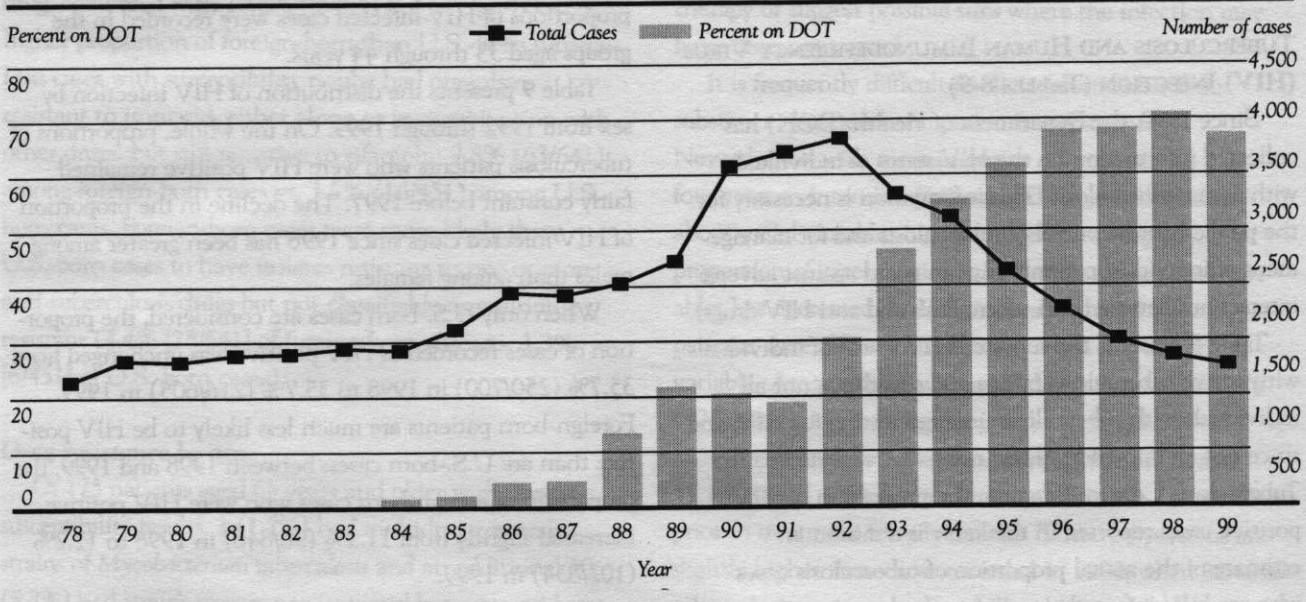
In 1999, 2.5% (8/ 321) of cases who were known to be HIV infected had MDRTB. This proportion is similar to the 2.0% (23/1,139) found to have MDRTB among cases with unknown or negative HIV status.

Treatment of tuberculosis can be complicated by the use of two 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 anti-tuberculosis regimen, is contraindicated or requires dose adjustments when administered 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 321 HIV-positive cases, 163 (50.8%) 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 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) and who were on DOT at any time up until the end of March following the year in which they were counted. 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 68.4% in 1999). 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. In 1999 the proportion of eligible patients on DOT decreased to 68.5% (881 of 1,287 eligible patients). The proportion of patients on DOT is higher among those who receive treatment in Department of Health (DOH) chest clinics, where DOT is considered the standard of care: of the 781 eligible patients confirmed in 1999 who received some or all treatment to date in DOH chest clinics, 84.8% (662) were on DOT for some or all of their therapy; of the 506 eligible patients confirmed in 1999 who received none of

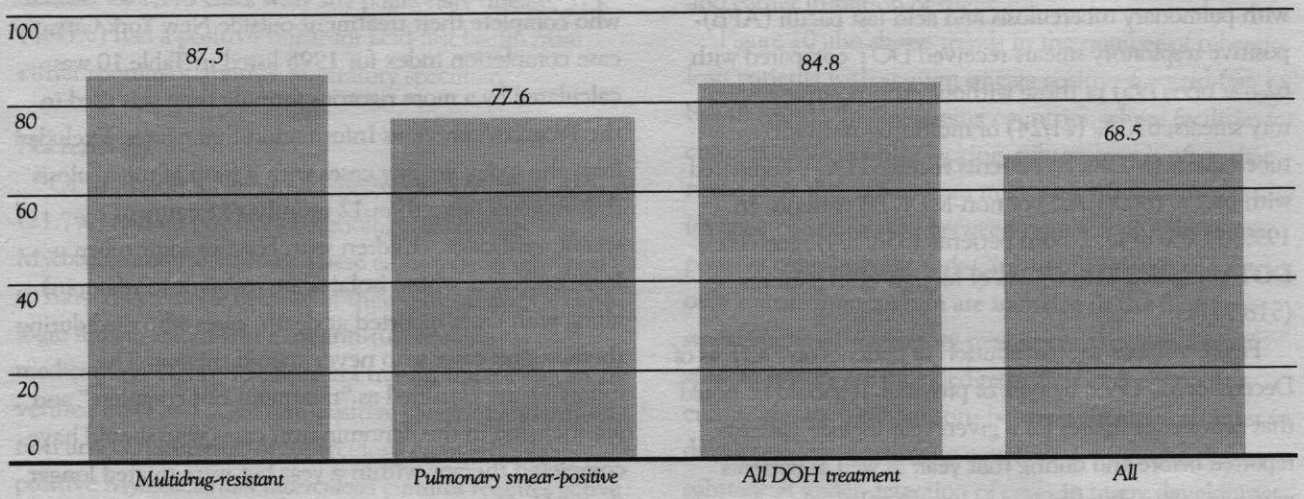
Figure 7
Tuberculosis Cases on Directly Observed Therapy*
New York City, 1978–1999**



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

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

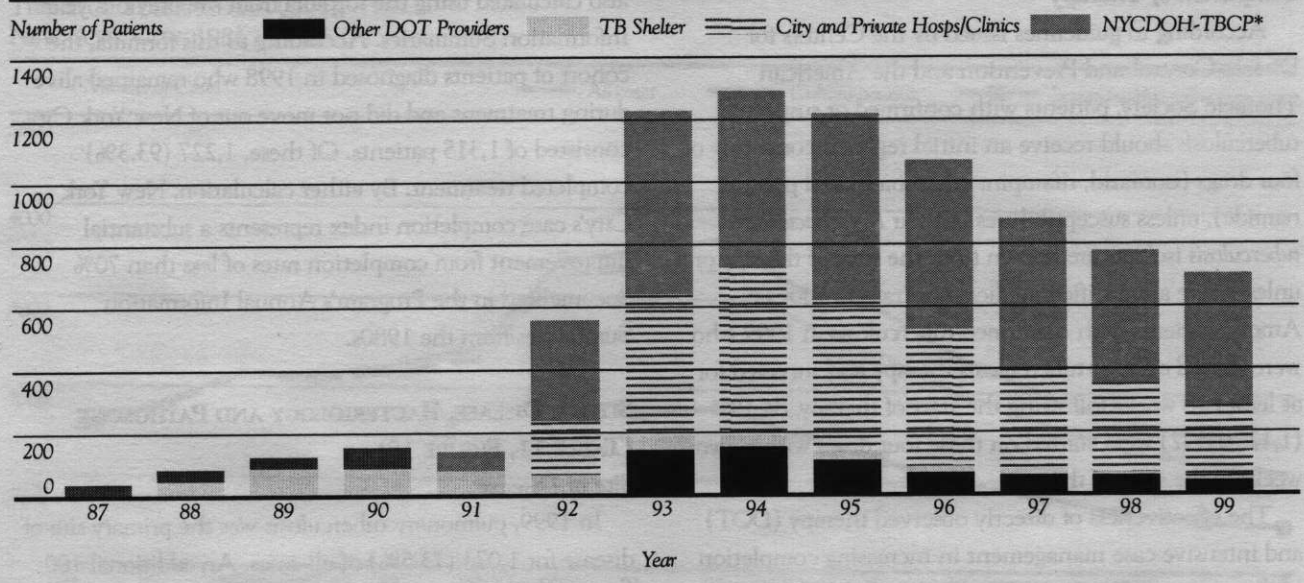
FIGURE 8
PERCENT ELIGIBLE* TUBERCULOSIS PATIENTS ON DOT**
NEW YORK CITY, 1999



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

** *Ever on DOT as of March of the year after being confirmed as a case of tuberculosis.*

FIGURE 9
TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY AS OF DECEMBER 31 BY TYPE OF PROVIDER
NEW YORK CITY, 1987–1999



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

their treatment in DOH chest clinics, 43.3% (219) were on DOT for some or all of their therapy (Figure 8). Patients with infectious and/or multidrug-resistant tuberculosis are an especially high priority for DOT. Of patients confirmed in 1999, 77.6% (382/492) of eligible patients with pulmonary tuberculosis and acid-fast bacilli (AFB)-positive respiratory smears received DOT compared with 62.8% (499/795) of those without AFB-positive respiratory smears; 87.5% (21/24) of multidrug-resistant tuberculosis (MDRTB) patients received DOT compared with 68.1% (860/1,263) of non-MDRTB patients. In 1999, 71.0% of U.S.-born patients (358/504) received DOT compared with 67.2% of foreign-born patients (518/771).

Figure 9 shows the distribution of patients on DOT as of December 31, 1999, 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-DOH facilities, which are funded by the New York State Department of Health, Medicaid, and Ryan White Care Act Funds, provided DOT to 231 (33.0%) of the 700 cases who were receiving DOT at that point. DOH Clinics and Outreach staff provided DOT to 264 (37.7%) cases and 167 (23.9%) cases respectively.

Completion of Therapy

According to guidelines issued by the Centers for Disease Control and Prevention and the 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 1999 who were started on anti-tuberculosis therapy and survived for at least two weeks following the start of therapy, 84.1% (1,129/1,342) were started on these four drugs within two weeks of the start of therapy.

The effectiveness of directly observed therapy (DOT) and intensive case management in increasing completion of therapy among patients diagnosed with tuberculosis in 1998 is illustrated in Table 10. Completion data are presented for 1998 instead of 1999 in order to allow enough time for patients who require a year of treatment to complete therapy.

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 1998 listed in Table 10 was calculated by a more rigorous formula than was used in the Program's previous Information Summaries. 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 are included in the denominator: cases who should have 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 1998 was 88.8%.

For comparative purposes, the completion index was also calculated using the formula from the previous years' Information Summaries. According to this formula, the cohort of patients diagnosed in 1998 who remained alive during treatment and did not move out of New York City, consisted of 1,315 patients. Of these, 1,227 (93.3%) completed treatment. By either calculation, New York City's case completion index represents a substantial improvement from completion rates of less than 70% documented in the Program's Annual Information Summaries from the 1980s.

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

Site of Disease

In 1999, pulmonary tuberculosis was the primary site of disease for 1,073 (73.5%) of all cases. An additional 100 cases (6.8%) had pulmonary tuberculosis as a non-primary site. Of persons with extrapulmonary disease, either alone

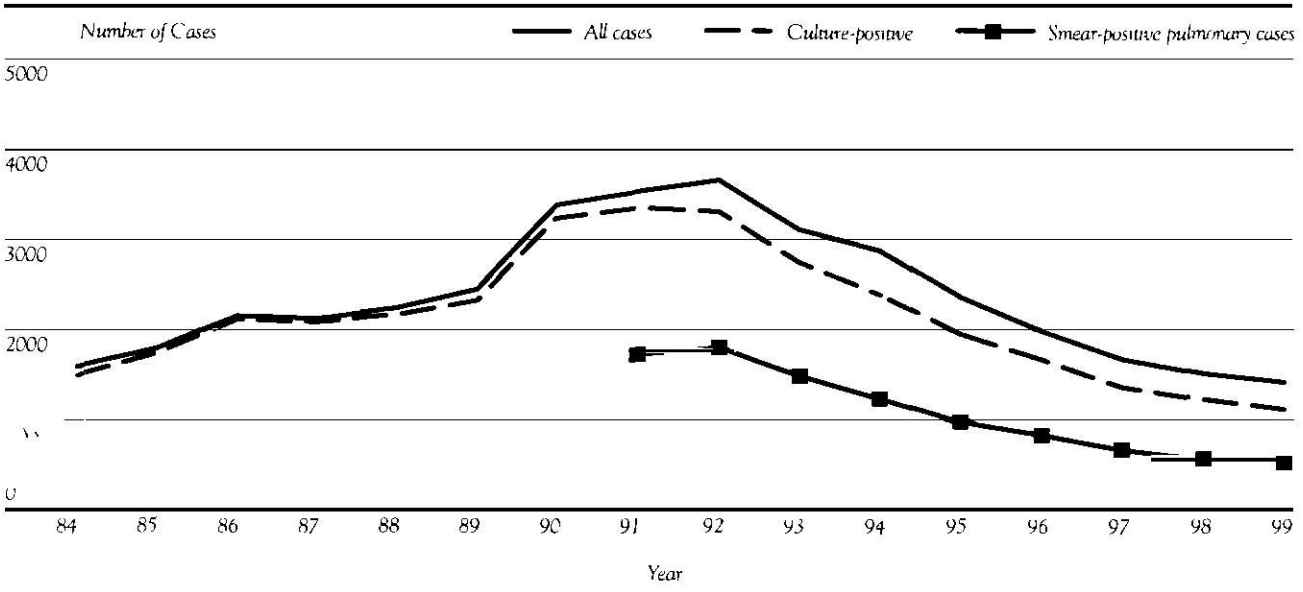
or in combination with pulmonary disease, lymphatic tuberculosis was the most common form of disease, followed by pleural disease. Of all cases reported in 1999, 175 (12.0%) had both pulmonary and extrapulmonary disease. Of 1,173 cases with any pulmonary disease, 573 (48.8%) had a positive smear for acid-fast bacilli from either sputum or another respiratory specimen.

Bacteriology

Of the 1,460 tuberculosis cases verified in 1999, 317 (21.7%) 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 detailed review of medical records by Tuberculosis Control Program 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 21.7% in 1999. While this increase most likely reflects surveillance artifact, it could also arise from detection of tuberculosis cases earlier in their course of disease and earlier initiation of therapy.

Figure 10 also shows trends in the number of tuberculosis patients with sputum smears positive for acid-fast bacilli (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 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 AFB smear-positive cases. The 515 such cases that occurred in New York City in 1999 yielded an incidence of 7.0 per 100,000. According to the World Health Organization, India and China have the greatest tubercu-

FIGURE 10
TREND OF TUBERCULOSIS CASES
NEW YORK CITY, 1984 - 1999*



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

losis burden in the world. The rates of sputum AFB smear-positive tuberculosis in these countries in 1998 are estimated to be 83.0 and 50.7 per 100,000 persons respectively. However, substantial under-reporting of such cases resulted in lower reported rates of 28.9 and 17.1 respectively. The reported rates of sputum smear-positive tuberculosis per 100,000 persons in some other countries contributing large numbers of foreign-born tuberculosis cases to New York City are: 81.0 in Haiti, 53.0 in Ecuador, and 26.7 in the Dominican Republic. However, the extent of under-reporting in these countries is estimated to range from 28.3% (in Ecuador) to 47.0% (in Haiti)[1].

Pathology

Of the 1,460 tuberculosis cases recorded in New York City in 1999, 439 are recorded in the Department of Health tuberculosis registry as having had tissue biopsies. Most of these cases (71.3%, [313/439]) had bacteriologic findings (from either the specimen which was biopsied or another specimen) that suggested or confirmed tuberculosis; 22.8% (100/439) 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 tuberculosis-infected persons who are at high risk for progression to active disease: contacts to active cases who have a positive tuberculin skin test and are presumed to be recently infected; persons who are human immunodeficiency virus (HIV) infected or at high risk for HIV infection or otherwise immunocompromised; children under five years of age, persons who have recently arrived in the United States from areas of the world where tuberculosis remains endemic; and persons with certain medical conditions.

Contact Investigations

An Expanded Contact Investigation (ECI) Unit was created in October 1995 within the Tuberculosis Control Program to allow rapid evaluation of possible transmission of tuberculosis by infectious patients in congregate settings (e.g., within schools or other institutions, or within work sites). When indicated, mass skin testing and effective education about tuberculosis are provided. In 1999, 15 epidemiologic investigations (14 contact investigations and 1 source case investigation) were conducted as a result of an exposure to a person with infectious tuberculosis in a congregate setting: 6 were workplace exposures, 4 were in schools, 2 were evaluations of clusters of tuberculosis cases in single-room occupancy (SRO) or cubicle hotels, 1 was in a senior center, and 1 was in a half-way house. The other investigation was a source case investigation in a day care center in which a source case was not found.

In all 14 of the contact investigations, the person with infectious tuberculosis was older than 13 years and had pulmonary disease. In 13 (92.9%) of these investigations, the index case was both smear-positive for acid-fast bacilli (AFB) and culture-positive for *Mycobacterium tuberculosis*; 5 (35.7%) of the index cases had cavitation on their chest radiograph.

Results of the contact investigations were classified according to the likelihood of tuberculosis transmission to contacts in the congregate setting; transmission was considered unlikely in 8 (57.1%) of these investigations, possible in 2 (14.3%); and probable in 3 (21.4%). One (7.1%) investigation is on-going. The total number of contacts tested in the 13 completed investigations was 394, 84 (21.3%) of those tested were found to be infected and were referred for medical evaluation. In addition, 442 persons with no known exposure to the index case requested testing; 24 (5.4%) of these were infected and were referred for medical evaluation.

Analysis of clustering by patients' address of residence was conducted for cases verified from 1995 through 1999. To date, 68 clusters of 4 or more cases were identified (excluding hospitals and jails); 86 cases (13 clusters) were in SRO or cubicle hotels. Epidemiologic investigations at each of these sites found previously unidentified transmission at 6 locations. Intensive efforts to provide treatment

[1] *World Health Organization. Global Tuberculosis Control WHO Report 2000. Geneva, Switzerland, WHO/CDS/CPC/TB/2000.275*

for latent tuberculosis infection have been made at these locations including weekly visits, incentives, and transportation to treatment locations.

Treatment of Latent Tuberculosis Infection

Two of the national objectives for treatment of latent infection concern contacts to infectious tuberculosis cases (Appendix 1) Besides ensuring that contacts to smear-positive pulmonary cases are evaluated, the Tuberculosis Control Program 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 1998, as not all contacts to cases confirmed in 1999 have yet been identified and evaluated Also, all contacts are considered, whether they received treatment from Department of Health (DOH) clinics or elsewhere.

Ninety-two percent of contacts to 1998 sputum acid-fast bacilli (AFB) smear-positive cases (3,553/3,873) were examined, compared with 89.0% (6,173/6,964) of contacts identified to 1997 cases. Many of those not examined were other-than-close contacts for whom testing was not indicated because close contacts to the identified cases were tuberculin skin test (TST) negative

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 which may last from six to twelve months, depending on a patient's age and human immunodeficiency virus (HIV) status. As of 1998 the completion index for contacts receiving treatment for latent infection is calculated as [total completed/(total started - number whose therapy was discontinued for medical reasons or died prior to completion)] Prior to 1997 the completion index also excluded patients who moved out of New York City from the denominator. In 1998, of 1,523 infected contacts who started on treatment for latent infection, 248 had to discontinue therapy for medical reasons or died prior to completion; of those remaining, 61.3% (752/1,275) completed at least six months of treatment for latent infection; the 1997 treatment for latent infection completion index for infected contacts was 62.5%.

The DOH 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 Centers for Disease Control and Prevention (CDC) objectives on treatment for latent infection concern program-supported treatment services, which are offered in DOH chest clinics. these objectives apply to all persons, contacts and others, who are evaluated for treatment for latent infection in DOH chest clinics. During 1998, of the 11,830 individuals who were known to the DOH to have started treatment for latent infection, 513 died or discontinued treatment for medical reasons, and 6,434 completed therapy, for an overall completion index of 56.9%; the 1997 overall completion index for latent infection was 55.3%, as of the 12,615 individuals who started treatment for latent infection in that year, 790 died, discontinued treatment for medical reasons or moved out of New York City, and 6,539 completed therapy. For comparison, in DOH chest clinics in 1998, of the 8,384 individuals who started treatment for latent infection, 294 died, or discontinued treatment for medical reasons, and 4,701 completed therapy, for a completion index of 58.1%; the 1997 completion index for treatment for latent infection at DOH chest clinics was 55.8%, as of the 9,169 individuals who started treatment for latent infection in that year, 565 died, discontinued treatment for medical reasons, or moved out of New York City, and 4,798 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 Program considered at high risk (contacts, immunocompromised, recent converters, persons with radiographic evidence of tuberculosis in the past, and children under

[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*

five years of age) had a 1998 completion index of 62.5%. In order to assure higher levels of completion of treatment for latent infection, the Tuberculosis Control Program 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 completing treatment of patients with active tuberculosis and with additional emphasis on treatment of latent infection, the New York City DOH, in cooperation with providers throughout New York City, will continue to reduce the City's burden of tuberculosis.

TABLES

TABLE 1 *(see page 8)*
TUBERCULOSIS INCIDENCE
NEW YORK CITY, 1920 - 1999

Year	*Number**	*Rate Per 100,000***	*Culture-Positive Cases*	*Sputum Smear-Positive Cases+ (Rate Per 100,000)*	*Multidrug-resistant Cases++*
1920	14,035	246 9			
1930	11,821	170.2			
1940	9,005	120 8			
1950	7,717	97 8			
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	1,772 (24 2)	366
1992	3,811	52 0	3,442	1,856 (25 3)‡‡	441
1993	3,235	44 2	2,854	1,526 (20 8)	296
1994	2,995	40 9	2,479	1,265 (17 3)	176
1995	2,445	33.4	2,014	989 (13 5)	109
1996	2,053	28 0	1,721	837 (11 4)	84
1997	1,730	23 6	1,401	665 (9 1)	56
1998	1,558	21 3	1,255	558 (7 6)	38
1999	1,460	19 9	1,143	515 (7 0)	31

* *For "phthisis," or pulmonary cases, 1920-1939, 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 and regardless of site of disease*

++ *Resistant to at least isoniazid and rifampin. Drug susceptibility made mandatorily reportable during 1991, figure from that year is not complete. Number for 1999 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 *(see pages 9, 11-12)*
TUBERCULOSIS INCIDENCE (RATES PER 100,000) BY RACE/ETHNICITY, SEX, AND AGE IN YEARS
NEW YORK CITY, 1999

	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	1	2	7	21	30	26	28	51	169
	1.3	0.8	0.8	1.4	3.3	3.7	6.1	7.6	8.1	7.8	5.3
Males	0	1	1	1	4	15	24	23	21	28	118
	0.0	1.5	1.5	1.4	3.9	5.2	9.8	13.9	13.1	11.3	7.9
Females	2	0	0	1	3	6	6	3	7	23	51
	2.7	0.0	0.0	1.4	2.8	2.1	2.5	1.7	3.8	5.7	3.1
Black, total	5	6	11	12	24	96	172	116	54	57	553
	3.3	4.2	7.6	8.2	15.6	28.9	63.1	58.3	37.9	35.8	29.9
Males	3	3	3	4	17	54	113	88	32	24	341
	3.9	4.1	4.2	5.6	23.9	36.3	96.2	105.4	55.3	43.6	41.2
Females	2	3	8	8	7	42	59	28	22	33	212
	2.7	4.2	11.0	10.8	8.5	22.8	38.0	24.2	26.0	31.6	20.8
Hispanic, total	17	6	6	10	29	101	103	46	35	33	386
	10.2	4.0	4.1	6.9	17.4	29.2	39.5	26.3	29.0	30.4	21.6
Males	9	1	4	4	20	68	64	31	23	12	236
	10.6	1.3	5.4	5.4	23.9	40.7	53.2	39.1	44.3	30.4	27.8
Females	8	5	2	6	9	33	39	15	12	21	150
	9.8	6.8	2.8	8.4	10.8	18.5	27.8	15.7	17.5	30.3	16.1
Asian, total	8	2	3	10	28	98	51	39	44	69	352
	21.0	6.1	9.1	26.9	63.7	81.6	53.5	69.1	116.3	201.3	66.6
Males	4	1	0	8	14	46	34	23	31	47	208
	20.2	5.9	0.0	42.2	64.2	74.9	69.0	79.3	169.4	304.8	77.7
Females	4	1	3	2	14	52	17	16	13	22	144
	21.9	6.3	18.5	11.0	63.2	88.6	37.0	58.3	66.6	116.7	55.2
TOTAL	**32**	**15**	**21**	**34**	**88**	**316**	**356**	**227**	**161**	**210**	**1,460**
	6.3	**3.3**	**4.7**	**7.2**	**15.3**	**23.1**	**31.9**	**29.3**	**25.0**	**22.0**	**19.9**
Males	**16**	**6**	**8**	**17**	**55**	**183**	**235**	**165**	**107**	**111**	**903**
	6.2	**2.6**	**3.5**	**7.2**	**19.6**	**27.5**	**44.2**	**46.2**	**37.1**	**31.1**	**26.3**
Females	**16**	**9**	**13**	**17**	**33**	**133**	**121**	**62**	**54**	**99**	**557**
	6.4	**4.0**	**5.8**	**7.3**	**11.1**	**18.9**	**20.7**	**14.9**	**15.1**	**16.6**	**14.3**

TABLE 3 *(see page 12)*
CRUDE AND AGE-ADJUSTED TUBERCULOSIS RATES
NEW YORK CITY, 1992 -1999

Borough	*Health District*	*Cases*	*Rates per 100,000 population*								
			1999 Crude+	*1999 Age-Adjusted**	*1998 Age-Adjusted**	*1997 Age-Adjusted**	*1996 Age-Adjusted**	*1995 Age-Adjusted**	*1994 Age-Adjusted**	*1993 Age-Adjusted**	*1992 Age-Adjusted**
Manhattan	Central Harlem	49	42 4	43 6	63 7	61 6	113 2	115 3	121 6	181.7	240 2
	East Harlem	27	21 2	21 7	28 3	35 2	45 4	60 3	71 5	73 1	95 8
	Kips Bay-Yorkville	11	4 7	3 5	11 1	10 3	9 3	10 9	14 8	14 4	19 1
	Lower East Side	83	34 7	32 1	30 4	40 0	45 7	51 3	74 8	69 5	101 5
	Lower West Side	54	18 4	15 1	15 0	22 7	33 3	29 9	45 9	44 8	77 9
	Riverside	39	18 7	17 1	10 5	21 4	21 8	32 0	41 1	59 0	72 1
	Washington Heights	65	24 4	25 5	31 0	31 7	51 4	36 6	49 1	52 9	60 9
	Total Manhattan	**328**	**22.0**								
Bronx	Fordham-Riverdale	44	17 9	18 8	28 2	18 1	29 0	24 5	34 6	27.5	37 8
	Morrisania	35	24 2	28 9	41 9	47 4	35 7	75 4	74 4	109 3	96 5
	Mott Haven	30	23 1	26 2	33 9	47 7	61 9	61 3	87 7	107 8	168 2
	Pelham Bay	21	9.6	9 6	12.3	13 1	8 1	13 3	21 1	20 1	20 3
	Tremont	42	22 0	30 0	33 4	45 2	47 6	56 7	88 5	76 0	105 8
	Westchester	29	10 5	10 9	13 5	13 9	16 7	26 0	19 8	34 0	35 8
	Total Bronx	**201**	**16.7**								
Brooklyn	Bay Ridge	47	19 7	18 4	15 3	13 5	12 7	20 2	18 6	20 1	15 9
	Bedford	75	32 2	34.0	41 6	48 2	54 8	68 4	82 3	89 1	107 5
	Brownsville	56	20 1	22 3	28 0	32 0	33 4	51 8	58 9	54 2	71 6
	Bushwick	37	20 3	24 6	26 8	29 1	45 8	61 1	72 8	83 3	83 1
	Flatbush	102	20 3	20 8	20 6	23 0	22 5	32 1	36 0	39 2	36 6
	Fort Greene	35	23 3	25 6	33 3	32 6	37 5	57 9	88 5	110 3	120 1
	Gravesend	47	16 5	16 9	14 9	18 5	14 3	20 2	23 6	21 9	20 4
	Red Hook-Gowanus	18	17 0	18 1	14 3	22 1	25 0	25 7	34 3	49 6	48 7
	Sunset Park	23	13 5	15.1	24 7	23 1	24 7	31 1	29 3	29 8	27 7
	W'burg-Grnpt	27	17 3	19 3	13 7	23 1	24 0	30 3	45 6	52 2	59 3
	Total Brooklyn	**467**	**20.3**								
Queens	Astoria-L I C	79	33 4	32 3	27 5	27 2	24 7	32 8	38 7	29 5	35 3
	Corona	122	41 9	40 4	34 0	29.0	42 6	45 3	39 5	44 5	56 3
	Flushing	81	17 7	16 7	15 1	18.9	16 4	19 9	18 4	17 3	14 6
	Jamaica East	64	19 0	19 3	16 8	18 1	28 3	28 7	35 9	33 7	34 0
	Jamaica West	52	14 4	14 7	18 0	13 9	18 7	23 5	26 2	25 2	21 5
	Maspeth-Forest Hills	32	11 9	11 7	11 7	12 5	12 3	10 6	20 4	18 5	12 3
	Total Queens	**430**	**22.0**								
Staten Island		34	9 0	8 9	6 6	8 7	7 7	10 4	17 7	15 3	17 8
TOTAL NYC		**1,460**	**19.9**	**19.9**	**21.3**	**23.6**	**28.0**	**33.4**	**40.9**	**44.2**	**52.0**

\+ *1999 crude rates are based on the 1990 Census for New York City*
* *1992-1999 age-adjusted rates are based on the New York City 1990 Census by the method of direct adjustment*

TABLE 4 *(see page 14)*
TUBERCULOSIS CASES BY AGE IN YEARS AND AREA OF BIRTH
NEW YORK CITY, 1999

	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]	0	2	4	0	7	28	22	6	1	3	**73**
Far East Asia[2]	0	0	0	4	9	33	17	14	21	44	**142**
Canada	0	0	0	0	0	0	0	0	0	0	**0**
Caribbean[3]	1	0	1	10	10	33	48	30	18	12	**163**
Central/S Amer[4]	1	2	3	7	19	68	49	17	14	11	**191**
Europe[5]	1	1	1	2	6	10	12	10	11	18	**72**
Indo/Pakistan[6]	1	0	3	4	13	46	22	17	9	10	**125**
Middle East[7]	1	0	0	1	0	3	1	1	0	0	**7**
Southeast Asia[8]	1	0	0	1	4	11	9	7	14	14	**61**
Oceania	0	0	0	0	0	0	0	0	0	0	**0**
TOTAL NON-USA	**6**	**5**	**12**	**29**	**68**	**232**	**180**	**102**	**88**	**112**	**834**
USA*	26	7	8	5	18	74	158	105	60	78	**539**
Puerto Rico	0	0	0	0	0	8	15	15	12	16	**66**
Total USA	**26**	**7**	**8**	**5**	**8**	**82**	**173**	**120**	**72**	**94**	**605**
Unknown	**0**	**3**	**1**	**0**	**2**	**2**	**3**	**5**	**1**	**4**	**21**
Total	**32**	**15**	**21**	**34**	**88**	**316**	**356**	**227**	**161**	**210**	**1,460**

* *Includes the U S Virgin Islands (2)*

[1] Guinea (9), Nigeria (9), Ivory Coast (6), The Gambia (5), Ghana (5), Liberia (4), Mali (4), Senegal (4), Sierra Leone (4), Other (23)
[2] China (108), Korea (27), Taiwan (7)
[3] Dominican Republic (66), Haiti (65), Jamaica (15), Cuba (5) Other (12)
[4] Ecuador (60), Mexico (38), Peru (22), Colombia (19), Guyana (16), Honduras (15), El Salvador (7), Panama (5), Guatamala (4), Other (5)
[5] Former Soviet Union (33), Poland (9), Yugoslavia (7) Other (23)
[6] India (45), Bangladesh (26), Nepal (24), Pakistan (24), Other (6)
[7] Yemen (4), Other (3)
[8] Philippines (33), Vietnam (11), Indonesia (8), Myanmar (5), Other (4)

TABLE 5 *(see page 15)*
DRUG RESISTANCE BY PLACE OF BIRTH

	N (%)			
	Total	*U S -born**	*Foreign-born*	*Unknown*
Positive culture for *M tuberculosis*	1,143	475	654	14
Tested for susceptibility to first-line drugs of those with positive cultures (% of those with positive culture for *M tuberculosis*)	1,106 (96 8)	451 (94 9)	641 (98 0)	14 (100 0)
Susceptibility results (% of those tested)				
Multidrug-resistant (resistant to at least isoniazid & rifampin)	31 (2 8)	14 (3 1)	17 (2 7)	0 (0 0)
Isoniazid-resistant and rifampin-susceptible	81 (7 3)	16 (3 5)	63 (9 8)	2 (14 3)
Resistant to first-line drugs other than isoniazid & rifampin	44 (4 0)	11 (2 4)	33 (5 1)	0 (0 0)
Resistant to rifampin only	7 (0 6)	6 (1 3)	1 (0 2)	0 (0 0)
Other resistance	1 (0 1)	1 (0 2)	0 (0 0)	0 (0 0)
Susceptible to all first-line drugs	942 (82 4)	403 (89 4)	527 (82 2)	12 (85 7)

* *Includes Puerto Rico and Virgin Islands*

TABLE 6 *(see page 16)*
SOCIAL CHARACTERISTICS OF TUBERCULOSIS CASES
NEW YORK CITY, 1999

*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	1,416 (97 0)	47 (3 3)
Non-injection drug use in12 months before diagnosis	1,416 (97 0)	124 (8 8)
Alcohol abuse in 12 months before diagnosis	1,419 (97 2)	186 (13 1)
Homeless at diagnosis or any time during treatment	1,460 (100.0)	77 (5 3)
Resident of correctional facility at time of diagnosis	1,460 (100 0)	45 (3 1)
Resident of long-term care facility at time of diagnosis	1,458 (99 9)	27 (1 9)
Health care or correctional facility worker in 24 months before diagnosis	1389 (95 1)	50 (3 6)

* *Categories not mutually exclusive*

TABLE 7 *(see page 17)*
TUBERCULOSIS DEATHS AND RATE (PER 100,000)
NEW YORK CITY, 1910–1999

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
1999	49	0.7

TABLE 8 *(see page 17)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1999

	N (%)								
	Females			Males			Total		
Age	HIV(+)	HIV(–)	NA*	HIV(+)	HIV(–)	NA*	HIV(+)	HIV(–)	NA*
0-4	0 (0 0)	11 (68 8)	5 (31 3)	1 (6.3)	7 (43 8)	8 (50 0)	1 (3 1)	18 (56 3)	13 (40 6)
5-9	0 (0 0)	1 (11 1)	8 (88 9)	2 (33 3)	1 (16.7)	3 (50 0)	2 (13 3)	2 (13 3)	11 (73 3)
10-14	0 (0 0)	5 (38 5)	8 (61 5)	1 (12 5)	3 (37 5)	4 (50 0)	1 (4 8)	8 (38 1)	12 (57 1)
15-19	1 (5 9)	14 (82 4)	2 (11 8)	0 (0 0)	12 (70.6)	5 (29 4)	1 (2 9)	26 (76 5)	7 (20 6)
20-24	3 (9 1)	21 (63 6)	9 (27 3)	1 (1 8)	37 (67 3)	17 (30 9)	4 (4 5)	58 (65 9)	26 (29 5)
25-34	23 (17 3)	88 (66 2)	22 (16 5)	42 (23 0)	113 (61 7)	28 (15 3)	65 (20 6)	201 (63 6)	50 (15 8)
35-44	57 (47 1)	45 (37 2)	19 (15 7)	97 (41 3)	103 (43 8)	35 (14 9)	154 (43 3)	148 (41 6)	54 (15 2)
45-54	11 (17 7)	30 (48 4)	21 (33 9)	54 (32 7)	72 (43 6)	39 (23 6)	65 (28 6)	102 (44 9)	60 (26 4)
55-64	7 (13 0)	29 (53 7)	18 (33 3)	14 (13 1)	63 (58 9)	30 (28 0)	21 (13 0)	92 (57 1)	48 (29 8)
65+	0 (0 0)	37 (37 4)	62 (62 6)	7 (6 3)	48 (43 2)	56 (50 5)	7 (3 3)	85 (40 5)	118 (56 2)
TOTAL**	**102 (18.3)**	**281 (50.4)**	**174 (31.2)**	**219 (24.3)**	**459 (50.8)**	**225 (24.9)**	**321 (22.0)**	**740 (50.7)**	**399 (27.3)**

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

TABLE 9 *(see page 17)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1992–1999

	N (%)					
	Females		Males		Total	
Year	HIV (+)		HIV (+)		HIV (+)	
1992	297	(25 1)	983	(37 4)	1,281	(33 6)
1993	308	(27 5)	760	(35 9)	1,068	(33 0)
1994	244	(23 5)	767	(39.2)	1,011	(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)
1999	102	(18 3)	219	(24 3)	321	(22 0)

TABLE 10 *(see page 18)*
TREATMENT COMPLETION FOR ACTIVE TUBERCULOSIS CASES DIAGNOSED IN 1998*

Outcome	*Number of Cases*	*Percent*
Treatment completed in ≤ 365 days	1,154	88 8
Treatment completed in >365 days	62	4 8
Still in Treatment	25	1 9
Refused/Stopped Treatment	7	0 5
Lost	26	2 0
Moved+	25	1 9
Total	**1,299**	**100.0**

* *Excludes patients found not to have TB, those who died, those who never started anti-tuberculosis therapy, those under 21 years of age with bone, miliary, or meningeal TB, and those initially resistant to rifampin*

\+ *Patients are categorized as moved only if their transfer to another jurisdiction is confirmed and no further follow-up information is available*

TABLE 11 *(see page 20)*
TUBERCULOSIS CASES BY PRIMARY SITE OF DISEASE
NEW YORK CITY, 1999

	Number of Cases	*(%)*
Pulmonary	1,073	(73 5)
Lymphatic	152	(10 4)
Pleural	69	(4.7)
Miliary	38	(2 6)
Bone/Joint	36	(2 5)
Meningeal	22	(1 5)
Genitourinary	17	(1 2)
Peritoneal	12	(0 8)
Other	41	(2 8)
Total	**1,460**	**(100.0)**
Tuberculosis cases by all sites of disease		
Only Pulmonary disease	998	(68 4)
Only extrapulmonary disease	287	(19 7)
Both Pulmonary and Extrapulmonary	175	(12 0)
Total	**1,460**	**(100.0)**

TABLE 12 *(see page 22)*
EPIDEMIOLOGIC INVESTIGATIONS OF TB EXPOSURE IN CONGREGATE SETTINGS
NEW YORK CITY, 1999

Site	Close Contacts					Casual Contacts					Self-Referred***			Transmission
	Identified**	Tested		Positive		Identified**	Tested		Positive		Tested	Positive		
	#	#	(%)	#	(%)	#	#	(%)	#	(%)	#	#	(%)	
School														
Primary School	20	20	(100)	2	(10)	6	6	(100)	0	(0)	104	0	(0)	Possible
Private School	27	23	(85)	0	(0)	23	18	(78)	0	(0)	24	1	(4)	Unlikely
Primary School	27	20	(74)	1	(5)	0	0	(0)	0	(0)	221	4	(2)	Unlikely
Residence														
SRO	30	25	(83)	4	(16)	0	0	(0)	0	(0)	7	2	(29)	Probable
SRO	14	10	(71)	1	(10)	40	30	(75)	8	(27)	11	1	(9)	Unlikely
Half-Way House	2	1	(50)	0	(0)	23	13	(57)	0	(0)	1	0	(0)	Unlikely
Worksite														
Church	28	19	(68)	7	(37)	96	30	(31)	5	(17)	9	1	(11)	Probable
Clothing Manufacturer	13	13	(100)	7	(54)	44	44	(100)	15	(34)	20	2	(10)	Probable
Restaurant	15	15	(100)	7	(47)	16	16	(100)	2	(13)	6	2	(33)	Possible
Diplomatic Mission	15	15	(100)	6	(40)	6	5	(83)	1	(20)	0	0	(0)	Unlikely
Clothing Manufacturer	10	10	(100)	3	(30)	0	0	(0)	0	(0)	4	2	(50)	Unlikely
Automotive Warehouse	10	8	(80)	1	(13)	8	3	(38)	1	(33)	4	0	(0)	Unlikely
Other														
Senior Center	50	50	(100)	13	(26)	0	0	(0)	0	(0)	31	9	(29)	Unlikely
Total	**261**	**229**	**(88)**	**52**	**(23)**	**262**	**165**	**(63)**	**32**	**(19)**	**442**	**24**	**(5)**	

* *Excludes 1 investigation that is on-going and 1 source case investigation*
** *Excludes prior positives*
*** *Persons who did not have known exposure to a person with TB, but requested tuberculin skin testing*

APPENDICES

APPENDIX 1

The Centers for Disease Control and Prevention's (CDC) objectives for tuberculosis control programs nationwide may be categorized as pertaining to completion of therapy, reporting, contact investigations, and treatment of latent tuberculosis infection. These objectives are as follows:

Completion of Therapy:

1 At least 90% of patients with newly diagnosed tuberculosis, for whom therapy of one year or less is indicated, will complete therapy within 12 months

Reporting:

1. All newly diagnosed cases of tuberculosis will be reported to CDC using the electronic reporting system developed by CDC. There will be at least 95% completeness for variables in the expanded Report of a Verified Case of Tuberculosis (RVCT)
2. Drug susceptibility results will be reported for at least 90% of all newly reported culture-positive tuberculosis cases.
3. Human immunodeficiency virus (HIV) status will be reported for at least 75% of all newly reported tuberculosis cases aged 25 through 44 years.

Contact Investigation:

1 Contacts will be identified for at least 90% of sputum acid-fast bacilli (AFB) smear-positive tuberculosis cases.

2. At least 95% of close contacts of sputum AFB smear-positive tuberculosis cases will be evaluated for infection and disease.

3 At least 85% of infected contacts who are started on treatment for latent tuberculosis infection will complete therapy.

Treatment of Latent Tuberculosis Infection:

1 At least 75% of persons with latent tuberculosis infection (LTBI) found through targeted skin testing activities (supported with program resources) and started on treatment for LTBI will complete therapy

APPENDIX 2

TUBERCULOSIS CASES BY UNITED HOSPITAL FUND NEIGHBORHOOD AND ZIP CODE: NEW YORK CITY, 1999

UHF Neighborhood	*Zip Code*	*1999 TB*
MANHATTAN		
Washington Heights	10031	17
	10032	16
	10033	17
	10034	12
	10040	–
Cent. Harlem	10026	12
Morningside Hghts	10027	18
	10030	11
	10037	8
	10039	9
East Harlem	10029	20
	10035	6
Upper West Side	10023	–
	10024	5
	10025	24
Upper East Side	10021	–
	10028	–
	10044	–
	10128	–
Chelsea-Clinton	10001	5
	10011	9
	10018	–
	10019	6
	10020	–
	10036	–
Gramercy Park	10010	–
	10016	19
	10017	–
	10022	–
Greenwich Village	10012	7
	10013	9
	10014	–
Union Square	10002	43
	10003	10
	10009	10
Lower Manhattan	10004	–
	10005	–
	10006	–
	10007	–
	10038	–
	10280	–
BRONX		
Kingsbridge-Riverdale	10463	8
	10471	–
Northeast Bronx	10466	–
	10469	6
	10470	–
	10475	–
Fordham-Bronx Park	10458	12
	10467	16
	10468	19
Pelham–Throgs Neck	10461	–
	10462	9
	10464	–
	10465	–
	10472	8
	10473	–
Crotona-Tremont	10453	17
	10457	10
	10460	8
High Bridge-Morrisania	10451	9
	10452	16
	10456	13

UHF Neighborhood	*Zip Code*	*1999 TB*
BRONX (continued)		
Hunts Point-Mott Haven	10454	5
	10455	8
	10459	11
	10474	–
BROOKLYN		
Greenpoint	11206	24
	11211	6
	11222	9
	11237	13
Downtown-Heights-Slope	11201	8
	11205	9
	11215	9
	11217	6
	11231	5
Bedford Stuyvesant-Crown Hts.	11212	17
	11213	14
	11216	20
	11221	15
	11233	18
	11238	10
East New York	11207	27
	11208	16
Sunset Park	11220	15
	11232	–
Borough Park	11204	10
	11218	23
	11219	14
	11230	12
East Flatbush-Flatbush	11203	22
	11210	13
	11225	15
	11226	24
Canarsie-Flatlands	11234	6
	11236	10
	11239	–
Bensonhurst-Bay Ridge	11209	14
	11214	9
	11228	–
Coney Island, Sheepshead Bay	11223	13
	11224	9
	11229	17
	11235	9
QUEENS		
Long Island-Astoria	11101	5
	11102	15
	11103	16
	11104	9
	11105	5
	11106	12
West Queens	11368	30
	11369	14
	11370	12
	11371	–
	11372	23
	11373	35
	11377	34
	11378	–
Flushing-Clearview	11354	8
	11355	27
	11356	–
	11357	–
	11358	8
	11359	–
	11360	–

UHF Neighborhhod	*Zip Code*	*1999 TB*
QUEENS (continued)		
Bayside-Little Neck	11361	–
	11362	–
	11363	–
	11364	–
Ridgewood-Forest Hills	11374	5
	11375	6
	11379	–
	11385	14
Fresh Meadows	11365	6
	11366	–
	11367	6
Southwest Queens	11414	–
	11415	–
	11416	–
	11417	–
	11418	6
	11419	7
	11420	6
	11421	–
Jamaica	11412	5
	11423	9
	11430	–
	11432	16
	11433	6
	11434	6
	11435	–
	11436	5
Southeast Queens	11001	–
	11004	–
	11005	–
	11411	–
	11413	5
	11422	5
	11426	–
	11427	–
	11428	–
	11429	8
Rockaway	11691	9
	11692	–
	11693	–
	11694	–
	11695	–
	11697	–
STATEN ISLAND		
Port Richmond	10302	–
	10303	–
	10310	8
Stapleton	10301	–
	10304	7
	10305	–
Willowbrook	10314	–
South Beach	10306	–
	10307	–
	10308	–
	10309	–
	10312	–
OTHER		–

- means < 5 cases

NOTES

To order copies of the TB76, TB78, laboratory/pathology report forms or report of patient services forms, call or mail the enclosed order form to:

Operations Unit
Tuberculosis Control Program
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-5100

To order additional copies of the Information Summary or other educational materials for tuberculosis, call:

Marcia Hampton
Tuberculosis Control Program
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-5100

TB CHEST CLINICS

BRONX CENTER

Morrisania Chest Clinic
1309 Fulton Ave., First Floor
Bronx, NY 10456
Tel (718) 901-6536/7/8

BROOKLYN

Bedford Chest Clinic
451 Hancock Ave., Room 208A
Brooklyn, NY 11221
Tel. (718) 574-2463/4

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., Fourth Floor
Brooklyn, NY 11201
Tel. (718) 643-8357/6551

MANHATTAN

Chelsea Chest Clinic
303 9th Avenue, Room 137
New York, NY 10031
Tel. (212) 239-1757/90

Washington Heights Chest Center
600 West 168th St. Third Floor
New York, NY 10032
Tel (212) 304-5435

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 415
Staten Island, NY 10301
Tel. (718) 983-4530

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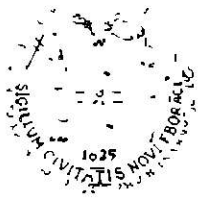

THE CITY OF NEW YORK
DEPARTMENT OF HEALTH

Rudolph W. Giuliani
Mayor

Neal L. Cohen M.D.
Commissioner

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