NEW YORK CITY DEPARTMENT OF HEALTH
TUBERCULOSIS CONTROL PROGRAM

INFORMATION SUMMARY: 2000

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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 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 1, 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 anti-tuberculosis medications for treatment of suspected or confirmed active tuberculosis.
2. All children younger than 5 years with positive tuberculin skin tests.

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

- AFB-positive smears
- Cultures positive for *Mycobacterium tuberculosis*
- Rapid diagnostic results that identity *Mycobacterium tuberculosis*
- Results of susceptibility tests performed on *Mycobacterium tuberculosis* cultures
- Pathology findings consistent with tuberculosis, including the presence of AFB and granulomata

As of January 1, 2001, mycobacteriology and pathology laboratories are required to forward the initial *M. tuberculosis* culture or sub-culture from each new patient to the New York City Bureau of Laboratories within 24 hours of identification.

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

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

HIGHLIGHTS

1. In 2000, New York City had the lowest tuberculosis case rate ever reported in the city. The 2000 rate of 16.6[1] cases per 100,000 persons is 3.5% lower than the previously lowest rate of 17.2 in 1978. New York City's tuberculosis rate in 1999 was 19.9 cases per 100,000 persons, and 52.0 in 1992. In 2000, 1,332 cases of tuberculosis were reported in New York City, an 8.8% decrease from the 1,460 cases reported in 1999 and a 65.0% decrease from the 3,811 cases reported in 1992, the peak of the recent epidemic.

2. Despite several years of progress, New York City's 2000 tuberculosis rate is still 2.9 times the national rate of 5.8 per 100,000, and is the second highest case rate of all areas reporting to the Centers for Disease Control and Prevention. 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 2000, 25 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). This represents a 19.4% decrease from the 31 cases reported in 1999 and a 94.3% decrease from the 441 cases reported in 1992. For the second year in a row, more multidrug-resistant tuberculosis patients were non-US-born (72.0%) than US-born (28.0%).

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 1999, 1,083 (87.6%) completed treatment within 365 days. Excluded from this index are patients found not to have tuberculosis, those who died before completing therapy, those who never started anti-tuberculosis therapy, those less than 21 years of age with bone, miliary, or meningeal tuberculosis, and those with *M. tuberculosis* isolates initially resistant to rifampin.

5. 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 non-US-born. The trend toward a predominance of non-US-born cases continued for the fourth year in a row in 2000: 804 of 2000 cases were non-US-born (60.4%), 511 were US-born (38.4%), and 17 (1.3%) had an unknown country of origin. In contrast, in 1992, only 17.7% of tuberculosis cases diagnosed in New York City were non-US-born.

6. The proportion of total cases known to be infected with the human immunodeficiency virus (HIV) in 2000 was 18.1% (241 cases). This proportion was lower than the percent known to be HIV-positive in 1999 (20.0%, 321 cases) and has steadily declined since 1992 (33.6%, 1,281 cases).

7. In an effort towards eliminating 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 1999, of 11,864 individuals who started treatment for latent tuberculosis infection, 47.0% (5,580) completed treatment. Of those starting treatment for latent tuberculosis infection, 8,622 (72.7%) started receiving their care at Department of Health chest centers.

8. As of January 1, 2001 the New York City Health Code was amended to require that clinical laboratories forward the initial *M. tuberculosis* culture or subculture from each new patient to the New York City Department of Health, Bureau of Laboratories within 24 hours of detection for DNA fingerprinting.

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[1] *Rate based on 2000 Census data.*

CONTENTS

OVERVIEW OF ACTIVITIES

Tuberculosis Control Program

The Tuberculosis Control Program (TBCP) 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 (TB) meets acceptable standards, the Program monitors care received by every patient diagnosed with active tuberculosis in New York City (NYC), regardless of whether or not the patient receives treatment in a Department of Health chest center. The Program's activities are directed toward meeting objectives established by the Centers for Disease Control and Prevention for treatment of patients with active tuberculosis and latent TB infection with the causative organism, *Mycobacterium tuberculosis* (see Appendix 1 for a list of these objectives).

Directly Observed Therapy

Directly Observed Therapy (DOT) programs foster treatment adherence by providing trained health care workers to observe patients swallowing their medication. Tuberculosis patients are provided with DOT through the Department of Health TB Control Networks, and by public and not-for-profit health care providers. While labor intensive, DOT is cost effective: the number and duration of hospital stays is reduced; the emergence of drug resistant tuberculosis organisms is less of a risk; and the likelihood that treatment will be completed is increased. DOT is the standard of care for tuberculosis patients.

The NY State Department of Health funds non-NYC Department of Health DOT providers; all providers may claim Medicaid, or other third party reimbursement, for which they are eligible. Both NYC DOH and non-DOH providers are subject to quality control monitoring which is conducted by the DOT Quality Assurance (QA) Unit. The QA Unit operates under a grant from the NY State Department of Health and is situated within the TBCP's Program Development Unit.

Chest Centers

The TBCP operates ten chest centers located throughout the city (see inside back cover for names and locations). These chest centers are staffed with pulmonary or infectious disease board-certified physicians who provide expert consultation to other TB providers throughout the city. The chest centers provide specialty care, including care for difficult to treat patients and DOT for individuals with active tuberculosis. The chest centers also provide treatment for latent TB 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 HIV counseling and testing. All care is confidential, state-of-the-art, and free of charge for the patient.

In 2000, the program collaborated with several community-based organizations to provide targeted testing and treatment for LTBI to high risk groups. Some of the chest centers maintained extended hours to accommodate patients whose work schedules often fell beyond the normal clinic hours. There is at least one chest center open on Saturdays in the Bronx, Brooklyn, Manhattan, and Queens.

In 2000, the Program's chest centers provided care to 901 patients with confirmed or suspected tuberculosis. Of 1,332 patients who were diagnosed with tuberculosis in 2000, 516 (38.7%) received some or all of their care in the Program's chest centers. The percentage of patients diagnosed with tuberculosis, receiving all of their care in the chest centers, and on DOT, decreased from 84.8% in 1999 to 76.4% in 2000; each month an average of 82% of patients remained above 80% adherent to their treatment regimen. These centers provide care to a high proportion of patients with multidrug-resistant tuberculosis (MDRTB): 66.0% (33/50) of the prevalent MDRTB cases in 2000 were in care at the DOH chest centers.

In 2000, the chest centers recorded 135,563 patient visits. This represents a 5.3% decrease from the 143,120 visits in 1999. The Corona Chest Center in Queens continued to account for more than 25% of the total patient visits to a DOH chest center in 2000, with 38,984 or 28.8% of the total patient visits. In 1999, 8,203 patients started treatment for LTBI in NYC chest centers. Preliminary figures

for 2000 indicate a slight increase in this number with 8,381 patients starting treatment for LTBI in the chest centers.

The chest centers continue to serve a large number of non-US-born patients. In 2000, 60% (25,039) of the total 41,529 patients seen at the chest centers were born outside of the United States. In 2000, 74% of patients receiving treatment for LTBI at one of the Program's chest centers did not have Medicaid; therefore, the Department of Health was unable to receive reimbursement for their care.

Field 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 and 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 guidelines. Specialized outreach groups offer tuberculosis control services to patients incarcerated at the Rikers Island Correctional Facility, the 30th Street Shelter, and at single room occupancy hotels in Manhattan and the Bronx. The city operates a civil detention ward at Goldwater Memorial Hospital for non-adherent patients 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 2000, outreach workers were responsible for providing DOT in the residences, places of employment or other meeting places of 351 tuberculosis patients (reported in 2000 or earlier as confirmed or suspected tuberculosis cases) who could not attend a clinic on a regular schedule, and for returning to clinical care an average of 55 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 2000, 3,650 contacts received tuberculin skin testing by outreach staff with 957 of 1,073 (89.2%) 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) or who has a cavitary chest x-ray. In 2000, 530 of the patients reported to the New York City Department of Health who ever had an AFB-positive smear and therefore assigned to outreach workers for interviews, were eventually found not to have tuberculosis. Before these patients were determined not to have tuberculosis, 350 of their contacts were evaluated.

Special Units in the Program Development Unit (PDU)

TB Control among special populations is a main function of the Program Development Unit. Tuberculosis control within homeless shelters, cubicle hotels, and single room occupancy hotels is coordinated by the Homeless Outreach Unit, which serves as a resource for issues of employee and client TB monitoring and prevention.

The Regulatory Affairs Unit is also situated within the PDU. This unit administers the processes and procedures necessary for determining the course of regulatory action, including detention, which may be necessary in managing tuberculosis patients who are unwilling or unable to complete treatment. The patients in two secure TB detention units are case managed by the Regulatory Affairs Unit.

Immigrants and refugees who enter the USA through the Port of NY, or refugees who are relocated in NYC and who have been issued certain TB classifications overseas, are referred to the Immigration and Refugee Unit. This Unit coordinates with the US Public Health Service and the DOH chest centers to provide necessary follow-up to these new arrivals.

The PDU also includes the Quality Management Unit, which oversees quality improvement for the Program, and the Expanded Screening Unit, a team which is trained and experienced in managing large scale TB screening events, usually in coordination with the Epidemiology Unit.

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 1,332 confirmed cases reported in 2000, Central Registry staff entered data for 2,693 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 2000, surveillance workers reviewed medical records for 930 suspected cases, and their efforts resulted in the confirmation of tuberculosis disease in 142 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 the Surveillance and Epidemiology staff to identify outbreaks, trends, and instances of possible laboratory contamination, and to research issues of clinical and operational importance. In 2000, Surveillance staff identified 35 patients from 1999 or 2000 thought to have tuberculosis who had a positive *Mycobacterium tuberculosis* culture which had resulted from laboratory contamination, mislabeling, or an error during sputum induction. Surveillance staff informed the medical providers of these patients that further evaluation was warranted and that medical treatment for tuberculosis might be unnecessary; 29 (82.9%) of these patients were found not to have tuberculosis.

Epidemiology

The epidemiology staff provides epidemiologic consultation to each of the five boroughs. The staff review cases with potential exposures in congregate settings to provide assistance in making assessment of the likelihood of transmission to the closest contacts and to evaluate the need to expand the concentric circle and test additional contacts in congregate settings. In 2000, 586 cases were reviewed by epidemiologists; for 16 cases, notification of contacts in congregate settings was done by letter. In addition, epidemiology staff conducted 13 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 field and clinic 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. 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.

In 2000, the New York City Health Code was amended to require that clinical laboratories forward the initial *M. tuberculosis* culture or sub-culture from each new patient to the NYCDOH Bureau of Laboratories within 24 hours of identification. The objectives of this new activity are to allow the program to more rapidly and efficiently:

1. Identify laboratory cross-contamination, so that clinicians can be notified of laboratory errors quickly to prevent unnecessary treatment of patients,
2. Identify nosocomial transmission not identified by conventional methods,

3. Assess tuberculosis transmission in outbreaks in order to refine contact investigations; and
4. Determine the extent and dynamics of on-going transmission to focus program interventions for specific geographic areas and populations.

Beginning in 2001, the TBCP will perform DNA analysis by both spoligotyping and the IS6110-based RFLP methods on isolates from all culture-positive patients.

Education and Training

The Education and Training unit provides TB education to the Tuberculosis Control Program staff, health care providers, high risk communities, and the general public. The unit develops, updates, and distributes a variety of multi-media educational materials that are targeted by population, reading level, language, and culture. These include the Clinical Policies and Procedures Manual and TB Fact Sheets targeted to MDs; pamphlets, for patients and the general public; and videos created for MDs, patients, and candidates for treatment of latent TB infection. In 2000, the Education and Training unit distributed 325,186 educational materials, and handled 1,425 telephone requests for information. The TB section of the NYC DOH Web site, (http:\\www.health.nyc.gov), offers publicly and professionally useful TB-related information (including the revised Clinical Policies and Procedures Manual, TB Fact Sheets and patient brochures).

The Education and Training unit provides training to staff responsible for carrying out the core TB prevention and control activities, including infection control practices. In 2000, the unit conducted 167 in-service training sessions for 2,661 persons. In 2000, the Education and Training unit also provided education and training to the public, answering requests from schools, government and community based organizations, businesses, and individuals. The unit presented 62 professional education sessions that were attended by 1,872 persons, 95 public educational sessions attended by 2,404 persons, and 54 health fairs attended by 12,254 persons. Also, 55 education sessions were conducted as a routine part of expanded contact investigations (ECIs) with attendance totaling 3,515 people in a variety of industrial, corporate, residential, hospitality, and academic settings.

Professional Education is promoted through TBCP sponsored educational sessions, bi-monthly accredited (continuing medical education) dinner seminars for physicians, and also through regular contributions to national and international TB related conferences.

Methods

Case Counting

Cases counted in 2000 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 2000 cases were first suspected of having disease in 1999; likewise, some individuals first suspected of having tuberculosis in late 2000 will be counted in 2001 if active tuberculosis is confirmed in 2001. Individuals who submitted a specimen for mycobacteriology culture in late 2000 were included in the 2000 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, 2001. 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 2000 census figures for New York City to calculate citywide and borough specific crude case rates per 100,000 population. Because breakdowns of 2000 Census data by age and gender were not available at the time of preparation of this text, all other case rates use the 1990 Census data. In each instance, the source of Census data is specified. Case rates from years before 1991 were based on Census data from the preceding decades. 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 other than the citywide and borough 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 US-born cases with non-US-born cases, persons from Puerto Rico, the US Virgin Islands, and all US territories are considered US-born. Ascertainment and reporting of place of birth have improved in the past six years, accounting for part of the increase in reported non-US-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.

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 DOH, within 24 hours, of all clinically suspected and confirmed cases of tuberculosis; of children less than five years with positive tuberculin skin tests; and of the results of bacteriology or pathology studies that suggest or confirm tuberculosis.

Physicians are also required to test (or refer to the 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 with confirmed TB 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 2000 as well as persons infected with the organism that causes tuberculosis.

In 2000, the number of confirmed tuberculosis cases in New York City declined for the eighth consecutive year, to a total of 1,332. This is an 8.8% decrease from the 1,460 cases reported in 1999. Using the population recorded in the 2000 census as a denominator,[1] the city's 2000 tuberculosis case rate is 16.6 tuberculosis cases per 100,000 persons, compared with a rate of 19.9 recorded in 1999. This is the lowest tuberculosis case rate ever reported in New York City. Previously, the lowest reported case rate was 17.2 per 100,000 reported in 1978.

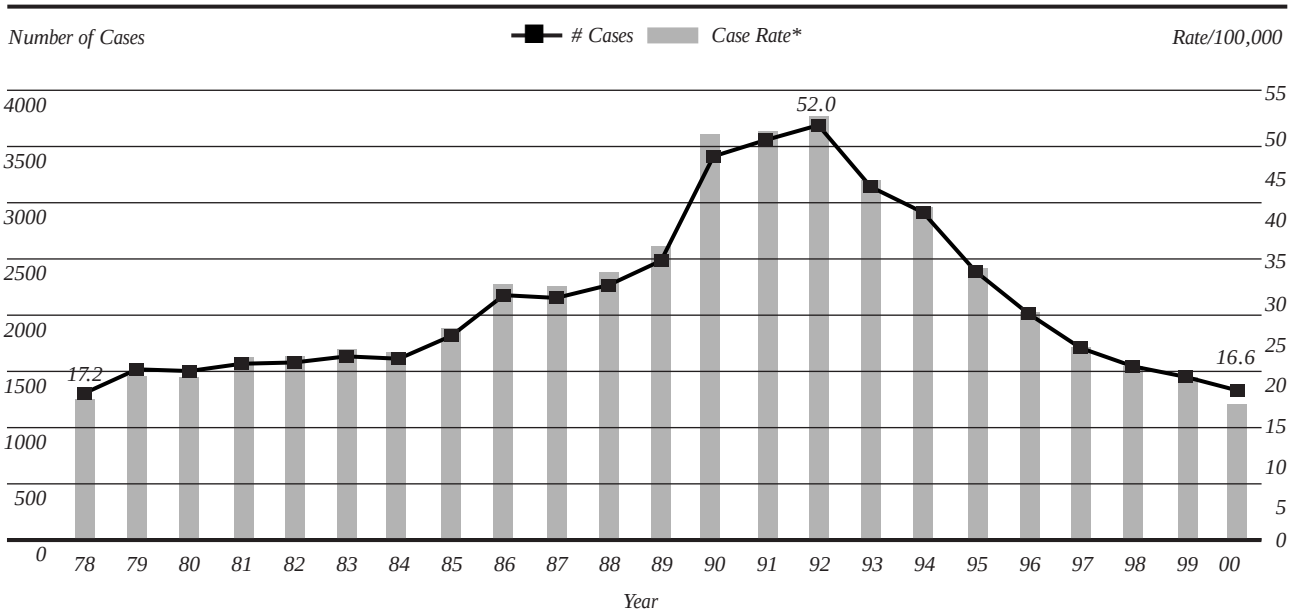
The lowest number of tuberculosis cases ever recorded in New York City (1,307) was also in 1978. For 14 years after 1978, the number of cases rose fairly steadily, to a peak in 1992 of 3,811 cases and a rate of 52.0 per 100,000. The number of cases reported in 2000 is 65.0% lower than the number reported in 1992. The drop in culture-confirmed cases between 1992 and 2000 is even greater: the number of culture-confirmed cases reported in 2000 (1,066) is 69.0% lower than the number reported in 1992 (3,442). In 2000, the ten healthcare facilities reporting the most tuberculosis cases reported a cumulative 35.2% of all tuberculosis cases.

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 2000, the number of cases nationally decreased by 10,296, to 16,377 cases in 2000. With 2,479 fewer cases in 2000 than in 1992, New York City contributed 24.1% to the national decrease in tuberculosis between those years.

While New York City has made great progress in its

[1] *According to the 2000 Census, the New York City population is 8,008,278. The 1990 Census population was 7,322,564.*

Figure 1
Tuberculosis Cases and Rates
New York City, 1978 - 2000



* *Rates based on Census data for each decade. 2000 Census data are used for 2000 case rate.*

struggle against tuberculosis over the past eight years, New York City's 2000 rate of 16.6 tuberculosis cases per 100,000 population is still 2.9 times the national rate of 5.8 per 100,000, the second highest case rate of all areas reporting to the Centers for Disease Control and Prevention. In 2000, New York City contributed 8.1% of the nation's total 16,377 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 population. The national rate of 5.8 is 1.7 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 non-US-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 was notably lower than that recorded in previous years: the proportion of HIV-infected tuberculosis cases continued to decline in 2000, to 18.1%. The proportion of tuberculosis cases with a known place of birth who were non-US-born increased in 2000 over that recorded in 1999 (61.1% vs. 58.0%). In 2000, 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 39.3%, compared with 38.2% in 1999.

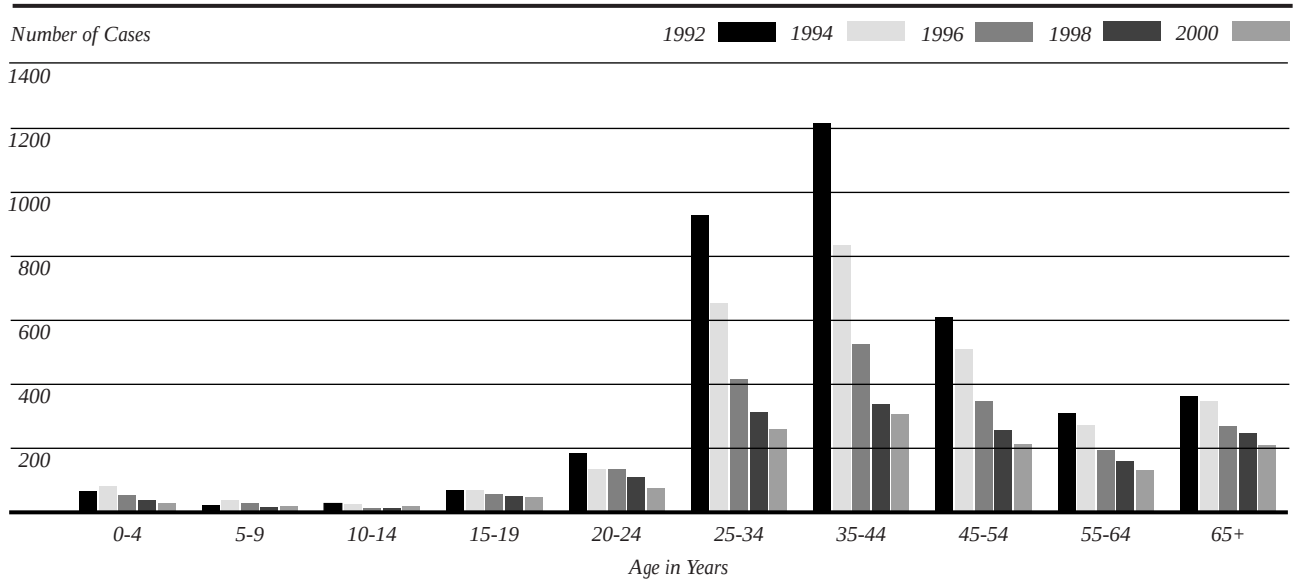
The first step in controlling the tuberculosis epidemic—ensuring the complete treatment of infectious cases—has been taken. However, if the city is to further reduce the burden of tuberculosis for future New Yorkers, it is important to treat latent infection in persons who became infected with *Mycobacterium tuberculosis* through their recent exposure to active cases, and others who are 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 2000.

Age Distribution

(Tables 2-3, Figures 2-3)

In 2000, people with active tuberculosis ranged in age from less than one year to 93 years old. Tuberculosis case rates were highest in the groups aged 35 through 44 and 45 through 54 years (27.7 per 100,000). Case rates were lowest in the group aged 10 through 14 years (4.7 per

Figure 2
Tuberculosis Cases by Age
New York City, 1992 - 2000



100,000). There were the same or fewer tuberculosis cases in all age groups in 2000 than in 1999, except for the groups aged 5 through 9 (46.7% increase, from 15 to 22), 15 through 19 (47.1% increase, from 34 to 50), and 65 years and older (1.0% increase, from 210 to 212). Within the 5 through 9 and 15 through 19 age groups, the increase was seen among both US and non-US-born; however, in the 65 years and older category, the number of US-born cases increased while non-US-born cases remained the same. 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 2000.

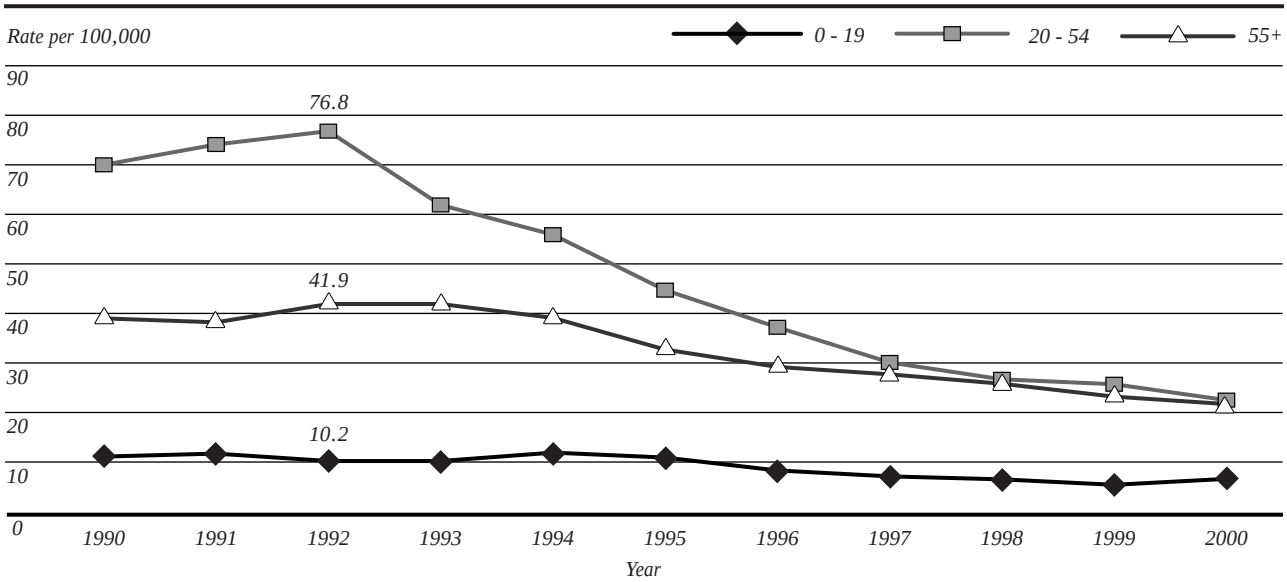
In areas where tuberculosis is well controlled, the highest proportion of cases tends to be among the elderly and the proportion of cases aged less than 65 years tends to be low. After 1992, as tuberculosis control efforts in New York City were strengthened and the city's cases overall decreased, the 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. After a slight increase in 1999 to 85.6%, the proportion of cases in the group younger than 65 years decreased to 84.1% in 2000.

The 53 cases that occurred in 2000 among children younger than 10 years represent 4.0% of total cases, which is more than the 3.2% recorded in 1999 (47 cases reported). The rate in this age group was 5.5 per 100,000 in 2000, compared with 4.9 per 100,000 in 1999. 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, despite the small increase in cases in 2000, the low rates of tuberculosis in this age group are encouraging, as they suggest a decline in recent transmission of the disease.

Children, including those aged 10 through 14 years, once infected with tuberculosis, are especially vulnerable to progression to active disease. The increase in cases observed in 1999 in this age group did not continue in 2000. Between 1999 and 2000, there was no significant change in the number of cases or the rate of the group aged 10 thorough 14 years (21 cases in 1999, 22 cases in 2000, and a rate of 4.7 each year). The largest increase (47.1%), from 34 cases in 1999 to 50 cases in 2000, was among older adolescents, aged 15 through 19 years; this group had a rate of 10.6. This increase was investigated and cases were not found to be clustered by region or country of origin.

Among adults, the group aged 25 through 34 years experienced the largest decrease, 17.4%, from 316 in 1999 to 261 in 2000; this group comprised 19.6% of total cases and had

FIGURE 3
TUBERCULOSIS CASE RATES BY AGE*
NEW YORK CITY, 1990 - 2000



* *Rates are based on 1990 Census data.*

a rate of 19.1. The only group with an increase among adults was the group aged 65 years and older (1.0% from 210 cases in 1999 to 212 in 2000); this group comprised 15.9% of total cases and had a rate of 22.2. The group aged 35 through 44 years experienced a 13.2% decrease in cases from 356 to 309; this group had a case rate of 27.7 per 100,000 and comprised the largest proportion (23.2%) of the total cases in 2000. Among other adult age groups, the incidence of tuberculosis and percent changes between 1999 and 2000 were as follows: the group aged 20 through 24 comprised 5.9% of the total and had a case rate of 13.5 and an 11.4% decrease between 1999 and 2000 (from 88 to 78 incident cases); the group aged 45 through 54 comprised 16.1% of the total, had a case rate of 27.7 and a decrease of 5.7% between 1999 and 2000 (from 227 to 214 incident cases); and those 55 through 64 comprised 10.1% of the total, had a case rate of 20.8 and experienced a 16.8% decrease between 1999 and 2000 (from 161 to 134 incident cases).

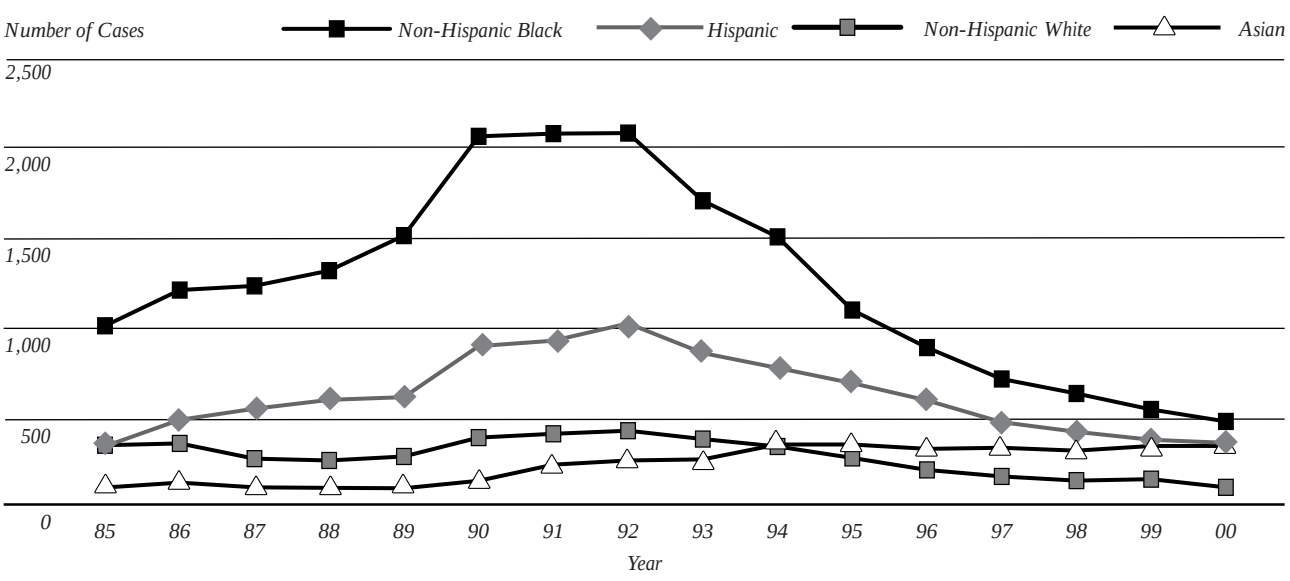
For the purposes of trend analyses, TB cases over the past decade were divided into three age groups: children and adolescents (ages 0 through 19 years) young and middle age adults (ages 20 through 54 years) and older adults (ages 55 and older). Trends of tuberculosis case rates for these age groups are shown in table 3 and figure 3. Low case rates observed among cases aged 0 through 19 years have declined further over the past decade (11.1 cases per 100,000 in 1990 to 6.6 in 2000). The age group 20 through 54 years of age contributed most significantly to the recent TB epidemic in New York City and case rates for this age group mimic the overall case rate trend observed for all cases during this period; case rates began at 70.0 cases per 100,000 in 1990, peaked at a rate of 76.8 in 1992 and decreased to 22.5 in 2000. Among cases 55 and older, a less pronounced peak occurred when the case rate increased from 39.0 in 1990 to 41.9 in 1992 and 1993, and then steadily decreased to 21.7 in 2000.

Distribution by Sex

(Table 2)

As in previous years, the incidence of tuberculosis among males in 2000 was nearly twice the incidence among females: 23.5 per 100,000 among males vs. 13.5 per 100,000 among females. Since 1986 there has been a trend toward an increasing proportion of female cases, which was interrupted in 1998, but resumed in 1999. In 2000, the proportion of female cases increased slightly (39.3%; 523/1,332 cases) compared to 1999 (38.2%; 557/1,460 cases) and surpassed the 1997 proportion of 39.0%. There was a larger percentage decline in male tuberculosis cases between 1999 and 2000 (10.4%, from

Figure 4
Tuberculosis Cases by Race/Ethnicity
New York City, 1985 - 2000



903 in 1999 to 809 in 2000) than in female cases (6.1%, from 557 in 1999 to 523 in 2000).

Among adult males, the greatest percentage decrease in cases between 1999 and 2000 occurred in the group aged 55 through 64 years (16.8% decrease, from 107 in 1999 to 89 in 2000). Among adult females, the greatest percentage decrease in cases occurred in the group aged 25 through 34 years (18.8% decrease, from 133 in 1999 to 108 in 2000). Among adult males, only those aged 65 years and older experienced an increase (5.4%, 111 in 1999 to 117 in 2000). Among adult females, only those aged 45 through 54 had an increase, (9.7%) from 62 in 1999 to 68 in 2000. All remaining adult male and female age groups experienced no change or a decrease in the number of cases from 1999 to 2000.

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 (40.8 per 100,000 for males vs. 16.3 for females).

Racial/Ethnic Distribution

(Tables 2-3, Figures 4-6)

Table 2 shows the distribution of 2000 tuberculosis cases by race/ethnicity and age among males and females. Racial/ethnic distributions for males and females were fairly similar with a few notable exceptions. Case rates of females exceeded those of males among Asians aged 10 through 14 years (30.8 for females compared to 5.9 for males) and among non-Hispanic Blacks aged 5 through 9 years (11.3 for females and 5.5 for males) and 15 through 19 years (14.8 for females and 9.7 for males). Between 1999 and 2000, tuberculosis cases decreased among non-Hispanic Whites, non-Hispanic Blacks, and Hispanics. There was no change in cases among Asians.

As in previous years, non-Hispanic Blacks comprised the highest proportion of 2000 tuberculosis cases (36.6%). The 487 cases reported among non-Hispanic Blacks in 2000 gave this group a case rate of 26.4 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 11.9% from the 553 recorded in 1999. Age-specific incidence rates in 2000 peaked in the 45 through 54 year age-group for non-Hispanic Black males (80.2 per 100,000) and the 35 through 44 year age group for non-Hispanic Black females (33.5 per 100,000).

The 369 Hispanic cases represented 27.7% of total 2000 tuberculosis cases. Hispanics had a case rate of 20.7 per 100,000. The number of tuberculosis patients who are Hispanic decreased by 4.4% from the 386 recorded in

Figure 5a
Tuberculosis Cases by Race/Ethnicity: Ages 0-19 Years
New York City, 1990 - 2000

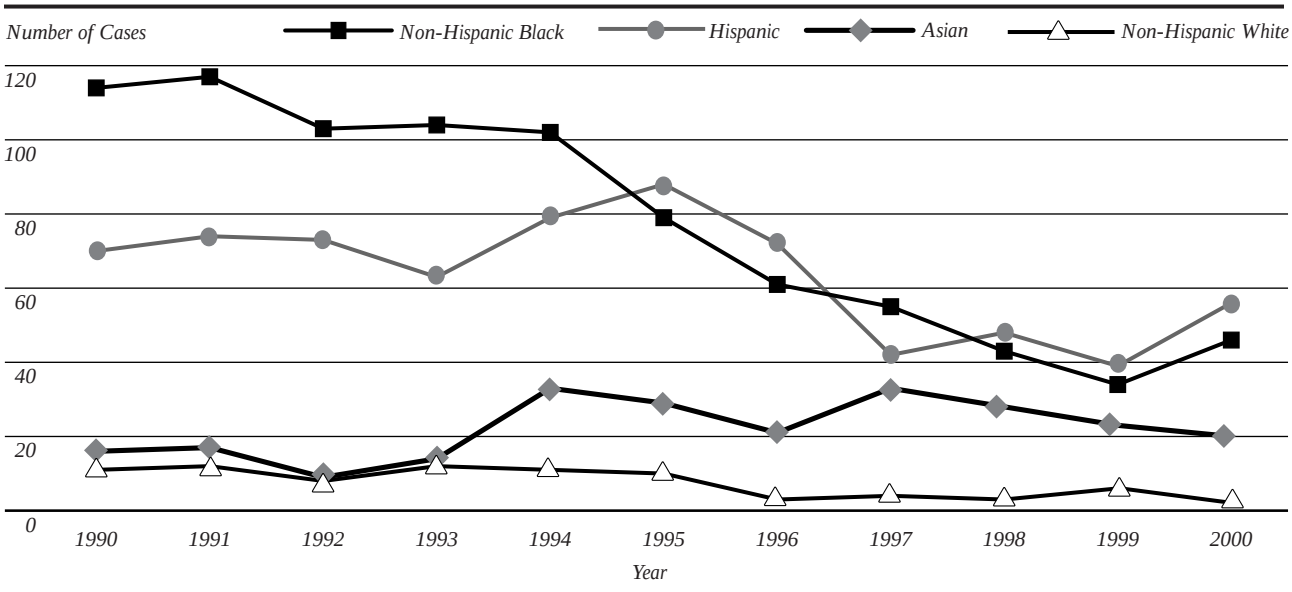


FIGURE 5B
TUBERCULOSIS CASES BY RACE/ETHNICITY: AGES 20-54 YEARS
NEW YORK CITY, 1990 - 2000

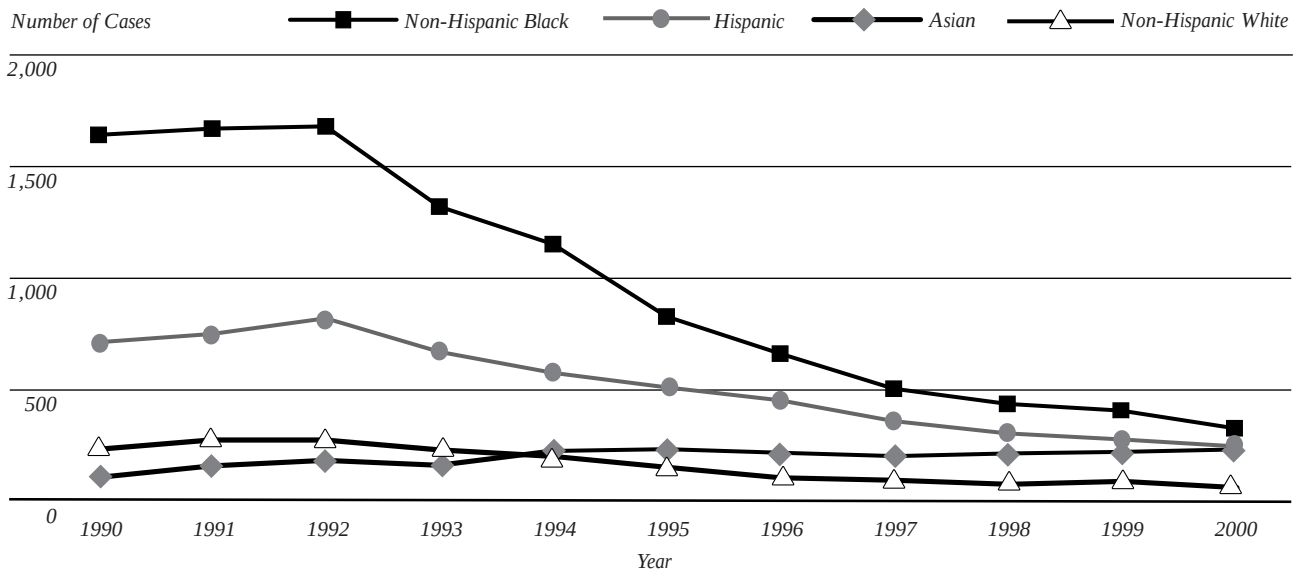
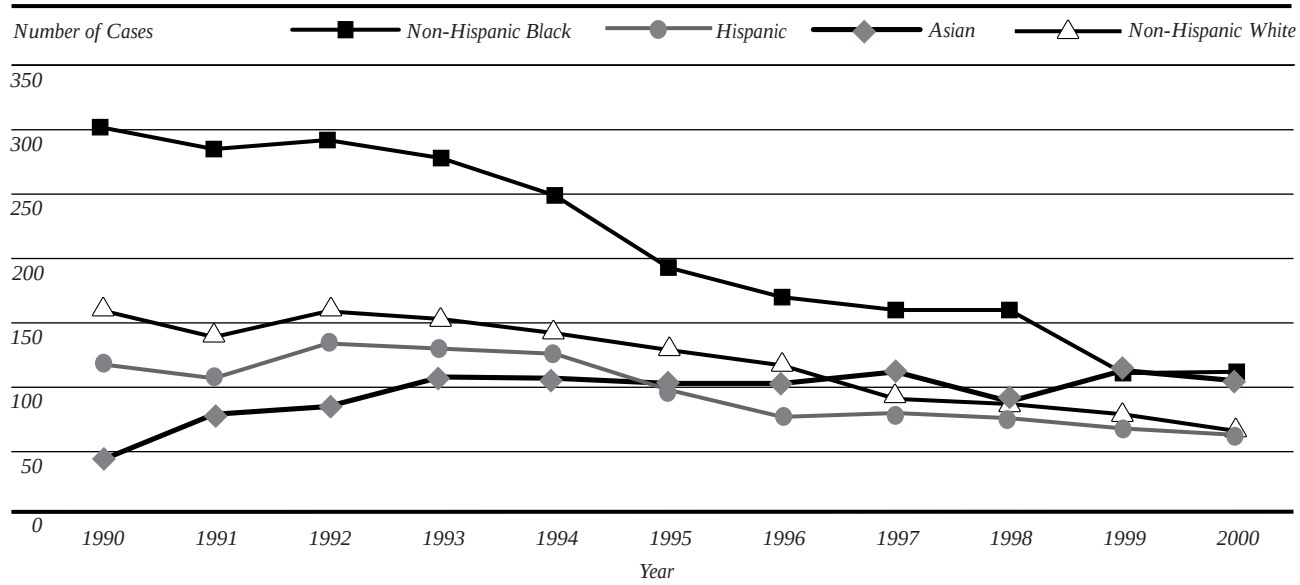


FIGURE 5C
TUBERCULOSIS CASES BY RACE/ETHNICITY: AGES 55 AND OLDER
NEW YORK CITY, 1990 - 2000



1999. Age-specific incidence rates in 2000 peaked in the 45 through 54 year age-group for Hispanic males (44.1 per 100,000) and the 65 and older age group for Hispanic females (31.8 per 100,000).

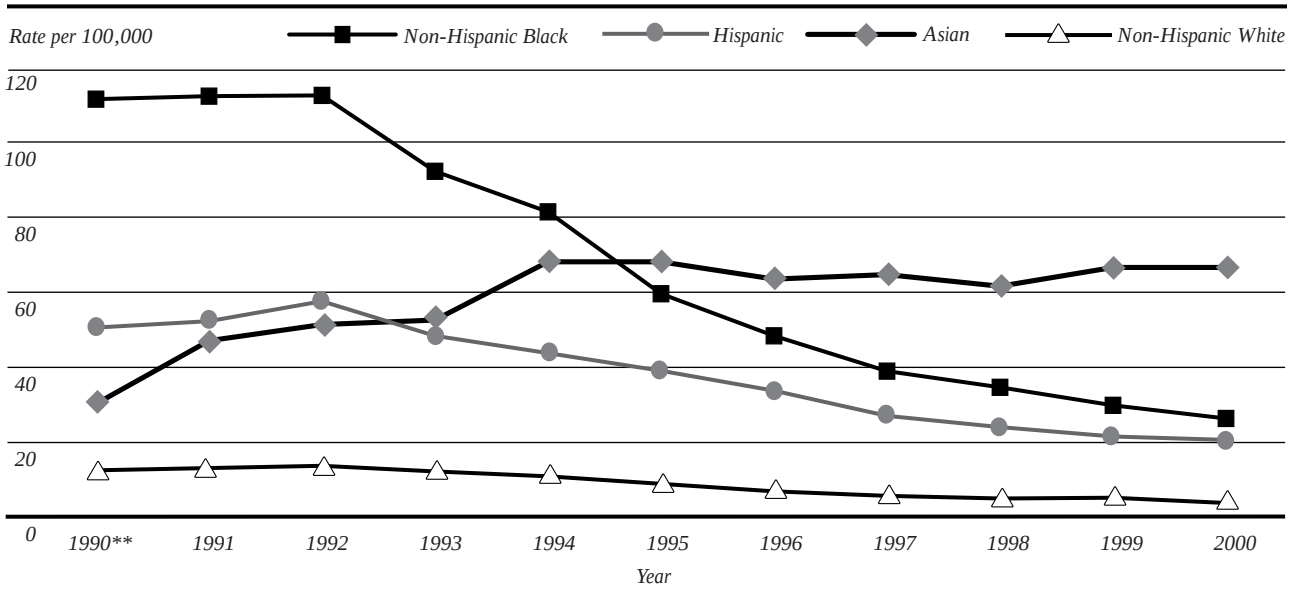
The 352 cases among Asians accounted for 26.4% of the 2000 cases. Asians had a case rate of 66.6, higher than that for any other racial/ethnic group. The number of cases recorded among Asians in 2000 is unchanged from that reported in 1999. As in 1999, the highest tuberculosis rates among Asian males and females in 2000 were observed among those aged 65 years and older (291.8 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 and based on 1990 census data.

The 124 cases among non-Hispanic Whites accounted for 9.3% of the 2000 total. Non-Hispanic Whites had a case rate of 3.9 per 100,000, lower than that for any other racial/ethnic group. The number of cases among non-Hispanic Whites decreased 26.6% in 2000 compared to 1999 (169). Age-specific incidence rates in 2000 peaked in the 65 years and older age group for non-Hispanic White males (7.2 per 100,000) and females (5.2 per 100,000).

Figure 4 shows the trend in case numbers by race since 1985, the earliest year data are available for Hispanics separately from other races. While the recent epidemic occurred primarily among non-Hispanic Blacks and Hispanics, the 487 cases among non-Hispanic Blacks in 2000 is well below the 1,014 seen in 1985, while the 369 cases in 2000 among Hispanics is similar to the 350 seen in this group in 1985. Cases among non-Hispanic Whites decreased from 356 in 1985 to 124 in 2000. Cases among Asians increased from 123 in 1985 to 352 in 2000.

Figures 5a through 5c show cases by race/ethnicity and age: ages 0 through 19 years, 20 through 54 years, and 55 and older. The difference between the race/ethnicity with the most and the least number of cases in a given year decreased in each age group from 1990 to 2000. In the 0 through 19 age group this difference decreased from 103 in 1990 to 54 in 2000. Among the age group 20 through 54 years, this difference decreased from 1,541 in 1990 to 273 in 2000. In the group aged 55

FIGURE 6
TUBERCULOSIS RATES* BY RACE
NEW YORK CITY, 1990 - 2000



* *Rates per 100,000 persons based on 2000 Census data.*

*** 1990 data do not include two Native American cases.*

years and older, this difference decreased from 259 in 1990 to 49 in 2000.

Figure 6 illustrates trends in case rates by race/ethnicity per 100,000 over the past decade. While the case rate was highest among non-Hispanic Blacks in 1990 (111.4 per 100,000), by 2000 the rate in this group decreased to 26.4, similar to that seen among Hispanics (20.7) and lower than the rate seen among Asians (66.6). It is important to note, however, that these rates are based on 1990 Census data and do not reflect the large numbers of immigrants that came to New York City during this decade.

Geographic Distribution

(Tables 4-5, Figures 7-9)

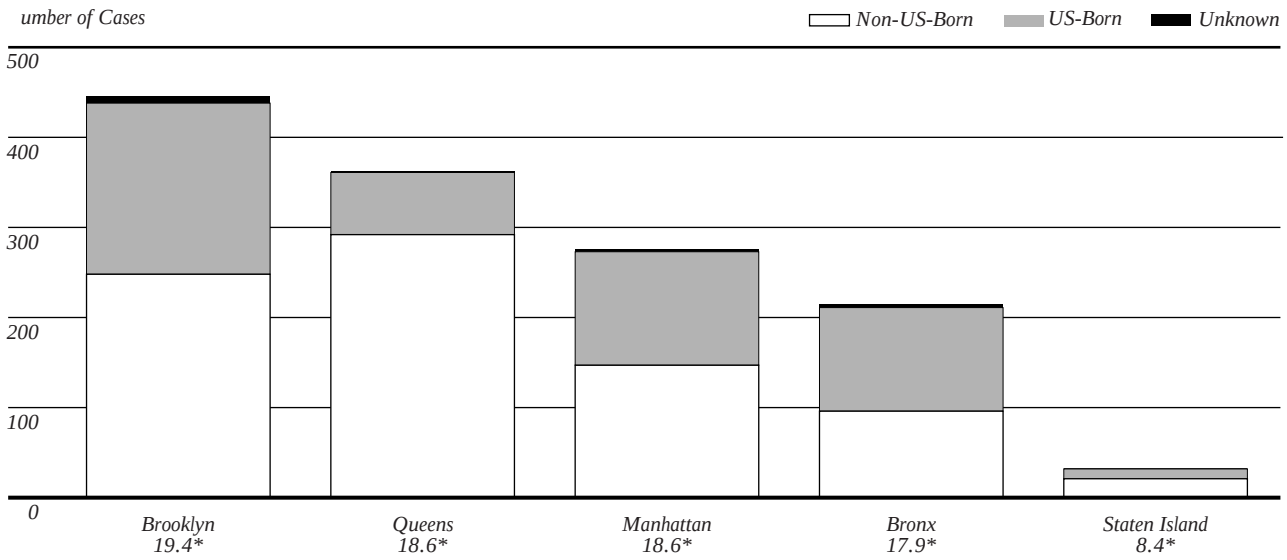
Incidence rates by health district of residence were calculated for 2000; age-adjusted and crude rates are presented in Table 4. Table 5 presents data by place of birth, human immunodeficiency virus (HIV) status, and numbers and rates of sputum smear positive tuberculosis for each health district. Figure 7 displays a map of health districts.

Figure 8 illustrates the number of tuberculosis cases contributed by each borough, and the proportion of non-US-born cases in each borough. The boroughs that contributed the largest proportions of total New York City cases were Brooklyn, Queens, and Manhattan. Between 1999 and 2000, the number of new tuberculosis cases decreased in the boroughs of Brooklyn, Manhattan, Queens, and Staten Island, and increased in the Bronx. In the Bronx, the number of tuberculosis cases increased by 7.0%, from 201 in 1999 to 215 in 2000. The increase in the Bronx was seen exclusively among non-US-born patients (24.7%, 77 in 1999 and 96 in 2000); among US-born patients, cases decreased 5.0% (from 121 in 1999 to 115 in 2000). In Manhattan, cases decreased by 15.9% (from 328 cases in 1999 to 276 cases in 2000), Queens cases decreased by 15.6% (from 430 cases in 1999 to 363 in 2000), and Brooklyn cases decreased by 4.5% (from 467 cases in 1999 to 446 in 2000). Between 1999 and 2000, the number of non-US-born cases decreased or remained unchanged in all boroughs except the Bronx and Staten Island which experienced a 24.7% increase (from 77 in 1999 to 96 in 2000 in the Bronx) and a 50.0% increase (from 14 in 1999 to 21 in 2000 in Staten Island) respectively. Queens had the largest number of non-US-born cases in 2000, 292 cases (80.4% of Queens' cases).

The three districts with the highest age-adjusted case rates in 2000 were Central Harlem, Tremont, and Corona. 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 continued in 1999 when the age-adjusted case rate dropped to 43.6. In 2000, Central Harlem's case rate decreased by an additional 10.6% to 39.0. A decrease in age-adjusted case rates between 1999 and 2000 was also observed in Corona (13.1%). Other districts that experienced substantial decreases in age-adjusted tuberculosis rates between 1999 and 2000 were Riverside, Lower East Side, and Washington Heights in Manhattan; Mott Haven and Morrisania in the Bronx; Gravesend, Red Hook-Gowanus, Williamsburg-Greenpoint, and Brownsville in Brooklyn; and Astoria-LIC, Jamaica East, and Jamaica West in Queens.

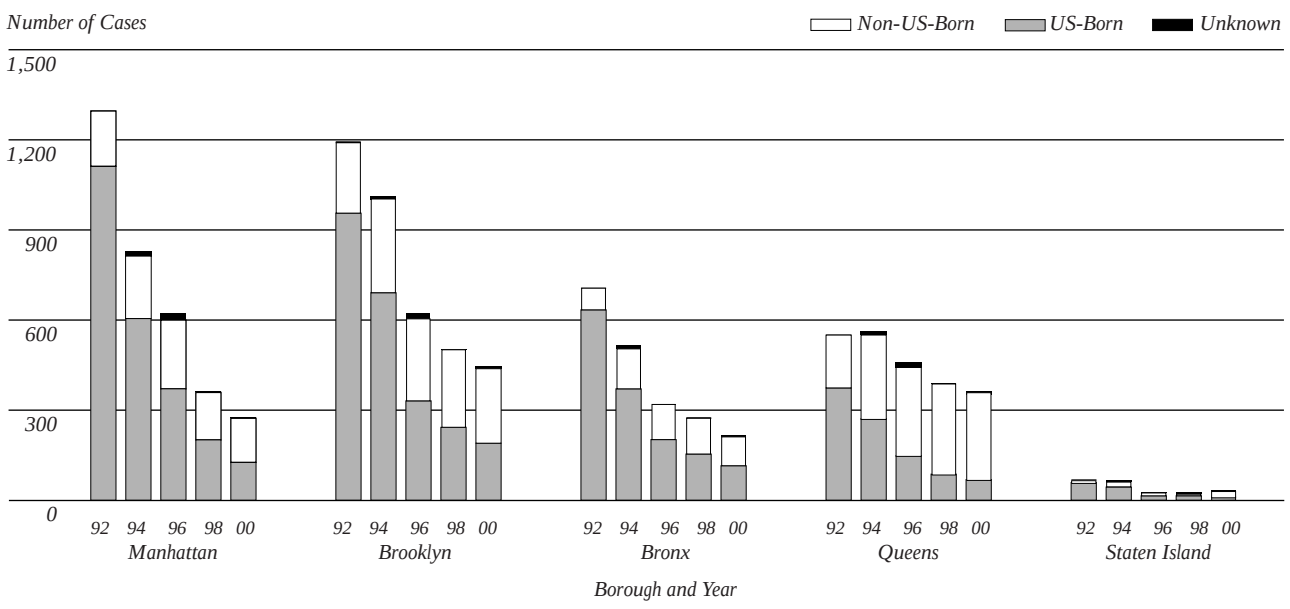
Figure 7
Health Center Districts, New York City

FIGURE 8
TUBERCULOSIS CASES BY AREA OF BIRTH AND BOROUGH OF RESIDENCE
NEW YORK CITY, 2000



** Rates per 100,000; based on 2000 Census data*

FIGURE 9
TUBERCULOSIS CASES BY AREA OF BIRTH AND BOROUGH OF RESIDENCE
NEW YORK CITY, 1992 - 2000



Despite overall decreases in age-adjusted case rates from 1999 to 2000, increases in non-US-born cases were seen in East Harlem and Washington Heights in Manhattan; Mott Haven in the Bronx; Williamsburg-Greenpoint in Brooklyn; Jamaica West in Queens, and Staten Island.

Five health districts in Brooklyn, the Bronx, and Manhattan had substantial increases in their age-adjusted case rates since 1999: Sunset Park in Brooklyn, Tremont, Westchester, and Fordham-Riverdale in the Bronx, and Kips Bay-Yorkville in Manhattan. In Sunset Park, Tremont, Fordham-Riverdale, and Kips Bay-Yorkville, there were increases both among non-US-born (63.2% increase from 19 in 1999 to 31 in 2000 in Sunset Park, 60.0% increase from 15 in 1999 to 24 in 2000 in Tremont, 19.2% increase from 26 in 1999 to 31 in 2000 in Fordham Riverdale, and a 180.0% increase from 5 in 1999 to 14 in 2000 in Kips Bay-Yorkville) and US-born patients (125.0% increase from 4 in 1999 to 9 in 2000 in Sunset Park, 18.5% increase from 27 in 1999 to 32 in 2000 in Tremont, 25.0% increase from 16 in 1999 to 20 in 2000 in Fordham Riverdale, and a 16.7% increase from 6 in 1999 to 7 in 2000 in Kips Bay-Yorkville). In Westchester, there was an increase only among the non-US-born patients (53.9% increase from 13 in 1999 to 20 in 2000). With the exception of Flushing and Maspeth-Forest Hills, the 2000 age-adjusted case rates decreased in every health district in Queens.

Figure 9 shows the trends for tuberculosis cases by borough and place of birth for alternate years over the past decade. Manhattan, Brooklyn, and the Bronx experienced the largest declines in the number of cases during this period.

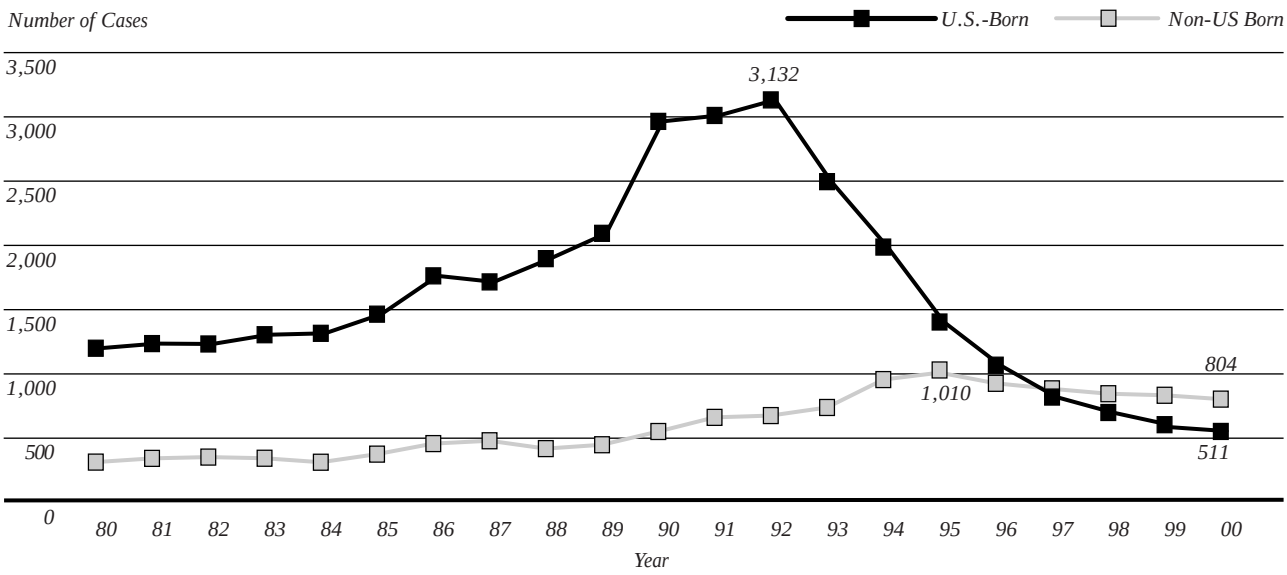
Cases by area of birth, HIV status, sputum smear status, and sputum AFB-smear positive crude case rates for each health district are shown in Table 5. The number of non-US-born cases for every health district in Queens and Staten Island exceeded the number of US-born cases. The percent of HIV infected cases was above the citywide percentage of 18.1% in every borough except Queens and Staten Island; the Bronx had the highest percent of HIV-infected patients at 28.8%. In terms of sputum smear status, Brooklyn had the highest number of AFB-smear positive cases (158) but Queens had the highest crude rate of AFB-smear positive cases (7.1 per 100,000).

Area of Origin

(Table 6, Figure 10)

In 2000, information about country of origin was available

Figure 10
US- and Non-US-Born Tuberculosis Cases*
New York City, 1980 - 2000



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

for 1,315 (98.7%) cases. Between 1999 and 2000, the number of non-US-born cases declined far less sharply than did the number of US-born cases: non-US-born cases dropped 3.6% from 834 to 804, while US-born cases dropped 15.5% from 605 to 511. Among cases with a known place of origin, the proportion of non-US-born cases increased from 58.0% recorded in 1999 to 61.1% in 2000. Figure 10 illustrates trends in numbers of non-US-born cases since 1980: the number of non-US-born tuberculosis cases in 2000 remains more than double the number recorded in 1980.

In 2000, using 1990 Census data, the rate among non-US-born persons in New York City was 38.6 cases per 100,000, compared with 9.7 per 100,000 among US-born persons; however, the number of non-US-born persons in New York City has increased substantially since the 1990 census. Using current estimates of the non-US-born population in New York City lowers the tuberculosis rate among non-US-born persons to 28.7 per 100,000.[2]

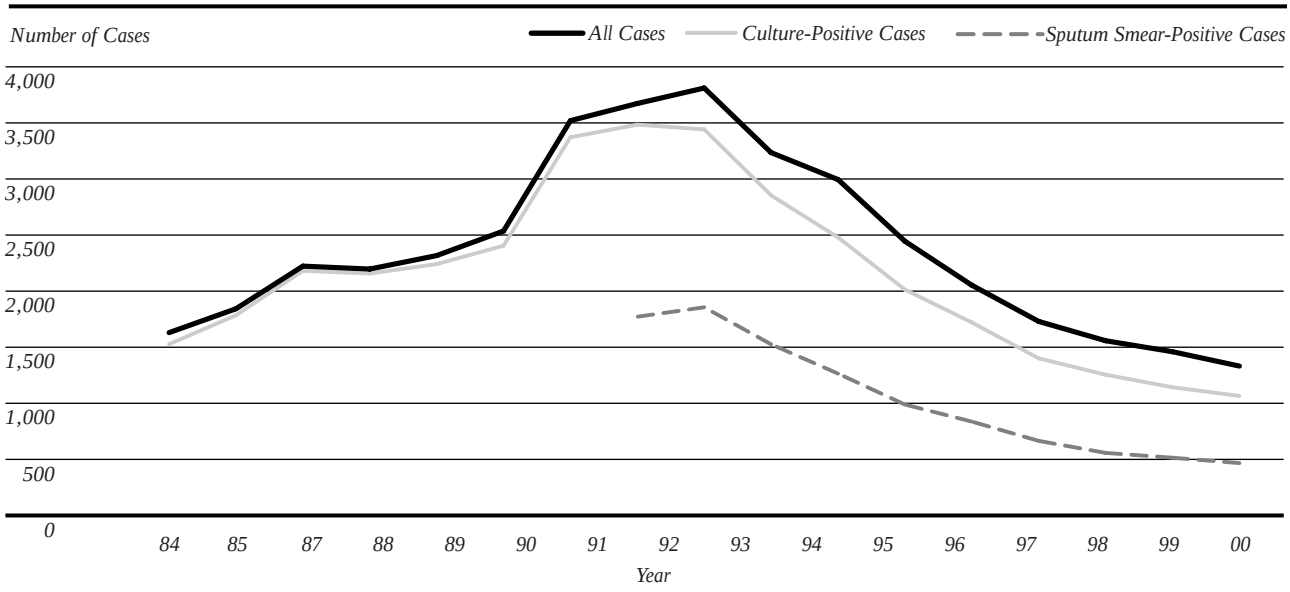
Recent immigration to the US in the past five years is a risk factor for developing active tuberculosis. Date of entry in the US was known for 93.7% (753/804) of the non-US-born cases in 2000. Of the 753, 334 (44.4%) entered the US less than five years before their tuberculosis diagnosis; of these, 40.4% (135/334) had been in the US less than one year before their tuberculosis diagnosis.

A total of 84 countries other than the United States or US territories were reported as places of origin for tuberculosis cases reported in 2000 compared with 86 countries of origin reported for 1999 cases. Central and South America (most prominently, Ecuador and Mexico) accounted for the largest non-US-born group, contributing 200 cases (15.2% of cases with known place of origin). The second largest non-US-born group (161 cases, 12.2% of total cases with known place of origin) came from Far East Asia (most prominently China,[3] and Korea). The third largest non-US-born group (146 cases, 11.1% of total cases with known country of origin) came from the Caribbean area (most prominently, Haiti and Dominican Republic). Aside from the United States, China was the leading country of origin for 2000 cases.

[2] *2000 Census data for New York City residents by country of origin was not available at the time of this report. Estimates provided by New York City, Department of City Planning.*

[3] *Includes Hong Kong and Taiwan*

FIGURE 11
TRENDS IN CULTURE-POSITIVE AND SPUTUM SMEAR-POSITIVE TUBERCULOSIS CASES
NEW YORK CITY, 1984 - 2000*



** Data on Smear-Positive Pulmonary cases not available before 1991.*

The age distribution of the 804 non-US-born cases resembled that seen among US-born cases: 692 (86.1%) of non-US-born cases were younger than 65 years and 112 (13.9%) were 65 years and older, compared with 414 (81.0%) US-born cases younger than 65 years and 97 (19.0%) 65 and older. As in 1999, of non-US-born cases, the largest proportion was in the group aged 25 through 34 years (23.4%, 188 cases) and of US-born cases the largest proportion was in the group aged 35 through 44 years (23.7%, 121 cases).

The total number of 2000 US-born cases includes 57 cases from Puerto Rico, which contributed 4.3% of total cases with known place of origin; between 1999 and 2000, the number of cases from Puerto Rico decreased by 13.6%, from 66 recorded in 1999.

Site of Disease, Bacteriology and Pathology *(Table 7, Figure 11)*

Site of Disease

In 2000, pulmonary tuberculosis was the primary site of disease for 993 (74.5%) cases. An additional 75 cases (5.6%) 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 (10.0%), followed by pleural disease (4.1%). Of all cases reported in 2000, 114 (8.6%) had both pulmonary and extrapulmonary disease. Of 1,068 cases with any pulmonary disease, 519 (48.6%) had a positive smear for acid-fast bacilli (AFB) from either sputum or another respiratory specimen.

Bacteriology

Of the 1,332 tuberculosis cases verified in 2000, 266 (20.0%) 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 11 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 increased from 9.7% in 1992 to at least 19.0% since 1997. 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 11 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 467 such cases that occurred in New York City in 2000 yielded an incidence of 5.8 per 100,000. According to the World Health Organization, India and China have the greatest tuberculosis burden in the world with rates of sputum AFB smear-positive tuberculosis in 1999 estimated to be 82.8 and 46.1 per 100,000 population respectively. However, substantial under-reporting of such cases resulted in lower reported rates of 35.0 and 16.8 per 1000,000 respectively. The reported rates of sputum AFB smear-positive tuberculosis per 100,000 population in some other countries contributing large numbers of non-US-born tuberculosis cases to New York City are: 84.4 in Haiti, 34.6 in Ecuador, and 41.7 in the Dominican Republic. However, the extent of under-reporting in these countries is estimated to range from 29.7% in the Dominican Republic to 55.1% in Ecuador. [4]

Pathology

Of the 1,332 tuberculosis cases recorded in New York City in 2000, 373 are recorded in the Department of Health tuberculosis registry as having had tissue biopsies. Most of these

[4] *World Health Organization. Global Tuberculosis Control. WHO Report 2001. Geneva, Switzerland, WHO/CDS/CPC/TB/2001.287.*

cases (74.3%, [277/373]) had bacteriologic findings (from either the specimen which was biopsied or another specimen) that suggested or confirmed tuberculosis; 20.6% (77/373) 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).

Drug Resistance

(Table 8, Figures 12a-12b)

In accordance with guidelines issued by the Centers for Disease Control and Prevention and the American Thoracic Society, the New York City Department of Health recommends that susceptibility testing be performed on the initial isolates of *Mycobacterium tuberculosis* obtained from every culture-positive patient. Susceptibility results must be reported to the New York City Department of Health as per the New York City Health Code Sections 11.03(b) and 11.05(c). New York State mandates that isolates with any resistance to first-line anti-tuberculosis drugs[5] should have susceptibility testing to second-line drugs[6].

During 2000, 1,066 (80.0%) of the city's tuberculosis cases had cultures positive for *Mycobacterium tuberculosis*. Of these, 1,036 (97.2%) had drug susceptibility test results for first-line anti-tuberculosis drugs reported and 906 (87.5%) were susceptible to all first-line anti-tuberculosis drugs.

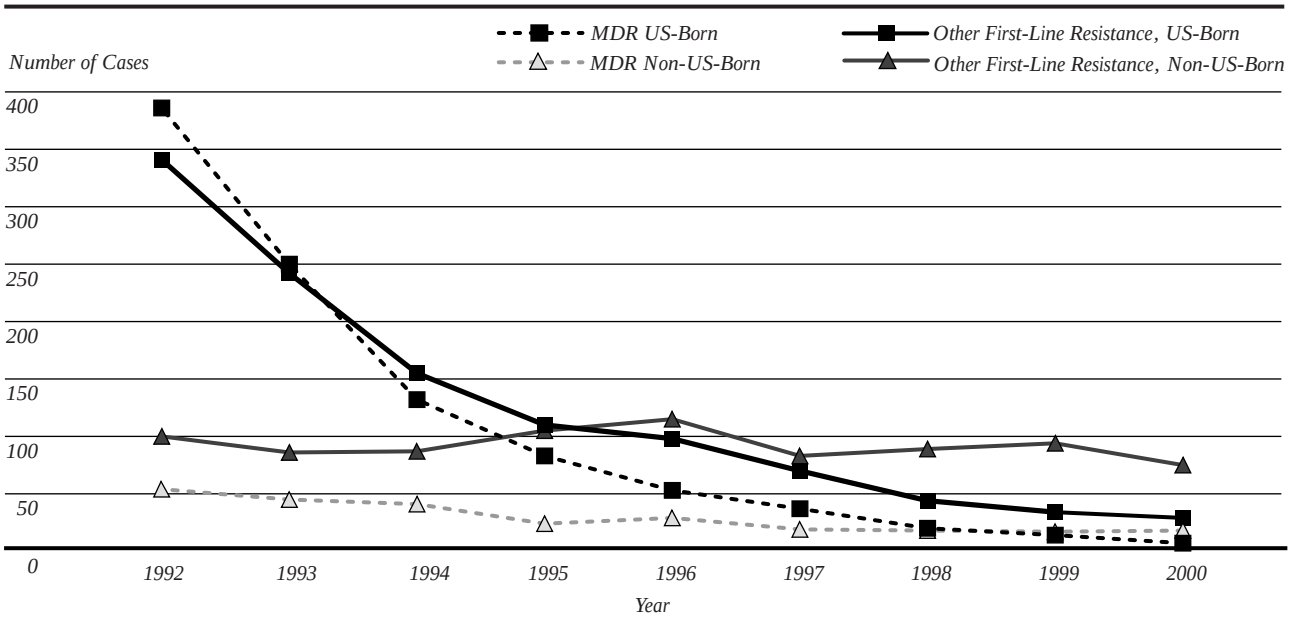
Of 130 cases in 2000 with isolates resistant to any first-line drugs, 103 (79.2%) had susceptibility results available for second-line drugs. Among those missing susceptibility results for second-line drugs, however, were 6 cases with isolates resistant only to pyrazinamide (PZA); mono-resistance to PZA is a marker for *Mycobacterium bovis*, and second-line testing is not routinely done for such cases.

Twenty-five cases (2.4%) had multidrug-resistant strains (i.e., they had isolates resistant to at least isoniazid and rifampin, [MDRTB]). This is a 19.4% decrease from the 31 cases in 1999 and a 94.3% decrease from the 441 MDRTB cases in 1992, when reporting of susceptibility results was first mandated. Of the 25 cases with MDRTB, 5 (20.0%)

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

[6] *Second-line anti-tuberculosis drugs include capreomycin, ciprofloxacin, clofazimine, cycloserine, ethionamide, kanamycin, amikacin, levofloxacin, ofloxacin, para-aminosalicylic acid, rifabutin, and sparfloxacin.*

Figure 12a
First-Line Drug Resistance by Area of Birth
New York City, 1992 - 2000



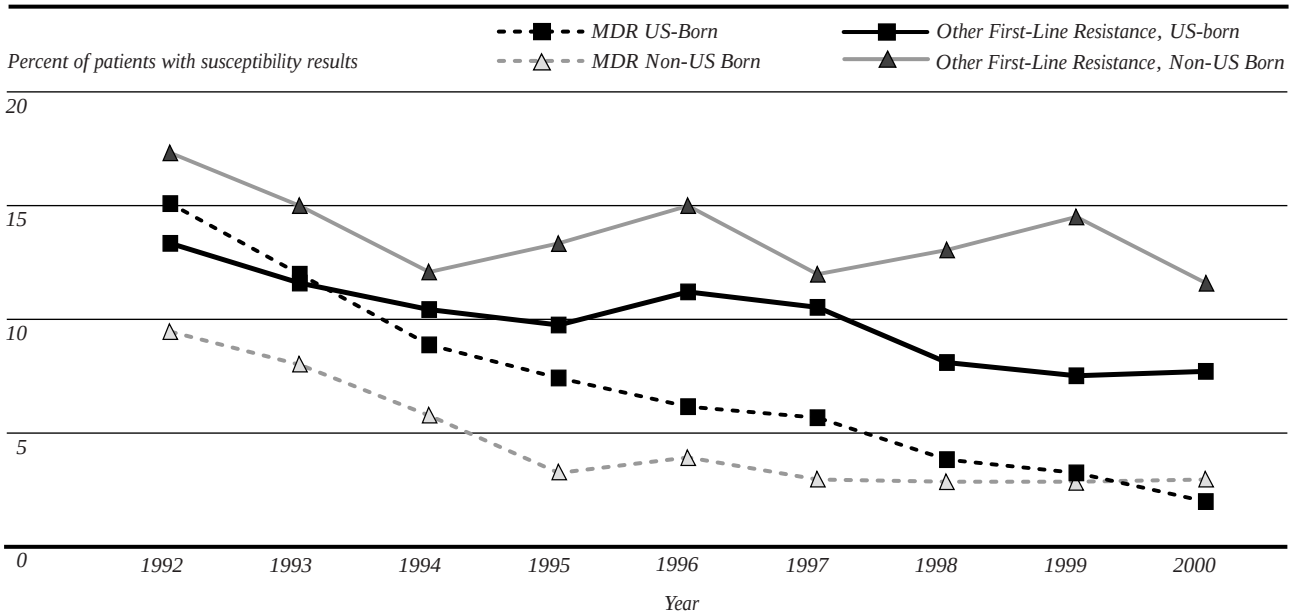
had isolates which were resistant to only isoniazid and rifampin (an increase from the 6.5% seen in 1999); 2 (8.0%) had isolates resistant to isoniazid, rifampin and one other first-line drug (compared with 12.9% in 1999); 9 (36.0%) had isolates resistant to isoniazid, rifampin and two other first-line drugs (an increase from the 32.3% seen in 1999); and 1 (4.0%) had isolates resistant to isoniazid, rifampin and three other first-line drugs (vs. 16.1% in 1999). Eight of the remaining 25 MDRTB patients (32.0%) had isolates resistant to most first-line drugs plus kanamycin (compared with 32.3% in 1999).

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 1,332 tuberculosis cases reported in 2000, 62 (4.7%) 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 2000. Six (24.0%) patients with MDRTB were documented to have a prior history of tuberculosis compared with 36 (2.8%) of patients with non-MDRTB. Some tuberculosis patients who 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 2000, similar proportions of MDRTB and non-MDRTB cases were known to have worked in the health care field; 4.0% (1/25) of MDRTB cases and 2.9% (38/1,307) of non-MDRTB cases were health care workers. In 2000, for the first time since 1991, when data started to be systematically collected on drug susceptibilities, a smaller proportion of cases with MDRTB were HIV-infected (8.0%, 2/25) compared with non-MDRTB cases (18.3%, 239/1,307).

Seventy-three (7.0%) of the 1,036 patients with first-line drug susceptibility test results had strains of *Mycobacterium tuberculosis* resistant to a single first-line drug; of these, 36 (49.3%) had isolates resistant to isoniazid alone, 24 (32.9%) to streptomycin alone, and 7 (9.6%) to rifampin alone. Thirty-two 2000 cases (3.1% of all those with susceptibility results available) had isolates

FIGURE 12B
FIRST-LINE DRUG RESISTANCE BY AREA OF BIRTH
NEW YORK CITY, 1992 - 2000



resistant to two or more first-line drugs but were not classified as MDRTB; 31 of these (96.9%) were resistant to at least isoniazid and 27 (84.4%) were resistant to at least isoniazid and streptomycin.

Drug resistance by area 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 and Puerto Rico (54.8% in other countries, 32.3% in the US and 12.9% in Puerto Rico). This trend continued in 2000 with 18 (72.0%) MDRTB cases born outside the United States, 6 (24.0%) born in the United States and 1 (4.0%) born in Puerto Rico. Among those with first-line susceptibility results, 2.8% (18/643) of non-US-born cases had MDRTB and 1.8% (7/379) of cases born in the US and Puerto Rico had MDRTB. Among US-born cases with first-line susceptibility results, 5.0% (19/379) had organisms resistant to a single drug, compared with 8.2% (53/643) of non-US-born cases. The proportion of non-US-born tuberculosis cases with organisms resistant to isoniazid, either alone or in combination with other drugs, but still sensitive to rifampin was 7.3% (47/643), similar to the 5.3% (20/379) seen among US-born cases. Non-US-born cases were equally likely as US-born cases to have isolates resistant to two or more anti-tuberculosis drugs but not classifiable as multidrug-resistant (3.4% [22/643] of non-US-born cases vs. 2.6% [10/379] of US-born cases). Overall, 90.5% (343/379) of US-born patients and 85.5% (550/643) of non-US-born patients were sensitive to all first line anti-tuberculosis drugs.

Figures 12a and 12b show the trends in MDRTB and other first line drug resistance (ODRTB) by area of birth since the height of the epidemic in 1992. The number of MDRTB US-born cases and MDRTB non-US-born cases decreased steadily from 1992 to 2000 (386 in 1992 to 7 in 2000 and 54 in 1992 to 18 in 2000 respectively), though the decline was greater among MDRTB US-born cases. Similarly, ODRTB cases decreased to a greater extent among US-born cases (341 in 1992 to 29 in 2000) than among non-US-born cases (100 in 1992 to 75 in 2000); non-US-born ODRTB cases actually peaked in 1996 at 115 cases. Among the US-born, ODRTB cases surpassed MDRTB cases in 1994 while non-US-born ODRTB cases have exceeded non-US-born MDRTB cases since 1992 and in 1996 exceeded the other groupings.

When examined by percent of patients with available susceptibility testing over the past eight years, non-US-born ODRTB cases have consistently comprised a larger percentage (17.6% in 1992 and 11.7% in 2000) compared to US-born ODRTB cases (13.5% in 1992 and 7.7% in 2000), US-born MDRTB cases (15.3% in 1992 and 1.8% in 2000), and non-US-born MDRTB cases (9.5% in 1992 to 2.8% in 2000).

Drug resistance by age

Of 177 patients aged 65 and older with first-line susceptibility results, 2 (1.1%) had multidrug-resistant strains of *Mycobacterium tuberculosis* and an additional 10 (5.6%) had strains resistant to isoniazid but susceptible to rifampin. In populations where more than 3% of tuberculosis patients have isolates resistant to isoniazid, alone or in combination with other drugs, the Centers for Disease Control and Prevention recommend that treatment for tuberculosis be initiated with four anti-tuberculosis drugs (isoniazid, rifampin, ethambutol, and pyrazinamide) until susceptibility results are available, in order to prevent development of multidrug-resistance in strains which are at first resistant to isoniazid but susceptible to rifampin. Medical practitioners sometimes assume that elderly patients do not require initial therapy with four anti-tuberculosis drugs. In New York City, unless susceptibility results are known for a given patient from the outset of treatment, all patients should initially be started on four drugs, regardless of age.

Sociomedical Factors

(Table 9)

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 five 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 2000, no more than 5.5% of patients were missing information about any one social variable. Among those with available information, 3.9% (49/1,272) had used illegal injectable drugs, 8.9% (113/1,269) had used illegal non-injectable drugs, and 9.6% (122/1,273) had abused alcohol in the 12 months prior to treatment for tuberculosis. These proportions are similar or slightly lower than those recorded in 1999, when 3.3% of tuberculosis patients had used illegal injectable drugs, 8.8% used illegal non-injectable drugs, and 13.1% abused alcohol in the 12 months prior to treatment.

All 2000 cases had information available on incarceration: 1.7% (23/1,332) had been incarcerated at the time of diagnosis, compared with 3.1% (45/1,460) in 1999. Of the 1,257 cases with information available on occupation in 2000 (94.5% of total), 40 (3.2%) had worked in the health care field or as correctional employees, compared with 50 of 1,389 cases (3.6%) with this information recorded in 1999. All 2000 cases had information available on homelessness, and 72 (5.4%) had been homeless at diagnosis or at some point during their treatment; of the 1,460 cases recorded in 1999, 77 (5.3%) had been homeless at diagnosis or at some point during their treatment.

Mortality

(Table 10)

Mortality figures presented in this year's report are based on statistics issued by the Bureau of Disease Intervention Services, Office of Vital Statistics of the New York City Department of Health. In 2000, there were 43 deaths in New York City with tuberculosis listed as the underlying cause of death on the death certificate. The crude tuberculosis mortality rate for 2000 was 0.5 per 100,000. There were an additional 39 deaths for which tuberculosis was listed as a secondary cause. Of these deaths, 19 (48.7%) listed acquired immune deficiency syndrome (AIDS) or HIV infection as the underlying cause of death.

Tuberculosis and Human Immunodeficiency Virus (HIV) Infection

(Tables 11-12)

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

Table 11 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. HIV infection has been identified as one of the strongest risk factors for developing tuberculosis disease. Worldwide, tuberculosis is the most common opportunistic infection in people with HIV infection.

In 2000, 66.1% (881/1,332) of New York City tuberculosis cases had a known and reported HIV status, a decrease from 72.7% (1,061/1,460) in 1999. Females were less likely to have a known HIV status (62.7% of females compared to 68.4% of males). HIV status was more likely to be known for US-born cases than for non-US-born cases: 70.5% (360/511) of US-born cases had a known HIV status vs. 64.1% (515/804) of non-US-born cases. As the HIV epidemic makes inroads into regions outside the United States that are increasingly represented among countries of origin of New York City cases, it is important that efforts be made to increase the proportion of non-US-born cases who are tested and to report these test results to the Department of Health (DOH); even though HIV seropositivity precludes legal immigration to the United States, undocumented immigrants, individuals with student and work visas, and visitors are not likely to have been tested.

In 2000, for the third consecutive year, the proportion of tuberculosis cases who were recorded as HIV infected was less than 25% of total cases: of 2000 tuberculosis cases, 18.1% (241) were reported as HIV positive and 48.0% (640) were reported as HIV negative. In 1999, 22.0% (321) were reported as HIV positive and 50.7%

(740) were reported as HIV negative. Among the 881 cases in 2000 with a known HIV status, 27.4% were HIV positive and 72.6% were HIV negative. In 2000, among male tuberculosis cases, the highest proportion of HIV-infected cases was recorded in the group aged 45 through 54 years. Among female tuberculosis cases, the highest proportion of HIV-infected cases was seen in the group aged 35 through 44 years.

Table 12 presents the distribution of HIV infection by sex from 1992 through 2000. 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 US-born cases are considered, the proportion of cases recorded as HIV positive decreased from 35.7% (216/605) in 1999 to 31.1% (159/511) in 2000. Non-US-born patients are much less likely to be HIV positive than are US-born cases; the proportion of non-US-born cases who were HIV positive decreased from 12.2% (102/834) in 1999 to 9.6% (77/804) in 2000.

In past years, HIV-infected cases were more likely to have multidrug-resistant tuberculosis (MDRTB) than were HIV negative cases. In 2000, however, HIV-infected cases were less likely to have MDRTB; 2 of the 241 cases (0.8%) who were known to be HIV infected had MDRTB, compared with 23 of the 1,091 cases (2.1%) with negative or unknown HIV status.

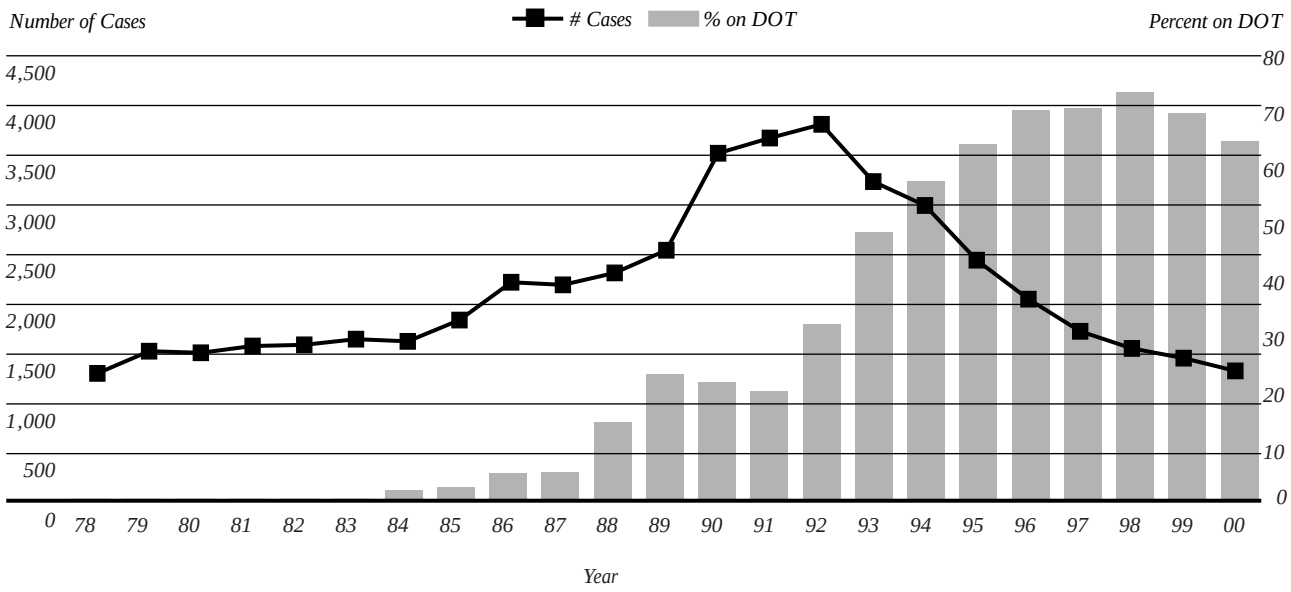
Treatment of tuberculosis can be complicated by the use of two classes of antiretroviral agents, protease inhibitors (PIs) and non-nucleoside reverse transcriptase inhibitors (NNRTIs). The use of a rifamycin (e.g., rifampin or rifabutin), an important component of a standard short course anti-tuberculosis 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 241 HIV-positive cases, 119 (49.4%) were on rifabutin at some time in their tuberculosis treatment.

Directly Observed Therapy (DOT) and Completion of Therapy

(Table 13, Figures 13-15)

Figure 13 illustrates the proportion of tuberculosis

FIGURE 13
TUBERCULOSIS CASES ON DIRECTLY OBSERVED THERAPY (DOT)*
NEW YORK CITY, 1978 - 2000



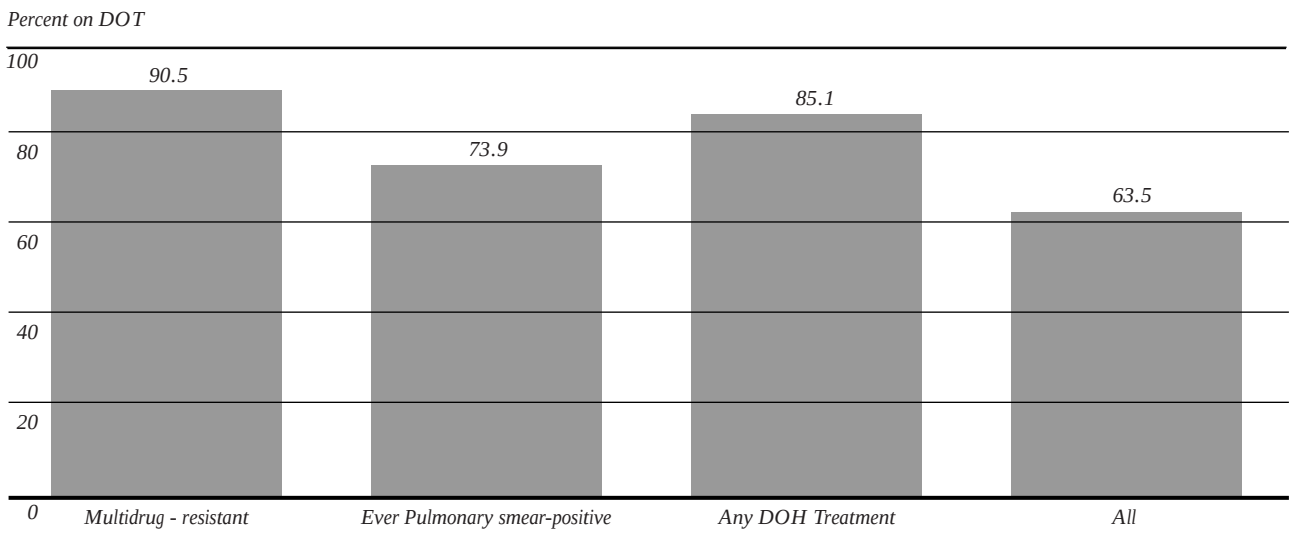
* *Of those who were diagnosed while alive and received some treatment on an outpatient basis.*

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 63.5% in 2000). 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 and 2000, the proportion of eligible patients on DOT decreased to 68.5% (881 of 1,287 eligible patients) and 63.5% (739 of 1,163 eligible patients) respectively. The proportion of patients on DOT is much higher among those who receive treatment in Department of Health (DOH) chest centers, where DOT is considered the standard of care: of the 666 eligible patients confirmed in 2000 who received some or all of their treatment as of March 2001 in DOH chest centers, 85.1% (567) were on DOT for some or all of their therapy; of the 497 eligible patients confirmed in 2000 who received none of their treatment in DOH chest centers, 34.6% (172) were on DOT for some or all of their therapy (Figure 14).

Patients with infectious and/or multidrug-resistant tuberculosis (MDRTB) are an especially high priority for DOT. Of patients confirmed in 2000, 73.9% (331/448) of eligible patients with pulmonary tuberculosis and acid-fast bacilli (AFB)-positive respiratory smears received DOT compared with 57.1% (408/715) of those without AFB-positive respiratory smears; 90.5% (19/21) of MDRTB patients received DOT compared with 63.0% (720/1,142) of non-MDRTB patients. In 2000, 65.7% of eligible US-born patients (281/428) received DOT compared with 62.5% of eligible non-US-born patients (454/726).

Figure 15 shows the distribution of patients on DOT as of December 31, 2000, 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 190 (33.5%) of the 568 cases who were receiv-

FIGURE 14
PERCENT ELIGIBLE* TUBERCULOSIS PATIENTS ON DOT**
NEW YORK CITY, 2000



* *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.*

ing DOT at that point. DOH Chest Centers and Field Services provided DOT to 184 (32.4%) cases and 161 (28.3%) cases respectively. Other DOT programs, including those for incarcerated, detained, or homeless patients provided DOT to the remaining 33 (5.8%) of patients on DOT.

Completion of Therapy

According to guidelines issued by the Centers for Disease Control and Prevention (CDC) 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 2000 who were started on anti-tuberculosis therapy and survived for at least two weeks following the start of therapy, 84.1% (1,024/1,218) 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 1999 is illustrated in Table 13. Completion data are presented for 1999 instead of 2000 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 indexes since 1998 were calculated by a more rigorous formula than was used in the Program's previous Information Summaries. This formula reflects the CDC national objective to complete treatment for tuberculosis within 365 days. 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 1999 was 87.6%.

For comparative purposes, the completion index was also calculated with the formula used prior to 1998. According to this formula, the cohort of patients diagnosed in 1999 who remained alive during treatment and did not move out of New York City, consisted of 1,261 patients. Of these, 1,153 (91.4%) 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.

PREVENTION OF FUTURE TUBERCULOSIS DISEASE *(Table 14)*

There are several categories of tuberculosis-infected persons who are at high risk for progression to active disease: contacts to infectious 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.

Treatment of Latent Tuberculosis Infection

In June 2000, the Centers for Disease Control and Prevention (CDC) and the American Thoracic Society jointly published revised guidelines *(MMWR Recommendations and Reports—Targeted Tuberculin Testing and Treatment of Latent Tuberculosis Infection)* for targeted testing and treatment of latent TB infection. The Tuberculosis Control Program has adopted these guidelines with minor changes[7] and adjusted programmatic practices

[7] *City Health Information:* Testing and Treatment for Latent Tuberculosis Infection, *Vol. 18, No. 3, October 2000*.

and recommendations accordingly. Although the new guidelines include changes in treatment regimen options, treatment duration, and selection of individuals for whom treatment is indicated, the objectives concerning treatment completion remain unchanged. 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 18 years and older[8] 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 1999, as not all contacts to cases confirmed in 2000 have yet been identified and evaluated. Also, all contacts are considered, whether they received treatment from Department of Health (DOH) chest centers or elsewhere.

Of 3,243 contacts to sputum acid-fast bacilli (AFB) smear-positive cases with pulmonary disease in 1999, 80.5% (2,609) were examined, compared with 91.7% (3,553/3,873) of contacts identified to 1998 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 1999, the completion index for contacts receiving treatment for latent infection is calculated as [total completed/total started]. In 1998 the completion index for contacts receiving treatment for latent infection was 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 1999, of 807 infected contacts who started on treatment for latent infection, 52.7% (425) completed at least six months of treatment for latent infection; the 1998 completion index for treatment of latent infection among infected contacts, using the new formula adopted in 1999, was 51.3% (782/1,523).

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 CDC objectives on treatment for latent infection concern program-supported treatment services, which are offered in DOH chest centers: these objectives apply to all persons, contacts and others, who are evaluated for treatment for latent infection in DOH chest centers. During 1999, of the 11,864 individuals who were known to the DOH to have started treatment for latent infection, 5,580 completed therapy, for an overall completion index of 47.0%; the 1998 overall completion index for treatment of latent infection, using the 1999 formula, was 54.4%, as of the 11,830 individuals who started treatment for latent infection in that year, 6,434 completed therapy. For comparison, in DOH chest centers in 1999, of the 8,622 individuals who started treatment for latent infection, 4,358 completed therapy, for a completion index of 50.5%; the 1998 completion index for treatment for latent infection at DOH chest centers was 56.1%, as of the 8,384 individuals who started treatment for latent infection in that year, 4,701 completed therapy. Efforts to ensure completion of treatment for latent infection in DOH chest centers vary in intensity depending on the patient's risk of developing active disease. Therefore, completion rates for patients treated at DOH chest centers 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 five years) had a 1999 completion index of 53.0%. 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

[8] *Investigations are also conducted to find contacts to children younger than 18 years with tuberculosis, 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.*

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.

Contact Investigations

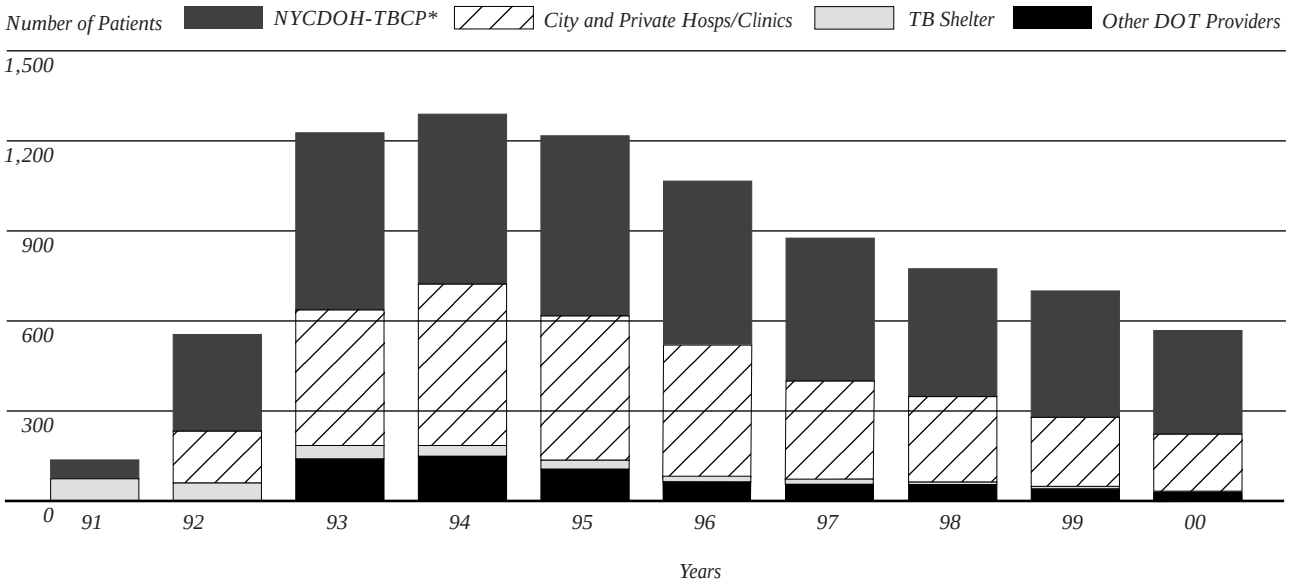
An Expanded Contact Investigation (ECI) Unit was created in October 1995 within the Tuberculosis Control Program to allow rapid evaluation of possible transmission of tuberculosis by infectious patients in congregate settings (e.g., within schools or other institutions, or within work sites). When indicated, mass skin testing and effective education about tuberculosis are provided. In 2000, 13 epidemiologic investigations were conducted as a result of exposures to persons with infectious tuberculosis in congregate settings: 8 were workplace exposures, 4 were in schools, and 1 was an evaluation of a cluster of tuberculosis cases in a single room occupancy (SRO) or cubicle hotel.

In all 13 of the contact investigations, the person with infectious tuberculosis was older than 12 years and had pulmonary disease. In 9 (69.2%) of these investigations, the index case was both smear-positive for acid-fast bacilli (AFB) and culture-positive for *Mycobacterium tuberculosis*; 5 (38.5%) 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 10 (76.9%) of these investigations; possible in 2 (15.4%); and unable to be determined in 1 (7.7%). The total number of contacts tested in the 13 completed investigations was 327 close contacts and 190 casual contacts; 110 (21.3%) of those tested were found to be infected and were referred for medical evaluation. In addition, 365 persons with no known exposure to the index case requested testing; 56 (15.3%) of these were infected and were referred for medical evaluation.

In addition to the 13 investigations that were completed, contacts in 16 additional settings were notified of an

FIGURE 15
TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY AS OF DECEMBER 31 BY TYPE OF PROVIDER
NEW YORK CITY, 1991 - 2000



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

exposure and advised to seek follow-up with a medical provider; an epidemiologic investigation was not conducted at these sites.

Analysis of clustering by patients' address of residence was conducted for cases verified from 1995 through 2000. To date, 5 clusters of 4 or more cases were identified (excluding hospitals and jails); 6 cases (1 cluster) were in an SRO. Epidemiologic investigations at each of these sites found previously unidentified transmission at one location. Intensive efforts to provide treatment for latent tuberculosis infection have been made at these locations including weekly visits, incentives, and transportation to treatment locations.

TABLES

TABLE 1 *(see page 9)*
TUBERCULOSIS INCIDENCE
NEW YORK CITY, 1920 - 2000

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	8,212	120.8			
1950	6,518	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
2000	1,332	16.6	1,066	467 (5.8)	25

* *For "phthisis," or pulmonary cases, 1920-1939; thereafter, all forms of tuberculosis.*
** *Population based on most recent Census data available at time of first publication of citywide case rate.*
\+ *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 2000 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 page 12, 13)*
TUBERCULOSIS INCIDENCE (RATES PER 100,000) BY RACE/ETHNICITY, SEX, AND AGE IN YEARS
NEW YORK CITY, 2000

	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*
Non-Hispanic White, total	1 0.7	1 0.8	0 0.0	0 0.0	3 1.4	14 2.5	18 3.7	21 6.1	15 4.4	51 7.8	124 3.9
Males	0 0.0	1 1.5	0 0.0	0 0.0	2 1.9	11 3.8	14 5.7	12 7.2	8 5.0	30 12.1	78 5.2
Females	1 1.3	0 0.0	0 0.0	0 0.0	1 0.9	3 1.1	4 1.6	9 5.1	7 3.8	21 5.2	46 2.8
Non-Hispanic Black, total	10 6.6	12 8.4	6 4.1	18 12.3	18 11.7	77 23.1	143 52.4	91 45.7	49 34.4	63 39.5	487 26.4
Males	7 9.1	4 5.5	3 4.2	7 9.7	10 14.1	44 29.6	91 77.4	67 80.2	37 64.0	33 60.0	303 36.7
Females	3 4.0	8 11.3	3 4.1	11 14.8	8 9.7	33 17.9	52 33.5	24 20.8	12 14.2	30 28.7	184 18.0
Hispanic, total	17 10.2	6 4.0	9 6.2	24 16.5	30 18.0	90 26.0	77 29.5	53 30.3	32 26.5	31 28.5	369 20.7
Males	9 10.6	3 4.0	2 2.7	14 18.8	20 23.9	53 31.7	49 40.7	35 44.1	19 36.6	9 22.8	213 25.1
Females	8 9.8	3 4.1	7 9.8	10 14.0	10 12.0	37 20.7	28 20.0	18 18.9	13 18.9	22 31.8	156 16.7
Asian, total	3 7.9	3 9.2	6 18.1	8 21.6	27 61.5	80 66.6	71 74.5	49 86.9	38 100.4	67 195.5	352 66.6
Males	2 10.1	1 5.9	1 5.9	5 26.3	17 78.0	45 73.3	42 85.2	32 110.4	25 136.6	45 291.8	215 80.3
Females	1 5.5	2 12.7	5 30.8	3 16.5	10 45.2	35 59.6	29 63.1	17 62.0	13 66.6	22 116.7	137 52.5
TOTAL	31 6.1	22 4.8	21 4.7	50 10.6	78 13.5	261 19.1	309 27.7	214 27.7	134 20.8	212 22.2	1,332 **16.6
Males	18 6.9	9 3.9	6 2.6	26 11.0	49 17.5	153 23.0	196 36.8	146 40.8	89 30.9	117 32.8	809 23.5
Females	13 5.2	13 5.8	15 6.7	24 10.3	29 9.8	108 15.3	113 19.3	68 16.3	45 12.6	95 15.9	523 13.5

* *Except where noted, rates are basd on 1990 census data.*
** *Rate based on 2000 census data.*

TABLE 3 *(see page 13)*
TUBERCULOSIS CASES BY RACE/ETHNICITY AND AGE
NEW YORK CITY, 1990 - 2000

Year
N
*Rate (per 100,000)**

Age Group & Race/Ethnicity	*1990***	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*
< 20 years, Total	211	220	193	192	225	206	157	134	122	102	124
	11.1	11.7	10.2	10.2	11.9	10.9	8.3	7.1	6.5	5.4	6.6
Non-Hispanic White	11	12	8	12	11	10	3	4	3	6	2
	2.0	2.2	1.4	2.2	2.0	1.8	0.5	0.7	0.5	1.1	0.4
Non-Hispanic Black	114	117	103	103	102	79	61	55	43	34	46
	19.4	19.9	17.6	17.7	17.4	13.5	10.4	9.4	7.3	5.8	7.8
Hispanic	70	74	73	63	79	88	72	42	48	39	56
	11.5	12.2	12.0	10.4	13.0	14.5	11.9	6.9	7.9	6.4	9.2
Asian/Pacific Islander	16	17	9	14	33	29	21	33	28	23	20
	11.3	12.1	6.4	9.9	23.4	20.6	14.9	23.4	19.9	16.3	14.2
20-54 years, Total	2,684	2,843	2,948	2,373	2,146	1,716	1,429	1,153	1,024	987	862
	70.0	74.1	76.8	61.9	55.9	44.7	37.2	30.1	26.7	25.7	22.5
Non-Hispanic White	227	269	269	225	196	147	100	89	71	84	56
	14.1	16.7	16.7	13.9	12.1	9.1	6.2	5.5	4.4	5.2	3.5
Non-Hispanic Black	1,642	1,670	1,680	1,321	1,153	829	663	506	438	408	329
	171.4	174.3	175.3	137.9	120.3	86.5	69.2	52.8	45.7	42.6	34.3
Hispanic	714	751	821	671	577	512	454	361	306	279	250
	75.3	79.3	86.6	70.8	60.9	54.0	47.9	38.1	32.3	29.4	26.4
Asian/Pacific Islander	101	153	178	156	220	228	212	197	209	216	227
	32.0	48.5	56.4	49.4	69.7	72.2	67.1	62.4	66.2	68.4	71.9
55+ years, Total	623	610	670	670	624	523	467	443	412	371	346
	39.0	38.2	41.9	41.9	39.1	32.7	29.2	27.7	25.8	23.2	21.7
Non-Hispanic White	160	139	159	153	142	129	117	91	87	79	66
	16.1	14.0	16.0	15.4	14.3	13.0	11.8	9.1	8.7	7.9	6.6
Non-Hispanic Black	302	285	292	279	249	193	170	160	160	111	112
	100.0	94.4	96.7	92.1	82.5	63.9	56.3	53.0	53.0	36.8	37.1
Hispanic	118	107	134	130	126	98	77	80	76	68	63
	51.5	46.7	58.5	56.7	55.0	42.7	33.6	34.9	33.2	29.7	27.5
Asian/Pacific Islander	43	79	85	108	107	103	103	112	89	113	105
	59.6	109.6	117.9	149.8	148.4	142.8	142.8	155.3	123.4	156.7	145.6

* *Rates are based on 1990 census data.*
** *Numbers by race and age for 1990 do not include 2 Native American cases in the 20 - 54 age group.*

TABLE 4 *(see page 16)*
CRUDE AND AGE-ADJUSTED TUBERCULOSIS RATES
NEW YORK CITY, 1992 - 2000

Health District	*Cases*	*Rates per 100,000 population*								
		2000 Crude+	*2000 Age-Adjusted**	*1999 Age-Adjusted**	*1998 Age-Adjusted**	*1997 Age-Adjusted**	*1996 Age-Adjusted**	*1995 Age-Adjusted**	*1994 Age-Adjusted**	*1993 Age-Adjusted**	*1992 Age-Adjusted**
Total Manhattan	**276**	**18.6**	**17.7**	**20.8**	**22.6**	**28.2**	**38.9**	**39.7**	**51.6**	**58.0**	**79.7**
Central Harlem	43	37.2	39.0	43.6	63.7	61.6	113.2	115.3	121.6	181.7	240.2
East Harlem	26	20.4	20.7	21.7	28.3	35.2	45.4	60.3	71.5	73.1	95.8
Kips Bay-Yorkville	21	8.9	7.2	3.5	11.1	10.3	9.3	10.9	14.8	14.4	19.1
Lower East Side	64	26.7	25.1	32.1	30.4	40.0	45.7	51.3	74.8	69.5	101.5
Lower West Side	43	14.6	13.8	15.1	15.0	22.7	33.3	29.9	45.9	44.8	77.9
Riverside	25	12.0	11.2	17.1	10.5	21.4	21.8	32.0	41.1	59.0	72.1
Washington Heights	54	20.3	20.7	25.5	31.0	31.7	51.4	36.6	49.1	52.9	60.9
Total Bronx	**215**	**17.9**	**21.5**	**20.2**	**25.5**	**28.9**	**31.2**	**38.3**	**50.4**	**57.5**	**69.2**
Fordham-Riverdale	53	21.6	22.8	18.8	28.2	18.1	29.0	24.5	34.6	27.5	37.8
Morrisania	28	19.3	24.3	28.9	41.9	47.4	35.7	75.4	74.4	109.3	96.5
Mott Haven	20	15.4	18.1	26.2	33.9	47.7	61.9	61.3	87.7	107.8	168.2
Pelham Bay	21	9.6	8.7	9.6	12.3	13.1	8.1	13.3	21.1	20.1	20.3
Tremont	57	29.9	38.2	30.0	33.4	45.2	47.6	56.7	88.5	76.0	105.8
Westchester	36	13.1	13.3	10.9	13.5	13.9	16.7	26.0	19.8	34.0	35.8
Total Brooklyn	**446**	**19.4**	**22.0**	**23.5**	**24.1**	**28.0**	**30.5**	**42.3**	**49.7**	**54.7**	**58.0**
Bay Ridge	39	16.4	16.6	18.4	15.3	13.5	12.7	20.2	18.6	20.1	15.9
Bedford	69	29.6	31.7	34.0	41.6	48.2	54.8	68.4	82.3	89.1	107.5
Brownsville	49	17.6	19.4	22.3	28.0	32.0	33.4	51.8	58.9	54.2	71.6
Bushwick	37	20.3	22.1	24.6	26.8	29.1	45.8	61.1	72.8	83.3	83.1
Flatbush	106	21.1	21.4	20.8	20.6	23.0	22.5	32.1	36.0	39.2	36.6
Fort Greene	39	26.0	27.0	25.6	33.3	32.6	37.5	57.9	88.5	110.3	120.1
Gravesend	31	10.9	10.4	16.9	14.9	18.5	14.3	20.2	23.6	21.9	20.4
Red Hook-Gowanus	13	12.3	13.5	18.1	14.3	22.1	25.0	25.7	34.3	49.6	48.7
Sunset Park	40	23.5	25.0	15.1	24.7	23.1	24.7	31.1	29.3	29.8	27.7
Williamsburg-Greenpoint	23	14.7	16.6	19.3	13.7	23.1	24.0	30.3	45.6	52.2	59.3
Total Queens	**363**	**18.6**	**19.1**	**21.3**	**20.6**	**20.1**	**23.4**	**27.4**	**29.4**	**27.7**	**29.1**
Astoria-L.I.C.	48	20.3	19.5	32.3	27.5	27.2	24.7	32.8	38.7	29.5	35.3
Corona	105	36.1	35.1	40.4	34.0	29.0	42.6	45.3	39.5	44.5	56.3
Flushing	86	18.8	18.2	16.7	15.1	18.9	16.4	19.9	18.4	17.3	14.6
Jamaica East	45	13.3	13.9	19.3	16.8	18.1	28.3	28.7	35.9	33.7	34.0
Jamaica West	44	12.2	12.4	14.7	18.0	13.9	18.7	23.5	26.2	25.2	21.5
Maspeth-Forest Hills	35	13.0	12.3	11.7	11.7	12.5	12.3	10.6	20.4	18.5	12.3
Staten Island	**32**	**8.4**	**8.9**	**8.9**	**6.6**	**8.7**	**7.7**	**10.4**	**17.7**	**15.3**	**17.8**
TOTAL NYC	**1,332**	**18.2**	**18.2**	**19.9**	**21.3**	**23.6**	**28.0**	**33.4**	**40.9**	**44.2**	**52.0**

+ 2000 crude rates by health district are based on the 1990 Census and 2000 crude rates by borough are based on the 2000 Census

** 1992 - 2000 age-adjusted rates are based on 1990 Census figures for New York City by the method of direct adjustment.*

TABLE 5 *(see page 16)*
TUBERCULOSIS CASES BY AREA OF BIRTH, HIV STATUS, AND SMEAR STATUS
NEW YORK CITY, 2000

Health District	*Country of Birth**				*HIV-Infected Cases***		*Sputum Smear Positive Cases****	*Crude Rate of Sputum Smear Positive Cases per 100,000#*
	US-Born		*Non-US-Born*					
	#	*%*	*#*	*%*	*#*	*%*		
Total Manhattan	**126**	**45.7**	**147**	**53.3**	**65**	**23.6**	**81**	**5.4**
Central Harlem	28	65.1	14	32.6	14	32.6	11	9.5
East Harlem	16	61.5	10	38.5	8	30.8	11	8.6
Kips Bay-Yorkville	7	33.3	14	66.7			6	2.5
Lower East Side	27	42.2	36	56.3	14	21.9	21	8.8
Lower West Side	17	39.5	26	60.5			12	4.1
Riverside	16	64.0	9	36.0	8	32.0	7	3.4
Washington Heights	15	27.8	38	70.4	13	24.1	13	4.9
Total Bronx	**115**	**53.5**	**96**	**44.7**	**62**	**28.8**	**76**	**6.3**
Fordham-Riverdale	20	37.7	31	58.5	17	32.1	22	9.0
Morrisania	21	75.0	7	25.0	11	39.3	9	6.2
Mott Haven	12	60.0	8	40.0	6	30.0	6	4.6
Pelham Bay	15	71.4	6	28.6			8	3.7
Tremont	32	56.1	24	42.1	21	36.8	23	12.1
Westchester	15	41.7	20	55.6			8	2.9
Total Brooklyn	**190**	**42.6**	**248**	**55.6**	**86**	**19.3**	**158**	**6.9**
Bay Ridge	7	17.9	32	82.1			17	7.1
Bedford	41	59.4	27	39.1	20	29.0	22	9.4
Brownsville	35	71.4	12	24.5	7	14.3	22	7.9
Bushwick	20	54.1	17	45.9			15	8.2
Flatbush	33	31.1	70	66.0	24	22.6	32	6.4
Fort Greene	27	69.2	11	28.2	13	33.3	9	6.0
Gravesend	4	12.9	26	83.9			9	3.2
Red Hook-Gowanus	8	61.5	5	38.5	6	38.5	5	4.7
Sunset Park	9	22.5	31	77.5	5	12.5	14	8.2
Williamsburg-Greenpoint	6	26.1	17	73.9			13	8.3
Total Queens	**69**	**19.0**	**292**	**80.4**	**23**	**6.3**	**138**	**7.1**
Astoria-L.I.C.	14	29.2	34	70.8	5	10.4	13	5.5
Corona	6	5.7	97	92.4	5	4.8	33	11.3
Flushing	13	15.1	73	84.9			34	7.4
Jamaica East	13	28.9	32	71.1	7	15.6	16	4.7
Jamaica West	13	29.5	31	70.5	6	13.6	22	6.1
Maspeth-Forest Hills	10	28.6	25	71.4			20	7.4
Staten Island	**11**	**34.4**	**21**	**65.6**			**14**	**3.7**
Total NYC	**511**	**38.4**	**804**	**60.4**	**23**	**1.7**	**467**	**6.4**

** 17 cases had an unknown country of birth*
*** To protect patient confidentiality, we are unable to provide data for some health districts with small numbers of cases.*
****Patients with a sputum smear positive for acid-fast bacilli regardless of culture result and regardless of site of disease.*
 # 2000 crude rates by health district are based on the 1990 Census. Borough rates are based on the 2000 Census.

TABLE 6 *(see page 18)*
TUBERCULOSIS CASES BY AGE AND AREA OF BIRTH
NEW YORK CITY, 2000

	Age Groups										
Area of Birth	*0–4*	*5–9*	*10–14*	*15–19*	*20–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65+*	*Total*
Africa[1]	1	2	1	6	6	17	24	7	3	0	67
Far East Asia[2]	0	1	3	3	11	29	26	24	17	47	161
Canada	0	0	0	0	0	0	0	1	0	0	1
Caribbean[3]	0	0	2	8	6	27	39	28	22	14	146
Central/S Amer[4]	2	3	3	19	26	58	44	17	11	17	200
Europe[5]	0	1	0	0	4	3	9	10	7	17	51
Indo/Pakistan[6]	0	1	2	2	12	42	21	11	11	12	114
Middle East[7]	0	0	0	0	0	0	2	1	1	0	4
Southeast Asia[8]	0	0	0	3	3	12	17	12	8	5	60
Oceania	0	0	0	0	0	0	0	0	0	0	0
TOTAL NON-USA	**3**	**8**	**11**	**41**	**68**	**188**	**182**	**111**	**80**	**112**	**804**
USA*	28	14	10	9	10	63	111	82	41	86	454
PUERTO RICO	0	0	0	0	0	6	10	17	13	11	57
TOTAL USA	**28**	**14**	**10**	**9**	**10**	**69**	**121**	**99**	**54**	**97**	**511**
UNKNOWN	**0**	**0**	**0**	**0**	**0**	**4**	**6**	**4**	**0**	**3**	**17**
TOTAL	31	22	21	50	78	261	309	214	134	212	1,332

** Includes the US Virgin Islands (3)*
[1] Guinea (12), Liberia (8), Ethiopia (6), Ghana (6), Senegal (6), Nigeria (5), Egypt (4), Other (20)
[2] China (114), Korea (30), Hong Kong (13), Other (4)
[3] Haiti (61), Dominican Republic (54), Trinidad & Tobago (11), Jamaica (10), Cuba (6), Other (4)
[4] Ecuador (57), Mexico (44), Honduras (20), Peru (20), Guyana (19), Colombia (16), Guatemala (8), El Salvador (5), Other (11)
[5] Russia (15), Poland (9), Italy (4), Other (17)
[6] India (56), Pakistan (25), Nepal (15), Bangladesh (11), Afghanistan (4), Other (3)
[7] Israel (1), Lebanon (1), Syria (1), Yemen (1)
[8] Philippines (36), Vietnam (11), Other (13)

TABLE 7 *(see page 20)*
TUBERCULOSIS CASES BY PRIMARY SITE OF DISEASE
NEW YORK CITY, 2000

	Number of Cases	*(%)*
Pulmonary	993	(74.5)
Lymphatic	133	(10.0)
Pleural	55	(4.1)
Bone/Joint	43	(3.2)
Miliary	30	(2.3)
Genitourinary	26	(2.0)
Peritoneal	15	(1.1)
Meningeal	11	(0.8)
Other	26	(2.0)
Total	**1,332**	**(100.0)**
Tuberculosis cases by all sites of disease		
Only Pulmonary disease	954	(71.6)
Only extrapulmonary disease	264	(19.8)
Both Pulmonary and Extrapulmonary	114	(8.6)
Total	**1,332**	**(100.0)**

TABLE 8 *(see page 21)*
FIRST-LINE DRUG RESISTANCE BY AREA OF BIRTH
NEW YORK CITY, 2000

	N (%)			
	Total	*US-born**	*Non-US-born*	*Unknown*
Positive culture for *M. tuberculosis*	1,066	396	656	14
Tested for susceptibility to first-line drugs of those with positive cultures (% of those with positive culture for *M. tuberculosis*)	1,036 (97.2)	379 (95.7)	643 (98.0)	14 (100.0)
Susceptibility results (% of those tested)				
Multidrug-resistant (resistant to at least isoniazid & rifampin)	25 (2.4)	7 (1.8)	18 (2.8)	0 (0.0)
Isoniazid-resistant and rifampin-susceptible	67 (6.5)	20 (5.3)	47 (7.3)	0 (0.0)
Resistant to first-line drugs other than isoniazid & rifampin	31 (3.0)	4 (1.1)	26 (4.0)	1 (7.1)
Resistant to rifampin only	7 (0.7)	5 (1.3)	2 (0.3)	0 (0.0)
Susceptible to all first-line drugs	906 (87.5)	343 (90.5)	550 (85.5)	13 (92.9)

** Includes Puerto Rico and Virgin Islands*

TABLE 9 *(see page 23)*
SOCIAL CHARACTERISTICS OF TUBERCULOSIS CASES
NEW YORK CITY, 2000

*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	1,272	(95.5)	49	(3.9)
Non-injection drug use in 12 months before diagnosis	1,269	(95.3)	113	(8.9)
Alcohol abuse in 12 months before diagnosis	1,273	(95.6)	122	(9.6)
Homeless at diagnosis or any time during treatment	1,332	(100.0)	72	(5.4)
Resident of correctional facility at time of diagnosis	1,332	(100.0)	23	(1.7)
Resident of long-term care facility at time of diagnosis	1,332	(100.0)	27	(2.0)
Health care or correctional facility worker in 24 months before diagnosis	1,257	(94.5)	40	(3.2)

** Categories not mutually exclusive*

TABLE 10 *(see page 24)*
DEATHS FROM TUBERCULOSIS: NUMBER AND RATE PER 100,000*
NEW YORK CITY, 1910 - 2000

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
2000	43	0.5

** Rates are based on Census data for each decade. 2000 Census data are used for 2000 rate.*

TABLE 11 *(see page 24)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX AND AGE
NEW YORK CITY, 2000

	N (%)								
	Females			*Males*			*Total*		
Age	*HIV(+)*	*HIV(–)*	*NA**	*HIV(+)*	*HIV(–)*	*NA**	*HIV(+)*	*HIV(–)*	*NA**
0-4	0 (0.0)	7 (53.8)	6 (46.2)	0 (0.0)	9 (50.0)	9 (50.0)	0 (0.0)	16 (51.6)	15 (48.4)
5-9	0 (0.0)	5 (38.5)	8 (61.5)	0 (0.0)	2 (22.2)	7 (77.8)	0 (0.0)	7 (31.8)	15 (68.2)
10-14	0 (0.0)	4 (26.7)	11 (73.3)	0 (0.0	4 (66.7)	2 (33.3)	0 (0.0)	8 (38.1)	13 (61.9)
15-19	1 (4.2)	14 (58.3)	9 (37.5)	1 (3.8)	17 (65.4)	8 (30.8)	2 (4.0)	31 (62.0)	17 (34.0)
20-24	2 (6.9)	14 (48.3)	13 (44.8)	4 (8.2)	35 (71.4)	10 (20.4)	6 (7.7)	49 (62.8)	23 (29.5)
25-34	20 (18.5)	69 (63.9)	19 (17.6)	27 (17.6)	88 (57.5)	38 (24.8)	47 (18.0)	157 (60.2)	57 (21.8)
35-44	30 (26.5)	57 (50.4)	26 (23.0)	64 (32.7)	91 (46.4)	41 (20.9)	94 (30.4)	148 (47.9)	67 (21.7)
45-54	15 (22.1)	31 (45.6)	22 (32.4)	48 (32.9)	57 (39.0)	41 (28.1)	63 (29.4)	88 (41.1)	63 (29.4)
55-64	4 (8.9)	16 (35.6)	25 (55.6)	19 (21.3)	43 (48.3)	27 (30.3)	23 (17.2)	59 (44.0)	52 (38.8)
65+	2 (2.1)	37 (38.9)	56 (58.9)	4 (3.4)	40 (34.2)	73 (62.4)	6 (2.8)	77 (36.3)	129 (60.8)
TOTAL**	**74 (14.1)**	**254 (48.6)**	**195 (37.3)**	**167 (20.6)**	**386 (47.7)**	**256 (31.6)**	**241 (18.1)**	**640 (48.0)**	**451 (33.9)**

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

TABLE 12 *(see page 24)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1992 - 2000

	N (%)					
Year	*Females HIV (+)*		*Males HIV (+)*		*Total HIV (+)*	
1992	297	(25.1)	983	(37.4)	1281	(33.6)
1993	308	(27.5)	760	(35.9)	1068	(33.0)
1994	244	(23.5)	767	(39.2)	1011	(33.8)
1995	226	(25.4)	575	(37.0)	801	(32.8)
1996	204	(26.0)	429	(33.8)	633	(30.8)
1997	147	(21.8)	301	(28.5)	448	(25.9)
1998	108	(18.6)	238	(24.4)	346	(22.2)
1999	102	(18.3)	219	(24.3)	321	(22.0)
2000	74	(14.1)	167	(20.6)	241	(18.1)

TABLE 13 *(see page 25)*
TREATMENT COMPLETION FOR ACTIVE TUBERCULOSIS CASES DIAGNOSED IN 1999
NEW YORK CITY

Outcome	*Number of Cases*	*Percent*
Treatment completed in ≤ 365 days*	1,083	87.6
Treatment completed in >365 days	62	5.0
Still in Treatment	36	2.9
Refused/Stopped Treatment	14	1.1
Lost	31	2.5
Moved**	10	0.8
Total	**1,236+**	**100.0**

* *Currently recommended treatment regimens for most patients can be completed within 365 days.*
** *Patients are categorized as moved only if their transfer to another jurisdiction is confirmed and no further follow-up information is available.*
\+ *Denominator excludes patients found not to have TB; those who died; those who never started anti-tuberculosis therapy; and those for whom more than 365 days of treatment is indicated (those under 21 years of age with bone, miliary, or meningeal TB, and those whose organism was initially resistant to rifampin).*

TABLE 14 *(see page 27)*
EPIDEMIOLOGIC INVESTIGATIONS OF TB EXPOSURE IN CONGREGATE SETTINGS
NEW YORK CITY, 2000, N=13

Site	*Close Contacts*				*Casual Contacts*				*Self-Referred*[2]			*Transmission*
	Identified[1] *#*	*Tested # (%)*		*Positive # (%)*	*Identified #*	*Tested # (%)*		*Positive # (%)*	*Tested #*	*Positive # (%)*		
School												
High School	46	28	(61)	4 (14)	95	27	(28)	7 (26)	48	4	(8)	Possible
Day Care Center	37	31	(84)	0 (10)	5	5	(100)	1 (20)	0	0	(0)	Unlikely
Vocational School	19	17	(89)	0 (0)	0	0		0	0	0	(0)	Unlikely
Special Education Program	24	21	(88)	1 (5)	0	0		0	31	2	(6)	Unlikely
Residence												
SRO	41	18	(44)	3 (17)	0	0		0	38	12	(32)	Unable to assess
Worksites												
Electronics Factory D	41	27	(66)	21 (78)	0	0		0	4	3	(15)	Possible
Office Building	35	35	(100)	2 (6)	43	43	(100)	6 (14)	149	9	(6)	Unlikely
Department Store	59	57	(97)	9 (16)	0	0		0	22	8	(36)	Unlikely
School Administrative Offices	24	23	(96)	4 (17)	20	19	(95)	4 (21)	20	1	(5)	Unlikely
Clothing Factory G	25	22	(88)	9 (41)	14	13	(93)	9 (69)	13	8	(62)	Unlikely
Department Store	12	9	(75)	2 (22)	126	62	(49)	13 (21)	20	4	(20)	Unlikely
Post Office	36	35	(97)	7 (20)	8	8	(100)	2 (25)	14	4	(29)	Unlikely
Grocery Store	5	4	(80)	1 (25)	13	13	(100)	5 (38)	6	1	(17)	Unlikely
Total	**404**	**327**	**(81)**	**63 (19)**	**324**	**190**	**(59)**	**47 (25)**	**365**	**56**	**(15)**	

[1] *Number identified excludes persons with a prior positive tuberculin skin test.*
[2] *Self-referred are persons who did not have known exposure to a person with TB, but requested tuberculin skin testing.*

APPENDIX: CENTERS FOR DISEASE CONTROL AND PREVENTION'S OBJECTIVES FOR TUBERCULOSIS CONTROL PROGRAMS

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.

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

Joan Clark
Tuberculosis Control Program
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-9771

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) 442-9968

TB CHEST CENTERS

Bronx

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

Brooklyn

Bedford Chest Center
485 Throop Ave., Room 208A
Brooklyn, NY 11221
Tel. (718) 574-2463/4

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

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

Fort Greene Chest Center
295 Flatbush Ave. Ext., Fourth Floor
Brooklyn, NY 11201
Tel. (718) 643-8357/6551

Manhattan

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

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

Staten Island

Richmond Chest Center
51 Stuyvesant Place, Room 415
Staten Island, NY 10301
Tel. (718) 983-4530