2001

Information Summary

Bureau of Tuberculosis Control

New York City Department of Health and Mental Hygiene

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 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 and Mental Hygiene 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 and Mental Hygiene 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 Public Health 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 and Mental Hygiene.

NEW YORK CITY
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
BUREAU OF TUBERCULOSIS CONTROL
INFORMATION SUMMARY: 2001

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HIGHLIGHTS

1. In 2001, New York City had the lowest number of tuberculosis cases ever reported in the city. The previous low was in 1978 (1,307 cases). In 2001, 1,261 cases of tuberculosis were reported in New York City, a 5.3% decrease from the 1,332 cases reported in 2000 and a 66.9% decrease from the 3,811 cases reported in 1992, the peak of the recent epidemic. The 2001 citywide case rate of 15.7 cases per 100,000 persons, is also the lowest case rate ever reported.

2. Despite several years of progress, New York City's 2001 tuberculosis rate is still 2.8 times the national rate of 5.6 per 100,000, and is the highest case rate of all areas reporting to the U.S. Centers for Disease Control and Prevention. The city's rate remains above the national goal established for tuberculosis control by the year 2000, of 3.5 cases per 100,000 persons. The case rates in all health districts, except Kips Bay-Yorkville in Manhattan, are above the national case rate.

3. In 2001, 24 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 4.0% decrease from the 25 cases reported in 2000 and a 94.6% decrease from the 441 cases reported in 1992. For the first time in two years, more MDRTB patients were U.S.-born (54.2%) than non-U.S.-born (45.8%).

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 2000, 988 (88.8%) 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 that are non-U.S.-born. The trend toward a predominance of non-U.S.-born cases continued for the fifth year in a row in 2001: 831 of 2001 cases were non-U.S.-born (65.9%), 412 were U.S.-born (32.7%), and 18 (1.4%) had an unknown country of origin. In contrast, in 1992, only 17.7% of tuberculosis cases diagnosed in New York City were non-U.S.-born. Furthermore, after five years of successive decreases, the number of non-U.S.-born cases increased from 804 in 2000 to 831 in 2001.

6. The proportion of total cases known to be infected with the human immunodeficiency virus (HIV) in 2001 was 14.6% (184 cases). This proportion was lower than the percent known to be HIV-positive in 2000 (18.1%, 241 cases) and has steadily declined since 1992 (33.6%, 1,281 cases).

7. To reduce the future burden of tuberculosis in New York City, greater emphasis has been placed on ensuring that persons infected with *Mycobacterium tuberculosis* complete a course of treatment for latent infection, especially if they are recently infected contacts to active cases or otherwise at high risk of progression to active disease. In 2000, of 11,188 individuals who started treatment for latent tuberculosis infection, 42.7% (4,774) completed treatment. Of those starting treatment for latent tuberculosis infection, 9,024 (80.7%) started receiving their care at Department of Health and Mental Hygiene 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 NYC Public Health Laboratories within 24 hours of detection for DNA fingerprinting. To date, DNA analysis was completed on 73.8% (711/964) of positive cultures. Analyses of these DNA fingerprinting data were performed to identify clusters of TB cases and potential false positive culture and nucleic acid amplification test results. The results of these analyses are included in the text of this Information Summary.

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Tuberculosis Control Program
Overview of Activities

GENERAL

Since its inception in 1866, New York City has been a leader in the fight against tuberculosis. The current Tuberculosis Control Program (TBCP) is multifaceted and integrates clinical services, field services, case management, directly observed therapy, epidemiology, surveillance, outreach to high risk groups, and education and training of staff and providers. The TBCP's financial and administrative oversight is provided by its operations unit. 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 the care received by every patient diagnosed with active tuberculosis in New York City, regardless of whether the patient receives treatment in a Department of Health and Mental Hygiene (DOHMH) Chest Center. The Program's activities are directed toward meeting objectives established internally and by the U.S. Centers for Disease Control and Prevention (CDC) for treatment of patients with active tuberculosis and latent TB infection with the causative organism, *Mycobacterium tuberculosis* (see Appendix for a list of these objectives).

Following the September 11th disaster, TBCP staff ensured that there was no interuption in services: the ten Department of Health and Mental Hygiene Chest Centers throughout the city remained open for patient care and directly observed therapy. However, all Central Offices of TBCP were closed for at least a week. Even after returning to the physical offices, the TB registry was not available in the Central Surveillance Office for at least two weeks. Telephone service was unavailable for two months, making it impossible for providers to report new cases of TB to the long standing TB hotline phone numbers. To compensate for the disruption in telephone services, within one week after the disaster, the TB reporting hotline was relocated to an outlying site with access to the TB registry. All NYC hospitals, and private physicians reporting at least 2 cases in the last two years, were notified by telephone and fax of the new temporary case reporting telephone and fax numbers. In addition, case reports that may have been missed in the interim were actively solicited. After two months, NYC hospitals and private physicians were again notified that the Central Surveillance Office had resumed normal operations.

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, public health nurses, and public health advisors, among other specialized staff. The chest centers provide specialty care, including care for difficult to treat patients, and directly observed therapy (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.

Some of the chest centers maintain extended hours to accommodate patients whose work schedules often fall beyond the normal clinic hours. There is at least one chest center open on Saturdays in each borough excluding Staten Island. These centers participate in activities to support research for treatment efficacy, interventions to improve treatment adherence, and internship opportunities for public health oriented professionals in the city.

In 2001, the Program's chest centers provided care to 1,203 patients with confirmed or suspected tuberculosis. Of 1,261 patients diagnosed with tuberculosis in 2001, 694 (55.0%) 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 76.4% in 2000 to 66.4% in 2001; each month an average of 86.8% of patients remained above 80% adherent to their treatment regimen. These centers provide care to a high proportion of patients with multidrug-resistant tuberculosis: 62.7% (32/51) of the prevalent MDRTB cases in 2001 were in care at the DOHMH chest centers.

In 2001, the chest centers recorded 138,211 patient visits. This represents a 2.1% increase from the 135,389 visits in 2000. The Corona Chest Center in Queens accounted for 27.1% of the total patient visits to a DOHMH chest center in 2001, with 37,065 of the total patient visits. In 2000, 12,979 patients started treatment for LTBI in NYC chest centers. Preliminary figures for 2001 indicate a slight increase in this number with 13,270 patients starting treatment for LTBI in the chest centers.

The chest centers continue to serve large number of non-U.S. born patients. In 2001, 57% (25,451) of the total 43,952 patients seen at the chest centers were born outside of the United States. In 2001, of the 21,055 who were treated for LTBI in the chest centers, 14,956 (71%) patients did not have Medicaid; therefore, the DOHMH was unable to receive reimbursement for their care.

FIELD SERVICES AND SPECIAL PROGRAMS

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. Collaboration between DOHMH and the Department of Homeless Services, has made possible a number of initiatives including: a shelter-based TB unit where men with tuberculosis receive dormitory services, medical monitoring, and DOT; Exposure Control programs in two of the city's largest mens shelters which combine ongoing employee tuberculin skin testing surveillance and tuberculosis infection control measures; and several DOT programs in smaller homeless shelters. In addition, we provided DOT and case management services to persons who are co-infected with HIV and TB, and who live in single room occupancy hotels.

After eight years, the civil detention ward at Goldwater Hospital was closed in December 2001. However, the city arranges for civil detention of non-adherent patients when all other efforts, including Commissioner's Orders for DOT, 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 2001, outreach workers were responsible for providing DOT in the residences, places of employment or other meeting places of 586 tuberculosis patients (reported in 2001 or earlier as confirmed or suspected tuberculosis cases) who could not attend a clinic on a regular schedule, 411 (70.1%) of them starting DOT in 2001. In 2001, outreach workers returned to clinical care an average of 29.6 cases of suspected or confirmed tuberculosis and 29.1 contacts per month who had

become non-adherent to therapy or who had missed clinic appointments.

Outreach workers in the Immigrant and Refugee Unit (IRU) work closely with the U.S. Public Health Service (USPHS) at JFK International Airport to evaluate all immigrants and refugees who enter the country with a CDC tuberculosis classification. Staff are responsible for ensuring that appropriate tuberculosis treatment is provided to new immigrants and refugees who settle in NYC. Additionally, the IRU manages unusual situations involving new immigrants and refugees at the request of the USPHS. In 2001, 631 immigrant and refugees were referred to this unit.

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 2001, 3,083 contacts received tuberculin skin testing by outreach staff with 927 of 1,164 (79.6%) 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 DOHMH with a sputum smear positive for acid-fast bacilli (AFB) or who has a cavitary chest x-ray. In 2001, 364 of the patients reported to the New York City Department of Health and Mental Hygiene who ever had an AFB-positive sputum smear and pulmonary disease, and were therefore assigned to outreach workers for interviews, were eventually found not to have tuberculosis. Before these patients were determined not to have tuberculosis, 141 of their contacts were evaluated.

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 and Mental Hygiene Tuberculosis Control Program 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.

Funded by a grant from the New York State Department of Health, the DOT Quality Assurance (QA) Unit has served to standardize DOT procedures throughout NYC. The Unit conducts routine ongoing monitoring of all DOT programs in the city, both TBCP and non-TBCP, and reports its findings to NYS Department of Health. DOT QA Unit personnel meet regularly with the state DOH TB personnel and with DOT providers to identify opportunities to correct or enhance elements of service provision. As members of a combined state, city, and non-governmental working group, the unit is instrumental in providing training, education, and guidance to DOT program staff and administrators. Because DOT compliance is frequently an issue in determining the need for regulatory intervention for individual patients, the DOT QA coordinator works closely with the Regulatory Affairs Unit.

SURVEILLANCE

Surveillance 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 1,261 confirmed cases reported in 2001, Surveillance staff entered data for 2,622 persons with suspected tuberculosis who were never confirmed as TB cases. Medical 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 2001, TBCP staff reviewed medical records for 1,537 suspected cases, and their efforts contributed to the confirmation of tuberculosis disease in 184 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, 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, to ensure complicance with reporting obligations.

Registry data are routinely analyzed by the Surveillance and Epidemiology staff to identify outbreaks, trends, and instances of possible false positive specimen results, and to research issues of clinical and operational importance. In 2001, 108 investigations into potential false positive *Mycobacterium tuberculosis* culture or nucleic acid amplification test results were completed. Surveillance staff identified 29 patients from 2001 with a confirmed false positive *Mycobacterium tuberculosis* culture, resulting from laboratory contamination, mislabeling, or an error during sputum induction and 11 patients with false positive nucleic acid amplification test results. Surveillance staff informed the medical providers of these patients that further evaluation was warranted and that medical treatment for tuberculosis might be unnecessary; 15 (51.7%) patients with a false positive *Mycobacterium tuberculosis* culture and 4 (36.4%) patients with a false positive nucleic acid amplification test result were found not to have tuberculosis.

EPIDEMIOLOGY

The epidemiology staff provides citywide epidemiologic consultation. The staff review cases with potential exposures in congregate settings to assist in assessing the likelihood of transmission to the closest contacts and to evaluate the need to expand the concentric circle and test additional contacts in the congregate setting. In 2001, 435 cases were reviewed by epidemiologists; for 14 cases, notification of contacts in congregate settings was done by letter. In addition, epidemiology staff conducted 24 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. Ongoing 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.

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 sub-culture from each new patient to the NYC Public Health Laboratories within 24 hours of identification. The objectives of this new activity are to allow the program to more rapidly and efficiently:

1. Identify false positive *M. tb* culture results, 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 ongoing transmission to focus program interventions for

specific geographic areas and populations.

Beginning in 2001, the TBCP performed DNA analysis by both spoligotyping and the IS6110-based RFLP methods on isolates from all culture-positive patients. Laboratory participation in the project has been high and the time needed to obtain DNA typing results and to identify false-positive cultures decreased during the year. To date, DNA analysis was completed on 73.8% (711/964) of positive cultures. Of these, 196 results were found to match at least one other fingerprint. For matching fingerprints, follow-up investigations were done to identify false positive results, confirm or rule out transmission within clusters, identify new clusters, identify links to previously known clusters, and to confirm transmission in a large multi-household outbreak.

EDUCATION AND TRAINING

The Education and Training unit provides TB education to the Tuberculosis Control Program (TBCP) 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 Facts 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 2001, the Education and Training unit distributed 274,487 educational materials, and handled 827 telephone requests for information. The TB section of the DOHMH Website, (http:\\www.nyc.gov/html/doh/html/tb/tb.html) offers publicly and professionally useful TB related information (including the Clinical Policies and Procedures Manual, TB Facts Sheets, patient brochures, and this information summary).

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 2001, the unit conducted 109 in-service training sessions for 1,393 persons. The Unit also provided education and training to the public, answering requests from schools, government and community based organizations, businesses, and individuals. The unit presented 54 professional education sessions that were attended by 1,389 persons, 183 public educational sessions attended by 12,513 persons, and 89 health fairs attended by 8,625 persons. Also, 57 education sessions were conducted as a routine part of expanded contact investigations (ECIs), with attendance totaling 1,904 people in a variety of industrial, corporate, residential, hospitality, and academic settings.

The Education and Training Unit coordinates the Community Partnerships Initiative, a project to create partnerships with community-based organizations (CBOs) and other groups who serve communities most at risk for TB. In 2001, the Unit collaborated with CBOs from the Mexican, Ecuadorian, and Haitian communities on TB education and outreach efforts. In addition, TBCP staff collaborated with Dominican, Russian, Chinese, and other communities to provide outreach and education.

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

In 2000 and 2001 as part of the Community Partnership Initiative, the Education and Training unit carried out the Mexican Outreach Project. The Mexican Outreach Project was developed as a way to educate recent Mexican immigrants about tuberculosis, and to increase their access to TB-related services. Eight community leaders were trained as trainers by Education and Training staff. By identifying and training community leaders, the TBCP is able to reach a large number of high risk individuals in the Mexican community. A total of 478 Mexicans have attended the educational sessions led by the newly trained community leaders.

In addition, the Unit conducted an evaluation of the Tuberculin Skin Test (TST) administration and

reading among clinic staff. The results of the evaluation point to the need for systematic evaluation and periodic TST re-training for health care workers.

TUBERCULOSIS SURVEILLANCE AND METHODS OF ANALYSIS

Case Counting

Cases counted in 2001 were those verified during that year and reported to the CDC as confirmed cases. Only clinical and demographic characteristics of cases are reported to the CDC; no case identifiers are provided.

Some 2001 cases were first suspected of having disease in 2000; likewise, some individuals first suspected of having tuberculosis in late 2001 will be counted in 2002 if active tuberculosis is confirmed in 2002. Individuals who submitted a specimen for mycobacteriology culture in late 2001 were included in the 2001 count if their culture was reported to be positive for any species in the *Mycobacterium tuberculosis* complex (*Mycobacterium tuberculosis, Mycobacterium bovis* [excluding the BCG strain of *M. 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. 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) are eventually confirmed by a positive *Mycobacterium tuberculosis* culture or based on clinical and/or radiographic improvement in response to anti-tuberculosis treatment. 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 all case rates per 100,000 population. Case rates from years before 2000 were based on Census data from the preceding decades, unless otherwise specified. Rates for racial/ethnic and age groups are based on numbers given in the 2000 Census. For the first time, the 2000 Census allowed for respondents to record more than one race/ethnicity; 225,149 (2.8% of the New York City population) reported being of two or more races. In addition, "Pacific Islanders" were included as a separate category in 2000, whereas in 1990, they were part of the "Asian/Pacific Islanders" category. Because tuberculosis case reports do not yet allow multiple races to be reported, rates for racial/ethnic groups are based on mutually exclusive categories of respondents reporting either a single non-Hispanic race or being of Hispanic ethnicity; respondents reporting two or more races are not included in the calculation of rates. The changes in the way racial/ethnic data are collected in the 2000 Census make precise comparisons to rates in earlier years difficult. For the four racial/ethnic groups reported in this document, the population reporting a single racial/ethnic group in the 2000 Census were: non-Hispanic White (2,801,267), Hispanic (2,160,554), non-Hispanic Black (1,962,154), and non-Hispanic Asian (780,229). For comparison, the numbers from the 1990 Census were: non-Hispanic White (3,163,125), Hispanic (1,783,511), non-Hispanic Black (1,847,049), and non-Hispanic Asian and others (528,879). As can be seen, there were significant changes in these groups from 1990 to 2000. Rates calculated for years after 1990 and prior to 2000 do not reflect the constant changes in population, especially the large number of immigrants that came to New York City during the 1990s.

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.

In comparisons of U.S.-born cases with non-U.S.-born cases, persons from Puerto Rico, the U.S. Virgin Islands, and all U.S. territories are considered U.S.-born.

Analysis By Race/Ethnicity

Race/ethnicity is based on patient self-report and categorized as non-Hispanic White, non-Hispanic Black, Hispanic and Asian (see previous section for additional information). 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 and laboratorians 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 DOHMH, 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 DOHMH for testing) household contacts of infectious cases and to notify the DOHMH of the test results or referral. Furthermore, the DOHMH 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 DOHMH 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 2001 as well as persons infected with the organism that causes tuberculosis.

In 2001, the number of confirmed tuberculosis cases in New York City declined for the ninth consecutive year, to the lowest number ever reported, 1,261 cases. This is a 5.3% decrease from the 1,332 cases reported in 2000. Previously, the lowest number of tuberculosis cases ever recorded in New York City (1,307) was 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 2001 is 66.9% lower than the number reported in 1992. The drop in culture-confirmed cases between 1992 and 2001 is even greater: the number of culture-confirmed cases reported in 2001 (964) is 72.0% lower than the number reported in 1992 (3,442). In 2001, the ten healthcare facilities reporting the most tuberculosis cases reported a cumulative 38.4% of all tuberculosis cases.

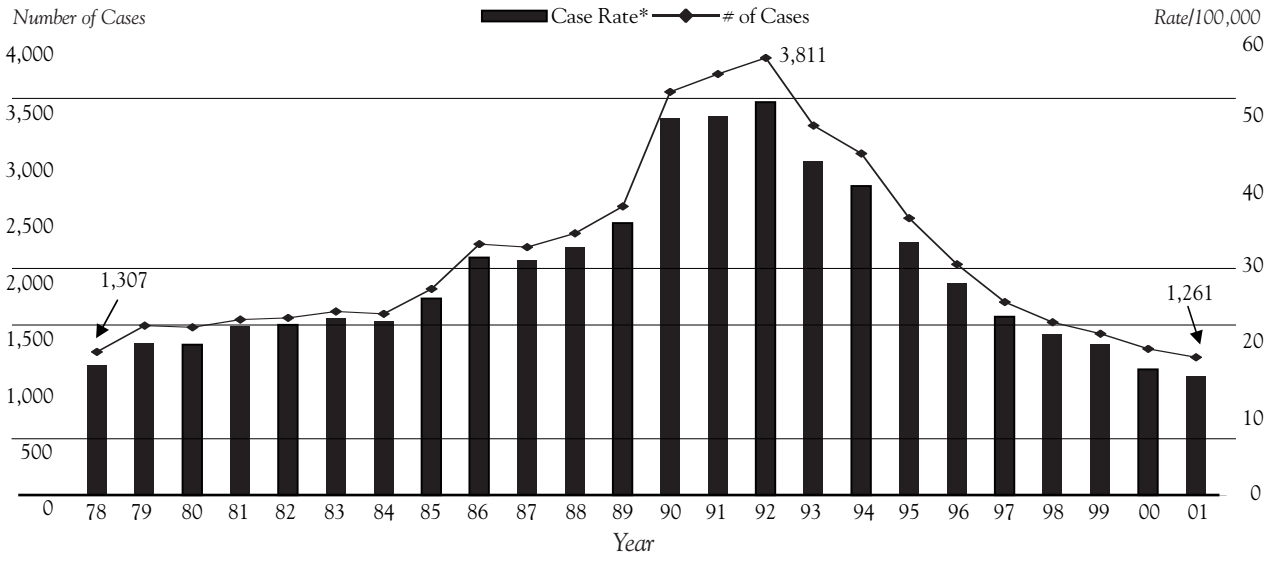
Using the population recorded in the 2000 Census as a denominator[1], the city's 2001 tuberculosis case rate is 15.7 tuberculosis cases per 100,000 persons, compared with a rate of 16.6 recorded in 2000. This is the lowest tuberculosis case rate ever reported in New York City. Prior to 2000, the lowest reported case rate was 17.2 per 100,000 reported in 1978.

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 2001, the number of cases nationally decreased by 10,684, to 15,989 cases in 2001. With 2,550 fewer cases in 2001 than in 1992, New York City contributed 23.9% to the national decrease in tuberculosis between those years.

While New York City has made great progress in its struggle against tuberculosis over the past nine years, New York City's 2001 rate of 15.7 tuberculosis cases

[1] *According to the 2000 Census, the New York City population is 8,008,278.*

FIGURE 1
TUBERCULOSIS CASES AND RATES
NEW YORK CITY, 1978 - 2001



* *Rates based on Census data for each decade.*

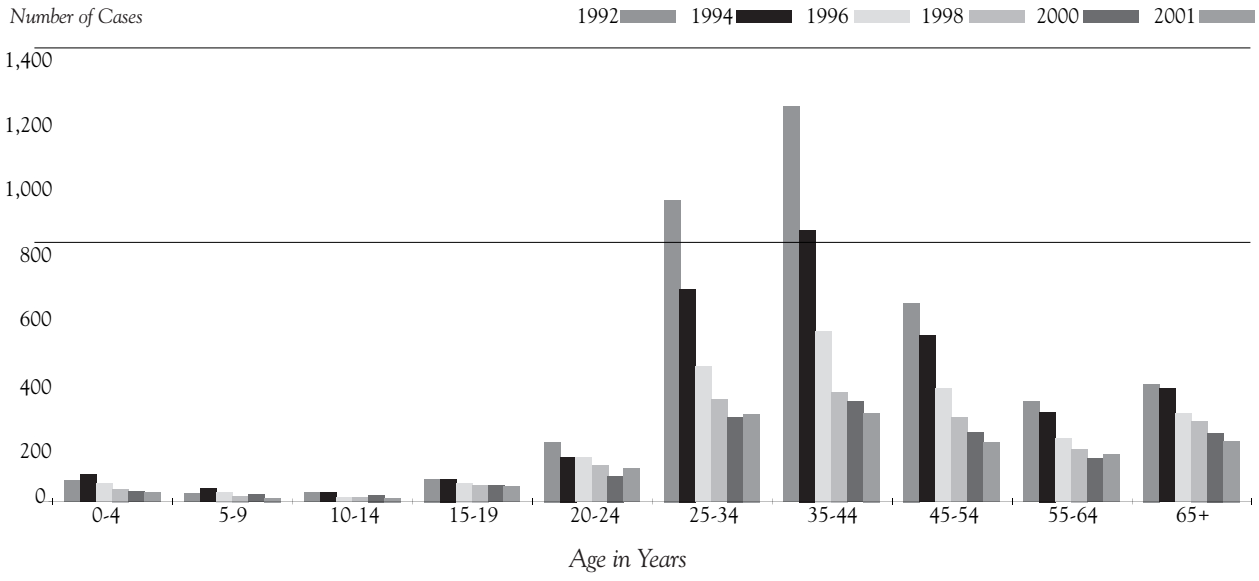
per 100,000 population is still 2.8 times the national rate of 5.6 per 100,000, the highest case rate of all areas reporting to the Centers for Disease Control and Prevention. In 2001, New York City contributed 7.9% of the nation's total 15,989 reported tuberculosis cases while it makes up 2.8% of the nation's total population. The goal for tuberculosis control for the year 2000, set by the U.S. Centers for Disease Control and Prevention, (CDC) was a national rate of 3.5 cases per 100,000 population. The national rate of 5.6 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-U.S.-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 2001, to 14.6%. The number and proportion of tuberculosis cases with a known place of birth who were non-U.S.-born increased in 2001 over that recorded in 2000 (831 vs. 804, 66.9% vs. 61.1%). The proportion of female cases steadily increased from 27.8% in 1986 to 38.9% (490/1,261) in 2001.

AGE DISTRIBUTION
(Table 2, Figures 2-3)

In 2001, people with active tuberculosis ranged in age from less than one year to 97 years old. Tuberculosis case rates were highest in the groups aged 35 through 44 years (21.7 per 100,000). Case rates were lowest in the group aged 5 through 9 years (2.1 per 100,000). There were fewer tuberculosis cases in all age groups in 2001 than in 2000, except for three age groups. The group with the largest increase among adults was the group aged 20 through 24 years (32.1% from 78 cases in 2000 to 103 cases in 2001); this group comprised 8.2% of total cases and had a rate of 17.5. Within this age group, an increase was seen both

FIGURE 2
TUBERCULOSIS CASES BY AGE
NEW YORK CITY, 1992 - 2001



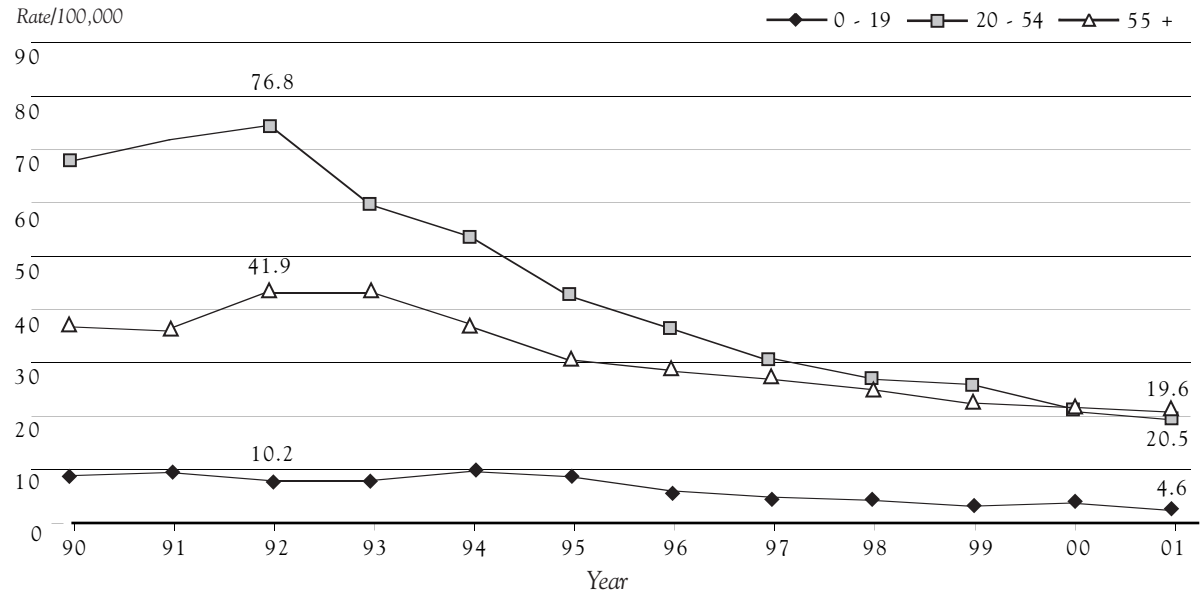
among U.S. and non-U.S.-born cases. The group aged 55 through 64 years comprised 11.6% of total cases and had a case rate of 21.4 and an increase of 9.0% between 2000 and 2001 (from 134 to 146 incident cases). In this age group, the number of U.S.-born cases increased while non-U.S.-born cases decreased. The group aged 25 through 34 years comprised 21.4% of the total and had a case rate of 19.7 and 3.4% increase between 2000 and 2001 (from 261 to 270 incident cases). In this age group, the increase was seen only among non-U.S.-born. Figure 2 presents a description of cases by age group since 1992. Figure 3 shows trends in case rates by age group since 1990. Table 2 presents cases and case rates by age group, race/ethnicity, and sex in 2001.

Among adults, the group aged 45 through 54 years experienced the largest decrease, 14.5% from 214 in 2000 to 183 in 2001; this group comprised 14.5% of total cases and had a rate of 18.1. The group aged 35 through 44 years experienced an 11.3% decrease in cases from 309 to 274; this group had a case rate of 21.7 per 100,000 and comprised 21.7% of the total cases in 2001. The group aged 65 years and older comprised 14.8% of the total, had a case rate of 19.9 and experienced an 11.8% decrease between 2000 and 2001 (from 212 to 187 incident cases).

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. Since 1998, the proportion of cases in the group younger than 65 years has remained fairly stable and in 2001 the proportion was 85.2%.

The 39 cases that occurred in 2001 among children younger than 10 years represent 3.1% of total cases, which is less than the 4.0% recorded in 2000 (53 cases reported). The rate in this age group was 3.5 per 100,000 in 2001, compared with 5.0 per 100,000 in 2000. Within the past five years, surveillance to identify culture-negative pediatric tuberculosis cases has increased in New York City. Young children with tuberculosis are regarded as sentinel cases; thus, the low rates of tuberculosis in this age group are encouraging, as they suggest a decline in recent transmission

FIGURE 3
TUBERCULOSIS CASE RATES BY AGE
NEW YORK CITY, 1990 - 2001



of the disease.

Children, including those aged 10 through 14 years, once infected with tuberculosis, are especially vulnerable to progression to active disease. Between 2000 and 2001, there was a 42.9% decrease in the number of cases in the group aged 10 thorough 14 years (21 cases in 2000, 12 cases in 2001, and a rate of 4.1 in 2000 and 2.4 in 2001). A decrease of 6.0%, from 50 cases in 2000 to 47 cases in 2001, was observed among older adolescents, aged 15 through 19 years; this group had a rate of 9.4 per 100.000.

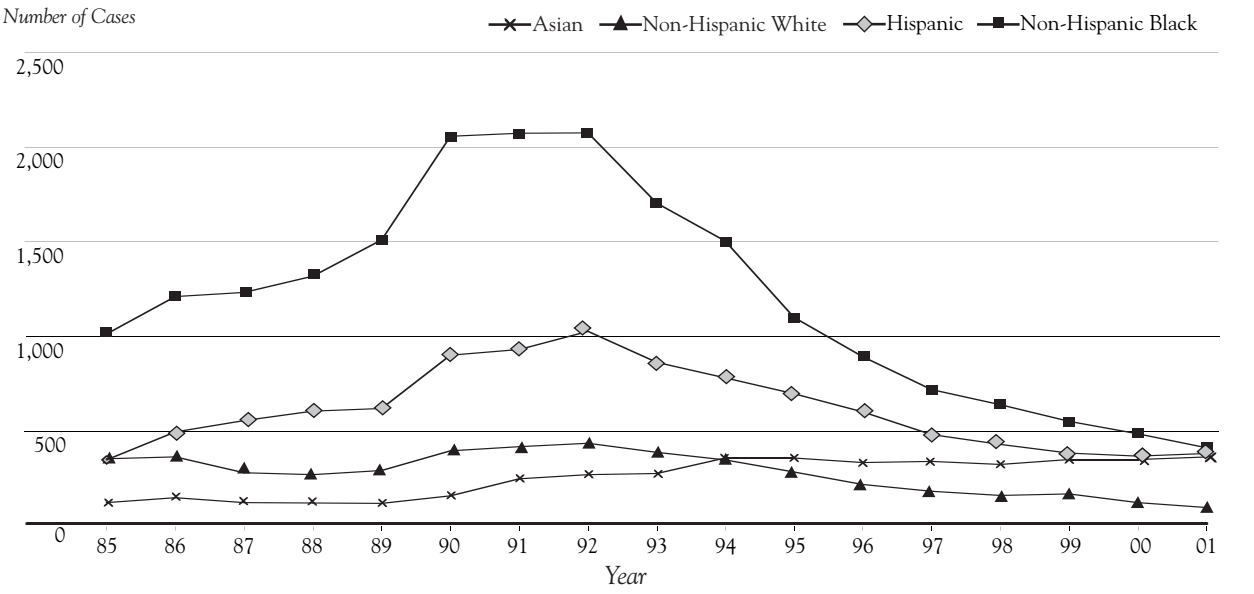
DISTRIBUTION BY SEX
(Table 2)

As in previous years, the incidence of tuberculosis among males in 2001 was nearly twice the incidence among females: 20.3 per 100,000 among males vs. 11.6 per 100,000 among females. The proportion of female cases steadily increased from 27.8% seen in 1986 to 38.9% (490/1,261) in 2001. In 2001, the proportion of female cases decreased slightly (38.9%; 490/1,261 cases) compared to 2000 (39.3%; 523/1,332 cases). There was a larger percentage decline in female tuberculosis cases between 2000 and 2001 (6.3%, from 523 in 2000 to 490 in 2001) than in male cases (4.7%, from 809 in 2000 to 771 in 2001).

Among adult males, the greatest percentage decrease in cases between 2000 and 2001 occurred in the group aged 45 through 54 years (12.3% decrease, from 146 in 2000 to 128 in 2001). Among adult females, the greatest percentage decrease in cases occurred in the group aged 65 years and older (24.2% decrease, from 95 in 2000 to 72 in 2001). Among adult males, increases were observed in the 20 through 24 age group (14.3%, 49 in 2000 to 56 in 2001) and in the 55 through 64 age group (10.1%, 89 in 2000 to 98 in 2001). Among adult females, increases were noted in three age groups: in the 20 through 24 age group (62.1%, from 29 in 2000 to 47 in 2001), in the 25 through 34 age group (17.6%, from 108 in 2000 to 127 in 2001), and in the 55 through 64 age group (6.7%, from 45 in 2000 to 48 in 2001). All remaining adult male and female age groups experienced a decrease in the number of cases from 2000 to 2001.

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.

FIGURE 4
TUBERCULOSIS CASES BY RACE/ETHNICITY
NEW YORK CITY, 1985 - 2001



The greatest difference between rates for males and females occurred in both the 55 through 64 year age group (32.1 per 100,000 for males vs. 12.7 for females) and the 65 years and older age group (31.9 per 100,000 for males vs. 12.7 for females).

RACIAL/ETHNIC DISTRIBUTION (Table 2, Figures 4 - 5)

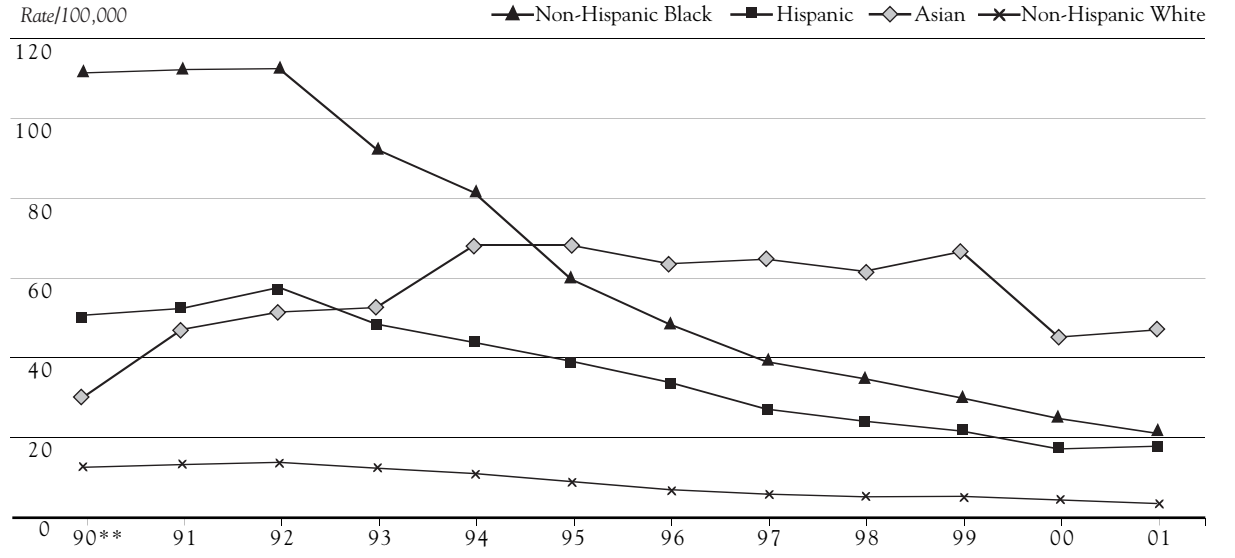
Table 2 shows the distribution of 2001 tuberculosis cases by race/ethnicity and age among males and females. Between racial/ethnic groups, the distributions of males and females were fairly similar. Between 2000 and 2001, tuberculosis cases decreased among non-Hispanic Whites and non-Hispanic Blacks. Tuberculosis cases increased among Hispanics and Asians between 2000 and 2001.

As in previous years, non-Hispanic Blacks comprised the highest proportion of 2001 tuberculosis cases (32.8%). The 414 cases reported among non-Hispanic Blacks in 2001 gave this group a case rate of 21.1 per 100,000, second only to that for Asians (46.9 per 100,000). The number of tuberculosis cases who are non-Hispanic Black decreased by 15.0% from the 487 recorded in 2000. Age-specific incidence rates in 2001 peaked in the 55 through 64 year age group for non-Hispanic Black males (58.0 per 100,000) and the 35 through 44 year age group for non-Hispanic Black females (28.1 per 100,000).

The 384 Hispanic cases represented 30.5% of total 2001 tuberculosis cases. Hispanics had a case rate of 17.8 per 100,000. The number of tuberculosis patients who are Hispanic increased by 4.1% from the 369 recorded in 2000. Age-specific incidence rates in 2001 peaked in the 65 years and older age group for Hispanic males (43.0 per 100,000) and the 25 through 34 year age group for Hispanic females (28.8 per 100,000). Among Hispanics, the increase in cases was only among non-U.S.-born cases (238 in 2000 and 269 in 2001).

The 366 cases among Asians accounted for 29.0% of the 2001 cases. Asians had a case rate of 46.9, higher than that for any other racial/ethnic group. The number of cases recorded among Asians in 2001 increased by 4.0% from 352 reported in 2000. As in 2000, the highest tuberculosis rates among Asian males and females in 2001 were observed among those aged 65 years and older (167.1 per 100,000 among

FIGURE 5
TUBERCULOSIS RATES* BY RACE
NEW YORK CITY, 1990 - 2001



* *Rates per 100,000 persons based on 1990 Census data prior to 2000 and 2000 Census data since 2000.*

** *1990 data do not include two Native American cases of tuberculosis in the 20-54 age group.*

males and 55.3 per 100,000 among females). The rate among elderly Asian males exceeded that of all other racial/ethnic age groups. Among Asians, non-U.S.-born cases increased from 340 in 2000 to 353 in 2001 and U.S.-born cases increased from 9 in 2000 to 11 in 2001.

The 97 cases among non-Hispanic Whites accounted for 7.7% of the 2001 total. Non-Hispanic Whites had a case rate of 3.5 per 100,000, lower than that for any other racial/ethnic group. The number of cases among non-Hispanic Whites decreased 21.8% in 2001 compared to 2000 (124 cases). Age-specific incidence rates in 2001 peaked in the 65 years and older age group for non-Hispanic White males (11.4 per 100,000) and the 20 through 24 age group for non-Hispanic White females (3.3 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 414 cases among non-Hispanic Blacks in 2001 is well below the 1,014 seen in 1985, while the 384 cases in 2001 among Hispanics is similar to the 350 seen in this group in 1985. Cases among non-Hispanic Whites decreased from 356 in 1985 to 97 in 2001. Cases among Asians increased from 123 in 1985 to 366 in 2001.

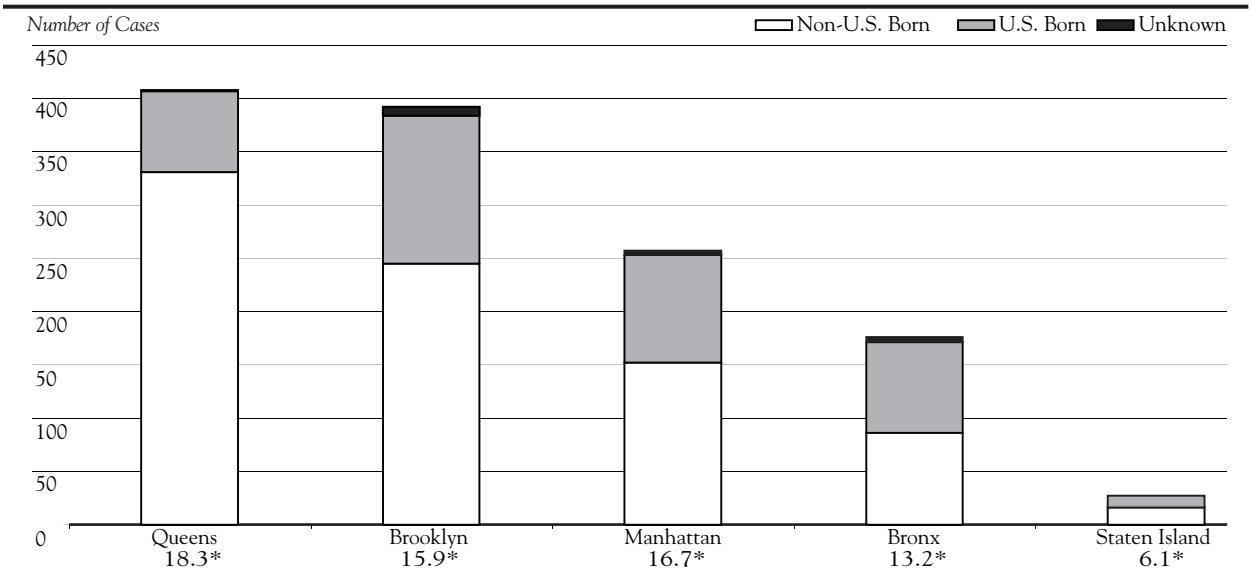
Figure 5 illustrates the trends in case rates per 100,000 over the past decade. While the case rate was highest among non-Hispanic Blacks in 1990 (111.4 per 100,000), in 1995 the case rate for Asians surpassed that of non-Hispanic Blacks and remains the race group with the highest rate (46.9 in 2001). The rate for non-Hispanic Blacks continues to decrease and approach that of Hispanics. Please refer to the Methods Section on page 9 for an explanation of limitations of rate comparisons with earlier years.

GEOGRAPHIC DISTRIBUTION
(Tables 3- 4, Figures 6 -8)

Incidence rates by health center district of residence were calculated for 2001; age-adjusted and crude rates are presented in Table 3. Table 4 presents data by place of birth, HIV status, and numbers and rates of sputum AFB-smear positive tuberculosis for each health center district.

Figure 6 illustrates the number of tuberculosis cases contributed by each borough, and the proportion of

FIGURE 6
TUBERCULOSIS CASES BY AREA OF BIRTH AND BOROUGH
NEW YORK CITY, 2001



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

non-U.S.-born cases in each borough. The boroughs that contributed the largest proportions of total New York City cases were Queens, Brooklyn, and Manhattan. Between 2000 and 2001, the number of new tuberculosis cases decreased in all boroughs except Queens. In Queens, the number of tuberculosis cases increased by 12.4%, from 363 in 2000 to 408 in 2001. The increase in Queens was seen both among non-U.S.-born patients (13.4%, 292 in 2000 and 331 in 2001) and U.S.-born patients (10.1%, from 69 in 2000 to 76 in 2001). Queens had the largest number of non-U.S.-born cases in 2001, representing 81.1% of its total caseload.

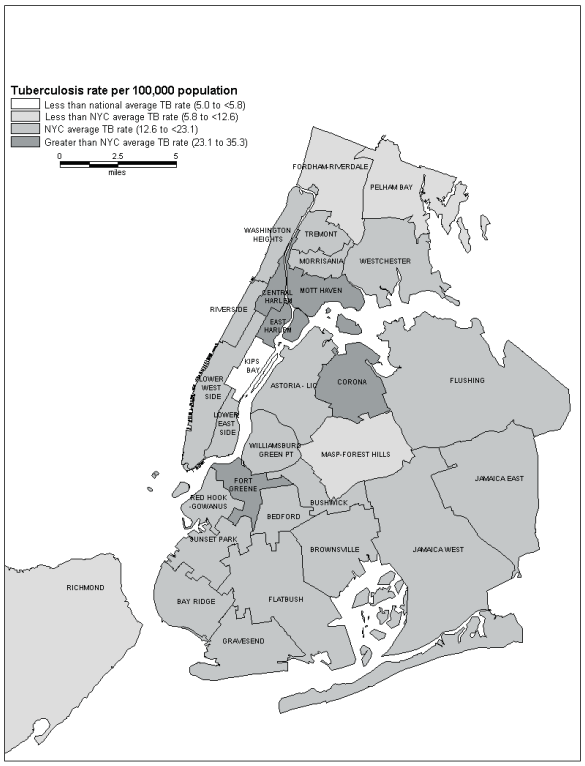
In the Bronx, cases decreased by 18.1% (from 215 cases in 2000 to 176 cases in 2001), Brooklyn cases decreased by 12.1% (from 446 cases in 2000 to 392 in 2001), Manhattan cases decreased 6.9% (from 276 in 2000 to 257 in 2001), and Staten Island cases decreased by 15.6% (from 32 cases in 2000 to 27 in 2001). Between 2000 and 2001, the number of non-U.S.-born cases decreased in each of the boroughs experiencing an overall decrease, except Manhattan, which experienced a 3.4% increase (from 147 in 2000 to 152 in 2001).

Figure 7 displays a map of health center districts shaded by incidence rate in relation to the citywide 2001 rate. The three districts with the highest age-adjusted case rates in 2001 were Corona, Mott Haven, and Central Harlem. The age-adjusted tuberculosis case rate for Central Harlem, which until 2001, consistently had the city's highest case rate, fell below 100 per 100,000, for the first time in 1997. In 2001, Central Harlem's case rate decreased by an additional 29.6% to 25.0 per 100,000 compared with 2000. Increases in age-adjusted case rates between 2000 and 2001 were observed in Corona (21.4%) and Mott Haven (96.9%). Other districts that experienced substantial decreases in age-adjusted tuberculosis rates between 2000 and 2001 were Kips Bay-Yorkville and Lower East Side in Manhattan; Fordham-Riverdale, Morrisania, Pelham Bay and Tremont in the Bronx; Bedford, Flatbush, and Sunset Park in Brooklyn; Maspeth-Forest Hills in Queens, and Staten Island.

Despite overall decreases in age-adjusted case rates from 2000 to 2001, increases in non-U.S.-born cases were seen in East Harlem, Lower East Side, Lower West Side, and Riverside in Manhattan; Morrisania, Mott Haven, Pelham Bay, and Westchester in the Bronx; Bay Ridge, Brownsville, Bushwick, Fort Greene, Gravesend, and Red Hook-Gowanus in Brooklyn; and all health center districts in Queens except Maspeth-Forest Hills.

Nine health center districts in Brooklyn, the Bronx, and Manhattan had substantial increases in their age-adjusted case rates since 2000: Bushwick, Gravesend, and Red Hook-Gowanus in Brooklyn; Mott Haven in the Bronx; Lower West Side in Manhattan; and Astoria - Long Island City (L.I.C), Corona, Jamaica East and Jamaica West in Queens. In the Lower West Side, Mott Haven, Gravesend,

FIGURE 7
TUBERCULOSIS RATES BY HEALTH CENTER DISTRICT
NEW YORK CITY, 2001



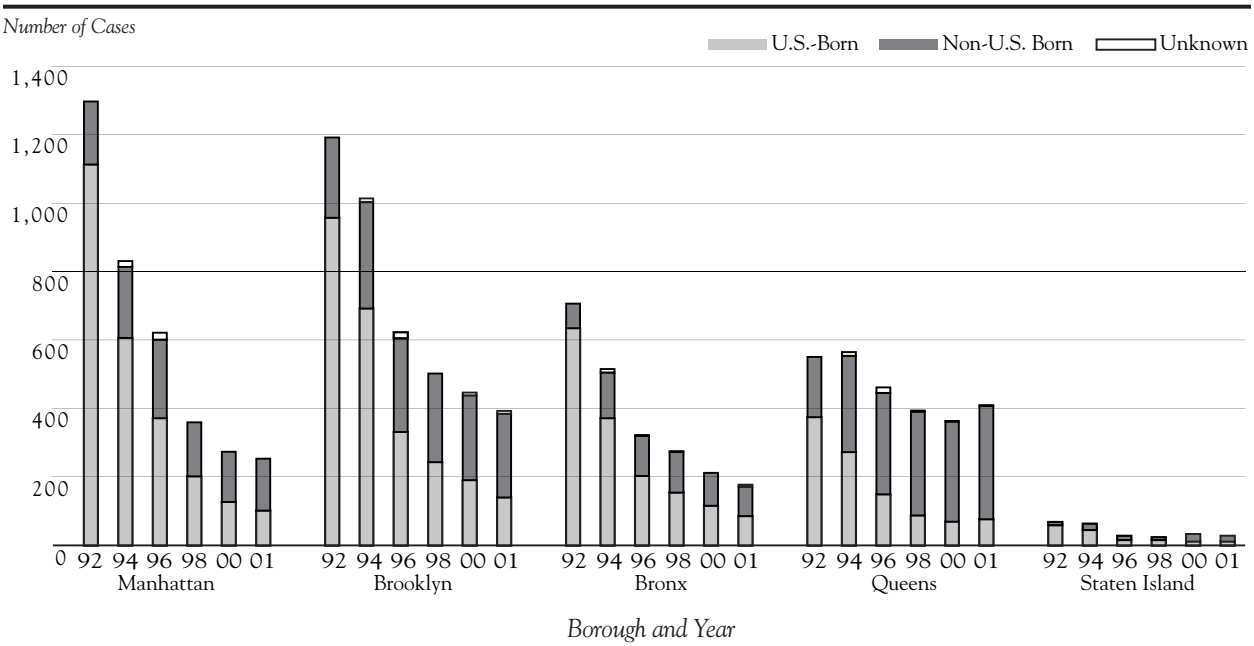
Red Hook-Gowanus, Corona, Jamaica East and Jamaica West, there were increases both among non-U.S.-born (26.9% increase from 26 in 2000 to 33 in 2001 in Lower West Side, 25.0% increase from 8 in 2000 to 10 in 2001 in Mott Haven, 30.8% increase from 26 in 2000 to 34 in 2001 in Gravesend, 60.0% increase from 5 in 2000 to 8 in 2001 in Red Hook-Gowanus, 14.4% increase from 97 in 2000 to 111 in 2001 in Corona, 25.0% increase from 32 in 2000 to 40 in 2001 in Jamaica East, and 12.9% increase from 31 in 2000 to 35 in 2001 in Jamaica West) and U.S.-born patients (11.8% increase from 17 in 2000 to 19 in 2001 in Lower West Side, 108.3% increase from 12 in 2000 to 25 in 2001 in Mott Haven, 25.0% increase from 4 in 2000 to 5 in 2001 in Gravesend, 25.0% increase from 8 in 2000 to 10 in 2001 in Red Hook-Gowanus, 200.0% increase from 6 in 2000 to 18 in 2001 in Corona, 69.2% increase from 13 in 2000 to 22 in 2001 in Jamaica East, and a 46.2% increase from 13 in 2000 to 19 in 2001 in Jamaica West). In Bushwick and Astoria-L.I.C. there was an increase only among the non-U.S.-born patients (76.5% increase from 17 in 2000 to 30 in 2001 in Bushwick, and a 50.0% increase from 34 to 51 in 2001 in Astoria-L.I.C.).

With the exception of Flushing and Maspeth-Forest Hills, the 2001 age-adjusted case rates increased in every health center district in Queens.

Figure 8 shows the trends for tuberculosis cases by borough and place of birth for selected 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, acid-fast bacilli (AFB)-sputum smear status, and crude sputum smear positive rates for each health center district are shown in Table 4. The number of non-U.S.-born cases exceeded the number of U.S.-born cases for every health center district in Queens, Staten Island, and all but Central Harlem in Manhattan. The percent of HIV infected cases was above the citywide percentage of 14.6% in the Bronx and Manhattan; the Bronx had the highest percent of HIV-infected patients at 23.3%. In terms of sputum smear status, Queens had the highest number of AFB-smear positive cases (138) but Manhattan had the highest crude rate of AFB-smear positive cases (7.2 per 100,000).

FIGURE 8
TUBERCULOSIS CASES BY BOROUGH OF RESIDENCE AND AREA OF BIRTH
NEW YORK CITY, 1992 - 2001



AREA OF ORIGIN
(Table 5, Figure 9)

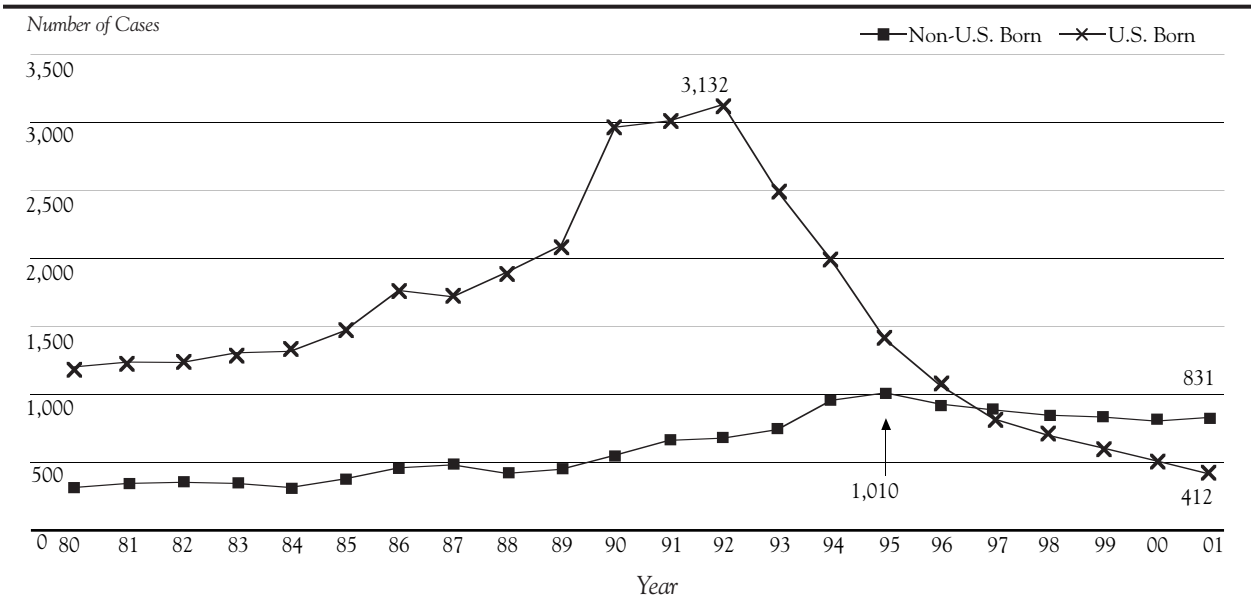
In 2001, information about country of origin was available for 1,243 (98.6%) cases. Between 2000 and 2001, the number of non-U.S.-born cases increased from 804 to 831 (3.4%) while U.S.-born cases dropped 19.4% from 511 to 412. Among cases with a known place of origin, the proportion of non-U.S.-born cases increased from 61.1% recorded in 2000 to 66.9% in 2001. Figure 9 illustrates trends in numbers of non-U.S.-born cases since 1980: the number of non-U.S.-born tuberculosis cases in 2001 remains more than double the number recorded in 1980.

Recent immigration to the U.S. in the past five years is a risk factor for developing active tuberculosis. Date of entry in the U.S. was known for 93.7% (779/831) of the non-U.S.-born cases in 2001. Of the 779, 372 (47.8%) entered the U.S. less than five years before their tuberculosis diagnosis; of these, 38.7% (144/372) had been in the U.S. less than one year before their tuberculosis diagnosis.

A total of 88 countries other than the United States or U.S. territories were reported as places of origin for 2001 tuberculosis cases compared with 84 countries of origin reported for 2000 cases. Central and South America (most prominently Ecuador and Mexico) accounted for the largest non-U.S.-born group, contributing 235 cases (18.9% of cases with known place of origin), a 17.5% increase from 200 cases in 2000. The second largest non-U.S.-born group (176 cases, 14.2% of total cases with known place of origin) came from Far East Asia (most prominently China[2] and Korea), a 9.3% increase from 161 cases in 2000. The third largest non-U.S.-born group (131 cases, 10.5% of total cases with known country of origin) came from the Caribbean area (most prominently Haiti and the Dominican Republic), a 10.3% decrease from 146 cases in 2000. Aside from the United States, China was the leading country of origin for 2001 cases. In 2001, using 2000 Census data, the rate among non-U.S.-born persons in New York City was 28.9 cases per 100,000, compared with 8.0 per 100,000 among U.S.-born persons. Rates were highest among persons from Africa (80.1 per 100,000), followed by all Asian regions (50.5 per 100,000), and all

[2] *Includes Hong Kong and Taiwan*

FIGURE 9
U.S.- AND NON-U.S.-BORN TUBERCULOSIS CASES*
NEW YORK CITY, 1980 - 2001



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

Latin American regions (24.2 per 100,000). The rate among persons from Europe was 7.7 per 100,000.

The age distribution of the 831 non-U.S.-born cases resembled that seen among U.S.-born cases: 719 (86.5%) of non-U.S.-born cases were younger than 65 years and 112 (13.5%) were 65 years and older, compared with 345 (83.7%) U.S.-born cases younger than 65 years and 67 (16.3%) 65 and older. As in 2000, of non-U.S.-born cases, the largest proportion was in the group aged 25 through 34 years (26.4%, 219 cases) and of U.S.-born cases the largest proportion was in the group aged 35 through 44 years (19.9%, 82 cases).

The total number of 2001 U.S.-born cases includes 52 cases from Puerto Rico, which contributed 4.2% of total cases with known place of origin; between 2000 and 2001, the number of cases from Puerto Rico decreased by 8.8%, from 57 recorded in 2000.

SITE OF DISEASE, BACTERIOLOGY, AND PATHOLOGY (Table 6, Figure 10)

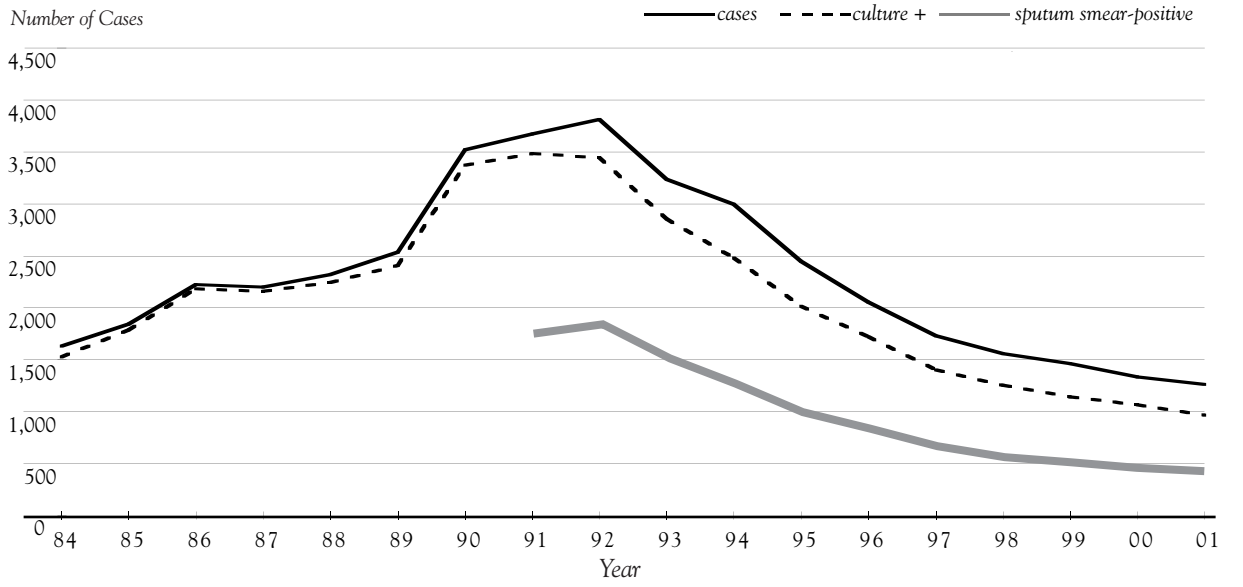
Site of Disease

In 2001, pulmonary tuberculosis was the primary site of disease for 936 (74.2%) of all cases. An additional 44 cases (3.5%) 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 (11.5%), followed by pleural disease (3.9%). Of all cases reported in 2001, 106 (8.4%) had both pulmonary and extrapulmonary disease. Of 980 cases with any pulmonary disease, 485 (49.5%) had a positive smear for acid-fast bacilli (AFB) from either sputum or another respiratory specimen.

Bacteriology

Of the 1,261 tuberculosis cases verified in 2001, 297 (23.6%) had no positive bacteriologic culture or nucleic acid amplification test for *Mycobacterium tuberculosis*. These cases were determined to have tuberculosis because of their clinical and/or radiologic improvement while on anti-tuberculosis medications. Eleven cases

FIGURE 10
TRENDS OF TUBERCULOSIS CASES
NEW YORK CITY, 1984 - 2001*



**Data on sputum smear positive cases not available before 1991.*

(0.9%) had a negative conventional culture but were confirmed on the basis of a positive nucleic acid amplification test (e.g., Amplicor®, Genprobe®), in accordance with CDC case counting guidelines.[3] Figure 10 illustrates trends, since 1984, in all verified cases and in culture-positive cases. The identification and confirmation of tuberculosis cases without positive *Mycobacterium tuberculosis* cultures requires active surveillance and detailed review of medical records by Tuberculosis Control Program staff. Before New York City's Tuberculosis Control Program was strengthened, these tuberculosis cases tended to comprise less than 10.0% of the total; since 1992, the proportion of cases not confirmed by positive cultures 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 10 also shows trends in the number of tuberculosis patients with sputum smears positive for acid-fast bacilli (AFB). In developing countries, where facilities for cultures are frequently lacking, tuberculosis is often diagnosed only through sputum microscopy. Therefore, to increase comparability between numbers of AFB smear-positive cases in New York City and developing countries, only smears from sputum are included in the figure, not smears from all respiratory specimens; also, positive sputum smears are included regardless of the patient's culture results. Comparisons between tuberculosis rates in developed and developing countries are tenuous due to substantial under-detection of cases in many developing countries, but are best made in terms of incidence of sputum AFB smear-positive cases. The 453 such cases that occurred in New York City in 2001 yielded an incidence of 5.7 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 2000 estimated to be 82.3 and 46.1 per 100,000 population respectively. However, substantial under-reporting of such cases resulted in lower reported rates of 35.0 and 17.0 per 100,000 respectively. The reported rates of sputum smear-positive tuberculosis per 100,000 population in some other countries contributing large numbers of non-U.S.-born tuberculosis cases to New York City are: 72.3 in Haiti, 40.0 in Ecuador, and 34.7 in the Dominican Republic. However, the extent of under-reporting in these countries is estimated to range from 46.2% in the Dominican Republic to 50.8% in Haiti. [4]

Pathology

Of the 1,261 tuberculosis cases recorded in New York City in 2001, 28.3% (357/1,261) are recorded in the Department of Health and Mental Hygiene tuberculosis registry as having had tissue biopsies. Most of these cases (86.3%, [308/357]) had a smear or culture result (from either the specimen which was biopsied or another specimen) that suggested or confirmed tuberculosis; 13.7% (49/357) of cases with biopsies, however, had neither a smear or culture result suggestive of tuberculosis. For comparison, in 2000, 13.4% (50/373) of patients with biopsies had no smear or culture result suggesting or confirming tuberculosis. In 2001, 36 of the 357 patients with biopsies done, but with no smear or culture result suggestive of tuberculosis, had 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).

[3] *CDC. case definitions for infectious conditions under public health surveillance. MMWR 1997;46 (No. RR-10): 40-41.*

[4] *World Health Organization. Global Tuberculosis Control. WHO Report 2002. Geneva, Switzerland, WHO/CDS/CPC/TB/2002.295.* http:\\www.who.int/gtb/publications/globrep02/index.html.

DRUG RESISTANCE
(Table 7, Figure 11)

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 and Mental Hygiene 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 and Mental Hygiene 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 2001, 964 (76.4%) of the city's tuberculosis cases had cultures positive for *Mycobacterium tuberculosis*. Of these, 927 (96.2%) had drug susceptibility test results for first-line anti-tuberculosis drugs reported and 780 (84.1%) were susceptible to all first-line anti-tuberculosis drugs.

Twenty-four cases (2.6%) had multidrug-resistant strains (i.e., they had isolates resistant to at least isoniazid and rifampin, [MDRTB]). This is a 4.0% decrease from the 25 cases in 2001 and a 94.6% decrease from the 441 MDRTB cases in 1992, when reporting of susceptibility results was first mandated. Of the 24 cases with MDRTB, 2 (8.3%) had isolates which were resistant to only isoniazid and rifampin (a decrease from the 20.0% seen in 2000); 4 (16.7%) had isolates resistant to isoniazid, rifampin and one other first-line drug (compared with 8.0% in 2000); 11 (45.8%) had isolates resistant to isoniazid, rifampin and two other first-line drugs (an increase from the 36.0% seen in 2000); and 7 (29.2%) had isolates resistant to isoniazid, rifampin and three other first-line drugs (vs. 4.0% in 2000). Seven of the 24 MDRTB patients (29.2%) had isolates resistant to most first-line drugs plus kanamycin and other second-line drugs (compared with 32.0% in 2000).

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 1,261 tuberculosis cases reported in 2001, 60 (4.8%) had a previous history of suspected or confirmed tuberculosis noted on their current records in the New York City DOHMH tuberculosis registry. Three (12.5%) patients with MDRTB were documented to have a prior history of tuberculosis compared with 57 (4.6%) 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 2001, a greater proportion of MDRTB than non-MDRTB cases were known to have worked in the health care field; 16.7% (4/24) of MDRTB cases and 2.7% (33/1,237) of non-MDRTB cases were health care workers. A larger proportion of 2001 cases with MDRTB were HIV-infected (20.8%, 5/24) compared with non-MDRTB cases (14.5%, 179/1,237).

Eighty-nine (9.6%) of the 927 patients with first-line drug susceptibility test results had strains of *Mycobacterium tuberculosis* resistant to a single first-line drug; of these, 40 (44.9%) had isolates resistant to streptomycin alone, 37 (41.6%) to isoniazid alone, 8 (9.0%) to pyrazinamide alone, 2 (2.3%) to rifampin alone, and 2 (2.3%) to ethambutol alone. Thirty-four 2001 cases (3.7% of all those with susceptibility results available) had isolates resistant to two or more first-line drugs but were not classified as MDRTB; 22 of these (64.7%) were resistant to isoniazid, and streptomycin; 4 (11.8%) were resistant to streptomycin and pyrazinamide; 2 (5.9%) were resistant to rifampin and

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[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.*

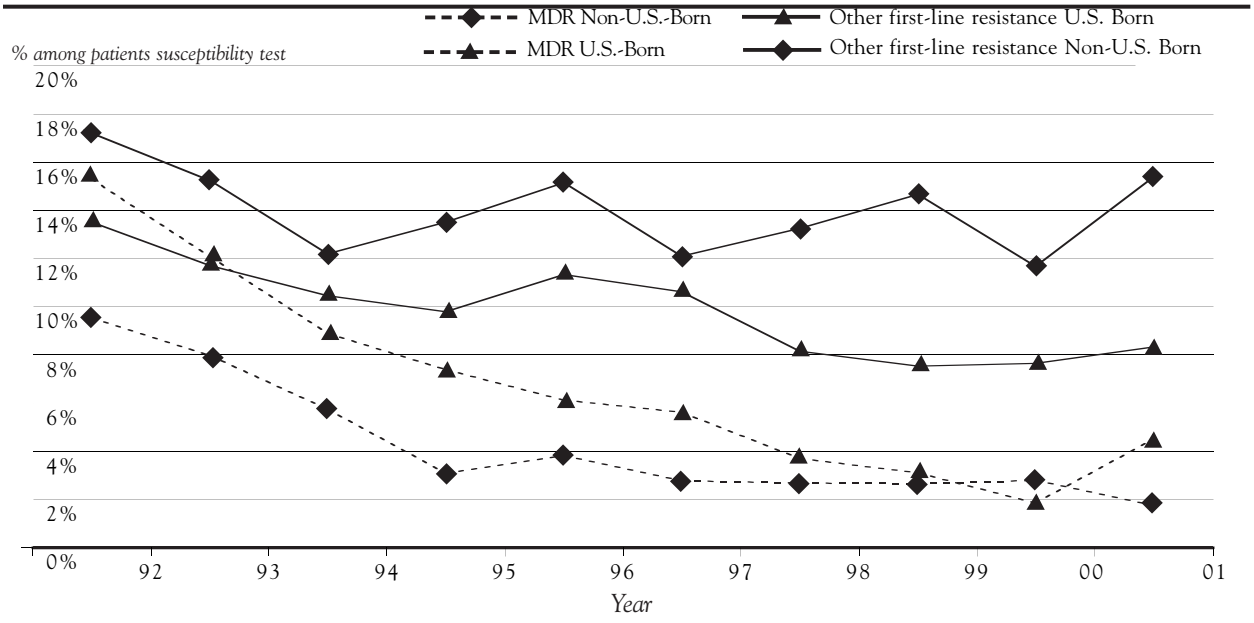
ethambutol; 2 (5.9%) were resistant to isoniazid, ethambutol, and streptomycin; and 1 each (2.9% each) were resistant to either isoniazid, ethambutol, streptomycin, and pyrazinamide; isoniazid, ethambutol, and streptomycin; isoniazid and pyrazinamide; or rifampin and streptomycin.

Of 147 cases in 2001 with isolates resistant to any first-line drugs, 125 (85.0%) 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*. Of the 125 cases with second-line susceptibility results, 38 (30.4%) isolates were resistant to at least one second-line drug. Among the 24 MDRTB cases with other-drug-resistance 21 (87.5%) had isolates resistant to at least one second-line drug and among 123 non-MDRTB cases, 17 (13.8%) had isolates resistant to at least one second-line drug. For comparison, in 2000 38 (36.9%) of 103 isolates tested for susceptibility to second-line drugs were resistant to at least one second-line drug; 21 (87.5%) of 25 MDRTB patients and 17 (16.2%) of 105 other-drug-resistant TB (ODRTB) patients.

Drug resistance by area of origin

In 2001, more multidrug-resistant tuberculosis (MDRTB) cases were born in the United States and Puerto Rico than in other countries (10, 41.7% in the U.S.; 3, 12.5% in Puerto Rico; and 11, 45.8% in other countries). Four MDRTB cases were from India and one MDRTB case was from each of the following countries: Bangladesh, China, the Dominican Republic, Haiti, Nepal, Trinidad and Tobago, and the Ukraine. Since 1991, when data started to be systematically collected on drug susceptibilities, only in 1999 and 2000 were more MDRTB cases born in other countries than in the United States and Puerto Rico (in 2000, 18 [72.0%] were born in other countries, 6 [24.0%] were born in the U.S. and 1 [4.0%] was born in Puerto Rico). In 2001, among those with first-line susceptibility results, 4.5% (13/288) of U.S.-born cases had MDRTB and 1.7% (11/630) of cases born outside the U.S. and Puerto Rico had MDRTB. Among U.S.-born cases with first-line susceptibility results, 6.3% (18/288) had organisms resistant to a single drug, compared with 11.0% (69/630) of non-U.S.-born. The proportion of U.S.-born tuberculosis cases with organisms resistant to isoniazid, either alone or in combina-

FIGURE 11
FIRST-LINE DRUG RESISTANCE BY AREA OF ORIGIN
NEW YORK CITY, 1992 - 2001



tion with other drugs, but still sensitive to rifampin was 4.9% (14/288), similar to the 7.8% (49/630) seen among non-U.S.-born cases. U.S.-born cases were twice as likely as non-U.S.-born cases to have isolates resistant to two or more anti-tuberculosis drugs but not classifiable as multidrug-resistant (2.1% [6/288] of U.S.-born cases vs. 4.4% [28/630] of non-U.S.-born cases). Overall, 87.1% (251/288) of U.S.-born patients and 82.9% (522/630) of non-U.S.-born patients were sensitive to all first line anti-tuberculosis drugs.

The number of MDRTB U.S.-born cases and MDRTB non-U.S.-born cases decreased steadily from 1992 to 2001 (386 in 1992 to 13 in 2001, and 54 in 1992 to 11 in 2001 respectively), though the decline was greater among MDRTB U.S.-born cases. Similarly, ODRTB cases decreased to a greater extent among U.S.-born cases (341 in 1992 to 24 in 2001) than among non-U.S.-born cases (100 in 1992 to 97 in 2001); non-U.S.-born ODRTB cases which peaked in 1996 at 115 cases, actually increased from 75 cases observed in 2000. Among the U.S.-born, ODRTB cases surpassed MDRTB cases in 1994 while since 1992, non-U.S.-born ODRTB cases has exceeded non-U.S.-born MDRTB cases and in 1996 exceeded both the number of U.S.-born MDRTB and ODRTB cases.

Figure 11 shows the trends in MDRTB and other first line drug resistance (ODRTB) by area of birth since the height of the epidemic in 1992. When examined by percent of patients with available susceptibility testing over the past eight years, non-U.S.-born ODRTB cases have consistently comprised a larger percentage (17.6% in 1992 and 15.4% in 2001) compared to U.S.-born ODRTB cases (13.5% in 1992 and 8.3% in 2001), U.S.-born MDRTB cases (15.3% in 1992 and 4.5% in 2001), and non-U.S.-born MDRTB cases (9.5% in 1992 to 1.7% in 2001).

Drug resistance by age

Of 148 patients aged 65 and older with first-line susceptibility results, 2 (1.4%) had multidrug-resistant strains of *Mycobacterium tuberculosis* and an additional 8 (5.4%) 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 or are more reluctant to use four medications due to fear of side-effects. 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.

MDRTB patients ranged in age from 18 to 78. Among U.S.-born cases with first-line susceptibility results, MDRTB was most common in the 20 through 24 age group (7.7%, 1 of 13 U.S.-born cases with first-line susceptibility results in this age group) and the 55 through 64 year age group (6.7%, 3 of 45 U.S.-born cases with first-line susceptibility results in this age group). Among non-U.S.-born cases with first-line susceptibility results, MDRTB was most common in the 25 through 34 age group (3.6%, 6 of 168 non-U.S.-born cases with first-line susceptibility results in this age group) and the 45 through 54 age group (2.7%, 2 of 75 non-U.S.-born cases with first-line susceptibility results in this age group).

ODRTB patients ranged in age from less than one year to 75 years of age. Among U.S.-born cases with first-line susceptibility results, ODRTB was most common among children aged 0 through 19 years (15.4%, 4 of 26 U.S.-born cases with first-line susceptibility results in this age group) and the 35 through 44 year age group (9.7%, 6 of 62 U.S.-born cases with first-line susceptibility results in this age group). Among non-U.S.-born cases with first-line susceptibility results, ODRTB was most common in the 20 through 24 age group (20.9%, 14 of 67 non-U.S.-born cases with first-line susceptibility results in this age group)

and the 25 through 34 age group (16.7%, 28 of 168 non-U.S.-born cases with first-line susceptibility results in this age group).

SOCIOMEDICAL FACTORS
(Table 8)

Information about social factors such 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 six 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 2001, no more than 8.9% of patients were missing information about any one social variable. Among those with available information, 2.8% (32/1,159) had used illegal injectable drugs, 7.2% (84/1,161) had used illegal non-injectable drugs, and 11.5% (134/1,164) had abused alcohol in the 12 months prior to treatment for tuberculosis. These proportions are similar to those recorded in 2000, when 3.9% of tuberculosis patients had used illegal injectable drugs, 8.9% used illegal non-injectable drugs, and 9.6% abused alcohol in the 12 months prior to treatment.

All 2001 cases had information available on incarceration: 2.3% (29/1,261) had been incarcerated at the time of diagnosis, compared with 1.7% (23/1,332) in 2000. Of the 1,149 cases with information available on occupation in 2001 (91.1% of total), 433 (37.7%) were employed and 37 (3.2%) had worked in the health care field or as correctional employees. This is compared with 430 of 1,257 (34.0%) cases being employed and 40 (3.2%) working in the health care or correctional field in 2000. All 2001 cases had information available on homelessness, and 51 (4.0%) had been homeless at diagnosis or at some point during their treatment; of the 1,332 cases recorded in 2000, 72 (5.4%) had been homeless at diagnosis or at some point during their treatment.

TUBERCULOSIS AND HUMAN IMMUNODEFICIENCY VIRUS (HIV) INFECTION
(Tables 9 - 10)

Since 1990, the TBCP 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 9 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, and leading cause of death in people with HIV infection.

In 2001, 61.5% (776/1,261) of New York City tuberculosis cases had a known and reported HIV status, a decrease from 66.1% (881/1,332) in 2000. Females were as likely as males to have a known HIV status (62.7% of females compared to 60.8% of males). HIV status was more likely to be known for U.S.-born cases than for non-U.S.-born cases: 69.7% (287/412) of U.S.-born cases had a known HIV status vs. 58.6% (487/831) of non-U.S.-born cases. As the HIV epi-

demic 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-U.S.-born cases who are tested and to report these test results to the DOHMH 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 2001, for the fourth consecutive year, the proportion of tuberculosis cases who were recorded as HIV infected was less than 25% of total cases: of 2001 tuberculosis cases, 14.6% (184) were reported as HIV positive and 46.9% (592) were reported as HIV negative. In 2000, 18.1% (241) were reported as HIV positive and 48.0% (640) were reported as HIV negative. Among the 776 cases in 2001 with a known HIV status, 23.7% were HIV positive and 76.3% were HIV negative. In 2001, among male and female tuberculosis cases, the highest proportion of HIV-infected cases was recorded in the group aged 35 through 44 years.

Table 10 presents the distribution of HIV infection by sex from 1992 through 2001. 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, which has been greater among males than among females, may be due to the introduction of anti-retroviral therapy for HIV-infected individuals.

When only U.S.-born cases are considered, the proportion of cases recorded as HIV-positive decreased from 31.1% (159/511) in 2000 to 29.9% (123/412) in 2001. Non-U.S.-born patients are much less likely to be HIV positive than are U.S.-born cases; the proportion of non-U.S.-born cases who were HIV positive decreased from 9.6% (77/804) in 2000 to 7.2% (60/831) in 2001. See Table 10 for a breakdown of HIV status among the U.S.-born versus non-U.S.-born.

HIV-infected cases were equally likely to have multidrug-resistant tuberculosis (MDRTB) than uninfected cases. In 2001, 2.7% (5/184) of cases who were known to be HIV infected had MDRTB, compared with 19 of the 1,077 cases (1.8%) with unknown or negative HIV status.

Treatment of tuberculosis can be complicated by the use of two classes of anti-retroviral agents, protease inhibitors (PIs) and non-nucleoside reverse transcriptase inhibitors (NNRTIs). The use of a rifamycin (e.g., rifampin or rifabutin), an essential 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 184 HIV-positive cases, 90 (48.9%) were on rifabutin at some time in their tuberculosis treatment.

DIRECTLY OBSERVED THERAPY (DOT) AND COMPLETION OF THERAPY (Table 11, Figures 12-14)

Figure 12 illustrates the proportion of tuberculosis patients counted in a given year who were eligible for DOT (i.e., patients who were diagnosed while alive and received some or all of their anti-tuberculosis 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 64.3% in 2001). 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 a peak of 72.3% in 1998. After two years of decreasing DOT rates, the proportion of eligible patients on DOT increased in 2001 to 64.3% (706 of 1,098 eligible patients) from 63.5% (739 of 1,163 eligible patients) in 2000.

The proportion of patients on DOT is much higher

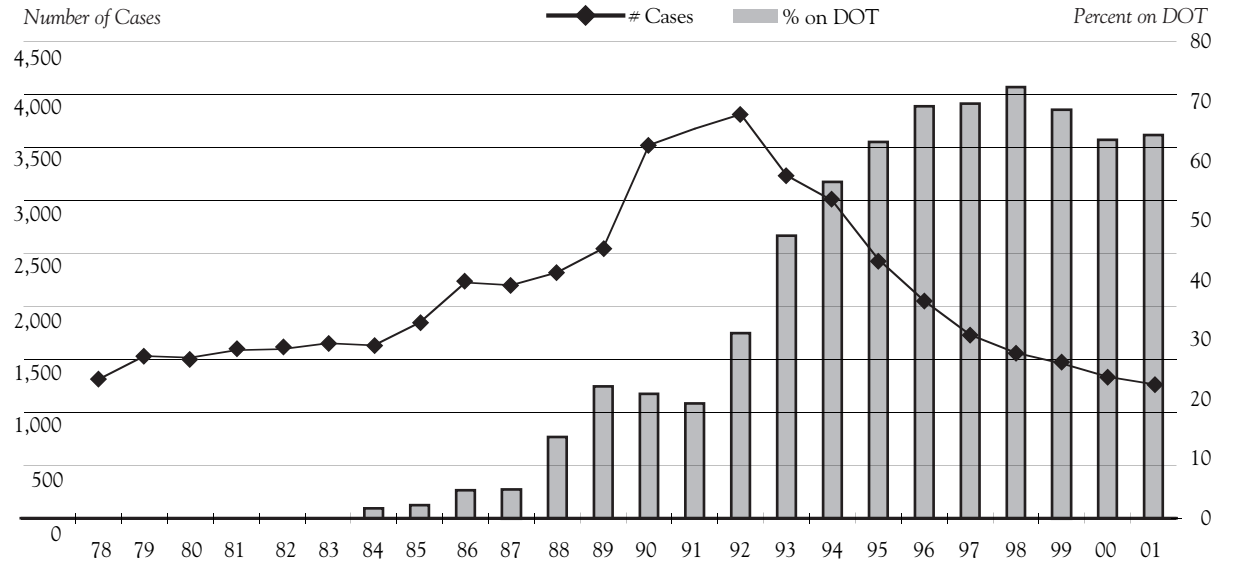
among those who receive treatment in Department of Health and Mental Hygiene Chest Centers, where DOT is considered the standard of care. Of the 655 eligible patients confirmed in 2001 who received some or all of their treatment as of March 2002 in DOHMH Chest Centers, 82.6% (541) were on DOT for some or all of their therapy; of the 443 eligible patients confirmed in 2001 who received none of their treatment in DOHMH Chest Centers, 37.2% (165) were on DOT for some or all of their therapy (Figure 13). Patients with infectious and/or multidrug-resistant tuberculosis are an especially high priority for DOT. Of patients confirmed in 2001, 75.1% (311/414) of eligible patients with pulmonary tuberculosis and acid-fast bacilli (AFB)-positive respiratory smears received DOT compared with 57.7% (395/684) of those without AFB-positive respiratory smears; 90.9% (20/22) of multidrug-resistant tuberculosis (MDRTB) patients received DOT compared with 63.8% (686/1,076) of non-MDRTB patients. In 2001, 66.4% of eligible U.S.-born patients (227/342) received DOT compared with 63.4% of eligible non-U.S.-born patients (474/748).

Figure 14 shows the distribution of patients on DOT as of December 31, 2001, 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-DOHMH facilities, which are funded by the New York State Department of Health, Medicaid, and Ryan White Care Act Funds, provided DOT to 138 (29.6%) of the 466 cases who were receiving DOT at that point. DOHMH Chest Centers and Field Services (including DOT provided to residents of single room occupancy hotels) provided DOT to 114 (24.5%) cases and 186 (39.9%) cases respectively. Other DOT programs, including those for incarcerated, detained, or homeless patients provided DOT to the remaining 23 (6.0%) patients on DOT.

Completion of Therapy

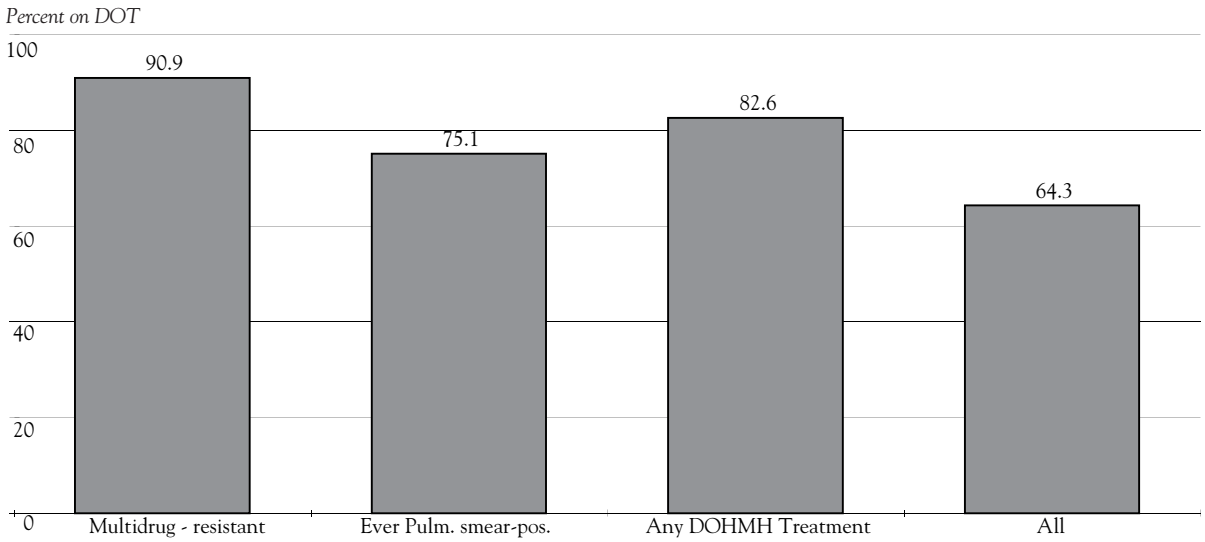
According to guidelines issued by the CDC and the American Thoracic Society, patients with confirmed or suspected tuberculosis should receive an initial regimen consisting of four drugs (isoniazid, rifampin, ethambutol and pyrazinamide), unless susceptibilities of their *Mycobacterium tuberculosis* isolates

FIGURE 12
TUBERCULOSIS CASES ON DIRECTLY OBSERVED THERAPY*
NEW YORK CITY, 1978 - 2001



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

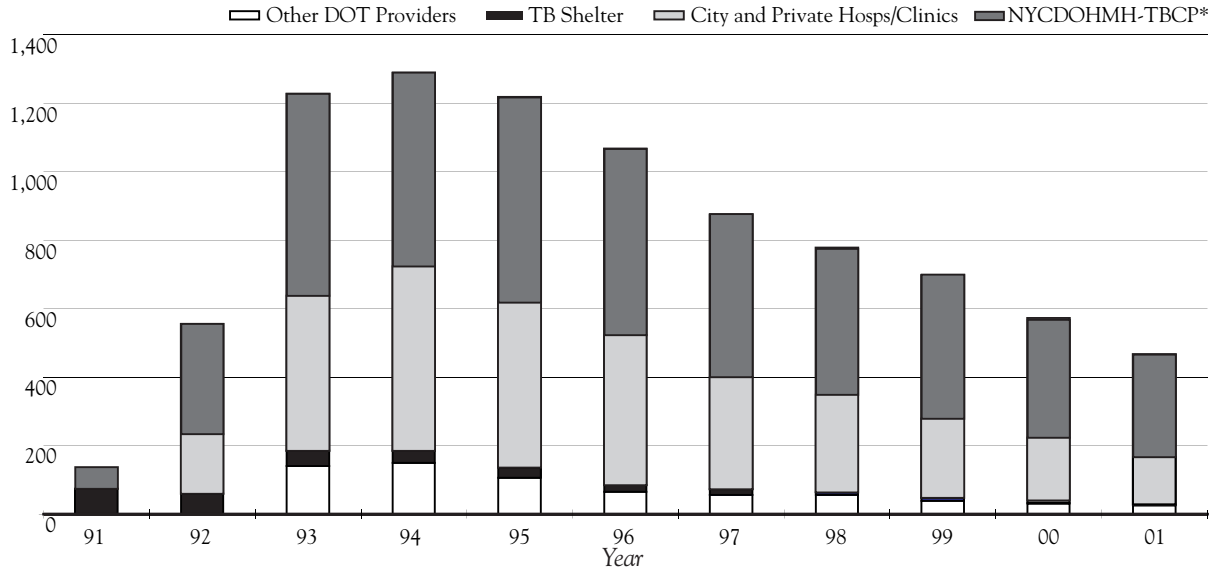
FIGURE 13
PERCENT ELIGIBLE* TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY**
NEW YORK CITY, 2001



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

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

FIGURE 14
TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY AS OF DECEMBER 31 BY TYPE OF PROVIDER
NEW YORK CITY, 1991 - 2001



* *New York City Department of Health and Mental HygieneTuberculosis Control Program.*

are known from the start of therapy or unless there are justified medical contraindications. Among patients with confirmed tuberculosis in 2001 who were started on anti-tuberculosis therapy, 86.7% (1,039/1,199) were started on these four drugs within two weeks of the start of therapy compared to 84.6% in 2000 (1,084/1,281).

The effectiveness of directly observed therapy (DOT) and intensive case management in increasing completion of therapy among patients diagnosed with tuberculosis in 2000 is illustrated in Table 11. Completion data are presented for 2000 instead of 2001 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 2000 was 88.8%, compared to a completion index of 87.6% in 1999 and 85.7% in 1998. New York City's completion index is approaching the CDC goal of 90% of patients with newly diagnosed tuberculosis, for whom therapy of one year or less is indicated, completing anti-tuberculosis therapy within 12 months. If cases who completed their treatment in more than 365 days are included in the numerator, the case completion index would increase to 91.3%.

MORTALITY
(Table 1)

Mortality figures presented in this year's report are based on statistics issued by the Bureau of Vital Statistics of the New York City Department of Health and Mental Hygiene. In 2001, there were 33 deaths in New York City with tuberculosis listed as the underlying cause of death on the death certificate. The crude tuberculosis mortality rate for 2001 was 0.4 per 100,000. There were an additional 19 deaths for which tuberculosis was listed as a secondary cause. Of these deaths, 9 (47.4%) listed acquired immune deficiency syndrome (AIDS) or HIV infection as the underlying cause of death.

PREVENTION OF FUTURE TUBERCULOSIS DISEASE
(Table 12)

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

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 2001.

In June 2000, the U.S. 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 New York City Tuberculosis Control Program has adopted these guidelines with minor changes [7] and adjusted programmatic practices 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.

Contacts with Latent Tuberculosis Infection

Two of the national objectives for treatment of latent infection concern contacts to infectious tuberculosis cases (Appendix). Besides ensuring that contacts to smear positive pulmonary cases are evaluated, the Tuberculosis Control Program has expanded its efforts to ensure that all contacts to patients 15 years and older with culture-confirmed pulmonary or laryngeal disease are evaluated, and that contacts found eligible for treatment for latent infection receive it .[8] The following discussion refers only to contacts of cases confirmed in 2000, as not all contacts to cases confirmed in 2001 have yet been identified and evaluated. Also, all contacts are considered, whether they received treatment from Department of Health and Mental Hygiene Chest Centers or elsewhere.

In 2000, of 4,357 contacts to patients for whom a contact investigation is indicated, 83.7% (3,646) were exmined, compared with 79.6% (4,219/5,300) of contacts identified to 1999 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 certain factors including a patient's age and human immunodeficiency virus (HIV) status. Starting in 1999, the completion index for contacts receiving treatment for latent infection was 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 2000, of 1,059 infected contacts who started on treatment for latent infection, 48.7% (516) completed at least six months of treatment for latent infection; the 1999 completion index for treatment of latent infection among infected contacts was 52.7% (425/807). In order to assure higher levels of completion of treatment for latent infection, the Tuberculosis Control Program is adopting a case management approach for contacts of sputum AFB smear-positive cases with pulmonary disease that is similar to the way patients with active disease are managed (e.g., patients are assigned to a case manager who helps to remind the patients to take their medication and the status of patients whose treatment for latent infection is directly observed is reviewed on a quarterly basis).

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

[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.

Treatment for Latent Tuberculosis Infection by DOHMH

The DOHMH has been leading efforts to increase treatment for latent TB infection among contacts to active cases and others at high risk for progression to active disease. Some CDC objectives on treatment for latent infection concern program-supported treatment services, which are offered in DOHMH Chest Centers: these objectives apply to all persons, contacts and others, who are evaluated for treatment for latent infection in DOHMH Chest Centers. In DOHMH Chest Centers in 2000, of the 12,979 individuals who started treatment for latent infection, 5,930 completed therapy, for a completion index of 45.7%; the 1999 completion index for treatment of latent infection at DOHMH Chest Centers was 50.5%, as of the 8,622 individuals who started treatment for latent infection in that year, 4,358 completed therapy. Efforts to ensure completion of treatment for latent infection in DOHMH Chest Centers vary in intensity depending on the patient's risk of developing active disease.

Through continued emphasis on completing treatment of patients with active tuberculosis and with additional emphasis on treatment of latent infection, the New York City DOHMH, in cooperation with providers throughout New York City, will continue to reduce the city's burden of tuberculosis.

Contact Investigations in Congregate Settings

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 2001, 24 epidemiologic investigations were conducted, one of these was an investigation of a tuberculosis cluster. Of the 23 that were a result of exposures to persons with infectious tuberculosis in congregate settings: 7 were workplace exposures, 15 were in schools, and 1 was in a place of worship.

In all 23 of the contact investigations, the person with infectious tuberculosis was older than 12 years and had pulmonary disease. In 18 (78.3%) of these investigations, the index case was smear-positive for acid-fast bacilli, and in 8 (34.8%), the index case had cavitation on chest radiograph. Patients with these characteristics are more likely to be infectious.

Results of the contact investigations were classified according to the likelihood of tuberculosis transmission to contacts in the congregate settings; transmission was considered unlikely in 13 (56.5%) of these investigations; possible in 2 (8.7%); probable in 4 (17.4%) and unable to be determined in 4 (17.4%). Investigations in which transmission is probable include expanding testing to include persons with lower risk of exposure. The total number of contacts tested was 689 close contacts and 522 other-than-close contacts; 137 (11.3%) of those tested were found to be infected and were referred for medical evaluation. In addition, 203 persons with no known exposure to the index case requested testing; 6 (3.0%) of these were infected and were referred for medical evaluation.

In addition to the 24 investigations that were completed, contacts in 14 additional settings were notified of an 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 2001. To date, 50 clusters of 4 or more cases were identified (excluding hospitals and jails). There were no additional sites in 2001 that had not previously been identified. However, ongoing transmission was identified at two previously identified sites; one was a single-room-occupancy hotel and another was a public housing project. Intensive efforts to identify infected persons and provide treatment for latent tuberculosis infection are being made at these locations.

CONCLUSION

While the current downward trend of TB cases in New York City over the past nine years is encouraging, tuberculosis continues to disproportionately affect certain communities within New York City. Immigrants formed the majority of New York City's tuberculosis cases at the beginning of the last century. In recent years, they have again accounted for most of New York City's tuberculosis cases. While HIV and a weak TB Control Program drove the resurgence of TB during the 1980's and early 1990s, today TB has become increasingly a disease of those born outside the United States. DOHMH's TB prevention and control strategy targets high-risk communities by working closely with health care providers to enhance their ability to provide culturally appropriate care. DOHMH is also collaborating with community leaders and organizations in immigrant communities at risk for TB to implement effective, targeted prevention and treatment strategies. While we will continue implementing our proven practices of careful case management and extensive use of directly observed therapy, in the future we expect community partnerships to play an even greater role in our continued fight to control TB in New York City.

TABLES

TABLE 1 *(see page 11)*
TUBERCULOSIS INCIDENCE
NEW YORK CITY, 1920 - 2001

Year	*Number*[1]	*Rate Per 100,000*[2]	*Culture-Positive Cases*	*Sputum Smear-Positive Cases*[3] *(Rate Per 100,000)*		*Multidrug-resistant Cases*[4]	*TB Deaths (Rate Per 100,000)*	
1920	14,035	246.9					7,915	(144.1)
1930	11,821	170.2					4,574	(68.2)
1940	9,005	120.8					3,680	(50.0)
1950	7,717	97.8					2,173	(27.4)
1960	4,699	60.4					824	(10.6)
1970	2,590	32.8					432	(5.5)
1971	2,572	32.6					316	(4.0)
1972	2,275	28.8					335	(4.3)
1973	2,101	26.6					259	(3.4)
1974	2,022	25.6					215	(2.8)
1975	2,151	27.2					208	(2.8)
1976	2,151	27.2					187	(2.5)
1977	1,605	21.1					175	(2.4)
1978[5]	1,307	17.2					188	(2.6)
1979	1,530	20.1					121	(1.7)
1980	1,514	19.9					143	(2.0)
1981	1,582	22.4					155	(2.2)
1982	1,594	22.5					168	(2.4)
1983	1,651	23.4					151	(2.1)
1984	1,629	23.0	1,527				168	(2.3)
1985	1,843	26.0	1,785				155	(2.2)
1986	2,223	31.4	2,181				186	(2.6)
1987	2,197	31.1	2,157				219	(3.0)
1988	2,317	32.8	2,241				246	(3.4)
1989	2,545	36.0	2,405				236	(3.2)
1990	3,520	49.8	3,372				256	(3.5)
1991	3,673	50.2	3,484	1,772	(24.2)	366	245	(3.3)
1992	3,811	52.0	3,442	1,856	(25.3)[6]	441	200	(2.7)
1993	3,235	44.2	2,854	1,526	(20.8)	296	166	(2.2)
1994	2,995	40.9	2,479	1,265	(17.3)	176	133	(1.8)
1995	2,445	33.4	2,014	989	(13.5)	109	94	(1.2)
1996	2,053	28.0	1,721	837	(11.4)	84	67	(0.9)
1997	1,730	23.6	1,401	665	(9.1)	56	55	(0.7)
1998	1,558	21.3	1,255	558	(7.6)	38	52	(0.7)
1999	1,460	19.9	1,143	515	(7.0)	31	49	(0.6)
2000	1,332	16.6	1,066	467	(5.8)	25	44	(0.5)
2001	1,261	15.7	964	453	(5.7)	24	33	(0.4)

[1] *For "phthisis," or pulmonary cases, 1920-1939; thereafter, all forms of tuberculosis.*
[2] *Population based on most recent Census data available at time of first publication of citywide case rate.*
[3] *Patients with a sputum smear-positive for acid-fast bacilli regardless of culture result and regardless of site of disease.*
[4] *Resistant to at least isoniazid and rifampin. Drug susceptibility made mandatorily reportable during 1991; figure from that year is not complete.*
[5] *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.*
[6] *This information was estimated for 1992, exact figures not available.*

TABLE 2 *(see pages 12-15)*
TUBERCULOSIS INCIDENCE (RATES PER 100,000) BY RACE/ETHNICITY, SEX, AND AGE IN YEARS
NEW YORK CITY, 2001

	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	0 0.0	1 0.8	4 3.2	6 3.4	5 1.0	18 4.3	19 4.8	10 3.5	33 6.2	97 3.5
Males	0 0.0	0 0.0	0 0.0	2 3.1	3 3.6	1 0.4	12 5.5	15 7.8	7 5.2	24 11.4	64 4.8
Females	1 1.5	0 0.0	1 1.7	2 3.2	3 3.3	4 1.7	6 2.9	4 2.0	3 2.0	9 2.8	33 2.3
Non-Hispanic Black, total	7 4.8	4 2.4	4 2.5	15 9.9	21 15.3	69 23.6	116 36.8	71 29.8	56 33.5	51 27.6	414 21.1
Males	4 5.4	3 3.5	3 3.7	7 9.3	12 19.1	37 29.2	66 48.1	49 48.5	39 58.0	25 39.1	245 28.0
Females	3 4.2	1 1.2	1 1.2	8 10.5	9 12.1	32 19.3	50 28.1	22 16.0	17 17.0	26 21.5	169 15.5
Hispanic, total	15 8.1	4 2.0	3 1.7	15 8.6	46 24.2	111 28.9	69 20.8	44 18.8	36 24.2	41 29.5	384 17.8
Males	11 11.6	4 4.0	1 1.1	10 11.1	27 28.1	55 29.0	47 29.8	30 28.5	21 31.9	22 43.0	228 21.9
Females	4 4.4	0 0.0	2 2.3	5 5.9	19 20.3	56 28.8	22 12.6	14 10.9	15 18.0	19 21.7	156 13.9
Asian, total	4 8.3	4 8.4	4 8.8	13 27.2	30 48.2	85 53.5	71 49.2	49 45.7	44 73.4	62 105.3	366 46.9
Males	3 12.2	2 8.1	1 4.2	8 32.3	14 46.7	50 64.8	47 63.6	34 63.5	31 106.2	44 167.1	234 60.3
Females	1 4.3	2 8.7	3 13.9	5 21.7	16 49.5	35 42.8	24 34.2	15 27.9	13 42.3	18 55.3	132 33.6
TOTAL	27 5.0	12 2.1	12 2.3	47 9.0	103 17.5	270 19.7	274 21.7	183 18.1	146 21.4	187 19.9	1,261 15.7
Males	18 6.5	9 3.1	5 1.8	27 10.2	56 19.6	143 21.6	172 28.1	128 27.2	98 32.1	115 31.9	771 20.3
Females	9 3.4	3 1.1	7 2.7	20 7.8	47 15.4	127 18.0	102 15.7	55 10.1	48 12.7	72 12.7	490 11.6

TABLE 3 *(see page 16)*
CRUDE AND AGE-ADJUSTED TUBERCULOSIS RATES BY HEALTH DISTRICTS
NEW YORK CITY, 1992 - 2001

	Rates per 100,000 population											
Health District	*Cases*	*2001 Crude*[1]	*2001 Age-Adjusted*[2]	*2000 Age-Adjusted*[2]	*1999 Age-Adjusted*[2]	*1998 Age-Adjusted*[2]	*1997 Age-Adjusted*[2]	*1996 Age-Adjusted*[2]	*1995 Age-Adjusted*[2]	*1994 Age-Adjusted*[2]	*1993 Age-Adjusted*[2]	*1992 Age-Adjusted*[2]
Total Manhattan	**257**	**16.7**	**15.7**	**17.1**	**20.8**	**22.6**	**28.2**	**38.9**	**39.7**	**51.6**	**58.0**	**79.7**
Central Harlem	30	24.2	25.0	35.5	43.6	63.7	61.6	113.2	115.3	121.6	181.7	240.2
East Harlem	29	21.3	21.1	19.3	21.7	28.3	35.2	45.4	60.3	71.5	73.1	95.8
Kips Bay-Yorkville	12	5.0	3.9	7.2	3.5	11.1	10.3	9.3	10.9	14.8	14.4	19.1
Lower East Side	56	23.1	20.3	24.5	32.1	30.4	40.0	45.7	51.3	74.8	69.5	101.5
Lower West Side	53	17.1	15.1	13.2	15.1	15.0	22.7	33.3	29.9	45.9	44.8	77.9
Riverside	28	13.8	12.2	11.4	17.1	10.5	21.4	21.8	32.0	41.1	59.0	72.1
Washington Heights	49	17.6	18.2	19.6	25.5	31.0	31.7	51.4	36.6	49.1	52.9	60.9
Total Bronx	**176**	**13.2**	**14.6**	**18.6**	**20.2**	**25.5**	**28.9**	**31.2**	**38.3**	**50.4**	**57.5**	**69.2**
Fordham-Riverdale	31	11.7	12.4	21.4	18.8	28.2	18.1	29.0	24.5	34.6	27.5	37.8
Morrisania	23	13.7	15.7	20.1	28.9	41.9	47.4	35.7	75.4	74.4	109.3	96.5
Mott Haven	37	26.7	31.3	15.9	26.2	33.9	47.7	61.9	61.3	87.7	107.8	168.2
Pelham Bay	15	6.1	6.1	8.1	9.6	12.3	13.1	8.1	13.3	21.1	20.1	20.3
Tremont	31	14.4	16.8	31.9	30.0	33.4	45.2	47.6	56.7	88.5	76.0	105.8
Westchester	39	12.9	13.4	12.3	10.9	13.5	13.9	16.7	26.0	19.8	34.0	35.8
Total Brooklyn	**392**	**15.9**	**17.4**	**19.5**	**23.5**	**24.1**	**28.0**	**30.5**	**42.3**	**49.7**	**54.7**	**58.0**
Bay Ridge	37	13.6	13.4	14.2	18.4	15.3	13.5	12.7	20.2	18.6	20.1	15.9
Bedford	44	19.1	20.7	32.0	34.0	41.6	48.2	54.8	68.4	82.3	89.1	107.5
Brownsville	54	17.9	19.3	18.0	22.3	28.0	32.0	33.4	51.8	58.9	54.2	71.6
Bushwick	39	20.1	23.7	20.6	24.6	26.8	29.1	45.8	61.1	72.8	83.3	83.1
Flatbush	70	13.1	13.7	20.4	20.8	20.6	23.0	22.5	32.1	36.0	39.2	36.6
Fort Greene	36	23.6	24.6	25.8	25.6	33.3	32.6	37.5	57.9	88.5	110.3	120.1
Gravesend	39	12.6	12.1	9.4	16.9	14.9	18.5	14.3	20.2	23.6	21.9	20.4
Red Hook-Gowanus	18	16.2	15.2	12.2	18.1	14.3	22.1	25.0	25.7	34.3	49.6	48.7
Sunset Park	34	17.4	18.7	21.5	15.1	24.7	23.1	24.7	31.1	29.3	29.8	27.7
Williamsburg-Greenpoint	21	12.8	14.4	15.1	19.3	13.7	23.1	24.0	30.3	45.6	52.2	59.3
Total Queens	**408**	**18.3**	**18.0**	**16.3**	**21.3**	**20.6**	**20.1**	**23.4**	**27.4**	**29.4**	**27.7**	**29.1**
Astoria-L.I.C.	55	20.3	18.5	16.6	32.3	27.5	27.2	24.7	32.8	38.7	29.5	35.3
Corona	129	35.3	34.0	28.0	40.4	34.0	29.0	42.6	45.3	39.5	44.5	56.3
Flushing	82	16.5	16.1	16.6	16.7	15.1	18.9	16.4	19.9	18.4	17.3	14.6
Jamaica East	62	16.4	16.7	12.2	19.3	16.8	18.1	28.3	28.7	35.9	33.7	34.0
Jamaica West	54	12.8	13.1	10.6	14.7	18.0	13.9	18.7	23.5	26.2	25.2	21.5
Maspeth-Forest Hills	26	8.8	8.5	11.4	11.7	11.7	12.5	12.3	10.6	20.4	18.5	12.3
Staten Island	**27**	**6.1**	**6.2**	**7.5**	**8.9**	**6.6**	**8.7**	**7.7**	**10.4**	**17.7**	**15.3**	**17.8**
TOTAL NYC[3]	**1,261**	**15.7**	**15.7**	**18.2**	**19.9**	**21.3**	**23.6**	**28.0**	**33.4**	**40.9**	**44.2**	**52.0**

[1] *2000 and 2001 crude rates by health district and borough are based on the 2000 Census*
[2] *1992 - 1999 age-adjusted rates are based on 1990 Census figures and 2000 - 2001 age-adjusted rates are based on 2000 Census figures for New York City by the method of direct adjustment.*
[3] *2001 Health district totals do not add to 2001 NYC total because one patient is not assigned to a NYC health district.*

TABLE 4 *(see page 16)*
TUBERCULOSIS CASES BY AREA OF BIRTH, HIV STATUS, AND SMEAR STATUS
NEW YORK CITY, 2001

Health District	*Country of Birth*[1] *U.S.-Born* #	*U.S.-Born* %	*Non-U.S.-Born* #	*Non-U.S.-Born* %	*HIV-Infected Cases* #	*HIV-Infected Cases* %	*Crude Rate of Sputum Smear-Positive Cases*[2]	*Sputum Smear-Positive Cases per 100,000*
Total Manhattan	**101**	**39.3**	**152**	**59.1**	**50**	**19.5**	**110**	**7.2**
Central Harlem	21	70.0	9	30.0	8	26.7	15	12.1
Harlem	14	48.3	15	51.7	9	31.0	14	10.3
Kips Bay-Yorkville	4	33.3	8	66.7	1	8.3	3	1.2
Lower East Side	13	23.2	42	75.0	2	3.6	27	11.1
Lower West Side	19	35.8	33	62.3	11	20.8	19	6.1
Riverside	13	46.4	15	53.6	13	46.4	12	5.9
Washington Heights	17	34.7	30	61.2	6	12.2	20	7.2
Total Bronx	**85**	**48.3**	**86**	**48.9**	**41**	**23.2**	**53**	**4.0**
Fordham-Riverdale	8	25.8	22	71.0	0	0.0	10	3.8
Morrisania	13	56.5	8	34.8	8	34.8	5	3.0
Mott Haven	25	67.6	10	27.0	12	32.4	8	5.8
Pelham Bay	6	40.0	9	60.0	2	13.0	5	2.0
Tremont	17	54.8	14	45.2	8	25.8	13	6.0
Westchester	16	41.0	23	59.0	11	28.2	12	4.0
Total Brooklyn	**139**	**35.5**	**245**	**62.5**	**55**	**14.0**	**141**	**5.7**
Bay Ridge	4	10.8	33	89.2	3	8.1	12	4.4
Bedford	24	54.5	20	45.5	13	29.5	14	6.1
Brownsville	35	64.8	18	33.3	11	20.4	14	4.6
Bushwick	8	20.5	30	76.9	2	5.0	17	8.8
Flatbush	14	20.0	54	77.0	9	12.9	25	4.7
Fort Greene	20	55.6	14	38.9	8	22.2	16	10.5
Gravesend	5	12.8	34	87.2	4	10.3	16	5.2
Red Hook-Gowanus	10	55.6	8	44.4	2	11.1	6	5.4
Sunset Park	7	20.6	27	79.4	0	0.0	12	6.1
Williamsburg-Greenpoint	12	57.1	7	33.3	3	14.3	9	5.5
Total Queens	**76**	**18.6**	**331**	**81.1**	**27**	**6.6**	**138**	**6.2**
Astoria-L.I.C.	4	7.3	51	92.7	1	1.8	22	8.1
Corona	18	14.0	111	86.0	5	4.8	39	10.7
Flushing	7	8.5	75	91.5	4	4.9	27	5.4
Jamaica East	22	35.5	40	64.5	7	15.6	21	5.6
Jamaica West	19	35.2	35	64.8	6	13.6	23	5.5
Maspeth-Forest Hills	6	23.1	19	43.1	4	15.4	6	2.0
Staten Island	**11**	**40.7**	**16**	**59.3**	**3**	**11.1**	**11**	**2.5**
Total NYC	**412**	**32.7**	**831**	**65.9**	**184**	**14.6**	**453**	**5.7**

[1] *18 cases had an unknown country of birth*

TABLE 5 *(see page 19)*
TUBERCULOSIS CASES BY AGE AND AREA OF ORIGIN
NEW YORK CITY, 2001

	Age Groups										
Area of Origin	*0–4*	*5–9*	*10–14*	*15–19*	*20–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65+*	***Total***
Africa[1]	1	0	0	7	5	24	25	8	3	1	74
Far East Asia[2]	0	0	1	3	13	38	37	24	20	40	176
Canada	0	0	0	0	0	1	0	0	0	0	1
Caribbean[3]	0	2	0	3	9	28	43	17	12	17	131
Central/S. Amer.[4]	2	1	3	12	36	82	47	20	12	20	235
Europe[5]	0	0	0	0	6	4	8	7	3	15	43
Indo/Pakistan[6]	2	3	2	6	15	32	18	12	14	11	115
Middle East[7]	0	0	0	0	1	1	0	2	1	0	5
Southeast Asia[8]	0	0	1	3	2	9	10	9	9	8	51
Oceania	0	0	0	0	0	0	0	0	0	0	0
TOTAL NON-U.S.	**5**	**6**	**7**	**34**	**87**	**219**	**188**	**99**	**74**	**112**	**831**
U.S.*	22	6	5	12	15	45	73	73	51	58	360
PUERTO RICO	0	0	0	1	1	6	9	8	18	9	52
TOTAL U.S.	**22**	**6**	**5**	**13**	**16**	**51**	**82**	**81**	**69**	**67**	**412**
UNKNOWN	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**3**	**3**	**8**	**18**
TOTAL	27	12	12	47	103	270	274	183	146	187	1,261

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

[1] Nigeria (13), Ghana (9), Guinea (8), Sierra Leone (6), Senegal (5), Egypt (4), Mali (4), Zaire (4), Other (21)
[2] China (128), Korea (34), Hong Kong (8), Other (6)
[3] Haiti (51), Dominican Republic (49), Trinidad & Tobago (13), Jamaica (9), Cuba (4), Other (5)
[4] Ecuador (83), Mexico (52), Peru (21), Colombia (17), Guyana (16), Honduras (15), El Salvador (10), Guatamala (5), Brazil (7), Other (9)
[5] Poland (7), Russia, (5) Yugoslavia (5), Other (26)
[6] India (51), Bangladesh (28), Pakistan (25), Nepal (7), Other (4)
[7] Yemen (4), Turkey (1)
[8] Philippines (25), Vietnam (11), Myanmar (5), Indonesia (5), Other (5)

TABLE 6 *(see page 20)*
TUBERCULOSIS CASES BY PRIMARY SITE OF DISEASE
NEW YORK CITY, 2001

	Number of Cases	*(%)*
Pulmonary	936	(74.2)
Lymphatic	145	(11.5)
Pleural	49	(3.9)
Bone/Joint	30	(2.4)
Miliary	23	(1.8)
Genitourinary	19	(1.5)
Peritoneal	16	(1.3)
Meningeal	10	(0.8)
Other	33	(2.6)
Total	**1,261**	**(100.0)**
Tuberculosis cases by all sites of disease		
Only Pulmonary disease	874	(69.3)
Only Extrapulmonary disease	281	(22.3)
Both Pulmonary and Extrapulmonary	106	(8.4)
Total	**1,261**	**(100.0)**

TABLE 7 *(see page 22)*
FIRST-LINE DRUG RESISTANCE BY AREA OF ORIGIN
NEW YORK CITY, 2001

	N (%)			
	Total	*U.S.-born*[1]	*Non-U.S.-born*	*Unknown*
Positive culture for *M. tuberculosis (% of total cases)*	964 (76.4)	303 (73.5)	649 (78.1)	12 (66.7)
Tested for susceptibility to first-line drugs of those with positive cultures (% of those with positive culture for *M. tuberculosis*)	927 (96.2)	288 (95.0)	630 (97.1)	9 (75.0)
Susceptibility results (% of those tested for susceptibility to first-line drugs)				
Multidrug-resistant (resistant to at least isoniazid & rifampin)	24 (2.6)	13 (4.5)	11 (1.7)	0 (0.0)
Isoniazid-resistant and rifampin-susceptible	64 (6.9)	14 (4.9)	49 (7.8)	1 (11.1)
Resistant to first-line drugs other than isoniazid & rifampin	54 (5.8)	10 (3.5)	43 (6.8)	1 (11.1)
Resistant to rifampin only	5 (0.5)	0 (0.0)	5 (0.8)	0 (0.0)
Susceptible to all first-line drugs	780 (84.1)	251 (87.1)	522 (82.9)	7 (77.8)

[1] *Includes Puerto Rico and U.S. Virgin Islands*

TABLE 8 *(see page 25)*
SOCIAL CHARACTERISTICS OF TUBERCULOSIS CASES
NEW YORK CITY, 2001

Social characteristic[1]	*# (%) of total cases for whom information is available*	*# reporting characteristic (% of cases with available information*
Injection drug use in 12 months before diagnosis	1,159 (91.9)	32 (2.8)
Non-injection drug use in 12 months before diagnosis	1,161 (92.1)	84 (7.2)
Alcohol abuse in 12 months before diagnosis	1,164 (92.3)	134 (11.5)
Homeless at diagnosis or any time during treatment	1,261 (100.0)	51 (4.0)
Resident of correctional facility at time of diagnosis	1,261 (100.0)	29 (2.3)
Resident of long-term care facility at time of diagnosis	1,260 (99.9)	31 (2.5)
Employed in 24 months before diagnosis	1,149 (91.1)	433 (37.7)
Health care or correctional facility worker in 24 months before diagnosis	1,149 (91.1)	37 (3.2)

[1] *Categories not mutually exclusive*

TABLE 9 *(see page 25)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX AND AGE
NEW YORK CITY, 2001

	N (%)								
	Females			*Males*			*Total*		
Age	*HIV(+)*	*HIV(–)*	*NA*[1]	*HIV(+)*	*HIV(–)*	*NA*[1]	*HIV(+)*	*HIV(–)*	*NA*[1]
0-4	0 (0.0)	7 (77.8)	2 (22.2)	0 (0.0)	9 (50.0)	9 (50.0)	0 (0.0)	16 (59.3)	11 (40.7)
5-9	0 (0.0)	0 (38.5)	3 (100.0)	0 (0.0)	4 (44.4)	5 (55.6)	0 (0.0)	4 (33.3)	8 (66.7)
10-14	0 (0.0)	4 (57.1)	3 (42.9)	0 (0.0)	1 (20.0)	4 (80.0)	0 (0.0)	5 (41.7)	7 (58.3)
15-19	0 (0.0)	11 (55.0)	9 (45.0)	0 (0.0)	3 (11.1)	24 (88.9)	0 (0.0)	14 (29.8)	33 (70.2)
20-24	2 (4.3)	30 (63.8)	15 (31.9)	2 (3.6)	41 (73.2)	13 (23.2)	4 (3.9)	71 (68.9)	28 (27.2)
25-34	21 (16.5)	78 (61.4)	28 (22.0)	19 (13.3)	79 (55.2)	45 (31.5)	40 (14.8)	157 (58.1)	73 (27.0)
35-44	25 (24.5)	50 (49.5)	27 (26.5)	52 (30.2)	79 (45.9)	41 (23.8)	77 (28.1)	129 (47.1)	68 (24.8)
45-54	11 (20.0)	24 (43.6)	20 (36.4)	32 (25.0)	59 (46.1)	37 (28.9)	43 (23.5)	83 (45.4)	57 (31.1)
55-64	4 (8.3)	19 (39.6)	25 (52.1)	12 (12.2)	40 (40.8)	46 (46.9)	16 (11.0)	59 (40.4)	71 (48.6)
65+	2 (2.8)	19 (26.4)	51 (70.8)	2 (1.7)	35 (30.4)	78 (67.8)	4 (2.1)	54 (28.3)	129 (69.0)
TOTAL	65 (13.3)	242 (49.4)	183 (37.3)	119 (15.4)	350 (45.4)	302 (39.2)	184 (14.6)	592 (46.9)	485 (38.5)

[1] *Not available*

TABLE 10 *(see page 25)*
HIV STATUS OF TUBERCULOSIS CASES BY SEX AND AREA OF ORIGIN
NEW YORK CITY, 1992 - 2001

			N (%)		
Year	*Females HIV (+)*	*Males HIV (+)*	*U.S.-Born HIV (+)*	*Non-U.S.-Born HIV (+)*	*Total*[1]
1992	297 (25.1)	983 (37.4)	1,294 (42.6)[2]	118 (16.5)[2]	1,281 (33.6)
1993	308 (27.5)	760 (35.9)	958 (38.4)	110 (14.9)	1,068 (33.0)
1994	244 (23.5)	767 (39.2)	852 (42.9)	147 (15.4)	1,011 (33.8)
1995	226 (25.4)	575 (37.0)	658 (46.9)	139 (13.8)	801 (32.8)
1996	204 (26.0)	429 (33.8)	490 (45.9)	124 (13.4)	633 (30.8)
1997	147 (21.8)	301 (28.5)	323 (39.4)	122 (13.4)	448 (25.9)
1998	108 (18.6)	238 (24.4)	250 (35.7)	96 (11.3)	346 (22.2)
1999	102 (18.3)	219 (24.3)	216 (35.7)	102 (12.2)	321 (22.0)
2000	74 (14.1)	167 (20.6)	159 (31.1)	77 (9.6)	241 (18.1)
2001	65 (13.3)	119 (15.4)	123 (29.9)	60 (7.2)	184 (14.6)

[1] *Total HIV infected cases may be more than sum of U.S. and non-U.S.-born HIV infected cases because area of origin is unknown for some cases*
[2] *Breakdown by area of origin for 1992 is estimated, exact figures are not available.*

TABLE 11 *(see page 26)*
TREATMENT COMPLETION FOR ACTIVE TUBERCULOSIS CASES DIAGNOSED IN 2000
NEW YORK CITY

Outcome	*Number of Cases*	*Percent*
Treatment completed in ≤ 365 days[1]	988	88.8
Treatment completed in >365 days	37	3.3
Still in Treatment	39	3.5
Refused/Stopped Treatment	13	1.2
Lost	30	2.7
Moved [2]	16	1.4
Total	**1,123** [3]	**100.0**

[1] *Currently recommended treatment regimens for most patients can be completed within 365 days.*
[2] *Patients are categorized as moved only if their transfer to another jurisdiction is confirmed and no further follow-up information is available.*
[3] *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*

TABLE 12 *(see page 31)*
EPIDEMIOLOGIC INVESTIGATIONS OF TB EXPOSURE IN CONGREGATE SETTINGS
NEW YORK CITY, 2001, (N=23[1])

Site	*Close Contacts*					*Other-than-close contacts*					*Self-Referred*			*Transmission*
	Identified[1] #	*Tested* #	(%)	*Positive* #	(%)	*Identified* #	*Tested* #	(%)	*Positive* #	(%)	*Tested* #	*Positive* #	(%)	
Worksites														
Bank	23	21	(91)	12	(57)	20	14	(70)	8	(57)	5	0	(0)	Probable
Grocery store	20	15	(75)	6	(40)	33	19	(58)	5	(26)	4	3	(75)	Probable
Factory	27	16	(59)	7	(44)	37	23	(62)	10	(43)	0	0	(0)	Possible
Hair Salon	32	25	(78)	11	(44)	0	0	(0)	0	(0)	4	0	(0)	Unlikely[2]
Bank	9	9	(100)	1	(11)	10	10	(100)	1	(10)	0	0	(0)	Unlikely
Hospital	64	19	(28)	0	(0)	251	2	(1)	1	(50)	0	0	(0)	Unlikely
Magazine Publisher	61	45	(74)	2	(4)	0	0	(0)	0	(0)	0	0	(0)	Unlikely
School														
Elementary School	30	17	(57)	5	(29)	194	21	(11)	2	(10)	6	1	(17)	Probable
High School	41	23	(56)	4	(17)	139	77	(55)	5	(6)	43	5	(12)	Probable
Adult Education	18	16	(89)	8	(50)	0	0	(0)	0	(0)	4	0	(0)	Unlikely
Elementary School	16	12	(75)	0	(0)	5	3	(60)	0	(0)	0	0	(0)	Unlikely
Elementary School	31	22	(71)	1	(5)	0	0	(0)	0	(0)	0	0	(0)	Unlikely
High School	50	30	(60)	3	(10)	21	20	(95)	1	(5)	10	1	(10)	Unlikely
High School	70	44	(63)	1	(2)	16	15	(94)	1	(7)	80	3	(4)	Unlikely
High School	8	6	(75)	0	(0)	118	44	(37)	0	(0)	38	2	(5)	Unlikely
Junior High School	210	164	(78)	3	(2)	225	214	(95)	8	(4)	1	0	(0)	Unlikely
Junior High School	124	81	(65)	10	(12)	0	0	(0)	0	(0)	0	0	(0)	Unlikely
School for Disabled Adults	16	9	(56)	0	(0)	16	15	(94)	0	(0)	0	0	(0)	Unlikely
High School	48	19	(40)	1	(5)	123	13	(11)	3	(23)	0	0	(0)	Unable to Determine
High School	85	34	(40)	2	(6)	29	18	(62)	1	(6)	6	1	(17)	Unable to Determine
School Bus	74	32	(43)	2	(6)	0	0	(0)	0	(0)	0	0	(0)	Unable to Determine
Day care center	7	7	(100)	0	(0)	14	14	(100)	0	(0)	1	0	(0)	Unable to Determine
Other														
Place of worship	35	24	(69)	12	(50)	0	0	(0)	0	(0)	1	0	(0)	Probable
Total	**1,099**	**689**	(63)	**91**	(13)	**1,251**	**522**	(42)	**46**	(9)	**203**	**16**	(8)	

[1] *Excludes one investigation of a tuberculosis cluster.*
[2] *Contacts were all from countries with high prevalence of tuberculosis.*

APPENDIX

U.S. Centers for Disease Control and Prevention's Objectives for Tuberculosis Control Programs

The U.S. 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.

NOTES:

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

Patient Care Services Unit
Tuberculosis Control Program
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-9936

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

DOHMH CHEST CLINICS

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

MANHATTAN

Chelsea Chest Center
303 9th Avenue, Room 137
New York, NY 10031
Tel. (212) 239-0919/1419/1866

Washington Heights Chest Center
600 West 168th St. Third Floor
New York, NY 10032
Tel. (212) 368-4500

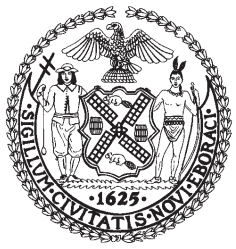
QUEENS

Corona Chest Center
34-33 Junction Blvd., 2nd floor
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



THE CITY OF NEW YORK
DEPARTMENT OF HEALTH AND MENTAL HYGIENE

Michael R. Bloomberg
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