2002 Information Summary

Bureau of Tuberculosis Control

New York City

Department of Health and Mental Hygiene

Pathway to TB Control is

Directly Observed Therapy

NYC Health
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New York City Department of Health and Mental Hygiene Bureau of Tuberculosis Control Mission Statement

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

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

1. Ensuring that suspected and confirmed cases of TB identified in all facilities in New York City are reported to the Bureau 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.

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.

7. Collaborating with community-based organizations and health and social agencies in New York City and New York State to improve case-finding and the prevention and control of TB through education, outreach, and targeted screening in communities at high risk for TB.

New York City Department of Health and Mental Hygiene

Bureau of Tuberculosis Control

Information Summary: 2002

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Table of Contents

Executive Summary

Tuberculosis (TB) in New York City has been declining since the peak of the recent epidemic in 1992. Despite this recent progress, New York City's case rate remains 2.6 times higher than the national rate. Efforts to further reduce TB must not only include the successful identification and treatment of new cases of tuberculosis, but also the prevention of disease in individuals with latent tuberculosis infection (LTBI). This is best done through collaborations between the Department of Health and Mental Hygiene (DOHMH), health care providers, and community groups. The following report describes the current state of tuberculosis control in New York City.

Accomplishments and Challenges

- In 2002, TB cases declined for the tenth consecutive year with the 1,084 cases representing a 14.0% decrease since 2001. Both the number of cases and case rate (13.5 per 100,000) are the lowest ever recorded in New York City. The steep decrease in new cases reported in 2002 is in part due to changes in TB case counting methods in New York City. See the footnote on page 6 for a more detailed explanation of this change.
- The percent of eligible patients on directly observed therapy (DOT) increased from 64.3% in 2001 to 67.4%, halting a three-year decline in DOT levels.
- The number of patients with isolates resistant to at least one anti-tuberculosis medication decreased 12.9% (from 147 in 2001 to 128 in 2002). The number of patients with multidrug-resistant tuberculosis (MDRTB) is 93.9% lower than at the peak of the recent epidemic in 1992.
- While 94.2% of 2001 TB cases eventually completed treatment, 86.7% completed within one year.
- Of contacts to sputum acid-fast bacilli (AFB) smear-positive cases counted in 2001, 85.3% were evaluated; although this is an increase, the rate falls short of the Centers for Disease Control and Prevention (CDC) goal of 95%.
- The percent of contacts completing treatment for LTBI among those who started treatment increased from 48.7% in 2000 to 58.1% in 2001, remaining short of the CDC goal of 85%.

Profile of New York City's Tuberculosis Cases in 2002

- Non-Hispanic Blacks comprise the largest proportion of tuberculosis cases (33.2% of all cases) while Asians have the highest case rate (39.0 per 100,000).
- Central Harlem health center district had the highest case rate (38.0 per 100,000) while Corona had the second highest rate in 2002 (28.5 per 100,000).
- Among cases with a known place of origin, 65.9% were born outside the United States. The largest numbers of non-U.S.-born cases were from China, Ecuador, the Dominican Republic, India, and Haiti.
- Documented HIV infection among tuberculosis patients increased from 14.6% in 2001 to 17.8% in 2002. This increase was primarily among males and U.S.-born patients.

Bureau of Tuberculosis Control Activities in 2002

- The Bureau provided 133,001 patient visits to 46,703 persons. The chest centers in Queens and Brooklyn accounted for more than 61% of total visits (26.3% and 35.3% respectively). The chest center in Corona had the highest number of visits (33,038), and the highest ratio of non-US born to U.S.-born patients. Corona Chest Center provided services to patients from 45 countries and was the fourth highest reporter of confirmed tuberculosis cases in the city in 2002.
- The chest centers provided care to 1,918 patients, representing 53% of all patients reported to the Bureau with suspected or confirmed TB. In addition, 16 or 59% of new MDRTB patients received all or a portion of their care at a DOHMH chest center.
- In February 2002, a multidisciplinary DOT Working Group was convened to develop strategies to increase enrollment in DOT in New York City.
- The Bureau has been collecting and analyzing DNA fingerprint results for all culture positive TB cases to track recent transmission and identify clusters since 2001, leading to one of the largest DNA fingerprint databases in the country.

- In 2002, 435 TB cases were reviewed for potential transmission in a congregate setting. The Bureau conducted 29 expanded contact investigations, a higher number than ever before; of those, there was evidence of transmission in 9 settings.
- In 2002, more than 7,000 patients started treatment for LTBI at a DOHMH chest center. As of the end of September 2003, over 3,000 (43%) have completed treatment and approximately 900 are still receiving treatment.
- In 2002, 402 immigrant and refugees to New York City who had possible signs or symptoms of tuberculosis were referred to the Bureau and 382 (95%) were evaluated; of those, 17 (4.5%) were found to have active tuberculosis.
- A total of 3,640 patients suspected or confirmed to have tuberculosis were reported to the Bureau, leading to follow-up and evaluation of many patients ultimately found not to have tuberculosis.
- The Bureau continued to work with community-based organizations and other groups in the city, providing education on TB and targeted skin testing activities. Many TB educational sessions were conducted in various settings and 304,645 TB-related print education materials were distributed.
- Several papers were published in peer-reviewed journals by Bureau staff. See Appendix 2 for a list of these publications.

Strategies for Continued Progress

In the coming year, the Bureau of Tuberculosis Control will utilize the following strategies to control tuberculosis in New York City.

- Encourage more laboratories to use rapid diagnostic testing to aid the early diagnosis of tuberculosis among patients with respiratory smears positive for acid-fast bacilli and explore the use of this test among patients with AFB negative respiratory smears.
- Ensure effective and efficient treatment of tuberculosis patients by becoming the primary treatment provider for more TB patients in New York City.
- Maintain a high level of enrollment in directly observed therapy for infectious and drug-resistant tuberculosis patients.
- Provide outreach to immigrant communities at high risk for tuberculosis.
- Continue using molecular epidemiology to identify instances of transmission and to target communities at risk for infection.
- Continue initiatives aimed at increasing completion of treatment for latent tuberculosis infection among contacts and other high risk groups.

Section 1. Tuberculosis in New York City, 2002 – Accomplishments and Challenges

Significant Accomplishments

More than one third of the world's population is infected with *Mycobacterium tuberculosis*, while eight million people develop tuberculosis and two million die of the disease each year. Inadequate treatment of individuals with tuberculosis causes further spread of disease and the development of drug resistant tuberculosis.

Ensuring that individuals with tuberculosis are appropriately treated and cured is the most important way to stop the spread of tuberculosis. Identification and treatment of individuals infected with *M. tuberculosis*, but who do not yet have active tuberculosis disease, is another important way to prevent future cases of tuberculosis.

In 2002, there were many significant accomplishments in New York City.

Fewer Tuberculosis Cases (Figure 1, Table 1)

- The number of confirmed tuberculosis cases in New York City declined for the tenth consecutive year: with the lowest number of cases (1,084) and case rate (13.5 per 100,000) ever reported in New York City.[1]
- Cases decreased 14.0% since 2001 and 71.6% since the peak of the recent epidemic in 1992.
- The number of patients with multidrug-resistant tuberculosis (MDRTB), (i.e. isolates resistant to at least isoniazid and rifampin) is 93.9% lower than in 1992. The number of patients with isolates resistant to at least one anti-tuberculosis medication decreased 12.9% (from 147 in 2001 to 128 in 2002).

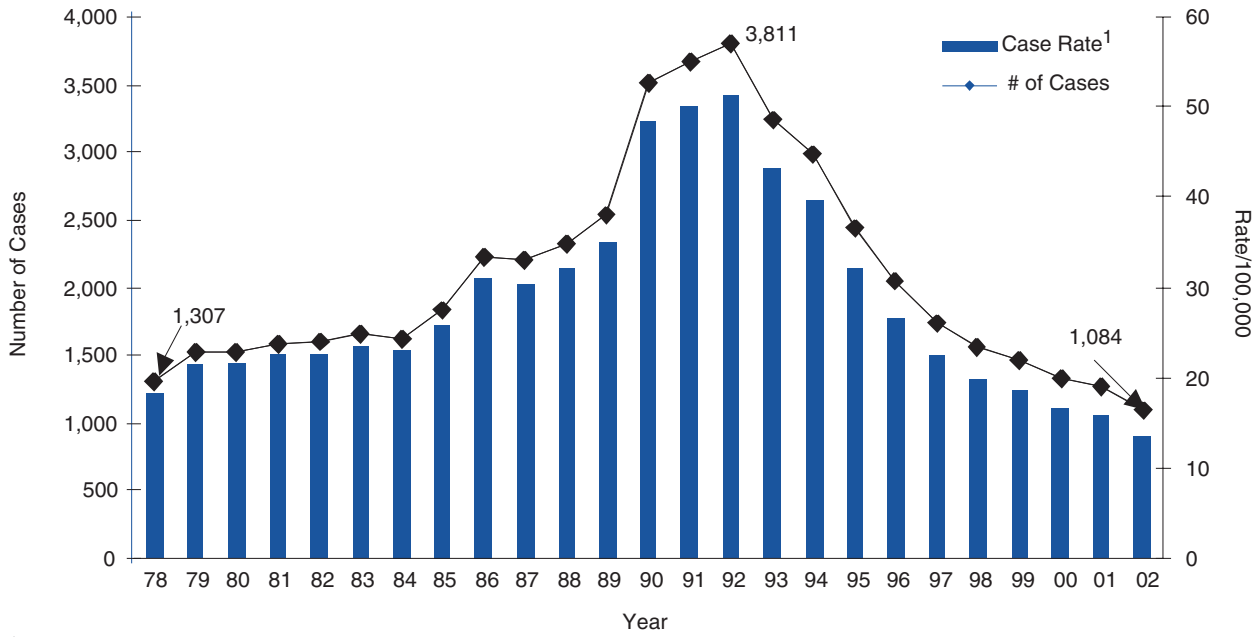
Improved Care and Prevention of Future TB Cases

- Of patients treated as outpatients and therefore eligible for DOT, the proportion of patients receiving DOT increased from 64.3% in 2001 to 67.4% in 2002.
- Among TB patients aged 25 through 44 years, 76.4% were tested for infection with the Human Immunodeficiency Virus (HIV), surpassing the CDC goal of 75%.
- The percent of contacts to sputum AFB smear-positive TB cases evaluated for tuberculosis infection and/or disease increased from 83.1% in 2000 to 85.3% in 2001.
- Treatment completion among patients with latent tuberculosis infection is improving. Of contacts starting treatment for LTBI in 2001, the percent completing treatment increased from 48.7% in 2000 to 58.1% in 2001.

1 Cases counted in 2002 were those verified during that year and reported to the Centers for Disease Control and Prevention (CDC) as confirmed cases.

In 2002 the definition of count date was changed to reflect the date the decision was made that a patient was a verified case of tuberculosis, regardless of when the patient was reported or when a specimen with a culture positive for *M. tuberculosis* was collected. Prior to 2002, individuals who had specimens submitted for mycobacteriology culture late in the year were included in that year's count if their culture was reported to be positive for any species in the *M. tuberculosis* complex (*M. tuberculosis, M. bovis* [excluding the BCG strain of *M. bovis], M. africanum, M. microti)* by January 31, of the following year. This change resulted in fewer cases being counted in December 2002, than in previous Decembers. The likely result is a larger-than-actual decrease between 2001 and 2002.

Figure 1
Tuberculosis Cases and Rates
New York City, 1978-2002



[1] Rates based on official Census data and intercensal estimates through 2000. Rates since 2000 are based on 2000 Census data.

Continuing Challenges

Tuberculosis Burden in New York City Remains Higher than the Rest of United States

- New York City's 2002 rate of 13.5 tuberculosis cases per 100,000 persons is still 2.6 times the national rate of 5.2 per 100,000 and substantially higher than the Healthy People 2010 goal of 1.0 case per 100,000.
- Only one reporting area has a higher case rate than New York City.

Numerous High Risk Groups Exist in New York City

- The proportion of tuberculosis cases known to be HIV-infected decreased steadily from 33.8% in 1994 to 14.6% in 2001 but increased to 17.8% in 2002.
- This increase was primarily among males (15.4% in 2001 and 20.4% in 2002) and U.S.-born patients (29.9% in 2001 and 35.6% in 2002).
- Most tuberculosis cases continue to occur in the non-U.S.-born population: 65.9% of TB cases reported in 2002 were non-U.S.-born, a significant increase since 1992 when 17.8% of cases were non-U.S.-born.
- TB patients came from 92 different countries and represent the many cultures and languages of New York City.

Additional Efforts Needed to Eliminate Tuberculosis

- The number of patients with isolates resistant to at least the two major anti-tuberculosis medications (MDRTB), isoniazid and rifampin, has remained stable since 2000 with 25 such cases in 2000, 24 in 2001, and 27 in 2002.
- While 94.2% of 2001 TB patients eventually completed treatment, 86.7% completed within one year, less than the CDC goal of 90.0%.
- Only 10.6% of patients treated by private providers were on DOT, although it is the standard of care.
- The proportion of contacts evaluated for tuberculosis remains below the CDC goal of 95%.
- Despite some improvement, the proportion of contacts completing treatment for latent tuberculosis infection remains considerably below the CDC goal of 85%.

Section 2. Demographic, Clinical, and Social Profile of Tuberculosis in New York City, 2002

Age Distribution (Figures 2-3, Table 2)

In areas where tuberculosis is well-controlled, the proportion of elderly cases tends to be high. In 1992, 9.6% of tuberculosis cases in New York City were aged 65 years or more. As tuberculosis control efforts in New York City were strengthened and the city's cases decreased, the proportion of elderly cases increased until 1998 when 16.0% were aged 65 years or older. Since 1998, the proportion of cases in this age group has remained fairly stable and in 2002 the proportion was 14.5%.

- Cases decreased in all but one age group since 2001. The largest decrease among adults was among those aged 25 through 34 years (19.3% decrease from 270 in 2001 to 218 in 2002).
- The case rate is highest in the group aged 35 through 44 years (19.0 per 100,000) and lowest in the group aged 5 through 9 years (0.9 per 100,000).
- Since 1992, case rates in the group aged 20 though 54 years have decreased dramatically and in recent years have been similar to case rates in the group aged 55 years and older.

Monitoring tuberculosis case rates among children is of special importance. Children are especially vulnerable to progression to active tuberculosis. Young children with tuberculosis are regarded as sentinel cases, indicating recent transmission.

- Pediatric tuberculosis cases (aged less than 20 years) decreased 19.4% from 98 in 2001 to 79 in 2002.
- The largest decrease among children was in the group aged 5 through 9 years (58.3% decrease from 12 in 2001 to 5 in 2002).
- Although the number of cases in the group aged 10 though 14 years is small, this group experienced a 25.0% increase (from 12 in 2001 to 15 in 2002).

Figure 2
Tuberculosis Cases by Age
New York City, 1992-2002

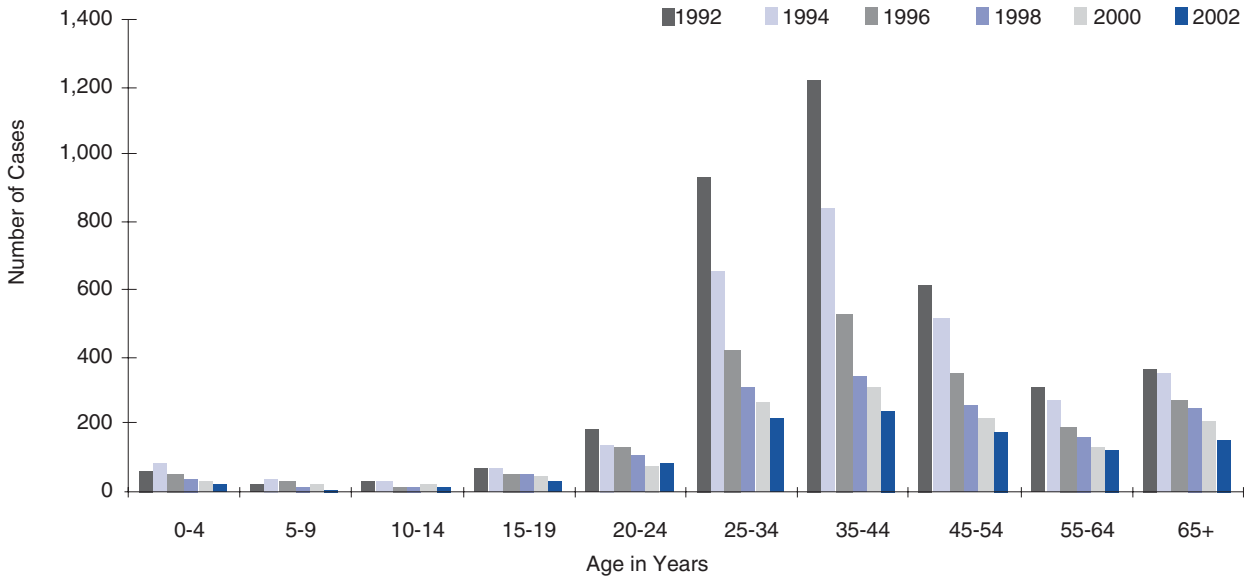
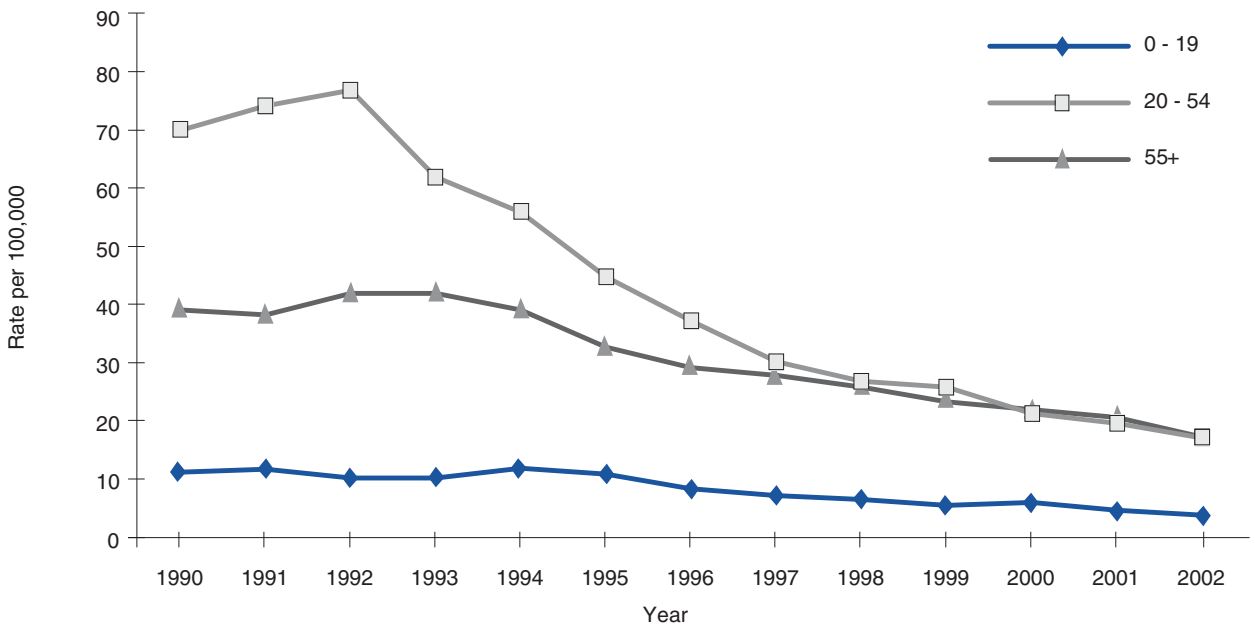


Figure 3
Tuberculosis Rates by Age Group, 1990-2002



Sex Distribution (Table 2)

As in previous years, the incidence of tuberculosis among males in 2002 was nearly twice the incidence among females: 17.6 per 100,000 among males vs. 9.9 per 100,000 among females. However, the proportion of female cases steadily increased from 27.8% in 1986 to 38.9% in 2001. In 2002, the proportion of female cases decreased slightly to 38.5% (417/1,084 cases).

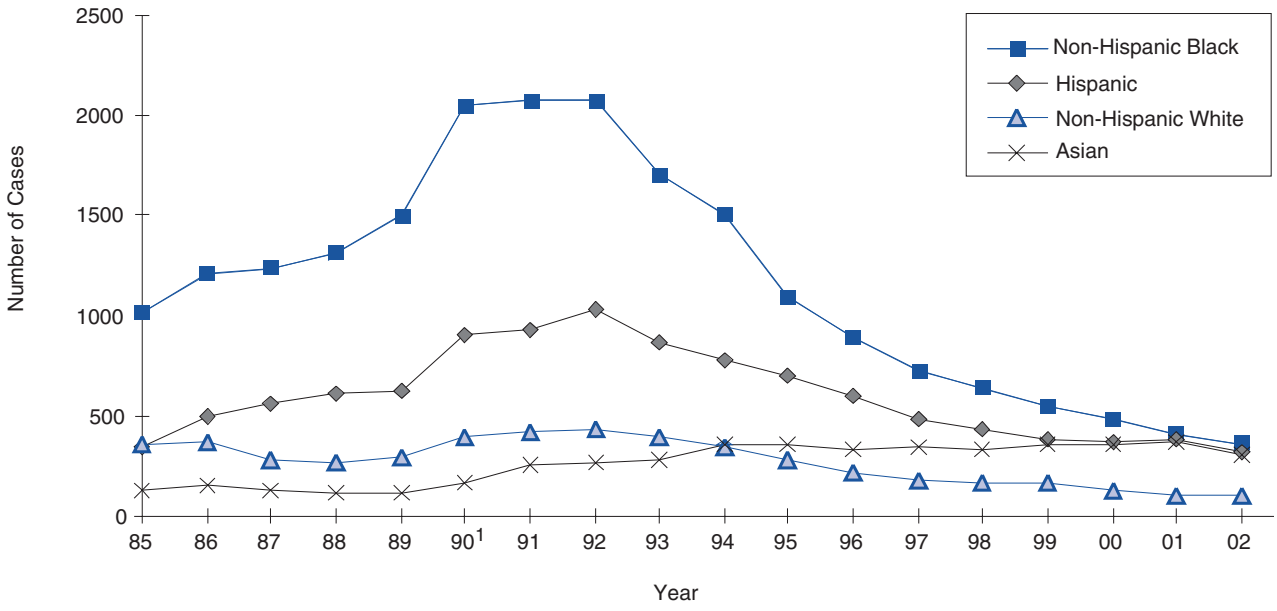
- Among males, cases decreased in all but one age group. Among adult males the largest decrease was in the group aged 55 through 64 years (20.4% decrease from 98 in 2001 to 78 in 2002).
- Male cases in the group aged 45 through 54 years increased from 128 in 2001 to 129 in 2002.
- Among male children, the largest decrease was in the group aged 5 through 9 years (88.9% decrease from 9 in 2001 to 1 in 2002).
- Among females, cases decreased in all adult age groups. The largest decrease was in the group aged 20 through 34 years (20.5% decrease from 47 in 2001 to 40 in 2002).
- Cases increased 57.9% in the youngest female age group (0 through 14 years) from 19 in 2001 to 30 in 2002.

Racial/Ethnic Distribution (Figures 4-5, Table 2)

- Non-Hispanic Blacks comprise the largest proportion of tuberculosis cases in New York City (33.2% of all cases) while non-Hispanic Whites have the smallest proportion of cases (9.7% of all cases). Hispanics comprise 29.1% of all cases and Asians comprise 28.0% of all cases.
- The highest case rate is among Asians (39.0 per 100,000) and the lowest case rate is among non-Hispanic Whites (3.7 per 100,000).
- Cases decreased in all groups in 2002 except among non-Hispanic Whites. The decrease was greatest among Hispanics (18.0% decrease from 384 in 2001 to 315 in 2002).
- Cases increased 8.2% among non-Hispanic Whites from 97 in 2001 to 105 in 2002.

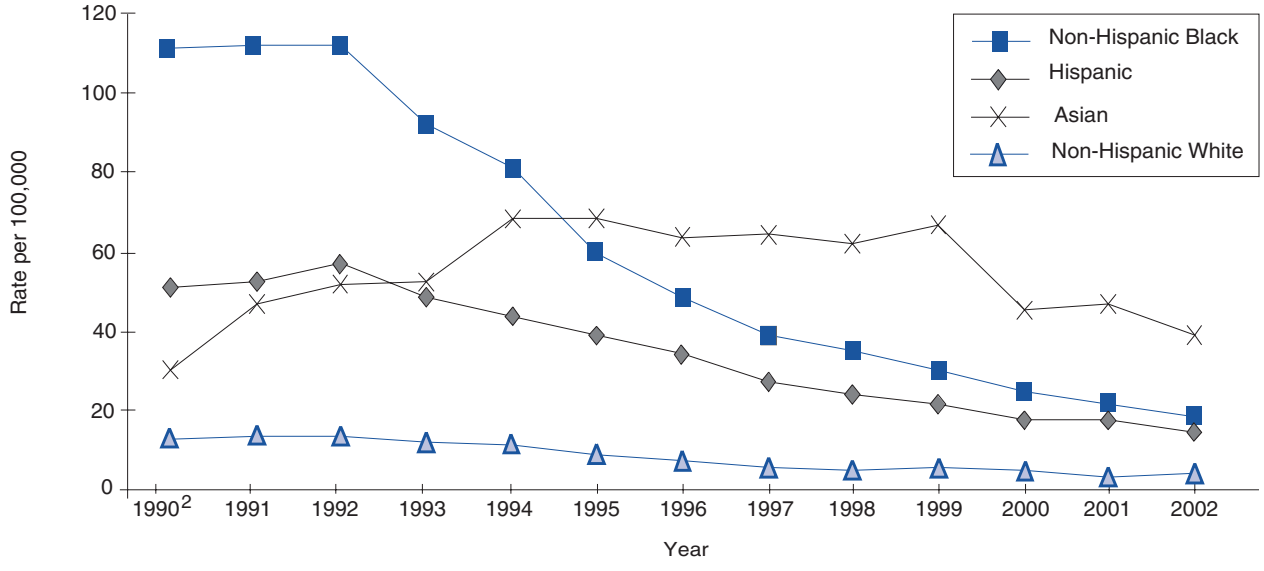
Figure 4 shows the trend in case numbers by race since 1985, the earliest year data are available for Hispanics separately from other races. While the recent epidemic occurred primarily among

Figure 4
Tuberculosis Cases by Race/Ethnicity
New York City, 1985-2002



[1] 1990 data do not include two Native American cases of tuberculosis in the 20-54 age group.

Figure 5
Tuberculosis Rates[1] by Race, 1990 - 2002



[1] Rates per 100,000 persons based on 1990 Census data prior to 2000 and 2000 Census data since 2000.
[2] 1990 data do not include two Native American cases of tuberculosis in the 20 - 54 age group.

non-Hispanic Blacks and Hispanics, the 360 cases among non-Hispanic Blacks in 2002 is well below the 2,076 seen in 1992, while the 315 cases in 2002 among Hispanics has decreased to a lesser extent from the 1,027 seen in this group in 1992. Cases among Asians increased from 272 in 1992 to 304 in 2002, surpassing non-Hispanic Whites in 1994 and most recently approaching the number of cases among Hispanics and non-Hispanic Blacks.

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 1992 (112.4 per 100,000), the case rate for Asians surpassed that of Hispanics in 1993 and that of non-Hispanic Blacks in 1995. In 2002, Asians remain the racial/ethnic group with the highest rate (39.0 in 2002). The rate for non-Hispanic Blacks continues to decrease and now approaches that of Hispanics.

Geographic Distribution (Figures 6-7, Table 3)

Trends in incidence rates by health center district of residence are presented in Table 3. Figure 6 illustrates the trend in tuberculosis cases contributed by each borough, and the proportion of non-U.S.-born cases in each borough. Figure 7 displays 2002 case counts and rates by United Hospital Fund Neighborhood, a somewhat different geographic breakdown used by some researchers.

- Cases decreased in all boroughs in 2002. The largest decrease was seen in Queens (22.1% decrease from 408 in 2001 to 318 in 2002).
- Two health center districts have notably hgher case rates, Central Harlem and Corona. Central Harlem health care district continued to have the highest case rate (38.0 per 100,000) in 2002, after dropping to the third highest case rate in 2001. Central Harlem had a 56.7% increase in cases since 2001. An increase in HIV-infected patients at a single hospital accounted for most of this increase. An investigation of this increase did not identify any community or nosocomial links.
- The Corona health center district in Queens had the second highest case rate in 2002 (28.5 per 100,000) after having the highest case rate in 2001.
- Non-U.S.-born patients made up the majority of tuberculosis cases in all boroughs but the Bronx. This proportion was highest in Queens (84.3%).
- Co-infection with HIV was most common in Manhattan where 28.8% of tuberculosis cases were also infected with HIV. This proportion was lowest in Queens (6.9%).

Figure 6
Tuberculosis Cases by Borough and Area of Birth, 1992-2002

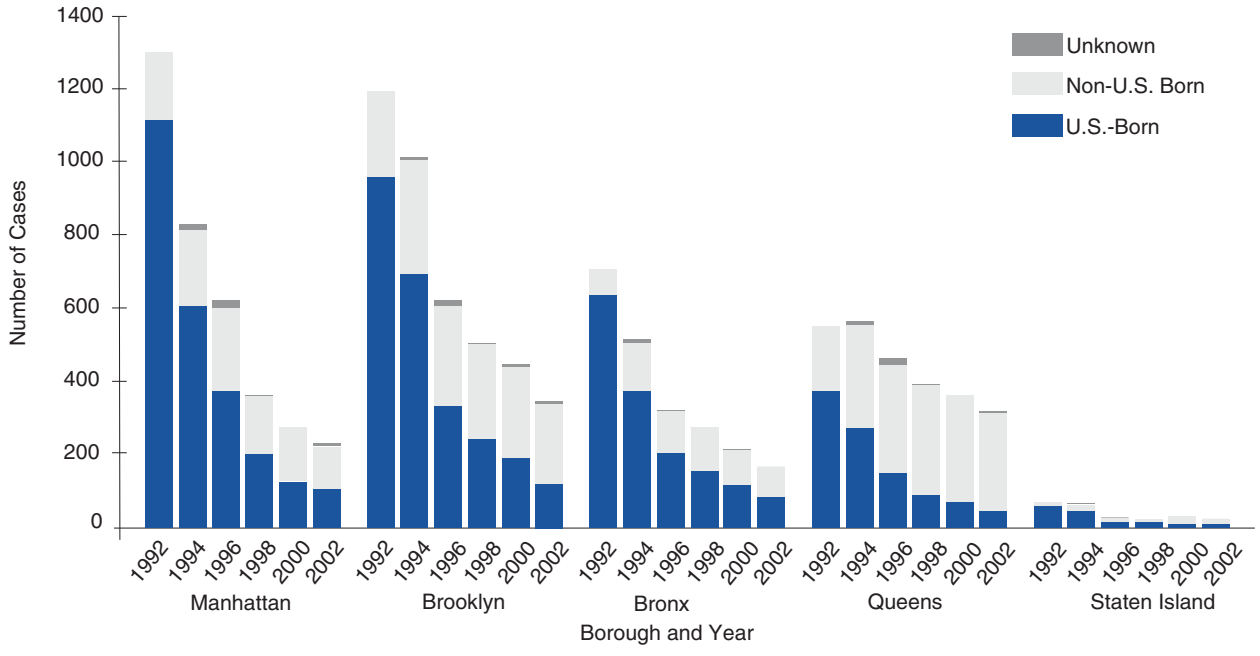
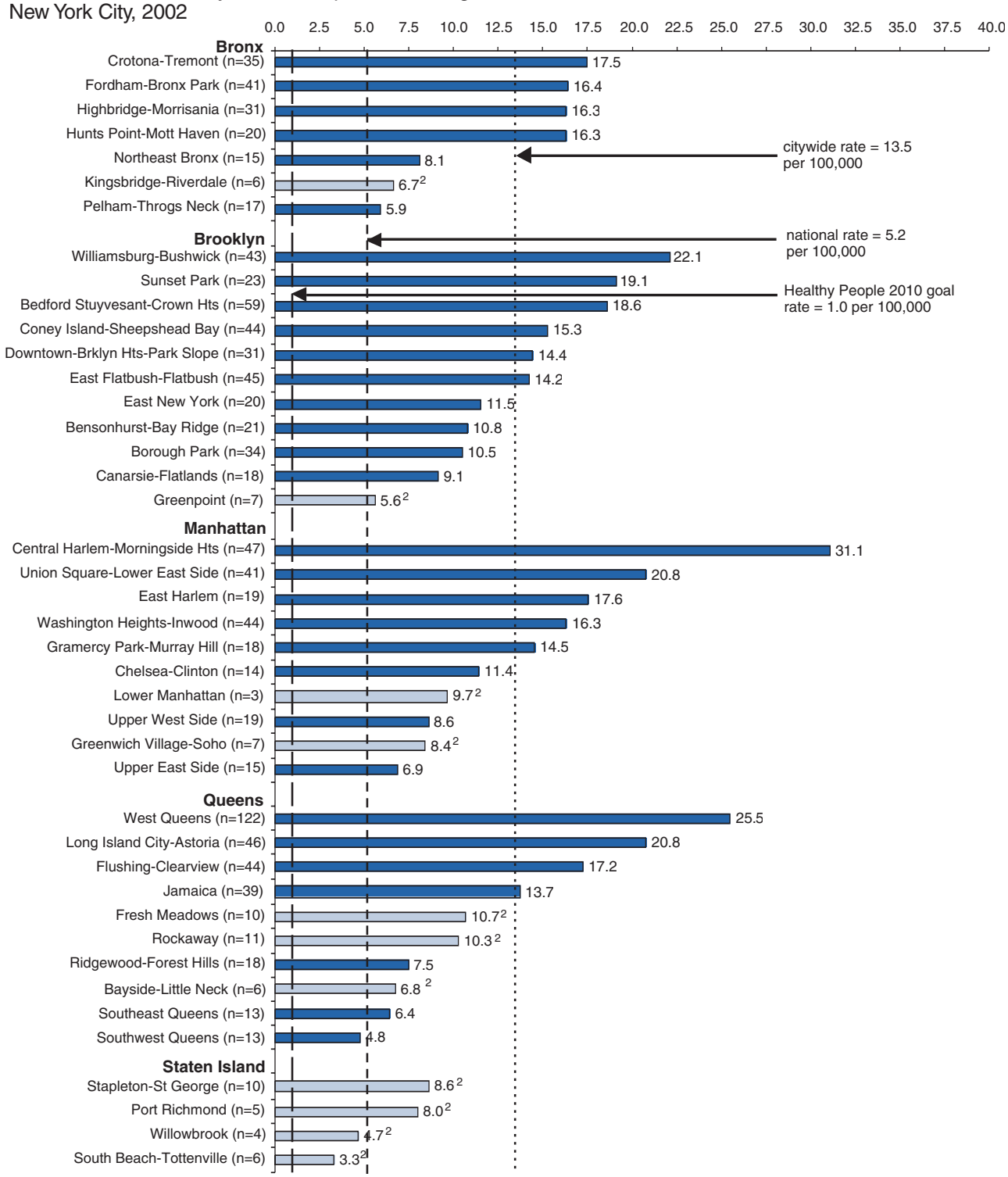


Figure 7
Rates of Tuberculosis by United Hospital Fund Neighboorhood[1]:
New York City, 2002



[1]Number of tuberculosis cases and rate per 100,000 population, by United Hospital Fund neighborhood (sorted highest to lowest by rate within each borough)

[2]Case rates in neighborhoods represented by lightly shaded bars were less precise (relative standard error greater than 30%) due to small number of cases. Caution should be used in interpreting these cases rates.

Area of Origin (Figure 8, Table 4)

In 2002, information about country of origin was available for 98.0% (1,062) of the cases. Figure 8 illustrates the trend in numbers of non-U.S.-born cases since 1980. In 1997 the number of non-U.S.-born cases surpassed the number of cases born in the United States. While the total number of U.S.-born cases is now well below the number in 1980, the number of non-U.S.-born tuberculosis cases in 2002 is more than double the number recorded in 1980.

- Among cases with a known place of origin, 65.9% were born outside the United States.
- The number of U.S.-born cases decreased 12.1% since 2001 while the number of non-U.S.-born cases decreased 15.8%.
- U.S.-born cases had the highest proportion of pediatric cases (12.2%).

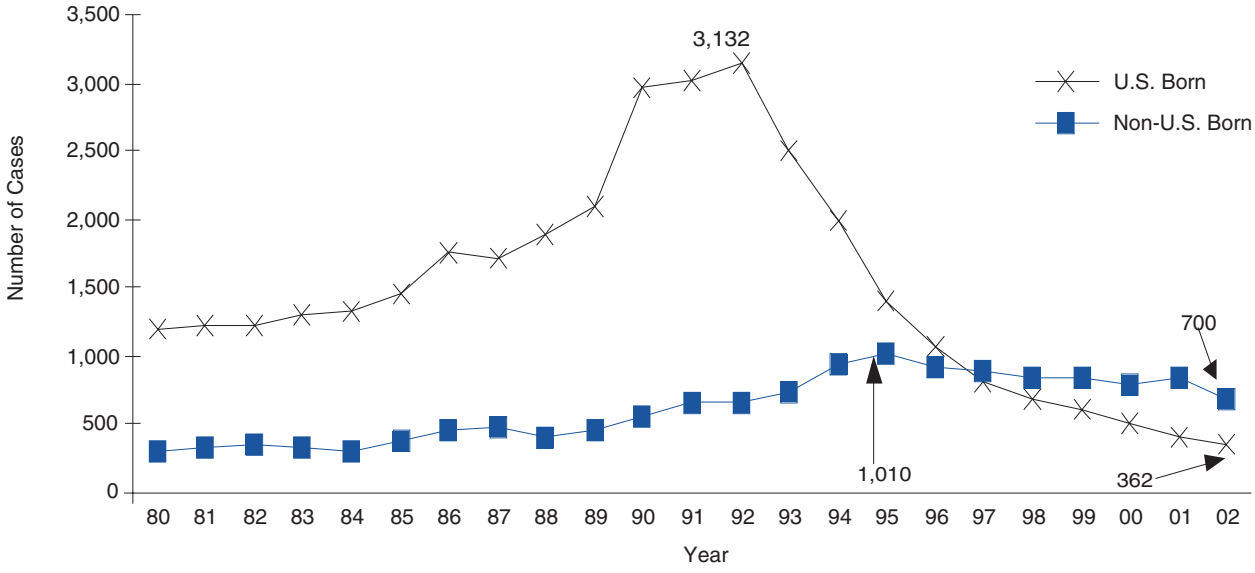
A total of 92 countries other than the United States and U.S. territories were reported as places of origin for 2002 tuberculosis cases. However, the five countries contributing the most cases made up 46.0% of all non-U.S.-born cases.

- The largest numbers of non-U.S.-born cases were from China (106), Ecuador (74), the Dominican Republic (55), India (44), and Haiti (44).
- Cases from the Dominican Republic increased 12.2% since 2001.
- Cases from Russia increased 240.0% from 5 in 2001 to 17 in 2002.

Tuberculosis among non-U.S.-born persons is often the result of infection prior to entering the United States. Differences in New York City case rates by region of birth partly reflect the varying burden of tuberculosis in other regions of the world.

- The tuberculosis rate in NYC among persons born outside the U.S. was 24.4 per 100,000 in 2002.
- The tuberculosis rate in NYC among persons from Africa was 66.0 per 100,000, while it was 42.5 per 100,000 for the Asian region, 19.8 for Latin America, and 8.3 for immigrants from Europe.
- The tuberculosis rate in NYC among U.S.-born persons was 7.0 per 100,000.

Figure 8
U.S.[1] and Non-U.S. Born Cases
New York City, 1980-2002



[1] Puerto Rico and U.S.-Virgin Islands included as U.S.-born

Clinical Characteristics (Figure 9, Tables 1, 5)

- Of cases diagnosed in 2002, 823 (75.9%) were culture positive for *M. tuberculosis*. The rest were confirmed based on the clinical case definition.
- Eight hundred fifty-four (78.8%) had pulmonary disease (either by itself or in combination with extrapulmonary disease), the form of tuberculosis that is more likely to be infectious; 230 (21.2%) only had extrapulmonary disease.
- Four hundred twenty-nine (39.6%; 5.4 per 100,000) of all 2002 cases had sputum smears positive for acid-fast bacilli, indicating a high potential for being infectious.
- Fifty-two (4.8%) cases had no positive smear or culture results, but had pathology findings suggestive of TB. This reinforces the importance of reporting by pathology laboratories of findings suggestive of tuberculosis (e.g. caseating or non-caseating granulomas).

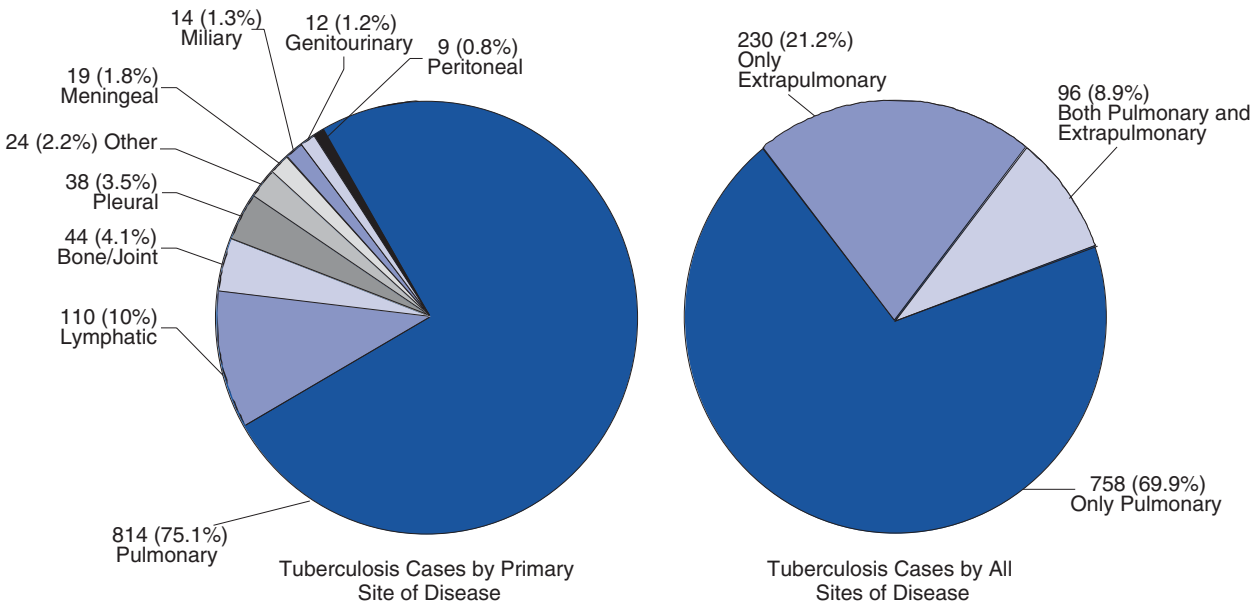
Table 5 presents the trend in reported HIV status for individuals with active tuberculosis by sex and area of birth from 1992 to 2002. Since not all individuals with tuberculosis undergo testing for HIV and not all known HIV test results are reported to the Bureau of Tuberculosis Control, the proportion of HIV-infected persons reported in this table is a minimum estimate.

- In 2002, 709 (65.4%) of 1,084 NYC tuberculosis cases were tested for infection with HIV compared to 776 (61.5%) of 1,261 cases in 2001. Among those aged 25 through 44 years, 76.4 % were tested.
- Overall, 193 (17.8%) of all NYC tuberculosis cases were infected with HIV.
- After decreasing each year since 1994, the proportion of HIV infected patients rose from 14.6% in 2001 to 17.8% in 2002.
- This increase was more pronounced among males, where HIV infection increased from 15.4% in 2001 to 20.4% in 2002. HIV-infection also increased more among U.S.-born tuberculosis cases (from 29.9% in 2001 to 35.6% in 2002).

The two main classes of drugs used to treat HIV infection, protease inhibitors (PIs) and non-nucleoside reverse transcriptase inhibitors (NNRTIs), interact with rifampin, thereby complicating the treatment of tuberculosis in HIV-infected persons. Rifampin-containing regimens (or those containing another rifamycin) 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 193 HIV-positive cases, 92 (47.7%) were on rifabutin at some time during their tuberculosis treatment.

Figure 9
Tuberculosis Cases by Site of Disease (N=1,084)
New York City, 2002

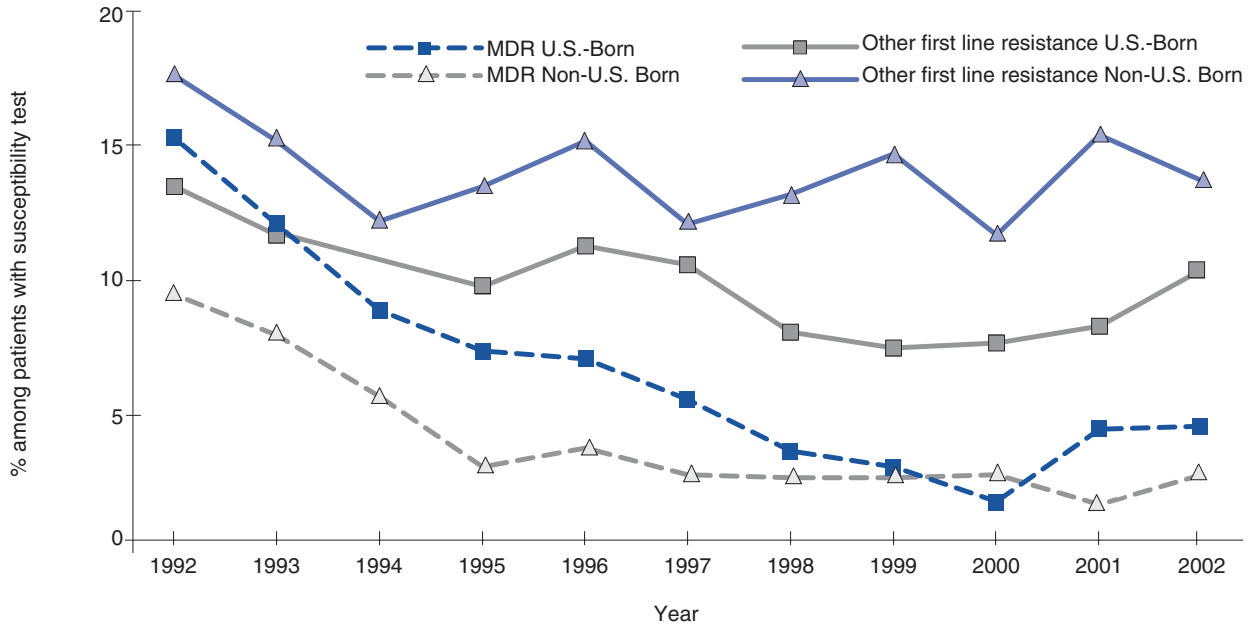


Drug Resistance (Figure 10, Table 6)

In accordance with guidelines issued by the Centers for Disease Control and Prevention (CDC) and the American Thoracic Society (ATS), the New York City Department of Health and Mental Hygiene recommends that susceptibility testing be performed on the initial isolates of 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[2] have susceptibility testing to second-line drugs[3].

- In 2002, first-line susceptibility testing was completed for 812 of 823 (98.7%) culture-confirmed cases.
- 128 (15.8%) had resistance to at least one drug compared to 147 (15.9%) in 2001.
- The number of cases with resistance to at least isoniazid and rifampin (MDRTB) increased slightly, and the percentage decreased slightly, from 24 (2.6%) in 2001 to 27 (3.3%) in 2002.
- Among MDRTB cases, 21 (77.8%) also had resistance to at least one second-line anti-tuberculosis drug.
- The number of cases with resistance to first-line anti-tuberculosis drugs, but who were not MDRTB (ODRTB) decreased from 123 (13.3%) in 2001 to 101 (12.4%) in 2002.
- Among ODRTB cases, 12 (11.9%) were also resistant to at least one second-line anti-tuberculosis drug.
- In 2002, 16 (59.3%) patients with MDR tuberculosis were women, the second year in a row that female MDR cases outnumbered males.
- Although 15 (55.6%) patients with MDR tuberculosis were born outside the United States, the proportion of MDR among U.S.-born tuberculosis patients (4.6%) was statistically similar to that seen among non-U.S.-born patients (2.7%).
- Thirty-three of 42 healthcare workers (78.6%) were culture-confirmed. Four of 27 (14.8%) MDR patients were healthcare workers compared to 2 of 101 (2.0%) patients with ODRTB.

Figure 10
First Line Drug Resistance by Area of Birth:
New York City, 1992-2002



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

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

Sociomedical Characteristics (Table 7)

It is frequently difficult to elicit information about substance abuse and occupation from patients. With more intensive efforts over the past six years to interview patients, the proportion of cases missing information about social variables has decreased. In 2002, less than 6.0% were missing information about any one social variable.

- The percent of patients who are employed has been steadily increasing; from 26.5% in 1996, when employment data was first consistently collected, to 42.0% in 2002. This has required increased flexibility in clinic hours and the work hours of DOT workers.
- Injection and non-injection drug use were reported for 3.7% and 8.0% of TB cases, respectively, while alcohol use was reported by 14.7% of patients.
- Four and half percent of patients were homeless and 4.3% were employed in a health care or correctional setting.

Directly Observed Therapy (DOT) (Figures 11-12)

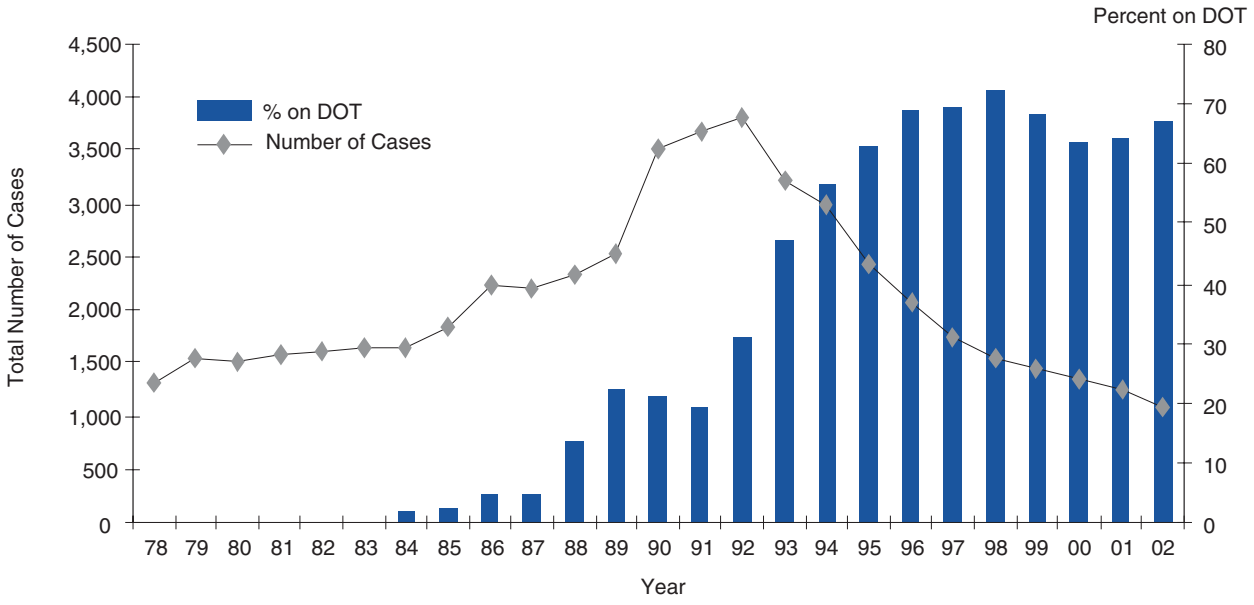
Figure 11 illustrates the trend in the proportion of tuberculosis patients counted in a given year who were eligible for DOT (i.e., patients diagnosed while alive who received some or all of their anti-tuberculosis therapy in an outpatient setting) and who were on DOT at some point before the end of March following the year in which they were counted.

- DOT levels increased from 64.3% in 2001 to 67.4% in 2002, reversing a recent trend in declining levels of DOT.
- Although DOT is encouraged for all tuberculosis patients, patients with drug resistance or who are at higher risk of infecting others are prioritized for DOT; 87.0% (20 of 23) of MDRTB patients seen in an outpatient setting received DOT, 74.7% (68 of 91) of ODRTB, and 76.3% (284 of 372) of patients with AFB-smear positive pulmonary tuberculosis received DOT.

Levels of DOT also varied by the type of health care provider who treated the patient.

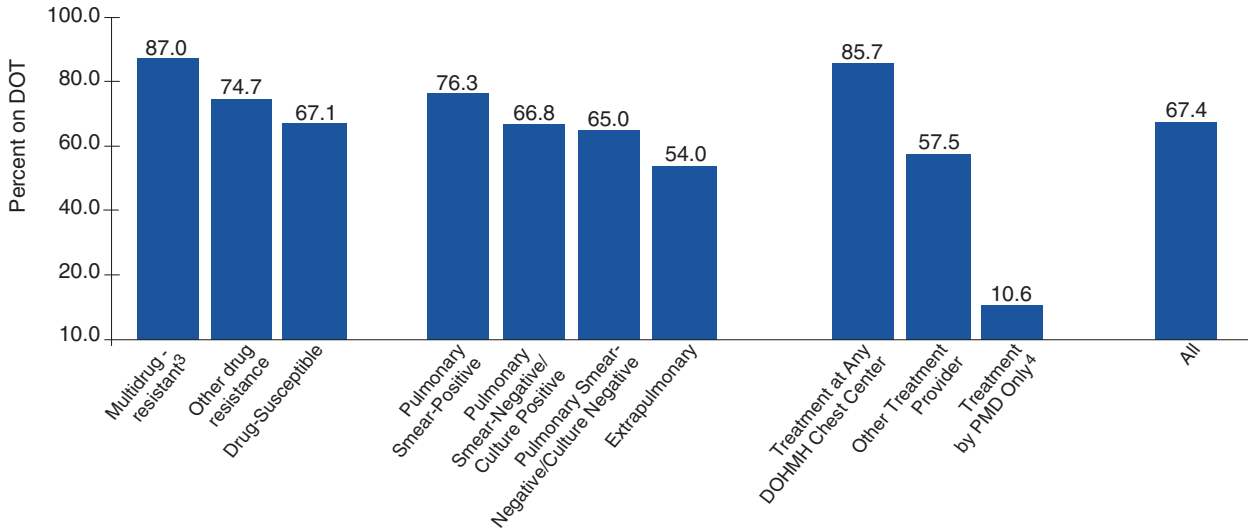
- Among patients ever treated at a DOHMH Chest Center, 85.7% (474 of 553) received DOT.
- Only 10.6% (14 of 132) of patients being treated by private physicians received DOT, although it is the standard of care for all tuberculosis patients.
- On average, 483 patients are on DOT each month, the majority of which receive the service through DOHMH. In December 2002, 63.1% (301 of 477) of all TB cases and suspects on DOT were receiving the service from DOHMH, either in a clinic setting, at a single room occupancy hotel, or other settings.
- Non-DOHMH facilities, which are funded by the New York State Department of Health, Medicaid, or Ryan White Care Act Funds, provided DOT to 34.6% (165 of 477) of patients who were receiving DOT in December, 2002. DOHMH provided DOT to 61.0% (291) patients (28.7% [137] in a field setting and 32.3% [154] in a clinic setting).

Figure 11
Tuberculosis Cases on Directly Observed Therapy[1]
New York City, 1978-2002



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

Figure 12
Proportion of Eligible[1] Tuberculosis Patients on DOT[2]
New York City, 2002



[1] Eligible patients were those diagnosed while alive and who received some treatment on an outpatient basis.
[2] Ever on DOT as of March of the year after being confirmed as a case of tuberculosis.
[3] Multidrug-resistant = resistant to at least rifampin and isoniazid.
[4] PMD = Private medical provider.

Completion of Therapy (Figure 13)

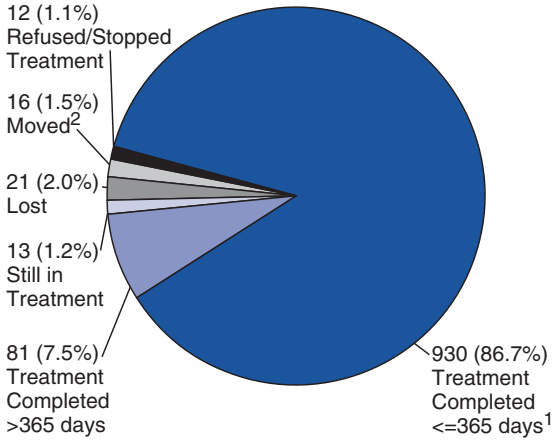
According to guidelines issued by the CDC and the ATS, patients with confirmed or suspected tuberculosis should receive an initial regimen consisting of four drugs (isoniazid, rifampin, ethambutol and pyrazinamide), unless the susceptibility pattern of their *M. tuberculosis* isolates is known from the start of therapy or there are justified medical contraindications.

- Among patients with confirmed tuberculosis in 2002 who were started on anti-tuberculosis therapy, 86.7% (898/1,036) were started on these four drugs within two weeks of the start of therapy, the same proportion as in 2001.

The effectiveness of directly observed therapy (DOT) and intensive case management in ensuring completion of therapy among patients diagnosed with tuberculosis in 2001 is illustrated in Figure 13. Treatment completion data are presented for patients diagnosed in 2001 to allow enough time for patients to complete therapy.

- The proportion of TB patients completing treatment within one year was 86.7% for 2001 patients, lower than the CDC objective of 90.0%.
- If cases who completed treatment in more than 365 days are included in the numerator, the completion index for all patients increases to 94.2%.

Figure 13
Treatment Completion for Active Cases Counted in 2001
New York City, 2002



[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, milary, or meningeal TB, and those initially resistant to rifampin). In 2001, 101 (8.0%) cases were either reported at death or died before completing treatment.

Prevention of Future Tuberculosis Disease (Table 8)

Several categories of persons infected with *M. tuberculosis* are at high risk for progression to active disease: contacts to infectious active cases; persons who are HIV-infected, 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, such as diabetes, silicosis, cancers of the head and neck, and certain other medical conditions.

Treatment of Latent Tuberculosis Infection

The first step in controlling the tuberculosis epidemic is to ensure the complete treatment of active TB cases. However, if the city is to further reduce the burden of tuberculosis, it is important to treat persons recently infected with *M. tuberculosis* and those at high risk for progression to active disease. The following subsection presents the status of programs for treatment of latent infection in New York City in 2002.

In June 2000, the CDC and the ATS 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 (LTBI). The Bureau of Tuberculosis Control adopted these guidelines with minor changes[4] 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.

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

Contacts with Latent Tuberculosis Infection

Besides ensuring that contacts to smear positive pulmonary cases are evaluated, the Bureau of Tuberculosis Control expanded its efforts to ensure that all contacts to patients 15 years and older[5] with culture-confirmed pulmonary or laryngeal disease are evaluated, and that contacts found eligible for LTBI treatment receive it. As not all contacts to cases confirmed in 2002 have yet been identified and evaluated, the following discussion refers to contacts of cases confirmed in 2001, regardless of where they were treated.

- Of 3,172 contacts to 2001 sputum AFB smear-positive cases identified, 2,707 (85.3%) were examined, slightly higher than in 2000 (83.1%).
- 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.
- Of 1,141 infected contacts to 2001 cases who started treatment for LTBI, 663 (58.1%) completed at least six months of therapy, higher than in 2000 when the final completion index was 48.7% (516 of 1,059).

In order to ensure higher levels of completion of treatment for latent infection, the Bureau of Tuberculosis Control adopted a case management approach for contacts of infectious TB cases and other infected persons at high risk for developing active disease which is similar to that of active TB patients. Patients are assigned to a case manager who reminds the patients to take their medication and follow-up with their medical provider. The status of these patients is reviewed on a quarterly basis. The first quarterly review was conducted in July 2002.

Contact Investigations in Congregate Settings (Table 8)

An Expanded Contact Investigation (ECI) Unit was created in October 1995 within the Bureau of Tuberculosis Control to allow rapid evaluation of possible transmission of tuberculosis by infectious patients in congregate settings (e.g., within schools, work sites or other institutions). When indicated, mass tuberculin skin testing and education about tuberculosis are provided.

- In 2002, 435 TB cases were reviewed for potential transmission in a congregate setting. The Bureau conducted 29 expanded contact investigations in which a total of 1,303 contacts were tested. A striking example was a contact investigation in a school where a high proportion of contacts were infected (65 [83%] of 78 close contacts and 27 [18%] of 149 other-than-close contacts) were TST positive.
- Of the 29 expanded contact investigations of exposures to persons with infectious tuberculosis in congregate settings, 18 occurred in a workplace, 9 in schools, one in a healthcare setting, and one in a single room occupancy hotel (SRO).
- In 27 (93.1%) of the investigations, the index case was older than 12 years and had AFB smear-positive and cavitary pulmonary disease.
- Transmission was considered probable in 6 (20.7%) investigations. Primary investigations in which transmission is probable result in a secondary expansion of testing for persons with lower risk of exposure.
- Transmission was considered possible in 3 (10.3%) investigations, unlikely in 19 (65.5%), and unable to be determined in one (3.4%).
- The total number of contacts tested was 633 close contacts and 670 other-than-close contacts; 312 (23.9%) of those tested were found to be infected and were referred for medical evaluation.
- In addition to the 29 investigations that were completed, contacts in 11 other settings were notified of an exposure and advised to seek follow-up with a medical provider; an epidemiologic investigation was not feasible and therefore not conducted at these sites.

Treatment for Latent Tuberculosis Infection by DOHMH

The DOHMH is leading efforts to increase treatment for latent infection among contacts to active cases and others at high risk for progression to active disease. The CDC objective for LTBI is that at least 75% of latently infected patients complete treatment. Data for 2002 are presented below.

- In 2002, the chest centers performed tuberculin skin tests (TSTs) for 27,436 persons, of whom 6,958 (25.4%) had positive reactions and were evaluated for treatment of LTBI. The chest centers evaluated several thousand additional individuals referred with a positive TST.
- In 2002, more than 7,000 patients started treatment for LTBI at a DOHMH chest center. As of the end of September 2003, over 3,000 (43.0%) have completed treatment and approximately 900 are still receiving treatment. We estimate that the final completion rate for 2002 will be higher than the previous year's completion rate of 45%.

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.

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

- Patients who are contacts, immunocompromised, recent converters, have radiographic evidence of tuberculosis in the past, or are under five years of age are considered to be at high risk for developing active disease.
- Among 9,261 patients designated as high risk in 2001, final analysis reveals that 4,157 (45%) completed treatment.

Treatment for Latent Tuberculosis Infection by Programs Supported by DOHMH

The BTBC supports the treatment of patients for LTBI by non-DOHMH health care providers through contractual agreements and pharmacy support. The BTBC has contractual agreements with various providers to provide testing, evaluation, treatment, and case management for LTBI patients. In addition, the BTBC provides pharmacy support, through the provision of purified protein derivative, syringes, isoniazid, and vitamin B6, to a number of health care providers.

- Overall, these programs have started 1,132 patients on treatment for LTBI in 2002; 433 (38.3%) of whom have completed treatment as of the end of September 2003.
- Among patients seen by providers under a contractual agreement with the BTBC, 42.0% have completed treatment for LTBI as of the end of September 2003.
- Thirty-four percent of patients starting treatment for LTBI and seen by programs receiving pharmacy support completed treatment as of the end of September 2003.

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 efforts to reduce the city's burden of tuberculosis.

Section 3. New York City's Bureau of Tuberculosis Control Activities in 2002

Since its inception in 1866, the New York City DOHMH remains a leader in the fight against tuberculosis. The mission of the Bureau of Tuberculosis Control (BTBC) is to prevent the spread of tuberculosis and eliminate it as a public health problem in NYC. Toward this goal, the Bureau conducts multifaceted activities integrating clinical and outreach services, case management, directly observed therapy, epidemiology, surveillance, outreach to high risk groups, and education and training of staff, providers and the public. To ensure that treatment for tuberculosis meets acceptable standards, the Bureau monitors the care received by every patient diagnosed with active tuberculosis in New York City, regardless of whether the patient receives treatment in a DOHMH chest center or elsewhere.

Clinical and Outreach Activities

The BTBC operates ten chest centers staffed with board-certified physicians, public health nurses and public health advisors. Services provided at the chest centers include screening for risk factors for tuberculosis; TST; chest x-rays; sputum induction; medical and nursing care for active tuberculosis and LTBI; free anti-tuberculosis medications; social services; routine blood tests; and HIV counseling and testing. Care is confidential, delivered in state-of-the-art facilities free of charge to the patient.

The chest centers provide expert specialty care, including care for difficult-to-treat patients such as those infected with multidrug-resistant tuberculosis. Directly observed therapy (DOT) is strongly promoted for all individuals with active tuberculosis and is offered at the chest centers or another location convenient to the patient.

The outside back cover of the report lists names and locations of the chest centers. Selected centers maintain extended hours to accommodate patients' schedules. There is at least one chest center open on Saturdays in the Bronx, Queens, Brooklyn, and Manhattan.

BTBC physicians review the treatment regimens of all confirmed tuberculosis cases in the city and provide recommendations and consultation to treating physicians based on local and national guidelines. The Bureau also offers on-site case management to patients at the Rikers Island Correctional Facility, the 30th Street Shelter, and at single room occupancy (SRO) hotels in Manhattan and the Bronx. Services at the 30th Street Shelter include clinical monitoring; DOT for active tuberculosis and LTBI patients, and case management.

The following free programs are available to all TB patients, including those managed by private providers:

- Gratis medications for patients enrolled in a state-approved DOT program,
- Evaluation of new immigrants or refugees in need of tuberculosis care follow-up,
- Case management to all active TB patients, consisting of patient education; return of lost patients to medical care; provision of directly observed therapy; communication with clinical providers to ensure appropriateness of treatment and compliance; and contact investigations and case management of contacts on treatment for latent TB infection.

Improving Directly Observed Therapy

In the 1990s, DOT was officially designated by the CDC and the ATS as the standard of care for tuberculosis treatment and received widespread recognition for its critical role in the dramatic decrease in tuberculosis and particularly multidrug-resistant cases in New York City.

DOT services improve treatment adherence by providing trained health care workers to observe patients ingest their medication, provide day-to-day case management and assist with resolution of medical and social issues. All active tuberculosis patients are strongly encouraged to enroll in DOT. DOT is provided on-site at clinics or chest centers, in the patient's home or in other locations mutually agreed upon by patient and DOT worker and at a time that is convenient for the patient.

- Because DOT rates had been decreasing in 2000 and 2001, in February 2002, a multidisciplinary DOT Working Group was convened to develop strategies to increase enrollment in DOT in New York City. The goals of the DOT Working Group were to: 1) develop practical recommendations for marketing DOT to private medical providers; 2) improve existing DOT materials targeted to medical providers; 3) update the formal agreement for DOT services that is made between Bureau staff and patients (called DOT contract); and 4) assess the effectiveness of the initial interview in convincing patients to accept DOT.
- Accomplishments of the DOT Working Group included:
  —Conducting an evaluation of the effectiveness of the initial patient interview in encouraging patients to start DOT and to develop recommendations to improve DOT acceptance. The findings indicated that interviews that did not meet DOT related standards (e.g., describing the benefits of DOT and identifying and beginning to resolve barriers that may affect DOT acceptance) were strongly associated with refusal of DOT. However, discussing DOT during the interview was not consistently associated with patients' acceptance of DOT. The recommendation that was derived from this survey was the need for intensive staff training in interviewing and marketing skills related to DOT.
  — Updating the DOT contract for patients receiving DOT at chest centers to include information on how the patient can get in touch with the DOT provider to help minimize missed appointments.
  — Developing and implementing a new contract for patients receiving DOT at other locations.
  — Developing DOT-related materials geared toward providers and patients, including, a simplified DOT referral form, "Management of Directly Observed Therapy" fact sheet and pamphlets in various languages introducing DOT to patients. These materials can be obtained by calling the Education and Training unit at (212) 442-9968.
  — Providing comprehensive training to Bureau staff on marketing DOT using the newly developed materials. Bureau field staff are now required to distribute DOT materials to as many private providers as possible and to arrange a face-to-face discussion of DOT whenever possible.
  — Conducting a survey of patients to evaluate other factors associated with DOT acceptance. Patients were asked about employment, school enrollment, work or school schedule, convenient hours for DOT and the number of times they were offered DOT by Bureau staff. This survey found that 29 (39%) of 74 participants were employed; patients who were never on DOT were more likely to be employed (80%) than those currently on DOT (20%). To increase DOT utilization, efforts are being made to offer DOT outside of working hours and utilize flexible DOT schedules. The Bureau is monitoring the number of patients of private providers enrolled in DOT to assess the results of this initiative.

While labor-intensive, DOT is cost-effective: the number and duration of hospital stays is reduced, the emergence of drug resistant tuberculosis is lessened and the likelihood that treatment will be completed in the prescribed time is increased. Providers should be encouraged to take advantage of the case management benefits associated with DOT.

- Although the 2002 DOT rate was an improvement on the previous two years, the rate remains lower than optimum.
- These rates were higher for MDRTB patients (87.0%), sputum-smear positive patients (76.3%), and those seen at DOHMH chest centers (85.7%), however, only 10.6% (14 of 132) of patients being treated by private physicians received DOT.

Though most patients will voluntarily adhere to treatment, some require legal intervention to complete treatment.

- In 2002, the DOHMH required the civil detention of 18 non-adherent TB patients in a secured hospital setting, including four for detention while infectious, one for examination and 13 for detention until treatment completion. In addition, the Bureau issued 13 Commissioner's Orders for DOT and two orders for treatment completion.

Surveillance

The major goals of BTBC Surveillance are to ensure complete reporting of TB cases, enter surveillance data in a timely manner, maintain and improve the quality and integrity of the data through regular quality checks, enhance the current TB registry and explore options for an improved registry, and disseminate TB data. Although labor-intensive, active surveillance ensures completeness of reporting.

- In 2002, Bureau staff entered data for the 1,084 confirmed cases reported in 2002 and for 2,556 persons with suspected tuberculosis who were never confirmed as cases. In addition, Bureau staff entered 44,520 laboratory results.
- In 2002, Bureau staff reviewed medical records of 1,717 suspected TB cases contributing to the confirmation of tuberculosis in 117 culture-negative patients. In addition, nearly 100,000 pathology reports were reviewed for findings suggestive of TB.
- Ninety-five investigations of potential false positive *M. tuberculosis* tests were completed and identified 30 patients with a confirmed false positive *M. tuberculosis* culture (28) or nucleic acid amplification test (2). Twenty of these patients were found not to have tuberculosis and 10 were judged to have TB based on clinical findings.
- Surveillance staff follow the progress of TB patients infected with drug-resistant strains to ensure that they are properly managed. Staff meet monthly to review available information and discuss problematic issues.
- Registry data are routinely analyzed by Bureau epidemiologists to identify outbreaks, trends, possible laboratory contamination, follow outcome indicators, research issues of clinical and operational importance, produce monthly, quarterly and annual reports.
- A major evaluation of the impact of TB control activities in New York City is just being started by surveillance staff, focusing on the identification of risk factors for potentially preventable tuberculosis cases and unnecessary hospitalizations.
- A drug-resistance survey, studying characteristics of and risk factors for drug-resistant tuberculosis was planned and will be started in 2003.
- The office of Surveillance provides follow-up on and referrals for patients who have moved to or from NYC. In 2002, a database was developed to capture information on these transfers.

Epidemiology

The BTBC epidemiologic activities consist of conducting expanded contact investigations, analyzing the molecular epidemiology of tuberculosis, providing epidemiologic consultation, and conducting research studies relevant to the control of tuberculosis in New York City.

- Of the many cases reviewed in 2002, 29 resulted in an expanded contact investigation, an increase in those investigations since the ECI Unit was created, despite a decrease in TB cases. A review of the process revealed an improvement in the identification of congregate settings where transmission may be possible.
- The Bureau conducts active surveillance of health care workers with tuberculosis to monitor tuberculosis trends in this group, facilitate early identification of clusters and improve communication about exposures with health care facilities.
- The Bureau participates in the National TB Epidemiologic Studies Consortium (TBESC) and the TB Trials Consortium (TBTC)
  - — As part of the TBESC, the Bureau is a partner in the following new or on-going projects: 1) models for incorporating HIV counseling, testing and referral into tuberculosis contact investigations; 2) a national genotyping registry for a molecular epidemiological analysis of MDR tuberculosis; 3) enhanced surveillance to identify missed opportunities for TB prevention in foreign-born populations in the US and Canada; 4) factors associated with acceptance of adherence to and toxicity from treatment of latent tuberculosis infection.
  - — As part of the TBTC, the Bureau is enrolling contacts and other LTBI patients at high risk for progression to active tuberculosis into a clinical trial comparing 9 months of INH therapy with 3 months of INH and rifapentine once weekly by DOT.
- The BTBC maintains one of the largest molecular epidemiology databases in the country. Since January 2001, the NYC Health Code has required clinical laboratories to forward each initial M. tuberculosis isolate to the DOHMH Public Health Laboratories for DNA fingerprinting. Isolates are typed using restriction fragment length polymorphism (RFLP) of IS6110 and spoligotyping, by the Public Health Research Institute and the New York State Public Health Laboratories, respectively. The objectives of this project are to: 1) identify instances of false-positive *M. tuberculosis* results; 2) identify nosocomial transmission; 3) assess tuberculosis transmission during outbreak investigations; and 4) determine the extent and dynamics of M. tuberculosis transmission.

—NYC clinical laboratories participation in the project is high and the time needed to obtain DNA typing results and to identify false-positive cultures is steadily improving. For 2002, DNA analysis was completed for 730 of 843 (86.6%) new culture-positive cases; of these, 189 (25.9%) were clustered, that is, they had strains identical to other 2002 culture-positive cases, and an additional 40 (5.5%) were clustered to 2001 cases.

- A study of factors associated with treatment interruption in a cohort of patients with culture positive pulmonary and extrapulmonary tuberculosis diagnosed in New York City. Of 2,329 new culture positive cases without MDR-TB diagnosed in New York City, 140 met at least one of the above criteria. Treatment interruption was associated with prolonged treatment course and decreased treatment completion rates in all groups. Two factors were significantly associated with every type of treatment interruption: homelessness and lack of awareness of the severity of tuberculosis disease. In multivariate analysis, only lack of awareness of the severity of disease remained independently associated with all interruption types.

Education and Training

The Bureau provides extensive tuberculosis-related training to BTBC personnel and professional education for health care providers in the city. The Bureau conducts general public education sessions as well as during investigations of tuberculosis exposure. Educational materials are developed for the public and the medical community.

The following are highlights of educational activities undertaken by the Bureau in 2002:

- **Staff and Professional Education**
  —The Bureau conducted several new staff training sessions, emphasizing the latest information on tuberculosis treatment, targeted testing and treatment of LTBI, contact investigation and case management. In addition, 207 Public Health Advisors (PHAs) were re-certified for doing tuberculin skin tests using safety syringes and revised techniques recommended by CDC.
  —The Bureau collaborated with the Charles P. Felton Model TB Center at Harlem Hospital to provide training to PHAs on how to discuss HIV and TB connection and HIV-related partner notification during contact investigations and how to refer contacts for HIV counseling and testing.
  —The Bureau conducted a seminar for BTBC medical providers entitled "Update for Physicians and Public Health Aspects of TB," emphasizing DOT and intermittent therapy.
- Public Education
  —Through community partnership initiatives, Bureau staff provided education on tuberculosis and coordinated several targeted skin testing activities. Thus far, the Bureau has established partnerships with Casa Mexico, El Comite de Inmigrantes Ecuatorianos, the Northern Queens Health Coalition, the Asian American Federation of NY, the Asian and Pacific Islander Coalition on HIV/AIDS, the Haitian Centers Council, and the Center for Immigrant Health.
  —The Bureau conducted 101 education sessions reaching 6,669 persons in various settings.
- Material Development and Distribution
  —The Bureau distributed 304,645 TB-related print education materials.
  —2,585 videos on the TB/HIV Connection and TB preventive therapy, available in several languages, were distributed; about 200 were sent to organizations that served HIV-infected individuals.

Laboratory Services

The New York City Public Health Laboratory (PHL) is the reference laboratory for New York City. The PHL provides the following TB-related testing: smear, culture and identification of *M. tuberculosis* complex and other mycobacteria, radiometric and conventional susceptibility tests, nucleic acid amplification tests (NAA) for rapid identification of *M. tuberculosis*, and sends specimens to the New York State Public Health Laboratory and the Public Health Research Institute for molecular typing. NAA and susceptibility testing are provided free of charge. In 2002:

- The PHL processed 11,654 clinical specimens from 6,268 patients, performed 445 NAA tests using the *M. tuberculosis* Direct (MTD®) test, and conducted mycobacterial identification testing on 2,134 cultures.
- Using radiometric and conventional methods, PHL analyzed 1,237 *M. tuberculosis* isolates for susceptibility to first line drugs including pyrazinamide (PZA). The 163 strains with resistance to one or more first-line drug were tested for susceptibility to second-line drugs resulting in 2,608 additional tests. In 2002 PHL performed 60% of all susceptibility tests for NYC.
- The PHL also prepared and shipped 2,009 *M. tuberculosis* isolates to either the New York State Molecular Typing Laboratory or the Public Health Research Institute for molecular typing.

Table 1 (see page 6)
Tuberculosis Incidence,
New York City, 1920 - 2002

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	32.9					316	(4.0)
1972	2,275	29.4					335	(4.3)
1973	2,101	27.5					259	(3.4)
1974	2,022	26.7					215	(2.8)
1975	2,151	28.7					208	(2.8)
1976	2,151	29.1					187	(2.5)
1977	1,605	21.9					175	(2.4)
1978[5]	1,307	18.1					188	(2.6)
1979	1,530	21.4					121	(1.7)
1980	1,514	21.4					143	(2.0)
1981	1,582	22.3					155	(2.2)
1982	1,594	22.4					168	(2.4)
1983	1,651	23.1					151	(2.1)
1984	1,629	22.7	1,527				168	(2.3)
1985	1,843	25.6	1,785				155	(2.2)
1986	2,223	30.8	2,181				186	(2.6)
1987	2,197	30.3	2,157				219	(3.0)
1988	2,317	31.9	2,241				246	(3.4)
1989	2,545	34.9	2,405				236	(3.2)
1990	3,520	48.1	3,372				256	(3.5)
1991	3,673	49.7	3,484	1,772	(24.0)	366	245	(3.3)
1992	3,811	51.1	3,442	1,856	(24.9)[6]	441	200	(2.7)
1993	3,235	43.0	2,854	1,526	(20.3)	296	166	(2.2)
1994	2,995	39.4	2,479	1,265	(16.7)	176	133	(1.8)
1995	2,445	31.9	2,014	989	(12.9)	109	94	(1.2)
1996	2,053	26.5	1,721	837	(10.8)	84	67	(0.9)
1997	1,730	22.2	1,401	665	(8.5)	56	55	(0.7)
1998	1,558	19.8	1,255	558	(7.1)	38	52	(0.7)
1999	1,460	18.4	1,143	515	(6.5)	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)
2002	1,084	13.5	823	429	(5.4)	27	30	(0.4)

1 For “phthisis,” or pulmonary cases, 1920-1940; thereafter, all forms of tuberculosis.

2 Rates through 2000 are based on official Census population data and intercensal estimates. Rates since 2000 are based on 2000 Census data.

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. The number for 2002 is preliminary because drug susceptibility tests have not yet been performed and results not yet reported on some patients’ isolates from the latter part of the year.

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 are not available.

Table 2 (see page 8)
Tuberculosis Incidence (Rates per 100,000) by Race/Ethnicity, Sex, and Age in Years
New York City, 2002

	Age Group N Rate[1]										
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	2 1.6	1 0.8	1 0.6	15 3.1	20 4.8	14 3.5	18 6.3	33 6.2	105 3.7
Males	1 1.4	0 0.0	0 0.0	1 1.6	1 1.2	5 2.1	12 5.5	13 6.8	11 8.2	24 11.4	68 5.1
Females	0 0.0	0 0.0	2 3.4	0 0.0	0 0.0	10 4.2	8 3.9	1 0.5	7 4.6	9 2.8	37 2.5
Non-Hispanic Black, total	7 4.8	2 1.2	5 3.1	9 6.0	21 15.3	54 18.5	98 31.1	72 30.2	43 25.7	49 26.5	360 18.3
Males	4 5.4	1 1.2	2 2.4	4 5.3	11 17.5	30 23.7	59 43.0	54 53.5	27 40.2	29 45.4	221 25.3
Females	3 4.2	1 1.2	3 3.7	5 6.6	10 13.4	24 14.4	39 21.9	18 13.1	16 16.0	20 16.5	139 12.8
Hispanic, total	14 7.5	3 1.5	4 2.3	13 7.5	44 23.2	70 18.2	67 20.2	46 19.7	29 19.5	25 18.0	315 14.6
Males	5 5.3	0 0.0	0 0.0	11 12.2	25 26.0	46 24.3	50 31.7	30 28.5	18 27.4	14 27.4	199 19.1
Females	9 9.9	3 3.1	4 4.6	2 2.4	19 20.3	24 12.4	17 9.8	16 12.5	11 13.2	11 12.5	116 10.4
Asian, total	5 10.4	0 0.0	4 8.8	9 18.8	22 35.3	79 49.7	55 38.1	48 44.7	32 53.4	50 84.9	304 39.0
Males	2 8.1	0 0.0	2 8.4	5 20.2	11 36.7	36 46.6	37 50.0	32 59.7	22 75.4	32 121.5	179 46.1
Females	3 12.8	0 0.0	2 9.3	4 17.4	11 34.0	43 52.6	18 25.6	16 29.8	10 32.5	18 55.3	125 31.9
TOTAL	27 5.0	5 0.9	15 2.8	32 6.1	88 14.9	218 15.9	240 19.0	180 17.8	122 17.9	157 16.7	1,084 13.5
Males	12 4.3	1 0.3	4 1.5	21 7.9	48 16.8	117 17.7	158 25.8	129 27.4	78 25.5	99 27.5	667 17.6
Females	15 5.7	4 1.5	11 4.2	11 4.3	40 13.1	101 14.3	82 12.6	51 9.4	44 11.6	58 10.0	417 9.9

1 Rates are based on 2000 census data.

Table 3 (see page 11)
Crude and Age-Adjusted Tuberculosis Rates by Borough and Health Center District
New York City, 1992-2002

Health Center District	Cases	Rate per 100,000 population											
		2002 Crude[1]	2002 Age-Adjusted[2]	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	**229**	**14.9**	**14.1**	**15.7**	**17.1**	**20.8**	**22.6**	**28.2**	**38.9**	**39.7**	**51.6**	**58.0**	**79.7**
Central Harlem	47	38.0	39.4	25.0	35.5	43.6	63.7	61.6	113.2	115.3	121.6	181.7	240.2
East Harlem	16	11.7	11.7	21.1	19.3	21.7	28.3	35.2	45.4	60.3	71.5	73.1	95.8
Kips Bay-Yorkville	19	7.9	8.3	3.9	7.2	3.5	11.1	10.3	9.3	10.9	14.8	14.4	19.1
Lower East Side	53	21.8	19.0	20.8	24.5	32.1	30.4	40.0	45.7	51.3	74.8	69.5	101.5
Lower West Side	27	8.7	7.3	15.1	13.2	15.1	15.0	22.7	33.3	29.9	45.9	44.8	77.9
Riverside	21	10.3	9.4	12.2	11.4	17.1	10.5	21.4	21.8	32.0	41.1	59.0	72.1
Washington Heights	46	16.5	17.0	18.2	19.6	25.5	31.0	31.7	51.4	36.6	49.1	52.9	60.9
Total Bronx	**167**	**12.5**	**13.2**	**14.6**	**18.6**	**20.2**	**25.5**	**28.9**	**31.2**	**38.3**	**50.4**	**57.5**	**69.2**
Fordham-Riverdale	38	14.4	15.0	12.4	21.4	18.8	28.2	18.1	29.0	24.5	34.6	27.5	37.8
Morrisania	23	13.7	15.3	15.7	20.1	28.9	41.9	47.4	35.7	75.4	74.4	109.3	96.5
Mott Haven	24	17.3	19.2	31.3	15.9	26.2	33.9	47.7	61.9	61.3	87.7	107.8	168.2
Pelham Bay	20	8.2	8.2	6.1	8.1	9.6	12.3	13.1	8.1	13.3	21.1	20.1	20.3
Tremont	43	19.9	23.1	16.8	31.9	30.0	33.4	45.2	47.6	56.7	88.5	76.0	105.8
Westchester	19	6.3	6.6	13.4	12.3	10.9	13.5	13.9	16.7	26.0	19.8	34.0	35.8
Total Brooklyn	**345**	**14.0**	**15.0**	**17.4**	**19.5**	**23.5**	**24.1**	**28.0**	**30.5**	**42.3**	**49.7**	**54.7**	**58.0**
Bay Ridge	35	12.9	12.1	13.4	14.2	18.4	15.3	13.5	12.7	20.2	18.6	20.1	15.9
Bedford	42	18.2	19.7	20.7	32.0	34.0	41.6	48.2	54.8	68.4	82.3	89.1	107.5
Brownsville	41	13.6	15.0	19.3	18.0	22.3	28.0	32.0	33.4	51.8	58.9	54.2	71.6
Bushwick	40	20.7	23.8	23.7	20.6	24.6	26.8	29.1	45.8	61.1	72.8	83.3	83.1
Flatbush	65	12.1	12.7	13.7	20.4	20.8	20.6	23.0	22.5	32.1	36.0	39.2	36.6
Fort Greene	31	20.3	22.1	24.6	25.8	25.6	33.3	32.6	37.5	57.9	88.5	110.3	120.1
Gravesend	47	15.2	14.6	12.1	9.4	16.9	14.9	18.5	14.3	20.2	23.6	21.9	20.4
Red Hook-Gowanus	8	7.2	6.8	15.2	12.2	18.1	14.3	22.1	25.0	25.7	34.3	49.6	48.7
Sunset Park	25	12.8	12.8	18.7	21.5	15.1	24.7	23.1	24.7	31.1	29.3	29.8	27.7
Williamsburg-Greenpoint	11	6.7	6.5	14.4	15.1	19.3	13.7	23.1	24.0	30.3	45.6	52.2	59.3
Total Queens	**318**	**14.3**	**14.3**	**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	19.3	18.5	16.6	32.3	27.5	27.2	24.7	32.8	38.7	29.5	35.3
Corona	104	28.5	27.1	34.0	28.0	40.4	34.0	29.0	42.6	45.3	39.5	44.5	56.3
Flushing	63	12.6	11.8	16.1	16.6	16.7	15.1	18.9	16.4	19.9	18.4	17.3	14.6
Jamaica East	38	10.1	9.9	16.7	12.2	19.3	16.8	18.1	28.3	28.7	35.9	33.7	34.0
Jamaica West	35	8.3	8.5	13.1	10.6	14.7	18.0	13.9	18.7	23.5	26.2	25.2	21.5
Maspeth-Forest Hills	23	7.8	7.8	8.5	11.4	11.7	11.7	12.5	12.3	10.6	20.4	18.5	12.3
Staten Island	**25**	**5.6**	**5.6**	**6.2**	**7.5**	**8.9**	**6.6**	**8.7**	**7.7**	**10.4**	**17.7**	**15.3**	**17.8**
TOTAL NYC	1,084	13.5	13.5	15.7	16.6	18.4	19.8	22.2	26.5	31.9	39.4	43.0	51.1

1 2000 through 2002 crude rates by health district and borough are based on the 2000 Census. Rates from 1992 through 1999 are based on intercensal estimates.

2 1992-1999 age-adjusted rates are based on 1990 Census figures and 2000-2002 age-adjusted rates are based on 2000 Census figures for New York City by the method of direct adjustment.

Table 4 (See Page 13)
Tuberculosis Cases by Age in Years and Area of Birth
New York City, 2002

Area of Birth	Age Groups 0 - 19 N	0 - 19 (%)	20 - 64 N	20 - 64 (%)	65+ N	65+ (%)	Total
Africa [1]	3	(4.9%)	56	(91.8%)	2	(3.3%)	61
Far East Asia[2]	6	(4.3%)	106	(75.2%)	29	(20.6%)	141
Canada	0	(0.0%)	2	(100.0%)	0	(0.0%)	2
Caribbean [3]	10	(7.9%)	94	(74.6%)	22	(17.5%)	126
Central/S. Amer. [4]	11	(6.4%)	160	(92.5%)	2	(1.2%)	173
Europe [5]	4	(8.7%)	25	(54.3%)	17	(37.0%)	46
Indo/Pakistan [6]	5	(5.3%)	80	(84.2%)	10	(10.5%)	95
Middle East [7]	0	(0.0%)	4	(100.0%)	0	(0.0%)	4
Southeast Asia [8]	0	(0.0%)	45	(86.5%)	7	(13.5%)	52
Oceania	0	(0.0%)	0	(0.0%)	0	(0.0%)	0
TOTAL NON-USA	**39**	**(5.6%)**	**572**	**(81.7%)**	**89**	**(12.7%)**	**700**
USA [9]	39	(12.2%)	231	(72.4%)	49	(15.4%)	319
Puerto Rico	0	(0.0%)	29	(67.4%)	14	(32.6%)	43
TOTAL USA	**39**	**(10.8%)**	**260**	**(71.8%)**	**63**	**(17.4%)**	**362**
UNKNOWN	1	(4.5%)	16	(72.7%)	5	(22.7%)	22
TOTAL	**79**	**(7.3%)**	**848**	**(78.2%)**	**157**	**(14.5%)**	**1,084**

[1] Guinea (9), Nigeria (8), Ivory Coast (7), Mali (6), Senegal (5), Other (26)
[2] China (106), Korea, Rep. (21), Hong Kong (7), Other (7)
[3] Dominican Republic (55), Haiti (44), Jamaica (9), Trinidad & Tobago (8), Other (10)
[4] Ecuador (74), Mexico (34), Peru (13), Guyana (12), Honduras (9), Columbia (8), Panama (5), El Salvador (4), Other (14)
Panama (5), El Salvador (4), Other (14)
[5] Russia (17), Poland (5), Ukraine (5), Other (19)
[6] India (44), Bangladesh (18), Pakistan (18), Nepal (12) Other (3)
[7] Turkey (3), Yemen (1)
[8] Philippines (25), Vietnam (9), Indonesia (5), Myanmar (4), Thailand (4), Other (5)
[9] Includes the U. S. Virgin Islands

Table 5 (See Page 14)
HIV Status of Tuberculosis Cases by Sex and Area of Birth
New York City, 2002

YEAR	N (%) FEMALES HIV (+)		MALES HIV (+)		U.S.-BORN[2] HIV (+)		NON-U.S.-BORN[2] HIV (+)		TOTAL[1] HIV (+)	
1992	297	(25.1)	983	(37.4)	1,294	(42.6)	118	(16.5)	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	(13.8)	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)
2002	57	(13.7)	136	(20.4)	129	(35.6)	58	(8.3)	193	(17.8)

1 Total HIV infected cases may be more than sum of U.S .and non-U.S.-born HIV infected cases because area of birth is unknown for some cases.

2 Breakdown by the area of birth for 1992 is estimated, exact figures are not available

Table 6 (see page 15)
First Line Drug Resistance by Area of Birth and Prior History of TB
New York City, 2002

	N (%)							
	Total		U.S.-born[1]		Non-U.S.-born		Unknown	
	History of Prior TB	No History of Prior TB	History of Prior TB	No History of Prior TB	History of Prior TB	No History of Prior TB	History of Prior TB	No History of Prior TB
Positive culture for *M. tuberculosis*	33	790	19	246	14	525	0	19
Tested for susceptibility to first-line drugs (% of those with positive culture for *M. tuberculosis*)	32 (97.0)	780 (98.7)	19 (100.0)	240 (97.6)	13 (92.9)	521 (99.2)	0 (0.0)	19 (100.0)
Susceptibility results (% of those tested for susceptibility to first-line drugs)								
Multidrug-resistant (resistant to at least isoniazid & rifampin)	3 (9.4)	24 (3.1)	2 (10.5)	10 (4.2)	1 (7.7)	14 (2.7)	0 (0.0)	0 (0.0)
Isoniazid-resistant and rifampin-susceptible	4 (12.5)	55 (7.1)	1 (5.3)	13 (5.4)	3 (23.1)	41 (7.9)	0 (0.0)	1 (5.3)
Resistant to first-line drugs other than isoniazid & rifampin	1 (3.1)	38 (4.9)	1 (5.3)	12 (5.0)	0 (0.0)	26 (5.0)	0 (0.0)	0 (0.0)
Rifampin-resistant and isoniazid susceptible	0 (0.0)	3 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	3 (0.6)	0 (0.0)	0 (0.0)
Susceptible to all first-line drugs	24 (75.0)	660 (84.6)	15 (78.9)	205 (85.4)	9 (69.2)	437 (83.9)	0 (0.0)	18 (94.7)

1 Includes Puerto Rico and Virgin Islands

Table 7 (See Page 16)
Social Characteristics of Tuberculosis Cases
New York City, 2002

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	1,020	(94.1)	38	(3.7)
Non-injection drug use in 12 months before diagnosis	1,021	(94.2)	82	(8.0)
Alcohol abuse in 12 months before diagnosis	1,021	(94.2)	150	(14.7)
Homeless at diagnosis or any time during treatment	1,084	(100.0)	49	(4.5)
Resident of correctional facility at time of diagnosis	1,084	(100.0)	28	(2.6)
Resident of long-term care facility at time of diagnosis	1,084	(100.0)	20	(1.8)
Employed in 24 months before diagnosis	1,027	(94.7)	431	(42.0)
Health care or correctional facility worker in 24 months before diagnosis	1,027	(94.7)	44	(4.3)

1 categories not mutually exclusive

Table 8 (see page 18)
Epidemiologic Investigations of TB Exposure in Congregate Settings
New York City, 2002, N=29

Site	Close Contacts					Other-than-close Contacts					Self-Referred			Trans-mission[1]
	Identified #	Tested #	Tested %	Positive #	Positive %	Identified #	Tested #	Tested %	Positive #	Positive %	Tested #	Positive #	Positive %	
Worksites														
Sewing Factory	10	10	100	10	100	18	17	94	11	65	1	0	0	Probable
Factory	15	14	93	7	50	7	7	100	0	0	1	0	0	Probable
Restaurant/Vocational School	34	23	68	6	26	4	4	100	0	0	31	9	29	Probable
Restaurant	15	12	80	6	50	7	3	43	0	0	0	0	0	Probable
Restaurant	44	27	61	11	41	19	13	68	8	62	3	2	67	Possible
Courier Service	43	26	61	15	58	66	12	18	1	8	0	0	0	Possible
Law Firm	31	20	65	0	0	0	0	0	0	0	6	0	0	Unlikely
Administrative Office	34	25	74	2	8	350	10	3	2	20	7	1	14	Unlikely
Factory	12	12	100	6	50	52	50	96	10	20	54	10	19	Unlikely
Post Office	9	9	100	3	33	51	50	98	17	34	2	0	0	Unlikely
Commercial Hotel	23	22	96	6	27	49	49	100	14	29	0	0	0	Unlikely
Post Office	2	2	100	1	50	189	100	53	25	25	0	0	0	Unlikely
Commercial Hotel	17	12	71	3	25	0	0	0	0	0	5	0	0	Unlikely
Administrative Office	9	9	100	2	22	43	43	100	10	23	28	8	29	Unlikely
Communication Agency	112	64	57	10	16	15	15	100	0	0	0	0	0	Unlikely
Jewelry factory	3	3	100	1	33	27	27	100	13	48	6	1	17	Unlikely
Jewelry factory	44	38	86	19	22	13	13	100	6	46	35	7	20	Unlikely
Law Enforcement Unit	89	30	34	3	10	47	14	30	2	7	0	0	0	Unable to assess
Health Care Facility														
Dialysis Center	30	21	70	3	14	29	18	62	1	6	0	0	0	Unlikely
Residence														
SRO	8	6	75	1	17	14	10	71	2	20	0	0	0	Possible
Schools														
Elementary School	22	20	90	3	15	9	9	100	1	11	0	0	0	Probable
Elementary School	83	78	94	65	83	166	149	90	27	18	47	1	2	Probable
Special Ed Pre-School	27	24	89	0	0	23	21	91	0	0	0	0	0	Unlikely
Elementary School	28	14	50	0	0	1	1	100	0	0	5	0	0	Unlikely
High School	36	23	64	1	1	98	4	4	1	25	8	0	0	Unlikely
High School	6	5	83	2	40	9	6	67	0	0	4	1	25	Unlikely
High School	50	36	72	1	3	202	51	25	2	4	162	5	3	Unlikely
Junior High School	30	24	80	1	4	10	5	50	0	0	183	12	7	Unlikely
School Bus	26	24	92	0	0	0	0	0	0	0	11	0	0	Unlikely
Total	**818**	**633**	**71**	**159**	**30**	**1,482**	**670**	**46**	**153**	**22**	**599**	**48**	**9**	

1 Transmission is "probable" when the exposed group has a significantly higher proportion of TST-positive individuals than a comparison group; or there are documented TST conversions in non-BCG vaccinated individuals; or secondary cases with epidemiologic or molecular linkage to the index case. Transmission is considered "possible" when the proportion of contacts who are TST-positive is significantly greater than the proportion in a comparison group but the proportion of identified contacts tested is less than 50%. Transmission is considered "unlikely" when these conditions are not met. "Unable to assess" indicates that less than 50% of potential contacts are tested and the proportion that is TST-positive among those tested is not greater than expected, and there are no TST conversions or secondary cases.

Appendix 1: Centers for Disease Control and Prevention's Objectives for Tuberculosis Control Programs

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

Completion of Therapy:

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

Reporting:

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

Contact Investigation:

1. Contacts will be identified for at least 90% of sputum acid-fast bacilli (AFB) smear-positive tuberculosis cases.
2. At least 95% of close contacts of sputum AFB smear-positive tuberculosis cases will be evaluated for infection and disease.
3. At least 85% of infected contacts who are started on treatment for latent tuberculosis infection will complete therapy.

Treatment of Latent Tuberculosis Infection:

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

Appendix 2: 2001 and 2002 Bureau Publications

1. Driver CR, Cordova IM, Munsiff SS. Targeting tuberculosis testing: the yield of source case investigations for young children with reactive tuberculin skin tests. Public Health Rep 2002; 117: 366-72.
2. Geng E, Kreiswirth B, Driver CR, Li J, Burzynski J, DellaLatta P, LaPaz A, Schluger NW. Changes in the transmission of tuberculosis in New York City from 1990 to 1999. N Engl J Med 2002;346:1453-8.
3. Sundaram V, Fujiwara PI, Osahan S, Munsiff SS, Driver CR. Yield of continued monthly sputum evaluation among tuberculosis patients after culture conversion. Int J Tuber Lung Dis 2002;6:238-45.
4. Munsiff SS, Bassoff T, Nivin B, Li J, Sharma A, Bifani P, Mathema B, Driscoll J, Kreiswirth B. Molecular epidemiology of multidrug-resistant tuberculosis, New York City, 1995-1997. Emerg Infect Dis. 2002; Nov;8(11):1230-8.
5. McElroy PD, Sterling TR, Driver CR, Kreiswirth B, Woodley CL, Cronin WA, Hardge DX, Shilkret KL, Ridzon R. Use of DNA fingerprinting to investigate a multiyear, multistate tuberculosis outbreak. Emerg Infect Dis. 2002; 8:1252-6.
6. Nivin B, O'Flaherty T, Leibert E, Zhao BY, Driscoll J. Sputum induction problems identified through genetic fingerprinting. Infect Control Hosp Epidemiol 2002; 23:580-3.
7. Driver CR, Munsiff SS, Li J, Kundamal N, Osahan SS. Relapse in patients treated for drug-susceptible tuberculosis: higher risk for patients with HIV co-infection. Clin Infect Dis. 2001; Nov 15;33(10):1762-9.
8. Lee Y, Munsiff SS, Li J, Driver CR, Mathema B, Kreiswirth BN. Rising number of tuberculosis cases among Tibetans in New York City. J Immig Health 2001; 3:173-80.
9. Small PM, Fujiwara PI. Management of Tuberculosis in the United States. N Engl J Med. 2001; 345:189-200.
10. Bifani P, Mathema B, Campo M, Moghazeh S, Nivin B, Shashkina E, Driscoll J, Munsiff SS, Frothingham R, Kreiswirth BN. Molecular identification of streptomycin monoresistant *Mycobacterium tuberculosis* related to multidrug-resistant W strain. Emerg Infect Dis. 2001; 7:842-8.

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225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 442-9968

Reporting Requirements for Health Care Providers

New York City Health Code section 11.03 (a) 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®)[1] 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.

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.

Physicians are 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.

Reporting Requirements for Laboratories

New York City Health Code section 13.03 (a) requires mycobacteriology and pathology laboratories to report to the New York City Department of Health and Mental Hygiene, within 24 hours of detection, any bacteriologic findings which suggest or confirm tuberculosis:

- AFB-positive smears
- Cultures positive for *Mycobacterium tuberculosis*
- Any culture result associated with an AFB-positive smear (even if negative for *Mycobacterium tuberculosis*)
- Rapid diagnostic results that identity *Mycobacterium tuberculosis*
- Any rapid diagnostic result associated with an AFB-positive smear (even if negative for *Mycobacterium tuberculosis*)
- Results of susceptibility tests performed on *Mycobacterium tuberculosis*ultures
- Pathology findings consistent with tuberculosis, including the presence of AFB and granulomata

If a patient has multiple positive results, all results must be reported, not just the first positive result.

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.

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

TB CHEST CENTERS

Bronx
Morrisania Chest Center
1309 Fulton Ave., First Floor
Bronx, NY 10456
Tel. (718) 579-4157/4163

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

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

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

Fort Greene Chest Center
295 Flatbush Ave. Ext., Fourth Floor
Brooklyn, NY 11201
Tel. (718) 643-6575/6531/6540

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) 420-1028/1167

NYC Health
nyc.gov/health

Department of Health and Mental Hygiene
The City of New York

Thomas R. Frieden, M.D., M.P.H.
Commissioner

Michael R. Bloomberg
Mayor