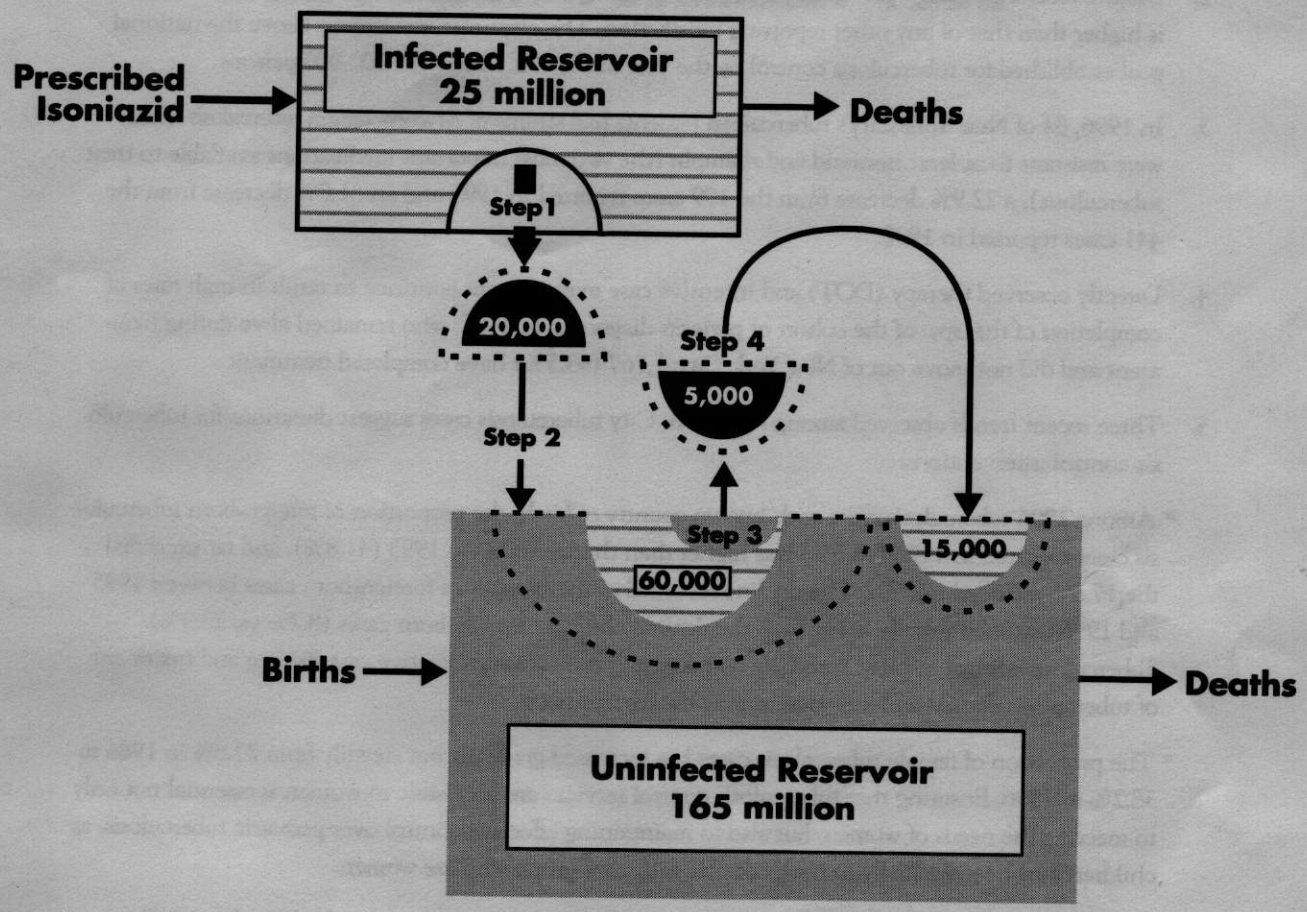
BUREAU OF TUBERCULOSIS CONTROL
NEW YORK CITY DEPARTMENT OF HEALTH
INFORMATION SUMMARY 1996

TB CONTROL WITH ISONIAZID PREVENTIVE THERAPY



*Adapted from SH Ferebee. An epidemiological model of tuberculosis in the United States *Natl Tb Assoc Bull* 1967;53:4-7.

The figure illustrates a model of the annual cycle of tuberculosis infection and disease in the United States and the impact of using isoniazid preventive therapy. Reducing transmission of tuberculosis requires not only curing individuals with tuberculosis disease but giving preventive therapy to those with tuberculosis infection, especially to those who are HIV-infected, close contacts of cases of active disease, and from areas of the world where tuberculosis is widespread. (See section entitled *Prevention of Future Tuberculosis Disease* in text, page 21.)

HIGHLIGHTS

1. In 1996, 2,053 new cases of tuberculosis were reported in New York City, a 16.0% decrease from the 2,445 cases reported in 1995 and a 46.1% decrease from the 3,811 cases reported in 1992, the peak of the current epidemic. New York City's tuberculosis rate in 1996 was 28.0 cases per 100,000 persons, compared with 33.4 in 1995 and 52.0 in 1992.

2. Despite recent progress, New York City's 1996 tuberculosis rate is still 3.5 times the national rate, and is higher than that of any other reporting jurisdiction. The city's rate remains far above the national goal established for tuberculosis control by the year 2000, of 3.5 cases per 100,000 persons.

3. In 1996, 84 of New York City's tuberculosis patients had strains of *Mycobacterium tuberculosis* which were resistant to at least isoniazid and rifampin (the two most important medications available to treat tuberculosis), a 22.9% decrease from the 109 cases reported in 1995 and an 81.0% decrease from the 441 cases reported in 1992.

4. Directly observed therapy (DOT) and intensive case management continue to result in high rates of completion of therapy: of the cohort of patients diagnosed in 1995, who remained alive during treatment and did not move out of New York City, 1,767 (93.5%) have completed treatment.

5. Three recent trends observed among New York City tuberculosis cases suggest directions for tuberculosis control interventions:

   * Among 1996 tuberculosis cases with known country of birth, the proportion of foreign-born tuberculosis cases reported in 1996 (46.5%) was higher than that recorded in 1995 (41.8%), and far exceeded the 17.8% recorded in 1992. The decline recorded in the number of foreign-born cases between 1995 and 1996 was substantially lower than the decline observed for US-born cases (8.2% vs. 23.9%). Tuberculosis control in New York City will depend on increasing effective case finding and treatment of tuberculosis disease and infection among the foreign-born.

   * The proportion of female tuberculosis cases has increased gradually but steadily from 27.8% in 1986 to 38.2% in 1996. Ensuring that tuberculosis control services are accessible to women is essential not only to meeting the needs of women, but also to maintaining effective control over pediatric tuberculosis, as children may be more likely to have contact with care-givers who are women.

   * The proportion of tuberculosis cases who are infected with HIV has remained relatively constant over the period when information about HIV status has been collected for tuberculosis cases (1992-1996), ranging between a high of 33.8% in 1994 and a low of 30.8% in 1996. Even after more intensive efforts on the part of Bureau of Tuberculosis Control staff to collect information about the HIV status of tuberculosis patients, HIV status was unknown for 31.0% of cases counted in 1996. Because of the interaction between HIV infection and tuberculosis, efforts to increase reporting of information about HIV status to the Bureau of Tuberculosis Control must continue. All medical providers should ensure that patients with tuberculosis are offered voluntary HIV counseling and testing.

6. To reduce the burden of tuberculosis on future generations of New Yorkers, the Department of Health and the medical community must place greater emphasis on ensuring that persons infected with *Mycobacterium tuberculosis* complete a course of preventive therapy, especially if they are recently infected contacts to active cases or otherwise at high risk of progression to active disease. In 1996, 13,450 individuals started taking preventive therapy; 11,355 (84.5%) individuals received some or all of their preventive therapy from Department of Health chest clinics.

NEW YORK CITY DEPARTMENT OF HEALTH
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MISSION STATEMENT

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

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

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

The Bureau achieves its goals through direct patient care, education, surveillance and outreach. Mandated activities include:

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

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

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

4 Setting standards and guidelines, and providing consultation, on the prevention, diagnosis, and treatment of tuberculosis infection and disease in New York City;

5 Ensuring that all identified contacts to active cases receive appropriate follow up;

6 Operating chest clinics throughout New York City to provide free state-of-the-art care to persons with suspected or confirmed tuberculosis disease and their close contacts in accordance with New York State Public Health Law 2202, Article 22, Title 1.

INFORMATION SUMMARY

Overview of Activities

Bureau of Tuberculosis Control

The Bureau of Tuberculosis Control operates a multifaceted program encompassing clinical services, outreach services, directly observed therapy, epidemiology and surveillance, education and training, and evaluation. To ensure that treatment for tuberculosis meets acceptable standards, the Bureau monitors care received by every patient diagnosed with active tuberculosis in New York City, regardless of whether or not the patient receives treatment in a Department of Health clinic.

Directly Observed Therapy

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

Clinical Services

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

In 1996, the Bureau's chest clinics provided care to 1,273 patients with confirmed or suspected tuberculosis. The Bureau has led the drive to implement effective preventive therapy programs for persons infected with tuberculosis in New York City: in 1996, 11,355 individuals were started on preventive therapy at Department of Health chest clinics, 84.5% of all patients who were started on preventive therapy in New York City. Of 2,053 patients who were diagnosed with tuberculosis in 1996, 697 (34.0%) received some or all of their care in the Bureau's chest clinics. These clinics provided care to a high proportion of patients with multidrug-resistant tuberculosis: of the 137 cases with multidrug-resistant tuberculosis prevalent in December 1996, 75 (54.7%) had received some or all of their treatment at Bureau chest clinics. Tuberculosis patients served by the Bureau's chest clinics are more likely to be foreign-born than tuberculosis patients served by other clinics: of the 697 patients diagnosed with tuberculosis in 1996 and ever treated at chest clinics, 397 (57.0%) were foreign-born, compared with 500 (40.4%) of the 1,239 patients who received some or all of their treatment to date from other providers.

Outreach Services

The Bureau's outreach workers educate, interview, and monitor hospitalized patients and outpatients; evaluate contacts of individuals with tuberculosis disease and ensure appropriate medical follow-up of contacts; and update patient information on the Bureau's city-wide tuberculosis registry. Outreach staff provide medical case management, locate and return patients to medical care, travel throughout the city to observe individuals as they ingest their medication, and test contacts of individuals with tuberculosis. Specialized outreach groups offer tuberculosis control services at the 30th Street Shelter, at Rikers Island Correctional Facility, and at single room occupancy sites in Manhattan. The city operates a controlled treat-

ment center at Goldwater Memorial Hospital for use when all other efforts have been exhausted, so that the most difficult-to-treat patients can complete a full course of treatment while the public health is safeguarded.

In 1996, outreach workers were responsible for providing DOT in the residences, places of employment or other meeting places of 909 tuberculosis patients who could not attend clinic on a regular schedule, and for returning to clinical care an average of 55 patients per month who had become non-adherent to therapy or who missed clinic appointments. Bureau outreach workers are playing an important role in efforts to increase completion of preventive therapy 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 1996, 7,025 contacts were evaluated.

The magnitude of the effort required to evaluate contacts to all potentially infectious tuberculosis cases is not captured by considering only confirmed tuberculosis cases: outreach workers must interview every patient who is initially reported to the Department of Health with a sputum smear positive for acid-fast bacilli (AFB). In New York City, 49.2% of the patients initially reported to the Department of Health in 1996 with AFB-positive sputum smears were eventually found to be infected with a mycobacterium other than *Mycobacterium tuberculosis*. Thus, in 1996, outreach and clinic workers were assigned to interview more than 600 patients suspected to have tuberculosis on the basis of positive sputum AFB smears but eventually found not to have tuberculosis.

In 1996, outreach workers visited over 30 hospital clinics to educate staff about the importance of reporting preventive therapy initiation and completion.

Epidemiology and Surveillance

The Surveillance and Central Registry Unit ensures that all data reported to the Bureau are entered into a computerized tuberculosis registry. In addition to entering demographic and clinical data for the 2,053 confirmed cases reported in 1996, Central Registry staff entered data for over 4,600 persons with suspected tuberculosis who were never confirmed as cases. Surveillance workers 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 radiologic findings: in 1996, surveillance workers reviewed medical records for 1,447 suspected cases, and their efforts contributed to the confirmation of tuberculosis disease in 332 patients who had no bacteriologic evidence of tuberculosis. Surveillance workers also ensure that reporting is done in a timely and thorough manner by auditing laboratories throughout the City, and they help investigate possible instances of laboratory contamination.

Registry data are routinely analyzed by the Surveillance and Epidemiology units to identify outbreaks, trends, and instances of possible laboratory contamination, and to research issues of clinical and operational importance. In 1996, epidemiology staff conducted 28 investigations to determine whether or not infectious tuberculosis patients had infected contacts in schools or workplaces. Surveillance and epidemiology staff identified 31 patients whose positive *Mycobacterium tuberculosis* cultures had resulted from laboratory contamination, and informed the medical providers of those patients that further evaluation was warranted and that medical treatment for tuberculosis might be unnecessary.

Education and Training

In addition to conducting introductory and in-service training for Department of Health (DOH) staff and non-DOH professionals, the Education and Training Unit responds to public requests for information: in 1996, 3,900 telephone inquiries about tuberculosis were answered. The unit develops and distributes multilingual educational brochures, flyers, posters, publications, videos, and technical articles: 302,000 documents were distributed in 1996. During 1996, the unit provided 3,200 training sessions for DOH staff, educational sessions for 9,500 members of the general public, and seminars/conferences for 350 non-DOH professionals. More than 200 participants from 22 states and 5 countries attended a 2-day symposium on "Investigation of Contacts to Tuberculosis Cases." A summary of symposium discussions was published.

Evaluation

Program monitoring and evaluation are critical components of the Bureau's activities. Program information is reported to the Centers for Disease Control and Prevention, the New York State Department of Health, and the Mayor's Office of Operations. In addition, the Bureau has created reports which are used internally to monitor trends and identify problems in a timely manner.

To address barriers to optimal program operation, Bureau staff use Continuous Quality Improvement (CQI) methods: CQI teams, composed of multi-disciplinary staff, review problems, propose changes for improvement, and monitor progress following the implementation of changes. This method has been used successfully in each of the Bureau's operational units. For example, clinic-based CQI teams conduct on-going patient flow analyses to assess the effectiveness and efficiency of chest clinics. Patient flow analysis documents utilization of clinic personnel along with the time spent by patients in receiving various clinical services and in waiting for services. Data from such analyses have enabled the Bureau's clinics to assess whether staff are effectively deployed, to reduce waiting time, and to improve general patient management.

Methods

Case Counting

Cases counted in 1996 were those verified during that year. Some 1996 cases were first suspected of having disease in 1995; likewise, some individuals first suspected of having tuberculosis in late 1996 will be counted in 1997 if active tuberculosis is confirmed in 1997. Individuals who submitted a specimen for mycobacteriology culture in late 1996 were included in the 1996 count if their culture was reported to be positive by January 31, 1996. A certain proportion of each year's counted cases are culture-negative for *Mycobacterium tuberculosis*. These cases never had a positive culture for *Mycobacterium tuberculosis* and were instead verified because their clinical symptoms and/or radiologic signs improved while they were on anti-tuberculosis medications. More complete verification of culture-negative cases by the Bureau of Tuberculosis Control in recent years has led to some surveillance artifact when longitudinal trends are considered, especially regarding tuberculosis cases in children, who tend to be culture-negative.

Rate Calculation

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

Age-adjusted case rates are provided in the section of the report on the geographic distribution of cases. Age standardization is a numerical tech-

nique that adjusts age-specific observed rates in population groups to a standard population age distribution so that different populations can be compared. Age standardization of the rates removes age differences between populations as a possible explanation for the differences in rates.

Since denominators used to calculate rates are derived from the 1990 census, rates included here do not reflect the significant numbers of immigrants who have entered New York City since 1990. Therefore, whenever possible, absolute numbers as well as crude and/or age-adjusted rates are compared. In comparisons of U.S. with foreign-born cases, persons from Puerto Rico, the U.S. Virgin Islands, and all U.S. territories are considered U.S.-born. Ascertainment and reporting of place of birth have improved in the past three years, accounting for part of the increase in reported foreign-born cases since 1990.

Analysis by race/ethnicity

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

Analysis by geographic area

The Bureau of Tuberculosis Control occasionally receives requests from other health agencies and community-based organizations for data aggregated by United Hospital Fund neighborhoods rather than by health districts. In the text of this report, data are presented by health districts; included in the appendix is a table presenting 1996 cases by United Hospital Fund neighborhood.

Introduction

(Table 1, Figure 1)

This report presents information on the demographic and clinical characteristics of tuberculosis cases confirmed in New York City in 1996 as well as on efforts to increase completion of preventive therapy by persons infected with the organism which causes tuberculosis.

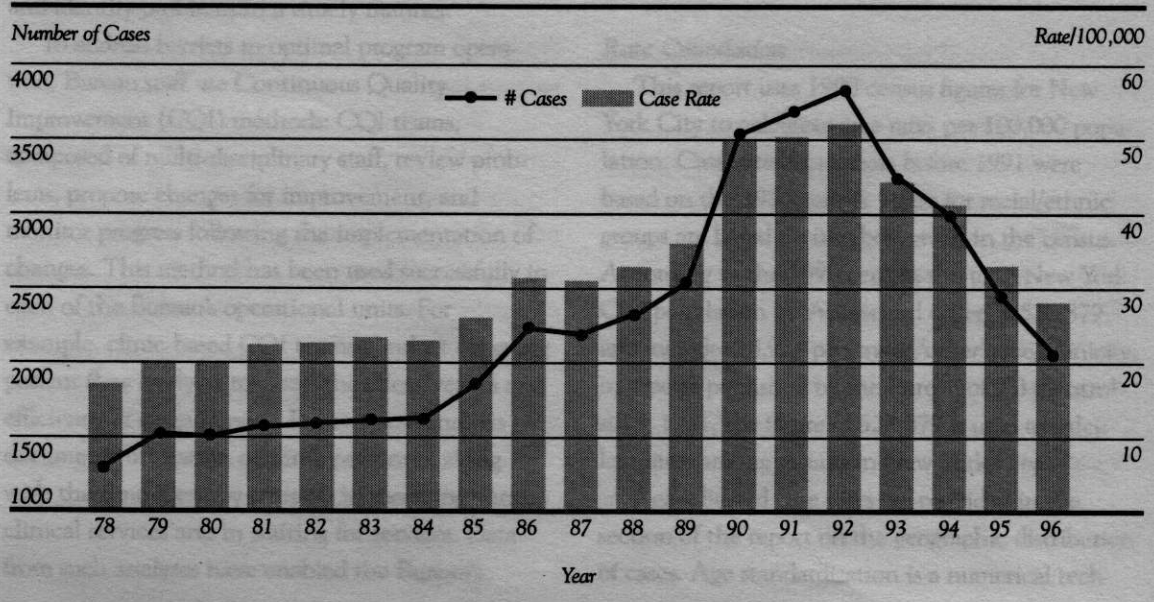
In 1996, the number of tuberculosis cases confirmed in New York City declined for the fourth consecutive year, for a total of 2,053. This is a 16.0% decrease from the 2,445 cases reported in 1995. The city's case rate is now 28.0 tuberculosis cases per 100,000 persons, compared with a rate of 33.4 recorded in 1995.

The lowest number of tuberculosis cases ever recorded in New York City was in 1978 (1,307). For 14 years after 1978, the number of cases rose fairly steadily, to peak in 1992 at 3,811 cases and a rate of 52.0 per 100,000. The number of cases reported in 1996 is 46.1% lower than the number reported in 1992. The drop in culture-confirmed cases between 1992 and 1996 is even more dramatic: the number of culture-confirmed cases reported in 1996 (1,721) is 50.0% lower than the number reported in 1992 (3,442).

New York City's recent tuberculosis epidemic started approximately six years before the nationwide epidemic. Fueled by increasing numbers of tuberculosis cases in New York City and other major urban centers, the national epidemic started in 1986 and peaked at 26,673 cases in 1992, yielding a national case rate of 10.5 per 100,000 population. Between 1992 and 1996, the number of cases nationally decreased by 5,346, to a preliminary figure of 21,327 cases in 1996. With 1,758 fewer cases in 1996 than in 1992, New York City contributed 32.9% 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 four years, the number of cases reported in the city in 1996 is 1.6 times greater than the number reported in 1978. New York City's 1996 rate of 28.0 tuberculosis cases per 100,000 population is 3.5 times the national rate of 8.0 per 100,000 and higher than that of any other reporting jurisdiction in the country. In 1996, New York City contributed 9.6%

Figure 1
Tuberculosis Cases and Rates
New York City, 1978 - 1996



of the nation's total 21,327 reported tuberculosis cases. In order for the nation as a whole to reach the goal set for tuberculosis control by the year 2000 (3.5 cases per 100,000 population), the campaign against tuberculosis must be maintained, especially by New York City and other major urban centers.

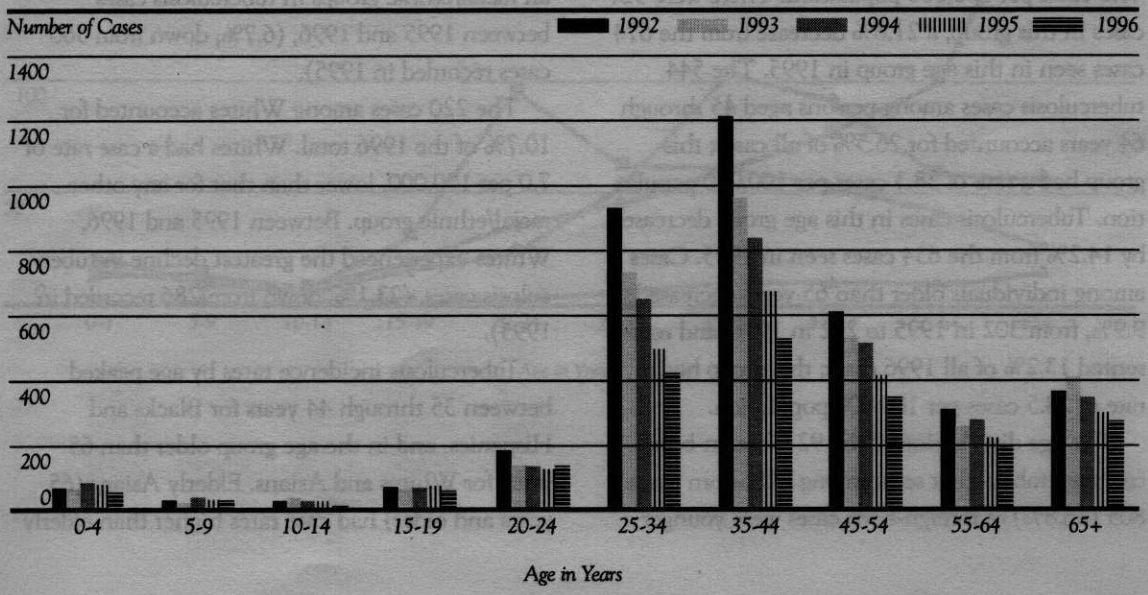
New York City has in recent years essentially experienced two tuberculosis epidemics, one among persons born in the United States, among whom infection with HIV has been an important contributing factor, and the other among foreign-born persons. In 1996, foreign-born patients comprised an even higher proportion of total tuberculosis cases than in 1995. Another trend which emerged clearly in 1996 was the gradual but steady increase in the proportion of tuberculosis cases who are women, from 27.8% in 1986 to 38.2% in 1996. It is unclear whether this increase is due to a somewhat greater tendency of foreign-born cases to be female, or to a factor yet to be determined. Ensuring that women have adequate access to tuberculosis control services, however, is essential to meeting their health needs as well as to maintaining effective control over tuberculosis among children, who may be more likely to have contact with care-givers who are women.

The first step in controlling the tuberculosis epidemic—ensuring the complete treatment of infectious cases—has been taken. If the city is to further reduce the burden of tuberculosis for future New Yorkers, it is important to offer preventive therapy to persons who became infected with *Mycobacterium tuberculosis* through their exposure to active cases during the recent epidemic, and to others who are infected with *Mycobacterium tuberculosis* and at high risk for progression to active disease. The final section of this report analyzes the status of preventive therapy programs in New York City in 1996.

Age Distribution
(Table 2, Figure 2)

In 1996, people with active tuberculosis ranged in age from less than one year old to 100 years old. Tuberculosis case rates were highest in the groups aged 35 through 44 years (47.2 per 100,000) and 45 through 54 years (45.1 per 100,000). All age groups, except that consisting of persons aged 20 through 24 years, had fewer tuberculosis cases in

FIGURE 2
TUBERCULOSIS CASES BY AGE
NEW YORK CITY, 1992 - 1996



1996 than in 1995. The group aged 20 through 24 years comprised 6.6% of total 1996 cases, had a rate of 23.6 per 100,000, and experienced an increase of 4.6%, from 130 to 136. The largest percentage decreases in tuberculosis incidence between 1995 and 1996 were seen among adolescents aged 10 through 14 years (48.1%, from 27 cases in 1995 to 14 in 1996) and in children aged 0 through 4 years (27.6%, from 76 cases in 1995 to 55 in 1996); in 1996, tuberculosis rates per 100,000 for these two groups were 3.1 and 10.8 respectively.

The 99 cases which occurred in 1996 among children and adolescents younger than 15 years represent 4.8% of total cases; between 1995 and 1996, the incidence of tuberculosis in this age group declined by 26.1%. Within the past three years, surveillance to identify culture-negative pediatric tuberculosis cases has increased in New York City. Thus, the large decrease in tuberculosis among younger children, who are regarded as sentinel cases, is particularly encouraging, as it suggests a decline in recent transmission of tuberculosis.

Among persons aged 25 through 34 years, there were 417 cases, accounting for 20.3% of total cases; this group had a rate of 30.5. The largest proportion of 1996 cases, 25.7%, occurred in the 35 through 44 year age group, which had a rate of 47.2 cases per 100,000 population. There were 527 cases in this group, a 21.8% decrease from the 674 cases seen in this age group in 1995. The 544 tuberculosis cases among persons aged 45 through 64 years accounted for 26.5% of all cases; this group had a rate of 38.3 cases per 100,000 population. Tuberculosis cases in this age group decreased by 14.2% from the 634 cases seen in 1995. Cases among individuals older than 65 years decreased 9.9%, from 302 in 1995 to 272 in 1996, and represented 13.2% of all 1996 cases; this group had a rate of 28.5 cases per 100,000 population.

The age distribution of the 927 foreign-born cases resembled that seen among U.S.-born cases: 805 (86.8%) of foreign-born cases were younger than 65 years and 122 (13.2%) were 65 years and older, compared with 923 (86.4%) of U.S.-born cases younger than 65 years and 145 (13.6%) 65 and older. Of foreign-born cases, the largest proportion was in the group aged 25 to 34 years (24.5%, 227 cases) and of U.S.-born cases the largest proportion was in the group aged 35 to 44 years (28.2%, 301 cases).

Racial/Ethnic Distribution
(Table 2, Figures 3-4)

As in previous years, in 1996 the highest proportion of tuberculosis cases (43.5%) occurred among Blacks. The 894 cases reported among Blacks in 1996 gave this group a case rate of 48.4 per 100,000, second only to that for Asians. The number of tuberculosis patients who are black decreased by 18.8% from the 1,101 recorded in 1995.

The 603 Hispanic cases represented 29.4% of total 1996 tuberculosis cases. Hispanics had a case rate of 33.8 per 100,000. The number of tuberculosis patients who are Hispanic decreased by 13.6% from the 698 recorded in 1995.

The 336 cases among Asians accounted for 16.4% of the 1996 total. Asians had a case rate of 63.5, higher than that for any other racial/ethnic group. Asians experienced the smallest decline of all racial/ethnic groups in tuberculosis cases between 1995 and 1996, (6.7%, down from 360 cases recorded in 1995).

The 220 cases among Whites accounted for 10.7% of the 1996 total. Whites had a case rate of 7.0 per 100,000, lower than that for any other racial/ethnic group. Between 1995 and 1996, Whites experienced the greatest decline in tuberculosis cases, (23.1%, down from 286 recorded in 1995).

Tuberculosis incidence rates by age peaked between 35 through 44 years for Blacks and Hispanics, and in the age group older than 65 years for Whites and Asians. Elderly Asians (65 years and older) had case rates higher than elderly

FIGURE 3
TUBERCULOSIS CASES BY RACE/ETHNICITY
NEW YORK CITY, 1985 - 1996

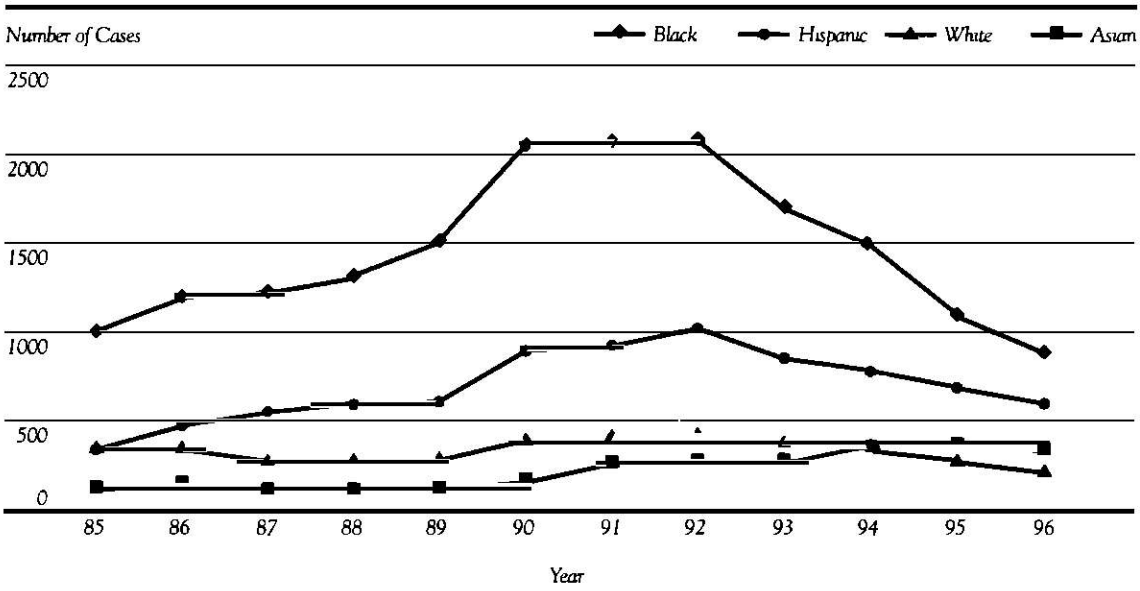
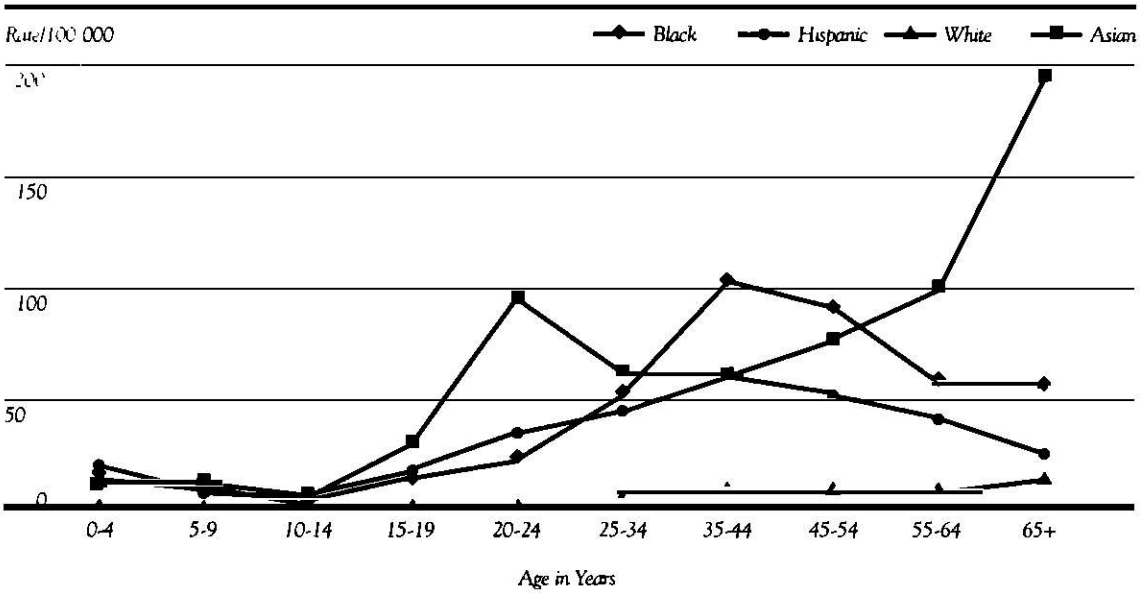


FIGURE 4
TUBERCULOSIS CASES BY AGE AND RACE/ETHNICITY
NEW YORK CITY, 1996



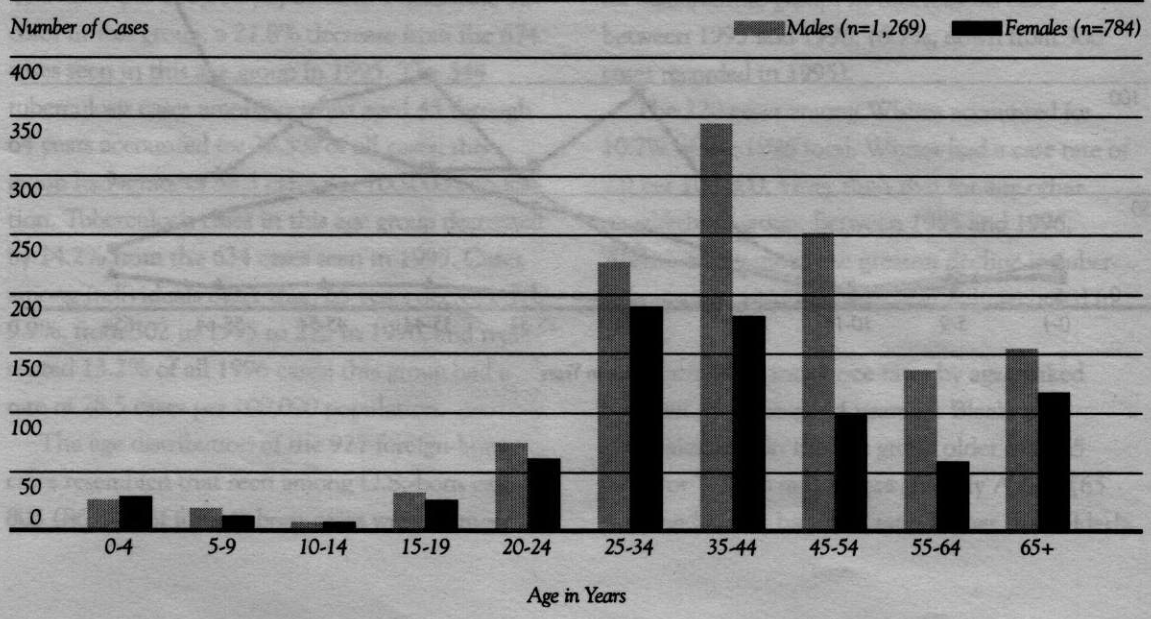
persons in any other racial/ethnic group, and their rate exceeded that of all other racial/ethnic age groups.

Distribution by Sex
(Tables 3-4, Figure 5)

As in previous years, the incidence of tuberculosis among males in 1996 was approximately twice the incidence among females: 36.9 per 100,000 among males vs. 20.2 per 100,000 among females. In three of the past four years, the annual decrease in tuberculosis cases was smaller among females than among males: from 1995 to 1996, cases declined 11.8% among females and 18.4% among males; between 1994 and 1995, cases declined 14.3% among females and 20.5% among males; and between 1992 and 1993 cases declined 5.3% among females and 19.5% among males. Between 1993 and 1994, tuberculosis cases in both sexes declined 7.4%. The proportion of cases who are female has increased gradually but steadily from 27.8% in 1986 to 38.1% in 1996.

One possible reason for the increase in the proportion of female cases is a somewhat greater tendency of foreign-born tuberculosis cases to be female compared with U.S.-born tuberculosis cases. Between 1993 and 1995, the proportion of females among foreign-born cases ranged from a low of 37.1% in 1993 to 38.6% in 1995, while the proportion of females among U.S.-born cases ranged from a low of 33.0% in 1994 to a high of 34.8% in 1995. In 1996, however, the proportion of females among foreign-born patients was somewhat lower than among U.S.-born patients (37.4% and 39.3% respectively). A possible association between the increasing proportion of female tuberculosis cases and the HIV epidemic must be investigated. Such an association is not readily evidenced in the trend of the proportion of female tuberculosis cases who are HIV-infected: since the peak of the tuberculosis epidemic in 1992, the proportion of female tuberculosis cases known to be HIV-infected remained fairly constant, fluctuating between a high of 27.5% in 1993 and a low of 23.5% in 1994. Trends in HIV-infected female tuberculosis cases, however, do not necessarily represent trends in HIV-infection among all women in New York City.

Figure 5
Distribution of Tuberculosis Cases by Sex and Age
New York City, 1996



Among males, the greatest percentage decreases in cases between 1995 and 1996 occurred in the groups aged 10 through 14 years (56.3% decrease, from 16 in 1995 to 7 in 1996) and less than 4 years (44.7% decrease, from 47 in 1995 to 26 in 1996). Among females, the greatest percentage decreases in cases occurred in the groups aged 10 through 14 years (36.4% decrease, from 11 in 1995 to 7 in 1996) and 15 through 19 years (33.3% decrease, from 39 in 1995 to 26 in 1996).

While case rates were similar for males and females in all age groups younger than 35 years, there were substantial differences between males and females in all older age groups. The greatest difference between rates for males and females occurred in the 45 through 54 year age group (70.2 per 100,000 for males vs. 23.5 for females).

Race/ethnicity of cases by age and gender

Please see tables 3 and 4 for the distribution of 1996 tuberculosis cases by race/ethnicity and age among males and females respectively. The race/ethnicity distribution for males and females was fairly similar.

Among males and females, the highest tuberculosis rates were observed among Asians aged 65 years and older (291.8 per 100,000 among males and 111.4 per 100,000 among females); it should be noted, however, that denominators for these groups are relatively small.

Among males, age-specific incidence rates for Blacks and Hispanics peaked in the group aged 45 through 54 years, and for Asians and Whites, in the group aged 65 years and older. Among females, also, age-specific incidence rates peaked in younger age groups for Blacks and Hispanics than for Whites and Asians: among black women, rates peaked in the group aged 35 through 44 years; among Hispanic women, in the group aged 25 through 34 years; and among Asian and white women, in the group aged 65 years and older.

Geographic Distribution

(Table 5, Figures 6-7)

Incidence rates by health district of residence (Figure 6) were calculated for 1996; age-adjusted and crude rates are presented in Table 5.

Figure 7 illustrates the number of tuberculosis cases contributed by each borough, and the proportion of foreign-born cases in each borough. Between 1995 and 1996, the number of new tuberculosis cases decreased in all five boroughs. The boroughs which contributed the largest proportions of total New York City cases (Brooklyn, Manhattan and Queens) had decreases in incidence rates of 26.6%, 2.6% and 10.9% respectively. The proportion of foreign-born cases was highest in Queens (64.2%). Between 1995 and 1996, the number of foreign-born cases decreased in all boroughs except Manhattan and the Bronx; Manhattan experienced an increase of 5.5%, from 217 to 229 and the Bronx experienced an increase of 4.5% from 112 to 117.

The three districts with the highest age-adjusted

Figure 6
Health Center Districts, New York City

case rates in 1996 were Central Harlem in Manhattan, Mott Haven in the Bronx, and Bedford in Brooklyn. Case rates in Central Harlem continue to exceed 100 per 100,000 people, more than ten times the national average and far higher than any other health district in New York City. Nevertheless, in two of the three districts with the highest rates (Central Harlem and Bedford), age-adjusted case rates decreased between 1995 and 1996, by 1.8% and 19.9% respectively. In Mott Haven, age-adjusted case rates increased slightly, by 1.0%. Since the peak of the epidemic in 1992, age-adjusted case rates decreased in all three districts: by 52.9% in Central Harlem, by 63.2% in Mott Haven, and by 49.0% in Bedford.

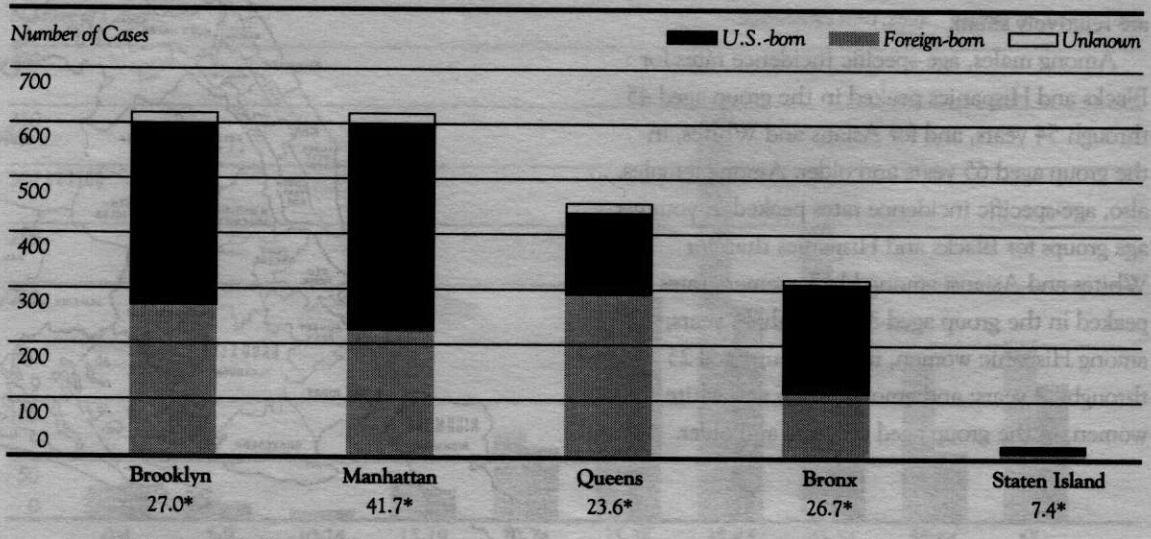
Between 1995 and 1996, age-adjusted case rates rose substantially in Washington Heights, which experienced a 40.4% increase. Tuberculosis cases in Washington Heights were more likely to be foreign-born compared to tuberculosis cases in the rest of Manhattan, (52.2% and 32.6% respectively). Age-adjusted case rates rose to a lesser extent in Fordham-Riverdale (by 18.4%), Maspeth-Forest Hills (by 16.0%), the Lower West Side (by 11.4%), and Mott Haven (by 1.0%).

Area of Birth
(Table 6, Figure 8)

In 1996, information about country of birth was available for 1,995 (97.2%) of New York City's tuberculosis cases. Between 1995 and 1996, the number of foreign-born cases declined less sharply than did the number of U.S.-born cases: foreign-born cases dropped from 1,010 to 927 (8.2%), while U.S.-born cases dropped from 1,404 to 1,068 (23.9%). Among cases with a known place of birth, the proportion of foreign-born cases increased to 46.5%, from 41.8% recorded in 1995. Figure 8 illustrates trends in numbers of foreign-born cases since 1980: between 1980 and 1996, the number of foreign-born tuberculosis patients more than doubled.

A total of 95 countries other than the United States or U.S. territories were reported as places of birth for 1996 tuberculosis patients. The Caribbean area, which accounted for the largest foreign-born group, contributed 274 (13.7%) of total cases. The total number of U.S.-born cases includes 136 cases born in Puerto Rico, which comprised 6.8% of total cases.

Figure 7
Tuberculosis Cases by Place of Birth and Borough
New York City, 1996



* *Rate per 100,000 population*

History of Prior Tuberculosis

Of the 2,053 tuberculosis cases reported in 1996, 101 (4.9%) had a previous history of tuberculosis documented on their current records in the New York City Department of Health tuberculosis registry, or had been assigned a record number as a confirmed or suspected case before their presentation in 1996. History of previous tuberculosis disease is of interest because 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.

Drug Resistance

(Table 7)

In accordance with guidelines issued by the Centers for Disease Control and Prevention and the American Thoracic Society, the New York City Department of Health recommends that susceptibility testing be performed on the initial and final isolates of *Mycobacterium tuberculosis* obtained from every culture-positive patient. Susceptibility results must be reported to the New York City Department of Health.

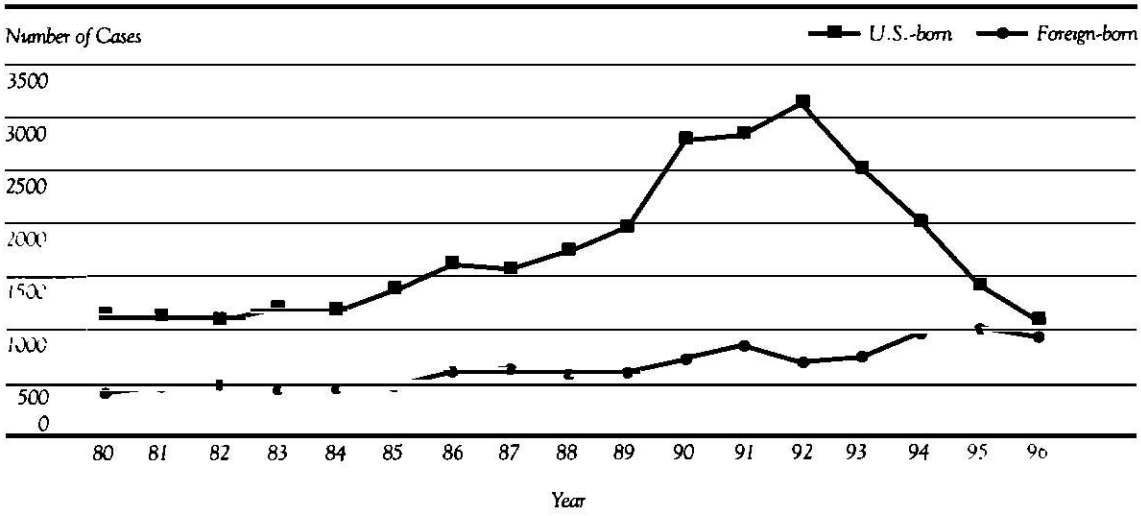
During 1996, 1,721 (83.8%) of the city's tuberculosis cases had cultures positive for *Mycobacterium tuberculosis*. Of these 1,721 individuals with positive *Mycobacterium tuberculosis* cultures, 1,667 (96.9%) had drug susceptibility test results for first-line anti-tuberculosis drugs reported in the New York City Department of Health tuberculosis registry;[1] of individuals with susceptibility results for first line anti-tuberculosis drugs, 287 (17.4%) also had susceptibility test results for second-line anti-tuberculosis drugs recorded for either the initial or final susceptibility test.[2]

Of individuals with drug susceptibility results for first-line drugs, 84 of 1,667 (5.0%) had multidrug-resistant strains (i.e., they had isolates resistant to at least isoniazid and rifampin). Between 1995 and 1996, the number of multidrug-resistant tuberculosis (MDRTB) cases decreased by 22.9%, from 109 cases in 1995 to 84 in 1996. The number of MDRTB cases reported in 1996 decreased by

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

[2] *Second line anti-tuberculosis drugs include all anti-tuberculosis drugs other than those listed under footnote 1.*

FIGURE 8
US AND FOREIGN-BORN CASES*
NEW YORK CITY, 1980 - 1996



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

81.0% from the 441 cases reported in 1992, at the peak of the epidemic. In addition to the 84 MDRTB cases which were confirmed in 1996, 2 patients with tuberculosis confirmed in earlier years and who had previously had non-multidrug-resistant *Mycobacterium tuberculosis* on culture were found to have multidrug-resistant cultures in 1996.

Of those individuals reported in 1996 with multidrug-resistant strains of tuberculosis, 16 (19.0%) had isolates which were resistant to only isoniazid and rifampin. In contrast, in 1995, individuals with *Mycobacterium tuberculosis* resistant to only isoniazid and rifampin represented 30.3% of all patients newly diagnosed with MDRTB. In 1996, 13 patients with MDRTB (15.5%) had isolates resistant to isoniazid, rifampin, and one other first-line drug; 16 (19.0%) had isolates resistant to isoniazid, rifampin, and two other first-line drugs; and 15 (17.9%) had isolates resistant to isoniazid, rifampin, and three other first-line drugs. The last group (patients resistant to isoniazid, rifampin and three other first-line drugs) accounted for 9.2% of all MDRTB cases in 1995. The remaining 24 patients with MDRTB in 1996 (28.6%) had isolates resistant to most first line drugs plus kanamycin. The proportion of new patients with MDRTB and such highly resistant strains increased slightly since 1995, when 25.7% of patients with multidrug-resistant strains of tuberculosis had isolates resistant to most first line drugs plus kanamycin.

Of the 84 patients with MDRTB in 1996, 29 (34.5%) were foreign-born, 53 (63.1%) were U.S.-born, and 2 (2.4%) had an unknown country of birth. Nine (10.7%) patients with MDRTB had previously received anti-tuberculosis medications compared with 92 (4.7%) patients with non-MDRTB. The proportion of MDRTB cases who were health-care workers (11.9%, 10/84) was 5.8 times the proportion of non-MDRTB cases who were health care workers (2.3%, 45/1,969).

Of the 1,667 individuals with susceptibility results to first-line drugs, 52 (3.1%) were resistant to two or more first line drugs, but were not classified as MDRTB. Of these, 43 were resistant to two drugs, 3 were resistant to three drugs, and 2 were resistant to four of the first line drugs.

Of the 1,667 individuals with susceptibility results to first-line drugs, 164 (9.8%) had strains of *Mycobacterium tuberculosis* resistant to a single first line drug. Both U.S.-born and foreign-born patients with isolates resistant to a single drug were most likely to have isolates resistant to isoniazid: 41.3% (31/75) of U.S.-born patients and 55.8% (48/86) of foreign-born patients with isolates resistant to a single drug were resistant to isoniazid.

Table 7 presents the age distribution and place of birth of patients who had multidrug-resistant, isoniazid-resistant, and susceptible strains of *Mycobacterium tuberculosis*. It should be noted that 3.0% of patients aged 65 and older had multidrug- resistant strains of *Mycobacterium tuberculosis* and an additional 8.3% had strains of *Mycobacterium tuberculosis* which were resistant to isoniazid but susceptible to rifampin. In populations where at least four percent 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 until susceptibility results are available, in order to prevent development of multidrug-resistance in strains which are at first resistant to isoniazid but susceptible to rifampin. Medical practitioners sometimes assume that elderly patients do not require initial therapy with four anti-tuberculosis drugs. In New York City, unless susceptibility results are known for a given patient from the outset of treatment, all patients should initially be started on four drugs regardless of age.

Site of Disease
(Table 8)

In 1996, pulmonary tuberculosis was the primary site of disease for 1,600 (77.9%) of all cases. Of persons with extrapulmonary disease, either alone or in combination with pulmonary disease, lymphatic tuberculosis was the most common form of disease, followed by bone and joint. Of all cases reported in 1996, 171 (8.3%) had both pulmonary and extrapulmonary disease. Of 1,600 cases with pulmonary disease, 820 (51.3%) had a positive AFB smear from either sputum or another respiratory specimen.

Sociomedical Factors
(Table 9)

Information about such social factors as use of illegal 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 and increased likelihood of adverse reactions to prescribed anti-tuberculosis drug regimens or suggest high risk for infection with the human immunodeficiency virus. A history of homelessness or work in certain fields (e.g., health care) may predict difficulties in assuring patient adherence 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 to interview patients and enter information about social variables into the tuberculosis registry, the proportion of cases missing information about any social variables has decreased from a range of 0-40% in 1995 to a range of 0-10% in 1996. In 1996, among the approximately 90% of patients for whom information about substance abuse in the 12 months before diagnosis was available, 122 (6.6%) had used illegal injectable drugs, 257 (14.0%) had used illegal non-injectable drugs, and 281 (15.2%) had abused alcohol. Among the patients diagnosed in 1995 for whom information on substance abuse was available, these percentages were 6.4%, 11.8% and 13.0% respectively.

All 1996 cases had information available on incarceration: 52 (2.5%) had been incarcerated at the time of diagnosis, compared with 77 of 2,442 (3.2%) in 1995. Of the 1,837 (89.5%) cases with information available on occupation in 1996, 58 (3.2%) had worked in the health care field or as correctional employees, compared with 53 of 1,515 (3.5%) in 1995. All 1996 cases had information available on homelessness: 99 (4.8%) had been homeless at diagnosis or at some point during their treatment. The accurate recording of homelessness was emphasized in 1996; therefore, comparison of data on homelessness between 1995 and 1996 is subject to surveillance artifact.

Mortality
(Table 10)

Mortality figures presented in this year's report are based on statistics issued by the Bureau of Health Statistics and Analysis of the New York City Department of Health. In 1996, there were 67 deaths in New York City with tuberculosis listed as the underlying cause of death on the death certificate. The crude tuberculosis mortality rate for 1996 was 0.9 per 100,000. There were an additional 133 deaths for which tuberculosis was listed as a secondary cause. Of these deaths, 108 (81.2%) listed AIDS or HIV infection as the underlying cause of death.

Tuberculosis and HIV Infection
(Tables 11-12)

Since 1990, the Department of Health has collected information on the HIV-serostatus 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 determine the appropriate duration of anti-tuberculosis treatment and to guard against adverse interactions between anti-tuberculosis and anti-HIV drugs).

Table 11 presents the reported HIV-serostatus of individuals with active tuberculosis by age and sex. Since not all individuals with tuberculosis undergo testing for HIV, and since not all known HIV test results are reported to the Bureau of Tuberculosis Control, the proportion of HIV-seropositive cases reported in this table is a minimum estimate of the actual proportion of tuberculosis cases who are HIV-infected.

In 1996, 69.0% (1,416/2,053) of New York City tuberculosis cases had a known and reported HIV status, an increase from 63.5% (1,553/2,445) in 1995. Among males and females, HIV status was most likely to be known for persons aged 35 through 44 years: 283 (82.3%) of males and 148 (80.9%) of females in this age group had a known HIV status. In all but the 0 through 9 and 20 through 34 age groups, HIV status was more likely to be known for males than for females: 71.2% of males had a known HIV status and 65.3% of females. HIV status was more likely to be known for U.S.-born cases than for foreign-born cases: 75.3% (804/1,068) of U.S.-born cases had a known HIV status vs 63.4% (588/927) of foreign-born cases.

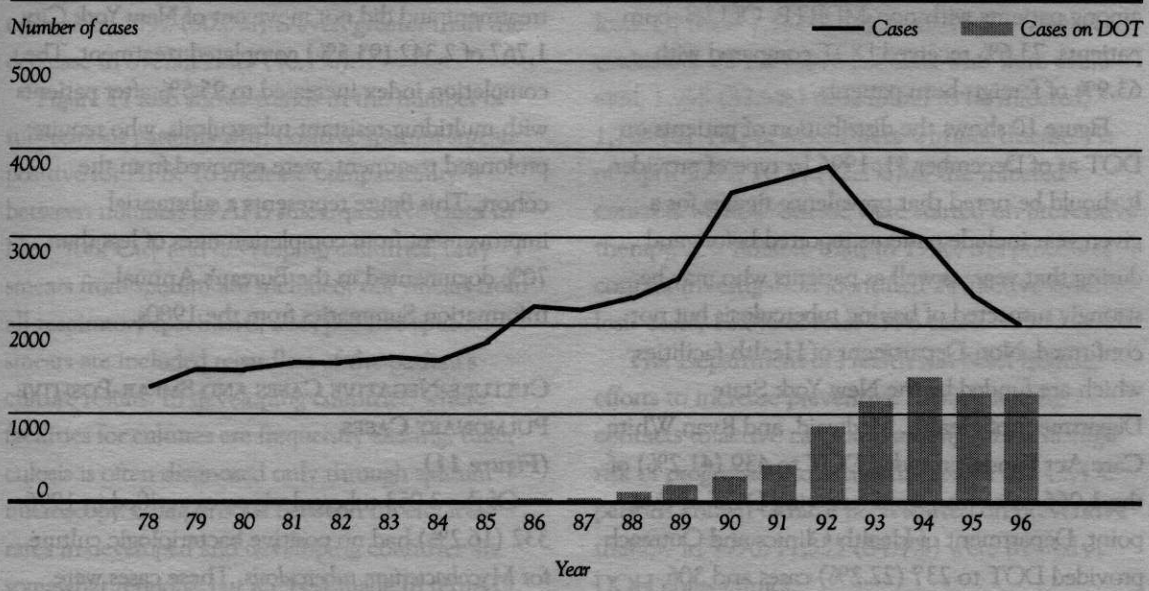
Of 1996 tuberculosis cases, 30.8% were reported as HIV-seropositive, 38.1% were reported as HIV-seronegative, and 31.0% had an unreported and/or unknown HIV status. Of the 1,269 male tuberculosis cases, 33.8% were reported as HIV-seropositive, 37.4% were reported as HIV-seronegative, and 28.8% had an unknown HIV status. Of the 784 female tuberculosis cases, 26.0% were reported as HIV-seropositive, 39.3% were reported as HIV-seronegative, and 34.7% had an unknown HIV status. Among males and females with tuberculosis, the 35 through 44 year age group had the highest proportion of HIV positive patients: 53.2% (183/344) among males and 50.3% (92/183) among females.

The proportion of patients with tuberculosis who are HIV-seropositive has varied only slightly in recent years: in 1992, 33.6% (1,280/3,811) of all patients with tuberculosis were known to be HIV-seropositive; in 1993, 33.0% (1,068/3,235); in 1994, 33.8% (1,011/2,995); and in 1995, 32.8% (801/2,445). Table 12 presents the distribution of HIV infection by sex from 1992 through 1996. While the proportion of HIV-infected cases was consistently higher among males, the proportion of HIV-infected cases has varied only slightly from year to year for both sexes. Among persons with active tuberculosis, those born outside the United States were less likely than those born in the United States to be HIV-seropositive: in 1996, 13.4% (124/927) of foreign-born patients were HIV-seropositive compared with 45.9% (490/1,068) of patients born in the United States. In comparing HIV-seropositivity among foreign-born vs. U.S.-born patients, however, it must be remembered that HIV-status was significantly more likely to be unknown for foreign-born cases.

Directly Observed Therapy (DOT) and Completion of Therapy
(Table 13, Figures 9-10)

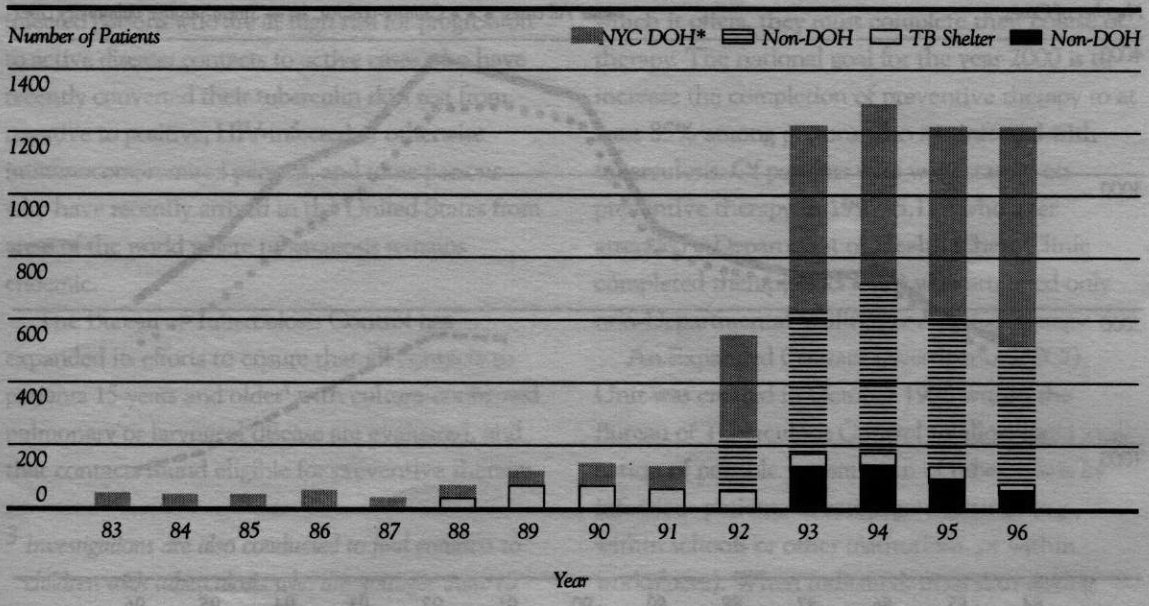
Figure 9 illustrates numbers of patients among those reported in each year since 1984 who were on DOT for some or all of their tuberculosis treatment during the year in which they were counted. The number of patients who were on DOT increased steadily from very low levels in the mid-1980s and early 1990s (e.g. 320 in 1991) to 1,448 in 1994. 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 (i.e., patients who were diagnosed while alive and had the opportunity to receive some or all of their therapy as outpatients) who were on DOT increased from 63.6% (1,269/1,994) in 1995 to 70.3% (1,191/1,695) in 1996. In 1996, the proportion of patients who ever received DOT was higher among those who had pulmonary tuberculosis with positive respiratory smears than among those who had pulmonary tuberculosis without positive respiratory smears. (564/723, [78.0%] compared with 600/972, [61.7%]

FIGURE 9
TUBERCULOSIS CASES ON DIRECTLY OBSERVED THERAPY
NEW YORK CITY, 1978 - 1996*



* *Before 1995, cases on DOT are of cases still known, as per current registry information, to have had tuberculosis.*

FIGURE 10
TUBERCULOSIS PATIENTS ON DIRECTLY OBSERVED THERAPY AS OF DECEMBER 31 BY TYPE OF PROVIDER
NEW YORK CITY, 1983 - 1996



* *New York City Department of Health*

for patients without positive respiratory smears). The proportion of patients with MDRTB who received DOT was 88.9%, compared with 68.0% among patients with non-MDRTB. Of U.S.-born patients, 73.6% received DOT compared with 63.9% of foreign-born patients.

Figure 10 shows the distribution of patients on DOT as of December 31, 1996 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 may be strongly suspected of having tuberculosis but not confirmed. Non-Department of Health facilities, which are funded by the New York State Department of Health, Medicaid, and Ryan White Care Act Funds, provided DOT to 439 (41.2%) of the 1,066 cases who were receiving DOT at that point. Department of Health Clinics and Outreach provided DOT to 237 (22.2%) cases and 306 (28.7%) cases respectively.

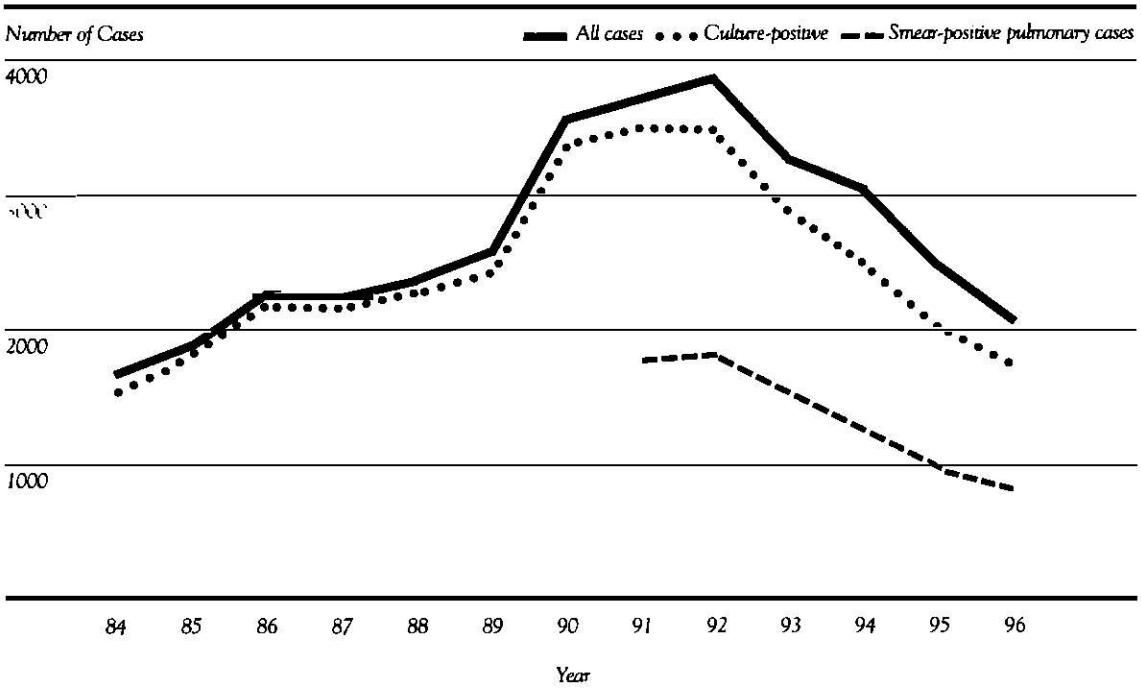
The effectiveness of DOT and intensive case management in increasing completion of therapy is illustrated in Table 13. Of the cohort of patients diagnosed in 1995, who remained alive during treatment and did not move out of New York City, 1,767 of 2,342 (93.5%) completed treatment. The completion index increased to 95.5% after patients with multidrug-resistant tuberculosis, who require prolonged treatment, were removed from the cohort. This figure represents a substantial improvement from completion rates of less than 70% documented in the Bureau's Annual Information Summaries from the 1980s.

Culture-Negative Cases and Smear-Positive Pulmonary Cases

(Figure 11)

Of the 2,053 tuberculosis cases verified in 1996, 332 (16.2%) had no positive bacteriologic culture for *Mycobacterium tuberculosis*. These cases were determined to have tuberculosis because of their clinical and/or radiologic improvement while on

FIGURE 11
TREND OF TUBERCULOSIS CASES
NEW YORK CITY, 1984 - 1996*



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

anti-tuberculosis medications. Figure 12 illustrates trends, since 1986, in all verified cases and in culture-positive cases. The drop in culture-positive cases since 1992 (50.0%) is even greater than the decrease in overall cases (46.1%).

Figure 11 also shows trends in the number of tuberculosis patients with positive sputum smears positive for AFB. To increase comparability between numbers of AFB smear-positive cases in New York City and developing countries, only smears from sputum are included, not smears from all respiratory specimens; also, positive sputum smears are included regardless of the patient's culture results. In developing countries, where facilities for cultures are frequently lacking, tuberculosis is often diagnosed only through sputum microscopy. Comparisons between tuberculosis rates in developed and developing countries are somewhat tenuous, but are best made in terms of incidence of sputum smear-positive pulmonary cases. In 1996, there were 820 such cases in New York City with an incidence of 11.2 per 100,000.

Prevention of Future Tuberculosis Disease

There are several categories of tuberculosis-infected persons who are at high risk for progression to active disease: contacts to active cases who have recently converted their tuberculin skin test from negative to positive, HIV-infected or otherwise immunocompromised persons, and some persons who have recently arrived in the United States from areas of the world where tuberculosis remains endemic.

The Bureau of Tuberculosis Control has expanded its efforts to ensure that all contacts to patients 15 years and older[3] with culture-confirmed pulmonary or laryngeal disease are evaluated, and that contacts found eligible for preventive therapy receive it. In 1996, 7,532 contacts were elicited from 1,553 cases aged 15 years or older with culture-confirmed pulmonary or laryngeal tuberculosis. Of these 7,532 contacts, 6,016 (79.9%) were evaluated. Of the 6,016 contacts who were evaluated, 1,955 (32.5%) were found to be infected, 1,708 (87.4%) of whom were without disease. As of April 1997, 1,234 (72.2%) of the infected contacts without disease were started on preventive therapy. It is notable that, in 1996, the process of contact investigation identified 247 active tuberculosis cases, 12.0% of total 1996 cases.

The Department of Health has been leading efforts to increase preventive therapy among contacts to active cases and among others at high risk of progression to active disease: of the 13,450 persons known to have been started on preventive therapy in 1996, 11,355 (84.4%) were treated at DOH chest clinics.

Starting a patient on preventive therapy is only the beginning of the drive to increase levels of preventive therapy: a course of preventive therapy lasts from six to twelve months, depending on a patient's HIV status and age. In order for patients to benefit from the full measure of protection which it offers, they must complete their course of therapy. The national goal for the year 2000 is to increase the completion of preventive therapy to at least 85% among persons who are infected with tuberculosis. Of patients who were started on preventive therapy in 1995, 5,129 who ever attended a Department of Health Chest Clinic completed therapy, and 1,034 who attended only non-Departmental facilities completed therapy.

An Expanded Contact Investigation (ECI) Unit was created in October 1995 within the Bureau of Tuberculosis Control to allow rapid evaluation of possible transmission of tuberculosis by infectious patients in congregate settings (e.g., within schools or other institutions, or within workplaces). When indicated, mass skin testing and effective education about tuberculosis are provided. During 1996, the ECI Unit completed 35 investigations of potential tuberculosis transmission

[3] *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.*

in congregate settings. Twenty-eight of these investigations involved an index case who was aged 15 years or older and who had pulmonary tuberculosis. In all but one of these 28 investigations, the index case was both smear-positive for AFB and culture-positive for *Mycobacterium tuberculosis*; twenty (71.4%) of the index cases had cavitation on chest radiograph. Results of the investigations were classified according to the likelihood of tuberculosis transmission to contacts in the congregate setting: transmission was considered unlikely in 20 (71.4%) of the investigations; possible in 2 (7.1%); and probable in 6 (21.4%). The total number of contacts tested in these investigations was 1,305; 282 (21.6%) of those tested were found to be infected and were referred for medical evaluation. Twelve of the investigations were conducted among persons who would be highly susceptible to progression to active disease after infection: ten were in schools or day care centers, and two were in residence facilities for persons with AIDS. Fifty percent of the investigations involved a foreign-born index case and/or a setting in which over 50 percent of contacts were foreign-born. This points to the importance of safeguarding patient confidentiality, including immigration status, in order to effectively conduct contact investigations and protect public health. It is essential that new legislation associated with the Welfare Reform Act not jeopardize this protection of confidentiality.

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

TABLES

TABLE 1
TUBERCULOSIS INCIDENCE
NEW YORK CITY, 1920 - 1996

Year	Number*	Rate Per 100,000**	Culture-Positive Cases	Smear-Positive Pulmonary+	Multidrug-Resistant Cases++
1920	14,035	246.9			
1930	11,821	170.2			
1940	8,212	110.0			
1950	6,518	98.0			
1960	4,699	60.4			
1970	2,590	32.8			
1971	2,572	32.6			
1972	2,275	28.8			
1973	2,101	26.6			
1974	2,022	25.6			
1975	2,151	27.2			
1976	2,151	27.2			
1977	1,605	21.1			
1978‡	1,307	17.2			
1979	1,530	20.1			
1980	1,514	19.9			
1981	1,582	22.4			
1982	1,594	22.5			
1983	1,651	23.4			
1984	1,629	23.0	1,527		
1985	1,843	26.0	1,785		
1986	2,223	31.4	2,181		
1987	2,197	31.1	2,157		
1988	2,317	32.8	2,241		
1989	2,545	36.0	2,405		
1990	3,520	49.8	3,372		
1991	3,673	50.2	3,484	1,747	366
1992	3,811	52.0	3,442	1,791‡‡	441
1993	3,235	44.2	2,854	1,506	296
1994	2,995	40.9	2,479	1,242	176
1995	2,445	33.4	2,014	962	109
1996	2,053	28.0	1,721	820	84

* For "phthisis," or pulmonary cases, 1920-1940; thereafter all forms of tuberculosis.
** Population based on census data for each decade.
\+ Patients with a sputum smear-positive for acid-fast bacilli regardless of culture result.
++ Resistant to at least isonaizid and rifampin. Drug susceptibility made mandatorily reportable during 1991; figure from that year is not complete. Number for 1996 is preliminary because drug susceptibility tests have not yet been performed and results reported on some patients' isolates.
‡ Case definition revised in 1978 to include persons who had verified disease in the past and were discharged or lost to supervision for more than 12 months and had verified disease again.
‡‡ This information was estimated for 1992, exact figures not available.

TABLE 2
TUBERCULOSIS INCIDENCE (RATES PER 100,000) BY RACE/ETHNICITY AND AGE IN YEARS
NEW YORK CITY, 1996

	Age Group N (Rate)										
Race	*0-4*	*5-9*	*10-14*	*15-19*	*20-24*	*25-34*	*35-44*	*45-54*	*55-64*	*65+*	*Total*
White	2	0	0	1	2	24	41	33	27	90	**220**
	1.3	0.0	0.0	0.7	0.9	4.2	8.4	9.6	7.9	13.8	**7.0**
Black	23	12	6	20	34	170	278	181	82	88	**894**
	15.1	8.4	4.1	13.7	22.1	51.1	101.9	90.9	57.5	55.2	**48.4**
Hispanic	26	14	6	26	58	151	152	93	49	28	**603**
	15.6	9.4	4.1	17.9	34.8	43.7	58.3	53.2	40.6	25.8	**33.8**
Asian	4	4	2	11	42	72	56	42	37	66	**336**
	10.5	12.2	6.0	29.6	95.6	59.9	58.8	74.4	97.8	192.6	**63.5**
Total	**55**	**30**	**14**	**58**	**136**	**417**	**527**	**349**	**195**	**272**	**2053**
	10.8	**6.6**	**3.1**	**12.3**	**23.6**	**30.5**	**47.2**	**45.1**	**30.2**	**28.5**	**28.0**

TABLE 3
TUBERCULOSIS INCIDENCE (RATES PER 100,000) IN MALES BY RACE/ETHNICITY AND AGE IN YEARS
NEW YORK CITY, 1996

	Age Group N (Rate)										
Race	*0-4*	*5-9*	*10-14*	*15-19*	*20-24*	*25-34*	*35-44*	*45-54*	*55-64*	*65+*	*Total*
White	0	0	0	1	1	16	29	29	21	52	**149**
	0.0	0.0	0.0	1.4	1.0	5.6	11.9	17.5	13.1	21.0	**10.0**
Black	14	9	3	10	18	89	175	126	60	44	**548**
	18.2	12.4	4.2	13.9	25.3	59.9	148.9	150.8	103.7	80.0	**66.3**
Hispanic	12	7	3	17	31	79	102	69	31	13	**364**
	14.2	9.2	4.1	22.9	37.1	47.3	84.7	87.0	59.7	33.0	**42.8**
Asian	0	2	1	4	24	43	38	27	24	45	**208**
	0.0	11.8	5.9	21.1	110.1	70.1	77.1	93.1	131.1	291.8	**77.7**
Total	**26**	**18**	**7**	**32**	**74**	**227**	**344**	**251**	**136**	**154**	**1269**
	10.0	**7.7**	**3.1**	**13.5**	**26.4**	**34.1**	**64.7**	**70.2**	**47.2**	**43.1**	**36.9**

TABLE 4
TUBERCULOSIS INCIDENCE (RATES PER 100,000) IN FEMALES BY RACE/ETHNICITY AND AGE IN YEARS
NEW YORK CITY, 1996

	Age Group N (Rate)										
Race	*0-4*	*5-9*	*10-14*	*15-19*	*20-24*	*25-34*	*35-44*	*45-54*	*55-64*	*65+*	*Total*
White	2	0	0	0	1	8	12	4	6	38	**71**
	2.7	0.0	0.0	0.0	0.9	2.8	4.9	2.2	3.3	9.4	**4.3**
Black	9	3	3	10	16	81	103	55	22	44	**346**
	11.9	4.2	4.1	13.4	19.4	44.0	66.4	47.6	26.0	42.1	**33.9**
Hispanic	14	7	3	9	27	72	50	24	18	15	**239**
	17.1	9.5	4.2	12.6	32.5	40.3	35.7	25.2	26.2	21.7	**25.6**
Asian	4	2	1	7	18	29	18	15	13	21	**128**
	21.9	12.7	6.2	38.6	81.3	49.4	39.1	54.7	66.6	111.4	**49.0**
Total	**29**	**12**	**7**	**26**	**62**	**190**	**183**	**98**	**59**	**118**	**784**
	11.6	**5.3**	**3.1**	**11.1**	**20.9**	**27.0**	**31.3**	**23.5**	**16.5**	**19.8**	**20.2**

TABLE 5
CRUDE AND AGE-ADJUSTED TUBERCULOSIS RATES
NEW YORK CITY, 1992-1996

Borough	*Health District*	*Cases*	*Rate per 100,000 population*					
			1996 Crude+	*1996 Age-Adjusted**	*1995 Age-Adjusted**	*1994 Age-Adjusted**	*1993 Age-Adjusted**	*1992 Age-Adjusted**
Manhattan	Central Harlem	122	105.6	113.2	115.3	121.6	181.7	240.2
	East Harlem	56	44.0	45.4	60.3	71.5	73.1	95.8
	Kips Bay-Yorkville	25	10.6	9.3	10.9	14.8	14.4	19.1
	Lower East Side	117	48.9	45.7	51.3	74.8	69.5	101.5
	Lower West Side	118	40.1	33.3	29.9	45.9	44.8	77.9
	Riverside	49	23.5	21.8	32.0	41.1	59.0	72.1
	Washington Heights	134	50.3	51.4	36.6	49.1	52.9	60.9
	Total Manhattan	**621**	**41.7**					
Bronx	Fordham-Riverdale	67	27.3	29.0	24.5	34.6	27.5	37.8
	Morrisania	44	30.4	35.7	75.4	74.4	109.3	96.5
	Mott Haven	71	54.7	61.9	61.3	87.7	107.8	168.2
	Pelham Bay	19	8.7	8.1	13.3	21.1	20.1	20.3
	Tremont	75	39.4	47.6	56.7	88.5	76.0	105.8
	Westchester	45	16.3	16.7	26.0	19.8	34.0	35.8
	Total Bronx	**321**	**26.7**					
Brooklyn	Bay Ridge	32	13.4	12.7	20.2	18.6	20.1	15.9
	Bedford	121	52.0	54.8	68.4	82.3	89.1	107.5
	Brownsville	86	30.9	33.4	51.8	58.9	54.2	71.6
	Bushwick	74	40.5	45.8	61.1	72.8	83.3	83.1
	Flatbush	110	21.9	22.5	32.1	36.0	39.2	36.6
	Fort Greene	54	35.9	37.5	57.9	88.5	110.3	120.1
	Gravesend	44	15.5	14.3	20.2	23.6	21.9	20.4
	Red Hook-Gowanus	27	25.6	25.0	25.7	34.3	49.6	48.7
	Sunset Park	39	22.9	24.7	31.1	29.3	29.8	27.7
	W'burg-Grnpt.	35	22.4	24.0	30.3	45.6	52.2	59.3
	Total Brooklyn	**622**	**27.0**					
Queens	Astoria-L.I.C.	60	25.4	24.7	32.8	38.7	29.5	35.3
	Corona	127	43.6	42.6	45.3	39.5	44.5	56.3
	Flushing	79	17.3	16.4	19.9	18.4	17.3	14.6
	Jamaica East	92	27.3	28.3	28.7	35.9	33.7	34.0
	Jamaica West	68	18.8	18.7	23.5	26.2	25.2	21.5
	Maspeth-Forest Hills	35	13.0	12.3	10.6	20.4	18.5	12.3
	Total Queens	**461**	**23.6**					
Staten Island	Richmond	28	7.4	7.7	10.4	17.7	15.3	17.8
TOTAL NYC		**2,053**	**28.0**	**28.0**	**33.4**	**40.9**	**44.2**	**52.0**

+ 1996 crude rates are based on the 1990 Census for New York City
* 1992-1996 age-adjusted rates are based on the New York City 1990 Census by the method of direct adjustment.

TABLE 6
TUBERCULOSIS CASES BY AGE IN YEARS AND AREA OF BIRTH
NEW YORK CITY, 1996

	Age Groups										
Area of Birth	*0-4*	*5-9*	*10-14*	*15-19*	*20-24*	*25-34*	*35-44*	*45-54*	*55-64*	*65+*	*Total*
Africa[1]	0	3	0	3	9	27	14	8	0	0	64
Asia[2]	0	0	0	2	16	29	26	19	20	48	160
Canada	0	0	0	0	0	1	1	0	0	0	2
Caribbean[3]	2	5	5	14	28	61	80	42	20	17	274
Central/S.America[4]	5	5	1	14	30	53	43	22	17	9	199
Europe[5]	0	0	0	1	1	9	11	6	9	31	68
Indo/Pakistan[6]	1	3	0	5	10	29	21	5	6	5	85
Middle East[7]	0	0	1	2	2	5	0	2	1	1	14
Southeast Asia[8]	1	0	1	0	8	13	9	11	7	11	61
Total Non USA	**9**	**16**	**8**	**41**	**104**	**227**	**205**	**115**	**80**	**122**	**927**
USA*	45	12	6	15	26	157	272	173	90	136	932
Puerto Rico	1	0	0	0	3	26	29	51	17	9	136
Total USA	**46**	**12**	**6**	**15**	**29**	**183**	**301**	**224**	**107**	**145**	**1,068**
Unknown	**0**	**2**	**0**	**2**	**3**	**7**	**21**	**10**	**8**	**5**	**58**
TOTAL	**55**	**30**	**14**	**58**	**136**	**417**	**527**	**349**	**195**	**272**	**2,053**

* Includes the U.S. Virgin Islands (1)

[1] Senegal (11), Ivory Coast (9), Nigeria (8), The Gambia (4), Guinea (4), Ghana (4), Mali (4), Other (20)
[2] China (106), Korea (33), Hong Kong (13), Taiwan (6), Japan (2)
[3] Dominican Republic (142), Haiti (78), Jamaica (25), Trinidad & Tobago (13), Cuba (5), Other (11)
[4] Ecuador (76), Mexico (28), Columbia (20), Guyana (17), Honduras (13), Peru (11), El Salvador (6), Belize (6), Guatemala (5), Panama (5), Other (12)
[5] Former Soviet Union (21), Poland (9), Yugoslavia (8), Germany (5), Italy (5), France (4), Other (16)
[6] India (39), Pakistan (25), Bangladesh (13), Other (8)
[7] Yemen (10), Turkey (2), Israel (1), Saudi Arabia (1)
[8] Philippines (32), Vietnam (15), Indonesia (5), Other (9)

TABLE 7
DRUG RESISTANCE BY AGE GROUP

Susceptibilities	*N (%)*			
	< 65 years		*65 and older*	
Tested for susceptibility to first line drugs of those with positive cultures	1,437	(80.7%)	230	(84.6%)
Multidrug-resistant (INH+RIF resistant)	77	(5.4%)	7	(3.0%)
Isoniazid-resistant and rifampin-susceptible	107	(7.4%)	19	(8.3%)
Resistant to other first line drugs	81	(5.6%)	9	(3.9%)
Susceptible to all first line drugs	1,172	(81.6%)	195	(84.8%)

DRUG RESISTANCE BY PLACE OF BIRTH

Susceptibilities	*N (%)*					
	U.S.-born		*Foreign-born*		*Unknown*	
Tested for susceptibility to first line drugs of those with positive cultures	866	(81.1%)	758	(81.8%)	43	(74.1%)
Multidrug-resistant (INH+RIF resistant)	53	(6.1%)	29	(3.8%)	2	(4.7%)
Isoniazid-resistant and rifampin-susceptible	51	(5.9%)	75	(9.9%)	0	(0.0%)
Resistant to other first line drugs	47	(5.4%)	40	(5.3%)	3	(7.0%)
Susceptible to all first line drugs	715	(82.6%)	614	(81.0%)	38	(88.4%)

TABLE 8
TUBERCULOSIS CASES BY PRIMARY SITE OF DISEASE
NEW YORK CITY, 1996

	Number of Cases	*(%)*
Pulmonary	1,600	(77.9)
Lymphatic	169	(8.2)
Bone/Joint	70	(3.4)
Pleural	65	(3.2)
Meningeal	35	(1.7)
Genitourinary	23	(1.1)
Miliary	20	(1.0)
Peritoneal	19	(0.9)
Other	52	(2.5)
Total	**2,053**	**(100.0)**
Both Pulmonary and Extrapulmonary	**171**	**(8.3)**

TABLE 9
SOCIAL CHARACTERISTICS OF TUBERCULOSIS CASES
NEW YORK CITY, 1996

Social characteristic	*# (% of total cases for whom information is available)*		*# reporting characteristic (% of cases with available information)*	
Injection drug use in 12 months before diagnosis	1,847	(90.0)	122	(6.6)
Non-injection drug use in 12 months before diagnosis	1,842	(89.7)	257	(14.0)
Alcohol abuse in 12 months before diagnosis	1,844	(89.8)	281	(15.2)
Homeless at diagnosis or any time during treatment	2,053	(100.0)	99	(4.8)
Resident of correctional facility at time of diagnosis	2,053	(100.0)	52	(2.5)
Resident of long-term care facility at time of diagnosis	2,053	(100.0)	51	(2.5)
Health care or correctional facility worker in 24 months before diagnosis	1,837	(89.5)	58	(3.2)

TABLE 10
TUBERCULOSIS DEATHS AND RATE (PER 100,000)
NEW YORK CITY, 1910 - 1996

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

TABLE 11
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1996

	N (%)								
	Females			*Males*			*Total*		
Age	*HIV(+)*	*HIV(-)*	*NA**	*HIV(+)*	*HIV(-)*	*NA*	*HIV(+)*	*HIV(-)*	*NA*
0-4	1 (3.4)	15 (51.7)	13 (44.8)	2 (7.7)	10 (38.5)	14 (53.8)	3 (5.5)	25 (45.5)	27 (49.1)
5-9	2 (16.7)	3 (25.0)	7 (58.3)	1 (5.6)	6 (33.3)	11 (61.1)	3 (10.0)	9 (30.0)	18 (60.0)
10-14	0 (0.0)	1 (14.3)	6 (85.7)	1 (14.3)	2 (28.6)	4 57.1)	1 (7.1)	3 (21.4)	10 (71.4)
15-19	0 (0.0)	15 (57.7)	11 (42.3)	1 (3.1)	21 (65.6)	10 (31.3)	1 (1.7)	36 (62.1)	21 (36.2)
20-24	3 (4.8)	43 (69.4)	16 (25.8)	4 (5.4)	45 (60.8)	25 (33.8)	7 (5.1)	88 (64.7)	41 (30.1)
25-34	69 (36.3)	77 (40.5)	44 (23.2)	82 (36.1)	100 (44.1)	45 (19.8)	151 (36.2)	177 (42.4)	89 (21.3)
35-44	92 (50.3)	56 (30.6)	35 (19.1)	183 (53.2)	100 (29.1)	61 (17.7)	275 (52.2)	156 (29.6)	96 (18.2)
45-54	30 (30.6)	40 (40.8)	28 (28.6)	119 (47.4)	74 (29.5)	58 (23.1)	149 (42.7)	114 (32.7)	86 (24.6)
55-64	6 (10.2)	23 (39.0)	30 (50.8)	27 (19.9)	64 (47.1)	45 (33.1)	33 (16.9)	87 (44.6)	75 (38.5)
65+	1 (0.8)	35 (29.7	82 (69.5)	9 (5.8)	53 (34.4)	92 (59.7)	10 (3.7)	88 (32.4)	174 (64.0)
TOTAL	**204 (26.0)**	**308 (39.3)**	**272 (34.7)**	**429 (33.8)**	**475 (37.4)**	**365 (28.8)**	**633 (30.8)**	**783 (38.1)**	**637 (31.0)**

*Not available

TABLE 12
HIV STATUS OF TUBERCULOSIS CASES BY SEX
NEW YORK CITY, 1992-1996

	N (%)			
	Females HIV (+)		*Males HIV (+)*	
Year				
92	297	(25.1)	983	(37.4)
93	308	(27.5)	760	(35.9)
94	244	(23.5)	767	(39.2)
95	226	(25.4)	575	(37.0)
96	204	(26.0)	429	(33.8)

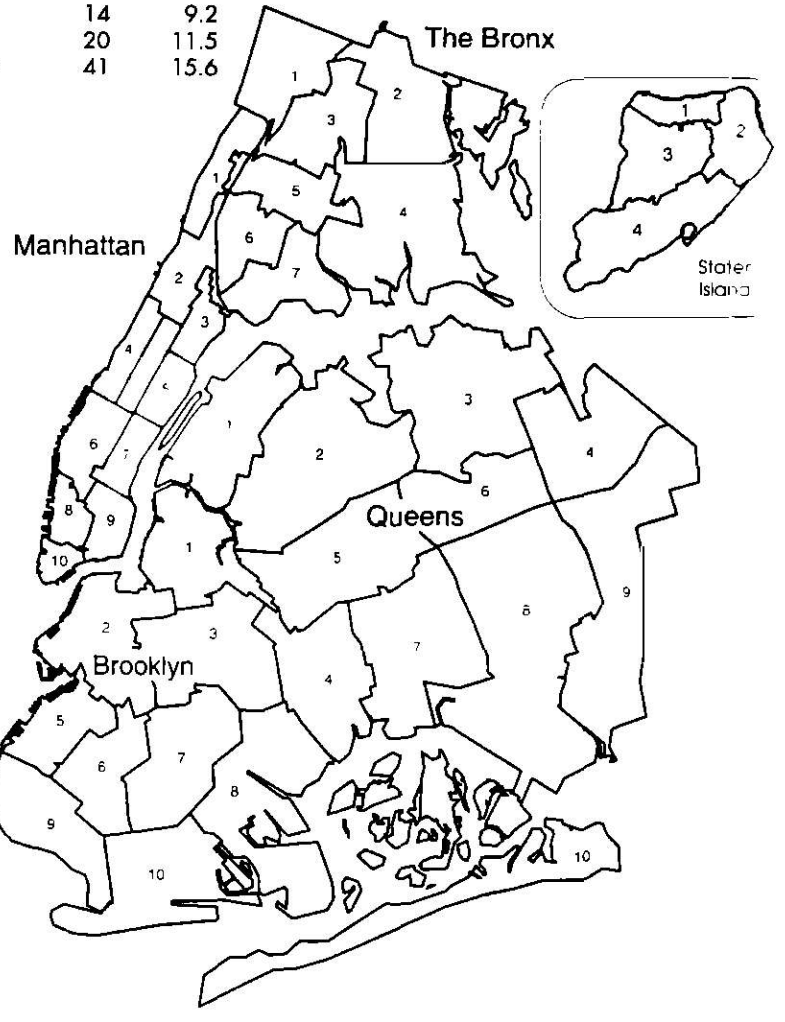
TABLE 13
COMPLETION INDEX FOR ACTIVE CASES DIAGNOSED IN 1995

Outcome	*N=2,342**			
	Number of Cases	*Percent*	*Completion Index***	*Completion Index without MDR Cases*
Completed Therapy	1,767	75.4	93.5	95.5
Died prior to completing treatment	362	15.5		
Prolonged Therapy	76	3.2		
Refused/Stopped Therapy	17	0.7		
Lost	30	1.3		
Moved+	90	3.8		

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

APPENDIX

Map Code	United Hospital Fund Neighborhood	1996 Cases	Rate per 100,000 population
Manhattan			
1	Washington Hts.-Inwood	81	40.4
2	Central Harlem-Morningside Hts.	158	85.1
3	East Harlem	74	62.9
4	Upper West Side	50	22.5
5	Upper East Side	20	9.5
6	Chelsea-Clinton	65	52.2
7	Gramercy Park-Murray Hill	41	34.2
8	Greenwich Village-Soho	35	44.2
9	Union Square-Lower East Side	87	45.0
10	Lower Manhattan	7	26.3
Bronx			
1	Kingsbridge-Riverdale	14	15.5
2	Northeast Bronx	11	6.5
3	Fordham-Bronx Park	64	29.0
4	Pelham-Throgs Neck	41	15.8
5	Crotona-Tremont	72	39.9
6	High Bridge-Morrisania	65	38.6
7	Hunts Point-Mott Haven	44	36.2
Brooklyn			
1	Greenpoint-Williamsburg	77	32.5
2	Downtown-Heights-Slope	50	23.2
3	Bedford Stuyvesant-Crown Hts.	212	47.3
4	East New York	50	28.3
5	Sunset Park	34	34.2
6	Borough Park	28	13.7
7	East Flatbush-Flatbush	95	28.9
8	Canarsie-Flatlands	14	9.2
9	Bensonhurst-Bay Ridge	20	11.5
10	Coney Island-Sheepshead Bay	41	15.6
Queens			
1	Long Island-Astoria	49	25.6
2	West Queens	157	41.3
3	Flushing-Clearview	47	20.1
4	Bayside-Little Neck	11	13.6
5	Ridgewood-Forest Hills	28	12.8
6	Fresh Meadows	14	16.9
7	Southwest Queens	32	14.7
8	Jamaica	76	29.6
9	Southeast Queens	37	19.7
10	Rockaway	23	22.8
Staten Island			
1	Port Richmond	7	13.5
2	Stapleton-St. George	14	14.2
3	Willowbrook	4	5.1
4	South Beach-Tottenville	4	2.7
Total NYC		**2,053**	**28.0**



New York City Health Code section 11.03 (a) requires written reports to the New York City Department of Health, within 24 hours of confirmation, of all clinically suspected and confirmed cases of tuberculosis; children under five years of age with positive tuberculin skin tests; and the results of laboratory bacteriological examinations which confirm tuberculosis.

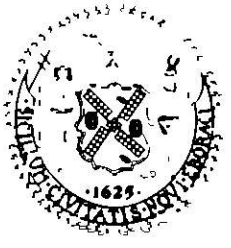
Attending physicans are also required to test (or refer to the Department for testing) household contacts of cases and notify the Department of the referral. Further, the Department may require household and non-household contacts to be tested and re-examined as needed. Physicians are also required to report when a "case" ceases to receive anti-tuberculosis treatment and the reason for cessation, as well as any other information required by the Department. See Health Code section 11.47.

Information on ordering reporting forms is below.

To order copies of the TB76 or laboratory/pathology report forms, call or mail the enclosed order form to:
Donnel Wright
Bureau of Tuberculosis Control
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 553-4200
Fax: (212) 608-2315

To order copies of the TB78 (preventive therapy) report forms, call or mail the enclosed order form to:
Marcia Hampton
Bureau of Tuberculosis Control
225 Broadway, 22nd floor, Box 72B
New York, NY 10007
Tel: (212) 553-4283
Fax: (212) 608-2315

RETURN TO
Marie Dorsinville



THE CITY OF NEW YORK
DEPARTMENT OF HEALTH

Rudolph W. Giuliani
Mayor

Benjamin Mojica, M.D.
Acting Commissioner of Health