



Annual Tuberculosis Summary, 2022

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

Mission: The New York City (NYC) Department of Health and Mental Hygiene (Health Department) aims to prevent the transmission of tuberculosis (TB) and eliminate it as a public health problem in NYC.

Goals

1

Identify all people with suspected or confirmed TB disease and ensure their appropriate treatment, ideally on directly observed therapy.

2

Ensure that people at high risk for progression from latent TB infection (LTBI) to TB disease complete treatment and do not develop disease.

Core Activities

To fulfill its mission and goals, the NYC Health Department collaborates with health care providers, laboratories, community partners and others to ensure effective TB care and prevention in NYC through an integrated, dynamic model of core activities and services.



About This Report

This report provides TB surveillance data and summaries of core NYC Health Department TB program activities for calendar year 2022. These data reflect the most complete information available as of January 15, 2023. For additional details on the use of population data and definitions in this report, see the Technical Notes (Page 33).

During 2020 and 2021, NYC was the epicenter for the global pandemic of SARS-CoV-2 (COVID-19) in the United States (U.S.). The vast number of COVID-19 cases in the city put a strain on the health care system that resulted in an unprecedented and, as yet, unquantified impact on TB transmission, diagnosis, care and reporting. For these reasons, this report will focus on data for 2022 and when comparing to prior years, will compare to 2019. Data for 2020 and 2021 are included in figures and tables showing trends over time.

Prepared By:

Jillian Knorr, MPH; Aminotu Ogunyemi, MPH; Anthony Romano, MPH; Jeanne Sullivan Meissner, MPH; Lisa Trieu, MPH

Program Content Provided By:

Joseph Burzynski, MD, MPH; Magali Calderon, MS; Christine Chuck, MPA; Hannah Jordan, MD, MPH; Joseph Lindsey, MPH; Michelle Macaraig, DrPH; HERN Modestil, BS; Diana Nilsen, RN, MD; Farah Parvez, MD, MPH; Shaila Rao, EdD, MPH; Marco Salerno, MPH; Abubaker Siddique, BS (Vet Sc.), MS

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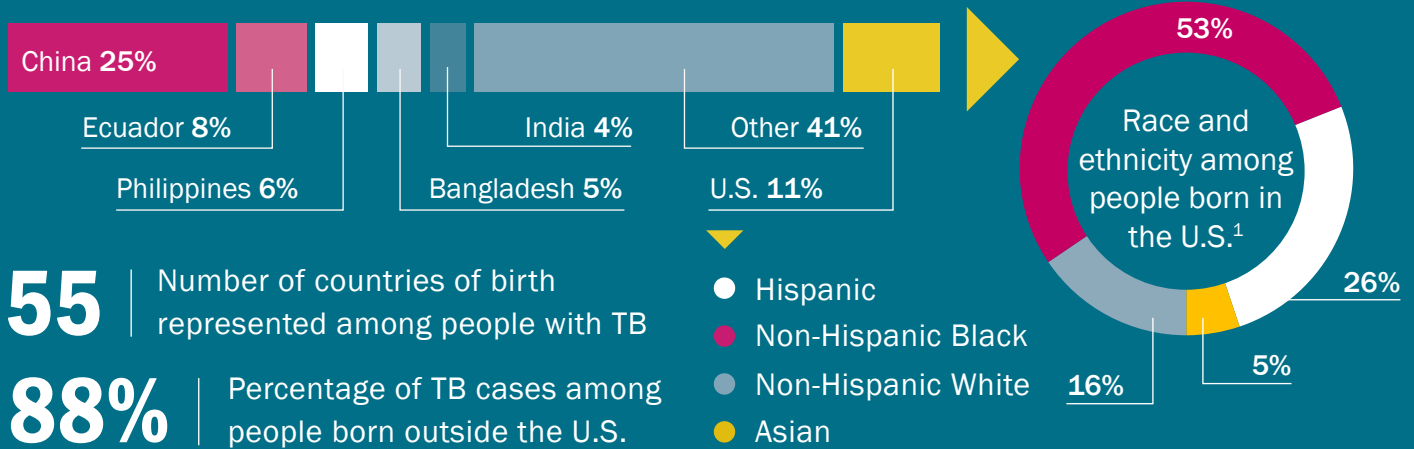
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Tuberculosis in NYC, 2022

There were **536** confirmed tuberculosis (TB) cases identified in New York City (NYC) in 2022, representing a return to pre-pandemic case rates and highlighting a need to recommit to the fight against TB. For more information, visit nyc.gov/health/tb.



Most common country of birth among people with TB:



55 | Number of countries of birth represented among people with TB

88% | Percentage of TB cases among people born outside the U.S.

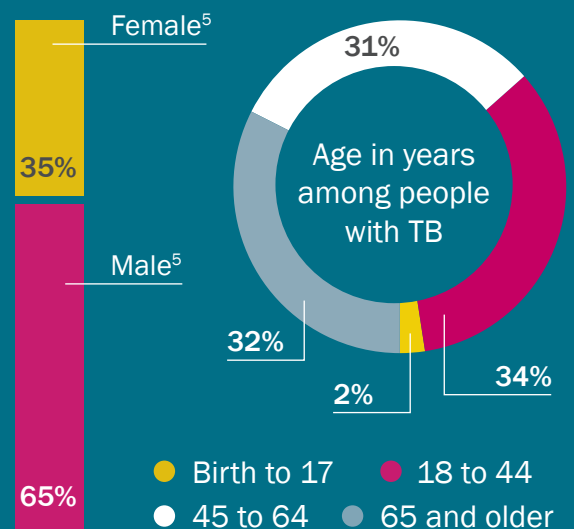
100% | Percentage of NYC neighborhoods² with at least one TB case

13 | Number of NYC neighborhoods² with a TB rate higher than the 2022 citywide rate³

8 | Number of people diagnosed with a multidrug-resistant (MDR) TB⁴ strain



5.5 | Median number of medications to which people diagnosed with an MDR TB⁴ strain were resistant



1. Does not include people of multiple, other or unknown races or ethnicities. 2. Defined by United Hospital Fund neighborhood designation (n=42). 3. Rates are per 100,000. 4. Defined as resistance to at least isoniazid and rifampin. 5. Data on patient gender are currently collected as "male," "female" and "transgender."

March 2023

Dear Colleagues,

Last year, the number of confirmed cases of TB disease in NYC was 536, just slightly higher than the number of cases in 2021. These numbers are about 20% higher than the number of TB cases in 2020 – when the COVID-19 pandemic disrupted health care systems, resulting in similar decreases in TB incidence reported globally – and represent a return to pre-pandemic case rates.

There continues to be a disproportionate burden of TB among non-U.S.-born people in NYC, with 88% of all cases among people born outside of the U.S. This past year also brought a large increase in the number of people arriving in NYC from Ukraine, and an influx of asylum-seekers from the U.S. southern border. In conjunction with agencywide and citywide efforts to coordinate access to medical, mental health, social service and other resources, the NYC Health Department is working to ensure access to TB testing, medical evaluation and treatment for these groups.

The majority of patients with TB first seek care from hospitals or private providers, which highlights the critical role these partners play in recognizing and diagnosing TB disease. NYC Health Department staff and community providers continue to work hard to help patients complete their TB treatment. The routine use of in-person and video directly observed therapy (DOT) and the use of shorter regimens for the treatment of TB have helped increase our completion rates. Tremendous advances in the detection and treatment of multidrug-resistant (MDR) TB have allowed us to use effective regimens that are better tolerated and shorter in duration. Many patients with MDR TB now complete therapy within six months.

As the decline of TB rates has slowed and substantial drops in TB incidence become more difficult to achieve, continued progress toward the goal of TB elimination will require novel approaches, the engagement of all parts of the health care system and partnership with the communities we serve. Over the last several decades, we have made tremendous progress toward decreasing the burden of TB in NYC, but continued commitment and dedication are essential to our ongoing success in the fight against TB.

Sincerely,



Joseph N. Burzynski, MD, MPH
Assistant Commissioner, Bureau of Tuberculosis Control
New York City Department of Health and Mental Hygiene

Core Activities

Core Activities

TB is an airborne, infectious disease caused by a bacteria. TB has two stages: active TB disease and latent TB infection (LTBI). TB is treatable and preventable, but without effective treatment, TB may lead to serious illness and death.

The NYC Health Department performs a variety of integrated activities to address and prevent TB disease and LTBI. These include surveillance, clinical care and treatment, medical consultation, case management, contact investigation, coordination of laboratory tests (for example, drug susceptibility testing), outbreak detection and response, outreach and education, program evaluation and research. These activities support effective, patient-centered TB care, control and prevention in NYC.

Surveillance and Reporting

Health care providers and laboratories are required to report to the Health Department:

1. All patients with confirmed TB disease
2. Anyone suspected of having TB disease
3. Children younger than 5 years of age with a positive test for TB infection and related chest radiograph findings and treatment information
4. Results of any blood-based test for TB infection, regardless of patient age (laboratories only)

Medical providers must also report these patients even though microbiologists and pathologists are required to report findings consistent with TB. Reports must be submitted using the Universal Reporting Form (URF) and must be received by the Health Department within 24 hours of diagnosis or clinical suspicion, whether sent electronically, by express or overnight mail, fax or telephone.



*For more information about TB reporting requirements in NYC and to download related forms, call **311** and ask for the BTBC Surveillance Unit or visit [nyc.gov](https://www.nyc.gov) and search for "TB reporting requirements." To download a URF, visit [nyc.gov](https://www.nyc.gov) and search for "URF."*

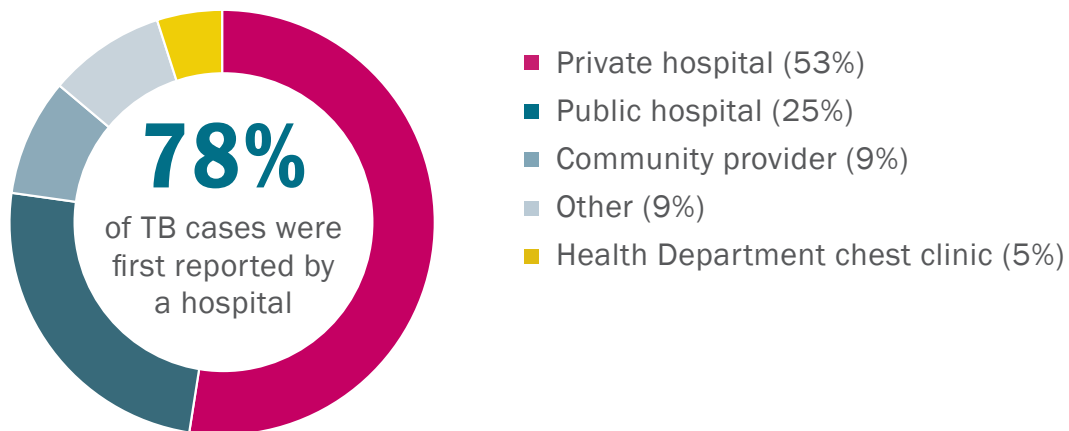
The Health Department reviews submitted reports for completeness and timeliness and determines whether patients are eligible for case management. The Health Department maintains an electronic TB surveillance registry and case management system (Maven version 6.3.1, Conduent Public Health Solutions, Florham Park, NJ) that has information for all reported patients and individuals exposed to TB. These data are used to conduct

case management; ensure treatment completion; monitor trends; detect outbreaks; prepare surveillance reports; report aggregated data to the New York State Department of Health (NYSDOH) and the Centers for Disease Control and Prevention (CDC); identify reporting and data quality issues; and inform programmatic decision-making.

TB Surveillance and Reporting in 2022:

- 536 confirmed TB cases were verified by the Health Department.
- 2,587 people with suspected TB disease were reported to the Health Department.
- 84 children younger than 5 years of age with TB infection were reported to the Health Department.
- 109 facilities reported at least one TB case; nearly half of all cases were reported by one of 11 facilities.

Figure 1: Initial reporter of confirmed TB cases verified in NYC by reporter type, 2022



Clinical Care and Treatment

The Health Department is a leading provider of TB care in NYC. TB services are available at three Health Department chest clinics located in the Bronx, Brooklyn and Queens. Physicians working at the chest clinics are specialists in internal, preventive and pulmonary medicine, and infectious disease.

Telehealth: During the COVID-19 pandemic, the NYC Health Department substantially increased its use of telehealth for remote delivery of health care services and clinical information, and telehealth continues to be an integral part of the delivery of service at Health Department chest centers. In 2022, 23% of patients had at least one telehealth appointment.

The Health Department provides TB diagnostic services, including testing for TB infection (using blood-based QuantiFERON-TB Gold Plus [QFT] test and tuberculin skin test [TST]), sputum induction, laboratory tests, medical evaluation, chest radiographs, treatment for TB disease and LTBI, and directly observed therapy (DOT) services for patients of all ages. The majority of patients evaluated and treated at Health Department chest clinics are referred by NYC health care providers, other health departments and social service providers. Health Department staff also refer patients to other medical professionals for further evaluation and treatment of non-TB related conditions.

Obtaining medications with limited availability for the treatment of MDR TB: Health Department staff can assist with obtaining certain medications that are available under limited circumstances, including pretomanid, bedaquiline, clofazimine and delamanid. Clofazimine and delamanid require the submission of a Single Patient Investigational New Drug application to the Food and Drug Administration and to the Health Department's Institutional Review Board for approval.



*For more information about these drugs or for help obtaining them, please call the **TB Hotline** at **844-713-0559**.*

HIV testing services: Health Department staff provide opt-out rapid HIV testing services to every eligible patient at Health Department chest clinics and refer patients who have HIV infection to health care providers who specialize in HIV care. The Health Department offers rapid HIV testing to contacts in household settings. Anonymous HIV testing services are available at all chest clinics independent of need for TB services.

Evaluation of refugees and immigrants applying for permanent status: People who are applying for permanent U.S. immigration status and refugee status are screened for TB as part of their overseas medical examination. If the pre-immigration examination finds a clinical diagnosis of TB, a Class A designation is given, and the applicant is not allowed to travel until treatment is completed or the patient is no longer infectious.

Responding to an influx of asylum seekers and humanitarian parolees in NYC: Since Spring 2022, NYC has become a destination for an unexpectedly high number of people who are at risk of having or developing active TB disease. The Health Department is partnering with community groups, health care providers and other City agencies to ensure access to TB testing, evaluation and treatment for these groups and to coordinate access to physical and mental health care, social services, housing, immigration legal services and other resources.

If findings suggest noninfectious TB, the applicant is given a Class B designation and travel clearance, and the applicant's destination city is notified by CDC. The destination city then notifies that individual of the need for TB reevaluation. The Health Department follows up with all immigrants and refugees who arrive in NYC with Class B status. The majority come to a Health Department chest clinic for evaluation.

TB Clinical Care and Treatment in 2022:

- **232 (43%)** patients confirmed with TB disease in 2022 received care at a Health Department chest clinic.
- **16** patients with an MDR TB strain received treatment, care and case management through the Health Department, including **8** patients newly diagnosed with an MDR TB strain in NYC and **1** patient initially verified as a TB case outside of NYC.
- **13** patients received bedaquiline; **1** patient received clofazimine.
- **1,455** immigrants and refugees arriving in NYC with a Class B designation were notified to the Health Department; **1,431 (98%)** were eligible for evaluation; **470 (61%)** were evaluated as of February 7, 2023.

Medical Consultation

Health Department TB medical consultants are physicians with many years of experience treating TB disease and LTBI. They provide expert consultation to community-based care providers and others regarding TB diagnosis; hospital discharge planning; TB treatment (including treatment of MDR TB, adverse reactions to TB drugs and treatment completion); contact investigation; infection control; and other TB-related public health concerns.

Recommendations are based on these physicians' professional experience and Health Department policies, which are informed by guidelines from the CDC, American Thoracic Society, Infectious Diseases Society of America, National TB Controllers Association and the World Health Organization (WHO). Medical consultants also conduct TB rounds and give medical talks throughout NYC.



*For consultation related to the management and treatment of TB, including MDR TB, please call the **TB Hotline** at **844-713-0559**.*

Case Management

The Health Department provides case management activities for NYC residents diagnosed with or suspected of having TB disease and their contacts, regardless of where the patient receives their TB care. Case management includes patient interviews, TB education, chart reviews, contact investigation, DOT and coordination with community providers to ensure

optimal TB treatment and care. Health Department staff conduct home assessments to identify contacts and to determine whether patients with infectious TB can be discharged from the hospital. Health Department staff also coordinate with colleagues in other jurisdictions to ensure continuity of care for patients with confirmed TB disease and contacts who work or live outside of NYC. Case managers perform monthly monitoring for treatment adherence and locate patients who have significant lapses in medical appointments or medication and help them return to medical supervision.

DOT: DOT is the standard of care for patients with suspected or confirmed TB disease in NYC, regardless of where they receive TB care. During DOT, a health care worker observes a patient ingesting their anti-TB medications. The Health Department provides face-to-face DOT services at all chest clinics and at homes, worksites and other locations as requested by the patient. The Health Department also provides video DOT (vDOT), which facilitates continuity of DOT outside traditional business hours and when patients travel. DOT is also available through NYC Health + Hospitals facilities: NYC Health + Hospitals/Elmhurst, NYC Health + Hospitals/Kings County and NYC Health + Hospitals/Bellevue.



*To learn more about the DOT program at the Health Department or to enroll a patient, please call **311**.*

Contact investigation: The Health Department conducts TB contact investigations in household, social and other congregate settings (for example, worksites and schools). During contact investigation, Health Department staff identify and evaluate individuals who were exposed to patients with infectious TB, ensure appropriate treatment among contacts who are diagnosed with TB disease or LTBI, determine whether transmission occurred, and assess whether further testing or other intervention is needed. When TB exposures occur in health care facilities, epidemiologists at the Health Department provide technical guidance and assist with contact investigation at the site as needed.

Expanded use of short-course treatment for TB disease: In the last several years, major advancements have been made in making shorter course treatment regimens available for patients with active TB. For drug-susceptible TB, a four-month regimen of high-dose rifapentine combined with moxifloxacin, isoniazid and pyrazinamide has been shown to be as effective as the standard six-month regimen.

For the treatment of multidrug-resistant or extremely drug resistant TB, a six-month regimen of bedaquiline, pretomanid and linezolid has largely replaced the 18-month regimen. These new regimens are safe and effective, make TB treatment an easier experience for patients, and are now available at Health Department chest centers.

Social service referrals: Health Department staff identify and address obstacles to care and unmet social service needs among patients and their families whenever possible. These include concerns about finances, housing, food security, unstable employment, school, health insurance eligibility, access to health care services, immigration status, language barriers, drug and alcohol use, and mental health issues. When these situations are identified, patients are referred to a social worker, who facilitates referrals to social service resources.

Regulatory action: The Health Department has authority under the NYC Health Code to mandate compulsory evaluation, DOT or involuntary hospitalization for patients with infectious TB who are not adherent to evaluation, isolation or treatment recommendations and pose a public health risk.

TB Case Management in 2022:

- **2,199** patients received case management services, including **536** patients with newly confirmed TB disease, **1,237** patients with suspected TB disease, **348** patients with TB diagnosed before 2022 and **78** patients with TB initially verified outside of NYC.
- **346** eligible patients with confirmed TB disease were enrolled in DOT through the Health Department or another health care provider. **48** patients were enrolled exclusively in face-to-face DOT; **298** received some or all observations through vDOT.
- **1,955** contacts were identified for **410** patients who were potentially infectious; **1,211 (62%)** were evaluated as of February 9, 2023; **284 (23%)** had a new positive TB test result.

Drug Susceptibility Testing and Whole Genome Sequencing

The NYC Health Code mandates that a portion of the initial isolate from all patients with culture-positive TB be sent for drug susceptibility testing (DST) and whole genome sequencing (WGS), performed at local, state and national public health laboratories.

DST: DST identifies drug resistance in TB strains and informs clinical management and treatment for patients with TB disease and their contacts. The NYC Public Health Laboratory (PHL) performs phenotypic DST testing for first line and select second-line TB drugs. Molecular-based laboratory tests are also being used routinely at PHL, hospitals, commercial laboratories, and other public health reference laboratories. These tests rapidly confirm the presence of *Mycobacterium tuberculosis* (*M. tuberculosis*) complex and can provide information about the presence of mutations in specific genes that are known to predict drug resistance, enabling earlier treatment of MDR TB and decreasing the amount of time the patient is infectious.

Universal WGS: In NYC, WGS enables identification of the *M. tuberculosis* complex and species within it; detection of genetic mutations associated with drug resistance; and analysis of single nucleotide polymorphisms to characterize and compare TB strains. The Health Department collaborates with the NYSDOH Wadsworth Center, PHL and CDC to conduct WGS for all patients with a positive culture for *M. tuberculosis*.

NYS currently reports 17 mutations associated with resistance to nine TB drugs. WGS also helps the Health Department identify false positive laboratory results, assess TB transmission and detect outbreaks. Possible instances of contamination and potential false positive results are promptly and systematically investigated to ensure patients are not placed on anti-TB medications unnecessarily. Cases among patients with similar TB strains are investigated to identify and interrupt TB transmission.

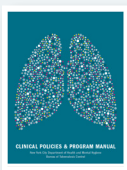
TB Drug Susceptibility Testing and Whole Genome Sequencing in 2022:

- **448** culture-confirmed TB cases had phenotypic DST results available (**97%**); among all cases, molecular DST results were available for **449 (97%)** cases.
- **431 (96%)** culture-confirmed TB cases had WGS results available.
- **14** instances of potential false positive laboratory results were investigated.
- **3** investigations confirmed a false positive result.

Outreach and Education

The Health Department engages diverse stakeholders to advance efforts to detect, treat and prevent TB and LTBI throughout NYC. Educational materials developed by the Health Department, the CDC and others are used to supplement staff training, which is delivered by experts from the Health Department and the Rutgers Global TB Institute.

Health care providers: Health care providers collaborate with the Health Department in many capacities and are invited to discuss TB testing, diagnosis and treatment through numerous channels. Health Department experts participate in TB presentations and case management conferences and provide clinical consultation at health care facilities across NYC. The Health Department co-sponsors two annual day-long medical conferences in honor of World TB Day for health care providers and other colleagues. Bimonthly trainings

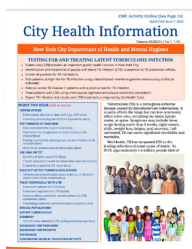


Clinical Policies and Program Manual, 5th Edition: In 2022, the Health Department published the 5th Edition of its Tuberculosis Clinical Policies and Program Manual, which details NYC policies, protocols and recommendations for the prevention, treatment and management of TB.

on TST are offered to physicians and nurses from various agencies. In addition, Health Department staff regularly meet with colleagues locally, nationally and internationally on matters related to TB policy and practice.

Community partners: Communities with a high burden of TB are engaged as partners in efforts to increase TB knowledge and inform care-seeking behavior. In partnership with elected officials, community-based groups and others, the Health Department delivers culturally and linguistically appropriate educational messaging through community events and print and electronic media. Community partners also support TB screening efforts at health fairs and other testing events.

Educational materials: The Health Department offers a selection of tailored TB education materials and other resources for patients, the general public and health care providers. To access these materials, policy updates and other information about TB and TB services in NYC, visit nyc.gov/health and search for "tuberculosis" or call **311**.



City Health Information

Testing for and Treating Latent Tuberculosis Infection

Guidance for health care providers on evaluation and treatment for latent TB infection. Includes an opportunity for CME credits (1).



Patient Brochure

Taking Control of Your Tuberculosis (TB): What to Expect and How to Stay Healthy

General information for patients starting treatment for latent TB infection or active TB disease. Available in 18 languages.



*For more information about the Health Department's TB community events and conferences and to sign up for our TB newsletter, **TB Action News**, please email TBoutreach@health.nyc.gov.*

Outreach and Education in 2022:

- **240** individuals were tested for TB infection during **5** community-based health events conducted in collaboration with community partners.

Funding and Administration

The Health Department receives city, state and federal funding for TB care and control. These funds support all TB prevention and control activities, from hiring staff to operating Health Department chest clinics. Staff ensure that funds are allocated, monitored and utilized efficiently.

Research

Health Department staff actively participate in research, including epidemiologic studies, implementation science and clinical research. This includes collaboration with the CDC TB Trials Consortium, which conducts national and international studies to support the development of TB treatment regimens. Health Department staff also participate in professional organizations and TB advisory groups.

Conferences: NYC's TB data and expertise are shared at meetings locally, nationally and internationally. In 2022, these included: National TB Controllers Association Conference • TB Medical Consultants Meeting • NYC Annual World TB Day Conference • Conference of The Union North America Region • Council of State and Territorial Epidemiologists Conference • American Public Health Association Conference • Tuberculosis Trials Consortium Annual Meeting • Mailman School of Public Health NYC Epi Forum.

BTBC memberships and staff participation in advisory groups and consortia, 2022:

Advisory Council for the Elimination of TB • CDC/Infectious Disease Society of America/ American Thoracic Society National MDR TB Guidelines Writing Committee • CDC TB Education and Training Network • CDC TB Program Evaluation Network • CDC TB Outbreak Detection Workgroup • CDC TB Trials Consortium • Council of State and Territorial Epidemiologists • Maven Users Group • National TB Controllers Association: Board of Directors; LTBI Reporting Workgroup; National Society of TB Clinicians; Society for Epidemiology in TB Control and Survey Committee • International Union Against TB and Lung Disease TB Contact Studies Consortium

Program Evaluation

The Health Department uses local, state and national performance indicators to assess program impact. These indicators inform planning and policy decisions and help identify programmatic issues and areas for improvement. Performance indicators and targets are developed in coordination with Health Department partners and funders, including CDC, NYSDOH and the NYC Mayor's Office. Reports include the quarterly report to NYSDOH, the CDC's Annual Performance Report, the CDC's Aggregate Reports for TB Program Evaluation and the CDC's National Tuberculosis Indicators Project.



Health Department TB Program staff publications in peer-reviewed journals, 2020-2022: Health Department staff actively participate in research, including epidemiologic studies, implementation science and clinical research. For a complete list of staff publications from 2020 to 2022, please scan the QR code at left.

Cohort review: One of the Health Department’s primary tools for evaluating its TB control program is the quarterly cohort review process. Staff review case management activities, treatment status and data quality for all patients with confirmed TB disease and their contacts four to six months after a patient's TB diagnosis. Successes and challenges related to patient care and case management are used to inform programmatic changes and identify training needs.

Table 1: Select TB performance measures, national targets¹ and NYC outcomes, 2021

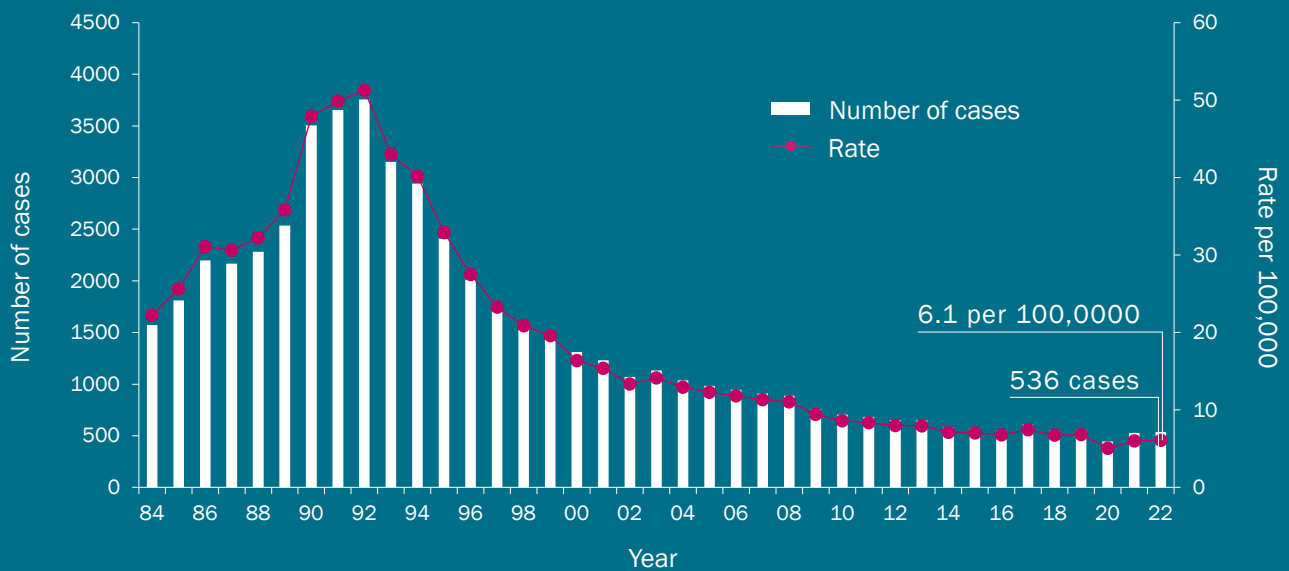
Indicator	2021	2025 target
Treatment and case management for persons with active TB		
Initiated TB treatment within 7 days of specimen collection ²	91%	96%
Sputum culture conversion within 60 days of treatment initiation ³	67%	83%
Completed treatment within 365 days of initiation ⁴	86%	95%
Contact investigation		
Eligible cases with contacts elicited ⁵	91%	100%
Eligible contacts evaluated ⁶	73%	94%
Eligible contacts who initiated treatment for TB infection ⁷	88%	92%
Eligible contacts who completed treatment for TB infection ⁸	84%	93%

1. Definitions for performance measures and national indicators are established by the CDC; the 2025 targets were set in 2020. For details, visit [cdc.gov/tb/programs/evaluation/indicators](https://www.cdc.gov/tb/programs/evaluation/indicators). Performance measures are not reported for the current year to allow sufficient time for follow-up. 2. Of TB patients with positive acid-fast bacilli (AFB) sputum-smear results who were alive at diagnosis. 3. Of TB patients with positive sputum culture results who were alive at diagnosis and have initiated treatment. Excludes patients who died within 60 days of initiating treatment. 4. Excludes patients who never started on anti-TB medications, those who died or moved outside of the U.S. within 365 days of treatment initiation, those with any rifampin resistance, those with meningeal TB and children 14 years of age or younger with disseminated TB. 5. Of AFB sputum smear-positive TB patients. 6. Of contacts to AFB sputum smear-positive TB patients counted in the year of interest. 7. Of contacts to AFB sputum smear-positive TB patients who have newly diagnosed TB infection. 8. Of contacts to sputum AFB smear-positive TB patients with newly diagnosed TB infection who started treatment.

Profile of TB Cases

There were **536** cases of active TB disease counted in NYC in 2022. The NYC TB incidence rate was 6.1 per 100,000, more than twice as high as the national TB rate.

Figure 2: TB cases and rates,¹ NYC, 1984-2022



1984-1992:

Overall increase: **139%**
 Average annual increase: **12%**

1992-2013

Overall decrease: **83%**
 Average annual decrease: **7%**

2013-2022:

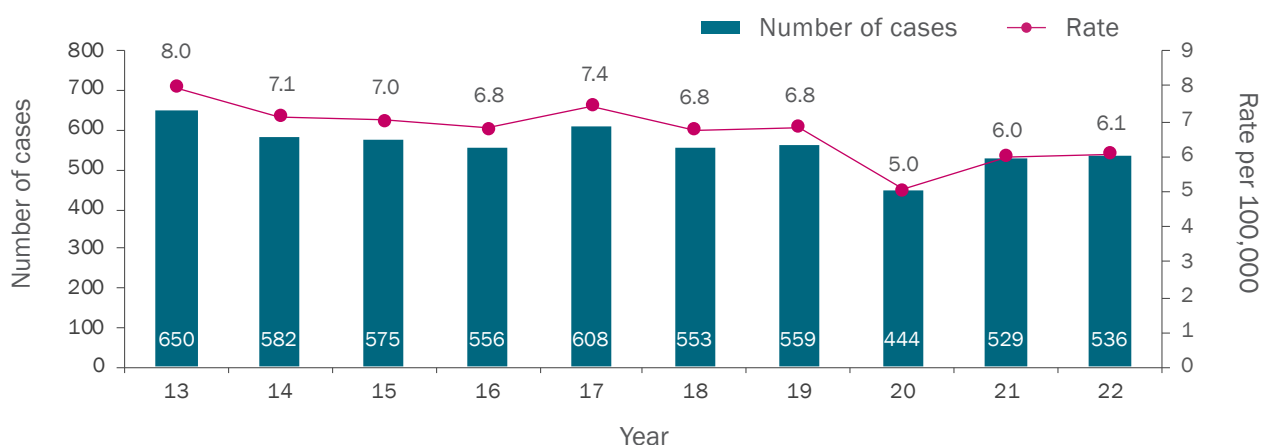
Overall decrease: **18%**
 Average annual decrease: **2%**

1. Rates are based on decennial census data.

TB in NYC

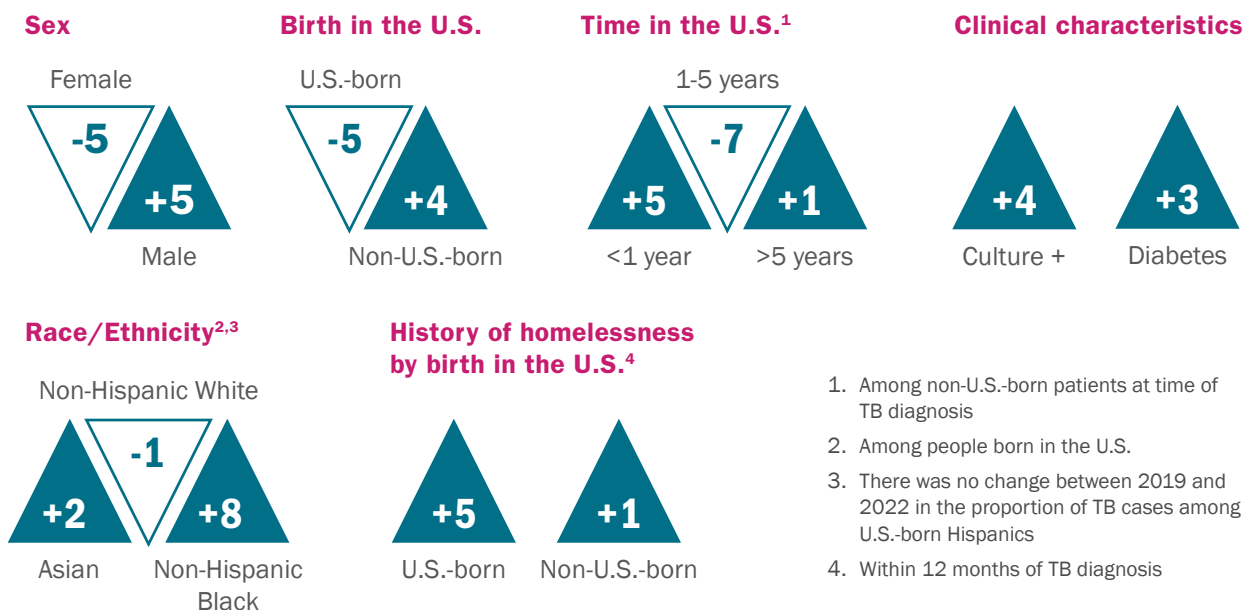
There were 536 cases of active TB disease counted in NYC in 2022, a 4% decrease compared to 2019. While the number of U.S.-born patients fell by 34% compared to 2019, the number of non-U.S.-born patients increased, especially among those who were in the U.S. for less than one year at time of TB diagnosis. The proportion of U.S.-born non-Hispanic Black patients increased 8% during this time period despite the overall decrease in the number of cases among U.S.-born patients. The proportion of U.S.-born patients with history of homelessness also increased, from 7% in 2019 to 12% in 2022.

Figure 3: TB cases and rates,¹ NYC, 2013-2022



1. Rates are based on decennial census data.

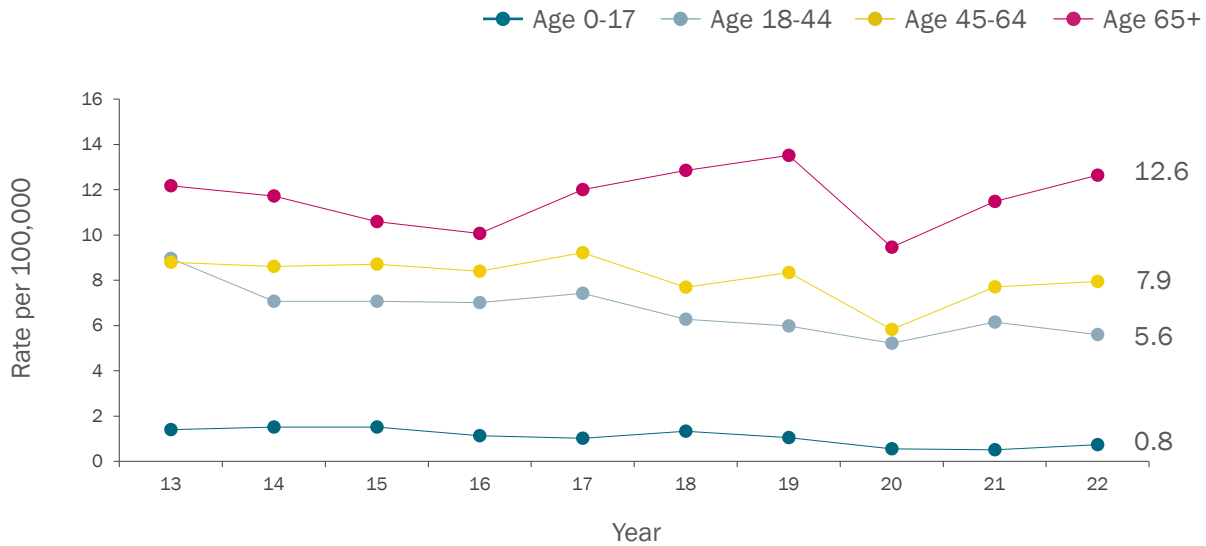
Figure 4: Percentage point change for select characteristics among patients with TB disease in 2022 compared to 2019, NYC



1. Among non-U.S.-born patients at time of TB diagnosis
2. Among people born in the U.S.
3. There was no change between 2019 and 2022 in the proportion of TB cases among U.S.-born Hispanics
4. Within 12 months of TB diagnosis

Demographic Characteristics

Figure 5: TB rates by age group in years,¹ NYC, 2013-2022



1. Rates are based on NYC Health Department population estimates, modified from U.S. Census Bureau interpolated intercensal population estimates, 2000-2022. Updated January 2023.

Figure 6: TB cases by age group in years, NYC, 2022

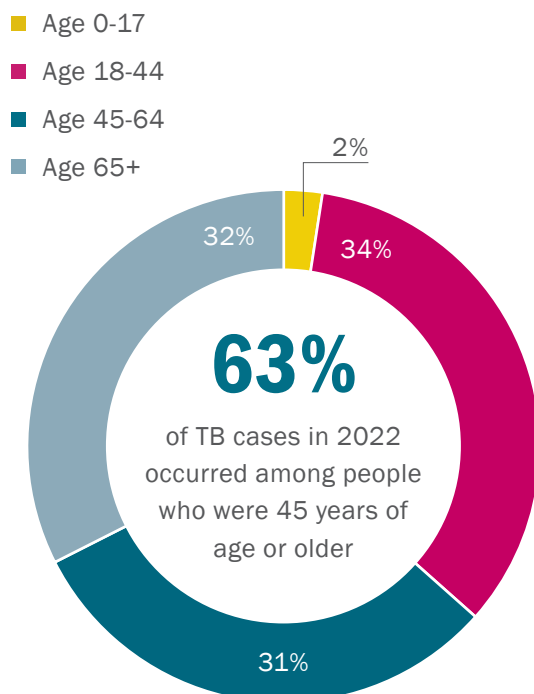
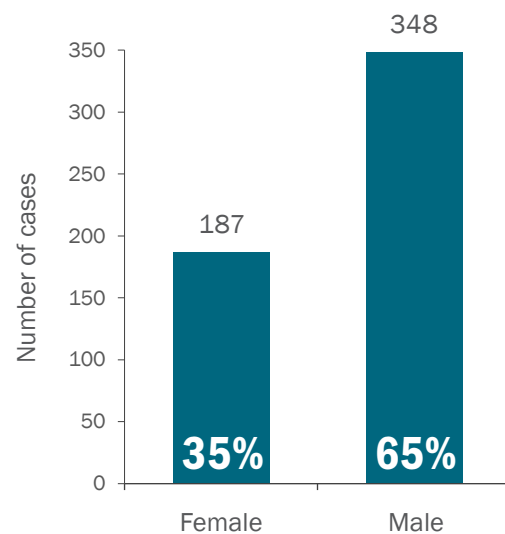
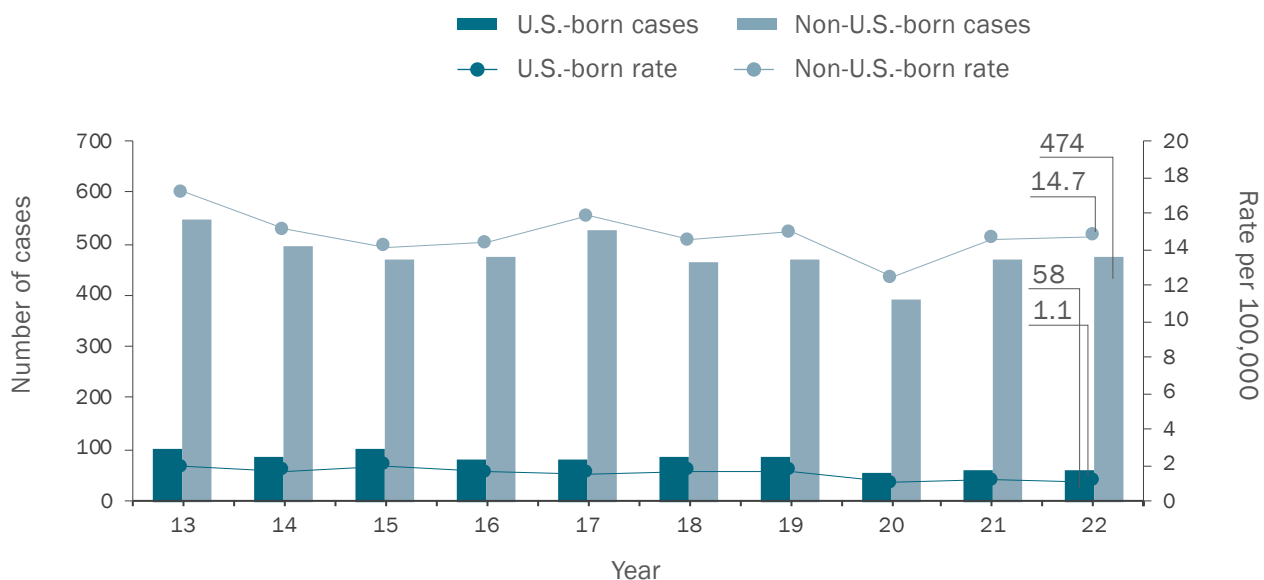


Figure 7: TB cases by sex,¹ NYC, 2022



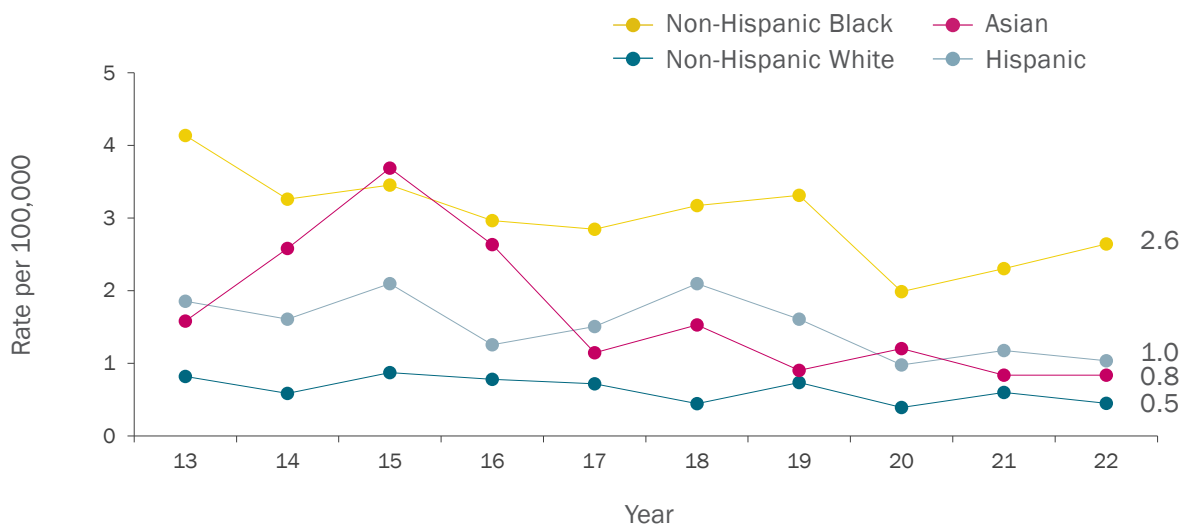
1. Data on patient sex are currently collected and categorized as "Male," "Female" and "Transgender." In future reports, more expansive categories of gender identity will be presented to reflect changes in data collection methods.

Figure 8: TB cases and rates¹ by birth in the U.S.,^{2,3} NYC, 2013-2022



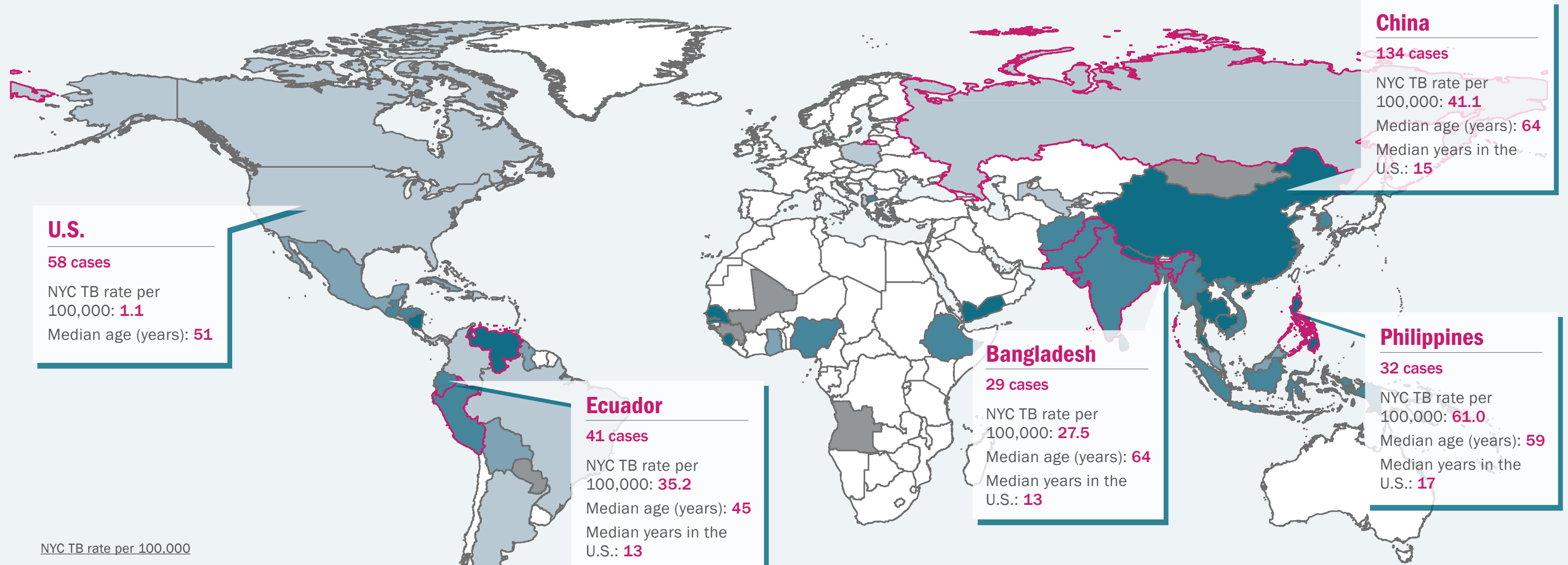
1. Rates are based on one-year American Community Survey data for the given year or the most recent available data. 2. U.S.-born includes individuals born in the U.S. and U.S. territories. 3. Excludes four cases with unknown country of birth.

Figure 9: TB rates¹ by race/ethnicity² among patients born in the U.S.^{3,4} NYC, 2013-2022



1. Rates are based on one-year American Community Survey Public Use Microdata Sample data for the given year or the most recent available data. 2. Data shown do not include patients with multiple, other or unknown race/ethnicity. 3. U.S.-born includes individuals born in the U.S. and U.S. territories. 4. Excludes cases with unknown country of birth.

Figure 5: TB cases, rates¹ and select characteristics by patient country of birth,²⁻⁵ NYC, 2022



Country of Birth

There were 55 countries of birth among patients with TB disease in 2022. Patient characteristics and TB risk factors, including age and comorbidities, differ by country of birth.

55 | Number of countries of birth represented among patients with TB disease in 2022

13 | Median number of years in the U.S. among non-U.S.-born TB patients

Top 5 Countries of Birth by NYC TB Burden and Incidence,^{1,2-3} 2022

Country of Birth	Number of Cases	Country (cases)	NYC TB rate/100,000
China ⁴	134	Cambodia (2)	105
U.S. ⁵	58	Senegal (5)	91
Ecuador	41	Nepal (10)	70
Philippines	32	Venezuela (9)	64
Bangladesh	29	Philippines (32)	61

1. Rates are based on 2022 American Community Survey one-year sample data. 2. 4 cases in 2022 were in patients with unknown country of birth. 3. There were 8 countries for which rate could not be calculated due to insufficient population data. 4. China includes individuals born in mainland China, Hong Kong, Taiwan and Macau. 5. U.S.-born includes individuals born in the U.S. and U.S. territories. 6. MDR TB is defined as resistance to at least isoniazid and rifampin.

TB in NYC Neighborhoods

Figure 11: TB rates¹ by neighborhood², NYC, 2022

Rate per 100,000

- Above citywide rate (6.2 to 22.4)
- At or below citywide rate (2.6 to 6.1)
- At or below provisional national rate (1.0 to 2.5)

West Queens

93 cases

TB rate per 100,000 people: **20.2**

Proportion non-U.S.-born among cases: **96%**

Flushing

58 cases

TB rate per 100,000 people: **22.4**

Proportion non-U.S.-born among cases: **95%**

Sunset Park

18 cases

TB rate per 100,000 people: **14.9**

Proportion non-U.S.-born among cases: **94%**

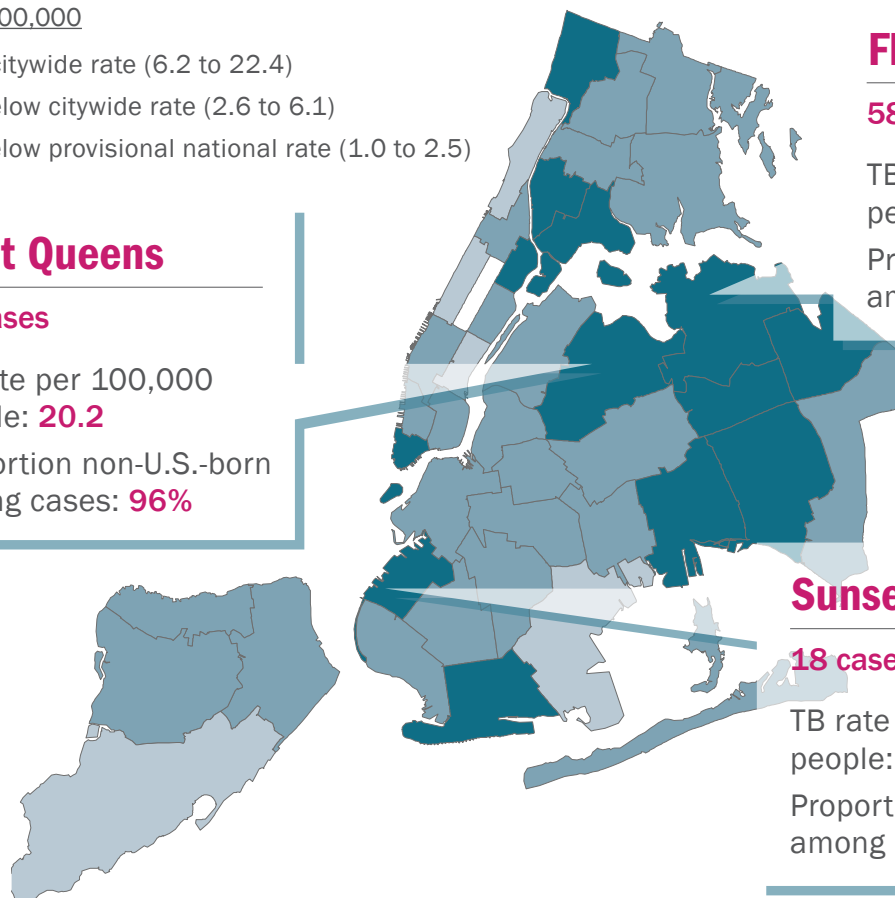
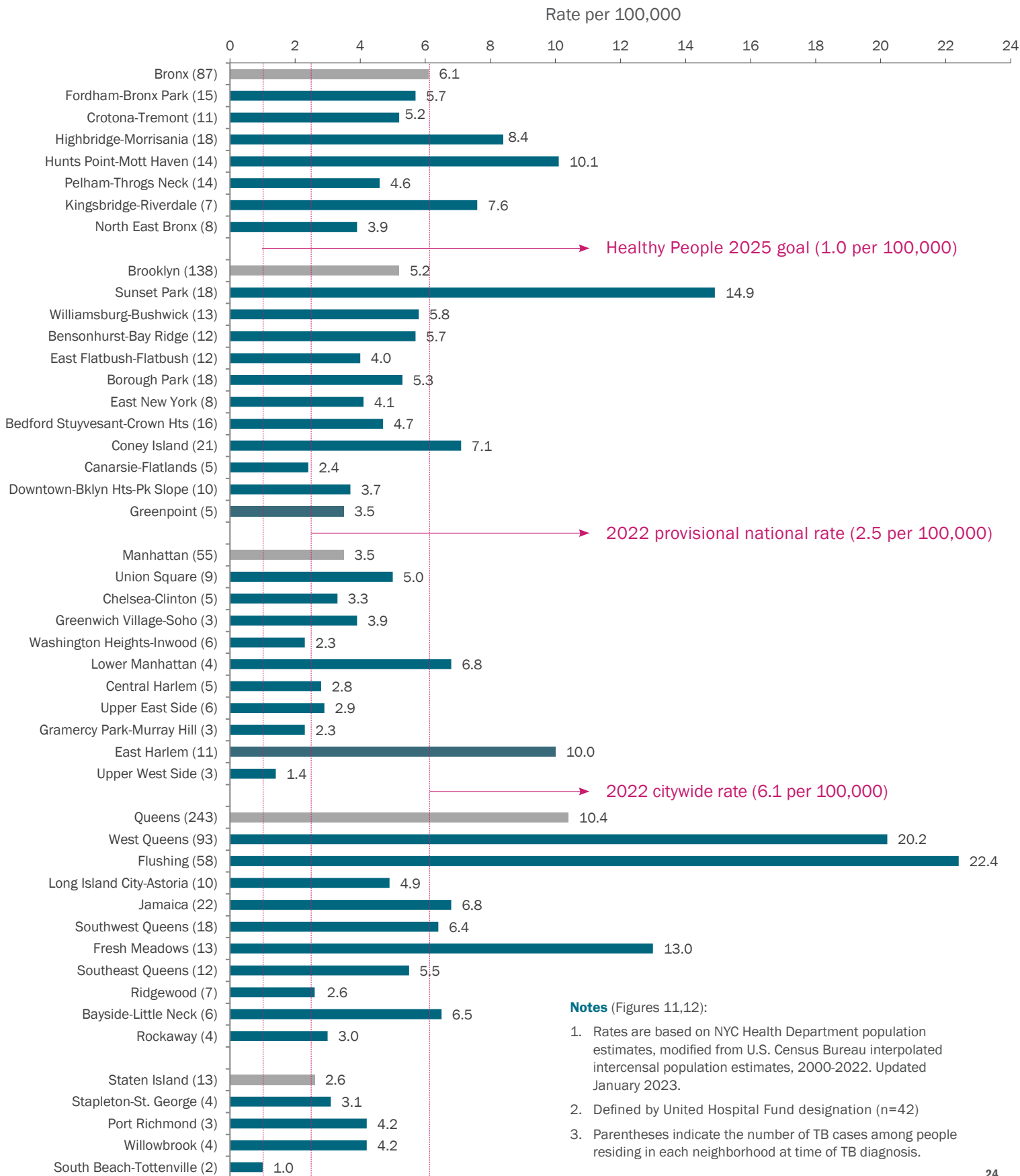


Table 2: Proportion of TB cases and rates¹ by birth in the U.S.²⁻³ and area-based poverty level of patient's residential neighborhood,⁴⁻⁵ NYC, 2022

Area-based poverty level ⁴⁻⁵	U.S.-born TB rate	% U.S.-born	Non-U.S.-born rate	% non-U.S.-born	Total NYC TB rate	% of all cases
Very high (30 to 100%)	3.1	38%	15.7	12%	7.5	15%
High (20 to < 30%)	1.5	26%	15.4	19%	6.8	20%
Medium (10 to < 20%)	0.8	29%	15.7	53%	7.2	50%
Low (< 10%)	0.3	7%	10.8	16%	3.8	15%

1. Rates are based on 2016-2020 American Community Survey data. 2. U.S.-born includes individuals born in the U.S. and U.S. territories. 3. Four cases in 2022 had unknown country of birth. 4. Area-based poverty level is based on 2016-2020 American Community Survey data on the proportion of ZIP code residents living below the Federal poverty limit. 5. Cases were assigned to a ZIP code based on their residence at time of TB diagnosis.

Figure 12: TB cases and rates¹ by neighborhood², NYC, 2022³



Clinical Characteristics

In 2022, 85% of TB cases involved a pulmonary site of disease, and 86% of people with TB disease had a positive culture. Between 2019 and 2022, the proportion of non-U.S.-born patients with diabetes increased from 23% to 27%.

Figure 13: TB cases by disease site, NYC, 2022

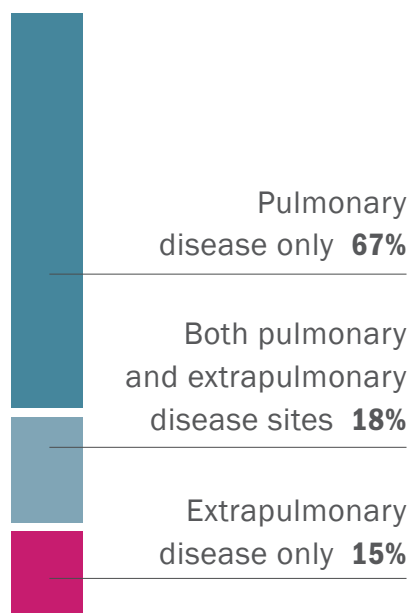


Table 3: Disease site among TB cases with extrapulmonary disease,¹ NYC, 2022 (n=176)

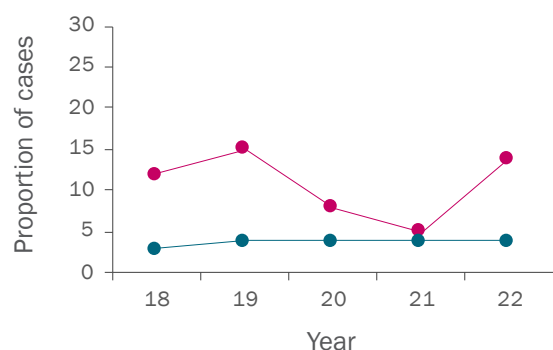
Disease site	Number of cases	Percentage
Any extrapulmonary site	176	-
Lymphatic	61	35%
Pleural	58	33%
Bone/joint	16	9%
Genitourinary	16	9%
Peritoneal	11	6%
Meningeal	11	6%
Laryngeal	2	1%
Other	46	26%

1. Categories are not mutually exclusive.

Figure 14: Select comorbidities among patients with TB disease by birth in the U.S.,^{1,2} NYC, 2018-2022

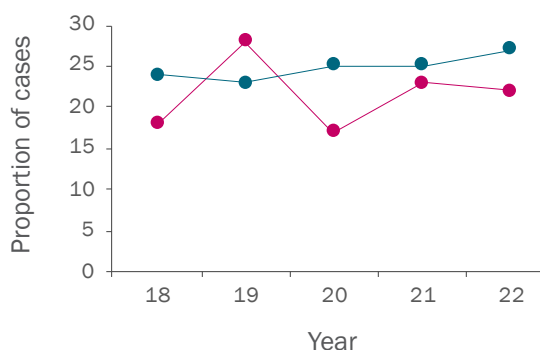
HIV Infection³

Overall proportion, 2022: **5%**



Diabetes

Overall proportion, 2022: **26%**



1. U.S.-born includes individuals born in the U.S. and U.S. territories. 2. Excludes cases with unknown country of birth. 3. There were 102 patients in 2022 with an unknown HIV status.

Figure 15: Proportion of culture-confirmed TB cases among all cases, NYC, 2022

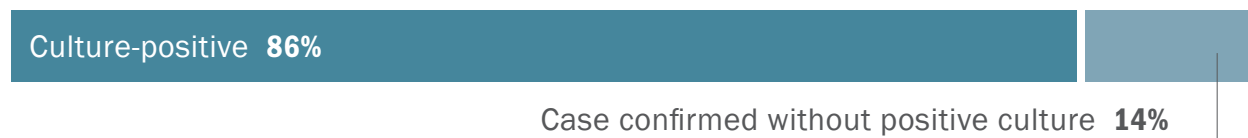
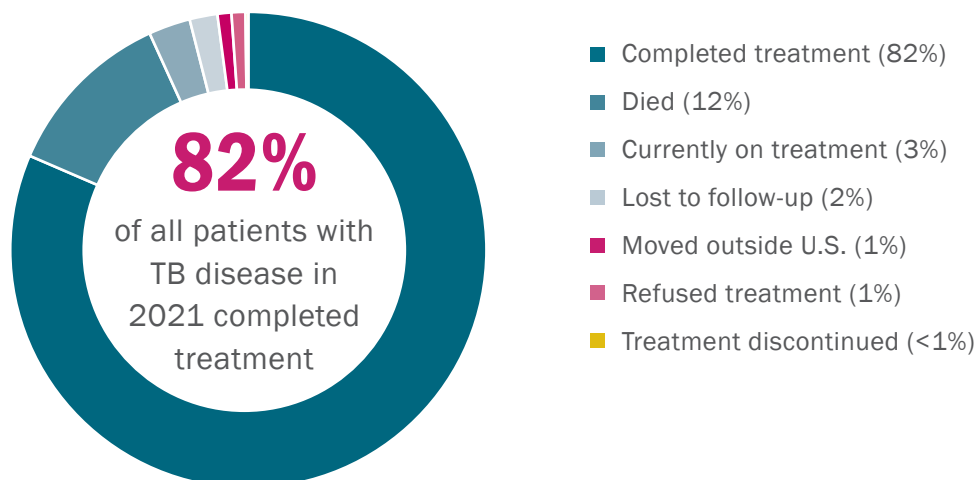
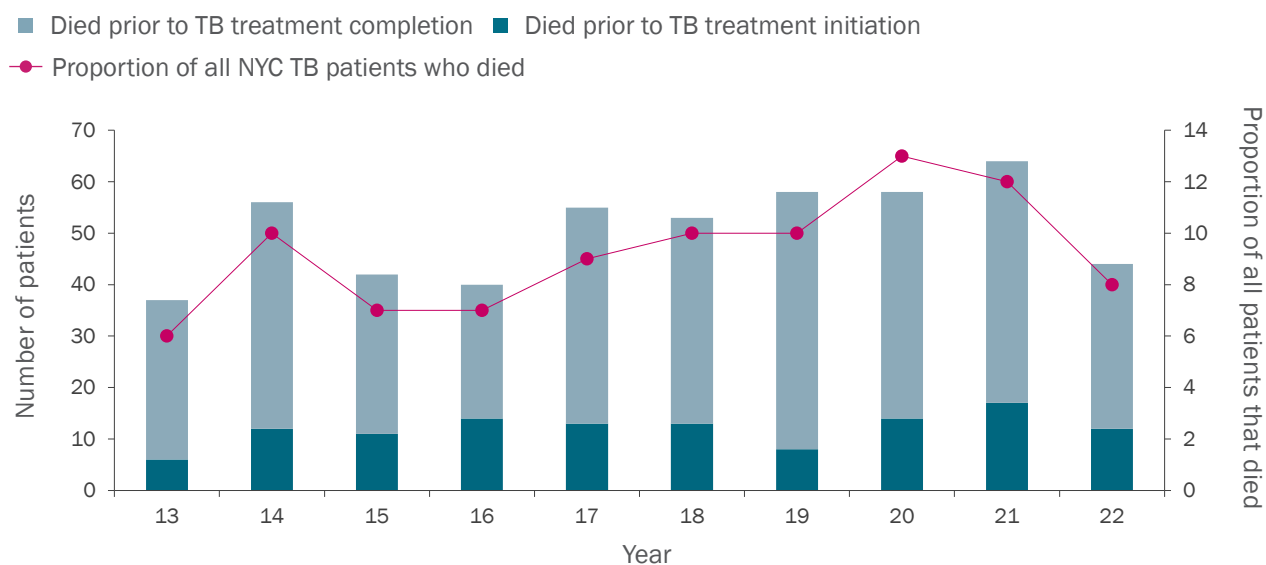


Figure 16: Treatment outcomes for TB cases counted in 2021,^{1,2} NYC (n=529)



1. Treatment outcomes are not reported for the current year to allow sufficient time for follow-up. 2. A death is defined as any patient who died prior to or during TB treatment, regardless of the cause of death. This excludes any patient who died after the completion of TB treatment.

Figure 17: Number and proportion of patients with TB who died^{1,2} before or during treatment, NYC, 2013-2022

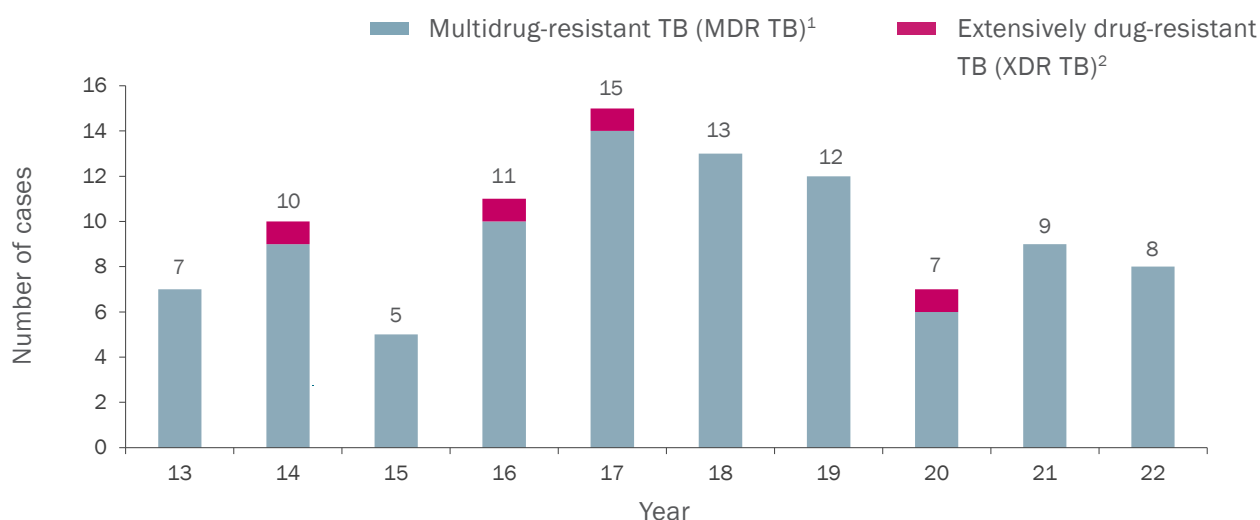


1. A death is defined as any case who died prior to or during TB treatment, regardless of the cause of death. This excludes any case who died after the completion of TB treatment.

Drug Resistance

Molecular-based tests, which rapidly detect mutations associated with drug resistance, are now being used routinely in hospitals, commercial laboratories and public health reference laboratories in NYC. In 2022, eight patients were newly diagnosed with MDR TB, defined as a TB strain resistant to both isoniazid and rifampin, two of the most effective TB drugs.

Figure 18: Multidrug resistance¹ among TB cases, NYC, 2013-2022



1. MDR TB is defined as resistance to at least isoniazid and rifampin. 2. XDR TB is defined as resistance to at least isoniazid and rifampin plus a fluoroquinolone and a second-line injectable anti-TB medication.

Table 4: Detection of resistance to select TB medications by test type,¹ NYC, 2022

	INH	RIF	EMB	PZA	FLQ ²	INJ ³
Number of patients with a molecular test ⁴	435	449	430	430	435	430
▶ Number with mutation detected (%)	39 (9%)	9 (2%)	5 (1%)	14 (3%)	5 (1%)	0
Number of patients with a phenotypic test	445	446	445	444	116	116
▶ Number with resistance detected (%)	41(9%)	11 (2%)	7 (2%)	24 (5%)	8 (7%)	1 (1%)
Number of patients with any drug susceptibility test conducted	457	458	455	455	436	431
▶ Number with resistance detected (%)	48 (11%)	19 (4%)	13 (3%)	30 (7%)	13 (3%)	1 (<1%)

Abbreviations: INH - isoniazid; RIF - rifampin; EMB - ethambutol; PZA - pyrazinamide; FLQ - fluoroquinolones; INJ - injectables

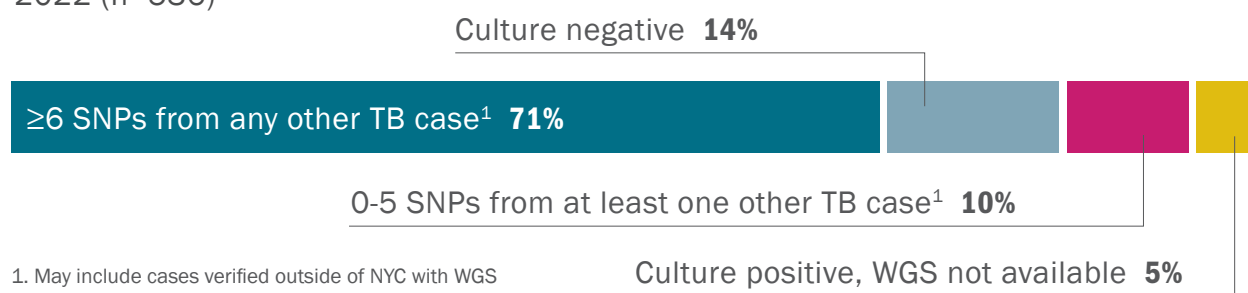
1. Categories are not mutually exclusive. 2. Fluoroquinolones include levofloxacin, moxifloxacin, ciprofloxacin and ofloxacin.

3. Injectables include kanamycin, capreomycin and amikacin. 4. Molecular tests include GeneXpert[®] MTB/RIF, pyrosequencing, Sanger sequencing and whole genome sequencing.

Whole Genome Sequencing and NYC Clusters

The Health Department uses whole genome sequencing (WGS) to characterize TB strains and assess transmission. Cases are reviewed, prioritized and assigned for epidemiologic investigation. A difference of five single nucleotide polymorphisms (SNPs) or less between isolates is considered suggestive of possible recent transmission and prompts further investigation.

Figure 19: TB cases by WGS availability and high quality SNP analysis results, NYC, 2022 (n=536)



1. May include cases verified outside of NYC with WGS results in the NYS Wadsworth laboratory database.

Table 5: Characteristics of patients whose isolate has less than or equal to five SNP differences from at least one other TB case,¹ NYC, 2022 (n=56)

Characteristic	n (percentage)
Male	41 (73%)
U.S.-born	16 (29%)
Non-U.S.-born	40 (71%)
▶ Most common countries of birth among non-U.S.-born patients	China (12), Guatemala (5), Mexico (5), Ecuador (4), Guyana (3)
▶ In the U.S. for >5 years	30 (75%)
Median age (range)	36 (12-80)
Borough of residence at diagnosis (Queens)	22 (39%)
Pulmonary site of disease	50 (89%)
Sputum smear positive	38 (68%)
Any drug resistance	3 (5%)
History of homelessness ²	4 (7%)
Nearest neighbor counted by New York State	4 (7%)
Known contact to a TB case	9 (16%)

1. May include cases verified outside of NYC with WGS results in the NYS Wadsworth laboratory database. 2. In the 12 months before TB diagnosis

Contact Investigation in Non-household Settings

The Health Department investigates TB exposures in non-household settings in NYC to identify and evaluate contacts, ensure appropriate treatment for contacts with TB disease or LTBI, determine if transmission has occurred and assess whether testing of additional contacts may be warranted.

Table 6: Contact investigation outcomes in non-household settings¹ by number of exposed contacts, NYC, 2022 (n=36)

	≥ 15 exposed contacts		< 15 exposed contacts		Total	
	n	(%)	n	(%)	n	(%)
Number of sites	10	28%	26	72%	36	
Likely transmission ²	1	10%	3	12%	4	11%
Transmission could not be assessed	4	40%	4	15%	8	22%
Total number of contacts	272	-	139	-	411	-
Contacts eligible for testing ³	271	99%	136	98%	407	99%
Contacts tested	183	68%	124	91%	307	75%
Contacts with a positive TB test result	7	4%	10	8%	17	6%

1. Excludes health care-associated investigations. 2. Proportion calculated among investigations where transmission could be assessed. 3. Contacts eligible for testing are defined as contacts without a known history of TB disease or documented positive test for TB infection who were alive after diagnosis of the infectious TB case to whom they were exposed.

Figure 20: Contact investigations in non-household settings¹ by site type, NYC, 2022 (n=411)

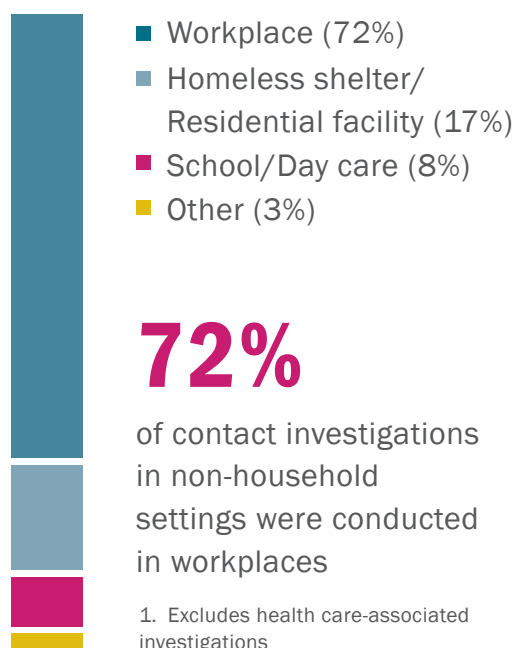


Figure 21: Contact investigations in health care-associated settings by site type, NYC, 2022 (n=132)

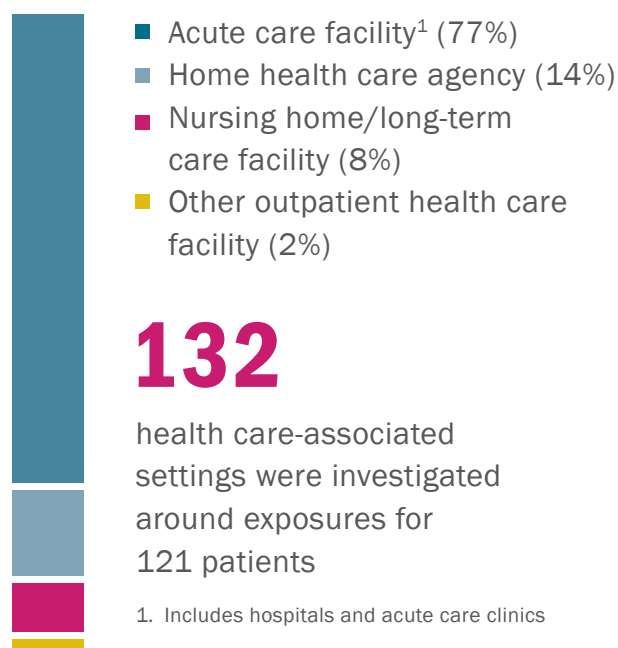


Table 7: Select demographic, social and clinical characteristics of TB cases by birth in the U.S.,¹ NYC, 2021-2022

Characteristics	2021						2022					
	U.S.-born ¹		Non-U.S.-born		Total ²		U.S.-born ¹		Non-U.S.-born		Total ²	
	n	%	n	%	n	%	n	%	n	%	n	%
Age group												
0-17	0	0%	9	2%	9	2%	7	12%	6	1%	13	2%
18-44	26	43%	175	37%	201	38%	19	33%	164	35%	183	34%
45-64	20	33%	141	30%	161	30%	20	34%	145	31%	166	31%
65+	15	25%	143	31%	158	30%	12	21%	159	34%	174	32%
Sex												
Female	25	41%	179	38%	204	39%	21	36%	165	35%	187	35%
Male	36	59%	289	62%	325	61%	37	64%	308	65%	348	65%
Race/ethnicity												
Non-Hispanic White	12	20%	16	3%	28	5%	9	16%	12	3%	21	4%
Non-Hispanic Black	27	44%	56	12%	83	16%	31	53%	45	9%	76	14%
Hispanic	17	28%	106	23%	123	23%	15	26%	129	27%	145	27%
Asian	3	5%	249	53%	252	48%	3	5%	268	57%	274	51%
Multiple/Other	2	3%	41	9%	43	8%	0	0%	19	4%	19	4%
Time in the U.S. (at time of reporting)												
< 1 year	n/a	n/a	23	5%	23	5%	n/a	n/a	46	10%	46	10%
1-5 years	n/a	n/a	110	24%	110	24%	n/a	n/a	88	19%	88	19%
> 5 years	n/a	n/a	327	70%	327	70%	n/a	n/a	328	69%	328	69%
Borough of residence												
Manhattan	13	21%	64	14%	77	15%	8	14%	47	10%	55	10%
Bronx	16	26%	48	10%	64	12%	15	26%	72	15%	87	16%
Brooklyn	15	25%	127	27%	142	27%	24	41%	111	23%	138	26%
Queens	14	23%	213	46%	227	43%	11	19%	231	49%	243	45%
Staten Island	3	5%	16	3%	19	4%	0	0%	13	3%	13	2%
Neighborhood poverty ³												
Low (< 10%)	10	16%	68	15%	78	15%	4	7%	74	16%	79	15%
Medium (10 to < 20%)	20	33%	250	53%	270	51%	17	29%	251	53%	269	50%
High (20 to < 30%)	18	30%	106	23%	124	23%	15	26%	91	19%	108	20%
Very High (30 to 100%)	13	21%	44	9%	57	11%	22	38%	58	12%	80	15%
Total	61	-	468	-	529	-	58	-	474	-	536	-

Table 7 (continued): Select demographic, social and clinical characteristics of TB cases by birth in the U.S.,¹ NYC, 2021-2022

Characteristics	2021						2022					
	U.S.-born ¹		Non-U.S.-born		Total ²		U.S.-born ¹		Non-U.S.-born		Total ²	
	n	%	n	%	n	%	n	%	n	%	n	%
Homeless ⁴	6	10%	12	3%	18	3%	7	12%	21	4%	28	5%
Employed ^{4,5}	26	43%	174	38%	200	38%	11	22%	125	27%	136	26%
Health care worker ^{4,5}	3	12%	18	10%	21	11%	1	9%	10	8%	11	8%
Ever respiratory smear positive ⁶	33	59%	220	58%	253	58%	24	49%	233	58%	258	57%
Sputum smear positive	29	88%	209	95%	238	94%	23	96%	212	91%	236	91%
Culture positive	52	85%	389	83%	441	83%	49	88%	408	86%	461	86%
Pulmonary only site of disease	42	69%	262	56%	304	57%	32	55%	325	69%	360	67%
Extrapulmonary only site of disease	5	8%	87	19%	92	17%	8	14%	70	15%	79	15%
Both pulmonary and extrapulmonary disease	14	23%	119	25%	133	25%	18	31%	79	17%	97	18%
Cavities present on chest x-ray ever ⁶	22	39%	74	19%	96	22%	11	22%	61	15%	72	16%
Rifampin resistance ⁷	4	7%	12	3%	16	3%	0	0%	10	2%	10	2%
Multidrug resistance ⁸	3	75%	6	50%	9	56%	0	0%	8	80%	8	80%
Extensive drug resistance ⁹	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
History of TB disease	2	3%	26	6%	28	5%	3	5%	35	7%	38	7%
HIV infection	3	5%	18	4%	21	4%	8	14%	18	4%	26	5%
Diabetes	14	23%	118	25%	132	25%	13	22%	127	27%	142	26%
Total	61	-	468	-	529	-	58	-	474	-	536	-

1. U.S.-born includes individuals born in the U.S. and U.S. territories. 2. Totals may not equal the sum of U.S.-born and non-U.S.-born due to missing country of birth data. 3. Area-based poverty level is based on 2016-2020 American Community Survey data on the proportion of ZIP code residents living below the federal poverty limit. Cases were assigned to a ZIP code based on their residence at TB diagnosis. 4. In the 12 months before TB diagnosis. 5. Among patients 18 years of age and older. 6. Percentage is among patients with a pulmonary site of disease. 7. Percentage is among patients with susceptibility testing performed for rifampin. 8. MDR TB is defined as resistance to at least isoniazid and rifampin. Percentage is among patients with susceptibility testing performed for isoniazid and rifampin. 9. XDR TB is defined as resistance to at least isoniazid and rifampin plus a fluoroquinolone and a second-line injectable anti-TB medication. Percentage is among patients with susceptibility testing performed for isoniazid, rifampin, any fluoroquinolone and any second-line injectable anti-TB medication.

Appendix

Table 8: TB cases and rates¹ by select characteristics, NYC, 1900-2022

Year	Number of TB cases	Rate per 100,000	Cases with positive culture	Cases with positive sputum smear	Multidrug-resistant cases ²	Deaths attributable to TB ³	Death rate per 100,000
1900	11,997	349.0				9,630	280.2
1910	32,065	672.7				10,074	211.3
1920	14,035	249.7				7,915	140.8
1930	11,821	170.6				4,574	66.0
1940	9,005	120.8				3,680	49.4
1950	7,717	97.8				2,173	27.5
1960	4,699	60.4				824	10.6
1970	2,590	32.8				432	5.5
1980	1,514	21.4				143	2.0
1990	3,506	47.9	3,384			256	3.5
1991	3,653	49.9	3,462	1,826	385	245	3.3
1992	3,755	51.3	3,401	1,855	437	200	2.7
1993	3,151	43.0	2,784	1,529	289	166	2.3
1994	2,941	40.2	2,433	1,280	183	133	1.8
1995	2,408	32.9	1,996	1,001	114	94	1.3
1996	2,013	27.5	1,693	873	84	67	0.9
1997	1,705	23.3	1,383	708	57	55	0.8
1998	1,528	20.9	1,232	611	38	52	0.7
1999	1,436	19.6	1,124	571	31	49	0.7
2000	1,311	16.4	1,043	516	24	44	0.5
2001	1,232	15.4	938	454	25	33	0.4
2002	1,071	13.4	819	436	29	30	0.4
2003	1,132	14.1	865	428	22	34	0.4
2004	1,036	12.9	793	395	19	31	0.4
2005	983	12.3	745	378	24	21	0.3
2006	947	11.8	705	354	24	18	0.2
2007	909	11.4	707	379	9	16	0.2
2008	886	11.1	685	339	11	18	0.2
2009	757	9.5	539	281	9	25	0.3
2010	705	8.6	511	265	11	26	0.3
2011	684	8.4	501	264	16	32	0.4
2012	652	8.0	495	271	18	15	0.2
2013	650	8.0	473	258	7	17	0.2
2014	582	7.1	454	243	10	31	0.3
2015	575	7.0	444	240	5	20	0.2
2016	556	6.8	448	225	11	21	0.2
2017	608	7.4	504	261	15	15	0.1
2018	553	6.8	421	230	13	20	0.2
2019	559	6.8	461	254	12	24	0.2
2020	444	5.0	366	212	6	Not available	Not available
2021	529	6.2	441	239	9	Not available	Not available
2022	536	6.3	461	238	8	Not available	Not available

1. Rates are based on decennial census data. 2. MDR TB is defined as resistance to at least isoniazid and rifampin. 3. Data on TB deaths are obtained from the Health Department's Office of Vital Statistics. Deaths recorded in a given year may include cases diagnosed in a previous year.

Technical Notes

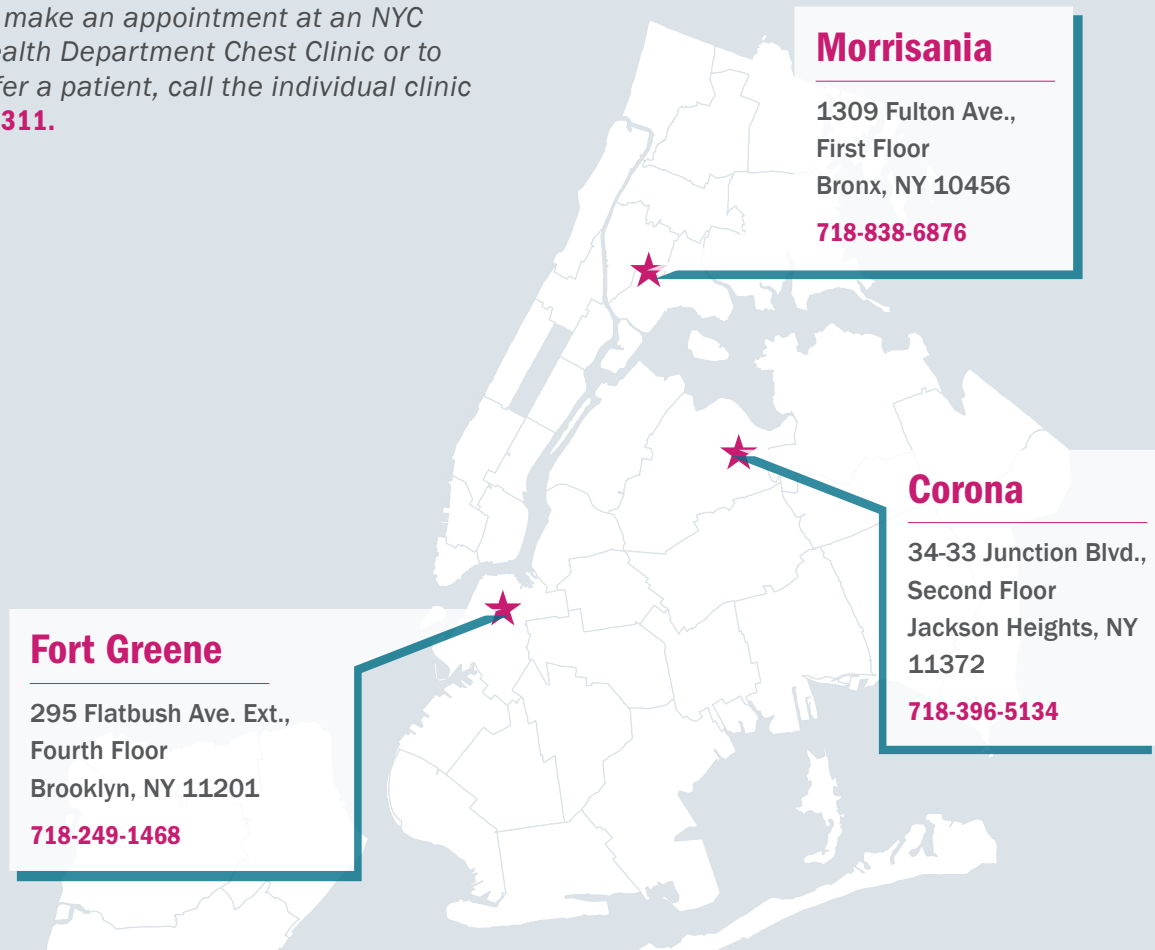
- Data for 2022 are preliminary and reflect the most complete information available as of Jan. 17, 2023.
- Data prior to 2022 have been updated since the release of the 2019 report. Data for these years reflect the final numbers and may differ from official estimates presented in previous reports.
- TB became a reportable disease on Jan. 19, 1897. From 1920-1940, only cases of pulmonary TB were reportable. Beginning in 1978 the TB case definition was amended to consider people who had verified TB disease 12 or more months before their current diagnosis as incident cases of TB disease.
- Data on patient sex are currently collected and categorized as male, female and transgender. In future reports, more expansive categories of gender identity will be used to reflect changes in data collection.
- Age groupings have been changed from previous reports; as a result, count data for earlier years may differ from previous reports.
- In all tables presenting data by birth in the U.S., column sums may not equal applicable totals due to missing or unknown data.
- In all tables where data are presented by geography, column sums may not equal applicable totals due to missing or unknown data.
- The sum of proportions do not always equal 100% due to rounding.
- All rates presented in this report are calculated per 100,000 population. Reported rates for earlier years may differ from previous reports due to corrected data and changes in the denominators used to calculate rates. The sources of denominator data are indicated throughout the report.
- The Health Department calculates population estimates based on modified U.S. Census Bureau interpolated intercensal estimates. Data are modified to account for population undercounts in northwest Queens and southern Brooklyn because of erroneously deleted housing units and housing units mislabeled as vacant. Population estimates are updated as new data become available. Therefore, rates may differ from previously reported rates.
- U.S.-born refers to patients born in the 50 states, District of Columbia or other U.S. territories and outlying areas, including American Samoa, Baker Island, Guam, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Island, Navassa Island, Northern Mariana Islands, Palmyra Atoll, Puerto Rico, U.S. Minor Outlying Islands, U.S. Pacific Islands, Virgin Islands and Wake Island. All others with a known country of birth are considered non-U.S.-born.
- Area-based poverty is defined using patients' ZIP code of residence at the time of TB diagnosis. Poverty level by ZIP code is based on the most recent American Community Survey five-year sample data from the American Community Survey that measures the proportion of residents living below the federal poverty level in that census tract. The federal poverty level is a measure of income used by the U.S. government to determine eligibility for subsidies, programs and benefits. The Department of Health and Human Services updates the poverty guidelines each January. Patients with addresses outside of NYC, addresses unable to be geocoded to a ZIP code or located in ZIP codes where poverty level could not be determined were not assigned to a poverty level.
- The geographic distribution of cases is presented by the 42 United Hospital Fund neighborhoods. These neighborhoods consist of adjoining ZIP codes that approximate NYC Community Planning Districts and contain an average of 200,000 individuals.
- Data presented on HIV status reflect information as collected by the Health Department. Misclassification of HIV status may occur if a patient refused to disclose known status or refused to be tested for HIV while under care for TB disease.
- Data on TB deaths are obtained from the NYC Office of Vital Statistics. Deaths recorded in a given year may include cases diagnosed in a previous year.
- Product names are provided for identification purposes only; their use does not imply endorsement by the NYC Health Department.

NYC Health Department Chest Clinics

Eligible patients can be referred to one of three NYC Health Department Chest Clinics located throughout the city for TB testing, radiography, sputum induction and treatment as needed. All chest clinic services, including medication, are provided at no cost to the patient and regardless of immigration or insurance status.



To make an appointment at an NYC Health Department Chest Clinic or to refer a patient, call the individual clinic or **311**.



The Health Department provides a variety of TB diagnostic services, including:

- Testing for TB infection using the latest generation blood-based QuantiFERON®-TB Gold Plus test and TST
- Sputum induction
- Chest radiographs
- Medical evaluation
- Treatment for TB disease and LTBI
- DOT services, including vDOT

Additional clinical services provided at each chest clinic include:

- Outpatient medical and nursing care
- Phlebotomy services
- Social services referrals
- HIV education and testing regardless of person's need for TB care
- TB evaluation for newly arrived immigrants and refugees referred by the CDC

