4: Case Detection

Definitions

Term	Definition
Active surveillance	Health departments actively contact and interact with healthcare facilities or individual providers to stimulate disease reporting, sometimes directly assuming the primary responsibility of reporting cases from large or high-volume institutions.
Case detection	Detection of one instance of a specific disease or exposure, e.g., TB. A front-line surveillance activity, it is typically accomplished as a by-product of routine medical or veterinary care, or laboratory work, or via an astute observer such as a health care worker.
Decline in reported tuberculosis	A large, unexpected decline in TB cases beyond the statistically expected range.
International Classification of Disease, 9th edition, Clinical Modification (ICD) 9 codes	A standardized classification of diseases, injuries, and causes of death, by etiology and anatomic localization, and codified into a 6-digit number, which allows clinicians, statisticians, policy makers, health planners, and others to speak a common language, both in the United States and internationally. Note that ICD codes are updated periodically.
Passive surveillance	Health departments passively receive case reports from healthcare providers and are dependent on healthcare providers to comply with reporting requirements.
Surveillance artifact	Factors influencing the reported number of TB cases because of misrepresentation of data due to changes in TB surveillance variables or systems, less active case finding because of staffing shortage or other disease priorities, or introduction of new diagnostic tests.

Term	Definition
Underdiagnosis	Failure to recognize or correctly diagnose a disease or condition, especially in a significant proportion of patients.
Underreporting	Reports are not received due to delays or disruption in flow of TB case information from the reporting jurisdictions to CDC, or because reports are absent from hospitals, other providers, or laboratories.

Quality Assurance Process for Case Detection

Primary Purpose

This section provides a quality assurance (QA) process to help jurisdictions find all patients with TB so they can be reported to the National Tuberculosis Surveillance System.

QA Process for Conducting Case Detection

Case detection is an essential component of TB prevention and control programs. TB programs must have a plan for case detection and must establish appropriate liaisons to find all TB patients in their reporting jurisdictions. The Cooperative Agreements (CoAg) requirements for case detection include:

- **A.** Maintain a registry of TB cases.
- **B.** Establish liaisons with appropriate reporting sources to enhance QA of TB surveillance data.
- **C.** Develop and implement active case detection activities.
- **D.** Evaluate the completeness of reporting of TB cases to the surveillance system.

Chapter 9: Quality Assurance Cross-cutting Systems and Process provides additional tools and systems [i.e., the National Tuberculosis Indicators Project (NTIP); Tuberculosis Genotyping System (TB GIMS); and Cohort Review] that can be used for improving case detection.

Table 4.1 includes a table format for the surveillance section of CoAg requirements and possible data sources and activities for case detection.

Table 4.1
Case Detection Quality Assurance Process
CoAg Requirements

Note: The requirements are based on Fiscal Year 2014 CoAg and may need to be updated when the CoAg is updated. The CoAg is reformatted into the following table and includes possible data sources and activities.

CoAg Requirements	Description	Possible Data Sources and Activities
Maintain a registry of TB cases.	**At a minimum, the registry of TB cases should contain** • The elements to produce data for the national TB case report, the revised RVCT. **All local jurisdictions should also have** • At least a log, if not a registry, that contains key demographic and clinical information **on each reported TB suspect**. **Include in the TB registry** • Data on TB cases receiving diagnostic, treatment, or contact investigation services in the local jurisdiction, although not included in the annual morbidity total.	Review TB database or log of all local jurisdictions.
Establish liaisons with appropriate reporting sources to enhance quality assurance of TB surveillance data.	**Enhance identification, reporting, and follow-up of TB cases and suspects by** • Establishing liaisons with appropriate reporting sources. **Provide a plan for** • Case finding, and • How appropriate liaisons have been or will be established. **TB programs should provide** • Periodic feedback. • At a minimum, an annual written report summarizing surveillance data to reporting sources.	Contact • Hospitals, • Clinics (e.g., TB and HIV/AIDS clinics), • Laboratories performing tests for mycobacteria, • Selected physicians (e.g., pulmonary and infectious disease subspecialists), • Correctional facilities, • Community and migrant health centers, • Pharmacies, and • Other public and private facilities providing care to populations with or at risk for TB.

CoAg Requirements	Description	Possible Data Sources and Activities
Develop and implement active case detection activities.	**At a minimum,** • Conduct ongoing active laboratory surveillance by on-site visits in all areas to ensure complete reporting of all TB cases and suspects with positive acid-fast bacilli (AFB) smears and cultures for *M. tuberculosis*.	Review laboratory reports.
Evaluate the completeness of reporting of TB cases to the surveillance system.	**Periodically (e.g., at least every two years)** • Evaluate the completeness of reporting of TB cases to the surveillance system by identifying and investigating **at least one population-based secondary data source** to find potentially unreported TB cases.	Conduct record reviews of secondary data sources such as • Statewide laboratory, • Pharmacy, and • Hospital discharge data.
	Verify potential TB cases identified during the evaluation. • Determine reasons for nonreporting of TB cases. • Develop and implement a plan for improvement.	Investigate by • Medical record review, • Physician interviews, and • Patient interviews.

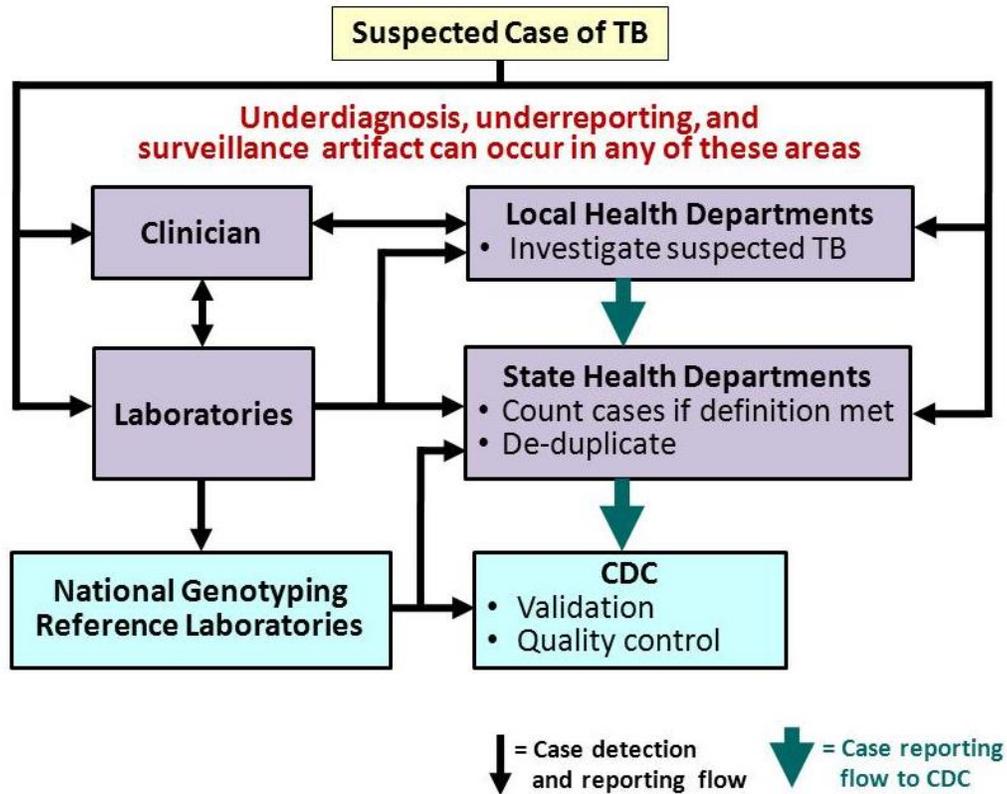## TB Case Detection and Reporting

Figure 4.1 is a simplified illustration of the TB reporting and surveillance system in the United States. When a clinician (in any setting, whether public or private), encounters a patient with suspected TB, specimens should be sent to a laboratory (public or private) for diagnosis. If a TB diagnosis is made (either clinically or lab confirmed), clinicians are legally required to report the case to the local health department (LHD) or state health department (SHD), usually by fax, phone, or mail, although some jurisdictions can report through secure web-based systems.

The LHD investigates the suspected case and reports verified cases (and sometimes suspects) to the SHD or the jurisdiction's counting authority. Laboratories are also required by law to report TB cases and do so both to the local and state health departments. The jurisdiction's counting authority ensures that the case meets the national TB case definition, and that the case is not a duplicate. The case is then added to the jurisdiction's case count and reported to CDC.

CDC receives reports on a daily basis, validates data, and conducts quality control checks both manually and electronically through programmed algorithms. All laboratories go through their state public health laboratories, send culture-confirmed TB isolates to two national genotyping reference labs for genotyping. The results are reported both to the SHD and CDC, which maintain the data in a secure electronic database.

In March of each year, CDC publishes provisional TB data for the previous year (in connection with World TB Day) in the MMWR. Later each year, confirmed data in a more comprehensive format are published in an annual TB surveillance report.

Figure 4.1
Factors Affecting TB Case Detection and Reporting

Example: Decline in Reported Tuberculosis Investigation

Primary Purpose

This section describes methods used to investigate a decrease in reported TB cases. It provides an example of intensive case detection and reporting that can be used in state or local jurisdictions.

Description

This was an investigation to find reasons for the unexpectedly large decline in TB incidence in 2009. This decline raised an urgent concern about potentially unidentified infectious TB cases. DTBE and partners formed teams to investigate the decline. Two investigative teams were deployed to two states, while other teams investigated additional sources including TB treatment initiation, medication sales, and laboratory and genotyping data for culture-positive TB. Table 4.2 provides possible reasons for the decline in TB cases in 2009.

Table 4.2
Possible Reasons for the Decline in TB Cases in 2009

Possible Main Reasons	Possible Specific Reasons
Surveillance artifact	• Changes in TB surveillance variables or systems • Possible delays in TB control activities (e.g., due to H1N1)
Underreporting of TB	• Providers, hospitals, or laboratories
Underdiagnosis of TB	• Change in laboratory diagnostic procedures (e.g., new diagnostics) • Physicians less likely to "think TB" • Patients less likely to seek care (e.g., due to economy)

True decrease in TB	• Changes in migration patterns
	    o Economic downturn leading to fewer job seekers
	• More stringent overseas TB screening of new immigrants
	    o Requirement of cultures for suspected TB
	    o TB treatment before immigration
	• Less transmission
	• Cumulative effect of years of TB control efforts

The main objective of the investigation was to estimate the possible contributions of underdiagnosis and underreporting to the overall decline in reported TB cases. The specific objectives included:

- Describe changes in epidemiology and reporting patterns.
- Identify unreported TB cases.
- Estimate extent to which underdiagnosis and underreporting contributed to the decline.
- Develop methods to investigate the decline in other jurisdictions.
- Plan further investigation and interventions based on findings.

Methods Used to Conduct the Investigation

The methods described in this section were used to conduct the investigation, but they may also be used to investigate an unexpected increase in reported cases of TB.

Because of concern for unidentified cases, methods needed to be simple, quick, and easy to implement. A systematic approach was used to assess the following possible causes:
- Surveillance artifact
- Underdiagnosis
- Underreporting

Table 4.3 provides the investigation process used for underreporting of TB for data already within the public health system. This is also Case Detection Tool–6.

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Table 4.3

Case Detection Tool–6

Investigation Process for Underreporting of TB

</div>

For Data Already Within the Public Health System
For underreporting due to delays or disruptions in flow of TB surveillance information from the local level to the state, and from the state level to CDC.
Interview TB staff to identify delays in reporting and counting, and changes in resources.
Compare counts of TB cases known to the county (or reporting district) versus cases known to state and CDC.
Review paper charts and laboratory data of suspect TB cases awaiting case verification.
Conduct system queries and analyses of all reported (i.e., suspect, verified, and counted) cases during the affected year to identify • Suspect cases still awaiting verification >90 days since first reported, • Cases waiting to be counted, • The percentage and monthly trend of counted cases during the affected year, and • Delays in counting (i.e., mean number of days between "record entry date" and "count entry date").
Develop and email surveys to the counties with a >3-case decline for the affected year to identify discrepancies in the numbers of counted and suspect TB cases between county and state records. Verify survey results by phone.
Conduct site visits to local TB programs with the largest declines. At site visits, interview staff to understand changes and challenges in routine reporting practices. In addition, compare state and county numbers of counted and suspect cases, and review charts of suspected TB cases still awaiting verification or not entered in the system.

Table 4.4 provides the investigation process used for underreporting of TB for data coming into the public health system. This is also Case Detection Tool−6.

Table 4.4
Case Detection Tool−6
Investigation Process for Underreporting of TB

For Data Coming Into the Public Health System
For underreporting due to absent reports from hospitals, other providers, and laboratories

Crossmatch patients with TB diagnosis based on hospital and laboratory data for the affected year with the system database of all reported cases during the affected period.
• Sources for hospital data
   o Request hospitals to fax a list of patients diagnosed with TB at their facilities during the affected year.
   o Review hospital discharge database including patients discharged from any acute health care facility in the state during the affected year, with an ICD-9 consistent with active TB. Match with the system based on the first two letters of each patient's first name and last name, last two letters of the last name, and date of birth in the hospital discharge database.
• Sources for laboratory data
   o Request the state lab and private labs to provide a list of all patients whose clinical specimen (i.e., specimens without prior culturing process) or referenced specimen had either a positive *Mycobacterium tuberculosis* (MTB) culture, a positive NAAT for MTB complex, an isolate identified as MTB, or a drug susceptibility test performed. The state can also provide a list of patients whose MTB isolates were only routed through the state lab for genotyping (by autonomous laboratories with capabilities to perform all TB tests except genotyping).

Develop a plan for follow-up of unmatched patients from hospital and lab data. Prioritize patients from the hospital discharge database not found in either system for follow-up (with the admitting hospitals) based on an ICD-9 codes most predictive for TB.
Visit the state lab to assess changes in reporting practices and procedures.
Query surveillance systems to identify private providers (non-hospital) with >3-case decline during the affected year.

Conclusions

Multiple factors contributed to the 2009 decline in TB. The decrease in TB cases was unlikely due to surveillance artifact, underreporting of TB cases, or underdiagnosis due to TB patients failing to seek care.

Based on staff interviews, the criteria used to count cases did not change and there was no evidence of overcounting of non-countable TB cases. A thorough evaluation of completeness of reporting into the public health system by hospitals and laboratories did not yield any evidence of underreporting.

There was an increase in the number of patients tested by culture. However, a drop in the proportion of patients with culture-confirmed TB strongly argues against underdiagnosis and suggests a true decline in cases.

Lessons Learned

During the investigation, the possibility of a surveillance artifact was important to rule out. Underdiagnosis was very difficult to assess because it required chart reviews. Also, there was no simple method to determine if TB patients did not seek care.

Laboratory data can be an objective measure of TB incidence. Crossmatching of secondary TB data sources and surveillance data is simple, but follow-up of unmatched cases can be challenging.

It is important to educate clinicians and healthcare staff to maintain vigilance for TB and promptly report new TB cases to public health authorities.

Ongoing data collection and analysis activities are necessary to continue to assess TB trends. Quality of data is key to investigating a decline in TB cases.

Additional Information

CDC. Decrease in reported tuberculosis cases --- United States, 2009: MMWR March 19; 2010 / 59(10):289-294.

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5910a2.htm?s_cid=mm5910a2_e

Exercise 4.1: Finding Unreported TB Cases

4.1	State A documented an unexpected and substantial decline in reported TB cases. The declines in reported TB case counts (-10.6%) and incidence rates (-11.4%) were the greatest single-year declines since reporting began in 1953.
	What are 4 possible reasons for the decline in the TB cases?
	What are 2 specific things you would do to investigate each of the four possible reasons?
	Write your answers below:

	Reason 1.
	
	    Specific things to investigate
	    A.
	
	    B.

	Reason 2.
	
	    Specific things to investigate
	    A.
	
	    B.

	Reason 3.
	
	    Specific things to investigate
	    A.
	
	    B.

	Reason 4.
	
	    Specific things to investigate
	    A.
	
	    B.

Case Detection Tools

This section includes case detection tools for QA for TB surveillance data (Table 4.5). Examples of the tools are located in Chapter 10: Toolkit for Quality Assurance. To view or download the tools, please visit:
http://www.cdc.gov/tb/programs/rvct/default.htm.

Table 4.5
Case Detection Tools

Tool #	Tool Name	Description and How to Use	Format	Source Contact
Case Detection–1	**TB PAM Flow Chart**	A flow chart to help search for patient records. It was created initially to emphasize the importance of always searching for a patient record within the TB Program Area Module (PAM) so that duplicate patient records are not created. This chart also outlines the process for creating "Provider Verified" cases, and also addresses approval and rejection of notification.	Word 1 page Legal size	Tennessee TB Elimination Program
Case Detection–2	**TB Case Notification Process**	A flow chart that shows the case notification process. Tennessee has a tiered process for TB case notification. The chart identifies each person's role (with a particular TB PAM access right) in the notification process, and what happens when a notification is rejected or approved. Within Tennessee, only TB Program Managers (nurses within the TB Program) create a notification, and it must be approved by the TB Program Central Office Epidemiologist before it is sent to CDC for case counting.	Word 1 page	Tennessee TB Elimination Program

Tool #	Tool Name	Description and How to Use	Format	Source Contact
Case Detection–3	**TB Suspects Weekly Report**	This report is generated weekly for all suspects reported in TB PAM, through Friday of the previous week. In Tennessee, suspects should be classified as a case or not a case within 56 days from the date of report. When the Date of Report is entered, a built-in feature calculates 56 days from that date. All suspects that are past due for classifying (over 56 days) require a follow-up from one of the Central Office Nurse Consultants.	Excel 1 page 11x17	Tennessee TB Elimination Program
Case Detection–4	**TB Case Verification and Treatment Status**	A table that indicates case verification and treatment status. This spreadsheet is used to monitor treatment progress with the goal of completing treatment within 12 months. There are built-in calculations for 3, 6, 9 and 12 months from treatment start that are populated when the Date Therapy Started is entered. Case Verification is included to help identify anticipated treatment length.	Excel 1 page Legal size	Tennessee TB Elimination Program
Case Detection–5	**Decline in Reported Tuberculosis Cases Survey**	Sample survey to investigate decline in reported TB cases.	Word 1 page	CDC/DTBE
Case Detection–6	**Investigation Process for Underreporting of TB for QA for TB Surveillance Data**	Table that provides a process for investigating underreporting of TB data.	Word 2 pages	CDC/DTBE
Case Detection–7	**Counted Tuberculosis Case Verification Report**	Form that provides counted TB case verification.	Word 1 page	Texas Department of State Health Services Epidemiology & Surveillance Branch

Tool #	Tool Name	Description and How to Use	Format	Source Contact
Case Detection– 8a	**TB Case Closeout Letter**	Sample letter to accompany TB Case Close List (Tool 8b) and TB Case Closeout Form (Tool 8c).	Word 2 pages	California Tuberculosis Control Branch, California Department of Public Health
Case Detection– 8b	**TB Case Close List**	List by jurisdiction indicating TB case closeout status.	Excel 1 page	California Tuberculosis Control Branch, California Department of Public Health
Case Detection– 8c	**TB Case Closeout Form**	Form for confirmation and signature on closeout of TB cases.	Word 1 page	California Tuberculosis Control Branch, California Department of Public Health