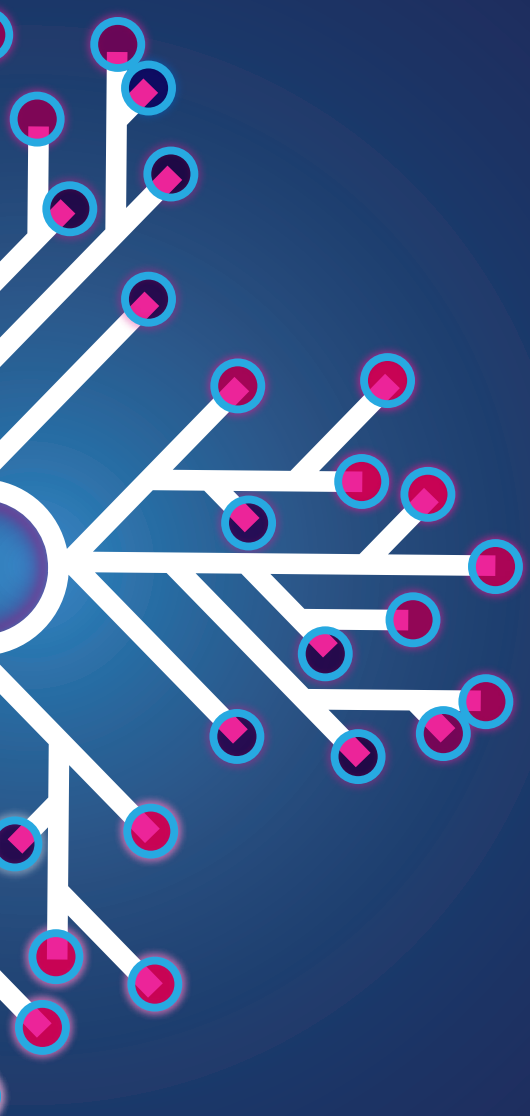
Consolidated guidance on tuberculosis data generation and use
Module 1

Tuberculosis surveillance

Web Annex A

Commonly observed problems and associated solutions



World Health Organization

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Contents

Chapter 1
Introduction

In 2012, WHO published the 1st edition of a checklist of standards and benchmarks for TB surveillance. This checklist was developed to assist countries assess the extent to which their national surveillance system met the quality standards required for the reporting of TB cases and deaths directly to national notification and vital registration systems for the purposes of the measurement of TB incidence and mortality, respectively.[1] The checklist includes ten standards that assess the overall quality and coverage of national notification and vital registration (VR) data, and three supplementary standards for key subpopulations (i.e. people with drug-resistant TB disease, people coinfected with TB and HIV, children less than 15 years with TB disease).

In 2013, national TB epidemiological reviews with standardized terms of reference (developed by WHO and partners) were initiated to systematically support the development of national strategic plans for TB, as well as the concept notes required for applications to the Global Fund. The terms of reference included assessments of national TB surveillance systems using the WHO checklist. The primary purpose of the reviews is to facilitate a detailed analysis of the availability and quality of surveillance, survey, programmatic and other relevant TB data in a standardized format, which is then used to develop a surveillance and M&E investment framework to address gaps that have been identified. The reviews are also intended to be used to build evidence-based consensus between the NTP and its stakeholders with regard to recommendations to address identified gaps, and to help build analytical capacity at national and subnational levels.

Between 2013 and April 2020, 81 countries had carried out a national epidemiological review which included an assessment of the performance of TB surveillance in accordance with WHO's terms of reference and using the 2012 checklist. During the time period, 41 countries conducted repeat assessments of the performance of their TB surveillance systems; in these countries, this allowed an evaluation of progress in improving TB surveillance to be made. Findings and recommendations from these assessments were synthesized and presented by WHO.[2]

In the 81 countries where assessments were carried out, the top six high-level recommendations to address the most commonly observed problems were:

1. Transition to (or strengthen) case-based digital surveillance (75 countries).
2. Improve health system capacity to diagnose TB (55 countries).
3. Develop or review standard operating protocols (SOPs) and/or tools for data quality and validity (54 countries).
4. Improve the availability and quality of TB mortality data (41 countries).
5. Measure the level of underreporting of diagnosed TB cases using an inventory study (36 countries).
6. Strengthen routine supervision for data quality checks, including through data validation workshops (36 countries).

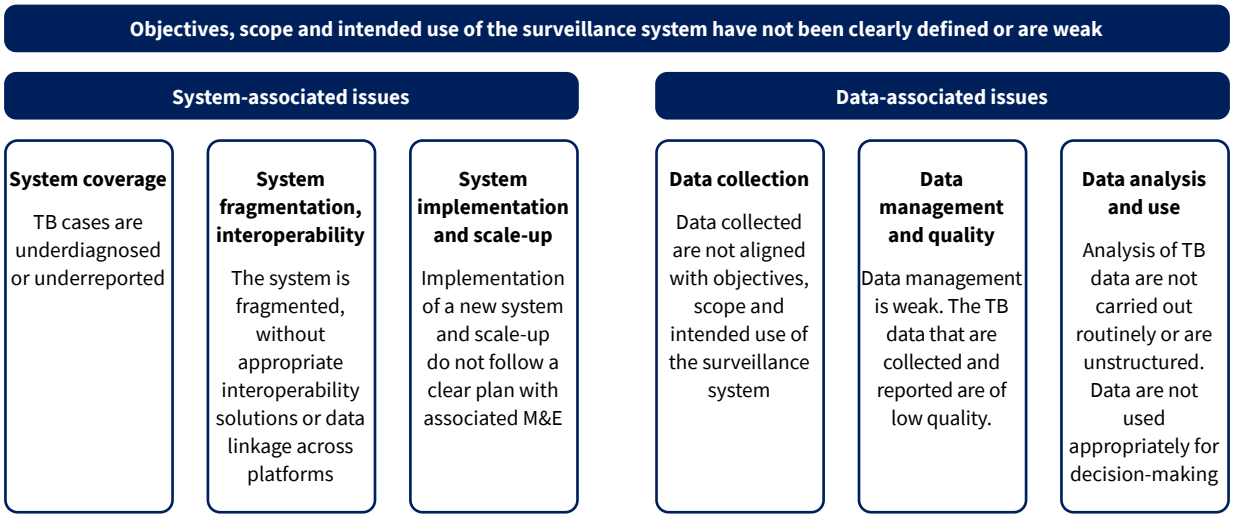
This annex focuses on the problems that have been commonly observed during these assessments. For convenience, these can be broadly grouped as either "system-associated" or "data-associated" (Fig. WA.1.1). "System-associated" are problems related to the surveillance system itself, particularly inefficiencies due to fragmentation and gaps in system coverage whereas "data-associated" are problems that affect data collection, data quality, analysis and use.

In the subsections that follow, we discuss each of these related sets of problem categories in turn, in each case describing the potential consequences and offering possible solutions. The suggested solutions are in line with the top six high-level recommendations. It should also be noted that the proposed solutions are intended to complement those identified by countries as a result of performing an epidemiological review and not replace them. Countries are still encouraged to carry out TB epidemiological reviews regularly, assess the performance of their surveillance systems, identify the fundamental reasons as to why problems are observed in their settings and address them accordingly.

[1] Standards and benchmarks for tuberculosis surveillance and vital registration systems: checklist and user guide. Geneva: World Health Organization; 2014 (https://apps.who.int/iris/handle/10665/112673).

[2] EndTB webinar on strengthening TB surveillance [video]. Geneva: World Health Organization; 2021 (https://www.youtube.com/watch?v=iS_gDobHK-w).

Fig. WA.1.1 Overview of commonly observed data- and system-associated problems of TB surveillance



Chapter 2
Commonly observed problems and proposed solutions

2.1 Objectives, scope and intended use of the surveillance system

Common problems

- The objectives of the surveillance system have not been clearly defined.
- The intended use and scope of the surveillance system have not been clearly defined.

Potential consequences

Without clearly defined objectives, intended use and scope of the surveillance system, its design, and roll out become unstructured, leading to inefficiencies. This could have a negative impact on the system coverage, for example due to underreporting of TB cases from atypical health providers not part of the usual NTP network.

Furthermore, if a considered approach is not taken to explicitly define the objectives of the surveillance system, then this can lead to misalignment between the implicit assumptions of the intended and the actual use of the data generated by the system. This often occurs for example when a system that is designed for surveillance is used for patient management or programmatic administration, with the result that data collected by the system are not fully fit-for-purpose for either function.

Proposed solutions (see Chapter 2)

- The objectives of the surveillance system should be defined through a structured process, ideally involving a working group convened for this purpose and comprising representatives of the M&E team and other relevant stakeholders, such as the Health Management Information System (HMIS) team. Once defined these objectives can serve as the basis for periodic evaluation of the surveillance system to ensure that it is meeting its targets. Objectives should not be viewed as fixed but subject to periodic review and adjusted if necessary.
- Objectives of the surveillance system should be specific and address all key components of surveillance activity including geographical coverage, data recording, reporting and analysis, dissemination, and use for programmatic action.
- While some objectives may be common to all systems, such as ensuring all TB cases are diagnosed, recorded and reported, others may be setting specific. For example, countries with low incidence of TB may need to frame their objectives in terms of identifying infrequent outbreaks; this might not be appropriate for a surveillance system in high-incidence settings where TB is endemic.
- Once the objectives have been finalized and agreed, they can serve as a framework to define the intended use and scope of the system used (be it paper-based or digital) to ensure that it meets the objectives by collecting the correct data, with the intended frequency and intended coverage.
- The objectives, intended use and scope of the surveillance system and platform should be documented and included in national strategy and policy documents, such as M&E plans, digital health information strategies and plans, and the surveillance component of the National Strategic Plan (NSP).

2.2 System-associated

2.2.1 Underdiagnosis and underreporting of TB cases

Common problems

- Limited access to care and weak capacity for TB diagnosis.
- Health service providers outside the network of NTPs are excluded from reporting data on people with TB into the national surveillance system.
- People with drug-resistant TB disease are not included in the national totals of notified cases.
- People diagnosed with TB disease are only recorded in the paper register or captured in the digital system when they start TB treatment at health facility.
- Underuse of data from other systems that capture TB data, such as surveillance programmes for other disease (e.g. HIV, notifiable diseases), health insurance schemes and civil registration and vital statistics (CRVS) systems.

Potential consequences

Epidemiological reviews have shown that access to appropriate TB diagnostics and care remains limited in many settings. While achieving Universal Health Coverage (UHC) is key to finding the missing people with TB, without a strong TB laboratory network which brings TB diagnostics, including drug susceptibility testing, closer to the patient, TB cases will continue to be underdiagnosed or will encounter delays in treatment initiation. Epidemiological reviews have also shown that TB programmes do not always include drug-resistant TB cases in national total notifications. This happens more frequently in countries which rely on two separate surveillance systems for drug-resistant TB and drug susceptible-TB (also see Section 2.2.2).

In some countries, sectors not affiliated with the NTP, including but not limited to, the military, correctional facilities and the private sector, are diagnosing and treating people with TB but remain outside the surveillance system. These cases are not routinely notified to the NTP, leading to significant underreporting in the national notification system. Evidence from epidemiological reviews has revealed that in many countries where this is an issue, omission of cases from the private sector represents the greatest source of underreporting.

Underreporting of cases can also arise in the public sector. This can occur when individuals diagnosed with TB are only recorded in the system if and when they start treatment. This means that individuals diagnosed with TB who do not start treatment or who have died before the start of treatment are not counted in the tally of notified cases, leading to underreporting of these individuals.

Failure to capture TB cases from other data sources, such as TB screening conducted as part of other disease programmes (e.g. HIV/AIDS), health insurance coverage schemes and CRVS (cause of death), through either routine record linkage exercises or direct linkage will also result in underreporting and an underestimation of the true burden of TB.

Proposed solutions (see Chapter 4 and Chapter 6)

- An inventory study (or similar nationally representative study) should be carried out to measure the magnitude of underreporting and to estimate underdiagnosis of TB cases. Such an exercise will help identify the largest contributors to underdiagnosis and underreporting, and help design appropriate interventions to address these gaps.
- Addressing issues of access to care and achieving UHC is a complex task that requires high-level multisectoral commitment and engagement which goes beyond the scope of TB programmes. Having a master health facility list, which include those who are currently providing TB diagnostic or treatment services, would be a useful way of identifying and mapping health facilities in a country and would contribute to delivery of UHC. To improve access to TB services specifically, such a list would provide a mechanism for identifying additional facilities that are not currently providing TB services which could be designated as a TB service facility in order to address identified gaps in access to TB facilities and to meet the needs of underserved population subgroups. This would require wider engagement within the ministry of health, which can be leveraged from the epidemiological review visits if needed.
- Addressing issues in access to TB diagnostics would typically require engagement with the national reference laboratory. Conducting a similar mapping exercise as that described above, covering the entire laboratory network, would be useful for identifying gaps in access to TB diagnostics in terms of geographical region and underserved population subgroups. However, filling identified gaps in WHO-recommended rapid diagnostic testing services would require a more detailed assessment of the infrastructure and careful longer-term planning and budgeting. In the meantime, some countries have achieved notable successes using sputum transport mechanisms. Use of the DHIS2 TB laboratory module can help to improve TB lab data and sharing of data with the referring health facility (such as confirmation of specimen reception and real-time transmission of lab results).
- All confirmed TB cases, regardless of drug-resistance status, should be reported in the national TB notifications. If this has not been done to date, then consider reviewing the data retrospectively to ensure that all TB cases are included. These notification data should also be updated in the WHO country data collection system.
- Engaging with non-NTP service providers, such as the private sector, is needed in order to ensure that TB cases diagnosed in the non-NTP sector are reported to the NTP and included in national notifications. Solutions to this issue will vary by country and are largely governed by the size of the non-NTP sector. Guidance on Public-Private Mix TB activities is available.[1] Countries have taken different approaches to collecting data from private health facilities. If private service provides are not able to enter TB case registration data directly in the NTP notification system, a mobile application is frequently used by

[1] Public–private mix for TB prevention and care: a roadmap. Geneva: World Health Organization; 2018 (https://iris.who.int/handle/10665/333885).

NTP staff during visits to collaborative private health facilities to periodically collect data retrospectively. Another approach sometimes taken by countries is to have NTP staff sit at a private health facility and collect data from TB cases seen at the facility in real-time.

- Several steps can be taken to ensure that all TB cases, even those who have not started treatment (primary lost to follow up) and those who died before starting treatment, are recorded in the health facility register and notified. Where necessary, paper-based registers should be redesigned and used in a way to include all TB cases, regardless of treatment initiation. In the absence of a direct linkage between the TB case register and the TB lab register (i.e. using a unique ID), periodic linkage exercises can be undertaken to retrospectively identify cases captured in the lab register who have not initiated treatment, but who have not been captured in the health facility TB case register. Digital platforms should be used similarly. Interoperability of the health facility with the lab information system (or DHIS2 TB laboratory module) would facilitate the reporting of TB cases at the time of diagnosis rather than treatment initiation.
- TB data collected from other systems, such as health insurance claims data and CRVS systems, could be used routinely to assess gaps in underreporting in the primary TB surveillance systems. If systems are not linked, then this would require manual record linkage of the data to identify cases captured in other systems that were not recorded in the national TB surveillance system. These cases should then be included in routine reporting to reduce the gaps in underreporting. A unique ID would facilitate this process.

2.2.2 Fragmentation of the surveillance system

Common problem

- Use of multiple digital systems, such as separate systems for people with DR-TB and those with DS-TB, or parallel use of digital aggregate and case-based systems.

Potential consequences

Capturing people with DR-TB and people with DS-TB in separate systems is a common cause of core surveillance system fragmentation, which leads to data management issues, such as double counting of cases if they are found in both systems. This can occur when a DS-TB patient is subsequently found to have MDR-TB and is not de-notified in the DS-TB system.

Proposed solutions (see Chapter 6)

- Develop a unified digital environment for TB surveillance all along the pathway of prevention and care.
- In countries with fragmented systems – one for MDR-TB and one for DS-TB – assess the utility of the systems and consider merging them. If merging the systems is not feasible, then consider the interoperability of the two digital systems, with a mechanism to ensure that cases are not being double counted.

2.2.3 Implementation of and transition to case-based digital systems

Common problems

- Lack of a clear implementation and roll-out plan, including systematic M&E of scale-up.
- Parallel use of paper-based and digital systems for reporting, including capturing TB data on paper registers prior to bulk entering onto digital system.

Potential consequences

The implementation and scale up of any new system is invariably challenging but those challenges will be multiplied in absence of a clear action plan. The lack of an implementation plan has been shown to lengthen the time needed to achieve a successful roll out and uptake of the new system. Experience has also shown that plans that do not have a M&E framework limits the ability of programme managers to track the progress of the implementation plan against milestones and identify and address any barriers as they arise.

While a TB programme transitions from one system to another, it is not uncommon for both the old and new reporting systems to be used in parallel, at least for a time. This is particularly common when countries transition from a paper-based system to a case-based digital system. Most countries who have successfully made this transition nevertheless still record TB data on paper tools before entering these data onto the digital system, at times in batches as infrequently as quarterly. If not handled properly, this can lead to a duplication of effort at the health facility and is inefficient use of staff time. Furthermore, this can delay case notification and the full potential of using a case-based, digital system for real-time surveillance is lost.

Proposed solutions (see Chapter 6)

- Strengthen political buy-in by having a clear digital health information strategic plan that highlights the need for patient-centred data. A multisectoral approach by engaging all relevant ministerial departments, governmental agencies, non-governmental organizations and other relevant stakeholders should be taken.

- Develop a clear implementation plan to support piloting and an eventual staged roll-out.
- Develop a plan for monitoring and evaluating the implementation process, including a mechanism to identify barriers and how to address these to ensure a successful scale-up.
- The transition towards a new system should be gradual; however, the implementation plan should provide guidance on how to phase out the old system, for example, by setting national and/or subnational level criteria using data quality and coverage indicators for the new system, to avoid parallel use for extended periods.
- When transitioning from a paper-based to a case-based, digital system, build trust with the end-users through education on the benefits and reliability of the digital data system, with evidence to show that data do not get lost.

2.2.4 System interoperability and data linkages

Common problems

- Lack of interoperability between systems developed to support M&E of community-based activities, household contact investigation systems, or other mobile systems and the primary surveillance system.
- Lack of interoperability between the TB lab network system and the primary national surveillance system.
- Lack of interoperability or data linkage between the central Health Management Information System (HMIS) or other horizontal disease surveillance systems, and the primary national surveillance system, leading to potential issues of inconsistency in reported data.

Potential consequences

The need for additional tools and software applications to fill gaps in data collection and routine TB surveillance is clear. However, without careful consideration of the interoperability of potential solutions, there is a risk of creating an even more fragmented system, thereby adding to complexities of data management and analysis. For case-based systems, a lack of interoperability across tools leads to difficulties in linking data elements to the correct patient (or index case), particularly in the absence of a unique patient identifier.

The absence of interoperability between the routine surveillance system and lab information system has multiple consequences. Traditionally, lab results need to be manually reported to the referring clinician, either by sending the results on paper or through other informal mechanisms such as by email or SMS/WhatsApp. Sending results on paper can take time, ultimately delaying treatment initiation, whereas sharing these data through email or SMS/WhatsApp poses some confidentiality issues.

The following is an example finding from an epidemiological review carried out in a country that relies on manual transmission of lab results through a courier service. In September, during a visit to the National Reference Laboratory, a count of all undelivered laboratory results in the preceding seven month period (January to July) was made. During this period, 115 microscopy results were not delivered, of which 37 (24%) were AFB positive. Similarly, 135 culture results were not delivered, of which 17 (13%) were culture positive and 5 (29%) of the culture positive results were resistant to all four first-line drugs. This meant that these individuals were potentially not receiving the care they needed and were contributing to the transmission of TB. From a surveillance perspective, this example highlights gaps in surveillance that contributes to underreporting of TB cases, ultimately affecting estimates of burden in the country.

Central HMIS takes a horizontal approach to data collection across many disease programme areas, focusing on a reduced set of core variables. For example, TB variables in HMIS might include total case notifications, drug susceptibility testing and treatment success. It has been observed through epidemiological reviews that the HMIS is rarely linked with the TB surveillance system, thus requiring additional reporting of TB data from the health facility. This is inefficient use of staff time at the health facility and is prone to error. Data validation checks between HMIS and the TB surveillance system are rarely carried out, potentially leading to inconsistencies in the data across both systems.

Proposed solutions (see Chapter 6)

- If necessary, undertake a mapping exercise of existing tools that are being used in the country for TB surveillance purposes. Different solutions will be needed depending on the tools being used. If the tools are from different developers, this would require contacting the developers to collaborate on an interoperability solution; for example, a solution which allow test results from a lab system to be pushed directly into the core TB surveillance system. Interoperability solutions should be considered when planning for the implementation of additional data collection systems and included in the country's digital health information strategic plan.
- As discussed above, lack of interoperability can contribute to the underreporting of TB cases in a fragmented surveillance system. Therefore, consider

carrying out an inventory or similar nationally representative study to measure the magnitude of underreporting (and underdiagnosis) of TB cases.

- Interoperability between DHIS2 packages is usually more straightforward and easier to achieve. WHO/GTB has been collaborating with University of Oslo on the development of DHIS2 packages for TB. Two packages are currently available for implementation at the health facility: aggregate and case-based systems. These two packages cover aspects of TB surveillance related to case notification, household contact tracing as well as bacteriological testing and linkage of test results.

As indicated above, achieving interoperability between HMIS and TB programmes will depend on which systems are in use for these functions. If DHIS2 is being used by both, then interoperability of systems and transmission of the data from the TB programme to HMIS is straightforward, provided that the definitions of data elements and indicators are consistent. Again, discordant systems would require involvement of the developers to collaborate on identifying an interoperability solution between the systems. In either case, cooperation between HMIS and the TB programme will be needed, which can be leveraged from the epidemiological review process.

2.3 Data-associated

2.3.1 Alignment of system objectives with actual data collected

Common problems

- The design and objectives of the surveillance system are misaligned with how the data the system produces are used.
- Paper reporting forms or digital aggregate systems capture excessive disaggregation of data.
- Excessive variables are collected but are not used for analyses or decision-making.

Potential consequences

Without clear linkages between system objectives, data collection and data use, the surveillance system risks being inefficient, either because the data that are collected are not used or because not enough data are collected to meet surveillance system objectives.

Additionally, in the absence of well-defined surveillance system objectives and a well-structured analytical plan, it can be difficult to define what level of data disaggregation is appropriate. It has been observed that some TB programmes collect data with unnecessary disaggregation as a precaution, but without a clear plan for analysis and use. While disaggregation of data is a key to identifying the demographic characteristics of TB cases (age, sex, geographical location), it can quickly become overly complex and unmanageable. The table below shows how disaggregation can quickly increase the volume of data (data elements) that needs to be collected (Table WA.2.1). For the four variables listed, disaggregated data collection means that a total of 240 individual data elements would need to be collected and recorded.

Problems associated with unnecessary or excessive disaggregation are more acute in the case of paper-based or digitally aggregated surveillance systems. Paper data entry forms which contain multiple levels of disaggregation can be especially difficult to manage. Completion requires manual aggregation of line lists from paper registers; this process is not only error-prone but also time-consuming and can lead to inefficient use of staff time and the reporting of low-quality data. Digital aggregate systems can also be difficult to maintain and can become slow if many health facilities are entering a large number of data elements at the same time.

Some of the problems around the collection of disaggregated data can be resolved by moving to a case-based digital system, since the level of disaggregation can be decided when generating reports or at the analytical stage. However, the volume of data - in terms of the number of data elements - that needs to be collected remains a consideration, as the data entry process can quickly become burdensome. Furthermore, the system can become difficult to maintain and slow down if the underlying data framework becomes overly complex.

Finally, analyzing so many variables becomes complicated and would usually involve re-aggregating some of the variables; therefore, making sense of the data requires undoing the excessive disaggregation on the form.

Proposed solutions (see Chapter 2, Chapter 4 and Chapter 5)

- The data that are being collected should be aligned with the objectives of the surveillance system and all variables should serve a purpose by being included in planned analyses and used to inform programme planning and decision-making.
- Disaggregation of the data should be kept to a minimum, especially with aggregate systems that require aggregating the data manually from paper registers. If data are being re-aggregated at the analysis stage, then consider reviewing the data entry forms to simplify the disaggregation at the data collection stage.
- If complicated disaggregation is needed, then consider moving to case-based surveillance which allows for more flexibility in aggregation at the analysis stage.

Table WA.2.1 Number of data elements to be collected based on dimensions of disaggregation

Variable	Categories (level of disaggregation)	Number of data elements	Cumulative total
TB case diagnosis	1. Pulmonary bacteriologically confirmed 2. Pulmonary clinically diagnosed 3. Extrapulmonary bacteriologically confirmed or clinically diagnosed	3	3
Case history	1. New 2. Recurrent 3. Re-registered 4. Treatment history unknown	4	3 x 4 = 12
Gender	1. Male 2. Female	2	3 x 4 x 2 = 24
Age group (years)	1. 0–4 2. 5–9 3. 10–14 4. 15–19 … 9. 55–64 10. ≥65	10	3 x 4 x 2 x 10 = 240

- An alternative approach would be to restrict surveillance system data capture to that needed for routine analyses but complement this by data collected by research programmes. Periodic research studies can be used to collect data from a representative sample of health facilities, with a greater degree of disaggregation and granularity than that provided by routine surveillance to answer specific research questions.

2.3.2 Data management and data quality

Common problems

- Data quality checks and supervisory visits to health facilities are either not taking place or are not taking place systematically.
- Appropriate automated validation checks not implemented (case-based and aggregated digital systems).
- Use of Excel for data storage and reporting of aggregate data without sufficient data validation rules, version control and safeguarding of captured data (aggregated paper systems).
- Absence of unique ID numbers to identify cases and inadequate deduplication (case-based digital systems).

Potential consequences

The potential for introducing error occurs at all points in the flow of data through the surveillance system. The sequence usually starts at the health facility and with paper-based systems this may involve the use of multiple data collection tools – case registers, treatment cards and aggregate reporting forms. In settings where data are manually transcribed from one tool to another, the risk of introducing error is especially high. If the data captured at source contain errors, this can lead to low-quality data being recorded and reported to higher levels, inaccurate analysis and ultimately poor programmatic decision-making.

Even if TB case data are captured accurately on paper records and forms, in a digital aggregated system the risk of transcription error still exists at the next stage of the data flow, at the point of data entry. These errors, if not identified through the implementation of either a manual or automated data validation process, will then be reported to higher administrative levels, leading to inaccurate, implausible or missing values for mandatory variables.

Countries that use a paper-based system for recording and reporting TB data often rely on Excel for transmitting and aggregating data from health facilities up to the national level. However, implementing automated data validation checks in Excel is difficult. Furthermore, many TB programmes rely on Excel arithmetic functions and equations to aggregate case data across multiple tables, tabs and excel sheets. Real-world evidence suggests that errors in equations are extremely common, especially errors involving incorrect cell specification for aggregation, leading to the incorrect total numbers being reported.

Countries using a case-based digital systems are not immune to problems related to data quality. An absence of unique patient identifiers (ID numbers) can lead to double counting of cases, and in turn an inaccurate picture of incidence in the country if the problem is severe. Double counting of cases is most likely to occur when cases are re-registered in a different health facility.

Proposed solutions (see Chapter 6 and Chapter 7)

- Implementing a system of supervisory visits, as well as data quality checks, is crucial in improving data quality at the source of data collection. This process can be supported by strong SOPs and use of a data quality instrument to assess the completeness and consistency of data across multiple sources – the TB case register, patient treatment cards, quarterly reporting forms and the laboratory register. Ideally, corrections should be made before data are entered into a digital system or are reported. However, corrections can also be made retrospectively.
- Data validation checks made during supervisory visits may only provide a snapshot of the situation in a given health facility; however, they may signal the need for a larger data quality audit using a nationwide sample of health facilities which collect and manage TB data.
- Automated data validation checks should be included in digital systems to minimize data entry errors and to improve completeness of mandatory variables.
- Use of a high-quality unique patient identifier or ID, such as national identification number, vastly improves the ability of case-based digital systems to identify and link patient records and avoid double counting of cases.
- Data quality procedures and processes should be clearly described in a detailed data management plan. In the case of digital systems this should include a list of automated data validation rules, as well as additional manual checks and deduplication procedures that need to be performed systematically before the data are considered suitable for analysis.
- Human resource capacity for data management should be increased to support the processes of ensuring high quality TB data.
- Instead of relying on Excel, which is not recommended for data storage and reporting, TB surveillance system managers should consider transitioning to a digital aggregate platform. WHO offers a DHIS2 platform (tbhistoric.org) for safeguarding TB data in the absence of a locally implemented digital system.

2.3.3 Routine data analysis and use

Common problems

- Analyses are not carried out or not carried out routinely.
- Analyses are often unstructured and do not follow a clear analysis plan or are not linked with system objectives.
- Analyses are limited to the national level.
- Data use for decision-making and programme planning is suboptimal.

Potential consequences

Countries which do not perform routine analyses of available surveillance data, at both national and subnational levels, will find it difficult to fully understand the epidemiology and burden of TB, and how it may have changed over time. Furthermore, without accurate data to inform the decision-making process, programme planning will become unstructured, relying instead on expert opinion or continuing with the status quo with minimal change. This presents missed opportunities for developing effective, evidence-based programme interventions that are aimed at those populations and regions of the country that need the most attention, which may in turn lead to inequitable or inefficient distribution of limited resources. Furthermore, lack of structured analysis of TB data at the national and subnational levels limits the ability of countries to measure their progress against targets and important achievements may go undocumented.

When data are being analyzed for programme planning, the approach is often unstructured, with excessive disaggregation of the results and complicated representation of the findings. Often Excel is used for the analysis, which is prone to errors and can be difficult to manage, particularly in countries with high numbers of cases. This unstructured approach to data analysis limits the utility of the results to inform programme planning and important findings may be missed or lead to inaccurate interpretations and either underuse or misuse of TB data for decision-making.

Proposed solutions (see Chapter 4 and Chapter 6)

- Ensure that the analysis, dissemination and use of data for programme planning is reflected in the objectives of the surveillance system.
- National and subnational analyses should be described in a well-structured analytical plan. Several WHO resources are available to assist programme managers develop a data analysis plan, including the handbook on *Understanding and using TB data* and the analytical dashboards of the WHO digital platform for historic TB data.[1,2]
- Develop SOPs for the dissemination of analytical findings. These should aim to provide a timeline of each step of the process and describe how tasks are distributed among different teams and stakeholders. The SOPs could also include a national/subnational report outline to facilitate the documentation and

[1] Understanding and using tuberculosis data. Geneva: World Health Organization, 2014 (https://apps.who.int/iris/handle/10665/129942).
[2] https://tbhistoric.org/

dissemination of findings and reporting of progress against targets. TB programmes are encouraged to make these regular reports available for download from the ministry of health web site for dissemination and accountability purposes.

- Consider organizing regular national TB surveillance workshops (e.g. annually) to serve as a forum for sharing results of the routine surveillance analysis, discussing progress and informing the planning process for the provision of TB services.
- Avoid using Excel for routine analyses and ensure that adequate capacity for conducting data analyses using more appropriate statistical software package or platform is available.
- Digital platforms provide the opportunity to include dashboards to facilitate data visualization of key surveillance indicators. This eliminates most of the routine analytical work as the dashboards are populated automatically as the data are entered and validated; however, this does not preclude the option of performing additional analyses on the stored dataset using an external software. These dashboards can be set up so that each subnational unit has access to the data from their (and, if appropriate, surrounding) units, whereas the national level can have access to visualize data from all subnational units as well as the national level. Transitioning to a digital platform with appropriate automated data visualization capabilities is thus highly recommended.
- Training on the analysis and use of TB data for programmatic action should occur at the national and subnational levels. This will equip the team with the necessary skills and knowledge for accurately interpreting TB data and subsequently using these findings for planning purposes.

Chapter 3
Summary

This annex draws on country experiences of running TB surveillance programmes as reported in WHO's epidemiological reviews. Solutions are proposed for common problems; these solutions are broadly aligned with the high-level recommendations that emerged from a global synthesis of information from 81 countries and published in epidemiological reviews between 2013 and April 2020.

In terms of lessons learned from nearly a decade of evaluating TB surveillance programmes, the importance of planning cannot be underestimated. Proper planning is central to achieving a high-quality TB surveillance system. Clearly defining the objectives, scope and intended use of the surveillance system, as well as having a detailed digital health strategic plan – which incorporates the need for human and financial resources – will help structure the overall system and help avoid some of the problems described in this Annex.

It is recognized that some proposed solutions are more challenging to implement than others, particularly those that are not under the direct control of the NTP and require multisectoral consultation and commitment. The WHO Multi-sectoral Accountability Framework (MAF) for TB,[1] provides guidance on this topic. Other solutions may require technical expertise that is not available at the NTP, in which case technical assistance from national and international stakeholders can be provided.

[1] Multisectoral accountability framework to accelerate progress to end tuberculosis by 2030. Geneva: World Health Organization; 2019 (https://www.who.int/tb/WHO_Multisectoral_Framework_web.pdf).

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