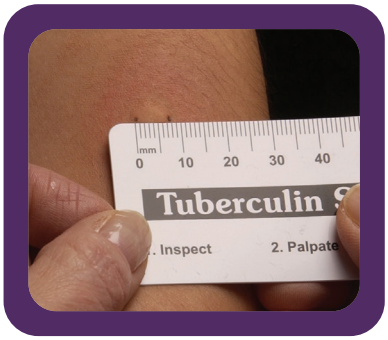
Self-Study Modules on Tuberculosis Slide Sets



Modules 1–5

Facilitator Guide

National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention
Division of Tuberculosis Elimination

Table of Contents

Self-Study Modules on Tuberculosis, 1-5 Slide Sets Facilitator Guide

Introduction

Purpose
The purpose of this guide is to provide facilitators guidance and tips for leading a training using the *Self-Study Modules on Tuberculosis, 1-5 Slide Sets.*

Slide Set Training Package
The *Self-Study Modules on Tuberculosis, 1-5 Slide Sets* training package consists of:

- Facilitator guide
- Presentation slides for each module
- Participant slide handouts for each module

Facilitator Guide
The facilitator guide is divided into sections that contain

- An overview of the *Self-Study Modules on Tuberculosis, 1-5 Slide Sets*
- Preparation information for conducting a training
- Training basics
- Sample agenda
- Additional information
- Facilitation tips for each of the five module presentations
- Sample course evaluation

Overview

Target Audiences

The target audiences for trainings using the modules slide set are outreach workers, nurses, physicians, administrators, health educators, and students from a variety of settings, including

- Tuberculosis (TB) programs
- Managed care organizations
- Correctional facilities
- Community-based organizations
- Homeless shelters
- Migrant clinics
- Substance abuse facilities
- Nursing and medical schools
- Community health centers
- Other facilities and programs serving persons with or at risk for TB

About the Slide Sets

The *Self-Study Modules on Tuberculosis, 1-5* are a series of modules designed to provide education on TB in a self-study format. The *Self-Study Modules on Tuberculosis, 1-5 Slide Sets* were developed as an accompaniment to the print-based modules to aid in the presentation of module content in a facilitator-led training.

The *Self-Study Modules on Tuberculosis Slide Sets* consist of five presentations:

- *Module 1: Transmission and Pathogenesis of Tuberculosis*
- *Module 2: Epidemiology of Tuberculosis*
- *Module 3: Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease*
- *Module 4: Treatment of Latent Tuberculosis Infection and Tuberculosis Disease*
- *Module 5: Infectiousness and Infection Control*

The content and organizational flow of the slide sets matches that of the print-based modules. Each module presentation contains the following sections:

- **Overview and Objectives**: A guide to the information participants should learn from the module.
- **Learning Material**: The material for the module, including bullet points, diagrams, charts, illustrations, and photographs.
- **Study Questions:** Sets of questions, spread throughout the presentations, designed to help participants assess how well they have learned the content of the module.
- **Case Studies:** Case studies designed to help participants apply the concepts they have learned in the module.

*Note: The study questions and case studies in the slide sets are the same as those in the print-based modules (e.g., study question 1.1 is the same in both the print-based module and the slide set presentation). Answers to the study questions and case studies are animated and appear on-click throughout the presentations. Answers are also provided in the facilitation notes and at the end of each print-based module. Participant handouts **do not** contain answers to study questions or case studies.*

Customizing the Slide Sets

The *Self-Study Modules on Tuberculosis, 1-5 Slide Sets* are in the public domain and therefore you are free to adapt and revise these materials. For example, content and images may be removed or added based on the training needs and background of the participants. However, you must remove the Department of Health and Human Services (DHHS) and Centers for Disease Control and Prevention (CDC) names and logos if changes are made.

To View or Order Module Materials

To view or download the *Self-Study Modules on Tuberculosis, 1-5 Slide Set* materials (facilitator guide, presentation slides, and participant slide handouts) please visit www.cdc.gov/tb/publications/slidesets/selfstudymodules/default.htm.

To view or download the *Self-Study Modules on Tuberculosis, 1-5* please visit www.cdc.gov/tb/education/ssmodules/default.htm. If you would like to request a print copy of the *Self-Study Modules on Tuberculosis, 1-5* please use the CDC Division of Tuberculosis Elimination's online ordering system: wwwn.cdc.gov/pubs/CDCInfoOnDemand.aspx.

Preparation for Training

Know the Content

For a training to be successful, it is critical to know the content of what you are training about. Even a facilitator with the best of training skills cannot hide the fact that he or she does not know the content.

- Study and review the content prior to the training (not at the last minute) so you will be prepared.
    - Read the print-based *Self-Study Modules on Tuberculosis, 1-5*
    - Read the *Self-Study Modules on Tuberculosis, 1-5 Slide Sets* facilitator guide
    - Work through study questions
    - Work through case studies
    - Review *Self-Study Modules on Tuberculosis, 1-5* presentation slides
- Anticipate areas of confusion
- Be prepared to answer questions and explain concepts
- Think about topics participants may find confusing
- Plan ways to help with difficult sections and topics and how to answer any possible questions

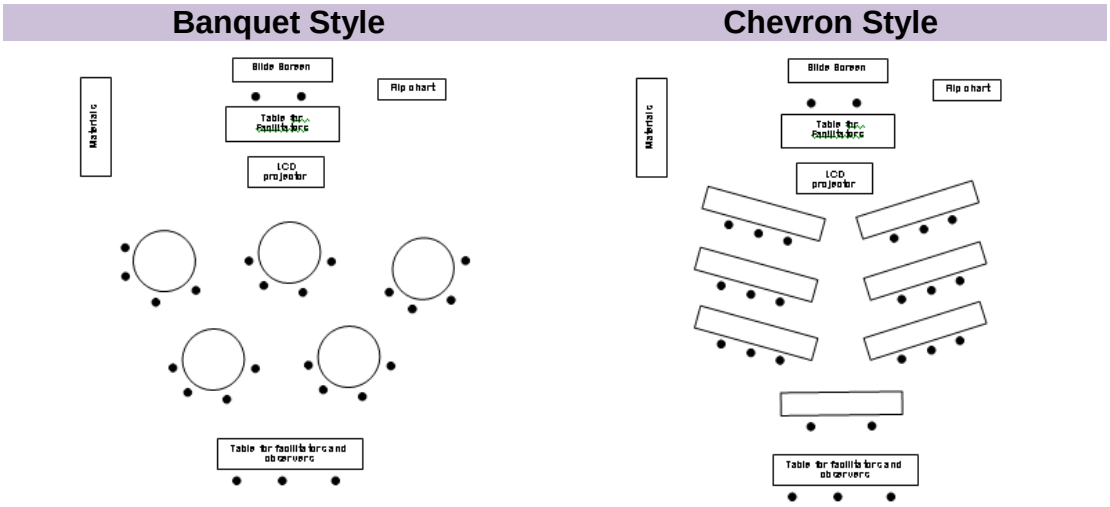
Event Set-Up

It is important to have a comfortable learning environment during the training. The room should be set up in such a way as to allow for group discussions and ensuring that each participant can easily see the presenters and the slides. Two recommended styles include the banquet or chevron style (Figure 1). Generally, the U-shape is not recommended because it can limit some participants' ability to see the slides and presenters.

Before the training, it is important to prepare the training room. This includes:

- Checking the room before the training day (if possible)
- Ensuring materials and supplies are available
- Making sure equipment works
- Arriving at least an hour early on the training day

Figure 1 Room Set-Up Styles.



Materials Checklist

You should have the following materials when you conduct a training on the *Self-Study Modules on Tuberculosis, 1-5:*

✓	Materials and Supplies
Materials and Supplies for Facilitator	
	Self-Study Modules on Tuberculosis, 1-5 Slide Set presentations (electronic and print)
	Facilitator guide for use during presentations
	Pens and/or pencils
	Print-based *Self-Study Modules on Tuberculosis, 1-5* for reference
Materials and Supplies for Participants	
	Participant handouts of *Self-Study Modules on Tuberculosis, 1-5 Slide Set* presentations
	Print-based *Self-Study Modules on Tuberculosis, 1-5* (optional)
	Course evaluations
Materials and Supplies for Training Classroom	
	Projection monitor (LCD) compatible with computer
	Computer
	Screen or wall for viewing presentations
	Extension cord
	Dry erase board, poster paper, or flip chart with markers
	Sign in sheet for participants
	Name tags/tents
	Pens and/or pencils

Training Basics

Understand Your Role as the Facilitator

The facilitator plays a unique role in facilitating the learning experience. One of the most important things a facilitator can do is to create a safe and supportive environment for participants. Participants need to feel comfortable to

- Ask any questions – even simple questions
- Share answers to the study questions and case study questions – even if the answers might be incorrect

Know Your Audience

One of the most important aspects of training is knowing your audience. Knowing your target audience will help you best design your training. Things to think about in terms of your audience include:

- Knowledge regarding topic (i.e., are participants new to the topic area or do they have pre-existing knowledge?)
- Training needs
- Skills or abilities
- Attitudes
- Experience
- Jobs/positions

There are various ways to get to know your audience. You could get to know your audience by doing a "get-to-know-you" exercise at the beginning of the training. It is also a good idea to share their expectations of the course.

Apply Adult Learning Principles

Adults learn differently from children and therefore require different training approaches. Knowing how adults learn is critical to the success of the training course. Understanding adult learning principles helps you use the right training techniques to enhance learning.

The following table provides principles of adult learning and describes some important training techniques you can use to engage the course participants.

Principles of Adult Learning

	Principle	Training Technique
1.	Adults bring a wealth of knowledge and experience which they want to share.	Encourage participants to share their knowledge and experiences. Include activities that utilize their knowledge and experience.
2.	Adults are decision-makers and self-directed learners.	Include problem-solving activities.
3.	Adults have different learning styles that must be respected.	Provide multiple ways for participants to learn the material.

4.	Adults want to participate rather than just listen to a lecture.	Create a participatory learning environment with various types of activities.
5.	Adults are motivated by information or tasks that are meaningful and applicable to their jobs.	Relate the content to problems participants encounter in their jobs.
6.	Adults prefer training that focuses on real-life problems.	Relate content to the types of problems they encounter in their jobs.
7.	Adults expect their time during training to be used carefully.	Follow a realistic time schedule.
8.	Adults feel anxious when participating in a group that makes them look uninformed, either professionally or personally.	Avoid criticism. Acknowledge all participants' contributions.
9.	Adults learn best in a positive environment where they feel respected and confident.	Create a positive environment by providing positive feedback and showing respect to all participants.
10.	Adults come from different cultures, life-styles, religious preferences, genders, and ages.	Respect all differences and encourage participants to respect each other's differences as well.

Discuss Ground Rules

At the beginning of the training, it is very helpful to discuss "Ground Rules." These are expectations of both the participants and the trainers on basic rules to follow during the training.

- Ask the participants to share their ideas for ground rules for the training
- Write suggestions on a flip chart
- Review the items on the flip chart
- Use the list below as a guide. Include any of the items below if participants do not mention them:
    - Arrive on time for the beginning of each session and after each break
    - Keep each session on time
    - Put cell phones on silent while in the training room
    - Treat each other as equals in the training room
    - Show respect to everyone regardless of age, gender, religion, or culture
    - Share experience and expertise. Many participants have previous experience and background in training.
    - All questions are good questions. Feel free to ask questions at any time.
    - Only one person should speak at a time
    - Everyone should participate and contribute. To ensure that the quieter voices are heard, do not allow 1 or 2 people to dominate the conversation.
    - No side-bar conversations. Comments should be made to the whole group.
    - Provide feedback, as long as it is constructive, not critical
    - Be flexible with differences in culture and language
    - Accept mispronunciation of names

    - Wear name tags
- Mention that ground rules are used throughout the training and new rules can be added. Facilitators and participants can refer to the ground rules during the training to remind each other about what was agreed to.

Utilize the "Parking Lot"

The "Parking Lot" is a place where topics can be "parked" for later discussion. You can write questions, concerns, or topics on sticky notes to place on a board marked as the Parking Lot so that it can be discussed at a later time. This is a great way to manage discussions that are taking too long, or those that are getting off topic.

Communicate Effectively and Engage Participants

Communicate Effectively

In order to be a good facilitator, you need to have good communication skills. For instance, facial expressions and tone of voice can influence the tone of the training (e.g., either friendly or unfriendly). Thus, it is important to have an approachable, friendly face during trainings so that people feel comfortable asking questions.

When conducting a training, it is important to remember to use a "trainer's voice." This includes:

- Projecting your voice so everyone can hear you
- Varying your pitch
- Using a comfortable and varied pace
- Speaking at the right technical level
- Using a friendly tone
- Using a microphone, if necessary

Engage Participants

It is very important to engage participants throughout the training. One way to do this is to use various types of questions to

- Encourage all participants to contribute
- Allow for differences of opinions
- Keep participants alert
- Help you determine participant's knowledge and understanding

Types of Questions

Question Type	Description	Examples	How to use
Close-ended	Generates short final answers such as "yes" or "no" or just a few words	• Is it …? • Do you need…? • Have you ever…?	Obtain a final answer, or conclusion, or for confirmation

Open-ended	Generates descriptive answers that encourage discussion	• What are some ways…? • How can you…? • Why would you…?	Encourage participation and sharing of knowledge and experiences
Probing	Generates additional discussion or can be used to probe for more information	• Tell me more about…? • Would you elaborate….? • What is an example…?	Encourage participants to explain in greater detail about a subject

Other Methods for Engaging the Participants

Method	Description
Analogies	Compare two or more situations to help explain complex material. Analogies are helpful for teaching about a complex concept or process.
Stories	Provide real-life situations from your experience (or the experience of others you know) to explain situations or provide examples. Stories are compelling and bring the content to life.
Statistics	Provide statistics (especially from your jurisdiction) that can demonstrate the importance of collecting information or illustrate results of the data.
Energizers	Use short physical activities to increase the energy level of participants (especially after lunch or when participants are getting tired).

Manage the Training

As the facilitator, you are the manager of the training and it is up to you to keep the training on schedule and under control. There may be difficult situations, difficult participants, and unexpected circumstances to deal with. It is your responsibility to keep control and manage the problem, whatever it may be.

Manage time

Participants typically enjoy group discussions and want to share their ideas and experiences. As a result, it is easy for discussions to take too much time or get focused on topics that may not be critical to the training. It is important to know when to quit discussing a topic and move on to the next part of the training. ELMO (Enough, Let's Move On) can be used as a code word to bring a discussion to a close.

Manage difficult participants

Throughout the training, continually assess the dynamics of the group. Occasionally, the learning environment might be disrupted by individual participants. Some characteristics of a difficult participant include

- Dominating the conversation

- Interrupting others
- Acting as a know-it-all
- Not participating

The following table includes suggestions for dealing with difficult participants.

Method	Description
Maintain control	You are the manager of the training and need to stay in control. There may be a participant who challenges this, but it is up to you to control the situation in a professional manner.
Use body language	• Stand next to or behind participants who are having side-bar conversations or are being disruptive • Look at someone "a little too long" if they are being disruptive • Avoid looking at a participant who tries to dominate the conversation
Use verbal cues	• For a participant who is dominating the conversation, thank him/her for contributing and then ask participants o "Are there any other opinions?" o "Can we hear from some other participants?" • Encourage participants who are quiet by o Asking for opinions from people who haven't been commenting and then looking at those specific people
Refer to the "ground rules" and the "parking lot"	It can be helpful to remind participants of the ground rules established at the beginning of the course. You can always add to the ground rules throughout the training. If someone is talking too much about a certain topic, use the parking lot.
Give the person a specific task	If the person is busy, he/she will be less likely to be disruptive. For example, have the person write comments on the flip chart or have them help keep time.
Change the dynamics of the group by changing seating arrangements	If a participant is disruptive, change the seating arrangements. • Strategically seat the difficult participant up front near you. • During breaks or lunch change the seating arrangement by moving the name tents. Make a general statement when participants return: "*In order to help you get acquainted with as many other participants as possible, the seating arrangements have been changed."* This is effective for separating participants who are having side bar conversations.

Talk to the person outside the classroom	• Address such behaviors in private at your earliest convenience (during a break or lunch). Tactfully tell the participant how he/she is being disruptive. Refer to the ground rules, and reinforce the importance of adhering to those rules. • Never reprimand a difficult participant in front of the larger group! When training adults, it is important to show respect. If you do not, they may become resentful and try to challenge you throughout the remaining of the training.
Never lose your "cool" or be rude	Always treat participants in a professional manner.

Sample Agenda

The *Self-Study Modules on Tuberculosis, 1-5 Slide Sets* may be used either as a complete course or as stand-alone presentations. The sample one-day agenda (below) could serve as the basis for a comprehensive training that integrates the information from all five module presentations.

Note: Times allocated for each section in the agenda are suggestions. All of the curriculum content is important; however, every training is different and the facilitator should adjust the times allocated according to the needs, knowledge, and experience of the group.

Sample One-Day Agenda

Time	Topic
8:00 – 8:30 am	Course Introduction/Overview
8:30 – 9:30 am	Module 1, Transmission and Pathogenesis of Tuberculosis
9:30 – 9:45 am	BREAK
9:45 – 10:45 am	Module 2, Epidemiology of Tuberculosis
10:45– 12:15pm	Module 3, Targeted Testing and the Diagnosis of LTBI and TB Disease
12:15 – 1:15 pm	LUNCH
1:15 – 2:45 pm	Module 4, Treatment of LTBI and TB Disease
2:45 – 3:00 pm	BREAK
3:00 – 4:15 pm	Module 5, Infectiousness and Infection Control
4:15 – 5:00 pm	Summary and Evaluations

Additional Information

Continuing Education Units

Continuing education units (CEUs), continuing medical education (CME), continuing nursing education (CNEs), and continuing education contact hours (CECH) are free of charge for the print-based *Self-Study Modules on Tuberculosis, 1-5*. For more information on CEUs for this activity, please visit the CDC Division of Tuberculosis Elimination's website at www.cdc.gov/tb/education/ssmodules/Cont_Ed_regist.htm.

Additional Information on TB

For additional information on TB, visit the CDC Division of Tuberculosis Elimination's website at www.cdc.gov/tb. If you have questions on state-specific TB guidelines, please contact your state TB control office. A list of state TB control offices can be found on the CDC Division of Tuberculosis Elimination's website at www.cdc.gov/tb.

Self-Study Modules on Tuberculosis, 1-5 Slide Sets Facilitation Tips

Module 1: Transmission and Pathogenesis of Tuberculosis

Facilitation Tips

Background

In this module, participants will learn about the history of tuberculosis (TB). Participants will also learn how TB is spread from person to person (transmission) and how TB disease develops in the body (pathogenesis). Our understanding of the transmission and pathogenesis of TB has guided us in developing strategies for controlling the spread of TB and for treating latent TB infection (LTBI) and TB disease. As public health workers, participants should understand these concepts so that they can educate the patients they serve.

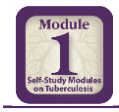
Learning Objectives

After this presentation, participants will be able to

1. Briefly describe the history of TB.
2. Explain how TB is spread (transmission).
3. Define drug-resistant TB.
4. Explain the difference between LTBI and TB disease.
5. Explain how LTBI and TB disease develop (pathogenesis).
6. Describe the classification system for TB.

Module Overview

Time	Activity	Content	Resources Needed
10 min.	Presentation	Introduction	Slides 1-5
5 min.	Presentation	History of TB	Slides 6-15
5 min.	Presentation	TB Transmission	Slides 16-24
5 min.	Presentation	Drug-Resistant TB	Slides 25-30
10 min.	Presentation	TB Pathogenesis	Slides 31-47
10 min.	Presentation	Progression from LTBI to TB Disease	Slides 48-56
5 min.	Presentation	Sites of TB Disease	Slides 57-60
5 min.	Presentation	TB Classification System	Slides 61-64
5 min.	Case Studies	Case Studies	Slides 65-69
60 min.	**Total Time**		

		Facilitation Tips
Slide 1	 ***Self-Study Modules on Tuberculosis, 1-5*** **Centers for Disease Control and Prevention** **Division of Tuberculosis Elimination** **2016**	• Introduce yourself to participants. Include your name and what organization you represent. • Ask participants to introduce themselves, stating their names and organizations • Provide information about the following: ○ Location of restrooms ○ Refreshments, if provided • Discuss ground rules and the parking lot • Ask participants to sign participant roster
Slide 2	**CDC Self-Study Modules on Tuberculosis, 1-5** • **Module 1: Transmission and Pathogenesis of TB** • **Module 2: Epidemiology of TB** • **Module 3: Targeted Testing and the Diagnosis of Latent TB Infection and TB Disease** • **Module 4: Treatment of Latent TB Infection and TB Disease** • **Module 5: Infectiousness and Infection Control** Module 1 – Transmission and Pathogenesis of Tuberculosis 2	• Explain to participants that the presentations were created using the print-based *Self-Study Modules on Tuberculosis, 1-5* • Ask who has worked through the print-based modules before • Review slide content • Mention that each module includes content about that topic • State that study questions and case studies are included in each module to help reinforce and apply content

Slide 3	*Self-Study Modules on Tuberculosis* Module 1 Self-Study Modules on Tuberculosis **Transmission and Pathogenesis of Tuberculosis** Module 1 – Transmission and Pathogenesis of Tuberculosis 3	• Introduce Module 1
Slide 4	**Module 1: Objectives** **At completion of this module, learners will be able to** 1. Describe the history of tuberculosis (TB). 2. Explain how TB is spread (transmission). 3. Define drug-resistant TB. 4. Explain the difference between latent TB infection (LTBI) and TB disease. 5. Explain how LTBI and TB disease develop (pathogenesis). 6. Describe the classification system for TB. Module 1 – Transmission and Pathogenesis of Tuberculosis 4	• State objectives of presentation *Background and Objectives - Module 1, p. 1*
Slide 5	**Module 1: Overview** • History of TB • TB Transmission • Drug-Resistant TB • TB Pathogenesis • Progression from LTBI to TB disease • Sites of TB disease • TB Classification System • Case Studies Module 1 – Transmission and Pathogenesis of Tuberculosis 5	• Review slide content

Slide 6

History of TB

Module 1 – Transmission and Pathogenesis of Tuberculosis 6

- Introduce section

History of TB - Module 1, pp. 5-6

Slide 7

History of TB (1)

- **TB has affected humans for millennia**
- **Historically known by a variety of names, including:**
  - **Consumption**
  - **Wasting disease**
  - **White plague**
- **TB was a death sentence for many**

Vintage image circa 1919
Image credit: National Library of Medicine

Module 1 – Transmission and Pathogenesis of Tuberculosis 7

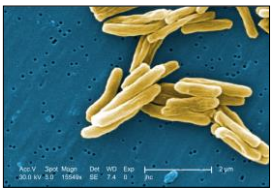
- Before showing slide, ask participants if they know of other names for TB
- Review slide content

History of TB - Module 1, p. 5
[Image credit: U.S. National Library of Medicine]

Slide 8

History of TB (2)
Scientific Discoveries in 1800s

- **Until mid-1800s, many believed TB was hereditary**
- **1865 Jean Antoine-Villemin showed TB was contagious**
- **1882 Robert Koch discovered *M. tuberculosis*, the bacterium that causes TB**

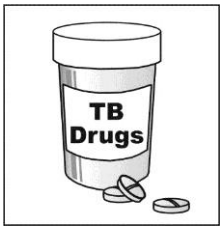


Mycobacterium tuberculosis
Image credit: Janice Haney Carr

Module 1 – Transmission and Pathogenesis of Tuberculosis 8

- Review slide content
- Note that the image is of *Mycobacterium tuberculosis*

History of TB - Module 1, p. 5
[Image credit: Janice Haney Carr]

Slide 9	**History of TB (3)** **Sanatoriums** • **Before TB antibiotics, many patients were sent to sanatoriums** • **Patients followed a regimen of bed rest, open air, and sunshine** • **TB patients who could not afford sanatoriums often died at home**  Sanatorium patients resting outside Module 1 – Transmission and Pathogenesis of Tuberculosis 9	• Review slide content • Explain that the image is of women at a sanatorium resting outside • Note that it used to be believed that cool, fresh air was beneficial for TB patients *History of TB - Module 1, p. 5*
Slide 10	**Breakthrough in the Fight Against TB (1)** **Drugs that could kill TB bacteria were discovered in 1940s and 1950s** • **Streptomycin (SM) discovered in 1943** • **Isoniazid (INH) and *p*-aminosalicylic acid (PAS) discovered between 1943 and 1952**  Module 1 – Transmission and Pathogenesis of Tuberculosis 10	• Review slide content *History of TB - Module 1, p. 5*
Slide 11	**Breakthrough in the Fight Against TB (2)** • **TB death rates in U.S. began to drop dramatically** • **Each year, fewer people died from TB** • **Most TB sanatoriums in U.S. had closed by mid 1970s** Module 1 – Transmission and Pathogenesis of Tuberculosis 11	• Review slide content • Mention that as the number of cases and deaths declined, many people began to hope that TB could be eliminated from the U.S., like smallpox and polio *History of TB - Module 1, p. 5*

Slide 12

TB Resurgence

- **Increase in TB in mid 1980s**
- **Contributing factors:**
  - **Inadequate funding for TB control programs**
  - **HIV epidemic**
  - **Increased immigration from countries where TB is common**
  - **Spread of TB in homeless shelters and correctional facilities**
  - **Increase and spread of multidrug-resistant TB**

March 16, 1992 Newsweek Magazine Cover

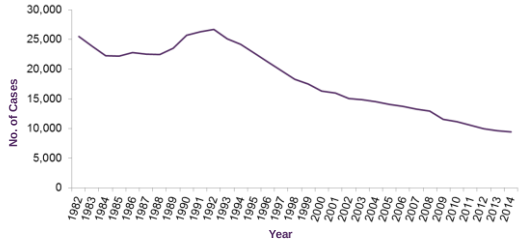
- Before showing the slide, ask participants why there was an increase in TB in the U.S. during the mid-1980s
- Review slide content

TB Resurgence - Module 1, p. 5 and Module 2, p. 4

Slide 13

TB Prevention and Control Efforts

- **Increased governmental funding for TB control programs began in 1992**
- **Number of TB cases declined from 1993 to 2014**



Reported TB Cases, U.S., 1982-2014

- Review slide content
- Point out the increase (1980s) and decrease (after 1993) in TB cases on the graph
- Stress that prevention and control efforts must be maintained since TB continues to be reported in almost every state and not all states have seen a decrease in TB cases

TB Prevention and Control Efforts - Module 2, pp. 4-5

Slide 14

TB History Timeline

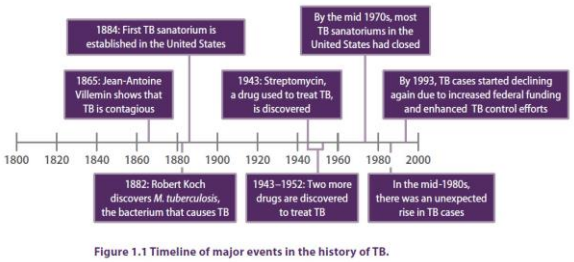


Figure 1.1 Timeline of major events in the history of TB.

- Recap the major events in the history of TB

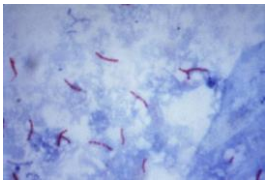
TB History Timeline - Module 1, p. 6

Slide 15	**History of TB** **Study Question 1.1** **In what year was each of the following discoveries made?** **a. TB was shown to be contagious** **1865** **b. The bacterium that causes TB was discovered** **1882** **c. The first drug that could kill TB bacteria was discovered** **1943** Module 1 – Transmission and Pathogenesis of Tuberculosis 15	• Introduce study questions • Ask participants to turn to p. 6 (if participants have print-based modules) • Ask for a volunteer to read question • Ask participants for answers • Click enter for the answer to appear *Note: All study questions and case studies are animated. The question appears first. Click "enter" and the answer will appear.* *Answers – Module 1, p. 26*
Slide 16	**TB Transmission** Module 1 – Transmission and Pathogenesis of Tuberculosis 16	• Introduce section • Ask participants how TB is transmitted *TB Transmission - Module 1, pp. 7-8*
Slide 17	**TB Transmission (1)** **Transmission is defined as the spread of an organism, such as *M. tuberculosis*, from one person to another.** Module 1 – Transmission and Pathogenesis of Tuberculosis 17	• Ask for a volunteer to read the definition of transmission *Definition of Transmission – Module 1, p. 7*

Slide 18

TB Transmission (2)
Types of Mycobacteria

- ***M. tuberculosis* causes most TB cases in U.S.**
- **Mycobacteria that cause TB:**
  - ***M. tuberculosis***
  - ***M. bovis***
  - ***M. africanum***
  - ***M. microti***
  - ***M. canetti***
- **Mycobacteria that do not cause TB**
  - **e.g., *M. avium*-complex**



M. tuberculosis

Module 1 – Transmission and Pathogenesis of Tuberculosis 18

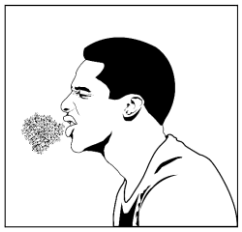
- State that mycobacteria are members of the bacteria family
- Explain that not all mycobacteria cause TB
- Review slide content

Types of Mycobacteria - Module 1, p. 7

Slide 19

TB Transmission (3)

- **TB is spread person to person through the air via droplet nuclei**
- ***M. tuberculosis* may be expelled when an infectious person:**
  - **Coughs**
  - **Speaks**
  - **Sings**
- **Transmission occurs when another person inhales droplet nuclei**



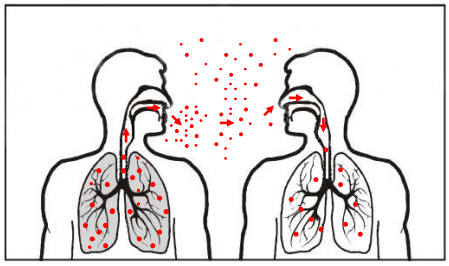
Module 1 – Transmission and Pathogenesis of Tuberculosis 19

- Review slide content
- Note that droplet nuclei are very small particles, less than 1/5,000 of an inch, and can remain suspended in the air for several hours
- Emphasize that transmission is more likely to occur in poorly ventilated and enclosed areas

TB Transmission - Module 1, p. 7

Slide 20

TB Transmission (4)



Dots in air represent droplet nuclei containing *M. tuberculosis*

Module 1 – Transmission and Pathogenesis of Tuberculosis 20

- Note that this image depicts airborne transmission. The individual on the left has infectious TB disease and is expelling it into the air. The individual on the right is inhaling the droplet nuclei into their lungs.

Note: Dots in the image are animated. Click "enter" once to start animation.

TB Transmission - Module 1, p. 8

Slide 21	**TB Transmission (5)** • **Probability that TB will be transmitted depends on:** – **Infectiousness of the TB patient** – **Environment in which the exposure occurred** – **Frequency and duration of the exposure** – **Susceptibility (immune status) of the exposed individual** • **The best way to stop transmission is to:** – **Isolate infectious persons** – **Provide treatment to infectious persons as soon as possible** Module 1 – Transmission and Pathogenesis of Tuberculosis 21	• Emphasize that not everyone who is exposed to TB becomes infected; it depends on many factors • Review slide content • Note that the length of time required for a patient to be considered noninfectious after starting treatment varies *TB Transmission - Module 1, p. 8*
Slide 22	**TB Transmission Study Question 1.2** **What organism causes TB?** ***M. tuberculosis*** **What are four other tuberculous mycobacteria?** ***M. bovis, M. africanum, M. microti, and M. canetti*** Module 1 – Transmission and Pathogenesis of Tuberculosis 22	• Introduce study questions • Ask participants to turn to p. 10 (if participants have print-based modules) • Ask for a volunteer to read question • Ask participants for answers *Answers – Module 1, p. 26*
Slide 23	**TB Transmission Study Question 1.3** **How is TB spread?** **TB is spread from person to person through the air via droplet nuclei containing *M. tuberculosis*.** Module 1 – Transmission and Pathogenesis of Tuberculosis 23	• Read question • Ask participants for answers *Answers – Module 1, p. 26*

Slide 24	**TB Transmission** **Study Question 1.4** **The probability that TB will be transmitted depends on what four factors?** • Infectiousness of the TB patient • Environment in which exposure occurred • Frequency and duration of the exposure • Susceptibility (immune status) of the exposed individual Module 1 – Transmission and Pathogenesis of Tuberculosis 24	• Read question • Ask participants for answers *Answers – Module 1, p. 26*
Slide 25	**Drug-Resistant TB** Module 1 – Transmission and Pathogenesis of Tuberculosis 25	• Introduce section *Drug-Resistant TB - Module 1, p. 9*
Slide 26	**Drug-Resistant TB (1)** • Caused by *M. tuberculosis* organisms resistant to at least one TB treatment drug • Resistant means drugs can no longer kill the bacteria Module 1 – Transmission and Pathogenesis of Tuberculosis 26	• Review slide content • Note that drug-resistant TB is more difficult to treat because there are fewer treatment options *Drug-Resistant TB - Module 1, p. 9*

Slide 27

Drug-Resistant TB (2)

Mono-resistant	Resistant to any one TB treatment drug
Poly-resistant	Resistant to at least any 2 TB drugs (but not both isoniazid and rifampin)
Multidrug-resistant (MDR TB)	Resistant to at least isoniazid and rifampin, the 2 best first-line TB treatment drugs
Extensively drug-resistant (XDR TB)	Resistant to isoniazid and rifampin, PLUS resistant to any fluoroquinolone AND at least 1 of the 3 injectable anti-TB drugs (e.g., amikacin, kanamycin, or capreomycin)

Module 1 – Transmission and Pathogenesis of Tuberculosis 27

- Review slide content
- Note that XDR TB is the most difficult type of drug-resistant TB to treat
- Explain that patients with drug-resistant TB should be closely monitored to see if they are responding to treatment; they should also remain in isolation until they are no longer infectious

Drug-Resistant TB - Module 1, p. 9

Slide 28

Drug-Resistant TB (3)

Primary Resistance	Caused by person-to-person transmission of drug-resistant organisms
Secondary Resistance (acquired)	Develops during TB treatment: • Patient was not treated with an appropriate regimen OR • Patient did not follow treatment regimen as prescribed

Module 1 – Transmission and Pathogenesis of Tuberculosis 28

- State that drug-resistant TB can be caused in two ways, primary and secondary
- Review slide content
- Note that drug-resistant TB can be transmitted in the same way as drug-susceptible TB; however, because it takes longer to diagnose, patients with drug-resistant TB may be infectious for longer periods of time

Drug-Resistant TB - Module 1, p. 9

Slide 29

Drug-resistant TB Study Question 1.5

What is drug-resistant TB?

Drug-resistant TB is caused by *M. tuberculosis* organisms that are resistant to at least one anti-TB drug.

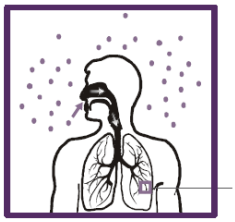
Drug-resistant TB can be difficult to treat.

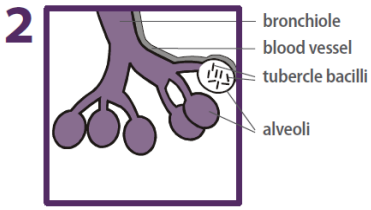
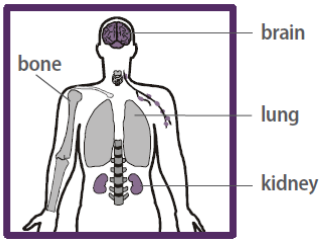
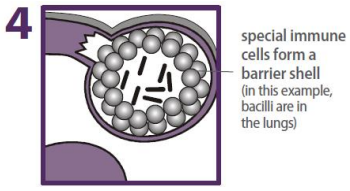
Module 1 – Transmission and Pathogenesis of Tuberculosis 29

- Introduce study questions
- Ask participants to turn to p. 10 (if participants have print-based modules)
- Ask for a volunteer to read question
- Ask participants for answers

Answers – Module 1, p. 26

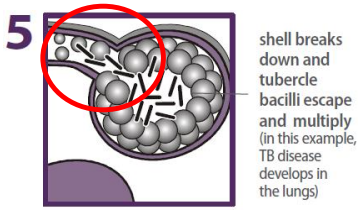
Slide 30	**Drug-resistant TB** **Study Question 1.6** **What is the difference between primary and secondary drug resistance?** • **Primary resistance is caused by person-to-person transmission of drug-resistant organisms.** • **Secondary resistance develops during TB treatment. Either the patient was not treated with the right TB drugs or the patient did not follow the prescribed treatment regimen.** Module 1 – Transmission and Pathogenesis of Tuberculosis 30	• Read question • Ask participants for answers *Answers – Module 1, p. 26*
Slide 31	**TB Pathogenesis** Module 1 – Transmission and Pathogenesis of Tuberculosis 31	• Introduce section • Ask participants if they can explain pathogenesis *TB Pathogenesis - Module 1, p. 11*
Slide 32	**TB Pathogenesis (1)** **Pathogenesis is defined as the way an infection or disease develops in the body.** Module 1 – Transmission and Pathogenesis of Tuberculosis 32	• Ask for a volunteer to read the definition of pathogenesis *TB Pathogenesis - Module 1, p. 11*

Slide 33	**TB Pathogenesis (2)** **Latent TB Infection (LTBI)** • **LTBI occurs when tubercle bacilli are in the body, but the immune system is keeping them under control** • **LTBI is detected by the Mantoux tuberculin skin test (TST) or by an interferon-gamma release assay (IGRA), such as:** – **QuantiFERON®-TB Gold In-Tube (QFT-GIT)** – **T-Spot®.*TB* test (T-SPOT)** • **People with LTBI are NOT infectious** Module 1 – Transmission and Pathogenesis of Tuberculosis 33	• Review slide content *LTBI – Module 1, p. 12*
Slide 34	**TB Pathogenesis (3)** **TB Disease** • **TB disease develops when the immune system cannot keep tubercle bacilli under control** – **May develop very soon after infection or many years after infection** • **About 10% of all people with normal immune systems who have LTBI will develop TB disease at some point in their lives** • **People with TB disease are often infectious** Module 1 – Transmission and Pathogenesis of Tuberculosis 34	• Review slide content *TB Disease – Module 1 p. 16*
Slide 35	**TB Pathogenesis (4)** 1  area of detail for boxes 2, 4, and 5 **Droplet nuclei containing tubercle bacilli are inhaled, enter the lungs, and travel to small air sacs (alveoli)** Module 1 – Transmission and Pathogenesis of Tuberculosis 35	• Review slide content • Explain that the dots in the air represent droplet nuclei being inhaled into the person's lungs *TB Pathogenesis – Module 1 p. 16*

Slide 36	**TB Pathogenesis (5)**  **Tubercle bacilli multiply in alveoli, where infection begins** Module 1 – Transmission and Pathogenesis of Tuberculosis 36	• Review slide content *TB Pathogenesis – Module 1 p. 16*
Slide 37	**TB Pathogenesis (6)**  **A small number of tubercle bacilli enter bloodstream and spread throughout body** Module 1 – Transmission and Pathogenesis of Tuberculosis 37	• Review slide content • State that tubercle bacilli can reach any part of the body, but areas where TB disease is more likely to develop include: ○ Lungs ○ Kidneys ○ Brain ○ Bones *TB Pathogenesis – Module 1, p. 17*
Slide 38	**TB Pathogenesis (7)** **LTBI**  • **Within 2 to 8 weeks the immune system produces special immune cells called macrophages that surround the tubercle bacilli** • **These cells form a barrier shell that keeps the bacilli contained and under control (LTBI)** Module 1 – Transmission and Pathogenesis of Tuberculosis 38	• Review slide content • Call attention to the barrier shell around the bacilli that is keeping the tubercle bacilli contained (upper left corner of figure) *TB Pathogenesis – Module 1, p. 17*

Slide 39

TB Pathogenesis (8)
TB Disease



- **If the immune system CANNOT keep tubercle bacilli under control, bacilli begin to multiply rapidly and cause TB disease**
- **This process can occur in different places in the body**

Module 1 – Transmission and Pathogenesis of Tuberculosis 39

- Review slide content
- Explain that the barrier shell around the bacilli has broken (upper left corner of figure)

Note: The red circle around broken barrier shell is animated. Click "enter" for the circle to appear.

TB Pathogenesis – Module 1, p. 17

Slide 40

LTBI vs. TB Disease (1)

Person with LTBI	Person with TB Disease (in the lungs)
• Has a small number of TB bacteria in his or her body that are alive, but under control	• Has a large number of **active** TB bacteria in his or her body
• Cannot spread TB bacteria to others	• May spread TB bacteria to others
• Does not feel sick, but may become sick if the bacteria become active in his or her body	• May feel sick and may have symptoms such as cough, fever, or weight loss
• TST or IGRA results usually positive	• TST or IGRA results usually positive
• Chest x-ray usually normal	• Chest x-ray usually abnormal

Module 1 – Transmission and Pathogenesis of Tuberculosis 40

- Review each row of the table, comparing LTBI and TB disease
- Refer participants to p. 12 to follow along

LTBI vs. TB Disease – Module 1, p. 12

Slide 41

LTBI vs. TB Disease (2)

Person with LTBI	Person with TB Disease (in the lungs)
• Sputum smears and cultures negative	• Sputum smears and cultures may be positive
• Should consider treatment for LTBI to prevent TB disease	• Needs treatment for TB disease
• Does not require respiratory isolation	• May require respiratory isolation
• Not a case of TB	• A case of TB

Module 1 – Transmission and Pathogenesis of Tuberculosis 41

- Review each row of the table, comparing LTBI and TB disease
- Refer participants to p. 12 to follow along

LTBI vs. TB Disease – Module 1, p. 12

Slide 42	**TB Pathogenesis** **Study Question 1.7** **When a person inhales droplet nuclei containing *M. tuberculosis*, where do the droplet nuclei go?** • Most of the larger droplet nuclei become lodged in the upper respiratory tract, where infection is unlikely to develop • However, droplet nuclei may reach the small air sacs of the lung (the alveoli), where infection may begin Module 1 – Transmission and Pathogenesis of Tuberculosis 42	• Introduce study questions • Ask participants to turn to p. 13 (if participants have print-based modules) • Ask for a volunteer to read question • Ask participants for answers *Answers – Module 1, p. 26*
Slide 43	**TB Pathogenesis** **Study Question 1.8** **After the tubercle bacilli reach the small air sacs of the lung (the alveoli), what happens to the tubercle bacilli?** • Tubercle bacilli multiply in alveoli and some enter the lymph nodes and bloodstream and spread throughout the body • Bacilli may reach any part of the body • Within 2 to 8 weeks, the immune system usually intervenes, halting multiplication and preventing further spread Module 1 – Transmission and Pathogenesis of Tuberculosis 43	• Ask for a volunteer to read question • Ask participants for answers *Answers – Module 1, p. 27*
Slide 44	**TB Pathogenesis** **Study Question 1.9** **In people with LTBI (but not TB disease), how does the immune system keep the tubercle bacilli under control?** The immune system produces special immune cells that surround the tubercle bacilli. The cells form a shell that keeps the bacilli contained and under control. Module 1 – Transmission and Pathogenesis of Tuberculosis 44	• Ask for a volunteer to read question • Ask participants for answers *Answers – Module 1, p. 27*

Slide 45

TB Pathogenesis
Study Question 1.10

How is LTBI detected?

LTBI is detected by the Mantoux tuberculin skin test (TST) or blood tests such as interferon-gamma release assays (IGRAs), which include the QuantiFERON®-TB Gold In-tube (QFT-GIT) or the T-SPOT®.*TB* test (T-SPOT).

Module 1 – Transmission and Pathogenesis of Tuberculosis 45

- Ask participants to turn to p. 16 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 1, p. 27

Slide 46

TB Pathogenesis
Study Question 1.11

What are the major similarities and differences between LTBI and TB disease? List characteristics of each.

Person with Latent TB Infection (LTBI)	Person with TB Disease (in the lungs)
Has a small number of TB bacteria in his or her body that are alive, but under control	Has a large number of **active** TB bacteria in his or her body
Cannot spread TB bacteria to others	May spread TB bacteria to others
Does **not** feel sick, but may become sick if the bacteria become active in his or her body	May feel sick and may have symptoms such as a cough, fever, or weight loss
Tuberculin skin test or interferon-gamma release assay results usually positive	Tuberculin skin test or interferon-gamma release assay results usually positive
Chest x-ray usually **normal**	Chest x-ray usually **abnormal**
Sputum smears and cultures **negative**	Sputum smears and cultures may be **positive**
Should consider treatment for LTBI to prevent TB disease	Needs treatment for TB disease
Does not require respiratory isolation	May require respiratory isolation
Not a case of TB	**A case** of TB

Module 1 – Transmission and Pathogenesis of Tuberculosis 46

- Read question
- Ask participants for answers

Answers – Module 1, pp. 27-28

Slide 47

TB Pathogenesis
Study Question 1.12

What happens if the immune system cannot keep the tubercle bacilli under control and the bacilli begin to multiply rapidly?

When this happens, TB disease develops. The risk that TB disease will develop is higher for some people than for others.

Module 1 – Transmission and Pathogenesis of Tuberculosis 47

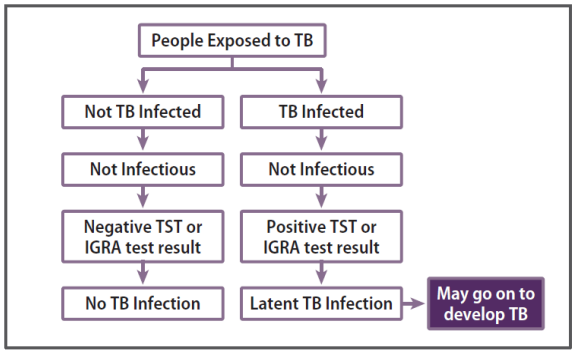
- Read question
- Ask participants for answers

Answers – Module 1, p. 28

Slide 48	**TB Pathogenesis** **Progression from LTBI to TB Disease** Module 1 – Transmission and Pathogenesis of Tuberculosis 48	• Introduce section *Progression from LTBI to TB Disease – Module 1, pp. 18-19*
Slide 49	**Progression to TB Disease (1)** • **Risk of developing TB disease is highest the first 2 years after infection** • **People with LTBI can be given treatment to prevent them from developing TB disease** • **Detecting TB infection early and providing treatment helps prevent new cases of TB disease** Module 1 – Transmission and Pathogenesis of Tuberculosis 49	• Review slide content • Explain that since the risk of progressing to TB disease is the highest in the first two years after infection, it is important to detect TB infection early *Progression to TB Disease – Module 1, p. 18*
Slide 50	**Progression to TB Disease (2)** **Some conditions increase probability of LTBI progressing to TB disease** • Infection with HIV • History of untreated or inadequately treated TB disease • Recent TB infection (within the past 2 years) • Immunosuppressive therapy such as tumor necrosis factor-alpha (TNF) antagonists, systemic corticosteroids, or immunosuppressive drug therapy following organ transplantation • Abusing drugs or alcohol or smoking cigarettes • Silicosis • Diabetes mellitus • Chronic renal failure • Certain types of cancer (e.g., leukemia, cancer of the head, neck, or lung) • Certain intestinal conditions • Low body weight Module 1 – Transmission and Pathogenesis of Tuberculosis 50	• Review slide content • Tell participants that some of these terms can be found in the glossary of print-based Module 1, pp. 2-4 *Progression to TB Disease – Module 1, pp. 18-19*

Slide 51

Progression to TB Disease (3)



Module 1 – Transmission and Pathogenesis of Tuberculosis 51

- Review slide content
- Emphasize that not everyone exposed to TB becomes infected with TB, and not everyone that becomes infected with TB develops TB disease

Progression to TB Disease – Module 1, p. 18

Slide 52

Progression to TB Disease (4)
TB and HIV

In an HIV-infected person, TB can develop in one of two ways:

- **Person with LTBI becomes infected with HIV and then develops TB disease as the immune system is weakened**
- **Person with HIV infection becomes infected with *M. tuberculosis* and then rapidly develops TB disease**

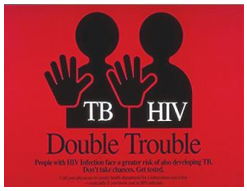


Image credit: Mississippi State Department of Health

Module 1 – Transmission and Pathogenesis of Tuberculosis 52

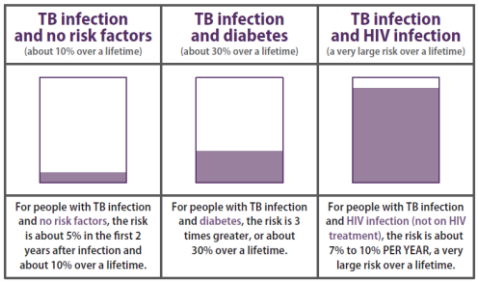
- Before showing slide, ask participants what is the strongest known risk factor for the progression of TB disease in people with TB infection
- Note that worldwide TB is responsible for the deaths of 1 in 3 people living with HIV/AIDS; making it the leading cause of death for people infected with HIV
- Review slide content

TB and HIV – Module 1, p. 19
[Image credit: Mississippi State Department of Health]

Slide 53

Progression to TB Disease (5)
TB and HIV

People who are infected with both *M. tuberculosis* and HIV are much more likely to develop TB disease



Module 1 – Transmission and Pathogenesis of Tuberculosis 53

- Review slide content
- Ask why the risk is so much greater with HIV infection

TB and HIV – Module 1, p. 19

Slide 54

Progression to TB Disease Study Question 1.13

What percentage of people who have LTBI (but not HIV infection) usually develop TB disease?

- About 10% of all people with LTBI will develop TB disease at some point
  - In U.S., about 5% of recently infected will develop TB disease in first year or two after infection
  - Additional 5% will develop disease later in life
- Remaining 90% will remain free of disease for the rest of their lives

Module 1 – Transmission and Pathogenesis of Tuberculosis 54

- Introduce study questions
- Ask participants to turn to p. 20 (if participants have print-based modules)
- Ask for a volunteer to read question
- Ask participants for answers

Answers – Module 1, p. 28

Slide 55

Progression to TB Disease Study Question 1.14

What conditions appear to increase the risk that LTBI will progress to TB disease?

- Infection with HIV
- History of untreated or inadequately treated TB disease
- Recent TB infection (within the past 2 years)
- Immunosuppressive therapy such as tumor necrosis factor-alpha (TNF) antagonists, systemic corticosteroids, or immunosuppressive drug therapy following organ transplantation
- Abusing drugs or alcohol or smoking cigarettes
- Silicosis
- Diabetes mellitus
- Chronic renal failure
- Certain types of cancer (e.g., leukemia, cancer of the head, neck, or lung)
- Certain intestinal conditions
- Low body weight

Module 1 – Transmission and Pathogenesis of Tuberculosis 55

- Ask for a volunteer to read question
- Ask participants for answers

Answers – Module 1, pp. 28-29

Slide 56

Progression to TB Disease Study Question 1.15

How does being infected with both *M. tuberculosis* and HIV affect the risk for TB disease?

- Much more likely to develop TB disease
- Risk of developing TB disease is 7% to 10% EACH YEAR (if HIV is not being treated)
- In an HIV-infected person, TB disease can develop in two ways:
  1. Person with LTBI becomes infected with HIV and then develops TB disease as the immune system is weakened
  2. Person with HIV infection becomes infected with *M. tuberculosis* and then rapidly develops TB disease

Module 1 – Transmission and Pathogenesis of Tuberculosis 56

- Ask for a volunteer to read question
- Ask participants for answers

Answers – Module 1, p. 29

Slide 57

TB Pathogenesis

Sites of TB Disease

Module 1 – Transmission and Pathogenesis of Tuberculosis 57

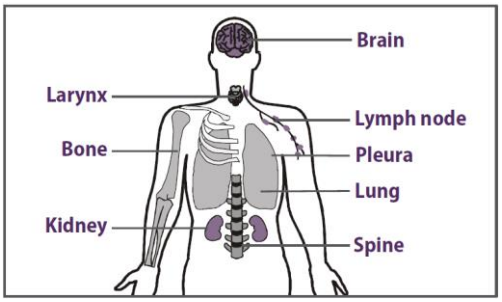
- Introduce section
- Note that some patients who have extrapulmonary TB also have pulmonary TB

Sites of TB Disease, Module 1, p. 22

Slide 58

Sites of TB Disease (1)

Bacilli may reach any part of the body, but common sites include:



Module 1 – Transmission and Pathogenesis of Tuberculosis 58

- Review slide content

Sites of TB Disease – Module 1, p. 22

Slide 59

Sites of TB Disease (2)

	Location	Frequency
Pulmonary TB	Lungs	Most TB cases are pulmonary
Extrapulmonary TB	Places other than lungs such as: ▪ Larynx ▪ Lymph nodes ▪ Pleura ▪ Brain ▪ Kidneys ▪ Bones and joints	Found more often in: • HIV-infected or other immunosuppressed persons • Young children
Disseminated TB	Carried to all parts of body, through bloodstream	Rare

Module 1 – Transmission and Pathogenesis of Tuberculosis 59

- Review slide content
- Note that disseminated TB is rare, but very serious

Sites of TB Disease – Module 1, p. 22

Slide 60

Sites for TB
Study Question 1.16

What part of the body is the most common site for TB disease?

Lungs are the most common site

What are some other common sites?

- Larynx
- Lymph nodes
- Pleura (membrane around the lungs)
- Brain
- Kidneys
- Bones and joints

Module 1 – Transmission and Pathogenesis of Tuberculosis 60

- Introduce study questions
- Ask participants to turn to p. 24 (if participants have print-based modules)
- Ask for a volunteer to read question
- Ask participants for answers

Answers – Module 1, p. 29

Slide 61

TB Pathogenesis
TB Classification System

Module 1 – Transmission and Pathogenesis of Tuberculosis 61

- Introduce section

TB Classification System Module 1, p. 23

Slide 62

TB Classification System (1)

Based on pathogenesis of TB

Class	Type	Description
0	No TB exposure Not infected	No history of TB exposure Negative result to a TST or to an IGRA
1	TB exposure No evidence of infection	History of TB exposure Negative result to a TST or an IGRA (done at least 8 to 10 weeks after exposure)
2	TB infection No TB disease	Positive result to a TST or to an IGRA Negative smears, molecular tests, and cultures No clinical or x-ray evidence of active TB disease

Module 1 – Transmission and Pathogenesis of Tuberculosis 62

- Review slide content
- State that this classification system is sometimes referred to as the American Thoracic Society (ATS) classification system

TB Classification System – Module 1, p. 23

Slide 63

TB Classification System (2)

Based on pathogenesis of TB

Class	Type	Description
3	TB, clinically active	Positive culture for *M. tuberculosis* OR Positive result to a TST or to an IGRA, and clinical, bacteriological, or x-ray evidence of current active TB disease
4	Previous TB disease (not clinically active)	Medical history of TB disease Abnormal but stable x-ray findings Positive result to a TST or to an IGRA Negative smears, molecular tests, and cultures (if done) No clinical or x-ray evidence of active TB disease
5	TB suspected	Signs and symptoms of TB disease, but diagnostic evaluation not complete

Module 1 – Transmission and Pathogenesis of Tuberculosis 63

- Review slide content
- State that any TB patient with a classification of 3 or 5 should receive treatment for TB, and should be reported to the health department

TB Classification System – Module 1, p. 23

Slide 64

TB Classification System Study Question 1.17

What is the classification system for TB based on? What is it used for?

The current classification system is based on the pathogenesis of TB. Many health departments and private health care providers use this system when describing patients.

Module 1 – Transmission and Pathogenesis of Tuberculosis 64

- Ask participants to turn to p. 24 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 1, p. 29

Slide 65

Case Studies

Module 1 – Transmission and Pathogenesis of Tuberculosis 65

- Introduce case studies

Slide 66	**Module 1: Case Study 1.1 (1)** **A 30-year-old man visits the health department for a TST because he is required to have one before starting his new job as a health care worker. He has an 18 mm positive reaction to the TST. He has no symptoms of TB, and his chest x-ray findings are normal.** Module 1 – Transmission and Pathogenesis of Tuberculosis 66	• Ask participants turn to p. 15 (if participants have print-based modules) • Read case study *Case Study 1.1 – Module 1, p. 15*
Slide 67	**Module 1: Case Study 1.1 (2)** **Should this be considered a case of TB?** **No. The man described above has LTBI. He has an 18 mm positive reaction to the TST, but no evidence of TB disease. Therefore, this is not a case of TB.** **Should this man be considered infectious?** **No, he should not be considered infectious. This man has LTBI, not TB disease. People with TB infection and no evidence of TB disease are not infectious.** Module 1 – Transmission and Pathogenesis of Tuberculosis 67	• Read questions • Ask participants for answers *Answers – Module 1, p. 30*
Slide 68	**Module 1: Case Study 1.2 (1)** **A 45-year-old woman is referred to the health department by her private physician because she was found to have LTBI as part of an employee testing program. She is overweight, with high blood pressure. Upon further questioning, she reports that she has injected illegal drugs in the past, but has never been tested for HIV infection.** Module 1 – Transmission and Pathogenesis of Tuberculosis 68	• Ask participants turn to p. 21 (if participants have print-based modules) • Read case study *Case Study 1.2 – Module 1, p. 21*

Slide 69

Module 1: Case Study 1.2 (2)

What conditions does this woman have that increase the risk that she will develop TB disease?

Drug abuse increases the risk that LTBI will progress to TB disease. This woman may also be at risk for HIV infection because of her injection drug use. HIV is the strongest known risk factor for developing TB disease. This woman should be offered HIV counseling, testing, and referral. Overweight and high blood pressure are NOT risk factors for TB disease.

- Read case study question
- Ask participants for answers
- Ask if there are any questions about Module 1 before moving on to Module 2

Answers – Module 1, p. 30

Module 2: Epidemiology of Tuberculosis

Facilitation Tips

Background

Epidemiology is the study of diseases and other health problems in groups of people. Epidemiologists determine the frequency and pattern (the distribution) of health problems in different communities. In other words, they find out who has a specific health problem, how often the problem occurs, and where the problem occurs. Using this information about who, when, and where, epidemiologists try to determine why the health problem is occurring.

Public health officials use epidemiologic information to design ways to prevent and control the diseases in the community. By finding out who is at risk for a specific health problem, they can target their prevention and control strategies at this group.

This module examines recent trends in TB in the United States and describes groups of people who are at higher risk for latent TB infection (LTBI) and TB disease. Groups of people who are at higher risk for TB vary from area to area; state and local health departments are responsible for determining specifically who is at risk in their area.

Learning Objectives

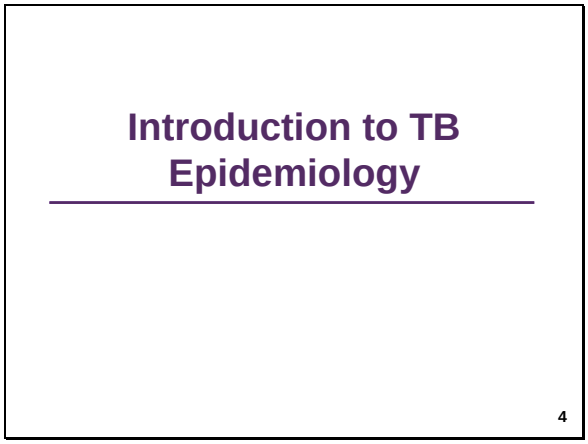
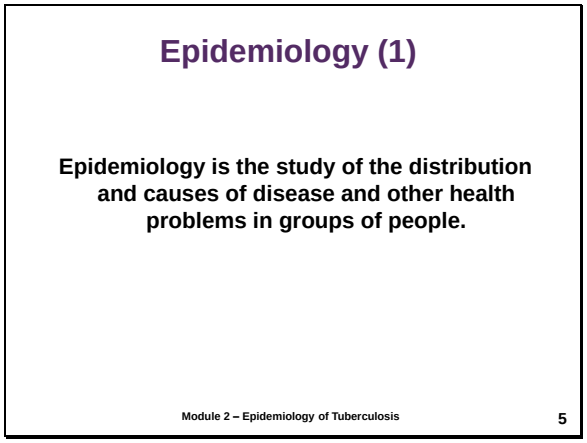
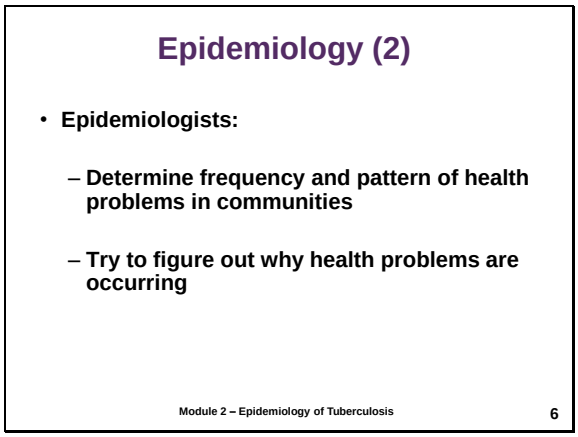
After this presentation, participants will be able to

1. Describe how the number of TB cases reported in the United States has changed over the last 60 years.
2. List five factors that contributed to the increase in the number of TB cases between 1985 and 1992.
3. List three improvements TB programs were able to make with increased federal, state, and other funds and resources that have contributed to a decrease in TB cases since 1993.
4. List the groups of people who are more likely to be exposed to or infected with *M. tuberculosis*.
5. List the groups of people who are more likely to develop TB disease once infected with *M. tuberculosis*.

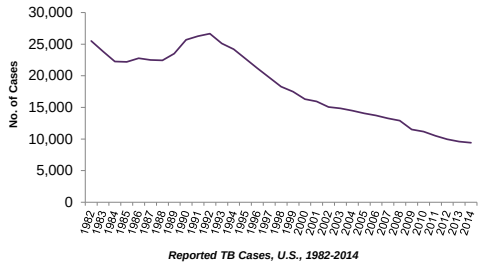
Module Overview

Time	Activity	Content	Slides
5 min.	Presentation	Introduction	Slides 1-3
15 min.	Presentation	Epidemiology of TB	Slides 4-31
35 min.	Presentation	People at High Risk for TB Infection and TB Disease	Slides 32-59
5 min.	Case Studies	Case Studies	Slides 60-62
60 min.	**Total Time**		

		Facilitation Tips
Slide 1	*Self-Study Modules on Tuberculosis* Module 2 Self-Study Modules on Tuberculosis **Epidemiology of Tuberculosis**	• Introduce Module 2 • Ask participants if they know what epidemiology is
Slide 2	**Module 2: Objectives** **At completion of this module, learners will be able to:** 1. Describe how the number of TB cases reported in the U.S has changed over the last 60 years 2. List 5 factors that contributed to the increase of TB cases between 1985 and 1992 3. List 3 improvements TB programs made with increased funds that have contributed to a decrease in TB cases since 1993 4. List groups of people who are more likely to be exposed to or infected with *M. tuberculosis* 5. List groups of people who are more likely to develop TB disease once infected with *M. tuberculosis* Module 2 – Epidemiology of Tuberculosis 2	• State objectives of presentation *Background and Objectives - Module 2, p. 1*
Slide 3	**Module 2: Overview** • Introduction to TB Epidemiology • People at High Risk for TB Infection and TB Disease • Case Studies Module 2 – Epidemiology of Tuberculosis 3	• Review slide content

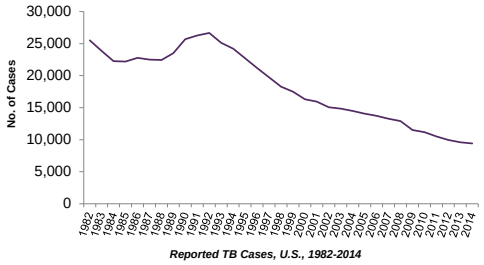
Slide 4		• Introduce section *Epidemiology of TB - Module 2, pp. 3-5*
Slide 5		• Ask for a volunteer to read the definition of epidemiology *Epidemiology definition - Module 2, p. 1*
Slide 6		• Review slide content *Epidemiology - Module 2, p. 1*

Slide 7	**Global Epidemiology of TB** • **TB is one of the leading causes of death due to infectious disease in the world** • **Almost 2 billion people are infected with *M. tuberculosis*** • **Each year about:** – **9 million people develop TB disease** – **1.5 million people die of TB** **Module 2 – Epidemiology of Tuberculosis** **7**	• Before showing slide, ask how many people in the world are infected with TB • State that 1/3 of the world's population is infected with TB • Review slide content *Global Epidemiology of TB - Module 2, p. 3*
Slide 8	**TB Reporting in U.S.** • **The Report of Verified Case of Tuberculosis (RVCT) is the national TB surveillance data collection form and is used for reporting all verified TB cases to CDC** – **The 50 states, District of Columbia, New York City, Puerto Rico, and 7 other jurisdictions in the Pacific and Caribbean report TB cases to CDC** • **Health care providers are required by law to report TB cases to state or local health departments** **Module 2 – Epidemiology of Tuberculosis** **8**	• Review slide content *TB Reporting in the U.S. - Module 2, p. 3*
Slide 9	**U.S. Epidemiology of TB** **1953 - 1986** • **1953:** – **More than 84,000 cases of TB** • **1953-1984:** – **TB cases declined about 6% each year** • **1985:** – **TB cases reached a low of 22,201** • **1986:** – **Significant increase in TB cases began** **Module 2 – Epidemiology of Tuberculosis** **9**	• Review slide content • Emphasize that from 1953-1984 TB cases were declining • Explain that one of the main reasons for this decline was that TB treatment drugs were discovered in the 1940s and 1950s *U.S. Epidemiology of TB - Module 2, p. 4*

Slide 10	**U.S. TB Resurgence (1)** **1986 - 1992**  *Reported TB Cases, U.S., 1982-2014* Module 2 – Epidemiology of Tuberculosis 10	• Review slide content • Call attention to the increase in TB cases on the graph (1980s) • Ask participants why they think there was 20% increase in TB cases in the 1980s *U.S. TB Resurgence - Module 2, p. 4*
Slide 11	**U.S. TB Resurgence (2)** **1986 - 1992** • **Contributing factors:** – **Inadequate funding for TB control and other public health efforts** – **HIV epidemic** – **Increased immigration from countries where TB is common** – **Spread of TB in certain settings (e.g., homeless shelters and correctional facilities)** – **Spread of multidrug-resistant TB (MDR TB)** Module 2 – Epidemiology of Tuberculosis 11	• Explain that there were several contributing factors to the TB resurgence in the U.S. • Review slide content *U.S. TB Resurgence - Module 2, p. 4*
Slide 12	**U.S. TB Control and Prevention (1)** **1993 - 2014** • **1993-2014:** – **Number of TB cases reported annually in U.S. steadily declined** • **Increased federal funds and other resources allowed TB programs to improve control efforts to:** – **Promptly identify persons with TB** – **Start appropriate initial treatment for TB cases** – **Ensure patients complete treatment** – **Conduct contact investigations** Module 2 – Epidemiology of Tuberculosis 12	• Review slide content • Stress that prevention and control efforts must be maintained in order to prevent another resurgence *U.S. TB Control and Prevention - Module 2, p. 5*

Slide 13

U.S. TB Control and Prevention (2)
1993 - 2014



Reported TB Cases, U.S., 1982-2014

Module 2 – Epidemiology of Tuberculosis 13

- Call attention to the decrease in TB cases on the graph (after 1993)
- State that there were 9,421 TB cases in the U.S. in 2014

U.S. TB Control and Prevention - Module 2, p. 5

Slide 14

Continuing Challenges in TB Control

- **TB is reported in almost every state and is increasing in some areas**
- **More than half of all TB cases in the U.S. are among foreign-born persons**
- **TB affects racial/ethnic minorities disproportionately**
- **MDR TB and extensively drug-resistant TB (XDR TB) remain serious public health concerns**

Module 2 – Epidemiology of Tuberculosis 14

- Explain that there remain several areas of ongoing challenges in TB control
- Review slide content

Continuing Challenges in TB Control – Module 2, p. 5

Slide 15

TB Case Rates (1)

- **A case rate is the number of TB cases that occur during a certain time period, divided by size of the population at that time**
- **Often expressed in terms of a population size of 100,000 persons**

Module 2 – Epidemiology of Tuberculosis 15

- Review slide content

TB Case Rate - Module 2, p. 5

Slide 16

TB Case Rates (2)

Example:

- **In the U.S. in 2014, there were 9,421 new TB cases in a population size of 318,857,056**

$$\frac{9{,}421}{318{,}857{,}056} \times 100{,}000 = 2.96$$

- **In 2014, the U.S. TB case rate was 2.96 TB cases per 100,000 persons (rounded to 3.0)**

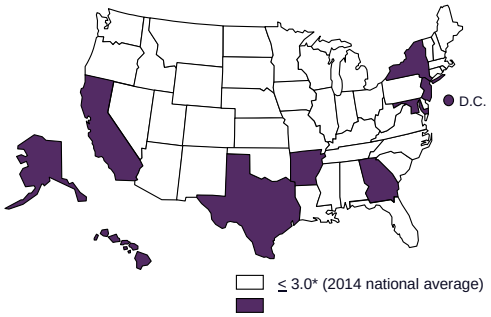
Module 2 – Epidemiology of Tuberculosis 16

- Use the example on slide to demonstrate how to calculate a case rate

TB Case Rate - Module 2, p. 5

Slide 17

TB Case Rates by State, 2014



*Cases per 100,000

Module 2 – Epidemiology of Tuberculosis 17

- Explain that this map shows TB case rates by state
- Ask which states had higher rates and which had lower rates
- Point out the case rates for your area

Note: Slide reflects 2014 surveillance data

TB Case Rates by State - Module 2, p. 6

Slide 18

TB Case Rates (3)

- **Health departments, CDC, and others can compare the occurrence of TB in different places, time periods, and groups of people using case rates**
- **Comparisons have shown that rates of TB are higher in certain groups than in others**

Module 2 – Epidemiology of Tuberculosis 18

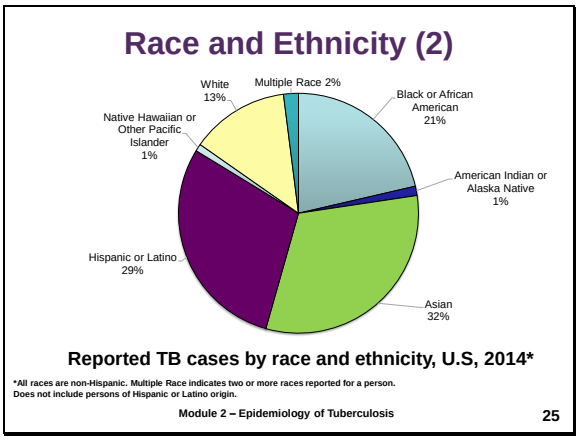
- Review slide content
- Ask which groups have higher TB case rates

TB Case Rate - Module 2, p. 5

Slide 19	**Epidemiology of TB** **Study Question 2.1** **What happened to the number of TB cases in the United States between 1953 and 1984?** **From 1953 - 1984, the number of TB cases reported in the U.S. decreased by an average of 6% each year.** Module 2 – Epidemiology of Tuberculosis 19	• Introduce study questions • Ask participants to turn to p. 7 (if participants have print-based modules) • Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 22*
Slide 20	**Epidemiology of TB** **Study Question 2.2** **What happened to the number of TB cases in the United States between 1985 and 1992?** **From 1985 - 1992, the number of new TB cases increased by 20%.** Module 2 – Epidemiology of Tuberculosis 20	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 22*
Slide 21	**Epidemiology of TB** **Study Question 2.3** **Name 5 factors that may have contributed to the increase in the number of TB cases between 1985 and 1992.** • Inadequate funding for TB control and other public health efforts • HIV epidemic • Increased immigration from countries where TB is common • Spread of TB in certain settings (e.g., correctional facilities and homeless shelters) • Spread of MDR TB Module 2 – Epidemiology of Tuberculosis 21	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 22*

Slide 22	**Epidemiology of TB Study Question 2.4** **What happened to the number of TB cases in the United States from 1993 to 2014?** **From 1993 to 2014, there was a steady decline in the number of TB cases reported annually in the United States.** Module 2 – Epidemiology of Tuberculosis 22	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 22*
Slide 23	**Epidemiology of TB Study Question 2.5** **Name 3 improvements TB programs were able to make with increased federal, state, and other funds that contributed to the decrease in TB cases since 1993.** • **Promptly identify persons with TB** • **Start appropriate initial treatment for TB cases** • **Ensure patients complete treatment** • **Conduct contact investigations** Module 2 – Epidemiology of Tuberculosis 23	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 22*
Slide 24	**Race and Ethnicity (1)** • **TB affects certain racial and ethnic minorities disproportionately** • **In 2014, about 85% of TB cases in the U.S. were among racial and ethnic minorities** • **Percentage of TB cases in racial and ethnic minorities is higher than expected based on percentage of these minorities in the U.S. population** Module 2 – Epidemiology of Tuberculosis 24	• Review slide content *Race and Ethnicity - Module 2, p. 8*

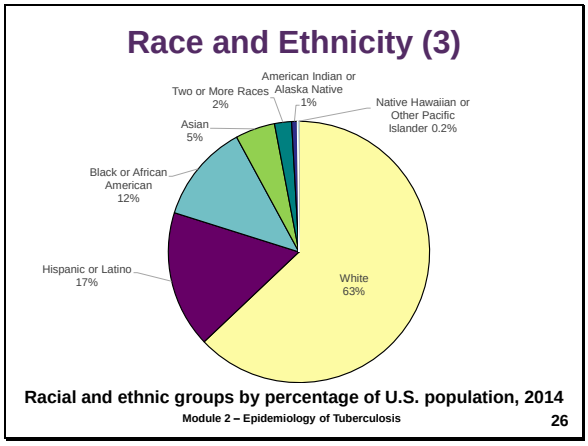
Slide 25



- Explain that this pie chart shows the reported TB cases in the U.S. in 2014 by race and ethnicity
- Ask participants which groups made up the greatest percentage of TB cases, and which groups made up the least

Reported TB Cases by Race and Ethnicity – Module 2, p. 8

Slide 26



- Explain that this pie chart shows the U.S. population broken down by race and ethnicity
- Ask participants what they notice when comparing this pie chart to the one on the previous slide (e.g., even though non-Hispanic whites make up more than 60% of the U.S. population, they only account for 13% of the TB cases)
- Explain that this means that the percentage of TB cases that occur in minorities is higher than expected based on their percentages in the U.S. population

Reported TB Cases by Race and Ethnicity – Module 2, p. 9

Slide 27	**Race and Ethnicity (4)** • **Disparities may exist due to racial and ethnic minorities having other risk factors for TB, such as:** – **Birth in a country where TB is common** – **HIV infection** – **Low socioeconomic status** – **Exposure to TB in high-risk settings** Module 2 – Epidemiology of Tuberculosis 27	• Review slide content *Reported TB Cases by Race and Ethnicity – Module 2, p. 9*
Slide 28	**Relative Risk for TB (1)** **Relative risk is a comparison of case rates between two groups.** Module 2 – Epidemiology of Tuberculosis 28	• Ask for a volunteer to read the definition of relative risk *Relative Risk for TB - Module 2, p. 10*
Slide 29	**Relative Risk for TB (2)** ***Example:*** • **The case rate for Asians is 17.8 compared to 0.6 for non-Hispanic whites. Therefore, the relative risk for Asians is about 29 times higher than non-Hispanic whites** **17.8 (TB case rate for Asians) = 29.6** **0.6 (TB case rate for non-Hispanic whites)** Module 2 – Epidemiology of Tuberculosis 29	• Use the example on slide to demonstrate how to calculate relative risk *Note: Slide reflects 2014 surveillance data* *Relative Risk for TB - Module 2, p. 10*

Slide 30

Relative Risk for TB (3)
Race and Ethnicity, 2014

Race/Ethnicity	TB Case Rate	Relative Risk
Asians	17.8	29.6
Native Hawaiians or Other Pacific Islanders	16.9	28.1
Blacks or African Americans	5.1	8.5
American Indians or Alaska Natives	5.0	8.3
Hispanics or Latinos	5.0	8.3
Multiple Race	2.8	4.6
Non- Hispanic Whites	0.6	1

Module 2 – Epidemiology of Tuberculosis 30

- Explain that in this table all case rates are compared to the case rate for non-Hispanic whites because non-Hispanic whites have the lowest case rate

Relative Risk for TB - Module 2, p. 10

Slide 31

Race and Ethnicity Study Question 2.6

Which racial and ethnic groups are disproportionally affected by TB?

Asians, Native Hawaiians or Other Pacific Islanders, non-Hispanic blacks, Hispanics, and American Indians or Alaska Natives are disproportionately affected by TB.

Module 2 – Epidemiology of Tuberculosis 31

- Introduce study questions
- Ask participants to turn to p. 10 (if participants have print-based modules)
- Ask for a volunteer to read question
- Ask participants for answers

Answers - Module 2, p. 22

Slide 32

People at High Risk for TB Infection and TB Disease

32

- Introduce section
- Ask participants who they think should be considered at high risk for TB infection

People at High Risk for TB Infection and TB Disease - Module 2, pp. 11-15

Slide 33

High-Risk Groups

- **High-risk groups can be divided into two categories:**
  - **High risk for <u>exposure to or infection</u> with *M. tuberculosis***
  - **High risk for <u>developing TB disease</u> after infection with *M. tuberculosis***

Module 2 – Epidemiology of Tuberculosis 33

- Review slide content

High-Risk Groups - Module 2, p. 11

Slide 34

People at High Risk for Exposure to or Infection with *M. tuberculosis*

- **Contacts**
- **People who have come to the U.S. within the last 5 years from areas of the world where TB is common**
- **Persons who visit areas with a high prevalence of TB disease**
- **People who live or work in high-risk congregate settings**
- **Health care workers who serve patients at increased risk**
- **Populations defined locally as having an increased incidence of LTBI or TB disease, possibly medically underserved, low-income populations, or persons who abuse drugs or alcohol**
- **Infants, children, and adolescents exposed to adults who are at increased risk for LTBI or TB disease**

Module 2 – Epidemiology of Tuberculosis 34

- Review slide content

People at High Risk for TB Infection – Module 2, p. 11

Slide 35

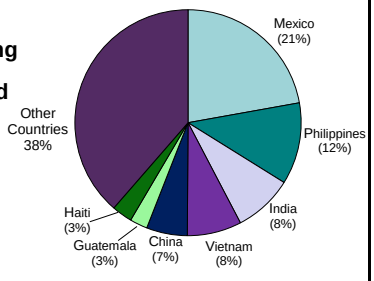
People at High Risk for Developing TB Disease after Infection with *M. tuberculosis* (1)

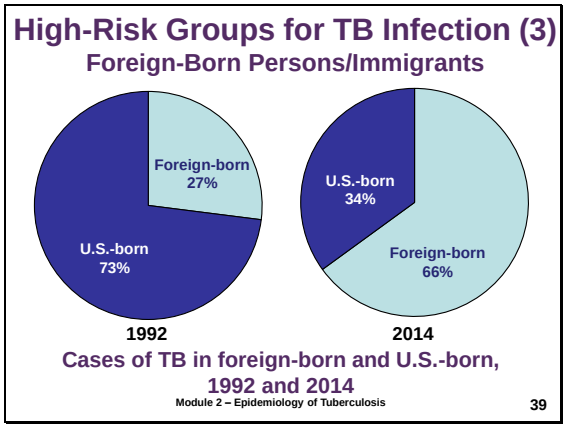
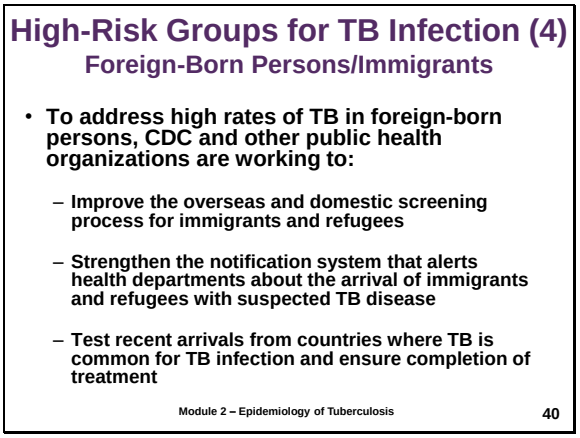
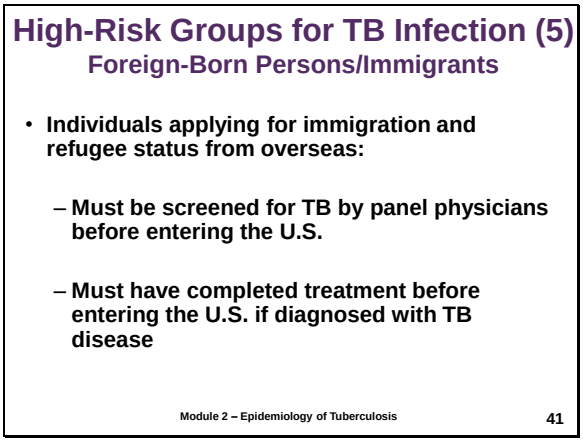
- **People living with HIV**
- **Children younger than 5 years of age**
- **People infected with *M. tuberculosis* within past 2 years**
- **People with a history of untreated or inadequately treated TB disease**
- **People who are receiving immunosuppressive therapy**
- **People with silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck, or lung**

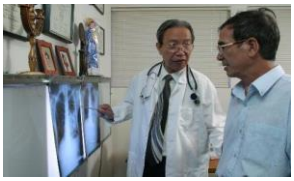
Module 2 – Epidemiology of Tuberculosis 35

- Explain that anyone who has LTBI can develop TB disease, but that some people are at higher risk than others
- Review slide content

People at High Risk for Developing TB Disease - Module 2, p. 11

Slide 36	**People at High Risk for Developing TB Disease after Infection with *M. tuberculosis* (2)** • Persons who have had a gastrectomy or jejunoileal bypass • Low body weight • Cigarette smokers and persons who abuse drugs or alcohol • Populations defined locally as having an increased risk Module 2 – Epidemiology of Tuberculosis 36	• Review slide content *People at High Risk for Developing TB Disease - Module 2, p. 11*
Slide 37	**High-Risk Groups for TB Infection (1)** **Contacts** • Contacts are persons who have spent time with someone who has infectious TB disease • May include: – Family members – Coworkers – Friends  Module 2 – Epidemiology of Tuberculosis 37	• Review slide content *Contacts - Module 2, p. 12*
Slide 38	**High-Risk Groups for TB Infection (2)** **Foreign-Born Persons/Immigrants** **In the U.S., LTBI and TB disease often occur among people born in areas of the world where TB is common:** – Asia – Africa – Russia – Eastern Europe – Latin America  Module 2 – Epidemiology of Tuberculosis 38	• Review slide content • Explain that the pie chart shows the overall distribution of the countries of birth of foreign-born persons reported with TB in 2014 in the U.S. The top 7 countries are highlighted. • Ask which of these foreign-born groups live in the participants' areas *Foreign-Born Persons/Immigrants – Module 2, p. 12*

Slide 39		• Explain that the two pie charts show the percentage of TB cases by foreign-born and U.S. born persons in 1992 and 2014 • Explain that the percentage of TB cases in the U.S. that are among foreign-born persons has increased over the years (27% in 1992 vs. 66% in 2014) *Foreign-Born Persons/Immigrants – Module 2, p. 12*
Slide 40		• Review slide content *Foreign-Born Persons/Immigrants – Module 2, p. 12*
Slide 41		• Review slide content • Explain that health departments are notified of immigrants who are suspected of having TB. This notification system allows health departments to assist patients to receive a medical evaluation. *Foreign-Born Persons/Immigrants – Module 2, p. 12*

Slide 42	**High-Risk Groups for TB Infection (6)** **Foreign-Born Persons/Immigrants** • **Immigrants living in the U.S. who apply for permanent residence or citizenship:** – **Must be tested for TB infection and evaluated for TB disease by U.S.- based civil surgeons**  Module 2 – Epidemiology of Tuberculosis 42	• Review slide content *Foreign-Born Persons/Immigrants – Module 2, p. 12*
Slide 43	**High-Risk Groups for TB Infection (7)** **Congregate Settings** • **In certain congregate settings, the risk of being exposed to TB is higher than other places. This may include:** – **Correctional facilities** – **Homeless shelters** – **Nursing homes** – **Health care facilities** Module 2 – Epidemiology of Tuberculosis 43	• Review slide content *Congregate Settings - Module 2, p. 13*
Slide 44	**High-Risk Groups for TB Infection (8)** **Congregate Settings** • **Risk of exposure to TB is higher than in other settings** • **Risk is higher if facility is crowded** Module 2 – Epidemiology of Tuberculosis 44	• Review slide content *Congregate Settings - Module 2, p. 13*

Slide 45

High-Risk Groups for TB Infection (9)
Correctional Facilities

- **Higher risk in correctional facilities may be due to:**
  - **Incarcerated population includes a high proportion of people at greater risk for TB than overall population (risk factors may include HIV-infection and a history of homelessness or drug use)**
  - **Physical structure of correctional facilities (e.g., close living quarters, overcrowding, potential for inadequate ventilation)**
  - **Movement of inmates into and out of facilities can lead to interruption of therapy**

Module 2 – Epidemiology of Tuberculosis 45

- Before showing slide, ask why groups in correctional settings are at higher risk for TB infection
- Review slide content
- Explain that being infected with HIV puts individuals at a higher risk of developing TB disease

Correctional Facilities - Module 2, p. 13

Slide 46

High-Risk Groups for TB Infection (10)
Health Care Workers

- **Might be exposed to TB at work**
- **Risk depends on:**
  - **Number of persons with TB in facility**
  - **Job duties**
  - **Infection control procedures**

Module 2 – Epidemiology of Tuberculosis 46

- Before showing slide, ask participants which factors can increase the risk for health care workers
- Review slide content
- Explain that facilities with a high risk of TB transmission should ensure appropriate TB prevention and control measures are taken
- Note that infection control procedures are discussed more in Module 5

Health Care Workers - Module 2, p. 13

Slide 47

High-Risk Groups for TB Infection (11)
Populations Defined Locally

Populations that may have an increased risk include

- **Persons experiencing homelssness**
- **Medically underserved populations**
- **Low-income groups**
- **Persons who abuse drugs or alcohol**

Module 2 – Epidemiology of Tuberculosis 47

- Review slide content

Populations Defined Locally - Module 2, p. 14

Slide 48

High-Risk Groups for TB Infection (12)
Populations Defined Locally

- **Low-income is linked to higher risk of TB exposure**
- **Possible reasons include factors associated with low-income:**
  - **Inadequate living conditions**
  - **Crowding**
  - **Malnutrition**
  - **Poor access to health care**
- **TB rates are 10 times higher for people experiencing homelessness**

Module 2 – Epidemiology of Tuberculosis 48

- Review slide content

Populations Defined Locally - Module 2, p. 14

Slide 49

High-Risk Groups for TB Infection (13)
Children and Adolescents

- **High risk if exposed to adults in high-risk groups**
- **If a child has TB infection or disease, it suggests that:**
  - **TB was transmitted relatively recently**
  - **Person who transmitted TB to child may still be infectious**
  - **Others may have been exposed**

Module 2 – Epidemiology of Tuberculosis 49

- Review slide content
- Note that the number of reported TB cases in children have been decreasing since 1993

Children and Adolescents - Module 2, p. 14-15

Slide 50

High-Risk Groups for TB Disease (1)
Infants and Children Younger than 5 Years

High risk for rapidly developing TB disease due to underdeveloped immune system

Module 2 – Epidemiology of Tuberculosis 50

- Review slide content

Infants and Children - Module 2, p. 14-15

Slide 51

High-Risk Groups for TB Disease (2)
People Living with HIV

- **HIV is the strongest known risk factor for developing TB disease**
- **TB is the leading cause of death for people with HIV/AIDS**
- **Risk of developing TB disease is 7% - 10% each year for people who are infected with both TB and HIV (if the HIV is not treated)**

Module 2 – Epidemiology of Tuberculosis 51

- Review slide content
- Explain that because HIV weakens the immune system, people with TB infection and HIV infection are at a very high risk of developing TB disease
- Explain that the risk of developing TB disease is only 10% over a lifetime for people infected only with *M. tuberculosis*

People Living With HIV - Module 2, p. 15

Slide 52

High-Risk Groups for TB Infection Study Question 2.7

Name 7 groups of people who are more likely to be exposed or infected with *M. tuberculosis.*

- Contacts of people known or suspected to have TB
- People who have come to the U.S. within last 5 years from countries where TB is common
- Persons who visit areas with a high prevalence of TB disease
- People who live or work in high-risk congregate settings
- Health care workers who serve high-risk groups
- Populations defined locally as having an increased incidence of LTBI or TB disease, possibly medically underserved, low-income populations, or persons who abuse drugs or alcohol
- Infants, children, and adolescents exposed to adults who are at increased risk for LTBI or TB disease

Module 2 – Epidemiology of Tuberculosis 52

- Introduce study questions
- Ask participants to turn to p. 16 (if participants have print-based modules)
- Ask for a volunteer to read question
- Ask participants for answers

Answers - Module 2, p. 23

Slide 53

High-Risk Groups for TB Infection Study Question 2.8

What are public health agencies doing to address the high rate of TB in foreign born persons?

- **Improve the overseas and domestic screening process for immigrants and refugees**
- **Strengthen the notification system that alerts health departments about the arrival of immigrants and refugees with suspected TB disease**
- **Test recent arrivals from countries where TB is common for TB infection and ensure completion of treatment**

Module 2 – Epidemiology of Tuberculosis 53

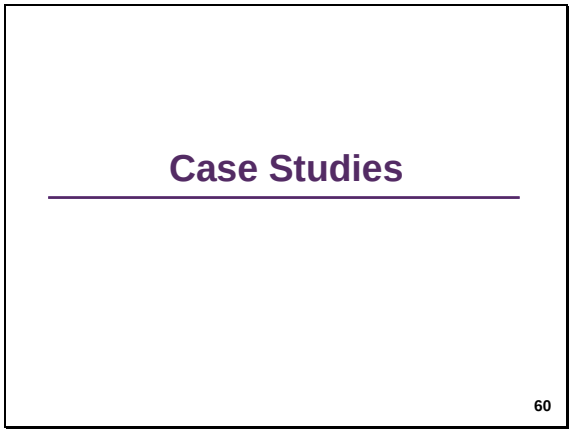
- Ask for a volunteer to read question
- Ask participants for answers

Answers - Module 2, p. 23

Slide 54	**High-Risk Groups for TB Infection Study Question 2.9** **Why is the risk of being exposed to TB higher in certain settings, such as nursing homes or correctional facilities?** • Many people in these facilities are at risk for TB disease • Risk of exposure is higher if facility is crowded Module 2 – Epidemiology of Tuberculosis 54	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 23*
Slide 55	**High-Risk Groups for TB Infection Study Question 2.10** **What are some reasons why rates of TB disease are higher in correctional facilities?** • The incarcerated population contains a higher proportion of people at greater risk for TB than the general population • An increasing number of inmates are infected with HIV, which means that they are more likely to develop TB disease if they become infected with *M. tuberculosis* • Some correctional facilities are crowded and may have inadequate ventilation, which promotes the spread of TB • Therapy can be interrupted when inmates are moved into and out of facilities Module 2 – Epidemiology of Tuberculosis 55	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 24*
Slide 56	**High-Risk Groups for TB Infection Study Question 2.11** **When a child has TB infection or disease, what does it tell us about the spread of TB in the child's home or community? Name 3 things.** • TB was transmitted relatively recently • The person who transmitted TB to the child may still be infectious • Other adults and children in the home or community have probably been exposed to TB Module 2 – Epidemiology of Tuberculosis 56	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 24*

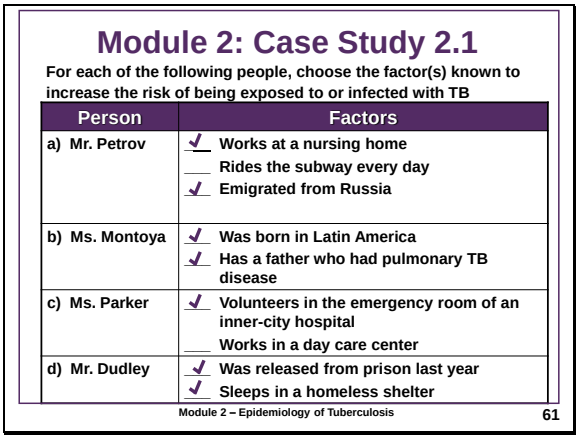
Slide 57	**High-Risk Groups for TB Disease Study Question 2.12** **Name 8 groups of people who are more likely to develop TB disease once infected.** • People living with HIV • Children younger than 5 years of age • People infected with *M. tuberculosis* within the past 2 years • People with a history of untreated or inadequately treated TB disease • People receiving immunosuppressive therapy • People with silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck, or lung • Persons who have had a gastrectomy or jejunoileal bypass • Low body weight • Cigarette smokers and person who abuse drugs or alcohol • Populations defined locally as having an increased incidence of disease due to *M. tuberculosis* Module 2 – Epidemiology of Tuberculosis 57	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 24*
Slide 58	**High-Risk Groups for TB Disease Study Question 2.13** **What is the strongest known risk factor for the development of TB disease?** **HIV infection is the strongest known risk factor for developing TB disease. HIV infection weakens the body's immune system, making it more likely for a person who has TB infection to develop TB disease.** Module 2 – Epidemiology of Tuberculosis 58	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 25*
Slide 59	**High-Risk Groups for TB Disease Study Question 2.14** **If a person is infected with both *M. tuberculosis* and HIV, what are his or her chances of developing TB disease? How does this compare to the risk for people who are infected only with *M. tuberculosis*?** • Risk is 7% to 10% each year if person is infected with both *M. tuberculosis* and HIV and the HIV is not treated • Risk is 10% over a lifetime if person is only infected with *M. tuberculosis* Module 2 – Epidemiology of Tuberculosis 59	• Ask for a volunteer to read question • Ask participants for answers *Answers - Module 2, p. 25*

Slide 60



- Introduce case studies

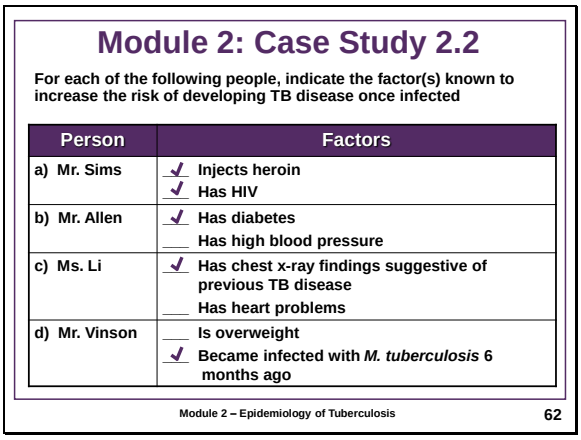
Slide 61



- Ask participants to turn to p. 18 (if participants have print-based modules)
- Read case study
- Ask participants which factors would be considered risk factors for each person

Answers - Module 2, p. 26

Slide 62



- Ask participants to turn to p. 20 (if participants have print-based modules)
- Read case study
- Ask participants which factors would be considered risk factors for each person
- Ask if there are any questions about Module 2 before moving on to Module 3

Answers - Module 2, p. 27

Module 3: Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

Facilitation Tips

Background

In this module, participants will learn about targeted testing and the diagnosis of latent tuberculosis (TB) infection (LTBI) and TB disease. Targeted testing is a TB control strategy that is used to identify people who have LTBI and are at high risk for developing TB disease and would benefit from treatment. LTBI is diagnosed with the Mantoux tuberculin skin test (TST) or an interferon-gamma release assay (IGRA), such as the QuantiFERON®-TB Gold In-Tube test (QFT-GIT) or the T-SPOT®.*TB* test (T-Spot).

It is important to medically evaluate people who have symptoms of TB disease; if they are found to have TB disease, they need treatment to be cured and to help stop the transmission of TB to others. For this reason, the diagnosis of TB disease is crucial to controlling the spread of TB in homes and communities. In most cases, TB disease is diagnosed with certain laboratory tests. For patients who may have pulmonary TB disease, a chest x-ray is also useful for diagnosis.

Learning Objectives

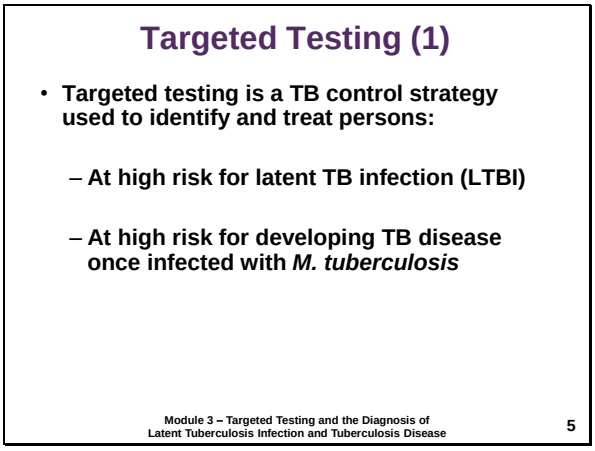
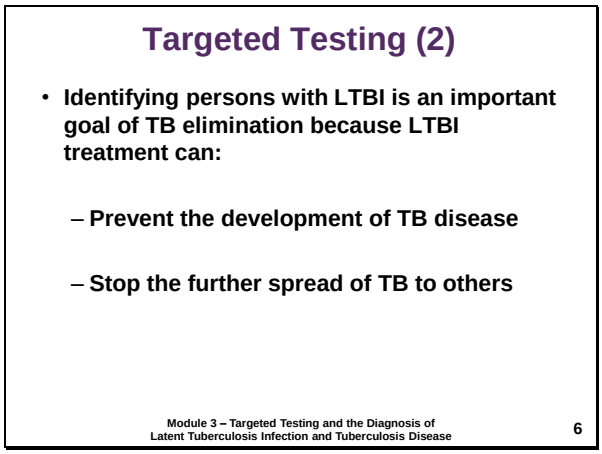
After this presentation, participants will be able to

1. Identify high-risk groups for targeted testing.
2. Describe how to place, read, and interpret a Mantoux tuberculin skin test.
3. Describe how to interpret an interferon-gamma release assay.
4. Discuss considerations for using either the Mantoux tuberculin skin test or an interferon-gamma release assay for diagnosing latent tuberculosis infection.
5. Describe the components of a medical evaluation for diagnosing TB disease.

Module Overview

Time	Activity	Content	Slides
2 min.	Presentation	Introduction	Slides 1-3
10 min.	Presentation	Targeted Testing	Slides 4-12
30 min.	Presentation	Diagnosis of LTBI	Slides 13-75
35 min.	Presentation	Diagnosis of TB Disease	Slides 76-129
3 min.	Presentation	Reporting TB Cases	Slides 130-134
10 min.	Case Studies	Case Studies	Slides 135-150
90 min.	**Total Time**		

		Facilitation Tips
Slide 1	*Self-Study Modules on Tuberculosis* Module 3 **Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease**	• Introduce Module 3
Slide 2	**Module 3: Objectives** **At completion of this module, learners will be able to:** 1. Identify high-risk groups for targeted testing 2. Describe how to place, read, and interpret a Mantoux tuberculin skin test (TST) 3. Describe how to interpret an interferon-gamma release assay (IGRA) 4. Discuss considerations for using either the TST or IGRA for diagnosing latent tuberculosis infection (LTBI) 5. Describe the components of a medical evaluation for diagnosing TB disease Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 2	• State objectives of presentation *Background and Objectives - Module 3, p. 1*
Slide 3	**Module 3: Overview** • Targeted Testing • Diagnosis of latent tuberculosis infection (LTBI) – TST – IGRAs – TB Testing Programs, the Booster Phenomenon, and Two-Step Testing • Diagnosis of TB Disease • Reporting TB Cases • Case Studies Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 3	• Review slide content

Slide 4		• Introduce section • Ask participants if they know what targeted testing is
Slide 5		• Review slide content *Targeted Testing – Module 3, p. 6*
Slide 6		• Review slide content *Targeted Testing – Module 3, p. 6*

Slide 7	**Targeted Testing (3)** **A Decision to Test is a Decision to Treat** • **TB testing activities should be done only when there is a plan for follow-up care** • **Health care workers (HCWs) should identify and test persons who are at high risk** – **People who are not at high risk generally should not be tested** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 7	• Review slide content • Explain that testing people who are not at high risk can take resources away from important activities. Also, positive test results in low-risk populations can be inaccurate. • Note that health care agencies and other facilities should consult with their local health department before starting a TB testing program *Targeted Testing – Module 3, p. 6*
Slide 8	**Targeted Testing (4)** **High-Risk Groups** • **High-risk groups can be divided into two categories:** – **People who are at high risk for exposure to or infection with *M. tuberculosis*** – **People who are at high risk for developing TB disease once infected with *M. tuberculosis*** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 8	• Review slide content • Explain that these are the high-risk groups that should be tested for TB • Note that definition of high risk should be made at the local (city, county, state) level according to local demographics and TB epidemiology *Targeted Testing – Module 3, pp. 6-7*
Slide 9	**Targeted Testing (5)** **High-Risk Groups for TB Infection** • **Contacts of people known or suspected to have TB disease** • **People who have come to U.S. within 5 years from areas of the world where TB is common** • **People who visit areas with a high prevalence of TB disease** • **People who live or work in high-risk congregate settings** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 9	• Review slide content • Tell participants that TB is more common in parts of Asia, Africa, Russia, Eastern Europe, and Latin America • Ask participants what settings they think could be considered “high-risk congregate settings” (examples include nursing homes, homeless shelters, and correctional facilities) *Groups at High Risk for TB Infection – Module 3, p. 7*

Slide 10	**Targeted Testing (6)** **High-Risk Groups for TB Infection** • **HCWs who serve patients at increased risk for TB disease** • **Populations defined locally as having an increased incidence of LTBI or TB disease (e.g., medically underserved, low income, or people who abuse drugs or alcohol)** • **Infants, children, and adolescents exposed to adults in high-risk groups** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 10	• Review slide content *Groups at High Risk for TB Infection – Module 3, p. 7*
Slide 11	**Targeted Testing (7)** **High-Risk Groups for TB Disease after Infection with *M. tuberculosis*** • **People living with HIV** • **Children younger than 5 years of age** • **People recently infected with *M. tuberculosis* (within the past 2 years)** • **People with a history of untreated or inadequately treated TB disease** • **People receiving immunosuppressive therapy** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 11	• Review slide content *Groups at High Risk for TB Disease – Module 3, p. 7*
Slide 12	**Targeted Testing (8)** **High-Risk Groups for TB Disease after Infection with *M. tuberculosis*** • **Persons with silicosis, diabetes mellitus, chronic renal failure, leukemia, or cancer of the head, neck, or lung** • **Persons who have had a gastrectomy or jejunoileal bypass** • **Low body weight** • **Cigarette smokers and persons who abuse drugs and alcohol** • **Persons defined locally as having an increased incidence of disease due to *M. tuberculosis*** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 12	• Review slide content *Groups at High Risk for TB Disease – Module 3, p. 7*

Slide 13	**Diagnosis of Latent TB Infection (LTBI)** 13	• Introduce section *Diagnosis of LTBI – Module 3, pp. 8-38*
Slide 14	**Diagnosis of LTBI** • **Available testing methods for *M. tuberculosis* infection:** – **Mantoux tuberculin skin test (TST)** – **Blood tests known as interferon-gamma release assays (IGRAs):** • **QuantiFERON®-TB Gold In-Tube (QFT-GIT)** • **T-SPOT®.*TB* test (T-Spot)** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 14	• Review slide content *Diagnosis of LTBI – Module 3, p. 8*
Slide 15	**Diagnosis of Latent TB Infection (LTBI)** **Mantoux Tuberculin Skin Test Administering the Test** 15	• Introduce section • Ask who has had a Mantoux tuberculin skin test (TST) • Ask (if appropriate) how many participants have administered a TST to others • Ask if the TST can detect TB disease *Mantoux Tuberculin Skin Test – Module 3, pp. 8-24*

Slide 16

Mantoux Tuberculin Skin Test (1)

- **TST is administered by injection**
- **Tuberculin is made from proteins derived from inactive tubercle bacilli**
- **Most people who have TB infection will have a reaction at injection site**

Syringe being filled with 0.1 ml of liquid tuberculin

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 16

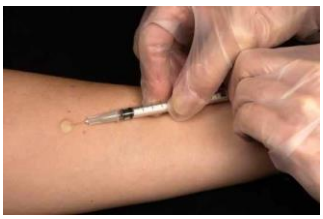
- Review slide content
- Explain that most people who have TB infection will have a reaction. Their immune system will recognize tuberculin because it is similar to tubercle bacilli.
- Note that the tuberculin used for the skin test is also known as purified protein derivative, or PPD. TST is also sometimes called a PPD skin test.

Mantoux Tuberculin Skin Test – Module 3, p. 8

Slide 17

Mantoux Tuberculin Skin Test (2)

0.1 ml of 5 tuberculin units of liquid tuberculin are injected between the layers of skin on forearm



HCW administering Mantoux TST

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 17

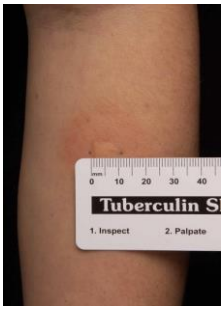
- Explain that the TST is given by using a single dose disposable syringe
- Review slide content
- Explain that a tuberculin unit is a standard strength of tuberculin
- State that tuberculin is NOT a vaccine

Mantoux Tuberculin Skin Test – Module 3, p. 8

Slide 18

Mantoux Tuberculin Skin Test (3)

- **Forearm should be examined within 48 to 72 hours by HCW**
- **Reaction is an area of induration (swelling) around injection site**
  - **Induration is measured in millimeters**
  - **Erythema (redness) is not measured**



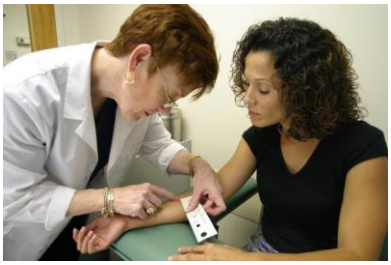
Only the induration is measured

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 18

- Review slide content
- Explain that patients should NOT be asked to read their own skin test results
- Explain that presence of erythema does NOT indicate a person has TB infection
- State that if the patient does not return in 48-72 hours the test must be repeated

Mantoux Tuberculin Skin Test – Module 3, p. 8

Slide 19	**Mantoux Tuberculin Skin Test Study Question 3.1** **What is the TST used for?** **The TST is used to determine whether a person has TB infection.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 19	• Introduce study questions • Ask participants to turn to p. 10 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 73*
Slide 20	**Mantoux Tuberculin Skin Test Study Question 3.2** **How is the TST given?** **The TST is given by a needle and syringe to inject 0.1 ml of 5 tuberculin units of liquid tuberculin between the layers of the skin, usually on the forearm.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 20	• Read question • Ask participants for answers *Answers – Module 3, p. 73*
Slide 21	**Mantoux Tuberculin Skin Test Study Question 3.3** **With the TST, when is the patient's arm examined?** **The patient's arm is examined by a health care worker 48 to 72 hours after the tuberculin is injected.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 21	• Read question • Ask participants for answers *Answers – Module 3, p. 73*

Slide 22	**Mantoux Tuberculin Skin Test Study Question 3.4** **How is the induration measured?** **The diameter of the indurated area is measured across the forearm; erythema (redness) around the indurated area is not measured.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 22	• Read question • Ask participants for answers *Answers – Module 3, p. 73*
Slide 23	**Diagnosis of Latent TB Infection (LTBI)** **Mantoux Tuberculin Skin Test Interpreting the Reaction** 23	• Introduce section
Slide 24	**Mantoux Tuberculin Skin Test (4)** **Interpreting the Reaction** **Interpretation of TST reaction depends on size of induration and person's risk factors for TB**  Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 24	• Review slide content *Interpreting the Reaction – Module 3, p. 12*

Slide 25	**Mantoux Tuberculin Skin Test (5)** **Interpreting the Reaction** • Induration of ≥ 5 mm is considered positive for: – People living with HIV – Recent contacts of people with infectious TB – People with chest x-ray findings suggestive of previous TB disease – People with organ transplants – Other immunosuppressed patients Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 25	• Review slide content *Interpreting the Reaction – Module 3, p. 12*
Slide 26	**Mantoux Tuberculin Skin Test (6)** **Interpreting the Reaction** • Induration of ≥ 10 mm is considered a positive reaction for: – People who have recently come to U.S. from areas where TB is common – People who abuse drugs – Mycobacteriology laboratory workers – People who live or work in high-risk congregate settings Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 26	• Review slide content *Interpreting the Reaction – Module 3, p. 12*
Slide 27	**Mantoux Tuberculin Skin Test (7)** **Interpreting the Reaction** • Induration of ≥ 10 mm is considered a positive reaction for: – People with certain medical conditions that increase risk for TB (e.g., silicosis, diabetes mellitus, severe kidney disease, certain types of cancer, and certain intestinal conditions) – Children younger than 5 years of age – Infants, children, or adolescents exposed to adults in high-risk categories Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 27	• Review slide content *Interpreting the Reaction – Module 3, p. 12*

Slide 28	**Mantoux Tuberculin Skin Test (8)** **Interpreting the Reaction** • **Induration of ≥ 15 mm is considered a positive reaction for people who have no known risk factors for TB** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 28	• Review slide content • Reiterate that targeted testing should only be done in high-risk groups *Interpreting the Reaction – Module 3, p. 12*
Slide 29	**Occupational Exposure** • **For people who may be exposed to TB on the job (e.g., HCWs, staff of nursing homes or correctional facilities), interpretation of TST depends on:** – **The employee's individual risk factors for TB** – **The risk of exposure to TB in the person's job** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 29	• Review slide content *Interpreting the TST Reaction for Occupational Exposure – Module 3, p. 13*
Slide 30	**Mantoux Tuberculin Skin Test Study Question 3.5** **What two factors determine the interpretation of a skin test reaction as positive or negative? What additional factor is considered for people who may be exposed to TB on the job?** • **Size of induration and risk factors for TB** • **An additional factor is the risk of exposure to TB in the person's job** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 30	• Ask participants to turn to p. 14 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 73*

Slide 31	**Mantoux Tuberculin Skin Test Study Question 3.6** **Name 5 groups of people for which ≥ 5 mm of induration is considered a positive reaction?** • People living with HIV • Recent contacts of people with infectious TB • People with chest x-ray findings suggestive of previous TB disease • Patients with organ transplants • Other immunosuppressed patients Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 31	• Read question • Ask participants for answers *Answers – Module 3, p. 73*
Slide 32	**Mantoux Tuberculin Skin Test Study Question 3.7** **Name seven groups of people for which ≥ 10 mm of induration is considered a positive reaction.** • People who have recently come to the U.S. (within the last 5 years) from areas where TB is common • People who abuse drugs • Mycobacteriology lab workers • People who live or work in high-risk congregate settings • People with certain medical conditions • Children younger than 5 years of age • Infants, children, and adolescents exposed to adults in high-risk categories Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 32	• Read question • Ask participants for answers *Answers – Module 3, p. 74*
Slide 33	**Mantoux Tuberculin Skin Test Study Question 3.8** **For which group of people is ≥ 15 mm of induration considered a positive reaction?** People with no risk factors for TB. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 33	• Read question • Ask participants for answers *Answers – Module 3, p. 74*

Slide 34	**Diagnosis of Latent TB Infection (LTBI)** **Mantoux Tuberculin Skin Test** **Factors that Affect the Reaction** 34	• Introduce section
Slide 35	**Mantoux Tuberculin Skin Test (9)** **False-Positive Reaction** • **Factors that may cause people to have a positive reaction even if they do not have TB infection:** – **Infection with nontuberculous mycobacteria (NTM)** – **BCG vaccination** – **Administration of incorrect antigen** – **Incorrect measuring or interpretation of TST reaction** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 35	• Explain that the TST is a valuable tool, but it is not perfect • Review slide content *False-Positive Reaction – Module 3, p. 17*
Slide 36	**Mantoux Tuberculin Skin Test (10)** **BCG Vaccine** • **People who have been vaccinated with BCG may have a false-positive TST reaction** – **However, there is no reliable way to distinguish a positive TST reaction caused by BCG vaccination from a reaction caused by true TB infection** • **Individuals should always be further evaluated if they have a positive TST reaction** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 36	• Explain that BCG is a vaccine for TB that is used in many countries. However, it is rarely used in the U.S. because studies have shown that it is not completely effective • Review slide content *BCG Vaccine – Module 3, p. 17*

Slide 37	**Mantoux Tuberculin Skin Test (11)** **False-Negative Reaction** • **Factors that may cause false-negative reactions:** – **Anergy** – **Recent TB infection (within past 8 to 10 weeks)** • **It can take 2 to 8 weeks after TB infection for body's immune system to react to tuberculin** – **Very young age (younger than 6 months)** – **Recent live-virus measles or smallpox vaccination** – **Incorrect method of giving the TST** – **Incorrect measuring or interpretation of TST reaction** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 37	• Review slide content *False-Negative Reaction – Module 3, p. 20*
Slide 38	**Mantoux Tuberculin Skin Test (12)** **Anergy** • **Inability to react to skin tests due to weakened immune system** • **Anergy testing is no longer routinely recommended** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 38	• Review slide content • Note that HIV infection is an important cause of anergy, but other conditions, such as cancer, measles, or other viral infections can also weaken the immune system *Anergy – Module 3, p. 20*
Slide 39	**Mantoux Tuberculin Skin Test (13)** **Any patient with symptoms of TB disease should be evaluated for TB disease, regardless of his or her skin test reaction.**  Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 39	• Review slide content • Stress that people with symptoms of TB should be evaluated for TB disease right away *Mantoux Tuberculin Skin Test – Module 3, p. 21*

Slide 40	**Mantoux Tuberculin Skin Test Study Question 3.9** **Name four factors that may cause false-positive reactions to the TST.** • Infection with nontuberculous mycobacteria (NTM) • BCG vaccination • Administration of incorrect antigen • Incorrect measuring or interpretation of TST reaction Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 40	• Ask participants to turn to p. 18 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 74*
Slide 41	**Mantoux Tuberculin Skin Test Study Question 3.10** **Is there a reliable way to distinguish a positive TST reaction caused by vaccination with BCG from a reaction caused by true TB infection?** No. Individuals who have had the BCG vaccine should be further evaluated for LTBI or TB disease the same as if they were not vaccinated with BCG. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 41	• Read question • Ask participants for answers *Answers – Module 3, p. 74*
Slide 42	**Mantoux Tuberculin Skin Test Study Question 3.11** **Name 6 factors that may cause false-negative reactions to the TST.** • Anergy • Recent TB infection (within past 8 to 10 weeks) • Very young age (younger than 6 months) • Recent live-virus measles or smallpox vaccination • Incorrect method of giving the TST • Incorrect measuring or interpretation of TST reaction Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 42	• Ask participants to turn to p. 22 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 75*

Slide 43	**Mantoux Tuberculin Skin Test Study Question 3.12** **What is anergy?** **The inability to react to skin tests because of a weakened immune system.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 43	• Read question • Ask participants for answers *Answers – Module 3, p. 75*
Slide 44	**Mantoux Tuberculin Skin Test Study Question 3.13** **After TB germs have been transmitted to someone, how long does it take before TB infection can be detected by the TST?** **2 to 8 weeks** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 44	• Read question • Ask participants for answers *Answers – Module 3, p. 75*
Slide 45	**Mantoux Tuberculin Skin Test Study Question 3.14** **What should be done if a patient has a negative TST result, but has symptoms of TB disease?** **Any patient with symptoms of TB disease should be evaluated for TB disease, regardless of his or her skin test reaction.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 45	• Read question • Ask participants for answers *Answers – Module 3, p. 75*

Slide 46

Diagnosis of Latent TB Infection (LTBI)

Interferon-Gamma Release Assays (IGRAs)

46

- Introduce section
- Ask who has had an IGRA test before
- Ask what an IGRA detects

Interferon-Gamma Release Assays – Module 3, pp. 25-31

Slide 47

Types of IGRAs

- **QuantiFERON®-TB Gold In-Tube (QFT-GIT)**
  - **Approved in 2007**
- **T-Spot®.*TB* test (T-SPOT)**
  - **Type of ELISpot assay**
  - **Approved in 2008**
- **CDC guidelines for IGRAs published in 2010**

QFT-GIT testing materials

T-Spot®.*TB* testing materials

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

47

- Review slide content

Types of IGRAs – Module 3, p. 25

Slide 48

IGRAs (1)

- **Blood tests that help diagnose *M. tuberculosis* infection**
- **Measures a person's immune reactivity to *M. tuberculosis***

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

48

- Review slide content

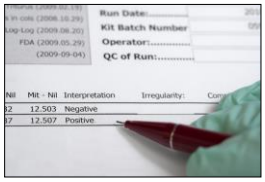
IGRAs – Module 3, p. 25

Slide 49	**IGRAs (2)** **Conducting the Test** • Confirm arrangements for testing in a qualified laboratory • Arrange for delivery of the blood sample to the laboratory in the time the laboratory specifies • Draw a blood sample from the patient according to the manufacturer's instructions • Schedule follow-up appointment for patient to receive test results • Based on test results, provide follow-up evaluation and treatment as needed Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 49	• Review slide content *Conducting an IGRA – Module 3, p. 25*
Slide 50	**IGRAs (3)** **How it Works** • Blood samples are mixed with antigens (protein substances that can produce an immune response) and incubated • If the person is infected with *M. tuberculosis*, blood cells will recognize antigens and release interferon gamma (IFN-γ) in response Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 50	• Review slide content *How IGRAs Work – Module 3, p. 26*
Slide 51	**IGRAs (4)** **Interpreting Results** • QFT-GIT Results – Based on amount of IFN-γ released in response to *M. tuberculosis* antigens and control substances • T-Spot Results – Based on number of IFN-γ producing cells (spots) produced Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 51	• Review slide content *Interpreting IGRA Results – Module 3, pp. 26-27*

Slide 52

IGRAs (5)
Interpreting Results

- **Qualitative test interpretation and quantitative assay measurements should be reported**
- **Laboratories use software provided by manufacturer to calculate results**
- **Results are sent to requesting health care provider**



QFT-GIT Results

- Review slide content
- Note that qualitative interpretations include positive, negative, indeterminate, or borderline. Quantitative measurements are reported as numerical values and may be useful for clinical decision making in combination with the patient's risk factors.

Interpreting IGRA Results – Module 3, pp. 26-27

Slide 53

IGRAs (6)
Report of Results

IGRA Result	Interpretation
Positive	***M. tuberculosis* infection likely**
Negative	***M. tuberculosis* infection unlikely, but cannot be excluded especially if** **1. Patient has signs and symptoms of TB** **2. Patient has a high risk for developing TB disease once infected with *M. tuberculosis***
Indeterminate	**The test did not provide useful information about the likelihood of *M. tuberculosis* infection. Repeating an IGRA or performing a TST may be useful.**
Borderline (T-Spot only)	**The test did not provide useful information about the likelihood of *M. tuberculosis* infection. Repeating an IGRA or performing a TST may be useful.**

- Review slide content

Interpreting IGRA Results – Module 3, pp. 26-27

Slide 54

IGRA Recommendations (1)

- **IGRAs are the preferred method of testing in**
  - **Groups of people who might be less likely to return for TST reading and interpretation**
  - **Persons who have received the BCG vaccine**
- **TST is the preferred method of testing for children younger than 5 years of age**

- Review slide content
- Explain that persons who may be less likely to return for a TST reading may include homeless persons or drug users

IGRA Recommendations – Module 3, p. 28

Slide 55

IGRA Recommendations (2)

- **Routine testing using both TST and IGRAs is NOT recommended**
- **Certain situations where results from both tests may be useful:**
  - **When the initial test is negative and:**
    - **Risk for infection, progression to disease, or a poor outcome is high**
    - **There is clinical suspicion for TB disease and confirmation of *M. tuberculosis* infection is desired**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 55

- Review slide content
- Explain that the risk for infection, progression to disease, or poor outcome may be higher for persons living with HIV or children younger than 5 years of age who are exposed to a person with infectious TB
- State that clinical suspicion for TB disease may include signs, symptoms, or radiographic evidence suggestive of TB disease

IGRA Recommendations – Module 3, p. 28

Slide 56

IGRA Recommendations (3)

- **Certain situations where results from both tests may be useful**
  - **When the initial test is positive and:**
    - **Additional evidence of infection is required to encourage the patient's acceptance and adherence to treatment**
    - **Person has a low risk of both infection and progression from infection to TB disease**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 56

- Review slide content

IGRA Recommendations – Module 3, p. 28

Slide 57

IGRA Advantages

- **Requires single patient visit to conduct test**
- **Results can be available in 24 hours**
- **Does not cause booster phenomenon which can happen with repeat TSTs**
- **BCG vaccination does not affect IGRA results**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 57

- Review slide content
- Explain that BCG vaccination does not affect IGRA results because the antigens used for IGRAs are not found in BCG vaccine strains

Note: Booster phenomenon is presented on slides 68-69

IGRA Advantages – Module 3, pp. 29-30

Slide 58	**IGRA Disadvantages and Limitations (1)** • Blood samples must be processed within 8 to 30 hours after collection • Errors in collecting or transporting blood specimens or in running and interpreting test can decrease accuracy • Limited data on its use in certain populations (e.g., children younger than 5, persons recently infected, immunocompromised persons, and serial testing) Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 58	• Review slide content *IGRA Disadvantages and Limitations – Module 3, p. 30*
Slide 59	**IGRA Disadvantages and Limitations (2)** • Limited data on its use to predict who will progress to TB disease • Tests may be expensive Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 59	• Review slide content *IGRA Disadvantages and Limitations – Module 3, p. 30*
Slide 60	**IGRAs** **Study Question 3.15** **What are the steps for conducting an IGRA?** • Confirm arrangements for testing in a qualified laboratory • Arrange for delivery of the blood sample to the laboratory • Draw a blood sample from the patient according to the manufacturer's instructions • Schedule follow-up appointment for patient to receive test results • Based on test results, provide follow-up evaluation and treatment as needed Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 60	• Ask participants to turn to p. 32 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 75*

Slide 61	**IGRAs** **Study Question 3.16** **How are IGRA results interpreted?** • QFT-GIT results are based on the amount of IFN-γ that is released in response to the antigens and control substances • T-Spot results are based on the number of IFN-γ producing cells (spots) produced • Both the standard qualitative test interpretation and the quantitative assay measurements should be reported Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 61	• Read question • Ask participants for answers *Answers – Module 3, p. 76*
Slide 62	**IGRAs** **Study Question 3.17** **How should negative IGRA results be interpreted?** • If the result is negative, the patient is unlikely to have *M. tuberculosis* infection • Patient may not require further evaluation unless they have signs and symptoms of TB disease Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 62	• Read question • Ask participants for answers *Answers – Module 3, p. 76*
Slide 63	**IGRAs** **Study Question 3.18** **What are 5 advantages for using an IGRA as compared to the TST?** • Requires a single patient visit • Results can be available in 24 hours • Does not cause the booster phenomenon • Laboratory test not affected by health care worker perception or bias • BCG vaccine does not affect IGRA results Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 63	• Read question • Ask participants for answers *Answers – Module 3, p. 76*

Slide 64	**Diagnosis of Latent TB Infection (LTBI)** **TB Testing Programs, the Booster Phenomenon, and Two-Step Testing** 64	• Introduce section *TB Testing Programs, Booster Phenomenon, and Two-Step Testing – Module 3, pp. 33-36*
Slide 65	**TB Testing Programs (1)** • Many residential facilities, health care settings, and other settings have TB testing programs – Employees and residents are periodically given TSTs or IGRAs • Testing programs: – Identify people who have LTBI or TB disease so they can be given treatment as needed – Determine whether TB is being transmitted in facility Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 65	• Review slide content • Ask participants what types of TB testing programs are used where they work *TB Testing Programs – Module 3, pp. 33-36*
Slide 66	**TB Testing Programs (2)** **Baseline Test** • Employees or residents are given TSTs or IGRAs when they first enter facility – If person is negative, they may be retested at regular intervals thereafter Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 66	• Review slide content *Baseline Test – Module 3, p. 33*

Slide 67

TB Testing Programs (3)
Conversion

- **Persons whose TST or IGRA result converts from negative to positive may have been infected with *M. tuberculosis***
  - **TST or IGRA conversions may indicate that TB is being transmitted in facility**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 67

- Review slide content
- Explain that people with skin test conversions are at high risk for developing TB disease because a conversion indicates that a person was infected relatively recently

Conversion – Module 3, p. 33

Slide 68

Booster Phenomenon

- Phenomenon in which people who are skin tested many years after they became infected with TB have:
  - Negative reaction to initial TST
  - Positive reaction to subsequent TST given up to one year later
- Occurs mainly in older adults
- May affect accuracy of baseline skin test
- TST can boost subsequent IGRA results

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 68

- Review slide content

Booster Phenomenon – Module 3, pp. 33-35

Slide 69

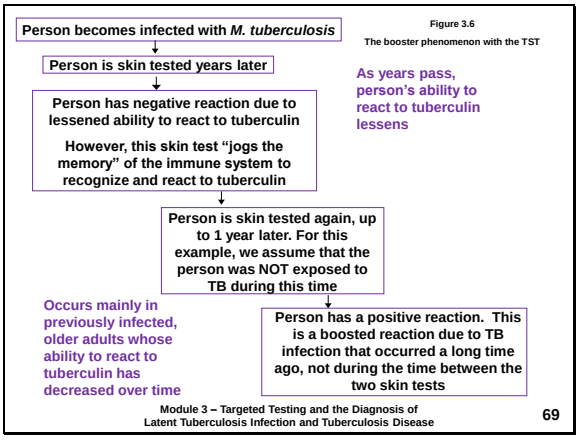


Figure 3.6
The booster phenomenon with the TST

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 69

- Explain the booster phenomenon using the flowchart

Booster Phenomenon – Module 3, p.34

Slide 70

Two-Step Testing

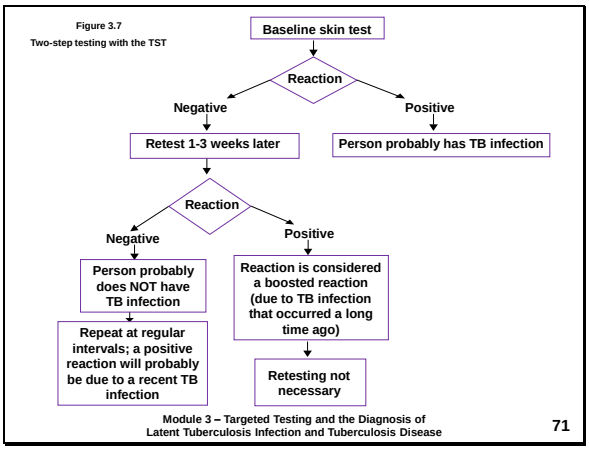
- Only conducted when TST is used
- Distinguishes between boosted reactions and reactions caused by recent infections
- Should be used for initial skin testing of persons who will be retested periodically
- If person's initial skin test is negative, they should be given a second test 1 to 3 weeks later
  - Second test positive: probably boosted reaction
  - Second test negative: considered uninfected

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 70

- Review slide content

Two-Step Testing – Module 3, pp. 35-36

Slide 71



Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 71

- Explain two-step testing using the flowchart

Two-Step Testing – Module 3, p. 35-36

Slide 72

Booster Phenomenon Study Question 3.19

What is the booster phenomenon?

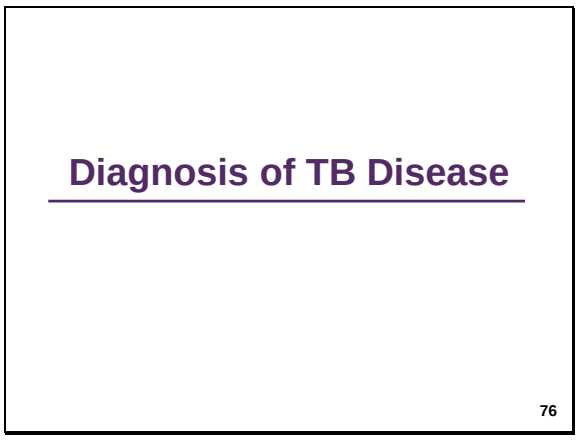
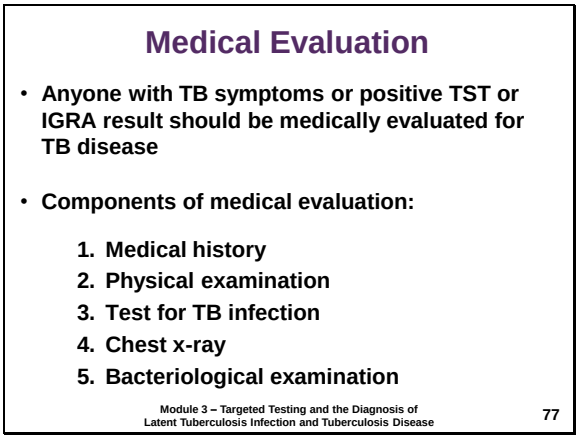
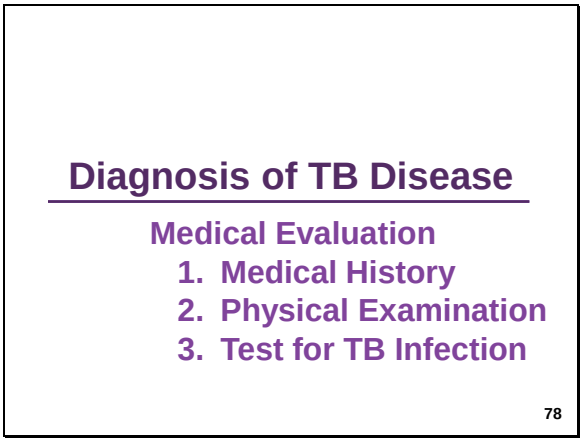
- Phenomenon in which people who are skin tested many years after becoming infected with *M. tuberculosis* have a negative reaction to an initial skin test, followed by a positive reaction to a skin test given up to a year later
- Occurs because the ability to react to tuberculin lessens over time in some people

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 72

- Introduce study questions
- Ask participants to turn to p. 37 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 3, p. 76

Slide 73	**Two-Step Testing** **Study Question 3.20** **What is the purpose of two-step testing?** **To distinguish between boosted reactions and reactions caused by recent infection.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 73	• Read question • Ask participants for answers *Answers – Module 3, p. 76*
Slide 74	**Two-Step Testing** **Study Question 3.21** **In what type of situation is two-step testing used?** **It is used in many programs for skin testing employees when they start their job.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 74	• Read question • Ask participants for answers *Answers – Module 3, p. 76*
Slide 75	**Two-Step Testing** **Study Question 3.22** **How is two-step testing done?** **If a person has a negative reaction to an initial skin test, he or she is given a second test 1 to 3 weeks later.** **–If reaction to second test is positive, it is considered a boosted reaction** **–If reaction to second test is negative, person is considered to be uninfected** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 75	• Read question • Ask participants for answers *Answers – Module 3, p. 77*

Slide 76		• Introduce section *Diagnosis of TB Disease – Module 3, pp. 39-68*
Slide 77		• Review slide content • Note that they key to diagnosing TB is for clinicians to "think TB" when they see a patient with symptoms of TB or abnormal chest x-ray findings *Medical Evaluation – Module 3, p. 39*
Slide 78		• Introduce section *Medical History, Physical Examination, and Test for TB Infection – Module 3, pp. 39-44*

Slide 79	**1. Medical History (1)** • **Clinicians should ask patients if they have:** – **Symptoms of TB disease** – **Been exposed to a person with infectious TB or have risk factors for exposure to TB** – **Any risk factors for developing TB disease** – **Had LTBI or TB disease before** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 79	• Review slide content • Explain that patients who have had TB disease before should be asked when they had disease and if it was treated *Medical History – Module 3, pp. 39-41*
Slide 80	**1. Medical History (2)** **General Symptoms of TB Disease** • **Fever** • **Chills** • **Night sweats** • **Weight loss** • **Appetite loss** • **Fatigue** • **Malaise** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 80	• Review slide content • Explain that people with TB disease may or may not have symptoms. However, most people with TB disease will have one or more symptoms. • Explain that usually when patients have symptoms, the symptoms have developed gradually and have been present for week or months *General Symptoms of TB Disease – Module 3, p. 40*
Slide 81	**1. Medical History (3)** **Symptoms of Pulmonary TB Disease** • **Cough lasting 3 or more weeks** • **Chest pain** • **Coughing up sputum or blood** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 81	• Review slide content *Symptoms of Pulmonary TB Disease – Module 3, p. 40*

Slide 82	**1. Medical History (4)** **Symptoms of Extrapulmonary TB Disease** • Symptoms of extrapulmonary TB disease depend on part of body that is affected • For example: – TB disease in spine may cause back pain – TB disease in kidneys may cause blood in urine Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 82	• Review slide content *Symptoms of Extrapulmonary TB Disease – Module 3, p. 40*
Slide 83	**2. Physical Examination** A physical examination cannot confirm or rule out TB disease, but can provide valuable information  Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 83	• Review slide content *Physical Examination – Module 3, p. 41*
Slide 84	**3. Test for TB Infection (1)** • Types of tests available for diagnosing TB infection in U.S.: – Mantoux TST – IGRAs • QFT-GIT • T-SPOT  Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 84	• Review slide content *Testing for TB Infection – Module 3, p. 42*

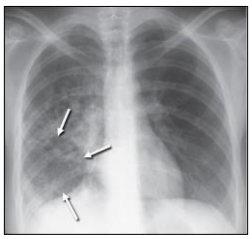
Slide 85	**3. Test for TB Infection (2)** • **Patients with symptoms of TB disease should always be evaluated for TB disease, regardless of their TST or IGRA test result** – **Clinicians should not wait for TST or IGRA results before starting other diagnostic tests** – **TST or IGRA should be given at the same time as other steps in the diagnosis of TB disease** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 85	• Review slide content • Explain that sometimes people with TB disease may have a negative test result *Testing for TB Infection – Module 3, p. 42*
Slide 86	**Diagnosis of TB Disease Study Question 3.23** **What are the 5 components for conducting a medical evaluation for diagnosing TB disease?** • **Medical history** • **Physical examination** • **Test for TB infection** • **Chest x-ray** • **Bacteriologic examinations** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 86	• Introduce study questions • Ask participants to turn to p. 43 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 77*
Slide 87	**Diagnosis of TB Disease Study Question 3.24** **What parts of a patient's medical history should lead a clinician to suspect TB?** • **Symptoms of TB disease** • **Exposure to a person who has infectious TB or has other risk factors for exposure to TB** • **Risk factors for developing TB disease** • **TB infection or TB disease in the past** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 87	• Read question • Ask participants for answers *Answers – Module 3, p. 77*

Slide 88	**Diagnosis of TB Disease** **Study Question 3.25** **What are the symptoms of pulmonary TB disease? What are the symptoms of extrapulmonary TB disease?** • General symptoms of TB disease: Weight loss, fatigue, malaise, fever, and night sweats • Pulmonary: Coughing, pain in chest, coughing up sputum or blood • Extrapulmonary: Depends on the part of the body that is affected by the disease. For example, TB of the spine may cause pain in the back; TB of the kidney may cause blood in the urine. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 88	• Read questions • Ask participants for answers *Answers – Module 3, p. 78*
Slide 89	**Diagnosis of TB Disease** **Study Question 3.26** **For patients with symptoms of TB disease, should clinicians wait for TST or IGRA results before starting other diagnostic tests?** No, clinicians should not wait for TST or IGRA results before starting other diagnostic tests. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 89	• Read question • Ask participants for answers *Answers – Module 3, p. 78*
Slide 90	**Diagnosis of TB Disease** **Medical Evaluation** **4. Chest X-Ray** 90	• Introduce section *Chest X-Ray – Module 3, p. 45*

Slide 91

4. Chest X-Ray (1)

- **When a person has TB disease in the lungs, the chest x-ray usually appears abnormal. It may show:**
  - **Infiltrates (collections of fluid and cells in lung tissue)**
  - **Cavities (hollow spaces within the lung)**



Abnormal chest x-ray with cavity

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 91

- Explain that chest x-rays are useful for diagnosing TB disease because pulmonary TB is the most common form of the disease
- Review slide content
- Explain that the patient in the picture has a cavity in the lower lobe

Chest X-Ray – Module 3, p. 45

Slide 92

4. Chest X-Ray (2)

- **Chest x-rays can:**
  - **Help rule out possibility of pulmonary TB disease in persons who have a positive TST or IGRA result**
  - **Check for lung abnormalities**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 92

- Review slide content

Chest X-Ray – Module 3, p. 45

Slide 93

4. Chest X-Ray (3)

- **Chest x-rays cannot confirm TB disease**
  - **Other diseases can cause lung abnormalities**
  - **Only bacteriologic culture can confirm patient has TB disease**
  - **Chest x-ray may appear unusual or even appear normal for persons living with HIV**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 93

- Review slide content

Chest X-Ray – Module 3, p. 46

Slide 94	**Chest X-Ray** **Study Question 3.27** **Name 2 purposes of the chest x-ray.** • Help rule out possibility of pulmonary TB disease in a person who has positive TST or IGRA result and no symptoms of TB • Check for lung abnormalities in people who have symptoms of TB disease Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 94	• Introduce study questions • Ask participants to turn to p. 47 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 78*
Slide 95	**Chest X-Ray** **Study Question 3.28** **Can the results of a chest x-ray confirm that a person has TB disease? Why or why not?** No. A variety of illnesses may produce abnormalities on chest x-ray. Only bacteriologic culture can prove whether or not a patient has TB disease. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 95	• Read question • Ask participants for answers *Answers – Module 3, p. 78*
Slide 96	**Diagnosis of TB Disease** **Medical Evaluation** **5. Bacteriologic Examination** 96	• Introduce section *Bacteriological Examination – Module 3, pp. 48-68*

Slide 97	**5. Bacteriologic Examination (1)** • TB bacteriologic examination is done in a laboratory that specifically deals with *M. tuberculosis* and other mycobacteria – Clinical specimens (e.g., sputum, urine) are examined and cultured in laboratory Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 97	• Review slide content *Bacteriological Examination – Module 3, p. 48*
Slide 98	**5. Bacteriologic Examination (2)** • Bacteriologic examination has 5 parts – Specimen collection – Examination of acid-fast bacilli (AFB) smears – Direct identification of specimen (nucleic acid amplification) – Specimen culturing and identification – Drug susceptibility testing Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 98	• Review slide content *Bacteriologic Examination – Module 3, p. 48*
Slide 99	**5. Bacteriologic Examination (3)** **Specimen Collection** • For pulmonary TB, specimens can be collected by: – Coughing up sputum sample – Inducing sputum sample – Bronchoscopy – Gastric washing  TB patient coughing up sputum in a sputum collection booth Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 99	• Review slide content • Explain that the image is of a TB patient coughing up sputum. The patient is sitting in a special sputum collection booth that prevents the spread of tubercle bacilli. *Specimen Collection – Module 3, pp. 48-51*

Slide 100

5. Bacteriologic Examination (4)
Sputum Sample Specimen Collection

- Easiest and least expensive method is to have patient cough into sterile container
- HCWs should coach and instruct patient
- Should have <u>at least 3</u> sputum specimens examined
  - Collected in 8 to 24 hour intervals
  - At least one early morning specimen

- Review slide content
- Note that health care workers should always supervise the patient when sputum is collected since patients are not always successful in providing an adequate specimen

Specimen Collection – Module 3, pp. 48-51

Slide 101

5. Bacteriologic Examination (5)
Induced Sputum Collection

- Induced sputum collection should be used if patient cannot cough up sputum on their own
- Patient inhales saline mist, causing deep coughing
- Specimen often clear and watery, should be labeled "induced specimen"

- Review slide content

Induced Sputum Collection – Module 3, p. 49

Slide 102

5. Bacteriologic Examination (6)
Bronchoscopy

- Bronchoscopy may be used:
  - If patient cannot cough up enough sputum
  - If an induced sputum cannot be obtained
- Procedure: instrument is passed through the mouth into the diseased portion of the lung to obtain sputum or lung tissue

Bronchoscopy being performed on a patient

- Review slide content

Bronchoscopy – Module 3, p. 49

Slide 103

5. Bacteriologic Examination (7)
Gastric Washing

- **Usually only used if sample cannot be obtained from other procedures**
- **Often used with children**
- **Tube is inserted through nose and into stomach to obtain gastric secretions that may contain sputum**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 103

- Review slide content
- Explain that the goal of gastric washing is to get a sample of gastric secretions that contains sputum that has been coughed into the throat and swallowed
- Explain that this technique is often used in children because most children produce little or no sputum when they cough

Gastric Washing – Module 3, p. 50

Slide 104

5. Bacteriologic Examination (8)
Extrapulmonary TB

- **Specimens other than sputum may be obtained**
- **Depends on part of body affected**
- **For example:**
  - **Urine samples for TB disease of kidneys**
  - **Fluid samples from area around spine for TB meningitis**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 104

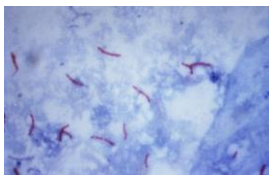
- Review slide content

Extrapulmonary TB – Module 3, p. 50

Slide 105

5. Bacteriologic Examination (9)
Examination of AFB Smears

- **Specimens are smeared onto glass slide and stained**
- **AFB are mycobacteria that remain stained after being washed in acid solution**



AFB smear

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 105

- Review slide content
- Explain that tubercle bacilli are one kind of AFB
- Note that in this photograph, the AFB (shown in red) are tubercle bacilli

Examination of AFB Smears – Module 3, pp. 53-54

Slide 106

5. Bacteriologic Examination (10)

Examination of AFB Smears

- **Number of AFB on smear are counted**
- **According to number of AFB seen, smears are classified as 4+, 3+, 2+, or 1+**
  - **For example, 4+ smear has 10 times as many AFB than 3+ smear**
- **If very few AFB are seen, the smear is classified by the actual number of AFB seen**
- **A negative smear does not rule out the possibility of TB**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 106

- Review slide content
- Explain that when very few AFB are seen, the smear is classified by the actual number of AFB seen and there is NOT a plus sign (+)

Examination of AFB Smears – Module 3, pp. 53-54

Slide 107

5. Bacteriologic Examination (11)

Examination of AFB Smears

Classification of Smear	Smear Result	Infectiousness of Patient
4+	Strongly positive	Probably very infectious
3+	Strongly positive	Probably very infectious
2+	Moderately positive	Probably infectious
1+	Moderately positive	Probably infectious
Actual number of AFB seen (no plus sign)	Weakly positive	Probably infectious
No AFB seen	Negative	May not be infectious

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 107

- Review slide content
- Explain that even though a smear is considered negative if no AFB are seen it does not rule out the possibility of TB disease because there can be AFB in the smear that were not seen

Examination of AFB Smears – Module 3, p. 54

Slide 108

Bacteriologic Examination Study Questions 3.29

What are the 4 ways to collect sputum specimens? Indicate which procedure is the least expensive and easiest to perform.

- **Patient simply coughs up sputum and the sputum is collected in a sterile container. This is the least expensive and easiest procedure.**
- **Induced sputum**
- **Bronchoscopy**
- **Gastric washing**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 108

- Introduce study questions
- Ask participants to turn to p. 55 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 3, p. 79

Slide 109	**Bacteriologic Examination Study Question 3.30** **What do laboratory personnel look for in a smear?** **Acid-fast bacilli (AFB)** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 109	• Read question • Ask participants for answers *Answers – Module 3, p. 79*
Slide 110	**Bacteriologic Examination Study Question 3.31** **What does a positive smear indicate about a patient's infectiousness?** **Patients who have many tubercle bacilli seen in their sputum have a positive smear. Patients who have positive smears are considered infectious because they can cough many tubercle bacilli into the air.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 110	• Read question • Ask participants for answers *Answers – Module 3, p. 79*
Slide 111	**Diagnosis of TB Disease** **Medical Evaluation** **5. Bacteriologic Examination (continued)** 111	• Introduce section

Slide 112	**5. Bacteriologic Examination (12)** **Nucleic Acid Amplification Tests (NAA)** • NAA tests directly identify *M. tuberculosis* from sputum specimens by: – Amplifying (copying) DNA and RNA segments • Can help guide clinician's decision for patient therapy and isolation • Does not replace need for AFB smear, culture, or clinical judgment Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 112	• Review slide content *Nucleic Acid Amplification Tests – Module 3, p. 58*
Slide 113	**5. Bacteriologic Examination (13)** **Nucleic Acid Amplification Tests (NAA)** • If NAA test and AFB smears are positive: – Patient is presumed to have TB and should begin treatment • If NAA test is negative and AFB smears are positive: – Patient may have nontuberculous mycobacteria infection (NTM) Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 113	• Review slide content *Nucleic Acid Amplification Tests – Module 3, p. 58*
Slide 114	**5. Bacteriologic Examination (14)** **Xpert MTB/RIF Assay** • Xpert MTB/RIF assay is a NAA test that simultaneously detects *Mycobacterium tuberculosis* complex (MTBC) and resistance to rifampin • To conduct this test, a sputum sample is mixed with the reagent that is provided with the assay • A cartridge containing the mixture is placed in the GeneXpert machine • Results are available in less than 2 hours Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 114	• Review slide content *Xpert MTB/RIF Assay – Module 3, pp. 58-59*

Slide 115

5. Bacteriologic Examination (15)
Xpert MTB/RIF Assay

- **Results that are positive for MTBC and for rifampin resistance indicate that the bacteria have a high probability of resistance to rifampin**
  - **Should be confirmed by additional rapid testing**
- **If rifampin resistance is confirmed, rapid molecular testing for drug resistance to both first-line and second-line drugs should be performed so an effective treatment regimen can be selected**

- Review slide content

Xpert MTB/RIF Assay – Module 3, pp. 58-59

Slide 116

5. Bacteriologic Examination (16)
Culturing and Identifying Specimen

- **Culturing:**
  - **Determines if specimen contains *M. tuberculosis***
  - **Confirms diagnosis of TB disease**
- **All specimens should be cultured**

Colonies of *M. tuberculosis* growing on media

- Review slide content
- Explain that the image is of colonies of *M. tuberculosis* growing on solid media

Culturing and Identifying Specimen – Module 3, pp. 59-61

Slide 117

5. Bacteriologic Examination (17)
Culturing and Identifying Specimen

- **Step 1: Detect growth of mycobacteria**
  - **Solid media: 3 to 6 weeks**
  - **Liquid media: 4 to 14 days**
- **Step 2: Identify organism that has grown**
  - **Nucleic acid probes: 2 to 4 hours**

- Review slide content
- Explain that mycobacteria grow very slowly
- Explain that it is necessary to identify the organism that has grown because all types of mycobacteria can grow on media. Laboratory tests must be done to determine whether the organism is *M. tuberculosis* or one of the nontuberculous mycobacteria.

Culturing and Identifying Specimen – Module 3, pp. 59-61

Slide 118	**5. Bacteriologic Examination (18)** **Culturing and Identifying Specimen** • **Positive culture: *M. tuberculosis* identified in patient's culture** – **Called *M. tuberculosis* isolate** – **Confirms diagnosis of TB disease** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 118	• Review slide content *Culturing and Identifying Specimen – Module 3, pp. 59-61*
Slide 119	**5. Bacteriologic Examination (19)** **Culturing and Identifying Specimen** • **Negative culture: *M. tuberculosis* NOT identified in patient's culture** – **Does not rule out TB disease** – **Some patients with negative cultures are diagnosed with TB based on signs and symptoms** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 119	• Review slide content *Culturing and Identifying Specimen – Module 3, pp. 59-61*
Slide 120	**5. Bacteriologic Examination (20)** **Culturing and Identifying Specimen** • **Bacteriological examinations are important for assessing infectiousness and response to treatment** • **Specimens should be obtained monthly until 2 consecutive cultures are negative** • **Culture conversion is the most important objective measure of response to treatment** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 120	• Review slide content • Explain that culture conversion is when the culture goes from positive growth to negative growth of *M. tuberculosis* *Culturing and Identifying Specimen – Module 3, pp. 59-61*

Slide 121

5. Bacteriologic Examination (21)
Drug Susceptibility Testing

- **Conducted when patient is first found to have positive culture for TB**
- **Determines which drugs kill tubercle bacilli**
- **Tubercle bacilli killed by a particular drug are susceptible to that drug**
- **Tubercle bacilli that grow in presence of a particular drug are resistant to that drug**

- Review slide content
- Explain that the drug susceptibility pattern of a strain of tubercle bacilli is the list of drugs to which the strain is susceptible and to which it is resistant
- Stress that it is crucial to identify drug resistance as early as possible to ensure effective treatment

Drug Susceptibility Testing – Module 3, pp. 64-66

Slide 122

5. Bacteriologic Examination (22)
Drug Susceptibility Testing

- **Tests should be repeated if:**
  - **Patient has positive culture after 3 months of treatment; or**
  - **Patient does not get better**

Drug susceptibility testing on solid media

- Review slide content
- Explain that the image is of drug susceptibility testing on solid media. Organisms are resistant to the drug in the upper right compartment and susceptible to the drugs in the lower compartments. The upper left contains no drugs.

Drug Susceptibility Testing – Module 3, pp. 64-66

Slide 123

5. Bacteriologic Examination (23)
Types of Drug-Resistant TB

Mono-resistant	**Resistant to any one TB treatment drug**
Poly-resistant	**Resistant to at least any two TB drugs (but not both isoniazid and rifampin)**
Multidrug-resistant (MDR TB)	**Resistant to at least isoniazid and rifampin, the two best first-line TB treatment drugs**
Extensively drug-resistant (XDR TB)	**Resistant to isoniazid and rifampin, PLUS resistant to any fluoroquinolone AND at least 1 of the 3 injectable second-line drugs (e.g., amikacin, kanamycin, or capreomycin)**

- Explain that these are four types of drug-resistant TB
- Review slide content

Types of Drug-Resistant TB – Module 3, p. 64

Slide 124	**5. Bacteriologic Examination (24)** **Growth-Based Drug Susceptibility Testing** • Growth-based susceptibility testing can be done using a liquid or solid medium method • Organisms that grow in media containing a specific drug are considered resistant to that drug • Liquid medium methods are faster than solid media methods for determining susceptibility to first-line TB medications • Results can be obtained within 7 to 14 days for liquid medium method and up to 21 days for solid medium method Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 124	• Review slide content *Growth-Based Drug Susceptibility Testing – Module 3, p. 65*
Slide 125	**5. Bacteriologic Examination (25)** **Molecular Detection of Drug Resistance** • Molecular tests provide preliminary guidance on effective therapy for TB patients • These tests should be considered for patients with the following characteristics: – High risk of rifampin resistance, including MDR TB; – First-line drug susceptibility results are available and show resistance to rifampin; – Infectiousness poses a risk to vulnerable contacts; and – Contraindications to essential first-line medications Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 125	• Review slide content *Growth-Based Drug Susceptibility Testing – Module 3, p. 65*
Slide 126	**Culture Specimen** **Study Question 3.32** **Why is it necessary to culture a specimen?** **It is necessary to culture a specimen to determine whether the specimen contains *M. tuberculosis* and to confirm diagnosis of TB disease. Additionally, culture is needed for genotyping and for performing drug susceptibility testing.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 126	• Introduce study questions • Ask participants to turn to p. 67 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 3, p. 79*

Slide 127	**Culture Specimen Study Question 3.33** **What does a positive culture for *M. tuberculosis* mean? How is this important for the TB diagnosis?** **It means that *M. tuberculosis* has been identified in a patient's culture. A positive culture for *M. tuberculosis* confirms the diagnosis of TB disease.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 127	• Read question • Ask participants for answers *Answers – Module 3, p. 80*
Slide 128	**Drug Susceptibility Study Question 3.34** **Why are drug susceptibility tests done?** **To determine which drugs will kill the tubercle bacilli that are causing disease in a particular patient. Test results can help clinicians choose the appropriate drugs for each patient.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 128	• Read question • • Ask participants for answers *Answers – Module 3, p. 80*
Slide 129	**Drug Susceptibility Study Question 3.35** **How often should drug susceptibility tests be done?** • **Should be done when the patient is first found to have a positive culture for *M. tuberculosis*** • **Tests should be repeated if a patient has a positive culture for *M. tuberculosis* after 3 months of treatment or if a patient is not getting better** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 129	• Read question • Ask participants for answers *Answers – Module 3, p. 80*

Slide 130

Reporting TB Cases

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- Introduce section

Reporting TB Cases – Module 3, p. 63

Slide 131

Reporting TB Cases

- **TB programs report TB cases to CDC using a standard case report form called the *Report of Verified of Case of Tuberculosis* (RVCT)**
  - **All cases that meet criteria are called verified TB cases**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

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- Review slide content
- State that health care providers are required by law to report TB cases to state or local health departments
- Note that the image is of the first page of the RVCT form

Reporting TB Cases – Module 3, p. 63

Slide 132

Criteria for Reporting TB Cases (1)

Cases that meet one of these four sets of criteria are counted as verified TB cases:

1. **Patient has positive culture for *M. tuberculosis***
2. **Patient has positive NAA test for *M. tuberculosis***
   - **NAA test must be accompanied by culture for mycobacteria species**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease

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- Explain that each reported TB case is checked to make sure it meets certain criteria. All cases that meet the criteria, called verified TB cases, are counted each year
- Review slide content

Reporting TB Cases – Module 3, p. 63

Slide 133	**Criteria for Reporting TB Cases (2)** 3. Patient has positive AFB smear, but culture has not been obtained or is falsely negative or contaminated 4. In the absence of laboratory confirmation, patient meets all of the following criteria: • Positive TST or IGRA, • Other signs and symptoms of TB disease, • Treatment with 2 or more TB drugs, and • A completed diagnostic evaluation. Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 133	• Review slide content *Reporting TB Cases – Module 3, p. 63*
Slide 134	**Criteria for Reporting TB Cases (3)** • Cases that do not meet any of these sets of criteria may be counted as a verified TB case if health care provider has reported the case and decided to treat the patient for TB disease Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 134	• Review slide content • Provide an example of this situation (e.g., a patient who is anergic and has a negative culture for *M. tuberculosis* but who has signs and symptoms of TB disease may be counted as a verified case of TB if the health care provider has reported the case and decided to treat the patient for TB disease) *Reporting TB Cases – Module 3, p. 63*
Slide 135	**Case Studies** 135	• Introduce case studies

Slide 136	**Module 3: Case Study 3.1** **Which of the following patients have a positive TST reaction? Circle the best answer(s).** a. Mr. West, 36 yrs. old, HIV infected, 8 mm induration b. Ms. Hernandez, 26 yrs. old, native of Mexico, 7 mm induration c. Ms. Jones, 56 yrs. old, diabetic, 12 mm induration d. Mr. Sung, 79 yrs. old, nursing home resident, 11 mm induration e. Mr. Williams, 21 yrs. old, no known risk factors, 13 mm induration f. Ms. Marcos, 42 yrs. old, chest x-rays findings suggestive of previous TB, 6 mm induration g. Ms. Rayle, 50 yrs. old, husband has pulmonary TB, 9 mm of induration Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 136	• Ask participants to turn to p. 16 (if participants have print-based modules) • Read case study • Ask participants which of the patients have a positive TST reaction *Answers – Module 3, p. 81*
Slide 137	**Module 3: Case Study 3.2 (1)** **A 30 year-old man who recently immigrated to the United States from India is given a TST and found to have 14 mm of induration. He reports that he was vaccinated with BCG as a child. He also says that his wife was treated for pulmonary TB disease last year.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 137	• Ask participants to turn to p. 19 (if participants have print-based modules) • Read case study *Case Study 3.2 – Module 3, p. 19*
Slide 138	**Module 3: Case Study 3.2 (2)** **How should this man's results be interpreted?** • Positive reaction to TST • Should be further evaluated for LTBI or TB disease **What factors make it more likely that this man's positive reaction is due to TB infection?** • From area of the world where TB is common • Wife had pulmonary TB Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 138	• Read case study questions • Ask participants for answers *Answers – Module 3, p. 82*

Slide 139	**Module 3: Case Study 3.3 (1)** **Mr. Bell comes to the TB clinic for a TST. He believes that he has been exposed to TB, and he knows he is at high risk for TB because he is HIV infected. He is given a TST, and his reaction is read 48 hours later as 0 mm of induration.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 139	• Ask participants to turn to p. 24 (if participants have print-based modules) • Read case study *Case Study 3.3 – Module 3, p. 24*
Slide 140	**Module 3: Case Study 3.3 (2)** **What are 3 ways to interpret this result?** • **May not have TB infection** • **May be anergic** • **It may be less than 8 to 10 weeks since he was exposed to TB** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 140	• Read case study question • Ask participants for answers *Answers – Module 3, p. 82*
Slide 141	**Module 3: Case Study 3.4 (1)** **Ms. Wilson is a 60-year-old nurse. When she started a job at the local hospital, she was given a TST, her first test in 25 years. Her reaction was read 48 hours later as 0 mm induration. Six months later, she was retested as part of the TB testing program in the unit where she works. Her skin test reaction was read 48 hours later as 11 mm of induration.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 141	• Ask participants to turn to p. 38 (if participants have print-based modules) • Read case study *Case Study 3.4 – Module 3, p. 38*

Slide 142	**Module 3: Case Study 3.4 (2)** **What are 2 ways to interpret this result?** • She was exposed to TB sometime in the 6 months between her first and second skin tests • She had a boosted reaction Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 142	• Read case study question • Ask participants for answers *Answers – Module 3, p. 83*
Slide 143	**Module 3: Case Study 3.5 (1)** **Mr. Lee has a cough and other symptoms of TB disease, and he is evaluated with a chest x-ray. However, he is unable to cough up any sputum on his own for the bacteriologic examination.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 143	• Ask participants to turn to p. 52 (if participants have print-based modules) • Read case study *Case Study 3.5 – Module 3, p. 52*
Slide 144	**Module 3: Case Study 3.5 (2)** **What should be done?** **Since he is unable to cough up sputum, other techniques can be used to obtain sputum. First, clinicians can try to obtain an induced sputum sample. If they cannot obtain the sample, a bronchoscopy or gastric washing may be done.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 144	• Read case study question • Ask participants for answers *Answers – Module 3, p. 83*

Slide 145	**Module 3: Case Study 3.6 (1)** **Ms. Thompson gave three sputum specimens, which were sent to the laboratory for smear examination and culture. The smear results were reported as 4+, 3+, and 4+.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 145	• Ask participants to turn to p. 56 (if participants have print-based modules) • Read case study *Case Study 3.6 – Module 3, p. 56*
Slide 146	**Module 3: Case Study 3.6 (2)** **What do these results tell you about Ms. Thompson's diagnosis and her infectiousness?** • **Results show that Ms. Thompson's sputum specimens contain many acid-fast bacilli** • **Clinicians should suspect that she has TB disease and should consider her infectious since her smears are positive** • **It is possible that the AFB are mycobacteria other than tubercle bacilli** • **Diagnosis cannot be confirmed until culture results are available** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 146	• Read case study question • Ask participants for answers *Answers – Module 3, p. 84*
Slide 147	**Module 3: Case Study 3.7 (1)** **Mr. Sagoo has symptoms of TB disease and a cavity on his chest x-ray, but all of his sputum smears are negative for acid-fast bacilli.** Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 147	• Ask participants to turn to p. 57 (if participants have print-based modules) • Read case study *Case Study 3.7 – Module 3, p. 57*

Slide 148

Module 3: Case Study 3.7 (2)

Does this rule out the diagnosis of pulmonary TB disease?

No

Why or why not?

***M. tuberculosis* may grow in the cultures even though there were no acid fast bacilli on the smear. Mr. Sagoo's symptoms and his abnormal chest x-ray suggest that he has pulmonary TB disease.**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 148

- Read case study questions
- Ask participants for answers

Answers – Module 3, p. 84

Slide 149

Module 3: Case Study 3.8 (1)

In the public health clinic, you see a patient, Ms. Sanchez, who complains of weight loss, fever, and a cough of 4 weeks duration. When questioned, she reports that she has been treated for TB disease in the past and that she occasionally injects heroin.

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 149

- Ask participants to turn to p. 68 (if participants have print-based modules)
- Read case study

Case Study 3.8 – Module 3, p. 68

Slide 150

Module 3: Case Study 3.8 (2)

What parts of Ms. Sanchez's medical history lead you to suspect TB disease?

- **Symptoms of TB disease (weight loss, fever, persistent cough)**
- **Past treatment for TB disease**
- **History of injecting illegal drugs**

What diagnostic tests should be done?

- **Chest x-ray**
- **Sputum smear and culture**
- **Drug susceptibility testing**

Module 3 – Targeted Testing and the Diagnosis of Latent Tuberculosis Infection and Tuberculosis Disease 150

- Read case study questions
- Ask participants for answers
- Ask if there are any questions about Module 3 before moving on to Module 4

Answers – Module 3, p. 84

Module 4: Treatment of Latent Tuberculosis Infection and Tuberculosis Disease

Facilitation Tips

Background

In this module, participants will learn about the principles of treating latent TB infection (LTBI) and TB disease. A person with LTBI is treated to prevent them from progressing to TB disease. Some people with LTBI are at very high risk of developing TB disease, and they should receive high priority for LTBI treatment. Patients with LTBI who do not complete treatment as prescribed can develop TB disease.

TB disease is treated to cure the patient and to stop the spread of TB. As a health care worker, participants may be responsible for ensuring that TB patients take their medications as prescribed. This is very important because patients with TB disease who do not complete treatment as prescribed may become infectious and spread TB to others or develop drug-resistant TB.

This module also explains the possible side effects of the drugs used to treat LTBI and TB disease. If participants work with TB patients, they should be aware of the signs and symptoms of these side effects.

Learning Objectives

After this presentation, participants will be able to

1. List the groups of people who should receive high priority for LTBI treatment.
2. Describe treatment regimens for LTBI.
3. Describe treatment regimens for TB disease.
4. Describe the principles of preventing drug resistance.
5. Describe patient monitoring during LTBI and TB disease treatment.
6. Describe TB treatment adherence strategies.
7. List the common adverse reactions to the drugs used to treat LTBI and TB disease.

Module Overview

Time	Activity	Content	Slides
5 min.	Presentation	Introduction	Slides 1-4
35 min.	Presentation	Treatment of LTBI	Slides 5-67
40 min.	Presentation	Treatment of TB Disease	Slides 68-133
10 min.	Case Studies	Case Studies	Slides 134-150
90 min.	**Total Time**		

		Facilitation Tips
Slide 1	*Self-Study Modules on Tuberculosis* Module 4 **Treatment of Latent Tuberculosis Infection and Tuberculosis Disease**	• Introduce Module 4
Slide 2	**Module 4: Objectives** **At completion of this module, learners will be able to:** 1. List groups of people who should receive high priority for latent TB infection (LTBI) treatment 2. Describe treatment regimens for LTBI 3. Describe treatment regimens for TB disease 4. Describe principles of preventing drug resistance 5. Describe patient monitoring during LTBI and TB disease treatment 6. Describe TB treatment adherence strategies 7. List common adverse reactions to drugs used to treat LTBI and TB disease Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 2	• State objectives of presentation *Background and Objectives - Module 4, p. 1*
Slide 3	**Module 4: Overview** • Treatment of LTBI – Patient Medical Evaluation – LTBI Treatment Regimens – Special Considerations for LTBI Treatment • Treatment of TB Disease – TB Disease Treatment Regimens Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 3	• Review slide content

Slide 4	**Module 4: Overview (cont.)** • Treatment of TB Disease (cont.) – Special Considerations and Alternative Treatment Regimens – Treatment and Monitoring Plan and Adverse Reactions – Adherence and Evaluating Patients' Response to Treatment – Role of Public Health Workers • Case Studies Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 4	• Review slide content
Slide 5	**Treatment of Latent TB Infection (LTBI)** 5	• Introduce section • Ask who should be treated for LTBI • Ask why people with LTBI should be treated *Treatment of LTBI - Module 4, pp. 4-21*
Slide 6	**Treatment of LTBI (1)** • LTBI is treated to prevent the development of TB disease • LTBI is treated with medication Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 6	• Review slide content *Treatment of LTBI - Module 4, p. 4*

Slide 7	**Treatment of LTBI (2)** • Targeted testing should be used to identify and treat people who are: – At high risk for exposure to or infection with *M. tuberculosis* – At high risk for developing TB disease once infected with *M. tuberculosis* • People in these groups should receive high priority for LTBI treatment if they have a positive tuberculin skin test (TST) or interferon-gamma release assay (IGRA) Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 7	• Explain that some groups are at higher risk for TB than others • Review slide content *Treatment of LTBI - Module 4, p. 4*
Slide 8	**High Priority for LTBI Treatment (1)** • High-priority groups for LTBI treatment if positive IGRA or TST result of ≥ 5 mm – Recent contacts of people with infectious TB disease – People living with HIV – People with chest x-ray findings suggestive of previous TB disease – Patients with an organ transplant – Other immunosuppressed patients Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 8	• Review slide content • Explain that other immunosuppressed patients include patients on prolonged therapy with corticosteroids equivalent to/greater than 15mg per day of prednisone for one month or more or those taking TNF-alpha antagonists *High Priority for LTBI Treatment - Module 4, p. 5*
Slide 9	**High Priority for LTBI Treatment (2)** • High-priority groups for LTBI treatment if positive IGRA or TST result of ≥ 10 mm: – People who have come to U.S. from countries where TB is common – People who abuse drugs – People who live or work in high-risk congregate settings – People who work in mycobacteriology laboratories Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 9	• Review slide content *High Priority for LTBI Treatment - Module 4, p. 5*

Slide 10	**High Priority for LTBI Treatment (3)** • High-priority groups for LTBI treatment if positive IGRA or TST result of ≥ 10 mm (cont.): – People with medical conditions that increase risk of TB disease – Children younger than 5 years of age – Infants, children, and adolescents exposed to adults in high-risk groups Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 10	• Review slide content *High Priority for LTBI Treatment - Module 4, p. 5*
Slide 11	**Low Priority for LTBI Treatment** • Individuals without any risk factors generally should not be tested for TB infection • However, individuals with no risk factors who are tested and have a positive IGRA or TST result of ≥ 15 mm should be evaluated for LTBI treatment Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 11	• Review slide content *Low Priority for LTBI Treatment - Module 4, p. 4*
Slide 12	**Treatment of Latent TB Infection (LTBI)** **Patient Medical Evaluation** 12	• Introduce section *Patient Medical Evaluation – Module 4, pp. 5-6*

Slide 13	**Patient Medical Evaluation (1)** **Medical evaluations should be done to:** 1. **Exclude possibility of TB disease** 2. **Determine whether patient has ever been treated for TB infection or TB disease** 3. **Find out if patient has any medical conditions that may complicate therapy** 4. **Establish and build rapport with patient** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 13	• Review slide content *Patient Medical Evaluation – Module 4, pp. 5-6*
Slide 14	**Patient Medical Evaluation (2)** 1. **Exclude possibility of TB disease** • **Treating TB disease with LTBI treatment regimen can lead to drug resistance** • **Clinicians should determine if the patient has symptoms of TB disease** • **Clinicians should evaluate the patient with a chest x-ray** • **Patients with symptoms or chest x-ray findings of TB disease should be given TB disease treatment, not LTBI treatment** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 14	• Review slide content • Explain that treating TB disease with an LTBI treatment regimen can lead to drug resistance since LTBI is usually only treated with a single drug *Patient Medal Evaluation – Module 4, p. 5*
Slide 15	**Patient Medical Evaluation (3)** 2. **Determine whether patient has ever been treated for TB infection or TB disease** • **Patients who have been adequately treated should not be treated again** • **TST or IGRA results cannot determine if patient has received treatment for LTBI or TB disease; or if they have been re-infected after treatment** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 15	• Review slide content • Explain that people who have a positive TST reaction will have another positive reaction if they are skin tested later in their lives, regardless of whether they have received treatment • Note that there is not enough data on the ability of either test to detect re-infection after treatment for both LTBI and TB disease *Patient Medical Evaluation – Module 4, pp. 5-6*

Slide 16

Patient Medical Evaluation (4)

3. **Find out if patient has any medical conditions that may complicate therapy or require more careful monitoring. These patients include:**
   - **People living with HIV**
   - **People with history of liver disorder or disease**
   - **People who use alcohol regularly**
   - **Women who are pregnant or just had a baby (within 3 months of delivery)**
   - **People who are taking other medications that may increase the risk of hepatitis**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 16

- Review slide content

Patient Medical Evaluation – Module 4, p. 6

Slide 17

Patient Medical Evaluation (5)

For patients with the medical conditions listed on the previous slide, baseline laboratory liver function tests (to detect injury to liver) are recommended before starting LTBI treatment.

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 17

- Review slide content

Patient Medical Evaluation – Module 4, p. 6

Slide 18

Patient Medical Evaluation (6)

- **It is important to find out if:**
  - **Patient has ever had adverse reactions to LTBI drugs**
  - **Patient is currently on medications that may interact with LTBI drugs**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 18

- Review slide content

Patient Medical Evaluation – Module 4, p. 6

Slide 19	**Patient Medical Evaluation (7)** 4. Establish and build rapport with patient • Health care workers (HCWs) should highlight important aspects of treatment, such as: –Benefits of treatment –Importance of adherence to treatment –Possible adverse reactions –Establishment of a follow-up plan Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 19	• Review slide content *Patient Medical Evaluation – Module 4, p. 6*
Slide 20	**Patient Medical Evaluation (8)** Because of the interaction between TB and HIV, HCWs should also recommend that patients undergo HIV counseling and testing Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 20	• Review slide content *Patient Medical Evaluation – Module 4, p. 6*
Slide 21	**Treatment of Latent TB Infection (LTBI)** **LTBI Treatment Regimens** 21	• Introduce section *LTBI Treatment Regimens – Module 4, pp. 6-9*

Slide 22

LTBI Treatment Regimens (1)
Isoniazid

- Isoniazid (INH) daily for 9 months is very effective in preventing the development of TB disease
- INH may also be given for 6 months
  - Cost effective and patients may find it easier to adhere, BUT:
    - Not as effective if given for less than 6 months
    - Not recommended for people living with HIV, individuals with previous TB disease, or children

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 22

- Explain that there are several treatment regimens available for LTBI
- Note that until recently, the standard regimen for LTBI was INH for 9 months
- Review slide content

Regimens for LTBI Treatment – Module 4, p. 7

Slide 23

LTBI Treatment Regimens (2)
Isoniazid and Rifapentine (12-Dose Regimen)

- Combination of INH and rifapentine (RPT) given in 12, once-a-week doses under DOT, if possible
- Recommended for patients who:
  - Are 12 years of age or older
  - Were recently exposed to infectious TB
  - Have a TST or IGRA conversion from negative to positive
  - Have chest x-ray findings of previous TB disease
- Regimen may be used in otherwise healthy HIV-infected persons who are:
  - 12 years of age or older
  - Not on antiretroviral therapy (ART), except those taking an efavirenz or raltegravir-based ART regimen

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 23

- Review slide content

Regimens for LTBI Treatment – Module 4, p. 7

Slide 24

LTBI Treatment Regimens (3)
Isoniazid and Rifapentine (12-Dose Regimen)

- This regimen is not recommended for
  - Children younger than 2 years of age
  - People with HIV/AIDS who are taking certain ART regimens
  - People presumed to be infected with isoniazid or rifampin-resistant *M. tuberculosis*
  - Pregnant women or women expecting to become pregnant within the 12–week regimen

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 24

- Review slide content

Regimens for LTBI Treatment – Module 4, p. 7

Slide 25

LTBI Treatment Regimens (4)
Rifampin

- **Rifampin (RIF) is also recommended for people with a positive TST or IGRA result**
  - **Especially if the person has been exposed to INH-resistant TB**
- **RIF should be given daily for 4 months**
- **RIF should not be used with certain combinations of ART**
- **In some cases, rifabutin (RFB) may be substituted when RIF cannot be used**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 25

- Review slide content

Regimens for LTBI Treatment – Module 4, p. 8

Slide 26

LTBI Treatment Regimens (5)
Rifampin and Pyrazinamide

- **CDC advises <u>against</u> using a combination of RIF and pyrazinamide (PZA) due to serious side effects such as:**
  - **Severe liver injury**
  - **Death**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 26

- Review slide content

Regimens for LTBI Treatment – Module 4, p. 8

Slide 27

LTBI Treatment Regimens (6)

Drug	Duration (months)	Frequency	Minimum Dose	Comments
INH	9	Daily	270	1. Preferred regimen is daily treatment for 9 months 2. DOT must be used with twice-weekly dosing
		Twice weekly	76	
INH	6	Daily	180	1. NOT recommended for people living with HIV, children, or people with chest x-rays suggestive of previous TB disease 2. DOT must be used with twice-weekly dosing
		Twice weekly	52	

Table 4.2

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 27

- Ask participants to turn to p. 8 (if participants have print-based modules)
- Explain that this table describes the various LTBI treatment regimens
- Review slide content

Regimens for LTBI Treatment – Module 4, pp. 8-9

Slide 28

LTBI Treatment Regimens (7)

Drug	Duration (months)	Frequency	Minimum Dose	Comments
INH and RPT	3	Once Weekly	12	1. NOT recommended for children younger than 2 years of age, HIV-infected patients taking certain ART regimens, patients with resumed INH or RIF-resistant TB, pregnant women, or women expecting to become pregnant 2. DOT is recommended, if possible
RIF	4	Daily	120	1. Recommended for patients who have INH-resistant TB 2. NOT recommended for HIV-infected patients on certain combinations of ART. RFB may be used instead for some patients.
RIF/ PZA	Due to the reports of severe liver injury and deaths, RIF and PZA combinations generally should not be offered for treatment of LTBI			

- Review slide content

Regimens for LTBI Treatment – Module 4, pp. 8-9

Slide 29

Treatment of LTBI Study Question 4.1

What is the purpose of LTBI treatment?

To prevent people with latent TB infection from developing TB disease.

- Introduce study questions
- Ask participants to turn to p. 10 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 4, p. 49

Slide 30

Treatment of LTBI Study Question 4.2

Which groups of people should receive high-priority for LTBI treatment if they have a positive IGRA or TST result of ≥ 5 mm? Name 5.

- **Recent contacts of people with infectious TB disease**
- **People living with HIV**
- **People with chest x-ray findings suggestive of previous TB disease**
- **Patients with an organ transplant**
- **Other immunosuppressed patients**

- Read question
- Ask participants for answers

Answers – Module 4, p. 49

Slide 31	**Treatment of LTBI Study Question 4.3** **Which groups of people should receive high priority for LTBI treatment if they have a positive IGRA result or a TST reaction that is ≥ 10 mm? Name 7.** • People who come to the U.S. from areas of the world where TB is common • People who abuse drugs • People who live or work in high-risk congregate settings • People who work in mycobacteriology laboratories • People with medical conditions that increase risk of TB disease • Children younger than 5 years of age • Infants, children, and adolescents exposed to adults in high-risk groups Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 31	• Ask for a volunteer to read question • Ask participants for answers *Answers – Module 4, p. 49*
Slide 32	**LTBI Treatment Regimens Study Question 4.4** **List 4 regimens that are approved for the treatment of LTBI.** • Isoniazid for 9 months • Isoniazid for 6 months • Isoniazid and rifapentine for 12, once-weekly doses (12-dose regimen) • Rifampin for 4 months Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 32	• Read question • Ask participants for answers *Answers – Module 4, p. 49*
Slide 33	**Treatment of Latent TB Infection (LTBI)** **Special Considerations for LTBI Treatment** 33	• Introduce section *Special Considerations for LTBI Treatment – Module 4, pp. 11-14*

Slide 34	**Special Considerations for LTBI (1)** **Directly Observed Therapy (DOT)** • DOT is when a HCW or another designated person watches a patient swallow each dose of medication – Used to help patients adhere to treatment – Should be considered for people who are at high risk for TB or suspected to be non-adherent – Recommended for intermittent therapy Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 34	• Review slide content • Explain that intermittent therapy is when regimens are given once or twice weekly *Directly Observed Therapy – Module 4, p. 11*
Slide 35	**Special Considerations for LTBI (2)** **Contacts** • Contacts are people who have been exposed to someone with infectious TB disease • Contacts should be quickly identified, located, and assessed for LTBI and TB disease – If TST or IGRA result is positive, contacts should be given high priority for LTBI treatment (once TB disease is ruled out) – If TST or IGRA result is negative, contacts should be retested in 8 to 10 weeks Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 35	• Review slide content • Explain that contacts should be retested after 8 to 10 weeks if their result is negative because sometimes it can take 2 to 8 weeks after TB infection for the body's immune system to produce a response to the TST or IGRA *Contacts – Module 4, p. 11*
Slide 36	**Special Considerations for LTBI (3)** **Contacts** • In general, contacts with positive test result and a documented history of completion of LTBI treatment do not need to be retreated • However, retreatment may be necessary for persons at high risk of: – Becoming re-infected – Progressing to TB disease Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 36	• Review slide content *Contacts – Module 4, p. 11*

Slide 37

Special Considerations for LTBI (4)

Contacts at High Risk for Rapid Development of TB Disease

- **Some contacts may be started on LTBI treatment even if their test result is negative, and <u>less than 8 to 10 weeks</u> have passed since last exposure to TB; this includes:**
  - **Children younger than 5 years of age**
  - **People living with HIV**
- **Expert consultation should be sought to determine if contacts with immunocompromised states other than HIV infection could benefit from treatment even if they have a negative TST or IGRA result**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 37

- Review slide content
- Explain that it is possible that some contacts are infected with M. tuberculosis but have a false-negative TST reaction because less than 8 to 10 weeks have passed since they were last exposed to TB

Contacts at High Risk for TB Disease – Module 4, p. 12

Slide 38

Special Considerations for LTBI (5)

Contacts at High Risk for Rapid Development of TB Disease

- **Once active TB disease is ruled out, contacts at high risk for TB disease should:**
  - **Start LTBI treatment**
  - **Be retested 8 to 10 weeks after last exposure to TB**
    - **If negative test result: stop LTBI treatment**
    - **If positive test result: continue LTBI treatment**
- **Contacts living with HIV may be given full course of LTBI treatment even if their second TST or IGRA result is negative**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 38

- Review slide content
- Explain that LTBI treatment is started to prevent persons from rapidly progressing to TB disease

Contacts at High Risk for TB Disease – Module 4, p. 12

Slide 39

Special Considerations for LTBI (6)

Infants and Children

- **Infants and children are more likely to develop life-threatening forms of TB disease**
- **Children younger than 5 years of age who have been exposed to TB should start taking LTBI treatment even if they have a negative TST or IGRA result because they:**
  - **Are at high risk for rapidly developing TB disease**
  - **May have a false-negative TST reaction**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 39

- Review slide content

Infants and Children – Module 4, pp. 12-13

Slide 40	**Special Considerations for LTBI (7)** **Infants and Children** • Infants and children should be retested 8 to 10 weeks after last exposure • LTBI treatment can be stopped if ALL of the following conditions are met: – Child is at least 6 months of age – Second TST or IGRA is negative – Second TST or IGRA was done at least 8 weeks after child was last exposed to a person with infectious TB disease • The 12-dose regimen is not recommended for children younger than 2 years of age Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 40	• Review slide content *Infants and Children – Module 4, p. 13*
Slide 41	**Special Considerations for LTBI (8)** **Contacts of INH-Resistant TB** • Contacts of patients with INH-resistant, but RIF-susceptible TB, may be treated with a 4-month daily regimen of RIF • In some patients, rifabutin (RFB) may be substituted if RIF cannot be used Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 41	• Review slide content *Contacts of INH-Resistant TB – Module 4, p. 13*
Slide 42	**Special Considerations for LTBI (9)** **Contacts of Multidrug-Resistant TB (MDR TB)** • The risk for developing TB disease should be considered before recommending LTBI treatment • Contacts of patients with MDR TB – May be treated for 6 to 12 months with an alternative regimen of drugs to which the *M. tuberculosis* isolate is susceptible – Can be observed for signs and symptoms of TB disease without treatment • All persons with suspected MDR LTBI should be followed and observed for signs and symptoms of TB disease for 2 years, regardless of the treatment regimen Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 42	• Review slide content • Note that an MDR TB treatment expert should be consulted *Contacts of Multidrug-Resistant TB – Module 4, p. 13*

Slide 43	**Special Considerations for LTBI (10)** **Pregnant Women** • For most pregnant women, LTBI treatment can be delayed until after delivery, unless they have certain risk factors • Immediate treatment should be considered if woman is living with HIV or is a recent TB contact • Preferred LTBI treatment regimen is 9 months of INH with a vitamin B6 supplement – INH has <u>not</u> been shown to have harmful effects on the fetus • The 12-dose regimen is not recommended for pregnant women or women expecting to become pregnant within the 12-week regimen Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 43	• Review slide content *Pregnant Women – Module 4, p. 13*
Slide 44	**Special Considerations for LTBI (11)** **Breastfeeding Women** • Women who are breastfeeding can take INH, but should also be given a vitamin B6 supplement • Amount of INH in breast milk is not enough to be considered treatment for infant  Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 44	• Review slide content *Breastfeeding Women – Module 4, p. 14*
Slide 45	**Special Considerations for LTBI (12)** **People Living with HIV** • Individuals living with HIV should be treated with 9-month regimen of INH • RIF <u>should not</u> be used for people who are taking certain combinations of ART – Dose-adjusted rifabutin (RFB) may be given • The 12-dose regimen of INH and RPT may be used for people living with HIV who are: – 12 years of age or older – Not on ART, except those taking an efavirenz or raltegravir-based ART regimen Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 45	• Review slide content *People Living with HIV – Module 4, p. 14*

Slide 46	**LTBI Treatment Regimens Study Question 4.5** **What LTBI treatment regimen may be recommended for people with a positive TST or IGRA result who have been exposed to INH-resistant TB?** **Treatment with rifampin for 4 months may be recommended in this situation.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 46	• Introduce study questions • Ask participants to turn to p. 15 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 4, p. 50*
Slide 47	**Special Considerations for LTBI Study Question 4.6** **In what circumstances may LTBI treatment be given to people who have a negative TST or IGRA result?** **Some contacts may start LTBI treatment if they have a negative TST or IGRA, but less than 8 to 10 weeks have passed since last exposed to TB; these contacts include:** • **Children who are younger than 5 years of age** • **People living with HIV** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 47	• Read question • Ask participants for answers • Note that expert consultation should be sought to determine if contacts with immune impairments other than HIV infection (e.g., contacts taking immunosuppressive therapies) could benefit from treatment even if they have a negative TST or IGRA result. *Answers – Module 4, p. 50*
Slide 48	**Special Considerations for LTBI Study Question 4.7** **What conditions must be met to stop LTBI treatment for children who are younger than 5 years of age and have been exposed to TB?** • **LTBI treatment can be stopped if ALL the following conditions are met:** – **Child is at least 6 months of age** – **Second TST or IGRA is negative** – **Second TST or IGRA was done 8 to 10 weeks after the child was last exposed to TB** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 48	• Read question • Ask participants for answers *Answers – Module 4, p. 50*

Slide 49	**Special Considerations for LTBI Study Question 4.8** **When should pregnant women be treated for LTBI and for how long?** • For most pregnant women with TB infection, LTBI treatment can be delayed until after delivery. If the pregnant woman is HIV-infected or a recent contact, immediate treatment should be considered. • Preferred treatment regimen for pregnant women is 9 months of INH with a vitamin B6 supplement. Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 49	• Read question • Ask participants for answers *Answers – Module 4, p. 51*
Slide 50	**Treatment of Latent TB Infection (LTBI)** **Adverse Reactions and Patient Monitoring** 50	• Introduce section *Adverse Reactions and Patient Monitoring – Module 4, pp. 17-19*
Slide 51	**Adverse Reactions to INH (1)** • About 10% to 20% of people treated with INH will have mild, abnormal liver test results during treatment – In most people, liver test results return to normal Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 51	• Explain that some health care workers have concerns about treating patients for LTBI due to the length of treatment and the possibility of adverse reactions • Stress that, as with any treatment, the risks and benefits of LTBI treatment must be weighed for each individual • Review slide content *Adverse Reactions – Module 4, p. 17*

Slide 52	**Adverse Reactions to INH (2)** **Hepatitis** • A major risk of INH is hepatitis (inflammation of the liver) • Hepatitis prevents the liver from functioning normally, causing symptoms such as: – Nausea – Vomiting – Abdominal pain – Fatigue – Brown urine Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 52	• Review slide content *Adverse Reactions – Module 4, p. 17*
Slide 53	**Adverse Reactions to INH (3)** **Hepatitis** • INH can cause hepatitis in anyone; however, hepatitis occurs in less than 1% of people taking INH • Certain risk factors increase the risk of serious hepatitis, such as: – Older age – Alcoholism Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 53	• Review slide content *Adverse Reactions – Module 4, p.17*
Slide 54	**Adverse Reactions to INH (4)** **Peripheral Neuropathy** • INH can cause peripheral neuropathy – Damage to sensory nerves of hands and feet – Symptoms include a tingling sensation, weakened sense of touch, or pain in the hands, palms, soles and feet • HIV, alcoholism, diabetes, and malnutrition increase risk for peripheral neuropathy – People with these conditions should be given vitamin B6 Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 54	• Review slide content *Adverse Reaction – Module 4, p. 17*

Slide 55	**Adverse Reactions to RIF, RPT, and RFB** • **Hepatitis is more likely to occur when RIF is combined with INH** • **Other side effects of RIF, RPT, and RFB include:** – **Rash** – **Gastrointestinal symptoms** – **Orange discoloration of urine, saliva, and tears** – **Interaction with many other drugs, such as birth control pills and implants, warfarin, some HIV drugs, and methadone** – **Hypersensitivity** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 55	• Review slide content • Explain that gastrointestinal symptoms may include abdominal pain, nausea, and anorexia • Note that orange discoloration is considered a minor reaction (not serious) *Adverse Reactions – Module 4, pp. 17-18*
Slide 56	**Adverse Reactions to RPT and RFB** • **RPT may cause flu-like symptoms** • **RFB may cause** – **Eye inflammation** – **Joint pain** – **Lower white blood cell count** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 56	• Review slide content *Adverse Reactions – Module 4, p. 18*
Slide 57	**Adverse Reactions** • **Patients should be instructed to report any signs and symptoms of adverse drug reactions to their health care provider** • **Patients should stop taking the medication and seek medical attention immediately if symptoms of serious adverse reactions occur** – **No appetite** – **Nausea** – **Vomiting** – **Yellowish skin or eyes** – **Fever for 3 or more days** – **Abdominal pain** – **Tingling in fingers and toes** – **Brown urine** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 57	• Review slide content *Adverse Reactions – Module 4, p. 18 and Module 4, p. 33* *Note: Adverse reactions to TB drugs are discussed more in-depth on slides 100-108*

Slide 58	**Patient Monitoring (1)** • All persons taking LTBI treatment should be educated about symptoms caused by adverse reactions • Patients need to be evaluated at least monthly during therapy for: – Adherence to prescribed regimen – Signs and symptoms of TB disease – Adverse reactions Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 58	• Review slide content • Stress that patients should be instructed to stop taking the medication and seek medical attention immediately if symptoms of serious adverse reactions occur *Patient Monitoring – Module 4, p. 18*
Slide 59	**Patient Monitoring (2)** • During each monthly evaluation, patients should be: – Asked whether they have nausea, abdominal pain, or other symptoms of adverse reactions – Examined by HCW for adverse reactions – Instructed to stop medications and contact HCWs immediately if they have signs or symptoms of hepatitis Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 59	• Review slide content *Patient Monitoring – Module 4, p. 18*
Slide 60	**Patient Monitoring (3)** • People at greatest risk for hepatitis should have baseline liver function tests before starting LTBI treatment and every month during therapy. This includes: – People living with HIV – People with history of liver disorder or disease – People who use alcohol regularly – Women who are pregnant or just had a baby – People taking medications that may increase risk of hepatitis Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 60	• Review slide content *Patient Monitoring – Module 4, p. 18*

Slide 61	**Patient Monitoring (4)** • For all patients, INH, RIF, and RPT should be stopped if liver function test results are: – 3 times higher than upper limit of the normal range and patient has symptoms OR – 5 times higher than upper limit of the normal range and patient has no symptoms Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 61	• Review slide content *Patient Monitoring – Module 4, p. 19*
Slide 62	**LTBI Treatment Follow-Up** • Patients should receive documentation of TST or IGRA results, treatment regimens, and treatment completion dates – Patients should present these documents any time they are required to be tested for TB infection • Patients should be re-educated about signs and symptoms of TB disease Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 62	• Review slide content *LTBI Treatment Follow-Up – Module 4, p. 19*
Slide 63	**Medical Evaluation Study Question 4.9** Name 4 reasons why patients should receive a medical evaluation before starting LTBI treatment. • Exclude possibility of TB disease • Determine whether they have ever been treated for TB infection or TB disease • Identify any medical conditions that may complicate therapy or require more careful monitoring • Establish and build rapport with patient Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 63	• Introduce study questions • Ask participants to turn to p. 20 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 4, p. 51*

Slide 64	**LTBI Treatment** **Study Question 4.10** **Why is it important to exclude the possibility of TB disease before giving a patient LTBI treatment?** **Treating TB disease with LTBI treatment regimen (usually a single drug) can lead to drug resistance.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 64	• Read question • Ask participants for answers *Answers – Module 4, p. 51*
Slide 65	**Adverse Reactions** **Study Question 4.11** **What are the symptoms of hepatitis?** • Nausea • Vomiting • Abdominal pain • Fatigue • Brown urine Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 65	• Read question • Ask participants for answers *Answers – Module 4, p. 51*
Slide 66	**Adverse Reactions** **Study Question 4.12** **Who is at greatest risk for hepatitis? What special precautions should be taken for these patients?** • People with greatest risk for hepatitis are: – People living with HIV – People with a history of liver disorder or disease – People who use alcohol regularly – Women who are pregnant or just had a baby – People who are taking other medications that may increase the risk of hepatitis • These patients should have liver function tests before starting LTBI treatment and during therapy Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 66	• Read questions • Ask participants for answers *Answers – Module 4, p. 51*

Slide 67	**Adverse Reactions** **Study Question 4.13** **How often should patients be evaluated for signs and symptoms of adverse reactions during LTBI treatment?** **All patients receiving LTBI treatment should be evaluated at least monthly during therapy.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 67	• Read question • Ask participants for answers *Answers – Module 4, p. 52*
Slide 68	**Treatment of TB Disease** 68	• Introduce section *Treatment of TB Disease – Module 4, pp. 22-30*
Slide 69	**Treatment of TB Disease (1)** • **Treating TB disease benefits both the person who has TB and the community** – **Patient: prevents disability and death; restores health** – **Community: prevents further transmission of TB** • **TB disease must be treated for at least 6 months; in some cases, treatment lasts longer** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 69	• Review slide content *Treatment of TB Disease – Module 4, p. 22*

Slide 70

Treatment of TB Disease (2)

Intensive Phase	• First 8 weeks of treatment • Most bacilli killed during this phase • 4 drugs used
Continuation Phase	• After first 8 weeks of TB disease treatment • Bacilli remaining after intensive phase are treated with at least 2 drugs
Relapse	• Occurs when treatment is not continued for long enough • Surviving bacilli may cause TB disease at a later time

- Review slide content

Treatment of TB Disease – Module 4, p. 22

Slide 71

Treatment of TB Disease (3)

- Intensive phase should contain the following four drugs:
  - Isoniazid (INH)
  - Rifampin (RIF)
  - Pyrazinamide (PZA)
  - Ethambutol (EMB)

Example of pills used to treat TB disease. From left to right: isoniazid, rifampin, pyrazinamide, and ethambutol.

- Review slide content
- Note that when drug susceptibility results are available, clinicians may change the regimen accordingly

Treatment of TB Disease – Module 4, p. 22

Slide 72

Treatment of TB Disease (4)

- Treatment must contain multiple drugs to which organisms are susceptible
- Treatment with a single drug can lead to the development of drug-resistant TB

- Review slide content

Treatment of TB Disease – Module 4, p. 22

Slide 73	**Preventing Drug Resistance (1)** • Drug resistance can develop when patients are prescribed an inappropriate regimen – TB disease must be treated with at least 2 drugs to which bacilli are susceptible – Using only one drug can create a population of tubercle bacilli resistant to that drug – Adding a single drug to failing regimen may have the same effect as only using one drug Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 73	• Review slide content • Explain that when two or more drugs are used together, each drug helps prevent the emergence of bacilli that are resistant to the other drugs *Preventing Drug Resistance – Module 4, pp. 23*
Slide 74	**Preventing Drug Resistance (2)** • Resistance can develop when patients do not take drugs as prescribed – Patients do not take all of their pills – Patients do not take pills as often as prescribed • When this happens, patients may expose the bacilli to a single drug Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 74	• Review slide content *Preventing Drug Resistance – Module 4, p. 23*
Slide 75	**Preventing Drug Resistance (3)** • Factors that increase the chance of patient having or developing drug-resistant TB: – Patient does not take their medicine regularly and completely – Patient comes from an area of the world where drug-resistant TB is common – Malabsorption of drugs – Patient is a contact to someone with drug-resistant TB – Failure to improve on drug-susceptible regimen – Patient develops TB disease again after having taken TB medicine in the past Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 75	• Review slide content *Preventing Drug Resistance – Module 4, p. 23*

Slide 76

Treatment of TB Disease

Treatment Regimens

76

- Introduce section

Slide 77

TB Treatment Regimens*

Table. 4.3

Regimen	INTENSIVE PHASE Drugs	INTENSIVE PHASE Interval and Doses (minimum duration)	CONTINUATION PHASE Drugs	CONTINUATION PHASE Interval and Doses (minimum duration)	Range of total doses	Comments	Regimen effectiveness
1	INH RIF PZA EMB	7 days/week for 56 doses (8 weeks) or 5 days/week for 40 doses (8 weeks)	INH RIF	7 days/week for 126 doses (18 weeks) or 5 days/week for 90 doses (18 weeks)	182 to 130	This is the preferred regimen for patients with newly diagnosed pulmonary TB.	greater
2	INH RIF PZA EMB	7 days/week for 56 doses (8 weeks) or 5 days/week for 40 doses (8 weeks)	INH RIF	3 times weekly for 54 doses (18 weeks)	110 to 94	Preferred alternative regimen in situations in which more frequent DOT during continuation phase is difficult to achieve.	
3	INH RIF PZA EMB	3 times weekly for 24 doses (8 weeks)	INH RIF	3 times weekly for 54 doses (18 weeks)	78	Use regimen with caution in patients with HIV and/or cavitary disease. Missed doses can lead to treatment failure, relapse, and acquired drug resistance.	
4	INH RIF PZA EMB	7 days/week for 14 doses then twice weekly for 12 doses	INH RIF	Twice weekly for 36 doses (18 weeks)	62	Do not use twice-weekly regimens in HIV-infected patients or patients with smear positive and/or cavitary disease. If doses are missed then therapy is equivalent to once weekly, which is inferior.	lesser

*For detailed information, refer to the *Official American Thoracic Society/Centers for Disease Control and Prevention/Infectious Diseases Society of America Clinical Practice Guidelines: Treatment of Drug-Susceptible Tuberculosis.*

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- Ask participants turn to p. 24 for table 4.3 that describes recommended treatment regimens since it may be difficult to view the table on the slide (if participants have print-based modules)
- Explain that there are several options for daily and intermittent therapy

TB Treatment Regimens – Module 4, p. 24

Slide 78

Treatment of TB Disease
Study Question 4.14

Why must TB disease be treated for at least 6 months?

Even though most bacilli are killed in the first 8 weeks, some bacilli can survive. Therefore, treatment must continue in order to kill all remaining bacilli.

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 78

- Introduce study questions
- Ask participants to turn to p. 25 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 4, p. 52

Slide 79	**Treatment of TB Disease** **Study Question 4.15** **Which 4 drugs are recommended for the intensive phase of treatment for TB disease?** **The intensive phase should include isoniazid, rifampin, pyrazinamide, and ethambutol.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 79	• Read question • Ask participants for answers *Answers – Module 4, p. 52*
Slide 80	**Treatment of TB Disease** **Study Question 4.16** **Why should multiple drugs be used to treat TB disease?** **Using only one drug can create a population of tubercle bacilli that is resistant to that drug. When multiple drugs are used together, each drug helps prevent the emergence of bacilli that are resistant to the other drugs.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 80	• Ask for a volunteer to read question • Ask participants for answers *Answers – Module 4, p. 52*
Slide 81	**Drug Resistance** **Study Question 4.17** **Name 2 factors that can lead to drug resistance.** **Drug resistance can develop when:** • **Patients are prescribed an inappropriate regimen for treatment** • **Patients do not follow treatment regimens as prescribed** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 81	• Read question • Ask participants for answers *Answers – Module 4, p. 52*

Slide 82	**Treatment of TB Disease** **Special Considerations** 82	• Introduce section
Slide 83	**Special Considerations (1)** • **TB medical experts should be consulted for complicated and challenging TB treatment issues** • **Consultation can be provided by State TB Programs and the CDC-funded TB Regional Training and Medical Consultation Centers (RTMCCs)** www.cdc.gov/TB/education/rtmc/default.htm Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 83	• Review slide content • Explain that the TB Regional Training and Medical Consultation Centers (RTMCCs) are regionally assigned to cover all 50 states and the U.S. territories • Tell participants that they may learn more about the RTMCCs by going to the website shown on the slide
Slide 84	**Special Considerations (2)** **People Living with HIV** • **For HIV-infected TB patients receiving ART, the recommended treatment is a 6-month daily regimen consisting of:** – **An intensive phase of INH, RIF, PZA, and EMB for 2 months** – **A continuation phase of INH and RIF for 4 months** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 84	• Review slide content • Explain that the management of HIV-infected TB patients is complex and therefore medical experts should be involved in the care and treatment of patients with HIV and TB *People Living with HIV – Module 4, p. 26*

Slide 85	**Special Considerations (3)** **People Living With HIV** • ART should be initiated during TB treatment to improve treatment outcomes for TB patients living with HIV • ART should ideally be initiated – Within 2 weeks of starting TB treatment for patients with CD4 cell counts <50/mm^3 – By 8 to 12 weeks of starting TB treatment for patients with CD4 cell counts >50/mm^3 ▪ For patients with TB meningitis or TB involving the central nervous system, ART should NOT be initiated during the first 8 weeks of TB treatment Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 85	• Review slide content *People Living with HIV – Module 4, p. 26*
Slide 86	**Special Considerations (4)** **People Living With HIV** • It is important to be aware of the interaction of RIF with some ART drugs – Rifabutin has fewer drug interaction problems and may be used as a substitute for RIF for some patients • DOT should be provided for all TB patients living with HIV • For patients not receiving ART during TB treatment, it is recommended to extend treatment to 9 months Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 86	• Review slide content *People Living with HIV – Module 4, p. 26*
Slide 87	**Special Considerations (5)** **Pregnant Women** • Treatment should begin as soon as TB disease is diagnosed • Regimen should consist of at least INH, RIF, and EMB for a minimum of 9 months • Clinicians should seek expert consultation to evaluate the risks and benefits of prescribing pyrazinamide (PZA) on a case-by-case basis • Streptomycin (SM) should NOT be used • Vitamin B6 supplements are recommended for all pregnant women taking INH Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 87	• Review slide content • Explain that PZA should not be used because effects on the fetus are unknown • Explain that SM should not be used because it has harmful effects on the fetus *Pregnant Women – Module 4, p. 27*

Slide 88	**Special Considerations (6)** **Breastfeeding** • **Women being treated with first-line TB drugs should <u>not</u> be discouraged from breastfeeding** – **Only a small concentration of the drugs is found in breast milk** – **Not harmful to infant** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 88	• Review slide content *Breastfeeding – Module 4, p. 27*
Slide 89	**Special Considerations (7)** **Breastfeeding** • **Concentration of drugs in breast milk is not considered effective treatment for LTBI or TB disease for infant** • **Vitamin B6 supplements are recommended for all women who are taking INH and are breastfeeding** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 89	• Review slide content *Breastfeeding – Module 4, p. 27*
Slide 90	**Special Considerations (8)** **Children** • **Children younger than 5 years of age should start TB treatment as soon as the diagnosis is suspected** • **Children can be treated with INH, RIF, PZA, and EMB for 2 months, followed by INH and RIF for 4 months** – **Children receiving EMB should be monitored for vision changes** • **A 3 drug regimen (INH, RIF, PZA) can be considered in the intensive phase for children who are too young to have their vision monitored, are not infected with HIV, have no prior TB treatment history, and are not at risk for having drug-resistant TB** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 90	• Review slide content *Children – Module 4, p. 27*

Slide 91	**Special Considerations (9)** **People with Extrapulmonary Disease** • **In general, regimens used for treating pulmonary TB are also effective for treating extrapulmonary TB** • **9 to 12 month regimen is recommended for TB of the meninges or central nervous system** • **6 to 9 month regimen is recommended for bone and joint TB** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 91	• Review slide content • Note that extending treatment should be considered for patients with TB in any site that is slow to respond *People with Extrapulmonary Disease – Module 4, p. 28*
Slide 92	**Treatment of TB Disease** **Alternative Regimens for Treating Drug-Resistant TB** 92	• Introduce section
Slide 93	**Alternative Treatment Regimens (1)** **Drug-Resistant TB** • **Alternative regimens should be used for treating drug-resistant TB** • **Treatment of drug-resistant TB should always be done under the supervision of a medical expert** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 93	• Review slide content *Drug-Resistant TB – Module 4, p. 28*

Slide 94	**Alternative Treatment Regimens (2)** **Drug-Resistant TB** • **INH-resistant TB can be treated with the following regimen:** – **RIF, EMB, and PZA for 6 months** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 94	• Review slide content *Drug-Resistant TB – Module 4, p. 28*
Slide 95	**Alternative Treatment Regimens (3)** **MDR TB** • **MDR TB is resistant to INH and RIF, and is more difficult to treat than drug-susceptible TB** • **Drugs that can be used are less effective and are more likely to cause adverse reactions** • **Treatment can last 18 to 24 months after culture conversion** • **As a last resort, some patients undergo surgery to remove part of the disease site** • **Expert consultation should be sought** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 95	• Review slide content • Remind participants that MDR TB is resistant to both INH and RIF *Alternative Treatment Regimens – Module 4, p. 28*
Slide 96	**Alternative Treatment Regimens (4)** **Extensively Drug-Resistant TB (XDR TB)** • **XDR TB is resistant to INH, RIF, plus any fluoroquinolone, and at least one injectable second-line drug (e.g., amikacin, kanamycin, or capreomycin)** • **XDR TB patients have less effective treatment options** • **XDR TB is very difficult to treat** • **Expert consultation should be sought** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 96	• Explain that XDR TB is a rare type of MDR TB • Review slide content *Alternative Treatment Regimens– Module 4, p. 28*

Slide 97

Alternative Treatment Regimens (5)
XDR TB

- **Successful outcomes for the patient depend greatly on:**
  - **Extent of drug resistance**
  - **Severity of disease**
  - **Whether the patient's immune system is compromised**

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 97

- Review slide content

Alternative Treatment Regimens – Module 4, p. 28

Slide 98

Special Considerations
Study Question 4.18

What treatment regimen should be used for HIV-infected TB patients?

- 6-month daily regimen consisting of an intensive phase of INH, RIF, PZA, and EMB for 2 months followed by a continuation phase of INH and RIF for 4 months
- ART should ideally be initiated
  - Within 2 weeks of starting TB treatment for patients with CD4 cell counts <50/mm^3
  - By 8 to 12 weeks of starting TB treatment for patients with CD4 cell counts ≥50/mm^3
- For patients with TB meningitis or TB involving the central nervous system, ART should NOT be initiated during the first 8 weeks of TB treatment

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 98

- Introduce study questions
- Ask participants to turn to p. 29 (if participants have print-based modules)
- Read question
- Ask participants for answers

Answers – Module 4, p. 53

Slide 99

Special Considerations
Study Question 4.19

In what situations should treatment for TB disease last longer than the usual course of treatment?

- HIV-infected TB patients need a minimum of 6 months of treatment. If an HIV-infected patient is NOT receiving ART during TB treatment, it is recommended to prolong treatment to 9 months.
- Pregnant women with TB disease should receive at least 9 months of treatment
- Persons with TB disease of the meninges or central nervous system should receive a 9 to 12-month regimen
- Persons with bone or joint TB disease should receive a 6 to 9-month regimen
- Extending treatment should be considered for patients with TB disease in any site that is slow to respond
- Treatment for MDR TB disease can last 18 to 24 months

Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 99

- Read question
- Ask participants for answers

Answers – Module 4, p. 53

Slide 100	**Treatment of TB Disease** **Treatment and Monitoring Plan and Adverse Reactions** 100	• Introduce section
Slide 101	**Treatment and Monitoring Plan** **TB Disease** • Every TB patient should have a specific treatment and monitoring plan developed in collaboration with local health department • Plan should include: – Description of treatment regimen – Methods of: • Monitoring for adverse reactions • Assessing and ensuring adherence to treatment • Evaluating treatment response Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 101	• Review slide content • Note that the treatment and monitoring plan should be done within one week of suspected diagnosis *Treatment and Monitoring Plan – Module 4, p. 31*
Slide 102	**Monitoring Adverse Reactions (1)** **TB Disease** • Before starting treatment for TB disease, patients should have baseline blood and vision tests to detect problems that may complicate treatment – For example, patients who are taking ethambutol should have baseline visual acuity testing and testing of color discrimination Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 102	• Review slide content *Treatment and Monitoring Plan – Module 4, p. 31*

Slide 103	**Monitoring Adverse Reactions (2)** **TB Disease** • **Follow-up tests should be done periodically if:** – **Results of baseline tests indicate abnormalities** – **Patient has symptoms that may be due to adverse reactions** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 103	• Review slide content *Monitoring Adverse Reactions – Module 4, p. 31*
Slide 104	**Monitoring Adverse Reactions (3)** **TB Disease** • **Patients should be educated about symptoms caused by adverse reactions to drugs** • **Patients should be seen by clinician at least monthly during treatment and evaluated for possible adverse reactions** • **Public health workers who have regular contact with patients should ask about adverse reactions to treatment** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 104	• Review slide content • Explain that patients should also be educated about minor side effects of treatment; such as orange discoloration of urine from rifampin • Note that monitoring for adverse reactions must be individualized, depending on the drugs the patient is taking and the patient's risk for adverse reactions *Monitoring Adverse Reactions – Module 4, pp. 31-32*
Slide 105	**Monitoring Adverse Reactions (4)** **TB Disease** • **If patient has symptoms of a serious adverse reaction, HCWs should:** – **Instruct patient to stop medication** – **Report situation to clinician and arrange for medical evaluation** – **Note symptoms on the patient's form**  Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 105	• Review slide content *Monitoring Adverse Reactions – Module 4, p. 32*

Slide 106

Adverse Reactions to TB Drugs (1)

Adverse Reaction	Caused by	Signs and Symptoms	Significance of Reaction*
Allergic	Any drug	• Skin rash	May be serious or minor
Eye damage	EMB	• Blurred or changed vision • Changed color vision	Serious
Hepatitis	PZA INH RIF	• Abdominal pain • Abnormal liver function test results • Brown urine, light colored stool • Fatigue • Fever for 3 or more days • Flu-like symptoms • Lack of appetite • Nausea • Vomiting • Yellowish skin or eyes	Serious

Table. 4.4 Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 106

- Ask participants turn to p. 34 (if participants have print-based modules)
- Explain that this table describes adverse reactions to TB drugs
- Review slide content

Adverse Reactions to TB Drugs – Module 4, p. 33

Slide 107

Adverse Reactions to TB Drugs (2)

Adverse Reaction	Caused by	Signs and Symptoms	Significance of Reaction*
Nervous system damage	INH	• Dizziness • Tingling or numbness around the mouth	Serious
Peripheral neuropathy	INH	• Tingling sensation, numbness, or pain in hands and feet	Serious
Stomach upset	PZA	• Stomach upset • Vomiting • Lack of appetite	May be serious or minor
Gout	PZA	• Abnormal uric acid level • Joint aches	Serious

Table. 4.4 Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 107

- Review slide content

Adverse Reactions to TB Drugs – Module 4, p. 33

Slide 108

Adverse Reactions to TB Drugs (3)

Adverse Reaction	Caused by	Signs and Symptoms	Significance of Reaction*
Bleeding problems due to low platelets	RIF	• Easy bruising • Slow blood clotting	Serious
Discoloration of body fluids	RIF	• Orange urine, sweat, or tears • Permanently stained soft contact lenses	Minor
Drug interactions	RIF	• Interferes with many medications, such as birth control pills or implants, blood thinners, some HIV medicines, and methadone	May be serious or minor

* Patients should stop medication for serious adverse reactions and consult a clinician immediately. Patients can continue taking medication if they have minor adverse reactions.

Table. 4.4 Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 108

- Review slide content

Adverse Reactions to TB Drugs – Module 4, p. 33

Slide 109	**TB Treatment and Monitoring Plan** **Study Question 4.20** **What should be included in each patient's treatment plan?** • Description of treatment regimen • Methods of monitoring for adverse reactions • Methods of assessing and ensuring adherence to the treatment • Methods for evaluating treatment response Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 109	• Introduce study questions • Ask participants to turn to p. 34 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 4, p. 54*
Slide 110	**Adverse Reactions to TB Drugs** **Study Question 4.21** **Name the drug or drugs that may cause each of the following symptoms or adverse reaction.** • **Nervous system damage:** INH • **Hepatitis:** INH, PZA, RIF • **Eye damage:** EMB • **Orange discoloration of the urine:** RIF Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 110	• Read question • Ask participants for answers *Answers – Module 4, p. 54*
Slide 111	**TB Treatment Monitoring** **Study Question 4.22** **How often should patients be monitored for adverse reactions to TB drugs?** **All patients should be seen at least monthly during treatment and evaluated for possible adverse reactions.** **Also, DOT providers should ask about any adverse reactions.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 111	• Read question • Ask participants for answers *Answers – Module 4, p. 54*

Slide 112	**Treatment of TB Disease** **Adherence and Evaluating Patients' Response to Treatment** 112	• Introduce section
Slide 113	**Adherence to TB Treatment (1)** • **Most effective strategy to encourage adherence to treatment is DOT** – **Should be considered for ALL patients** – **Should be used for all children and adolescents** – **Should be done at a time and place that is convenient for patients**  Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 113	• Explain that in order to cure TB and prevent drug resistance, TB patients must adhere to treatment • Explain that adherence to TB treatment can be difficult because patients need to take several different medications for many months • Review slide content • Ask participants what adherence problems they have encountered with patients and strategies they have used to overcome them *Adherence to TB Treatment – Module 4, p. 37*
Slide 114	**Adherence to TB Treatment (2)** • **Incentives and enablers can be used to improve patient adherence** – **Incentives are rewards given to patient, e.g., gift cards** – **Enablers help patient receive treatment, e.g., bus tokens** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 114	• Review slide content • Explain that incentives are small rewards given to patients to encourage them to take their medicines or keep DOT appointments • Explain that enablers help patients receive treatment • Mention that incentives and enablers are generally offered along with DOT *Adherence to TB Treatment – Module 4, p. 38*

Slide 115	**Adherence to TB Treatment (3)** • Patients should be educated about TB disease and treatment – Cause of TB, transmission, diagnosis, and treatment plan – How and when to take medication  Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 115	• Review slide content *Adherence to TB Treatment – Module 4, p. 38*
Slide 116	**Monitoring Patients' Adherence to Therapy** • Patients not receiving DOT should be monitored for adherence to treatment: – Check if patient is reporting to clinic as scheduled – Ask about adherence – Ask patient to bring medications to clinic and count number of pills taken – Use urine tests to detect medication in urine – Assess patient's clinical response to treatment Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 116	• Review slide content • Explain that none of these methods can be used to prove a patient took every dose of medication; the best way to ensure adherence to treatment is to use DOT *Monitoring Adherence to Therapy – Module 4, p. 38*
Slide 117	**Evaluating Patients' Response to Treatment (1)** Three methods to determine whether a patient is responding to treatment: 1. Check to see if patient has TB symptoms (clinical evaluation) 2. Conduct bacteriologic examination of sputum or other specimens 3. Use chest x-rays to monitor patient's response to treatment Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 117	• Review slide content *Evaluating Patients' Response to Treatment – Module 4, pp. 39-40*

Slide 118	**Evaluating Patients' Response to Treatment (2)** 1. Check to see if patient has TB symptoms (clinical evaluation) • TB symptoms should gradually improve and go away after starting treatment • Patients whose symptoms do not improve during the first 2 months of treatment, or whose symptoms worsen after initial improvement, should be reevaluated Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 118	• Review slide content • Explain that although each patient responds to treatment at a different pace, all patients' TB symptoms should gradually improve *Evaluating Patients' Response to Treatment – Module 4, pp. 39-40*
Slide 119	**Evaluating Patients' Response to Treatment (3)** 2. Conduct bacteriologic examination of sputum or other specimens • Specimens should be examined every month until culture results have converted from positive to negative • Any patient whose culture results have not become negative after 2 months of treatment, or whose results become positive after being negative, should be reevaluated Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 119	• Review slide content *Evaluating Patients' Response to Treatment – Module 4, pp. 39-40*
Slide 120	**Evaluating Patients' Response to Treatment (4)** 3. Use chest x-rays to monitor patient's response to treatment • Repeated x-rays are not as helpful as monthly bacteriologic and clinical evaluations • Chest x-rays taken at end of treatment can be compared to any follow-up x-rays Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 120	• Review slide content • Explain that chest x-rays can be useful for patients who have negative culture results before treatment *Evaluating Patients' Response to Treatment – Module 4, pp. 39-40*

Slide 121	**Evaluating Patients' Response to Treatment (5)** • TST or IGRA cannot be used to determine whether the patient is responding to treatment • Treatment completion is defined by number of doses the patient takes within a specific time frame • Length of treatment depends on drugs used, drug susceptibility test results, and the patient's response to therapy Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 121	• Review slide content • Explain that most people who have a positive TST result will have a positive result again if they are skin tested later in their lives, regardless of whether they have received treatment *Evaluating Patients' Response to Treatment – Module 4, pp. 39-40*
Slide 122	**Reevaluating Patients Who Do Not Respond to Treatment (1)** • Reevaluating the patient means – Obtaining a new specimen for TB culture, and (if positive) drug susceptibility testing – Assessing whether the patient has taken medication as prescribed – Reviewing symptoms – Performing a clinical examination – Repeating chest x-rays Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 122	• Review slide content *Reevaluating Patients Who Do Not Respond to Treatment – Module 4, p. 40*
Slide 123	**Reevaluating Patients Who Do Not Respond to Treatment (2)** • Patients should be reevaluated if: – Symptoms do not improve in first 2 months of therapy – Symptoms worsen after improving initially – Culture results have not become negative after 2 months of treatment – Culture results become positive after being negative – Chest x-rays show worsening Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 123	• Review slide content *Reevaluating Patients Who Do Not Respond to Treatment – Module 4, p. 40*

Slide 124	**Adherence to Therapy** **Study Question 4.23** **Name 4 ways clinicians can assess whether a patient is adhering to treatment.** • Check whether patient is reporting to clinic as scheduled • Ask patient to bring medications to each clinic visit and count the number of pills • Use urine tests to detect medication • Assess patient's clinical response to therapy Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 124	• Introduce study questions • Ask participants to turn to p. 41 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 4, p. 54*
Slide 125	**Adherence to Therapy** **Study Question 4.24** **What is the best way to ensure that a patient adheres to treatment?** Directly observed therapy (DOT) Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 125	• Read question • Ask participants for answers *Answers – Module 4, p. 54*
Slide 126	**Response to Treatment** **Study Question 4.25** **How can clinicians determine whether a patient is responding to treatment?** • Clinical evaluations • Bacteriologic evaluations • Chest x-rays Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 126	• Read question • Ask participants for answers *Answers – Module 4, p. 55*

Slide 127	**Reevaluating the Patient** **Study Question 4.26** **Under what circumstances should patients be reevaluated?** • Symptoms do not improve during first 2 months of therapy • Symptoms worsen after improving initially • Culture results have not become negative after 2 months of treatment • Culture results become positive after being negative • Chest x-rays show worsening Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 127	• Read question • Ask participants for answers *Answers – Module 4, p. 55*
Slide 128	**Reevaluating the Patient** **Study Question 4.27** **What does reevaluating the patient mean?** **Reevaluating the patient means obtaining a new specimen for TB culture, and (if positive) drug susceptibility testing, assessing whether the patient has been taking medication as prescribed, reviewing symptoms, performing a clinical evaluation, and repeating chest x-rays.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 128	• Read question • Ask participants for answers *Answers – Module 4, p. 55*
Slide 129	**Treatment of TB Disease** **Role of Public Health Workers** 129	• Introduce section

Slide 130	**Role of Public Health Workers (1)** • Successful TB treatment is the responsibility of medical providers and HCWs, not the patient • Case management can be used to ensure that patients complete TB treatment • A health department employee is assigned responsibility for the management of specific patients Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 130	• Review slide content *Role of Public Health Workers – Module 4, pp. 43-44*
Slide 131	**Role of Public Health Workers (2)** • Provide DOT • Help monitor patients' response to treatment • Educate patients and families about TB • Locate patients who have missed DOT visits or clinic appointments • Act as interpreters, arrange and provide transportation for patients, and refer patients to other social services • Work with private physicians to make sure TB patients complete an adequate regimen Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 131	• Review slide content *Role of Public Health Workers – Module 4, pp. 43-44*
Slide 132	**Role of Public Health Workers Study Question 4.28** **What is the goal of case management?** **To provide patient-centered care for completion of treatment and to ensure all public health activities related to stopping TB transmission are completed.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 132	• Introduce study questions • Ask participants to turn to p. 45 (if participants have print-based modules) • Read question • Ask participants for answers *Answers – Module 4, p. 55*

Slide 133	**Role of Public Health Workers Study Question 4.29** **What should a public health worker do if he or she notices that a patient has symptoms of a serious adverse reaction?** • Instruct patient to stop taking medication • Report situation to clinician and arrange for a medical evaluation right away • Note symptoms on patient's form Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 133	• Read question • Ask participants for answers *Answers – Module 4, p. 55*
Slide 134	**Case Studies** 134	• Introduce case studies
Slide 135	**Module 4: Case Study 4.1 (1)** **You are sent to visit the home of a TB patient who was admitted to the hospital last week and diagnosed with infectious TB disease. Living in the home are his wife and his 1-year-old daughter. Neither one has symptoms of TB disease. You give them both a TST and return 2 days later to read the results. You find that the wife has 14 mm of induration, but the daughter has no induration.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 135	• Ask participants to turn to p. 16 (if participants have print-based modules) • Read case study *Case Study 4.1 – Module 4, p. 16*

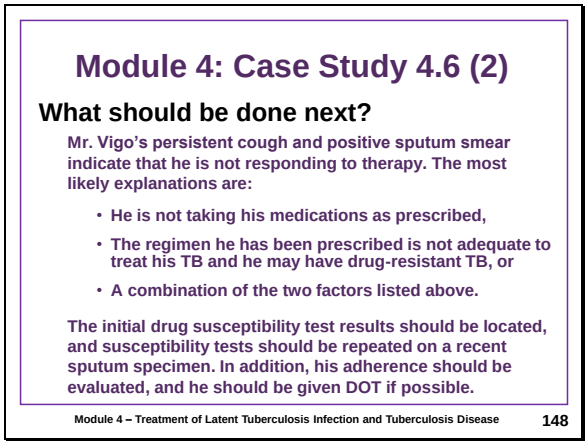
Slide 136	**Module 4: Case Study 4.1 (2)** **Should either one receive further evaluation for LTBI or TB disease?** **Yes, both should receive further evaluation for LTBI or TB disease.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 136	• Read case study question • Ask participants for answers *Answers – Module 4, p. 56*
Slide 137	**Module 4: Case Study 4.1 (3)** **Should either one start LTBI treatment? Explain.** **Yes, both should start LTBI treatment. The wife is a contact of someone with infectious TB disease, and she has a positive TST. Therefore, after receiving a medical evaluation (and TB disease is ruled out), she should complete an entire course of LTBI treatment, regardless of her age.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 137	• Ask participants why the wife should receive LTBI treatment *Answers – Module 4, p. 56*
Slide 138	**Module 4: Case Study 4.1 (4)** **Should either one start LTBI treatment? Explain. (cont.)** **The daughter has a negative TST, but only one week has passed since her last TB exposure. It is possible that not enough time has passed for her to be able to react to the TST.** **Since it is currently impossible to tell whether she has TB infection and because she may develop TB disease very quickly after infection, she should start LTBI treatment now and be retested 8 to 10 weeks after last exposure to TB. If negative upon retest, she may stop taking medicine. If positive, she should complete the entire course of LTBI treatment (9 months for children).** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 138	• Ask participants why the daughter should receive LTBI treatment *Answers – Module 4, p. 56*

Slide 139	**Module 4: Case Study 4.2 (1)** **A 65-year-old man is prescribed LTBI treatment with INH because he is a contact of a person with infectious TB disease and he has an induration of 20 mm to the TST. His baseline liver function tests are normal, but he drinks a six-pack of beer every day.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 139	• Ask participants to turn to p. 21 (if participants have print-based modules) • Read case study *Case Study 4.2 – Module 4, p. 21*
Slide 140	**Module 4: Case Study 4.2 (2)** **What kind of monitoring is necessary for this patient while he is taking INH?** • **Although his liver function tests are normal, he is at high risk of INH-associated hepatitis because he is older and he abuses alcohol.** • **He should be educated about the symptoms of adverse reactions to INH and instructed to seek medical attention immediately if these symptoms occur.** • **He should be seen by a clinician monthly to ask about his symptoms, examine him for signs of adverse reactions, and consider performing liver function tests.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 140	• Read case study question • Ask participants for answers *Answers – Module 4, p. 57*
Slide 141	**Module 4: Case Study 4.3 (1)** **An 18-month-old girl is admitted to the hospital because of meningitis. Doctors discover that her grandmother had pulmonary TB disease and was treated with a 6-month regimen. The medical evaluation of the child confirms the diagnosis of TB meningitis.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 141	• Ask participants to turn to p. 30 (if participants have print-based modules) • Read case study *Case Study 4.3 – Module 4, p. 30*

Slide 142	**Module 4: Case Study 4.3 (2)** **How long should the child be treated?** **The child should be treated for 9 to 12 months because she has TB meningitis.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 142	• Read case study question • Ask participants for answers *Answers – Module 4, p. 57*
Slide 143	**Module 4: Case Study 4.4 (1)** **You are assigned to deliver medications to TB patients as part of the DOT program where you work. When you visit Mr. Jackson's house, you ask him how he is feeling. He tells you that he was up all night vomiting.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 143	• Ask participants to turn to p. 35 (if participants have print-based modules) • Read case study *Case Study 4.4 – Module 4, p. 35*
Slide 144	**Module 4: Case Study 4.4 (2)** **What are the possible causes? What should you do?** **His vomiting may be a symptom of hepatitis (caused by INH, RIF, and PZA) or of stomach upset due to PZA. Mr. Jackson should be advised to stop his medication, and the situation should be reported to the clinician immediately. Mr. Jackson should be given a medical evaluation right away.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 144	• Read case study question • Ask participants for answers *Answers – Module 4, p. 57*

Slide 145	**Module 4: Case Study 4.5 (1)** **Ms. Young, a patient who started treatment for TB disease last week, calls the TB clinic to complain that her urine has changed to an odd color.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 145	• Read case study *Case Study 4.5 – Module 4, p. 36*
Slide 146	**Module 4: Case Study 4.5 (2)** **Name 2 possible causes, and explain how each would affect the color of urine.** **One possible cause is the discoloration of body fluids, a common side effect of RIF. This would cause Ms. Young's urine to turn orange. This is NOT a serious condition.** **Another possible cause is hepatitis, which can be caused by INH, RIF, or PZA. Hepatitis, a serious condition, would cause Ms. Young's urine to turn dark. If Ms. Young's urine is brown, the situation should be reported to the clinician and Ms. Young should receive a medical examination right away.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 146	• Read case study question • Ask participants for answers *Answers – Module 4, p. 58*
Slide 147	**Module 4: Case Study 4.6 (1)** **Mr. Vigo was diagnosed with smear-positive pulmonary TB disease in January. He was treated with INH, RIF, and PZA by his private physician. He visited his physician again in March. His drug susceptibility test results were not available at the time of this appointment. Nevertheless, the physician discontinued his prescription of PZA and gave him refills of INH and RIF. Mr. Vigo visited his physician again in April. He had a persistent cough, and his sputum smear was found to be positive.** Module 4 – Treatment of Latent Tuberculosis Infection and Tuberculosis Disease 147	• Ask participants to turn to p. 42 (if participants have print-based modules) • Read case study *Case Study 4.6 – Module 4, p. 42*

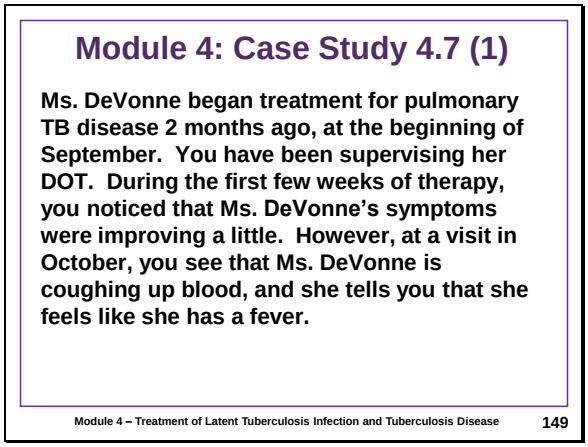
Slide 148



- Read case study question
- Ask participants for answers

Answers – Module 4, p. 58

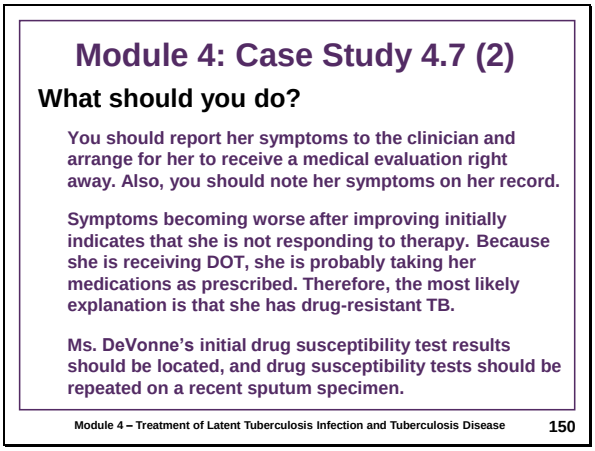
Slide 149



- Ask participants to turn to p. 46 (if participants have print-based modules)
- Read case study

Case Study 4.7 – Module 4, p. 46

Slide 150



- Read case study question
- Ask participants for answers
- Ask if there are any questions about Module 4 before moving on to Module 5

Answers – Module 4, p. 59

Module 5: Infectiousness and Infection Control

Facilitation Tips

Background

In this module, participants will learn about the factors that determine the infectiousness of a person with TB disease. This will help participants decide whether a particular patient should be considered infectious. Participants will also learn about the precautions they should take if they come in contact with patients who are considered infectious to prevent the spread of TB in health care settings and communities. These precautions, or measures, are part of a TB infection-control program that each health care setting should develop to minimize the risk for transmission of *Mycobacterium tuberculosis*.

Learning Objectives

After this presentation, participants will be able to

1. Describe the factors that determine the infectiousness of a TB patient.
2. Describe the main goals of a TB infection-control program.
3. Describe the three levels of control measures that are the basis of an effective infection-control program.
4. Describe the purpose and the characteristics of a TB airborne infection isolation room.
5. Describe the circumstances when personal respirators should be used.

Module Overview

Time	Activity	Content	Resources Needed
2 min.	Presentation	Introduction	Slides 1-3
10 min.	Presentation	Infectiousness	Slides 4-12
15 min.	Presentation	TB Infection Control	Slides 13-27
25 min.	Presentation	TB Infection Control Measures	Slides 28-60
3 min.	Presentation	TB Risk Assessment	Slides 61-65
5 min.	Presentation	Infection Control in Nontraditional Facility-Based Settings	Slides 66-72
5 min.	Presentation	TB Infection Control in the Home	Slides 73-81
10 min.	Case Studies	Case Studies	Slides 82-93
75 min.	**Total Time**		

		Facilitation Tips
Slide 1	*Self-Study Modules on Tuberculosis* Module 5 Self-Study Modules on Tuberculosis **Infectiousness and Infection Control**	• Introduce Module 5
Slide 2	**Module 5: Objectives** **At completion of this module, learners will be able to:** 1. Describe the factors that determine the infectiousness of a TB patient 2. Describe the main goals of a TB infection-control program 3. Describe the three levels of control measures that are the basis of an effective TB infection-control program 4. Describe the purpose and the characteristics of a TB airborne infection isolation (**AII**) room 5. Describe the circumstances when personal respirators should be used Module 5 – Infectiousness and Infection Control 2	• State objectives of presentation *Objectives - Module 5, p. 1*
Slide 3	**Module 5: Overview** • Infectiousness • TB Infection Control – TB Infection Control Measures – TB Risk Assessment – Infection Control in Nontraditional Facility-Based Settings – TB Infection Control in the Home • Case Studies Module 5 – Infectiousness and Infection Control 3	• Review slide content

Slide 4

Infectiousness

4

- Introduce section
- Ask participants which factors are associated with infectiousness

Infectiousness - Module 5, pp. 4-5

Slide 5

Infectiousness (1)

- **Infectiousness is directly related to number of tubercle bacilli TB patients expel into air**
- **TB patients generally expel more tubercle bacilli if their cough produces a lot of sputum**
- **Only people with TB of the lungs, airway, or larynx are infectious**

Module 5 – Infectiousness and Infection Control 5

- Review slide content

Infectiousness - Module 5, pp. 4-5

Slide 6

Infectiousness (2)

Factors generally associated with infectiousness:

• Presence of cough	• Not covering mouth when coughing
• Cavity in the lung	• Not receiving adequate treatment or prolonged illness
• Acid-fast bacilli on sputum smear	• Undergoing cough inducing procedures
• TB of lungs, airway, or larynx	• Positive sputum cultures

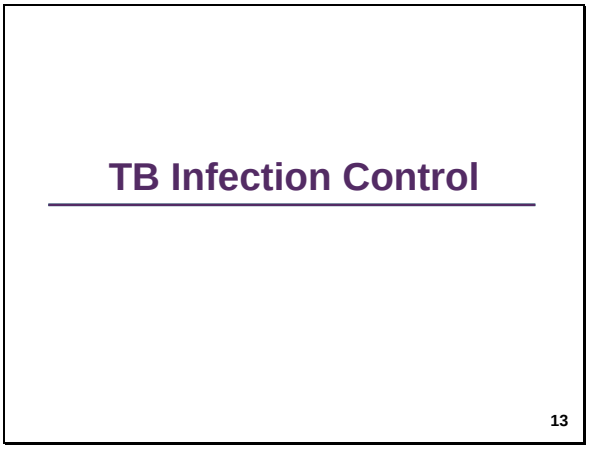
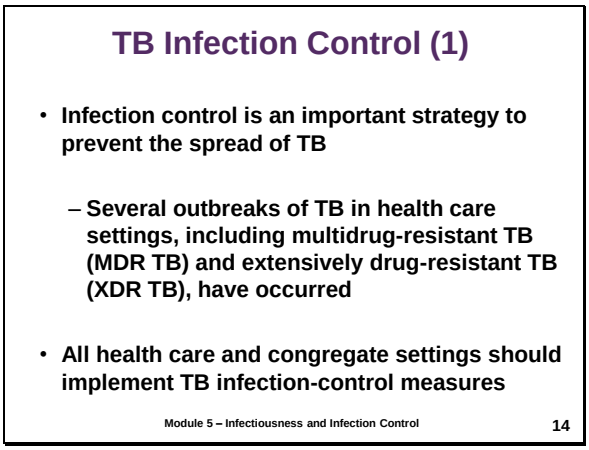
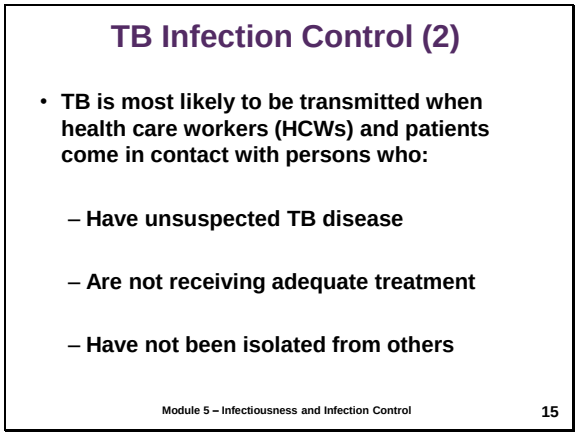
Module 5 – Infectiousness and Infection Control 6

- Review slide content

Infectiousness - Module 5, pp. 4-5

Slide 7	**Infectiousness (3)** • Infectiousness appears to decline rapidly after adequate treatment is started; however: – How quickly infectiousness declines varies from patient to patient (weeks to months) – Patients with drug-resistant TB may not respond to initial drug regimen; meaning they may remain infectious for longer Module 5 – Infectiousness and Infection Control 7	• Review slide content *Infectiousness - Module 5, pp. 4-5*
Slide 8	**Infectiousness (4)** • Patients can be considered non-infectious when they meet <u>all</u> of the following criteria: – Received adequate treatment for 2 weeks or longer – Symptoms have improved – Three consecutive negative sputum smears from sputum collected in 8 to 24 hour intervals (at least one early morning specimen) Module 5 – Infectiousness and Infection Control 8	• Review slide content *Infectiousness - Module 5, pp. 4-5*
Slide 9	**Infectiousness (5)** • Children are less likely than adults to be infectious – Children generally do not produce a lot of sputum when they cough • Young children can still transmit TB if they exhibit signs of infectiousness  Module 5 – Infectiousness and Infection Control 9	• Before showing slide, ask participants if children are more or less likely than adults to be infectious • Review slide content • Explain that children can transmit TB to others if they have signs of infectiousness, such as a positive AFB smear or cavity in their lung *Infectiousness - Module 5, pp. 4-5*

Slide 10	**Infectiousness** **Study Question 5.1** **List 7 factors that affect the infectiousness of a TB patient.** • Presence of a cough • Chest x-ray showing cavity in lung • Positive acid-fast bacilli sputum smear result • TB of lungs, airway, or larynx • Patient not covering mouth or nose when coughing • Not receiving adequate treatment or having prolonged illness • Undergoing cough-inducing procedures Module 5 – Infectiousness and Infection Control 10	• Introduce study questions • Ask participants to turn to p. 6 (if participants have print-based modules) • Read question • Ask participants for answers *Answers - Module 5, p. 37*
Slide 11	**Infectiousness** **Study Question 5.2** **Why does the site of disease affect the infectiousness of a TB patient?** • Usually only people with pulmonary or laryngeal TB are infectious. These people may be coughing and expelling tubercle bacilli into air. • People with extrapulmonary TB are generally not infectious Module 5 – Infectiousness and Infection Control 11	• Read question • Ask participants for answers *Answers - Module 5, p. 37*
Slide 12	**Infectiousness** **Study Question 5.3** **When can a TB patient be considered noninfectious? List all 3 criteria.** When they meet <u>all</u> of the following criteria: – Received adequate TB treatment for a minimum of 2 weeks – Symptoms have improved – 3 consecutive negative sputum smears from sputum collected in 8-24 hour intervals (one being early morning specimen) Module 5 – Infectiousness and Infection Control 12	• Read question • Ask participants for answers *Answers - Module 5, p. 37*

Slide 13		• Introduce section *TB Infection Control - Module 5, pp. 8-35*
Slide 14		• Review slide content *TB Infection Control - Module 5, p. 8*
Slide 15		• Review slide content • Explain that TB can be transmitted in just about any setting but that it is most likely to be transmitted in health care settings with these three characteristics *TB Infection Control - Module 5, p. 8*

Slide 16	**TB Infection Control (3)** **Role of the Health Department** • **Health department TB control programs should:** – **Ensure each of their clinics develop a TB infection-control program** – **Provide consultation about TB infection control to other health care and congregate settings** Module 5 – Infectiousness and Infection Control 16	• Review slide content *TB Infection Control - Module 5, p. 9*
Slide 17	**TB Infection Control (4)** **Role of the Health Department** • **Health departments should specifically assist health care settings with:** – **Understanding infection control principles** – **Reporting confirmed or suspected TB cases** – **Conducting contact investigations** – **Ensuring a plan for TB patients to receive follow-up care after discharge** – **Conducting risk assessments, testing, surveillance, and outbreak investigations** – **Planning and implementation of TB control activities** Module 5 – Infectiousness and Infection Control 17	• Review slide content • Explain that health departments should work closely with health care facilities to help them report confirmed or suspected TB cases as quickly as possible *TB Infection Control - Module 5, p. 9*
Slide 18	**TB Infection-Control Program (1)** • **Main goals of a TB infection-control program are to ensure early and prompt:** – **Detection of TB disease** – **Airborne precautions (e.g., isolation of people who have or are suspected of having TB disease)** – **Treatment of people who have or are suspected of having TB disease** Module 5 – Infectiousness and Infection Control 18	• Review slide content *TB Infection Control Program - Module 5, p. 10*

Slide 19	**TB Infection-Control Program (2)** **Detection of TB disease** • HCWs should suspect TB disease in anyone with any of these symptoms: – Persistent cough – Chest pain – Bloody sputum – Weight loss or loss of appetite – Fever – Chills – Night sweats  Module 5 – Infectiousness and Infection Control 19	• Review slide content • Explain that in areas where TB is common staff at health care facilities should stay alert for TB; especially staff at public health and community clinics *TB Infection-Control Program - Module 5, p. 10*
Slide 20	**TB Infection-Control Program (3)** **Detection of TB disease** • When a health care worker suspects that a patient has TB disease, the patient should be: – Placed in an area away from other patients and evaluated – Given a surgical mask to wear – Given tissues and asked to cover nose and mouth when coughing or sneezing Module 5 – Infectiousness and Infection Control 20	• Before showing slide, ask what a health care worker should do if they suspect a patient has TB disease • Review slide content *TB Infection Control Program - Module 5, p. 10*
Slide 21	**TB Infection-Control Program (4)** **Airborne Precautions** • Airborne precautions should be taken for any person who has signs or symptoms of TB disease • If facility has an **AII** room, TB suspects and TB patients should be placed there • Health care settings, such as TB clinics, should implement a respiratory-protection program Module 5 – Infectiousness and Infection Control 21	• Before showing slide, ask what airborne precautions should be taken for a person who has signs or symptoms of TB disease • Review slide content • Explain that if a facility does not have an AII room, patients who have or are suspected of having TB should be placed in an area away from other patients • Explain that for settings other than clinics, patients with suspected TB should be promptly referred for a medical evaluation *TB Infection Control Program - Module 5, pp. 11-12*

Slide 22	**TB Infection-Control Program (5)** **Treatment** • **Patients diagnosed with TB should start treatment immediately** • **DOT should be used to ensure adherence**  Module 5 – Infectiousness and Infection Control 22	• Review slide content • Emphasize that DOT is the best way to ensure adherence to treatment *TB Infection Control Program - Module 5, p. 12*
Slide 23	**TB Infection Control Study Question 5.4** **Under what circumstances is TB most likely to be transmitted in health care facilities?** **TB is most likely to be transmitted when health care workers and patients come into contact with persons who:** • **Have unsuspected TB disease** • **Are not receiving adequate treatment** • **Have not been isolated from others** Module 5 – Infectiousness and Infection Control 23	• Introduce study questions • Ask participants to turn to p. 13 (if participants have print-based modules) • Read question • Ask participants for answers *Answers - Module 5, p. 37*
Slide 24	**TB Infection Control Study Question 5.5** **How can the health department assist health care settings in preventing the spread of TB?** **The health department can help health care facilities with:** • **Understanding infection control principles** • **Reporting confirmed or suspected TB cases** • **Conducting contact investigations** • **Ensuring there is a plan for TB patients to receive follow-up care after they are discharged** • **Risk assessments, testing, surveillance, and outbreak investigations** • **Planning and implementing TB control activities** Module 5 – Infectiousness and Infection Control 24	• Read question • Ask participants for answers *Answers - Module 5, p. 38*

Slide 25	**TB Infection Control Study Question 5.6** **What are the main goals of a TB infection-control program?** **The main goals are to detect TB disease early and to promptly isolate and treat people who have TB disease.** Module 5 – Infectiousness and Infection Control 25	• Read question • Ask participants for answers *Answers - Module 5, p. 38*
Slide 26	**TB Infection Control Study Question 5.7** **What would make a health care worker suspect that a patient has TB disease?** • Persistent cough • Bloody sputum • Weight loss or loss of appetite • Fever • Night sweats Module 5 – Infectiousness and Infection Control 26	• Read question • Ask participants for answers *Answers - Module 5, p. 38*
Slide 27	**TB Infection Control Study Question 5.8** **What should be done when a health care worker suspects that a patient has TB disease?** **The patient should be** • Placed in an area away from other patients and evaluated • Given surgical mask to wear • Given tissues and asked to cover nose and mouth when coughing or sneezing **Patients who are diagnosed with TB should start appropriate treatment at once** Module 5 – Infectiousness and Infection Control 27	• Read question • Ask participants for answers *Answers - Module 5, p. 38*

Slide 28	**TB Infection Control** **TB Infection Control Measures** 28	• Introduce section *TB Infection Control Measures - Module 5, p. 16*
Slide 29	**TB Infection Control Measures (1)** **Hierarchy of Infection Control**  Module 5 – Infectiousness and Infection Control 29	• Explain that there are three levels of infection control • Review slide content *TB Infection Control Measures - Module 5, p. 16*
Slide 30	**TB Infection Control Measures (2)** **Three levels of control measures:** • **Administrative controls: managerial measures to reduce risk of exposure to *M. tuberculosis*** • **Environmental controls: engineering systems to prevent the spread of and reduce the concentration of infectious *M. tuberculosis* droplet nuclei in air** • **Respiratory-protection controls: personal protection to further minimize risk for exposure to *M. tuberculosis*** Module 5 – Infectiousness and Infection Control 30	• Review slide content *TB Infection Control Measures - Module 5, p. 16*

Slide 31	**TB Infection Control** **TB Infection Control Measures** **Administrative Controls** 31	• Introduce section • Ask participants what types of administrative controls should be used *Administrative Controls - Module 5, pp. 17-19*
Slide 32	**Administrative Controls (1)** • **Administrative controls:** – **First and most important level of TB infection-control program** – **Goal is to reduce risk of exposure to persons who might have TB disease** Module 5 – Infectiousness and Infection Control 32	• Review slide content *Administrative Controls - Module 5, p. 17*
Slide 33	**Administrative Controls (2)** • **Administrative control activities:** – **Assigning someone responsibility for TB infection control** – **Developing and implementing a written TB infection control plan** – **Conducting a TB risk assessment** – **Ensuring availability of prompt laboratory processing, testing, and reporting of results** Module 5 – Infectiousness and Infection Control 33	• Review slide content • Explain that a TB risk assessment consists of evaluating the risk of transmission • Explain that an infection control plan should specify policies and practices to ensure prompt detection, isolation, and treatment or transfer of persons who have suspected or confirmed disease • Explain that laboratory services help to determine if patients are still infectious and if they need to remain in an AII room *Administrative Controls - Module 5, p. 17*

Slide 34

Administrative Controls (3)

- **Administrative control activities (cont.):**
  - **Implementing effective work practices for managing patients who may have TB**
  - **Ensuring proper cleaning and sterilization or disinfection of equipment**
  - **Educating, training, and counseling HCWs about TB**
  - **Testing and evaluating workers who are at risk for TB or may be exposed to TB**

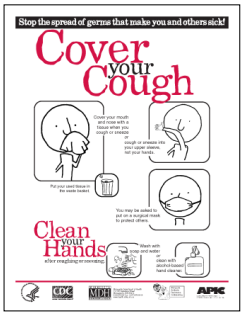
- Review slide content
- Explain that all health care workers should be educated about basic TB concepts, infection control, and the importance of testing programs
- Explain that TB testing programs can protect both workers and patients. Each health care setting should determine if and how often serial testing is offered depending upon the risk of TB transmission in their setting

Administrative Controls - Module 5, p. 18

Slide 35

Administrative Controls (4)

- **Administrative control activities (continued):**
  - **Applying epidemiology-based prevention principles**
  - **Using posters to remind patients of proper cough etiquette**
  - **Coordinating efforts between health departments and high risk settings**



- Review slide content
- Emphasize that state or local health department TB control programs and high-risk health care and congregate settings should establish regular communication

Administrative Controls - Module 5, p. 19

Slide 36

TB Infection Control

TB Infection Control Measures
Environmental Controls

- Introduce section

Environmental Controls - Module 5, pp. 19-22

Slide 37	**Environmental Controls** • Second level of infection-control program • Consist of technologies that are designed to prevent the spread and reduce the concentration of TB in the air – Ventilation technologies – High efficiency particulate air filtration (HEPA) – Ultraviolet germicidal irradiation (UVGI) Module 5 – Infectiousness and Infection Control 37	• Review slide content • Explain that the specifics of environmental controls will differ for each health care setting *Environmental Controls - Module 5, p. 19*
Slide 38	**Ventilation Technologies (1)** • Ventilation is the movement of air in a building and the replacement of air inside with air from outside • Ventilation technologies include: – Natural ventilation – Mechanical ventilation Module 5 – Infectiousness and Infection Control 38	• Review slide content • State that when fresh air enters a room, it dilutes the concentration of particles in room air, such as droplet nuclei containing *M. tuberculosis* *Environmental Controls - Module 5, p. 20*
Slide 39	**Ventilation Technologies (2)** **Natural Ventilation** • Doors and windows should be open • Fans can be used to distribute air • HCW should sit near fresh air source • Can be useful for nontraditional settings that do not have a central ventilation system  Module 5 – Infectiousness and Infection Control 39	• Review slide content • Explain that natural ventilation relies on open doors and windows to bring in air from the outside • State that waiting rooms, shelter dormitories, or other rooms in which people congregate should have an operable door, window, or skylight kept open as often as possible *Environmental Controls - Module 5, p. 19*

Slide 40	**Ventilation Technologies (3)** **Mechanical Ventilation** • Refers to the use of technological equipment to circulate and move air • Consists of two types of technologies – Local exhaust ventilation – General ventilation • Should be used by hospitals, TB clinics, and other settings where TB patients are expected Module 5 – Infectiousness and Infection Control 40	• Review slide content *Environmental Controls - Module 5, p. 20*
Slide 41	**Ventilation Technologies (4)** **Mechanical Ventilation** • Local exhaust ventilation – Stops airborne contaminants from spreading into general environment – Includes external hoods, booths, and tents – Should be used for cough-inducing procedures Module 5 – Infectiousness and Infection Control 41	• Review slide content *Environmental Controls - Module 5, p. 20*
Slide 42	**Ventilation Technologies (5)** **Mechanical Ventilation** • General ventilation systems: – Dilute contaminated air – Remove contaminated air – Control airflow patterns in patient and procedure rooms (e.g., negative pressure in **AII** room) Module 5 – Infectiousness and Infection Control 42	• Review slide content *Environmental Controls - Module 5, p. 21*

Slide 43

Ventilation Technologies (6)
Mechanical Ventilation

- **AII rooms are designed to prevent spread of droplet nuclei expelled by patient**
  - **Negative pressure**
  - **Clean air flows from corridors into AII room**
- **Air cannot escape AII room**
  - **Exhausted outdoors or passed through filter**

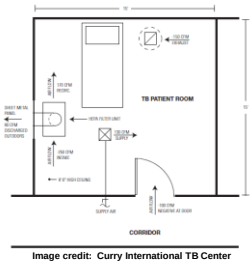


Image credit: Curry International TB Center

Module 5 – Infectiousness and Infection Control 43

- Explain that in TB clinics, hospitals, and other inpatient settings, patients known or suspected of having TB disease should be placed in an AII room
- Review slide content
- Note that air from AII rooms can be exhausted outdoors because any infectious droplet nuclei will be diluted in the outdoor air and killed by sunlight

Environmental Controls - Module 5, p. 21

Slide 44

HEPA Filters

- **HEPA filters are special filters used to remove droplet nuclei from air**
- **Must be used when releasing air from:**
  - **Local exhaust ventilation booths to surrounding area**
  - **AII room to general ventilation system**

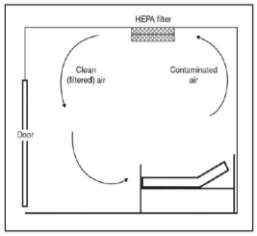


Image credit: Curry International TB Center

Module 5 – Infectiousness and Infection Control 44

- Review slide content
- Use the image to illustrate how air circulates through the room

Environmental Controls - Module 5, p. 21

Slide 45

UVGI

- **UVGI is air cleaning technology that consists of lamps that give off UV light, which can kill tubercle bacilli**
- **Should be used with other infection control measures**
- **UV light can be harmful to skin and eyes**

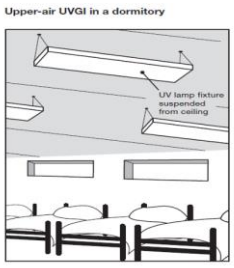


Image credit: Curry International TB Center

Module 5 – Infectiousness and Infection Control 45

- Review slide content
- State that because UV light can be harmful to skin and eyes the lamps must be installed in upper part of rooms or corridors or placed in exhaust ducts

Environmental Controls - Module 5, p. 22

Slide 46	**TB Infection Control** **TB Infection Control Measures** **Respiratory-Protection Controls** 46	• Introduce section • Ask what types of respiratory protection controls should be used by the patient and the health care worker *Respiratory-Protection Controls - Module 5, pp. 22-24*
Slide 47	**Respiratory-Protection Controls (1)** • **Third level of infection-control that includes:** – **Implementing a respiratory-protection program** – **Training health care workers on respiratory-protection** – **Educating patients on respiratory hygiene** Module 5 – Infectiousness and Infection Control 47	• Review slide content • Note that all health care settings that use respiratory-protection controls are required by the Occupational Safety and Health Administration (OSHA) to develop, implement, and maintain a respiratory-protection program • Explain that respiratory-protection controls reduce the risk of TB transmission in settings where administrative and environmental controls may not fully protect persons against droplet nuclei *Respiratory-Protection Controls - Module 5, p. 22*
Slide 48	**Respiratory-Protection Controls (2)** **Personal Respirators** • **Respirators filter out droplet nuclei** • **Should be used in:** – **TB AII rooms** – **Rooms where cough-inducing or aerosol generating procedures are done** – **Ambulances transporting infectious TB patients** – **Homes of infectious TB patients** Module 5 – Infectiousness and Infection Control 48	• Review slide content *Respiratory-Protection Controls - Module 5, p. 22*

Slide 49

Respiratory-Protection Controls (3)
Personal Respirators

- **Important that respirator fits properly:**
  - **Fit test used to determine which respirator to wear**
  - **User seal check should be done each time a respirator is put on**

Health care worker undergoing a fit test
Image credit: Paul Jensen

Module 5 – Infectiousness and Infection Control 49

- Review slide content
- Emphasize that the most important factor to consider when selecting respirator is whether the respirator fits properly
- Explain that the image is of a health care worker undergoing a fit test for a personal respirator

Respiratory-Protection Controls - Module 5, p. 23

Slide 50

Respiratory-Protection Controls (4)
Personal Respirators

- **Respirators that can be used to protect against *M. tuberculosis*:**
  - **Nonpowered respirators with N95, N99, N100, R95, R99, R100, P95, P99, and P100 filters**
  - **Powered air-purifying respirators (PAPRs) with high-efficiency filters**
  - **Supplied-air respirators**

Image credit: Greg Knobloch

Module 5 – Infectiousness and Infection Control 50

- Review slide content
- Explain that the top image shows non-powered respirators
- Explain that the bottom image is of a woman wearing a powered air-purifying respirator (PAPR)

Respiratory-Protection Controls - Module 5, p. 23

Slide 51

Respiratory-Protection Controls (5)
Respirators and Surgical Masks

- **Important to understand the difference between respirators and surgical masks**
  - **Respirators protect individuals from inhaling droplet nuclei**
  - **Surgical masks stop droplet nuclei from being exhaled into air by infectious TB patients or suspects**

Module 5 – Infectiousness and Infection Control 51

- Review slide content
- Explain that respirators protect individuals from becoming infected with *M. tuberculosis* and that surgical masks protect individuals from expelling infectious droplet nuclei

Respiratory-Protection Controls - Module 5, p. 23

Slide 52	**Respiratory-Protection Controls (6)** **Respirators**  **Health care worker wearing a personal respirator** Module 5 – Infectiousness and Infection Control 52	• Explain that this image is of a health care worker wearing a personal respirator *Respiratory-Protection Controls - Module 5, p. 24*
Slide 53	**Respiratory-Protection Controls (7)** **Surgical Masks**  **Patient wearing a surgical mask** Module 5 – Infectiousness and Infection Control 53	• Explain that this image is of a patient wearing a surgical mask • Emphasize that patients should not wear respirators because respirators are designed to prevent persons from inhaling droplet nuclei *Respiratory-Protection Controls - Module 5, p. 24*
Slide 54	**TB Infection-Control Study Question 5.9** **What are the three levels of control that form the basis of a TB infection-control program?** • Administrative controls • Environmental controls • Respiratory-protection controls Module 5 – Infectiousness and Infection Control 54	• Introduce study questions • Ask participants to turn to p. 26 (if participants have print-based modules) • Read question • Ask participants for answers *Answers - Module 5, p. 38*

Slide 55	**Administrative Controls Study Question 5.10** **List 5 administrative control measures that should be taken in health care settings to reduce the risk of exposure to persons who may have TB disease.** • Assign responsibility for TB infection control • Conduct TB risk assessment • Develop and implement a written TB infection-control plan • Ensure prompt availability of recommended laboratory processing, testing, and reporting of results • Implement effective work practices for the management of patients • Ensure proper cleaning, sterilization, or disinfection of equipment • Train and educate health care workers • Test and evaluate health care workers for TB • Apply epidemiology-based prevention principles • Use posters and signs educating and advising respiratory hygiene and cough etiquette • Coordinate efforts with health department and high-risk health care and congregate settings Module 5 – Infectiousness and Infection Control 55	• Read question • Ask participants for answers *Answers - Module 5, p. 39*
Slide 56	**Environmental Controls Study Question 5.11** **Where should sputum induction, bronchoscopy, or other cough-inducing procedures be done?** **These medical procedures should be done in special AII rooms or sputum induction booths to prevent any droplet nuclei expelled during the procedure from reaching other parts of the facility.** Module 5 – Infectiousness and Infection Control 56	• Read question • Ask participants for answers *Answers - Module 5, p. 39*
Slide 57	**Environmental Controls Study Question 5.12** **What is a TB AII room? What are the important characteristics of an AII room?** **Airborne infection isolation (AII) rooms have special characteristics to prevent spread of droplet nuclei expelled by a TB patient. They are at negative pressure relative to other parts of the facility, and air from the room is exhausted directly to the outdoors or passed through a filter.** Module 5 – Infectiousness and Infection Control 57	• Read question • Ask participants for answers *Answers - Module 5, p. 39*

Slide 58	**Ventilation Systems Study Question 5.13** **How do ventilation systems help prevent the spread of TB?** **Ventilation systems maintain negative pressure and exhaust air properly. These systems can also be designed to minimize the spread of TB in other areas of the facility.** Module 5 – Infectiousness and Infection Control 58	• Read question • Ask participants for answers *Answers - Module 5, p. 40*
Slide 59	**Ventilation Systems Study Question 5.14** **Give 4 examples of settings where personal respirators should be used.** • TB **AII** rooms • Rooms where cough-inducing procedures are done • Ambulances or other vehicles transporting infectious TB patients • Homes of infectious TB patients Module 5 – Infectiousness and Infection Control 59	• Read question • Ask participants for answers *Answers - Module 5, p. 40*
Slide 60	**Respiratory Protection-Controls Study Question 5.15** **What is the difference in use between a respirator and a surgical mask?** • Respirators protect individuals from inhaling droplet nuclei • Surgical masks stop droplet nuclei from being exhaled into the air by the person wearing them Module 5 – Infectiousness and Infection Control 60	• Read question • Ask participants for answers *Answers - Module 5, p. 40*

Slide 61	**TB Infection Control** **TB Risk Assessment** 61	• Introduce section *TB Risk Assessment - Module 5, pp. 28-30*
Slide 62	**TB Risk Assessment (1)** • Administrative control measure • Helps to inform infection control plan • Determines types of controls needed for setting • Serves as an initial and ongoing monitoring and evaluation tool for infection-control program • Helps determine frequency of employee testing Module 5 – Infectiousness and Infection Control 62	• Explain that every health care and congregate setting should conduct initial and ongoing evaluations of the risk for transmission of *M. tuberculosis* • Review slide content *TB Risk Assessment - Module 5, p. 28*
Slide 63	**TB Risk Assessment (2)** • Risk assessment examines many factors, including: – Number of patients with TB disease in setting – Promptness of detection, isolation, and evaluation of patients with suspected or confirmed TB – Evidence of transmission of *M. tuberculosis* in setting – Community rate of TB disease Module 5 – Infectiousness and Infection Control 63	• Review slide content *TB Risk Assessment - Module 5, p. 28*

Slide 64

TB Risk Classification

- **Low risk**
  - **Persons with TB disease are not expected to be encountered**
- **Medium risk**
  - **Possible exposure to persons with TB disease**
  - **Possible exposure to clinical TB specimens**
- **Potential ongoing transmission**
  - **Setting where there is evidence of person-to-person transmission of *M. tuberculosis* in past year**

Module 5 – Infectiousness and Infection Control 64

- Explain that the risk level will vary from setting to setting. There are three TB risk classifications
- Review slide content

TB Risk Assessment - Module 5, p. 28

Slide 65

TB Testing Frequency

TB Risk Classification	Frequency for TB Testing
Low Risk	• Conduct baseline test when health care worker is hired • No further testing needed unless exposure occurs
Medium Risk	• Conduct baseline test when health care worker is hired • Repeat test annually
Potential Ongoing Transmission	• Conduct baseline test when health care worker is hired • Repeat test every 8 to 10 weeks until there is no evidence of *M. tuberculosis* transmission in setting

Module 5 – Infectiousness and Infection Control 65

- Explain that TB risk assessment helps to determine the need for a TB testing program and the frequency of the testing
- Review slide content

TB Risk Assessment - Module 5, p. 30

Slide 66

TB Infection Control

Infection Control in Nontraditional Facility–Based Settings

66

- Introduce section

Infection Control in Nontraditional Facility-Based Settings - Module 5, pp. 30-32

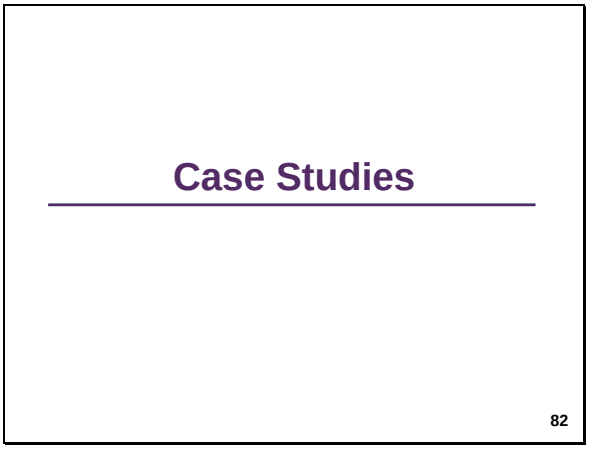
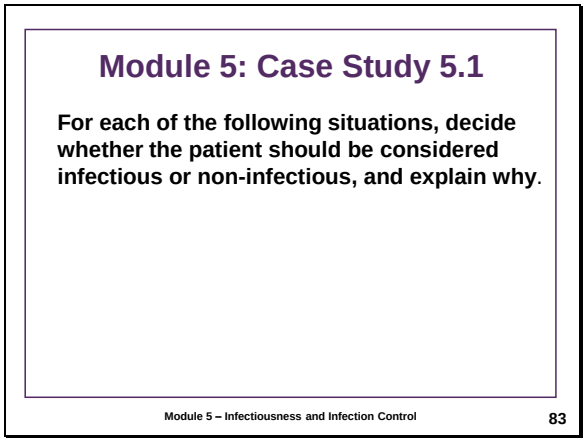
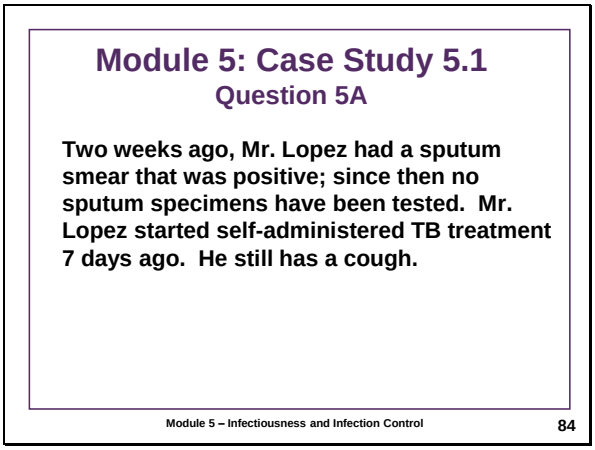
Slide 67	**Special Considerations (1)** • **Nontraditional facility-based settings where TB patients receive care should establish and follow an infection-control program** • **Includes settings such as:** – **Nursing homes** – **Correctional facilities** – **Homeless shelters** – **Drug treatment centers** – **Emergency medical services** – **Home-based health care** – **Outreach settings** Module 5 – Infectiousness and Infection Control 67	• Review slide content • Explain that the main goal should be to detect TB disease early and arrange for isolation and treatment of patients suspected of having TB • Local health departments and congregate settings should collaborate to provide training and education about TB as well as conducting contact investigations when necessary *Infection Control in Nontraditional Facility-Based Settings - Module 5, p. 30*
Slide 68	**Special Considerations (2)** **Correctional Facilities** • **Medical settings within correctional facilities should:** – **Classify as medium risk or higher** – **Test all staff annually** – **Implement a respiratory-protection program with at least one AII room** Module 5 – Infectiousness and Infection Control 68	• Review slide content *Infection Control in Nontraditional Facility-Based Settings - Module 5, pp. 30-31*
Slide 69	**Special Considerations (3)** **Correctional Facilities** • **Medical settings within correctional facilities should (cont.):** – **Have inmates with suspected or confirmed TB disease wear surgical mask when transported** – **Establish and maintain a tracking system for inmate testing and treatment** Module 5 – Infectiousness and Infection Control 69	• Review slide content • State that confidentiality of inmate information should be ensured during testing for signs and symptoms of TB *Infection Control in Nontraditional Facility-Based Settings - Module 5, p. 31*

Slide 70	**Special Considerations (4)** **Homeless Shelters** • Should observe the same TB infection-control measures as outpatient clinics • Several factors in shelter environment can influence likelihood of TB transmission: – Crowdedness of shelter – Ventilation system of shelter Module 5 – Infectiousness and Infection Control 70	• Explain that TB is more common in the homeless population than the general population • Review slide content *Infection Control in Nontraditional Facility-Based Settings - Module 5, p. 31*
Slide 71	**Special Considerations (5)** **Emergency Medical Services (EMS)** • EMS workers should be included in TB testing program based on risk for the setting • Persons with infectious TB who are transported in ambulance should wear surgical mask • Drivers, health care workers, and other staff should consider wearing a respirator • Ambulance should allow for maximum amount of outdoor air to be circulated in vehicle Module 5 – Infectiousness and Infection Control 71	• Explain that even though the overall risk of transmission of *M. tuberculosis* in EMS settings is low, there has been documented transmission • Review slide content *Infection Control in Nontraditional Facility-Based Settings - Module 5, p. 31*
Slide 72	**Special Considerations (6)** **Long-Term Care Facilities (LTCFs)** • LTCFs (e.g., hospices and nursing homes) should: – Symptom screen and possibly test new employees and residents – Have administrative and environmental controls IF they accept patients with infectious TB • Persons with TB disease who are non-infectious can stay in LTCFs and do not need **AII** room Module 5 – Infectiousness and Infection Control 72	• Review slide content • Emphasize that patients with suspected or confirmed infectious TB disease should not stay in a long-term care facility unless adequate administrative and environmental controls are in place *Infection Control in Nontraditional Facility-Based Settings - Module 5, p. 32*

Slide 73	**TB Infection Control** **TB Infection Control in the Home** 73	• Introduce section • Ask what type of TB infection control should be used in the home for the family and for the health care worker *TB Infection Control in the Home - Module 5, pp. 32-33*
Slide 74	**TB Infection Control in the Home (1)** **Patient Returning Home** **TB patients and TB suspects may be sent home after starting treatment, even though they may be infectious** Module 5 – Infectiousness and Infection Control 74	• Review slide content *TB Infection Control in the Home - Module 5, p. 32*
Slide 75	**TB Infection Control in the Home (2)** **Patient Returning Home** • **Criteria for patient to return home:** – **Follow-up plan has been made with the local TB program** – **Patient on TB treatment and DOT arranged** – **No infants or children younger than 5 years of age or persons with immunocompromising conditions in home** Module 5 – Infectiousness and Infection Control 75	• Explain that TB patients can return home even if they do not have three negative sputum smears, if certain criteria are met • Explain that patients with TB disease are allowed to go back home if all of the criteria are met • Review slide content *TB Infection Control in the Home - Module 5, p. 32*

Slide 76	**TB Infection Control in the Home (3)** **Patient Returning Home** • Criteria for patient to return home (cont.): – All household members have already been exposed to TB patient – Patient is willing to not travel outside of home until sputum smear results are negative Module 5 – Infectiousness and Infection Control 76	• Review slide content *TB Infection Control in the Home - Module 5, p. 32*
Slide 77	**TB Infection Control in the Home (4)** **Patient Returning Home** • TB patients and members of household should take steps to prevent spread of TB • Patients with TB should be instructed to: – Cover mouth and nose with tissue when coughing or sneezing – Sleep alone – Not have visitors until noninfectious Module 5 – Infectiousness and Infection Control 77	• Review slide content • Note that it is more likely that TB patients transmitted TB to members of their household before their TB was diagnosed and TB started; however, steps should still be taken to prevent the spread of TB in the home when the patient returns *TB Infection Control in the Home - Module 5, p. 32*
Slide 78	**TB Infection Control in the Home (5)** **Health Care Workers (HCWs)** • HCWs should: – Be trained in detecting TB signs and symptoms – Take precautions to protect themselves: • Instruct patient to cover mouth when coughing • Wear personal respirator • Collect sputum in well-ventilated areas • Participate in TB testing and prevention programs Module 5 – Infectiousness and Infection Control 78	• Review slide content *TB Infection Control in the Home - Module 5, p. 33*

Slide 79	**TB Risk Assessment** **Study Question 5.16** **What are 3 different TB risk classifications that can be assigned to health care settings?** • Low risk • Medium risk • Potential ongoing transmission Module 5 – Infectiousness and Infection Control 79	• Introduce study questions • Ask participants to turn to p. 34 (if participants have print-based modules) • Read question • Ask participants for answers *Answers - Module 5, p. 40*
Slide 80	**TB Risk Assessment** **Study Question 5.17** **Depending on risk classification, how often should health care settings test workers for TB?** • Low Risk Settings – Conduct TB baseline test when HCW is hired – No further testing needed unless exposure occurs • Medium Risk Settings – Conduct TB baseline test when HCW is hired – Repeat test annually • Potential Ongoing Transmission – Conduct baseline test when HCW is hired – Repeat test 8-10 weeks until there is no longer evidence of *M. tuberculosis* transmission in the setting Module 5 – Infectiousness and Infection Control 80	• Read question • Ask participants for answers *Answers - Module 5, p. 41*
Slide 81	**TB Infection Control in the Home** **Study Question 5.18** **What precautions should a health care worker take when visiting the home of a TB patient who may be infectious?** • Instruct patients to cover mouth and nose with a tissue when coughing or sneezing • Wear a personal respirator • Collect sputum specimen in a well-ventilated area • Participate in a TB testing and prevention program Module 5 – Infectiousness and Infection Control 81	• Read question • Ask participants for answers *Answers - Module 5, p. 41*

Slide 82		• Introduce case studies
Slide 83		• Read case study • Ask participants for answers *Case Study 5.1 – Module 5, p. 7*
Slide 84		• Ask participants to turn to p. 7 (if participants have print-based modules) • Read case study • Ask participants for answers *Case Study 5.1 – Module 5, p. 7*

Slide 85	**Module 5: Case Study 5.1** **Question 5A: Answer** • Mr. Lopez should be considered infectious • Should be given his treatment by DOT to ensure he receives adequate treatment • Does not meet the criteria for noninfectiousness because: – He has been receiving treatment for only 7 days, not 2 weeks – His symptoms have not improved – He does not have 3 consecutive negative sputum smears Module 5 – Infectiousness and Infection Control 85	*Answers - Module 5, p. 42*
Slide 86	**Module 5: Case Study 5.1** **Question 5B** **Ms. Nguyen, a patient with pulmonary TB, has been receiving DOT treatment for 6 weeks and no longer has symptoms of TB. She has had three sputum smears. The first one was positive, but the last two were negative.** Module 5 – Infectiousness and Infection Control 86	• Read case study question • Ask participants for answers *Case Study 5.1 – Module 5, p. 7*
Slide 87	**Module 5: Case Study 5.1** **Question 5B: Answer** • Ms. Nguyen should be considered infectious until she has 3 consecutive negative sputum smears • She meets the first 2 criteria for noninfectiousness: – Has been receiving treatment for at least 2 weeks – Her symptoms have improved Module 5 – Infectiousness and Infection Control 87	*Answers - Module 5, p. 42*

Slide 88	**Module 5: Case Study 5.1** **Question 5C** **Mr. Martin started DOT treatment for pulmonary TB in April. His symptoms went away and his sputum smears were negative in May. However, the outreach worker was unable to locate him on June 5th and has not been able to contact him since that time. Mr. Martin returned to the TB clinic on August 2nd, and was still coughing.** Module 5 – Infectiousness and Infection Control 88	• Read case study question • Ask participants for answers *Case Study 5.1 – Module 5, p. 7*
Slide 89	**Module 5: Case Study 5.1** **Question 5C: Answer** • Mr. Martin, at this point, should be considered infectious • He might have been noninfectious in May, but it appears that he may be infectious again – Has been coughing and has not received adequate treatment since June 4th • Should be evaluated for infectiousness and nonadherence to treatment Module 5 – Infectiousness and Infection Control 89	*Answers - Module 5, p. 42*
Slide 90	**Module 5: Case Study 5.2 (1)** **You are checking patients into the TB clinic. An elderly man comes to the desk and says he was told to come and get checked because one of his friends has TB. You notice that he looks sick and is coughing frequently. The waiting room is full of patients, and you know it will probably be more than an hour before the physician can see him.** Module 5 – Infectiousness and Infection Control 90	• Ask participants to turn to p. 15 (if participants have print-based module) • Read case study *Case Study 5.2 – Module 5, p. 15*

Slide 91	**Module 5: Case Study 5.2 (2)** • **What should you do?** – **Suspect that this man has infectious TB and work with clinical staff to ensure he is evaluated for TB quickly** – **Give him a surgical mask, instruct him to keep it on, and ask him to cover his mouth and nose when coughing or sneezing.** – **Move the man to an area away from other patients right away** Module 5 – Infectiousness and Infection Control 91	• Read case study question • Ask participants for answers *Answers - Module 5, p. 43*
Slide 92	**Module 5: Case Study 5.3 (1)** **You are sent to deliver directly observed therapy (DOT) to a woman who started treatment last week for suspected pulmonary TB. Her sputum smear results are not back yet. You are asked to collect another sputum specimen while you are at the woman's home.** Module 5 – Infectiousness and Infection Control 92	• Ask participants to turn to p. 35 (if participants have print-based modules) • Read case study *Case Study 5.3 – Module 5, p. 35*
Slide 93	**Module 5: Case Study 5.3 (2)** • **What precautions should you take?** • **Instruct patient to cover her mouth and nose when she coughs or sneezes.** • **Wear a personal respirator when visiting her home.** • **Collect sputum in well-ventilated area, away from other household members.** • **Participate in a TB testing and prevention program** Module 5 – Infectiousness and Infection Control 93	• Read case study question • Ask participants for answers • Ask if there are any questions about Module 5 *Answers - Module 5, p. 43*

Self-Study Modules on Tuberculosis, 1-5 Slide Sets Sample Course Evaluation

Self-Study Modules on Tuberculosis, 1-5 Course Evaluation

Thank you for participating in this training. Please complete this evaluation form to the best of your ability. In this evaluation form, there are no wrong or right answers. You do not need to put your name on this form – your responses will be anonymous.

For each item below, please circle one response.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The training was well organized	1	2	3	4	5
2. The training sessions were relevant to my needs	1	2	3	4	5
3. The presenters were well prepared	1	2	3	4	5
4. The presenters were receptive to participant comments	1	2	3	4	5
5. The study questions helped me learn the material	1	2	3	4	5
6. The case studies helped me learn the material	1	2	3	4	5
7. There was enough time to cover all the material	1	2	3	4	5
8. The training enhanced my knowledge in TB	1	2	3	4	5
9. The learning environment was conducive to learning	1	2	3	4	5
10. The course was consistent with the stated objectives	1	2	3	4	5

OVER →

11. What did you like best about this course?

12. What did you like least about this course?

13. What topics would you like MORE emphasis on?

14. What topics would you like LESS emphasis on?

15. Additional Comments:

Thank you for completing this form!

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