

# Global Infectious Diseases

## Course

World Health  
Research

## Unit VII

Global Infectious  
Diseases

## Essential Question

What can be  
done to  
eliminate and  
deter infectious  
diseases in  
developing  
countries?

## TEKS

130.209.(c)  
1 F, 2 A, 3 A

## Prior Student Learning

Introduction to  
microorganisms  
& infectious  
diseases

## Estimated time

3-4 hours

## Rationale

Despite safe and effective medical interventions, infectious diseases are the major cause of death, disability, and socioeconomic disruption for millions of people. An inquiry into the world's most deadly infectious diseases is necessary in order to raise awareness of their broad and borderless impact.

## Objectives

Upon completion of this lesson, the student will be able to:

- Explain why infectious diseases are still one of the leading causes of death worldwide despite available technology and treatments
- Differentiate between emerging and reemerging diseases, and give examples of each
- Analyze at least ten of the world's most common infectious diseases
- Examine available technology to combat infectious diseases in developing countries

## Engage

Discuss the following:

"In the year of 1657 I discovered very small living creatures in rain water. No more pleasant sight has met my eye than this of so many thousands of living creatures in one small drop of water..."

—stated by Anton Leeuwenhoek after discovering he could see 'wee animacules' (bacteria) with the microscopic lens he developed

## Key Points

Open lecture with [A Global Health Challenge: A Tale of Two Girls](#) Flash movie (requires [Flash player](#)). This short feature story contrasts the lives of two baby girls: one born in a developed country, Japan; and the other in a developing country, Sierra Leone.

<http://www.who.int/features/2003/11/en/index.html>

- I. The impact of global infectious diseases
  - A. Over 9.5 million people die each year due to infectious diseases
  - B. Nearly all live in developing countries
  - C. Children are particularly vulnerable
    1. Pneumonia, diarrhea, and malaria are the leading causes of death in children under age 5
    2. Infectious disease in adults may lead to disability, decreased productivity, and death
  - D. Each year between 1.3 and 3 million people die of malaria and 1.7 million die from tuberculosis (TB)
    1. Together these diseases cause more deaths than HIV/AIDS

- II. Co-infection
  - A. People infected with one infectious disease become more susceptible to other diseases
  - B. Examples: HIV/AIDS co-infection with tuberculosis or malaria
- III. Infectious diseases remain among the leading causes of death worldwide for three reasons:
  - A. Emergence of new infectious diseases
  - B. Reemergence of old infectious diseases
  - C. Persistence of stubborn infectious diseases
- IV. Emerging diseases include
  - A. Outbreaks of previously unknown diseases
  - B. Examples of emerging diseases
    - 1. Ebola virus – first outbreaks in 1976; discovery of the virus in 1977
    - 2. HIV/AIDS – the virus was first isolated in 1983
    - 3. Hepatitis C – first identified in 1989; now known to be the most common cause of post-transfusion hepatitis worldwide
- V. Reemerging diseases include
  - A. Known diseases that have reappeared after a significant decline in incidence
  - B. Old infectious diseases that have undergone natural genetic variations, recombinations, and adaptations to which the immune system has not been previously exposed
  - C. Examples of re-emerging diseases
    - 1. Pertussis (whooping cough) – a vaccine in the late 1940s largely eradicated this condition; now reemerging because adult immunizations to this disease have worn off and many children today are not fully immunized
    - 2. Tuberculosis (TB) – an ancient bacterial disease that remains one of the major causes of disability and death worldwide; the discovery and use of antibiotics took TB out of the spotlight; however, the bacteria has mutated, and in 2006, 9.2 million new cases of TB reemerged
    - 3. West Nile virus – heavy rains followed by flooding and higher temperatures have contributed to the reemergence of this mosquito-transmitted disease
- VI. Continued infectious disease evolution and emergence due to
  - A. Demographics, trade (food, animals, plants), travel, and land use
    - 1. Rapid urbanization brings people into closer proximity, resulting in more frequent contact with disease vectors and novel pathogens

2. Increasing trade in exotic animals for pets and as food sources has given opportunity for pathogens to jump from animal reservoirs to humans
3. Traveling by jet nowadays allows pathogens to infect people from one country or continent within short periods of time
4. Changes in the landscape such as
  - a. Developing irrigated agriculture that can create breeding grounds for mosquitoes
  - b. Urbanized areas where there is inadequate storm drainage and sewage systems that can facilitate the spread of waterborne pathogens
  - c. Deforestation that transforms natural areas and can lead to the extinction of predators that favor some disease vectors

## VII. Infectious Disease Expenditures

- A. Foundations and public and/or private partnerships play an important role in funding for research into infectious diseases
  1. Pharmaceutical companies partner with governments and nongovernmental organizations to provide drugs and materials at no or low cost, particularly for neglected diseases in resource poor countries
  2. The Bill and Melinda Gates Foundation contributed more than \$1.87 billion in grants to combat infectious diseases
    - a. The foundation provides support for vaccine research and has pledged to triple its funding for TB by 2015

## Activity

- I. Complete the activity, *Track that Disease!* parts I & II and participate in a group presentation.

## Assessment

*Track That Disease!* Evaluation/Presentation Rubric

## Materials

Enrichment handouts from [The Global Health Council](http://www.globalhealth.org/infectious_diseases/) (scroll to the bottom of the page; handouts are in PDF format)

- *Understanding Infectious Diseases*
- *Infectious Disease Expenditures*
- *Infectious Disease Interventions*
- *Overcoming Neglected Tropical Diseases*

[http://www.globalhealth.org/infectious\\_diseases/](http://www.globalhealth.org/infectious_diseases/)

Butcher paper, scissors, stick glue, markers, and map of the world template, for the Global Wall Map project

## Disease Cards

### Track That Disease! Evaluation Rubrics

Class computers (for the investigation phase of the project)

PBS DVD: *The Heroes* -

<http://www.pbs.org/wgbh/rxforsurvival/series/about/special.html>

### **Accommodations for Learning Differences**

For reinforcement, the students define key terms from the lesson.

For enrichment, the students will view and report on the PBS documentary DVD *The Heroes: Extraordinary Individuals Battling the World's Most Dangerous Diseases*. (2 hrs.)

<http://www.pbs.org/wgbh/rxforsurvival/series/about/special.html>

### **National and State Education Standards**

National Health Science Cluster Standards

HLC02.01

Health care workers will know the various methods of giving and obtaining information. They will communicate effectively, both orally and in writing.

HLC06.02

Health care workers will understand the fundamentals of wellness and the prevention of disease processes. They will practice preventive health behaviors among their clients.

TEKS

130.209 (c) 1F identify and describe the challenges in global health, which can have the greatest impact on health in developing nations;

130.209 (c) 2A compare the availability of health care in developing and developed countries;

130.209 (c) 3A describe technologies that support the prevention and treatment of infectious diseases.

Texas College and Career Readiness Standards

English Language Arts

II. B. 1. Identify new words and concepts acquired through study of their relationships to other words and concepts.

III. A. 2. Adjust presentation (delivery, vocabulary, length) to particular audiences and purposes.

III. B. 1. Participate actively and effectively in one-on-one oral communication situations.

III. B. 2. Participate actively and effectively in-group discussions.

- III. B. 3. Plan and deliver focused and coherent presentations that convey clear and distinct perspectives and demonstrate solid reasoning.
- IV. B. 3. Listen actively and effectively in group discussions.
- V. A. 3. Explore a research topic.
- V. B. 1. Gather relevant sources.
- V. B. 2. Evaluate the validity and reliability of sources.
- V. B. 3. Synthesize and organize information effectively.
- V. C. 1. Design and present an effective product.

#### Science

- III. B. 3. Recognize scientific and technical vocabulary in the field of study and use this vocabulary to enhance clarity of communication.
- III. C. 1. Prepare and present scientific/technical information in appropriate formats for various audiences.
- III. D. 1. Use search engines, databases, and other digital electronic tools effectively to locate information.
- IV. B. 1. Understand how scientific research and technology have an impact on ethical and legal practices.
- X. E. 5. Understand how human practices affect air, water, and soil quality.

#### Social Studies

- I. A. 2. Analyze the interaction between human communities and the environment.

#### Cross-Disciplinary

- I. A. 1. Engage in scholarly inquiry and dialogue.
- I. E. 1. Work independently.
- I. E. 2. Work collaboratively.

#### Sources:

[World Health Organization \(WHO\)](#)

[Global Health Council](#)

[National Institute of Allergy and Infectious Diseases](#)

[ActionBioscience.org](#)

[Environmental Knowledge for Change](#)

## **Activity I**

### **Part I: *Track That Disease!***

Student groups will draw and label a global wall map and track diseases around the world.

#### **Materials**

- Blue and green butcher paper (each sheet 4 to 5 feet long)
- Map of the World Template
- Pencils
- Black marker
- Overhead projector

#### **Directions**

Divide students into six groups

- Group 1: North America, middle & Central America, and Greenland
- Group 2: South America
- Group 3: Europe, Central Asia, and the Middle East
- Group 4: Africa and Madagascar
- Group 5: Asia and Southeast Asia
- Group 6: Australia, New Zealand, and the South Pacific

Making the map

1. Tape green butcher paper to a wall and project the world map template onto it (I like to make BIG wall maps and usually tape two strips of butcher paper horizontally before hanging. Also, I sometimes like to use different colored butcher paper for each continent, but if you want to keep it simple, use all green paper)
2. Have a student from each group trace his or her group's assigned continent (students can use a more detailed map to draw their countries)
3. Each group will cut out their continent and countries, outline them, and label them with black marker
4. Piece the map together and tape it to the blue butcher paper
5. Label the oceans
6. Hang it on the wall

Later, when students begin tracking diseases (part II of this activity), they can make disease labels and tack "outbreak labels" to the corresponding countries around the world.

# Map of the World Template

[www.nationsonline.jpg](http://www.nationsonline.jpg)



## **Part II: *Track That Disease!***

### **Materials**

- Disease Cards
- Student Computers
- Investigation/Presentation Rubric

### **Introduction**

Read the following information to the class:

I will be passing out a list of some of the most common infectious diseases worldwide. Accurate caseload numbers of these diseases are difficult to determine because so many of them are endemic to developing countries, where many people do not have access to modern medical care. However, approximately half of all deaths caused by infectious diseases each year can be attributed to just three diseases: tuberculosis, malaria, and AIDS. Together, these diseases cause over 300 million illnesses and more than 5 million deaths each year.

Sources: [The Centers for Disease Control](http://www.cdc.gov/) (CDC); [The World Health Organization](http://www.who.int/) (WHO).

### **Computer Research**

1. Assign each group two diseases from the Disease Card list
2. Have them fill out their group cards
3. After completing the cards, each group needs to track their disease by going to the Health Map: <http://www.healthmap.org/en/>. There is a search box at the top of this webpage where the students can type in their assigned diseases
4. After seeing where their assigned disease outbreaks are, the student groups can make disease nametags and paste them to the class wall map in the appropriate countries (I have the students track the same diseases for the duration of the course so that they can see the patterns and movement of diseases)

### **Investigation/Oral Presentation**

- Give each student group a *Track That Disease!* Evaluation Rubric to help them prepare for their group presentation
- Student groups complete this activity by giving an oral presentation to the class
- Grade presentation groups with the *Track That Disease!* Evaluation Rubric



# DISEASE CARDS

To help with disease pronunciation, check out [howsay.com](http://howsay.com).

1. <b>AFRICAN TRYPANOSOMIASIS</b> (sleeping sickness)	Pathogen	Transmission
Symptoms:		
2. <b>CHOLERA</b>	Pathogen	Transmission
Symptoms:		
3. <b>CRYPTOSPORIDIOSIS</b>	Pathogen	Transmission
Symptoms:		
4. <b>DENGUE FEVER</b>	Pathogen	Transmission
Symptoms:		
5. <b>EBOLA HEMORRHAGIC FEVER</b>	Pathogen	Transmission
Symptoms:		

**6. HANTA VIRUS****Pathogen****Transmission****Symptoms:****7. HEPATITIS A****Pathogen****Transmission****Symptoms:****8. HEPATITIS B****Pathogen****Transmission****Symptoms:****9. HEPATITIS C****Pathogen****Transmission****Symptoms:****10. HIV/AIDS****Pathogen****Transmission****Symptoms:**

**11. INFLUENZA****Pathogen****Transmission****Symptoms:****12. JAPANESE ENCEPHALITIS****Pathogen****Transmission****Symptoms:****13. LEISHMANIASIS****Pathogen****Transmission****Symptoms:****14. MALARIA****Pathogen****Transmission****Symptoms:****15. MEASLES****Pathogen****Transmission****Symptoms:**

**16. MENINGITIS****Pathogen****Transmission****Symptoms:****17. ONCHOCERCIASIS**  
**“river blindness”****Pathogen****Transmission****Symptoms:****18. PNEUMONIA****Pathogen****Transmission****Symptoms:****19. POLIO****Pathogen****Transmission****Symptoms:****20. ROTAVIRUS****Pathogen****Transmission****Symptoms:**

**21. SEVERE ACUTE  
RESPIRATORY  
SYNDROME (SARS)**

**Pathogen**

**Transmission**

Symptoms:

**22. SCHISTOSOMIASIS**

**Pathogen**

**Transmission**

Symptoms:

**23. SHIGELLOSIS**

**Pathogen**

**Transmission**

Symptoms:

**24. STREP THROAT**

**Pathogen**

**Transmission**

Symptoms:

**25. TUBERCULOSIS (TB)**

**Pathogen**

**Transmission**

Symptoms:

**26. TYPHOID**

**Pathogen**

**Transmission**

**Symptoms:**

**27. WEST NILE VIRUS**

**Pathogen**

**Transmission**

**Symptoms:**

**28. YELLOW FEVER**

**Pathogen**

**Transmission**

**Symptoms:**

## ***Track That Disease! Evaluation/Presentation Rubric***

Period \_\_\_\_\_

Date \_\_\_\_\_

Assigned Diseases:

1) \_\_\_\_\_

2) \_\_\_\_\_

Group Member's Names \_\_\_\_\_

\_\_\_\_\_

Criteria	Excellent 90-100	Very good 80-89	Average 75-79	Marginal 70-74	Failed to meet basic requirements 60 ↓
<b>WALL MAP TEAM WORK:</b>					
1. Team worked amicably on their map					
2. Each member was engaged in the project					
3. The team stayed focused on the project					
4. The team completed the map and labeling in the allotted time					
<b>DISEASE INVESTIGATION:</b>					
Students identified					
1. pathogen that caused their assigned diseases					
2. vector(s) that transmitted their assigned diseases					
3. signs and symptoms of their assigned diseases					
4. countries where there is an outbreak of their assigned diseases					
5. reasons why their assigned diseases are prevalent in those countries					
6. available technology to treat their assigned diseases					
<b>ORAL PRESENTATION:</b>					
1. Lead speaker introduced the team and the two diseases they tracked					

2. Speakers held the audiences' attention					
3. Group members spoke clearly and projected their voices					
4. Speakers faced the audience (not the projector screen)					
5. Each member took an equal part in the presentation					
6. Group knew the topic and didn't read exclusively from index cards or slides					
7. The presentation was organized and smooth					
8. Members were able to reasonably answer questions during the Q & A					

Give points for each grade category and average.

Grade \_\_\_\_\_

**Teacher Comments:**