

Outbreak!

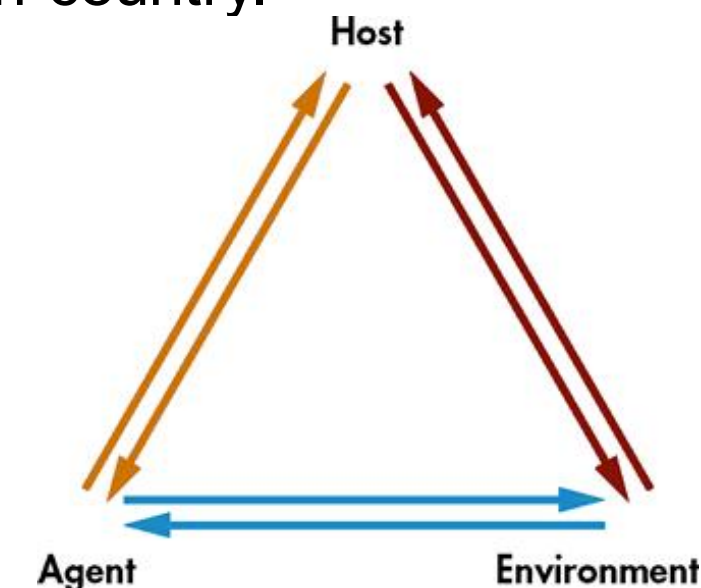
A SENCER-ized High School Unit on Infectious Disease

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INTRODUCTION

Carolina Day School is an independent, PK-12 school located in Asheville, North Carolina. The Upper School, grades 9-12, enrolls about 180 students, most of whom plan to continue their education at a 4 year college or university. Students are required to take six courses each semester; for ninth grade students, two of these courses are Global Studies and Human Biology.

Outbreak! is a month long interdisciplinary unit that focuses on the capacious, complex, current problem of infectious disease. Specifically, the goal of the unit is for students to recognize that an effective response to an outbreak of infectious disease must be rooted in an understanding of biological, geopolitical and socioeconomic factors. Because all ninth grade students are enrolled in both Global Studies and Human Biology, the course can be team-taught in parallel, meaning that each course maintains its independence and students investigate each case study from different perspectives within each discipline. For the final project, students collaborate in small groups to develop an effective response to a fictional outbreak in a modern country.

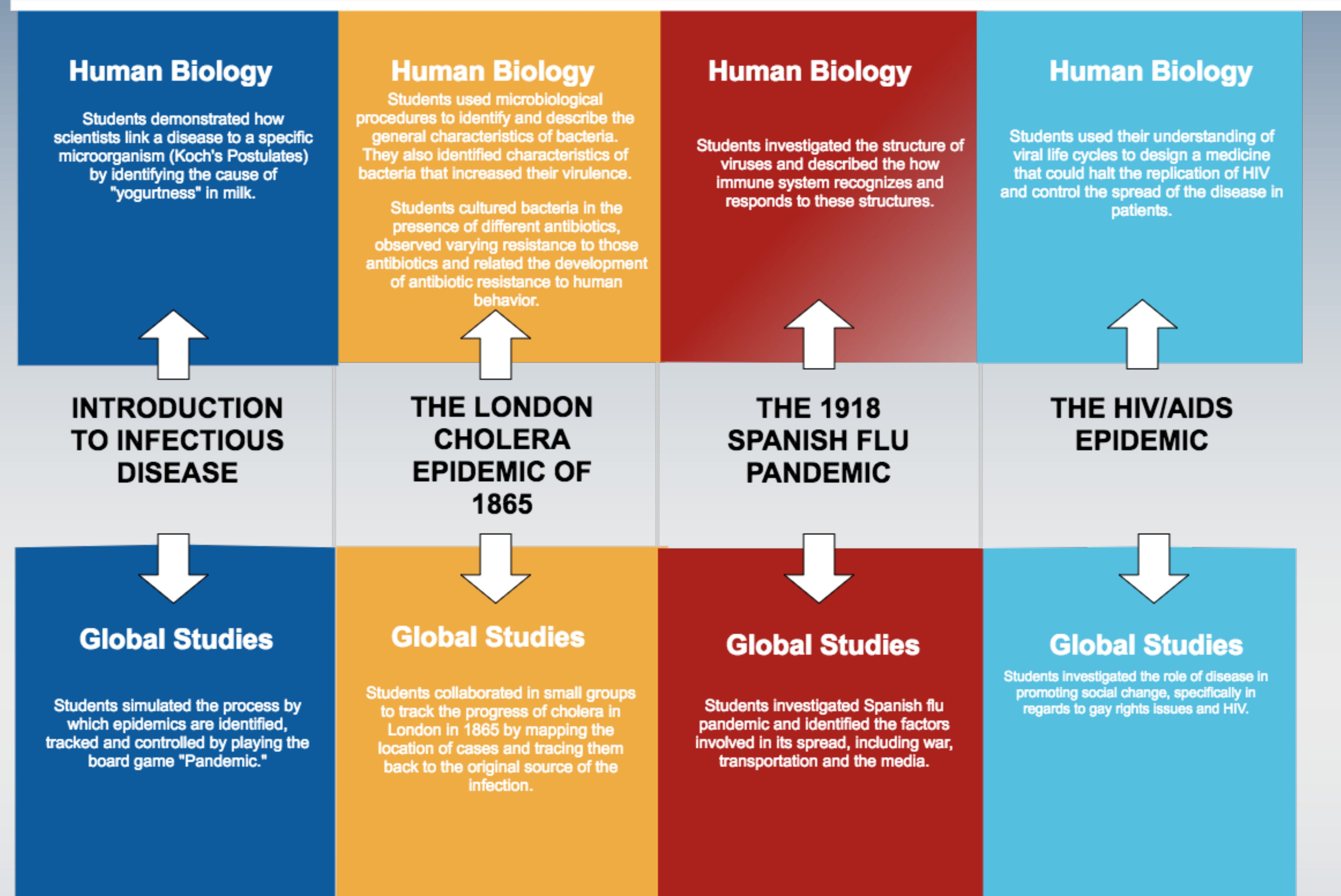


Essential Questions

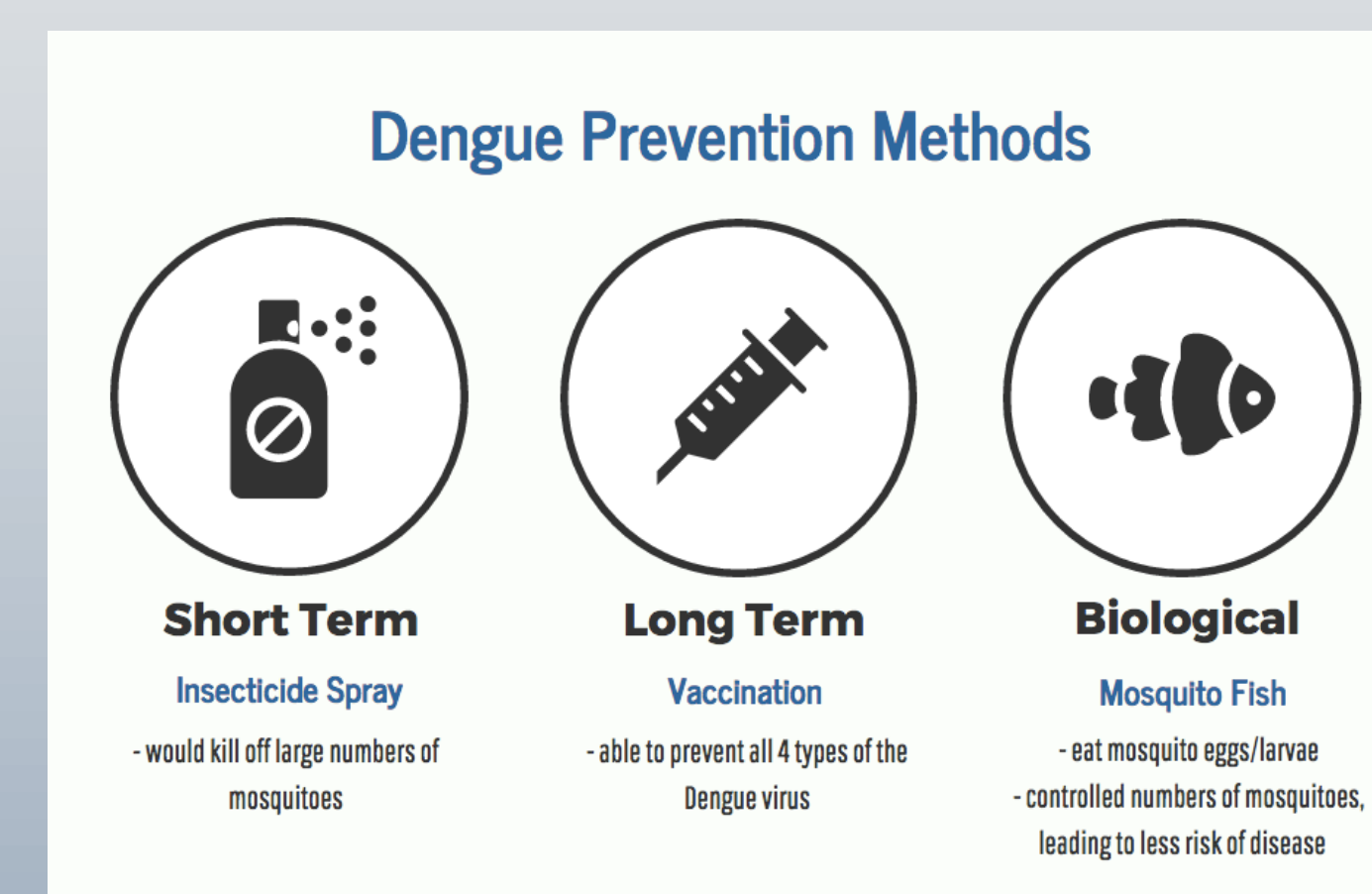
HUMAN BIOLOGY	GLOBAL STUDIES
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- If there was an outbreak of an infectious disease, what would an effective response look like?
- How is the scientific method used to link an infectious disease to a microorganism?
- How do urbanization, demographics, population growth and establishment resistance contribute to the spread of infectious disease?
- How are the symptoms and epidemiology of infectious diseases dependent on the characteristics of the causative organism?
- How do bacteria develop resistance to antibiotics?
- What challenges are presented to controlling the spread of infectious diseases by a dysfunctional health care system, mistrust of public officials, and delays in response to the outbreak?
- How can a knowledge of the life cycle of viruses be used to develop treatments for viral infections?
- How does the body respond to and eliminate infectious organisms?
- How do war, transportation and propaganda contribute to the spread of infectious disease?
- How do diseases act as motivators of social change?
- How can infectious diseases alter the course of human history?

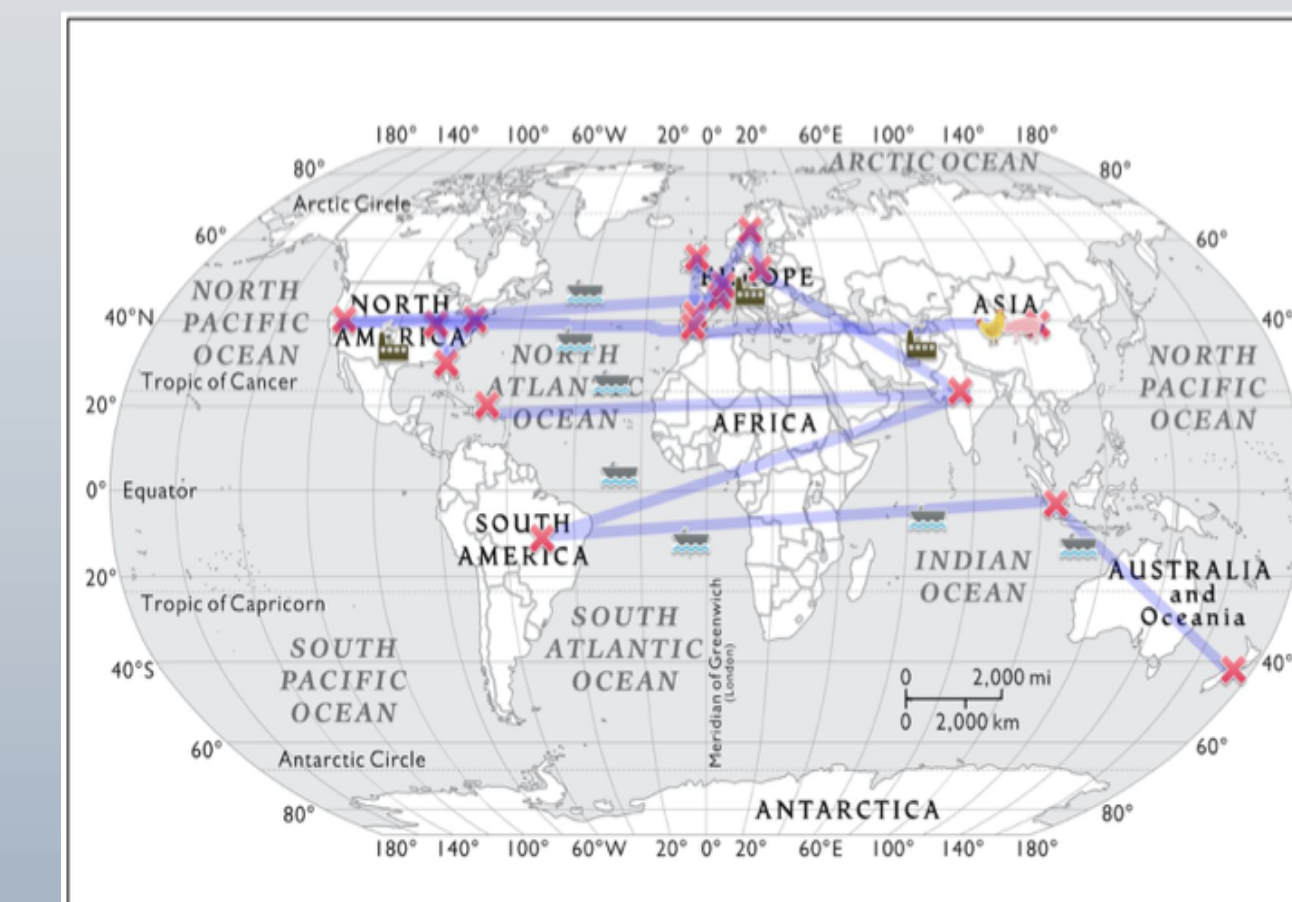
OUTBREAK! CURRICULUM FLOW



Students use DNA gel electrophoresis to diagnose the outbreak in Dhankhadi, Nepal as Middle East Respiratory Syndrome



Multiple mosquito control options identified by the Lagos Response Team



Student mapping project for the Spanish Flu Epidemic of 1918

STUDENT AND PARENT REFLECTIONS ON THE OUTBREAK! UNIT

"The fact that we were focusing on generally the same topic in history and biology helped me understand more thoroughly. For example, we studied the history of viruses and the major outbreaks in Global and in Biology we studied what a virus is and how it is spread. I then used both sides of the topic and piece them together to further comprehend."

"It's pretty cool how our classes are related because I am able to learn how viruses work and then see how that matters in the real world. Like the scientific method, John Snow, and cholera."

"I love these two classes because I never thought biology and history would ever be related in any way, but now I see the connection, especially with disease."

"When the teachers at Carolina Day created a multi-discipline learning experience to explore infectious diseases and epidemics in the world, Murphy talked very little about it. I'd get the basics. He'd answer my questions with as little information as he could get away with, but I started seeing a change. When the news came on in the evening, Murphy would appear if there was a story about disease or doctors working to control an outbreak. And in May when he found Time Magazine on the coffee table with the cover, 'Warning: We are not ready for the next pandemic,' Murphy didn't walk past it. He picked it up, sat down and read everything related to the cover's topic."

Final Assessment

You are a CDC healthcare worker in Camp Zataari, Jordan. Your team is hearing reports about larger than normal numbers of patients at surrounding clinics reporting the following symptoms:

Fever headaches, body aches and cough

There are five diseases that could be responsible for this potential outbreak. They are:

- Meningococcal Meningitis
- Dengue
- Typhoid
- Polio
- Middle East Respiratory Syndrome

STEP ONE: DIAGNOSIS

Before you can begin helping your patients, you must identify the disease.

Your first step in identifying the disease afflicting your area is to find out the microorganism that is associated with each of the five diseases. Once you have done that, you will have access to the lab and to the following: blood samples from your patient and DNA samples from your patient as well as control DNA samples for each disease.

STEP TWO: AGENT

Remember, the agent is the cause of the disease. When studying the epidemiology of most infectious diseases, the agent is a microbe—an organism too small to be seen with the naked eye.

Now that you have a name for the agent, it is important that you learn all that you can about it. This should include the structure of the agent, how it causes disease in patients, its mode of transmission and effective medical treatments against it.

STEP THREE: HOST

Organisms associated with a disease can include both the host (the organism exhibiting symptoms of the disease) and the reservoir (organisms that may carry the pathogen but not show symptoms of the diseases).

Now that you know all about your agent, it's important you understand:

- *who it is infecting
- *how it is coming into contact with people
- *the symptoms associated with disease
- *whether or not there is another organism (a vector) involved in the process

STEP FOUR: ENVIRONMENT

The environment is the favorable surroundings and conditions external to the host that cause or allow the disease to be transmitted. Environmental factors include, but are not limited to:

- *the geography
- *weather conditions (seasons, etc.)
- *sanitation
- *population density
- *transportation and the movement of people in your country
- *current social, political, cultural and economic situation

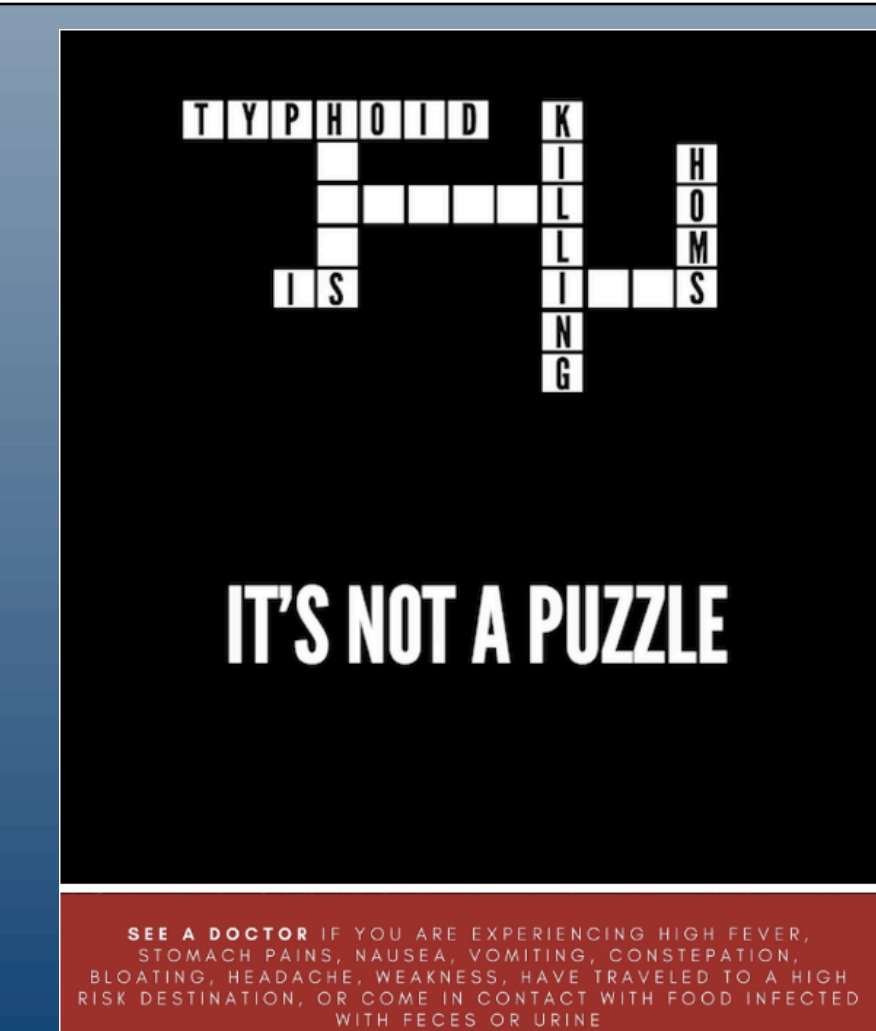
STEP 5: RESPONSE PLAN

Now that you have a complete picture of your outbreak, it is time to create your response plan. Keep in mind that your response plan needs to address the following:

- *How will the characteristics of your agent affect your response?
- *If there is a treatment available, how effective will it be, how will you store it, who will administer it, and how will you get it to people in need?
- *What are the socio-political factors that might hinder or enhance your ability to stop the spread of this disease?
- *How are you going to convince the local populace that your efforts are for their benefit and enlist their assistance in your response plan?
- *What local, national and international resources are available to you and how will you use them?

STEP 6: ACTIVISM//ADVOCACY/ EDUCATIONAL COMPONENT

You are to choose ONE controversial aspect of either your disease transmission OR government resistance to treatment, etc. that your advocacy plan will address. You may also choose to educate or increase awareness of your disease or chosen country to outsiders.



Student designed infographic on typhoid fever outbreak in Homs, Syria