

An interdisciplinary One Health case study for high school students

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Abstract

One Health is a term used to describe the interconnectedness of human, animal, and environmental health. Those individuals who work on solving One Health issues, such as the spread of zoonotic diseases, must be well-trained in their own disciplines but must also be able to work as members of interdisciplinary teams. It is important that students at the high school and college levels are introduced to these concepts so that they have the appropriate critical thinking and social skills to help solve One Health issues when they enter the workforce. There are currently very few One Health lesson plan resources available for high school teachers and students. This report provides the rationale for teaching high school students about the One Health approach to solving global health issues through an interdisciplinary case study. The case study, which is centered around a theoretical outbreak of Rift Valley fever virus, can easily be incorporated into biology, animal science, or health courses and is aligned with several of the One Health core competencies suggested by the National Academy of Medicine.

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Chapter 1 – Introduction

Background and Significance

It has become increasingly clear over the last several decades that human, animal, and environmental health are undeniably linked. “One Health” is the relatively new term used to refer to the overlap among these three domains. A One Health approach to research seeks to tear down the boundaries between these fields so that all stakeholders can be simultaneously involved in solving global health problems.¹ Currently, a couple of the One Health topics of main concern include the spread of zoonotic diseases² and antibiotic resistance.³ The One Health approach to solving global health issues is still relatively new and it requires that people from multiple domains at the local, national, and even global levels work together to find solutions, which can be challenging.⁴

The term One Health came from a collaboration between the American Veterinary Medical Association (AVMA) and the American Medical Association (AMA) in 2007. Their ongoing goal is to use the One Health concept to prevent human and animal diseases by focusing on the driving factors of disease from the individual level all the way up to the ecosystem level.⁵ Some of the driving factors of disease emergence and reemergence include the ways in which humans change land for their own use, the ever-evolving interactions between pathogens and host species, and the exponential growth of the human population.⁶

Zoonotic diseases, those that pass between humans and animals, have increased in number over the last two decades. Asokan (2015) explains, “An estimated two-thirds of all known infectious diseases and 75% of emerging diseases are zoonoses.” The number of viral zoonotic diseases has increased the most, and many of these new viruses have come from South East Asia. Examples of some of these emerging viruses include severe acute respiratory

syndrome coronavirus (SARS-CoV), Nipah virus, and various influenza viruses.⁵ Zoonotic outbreaks can be devastating for the populations they affect. For example, an outbreak of Rift Valley fever in Kenya between 1997 and 1999 resulted in over 27,000 human infections and the death of approximately 70% of the nation's livestock.⁶

A One Health approach can be helpful in preventing major outbreaks of many of these zoonotic diseases. This approach will require very careful consideration of human, animal, and ecological drivers of disease. It will likely involve scientists working in the field and in the lab in combination with people working on theoretical modeling and statistical analysis.

Researchers will also need to develop global surveillance programs to identify new pathogens. Currently, a few surveillance programs are in place that monitor disease hotspots, animal populations known to carry zoonotic diseases, and human behaviors. More of these programs would be beneficial. Programs that identify new pathogens in combination with One Health programs that look at the human, animal, and environmental drivers of disease could reduce the risk of spillover events and even pandemics.⁷

If One Health is to be a successful initiative, it is going to require workers with an extra set of skills. As an interdisciplinary field, One Health researchers need to be able to communicate data and coordinate cooperation across disciplines. They should have strong training not only in their respective disciplines but also in how to work with people of diverse backgrounds in an interdisciplinary setting. They must be able to build trust and foster accountability with various groups and team members to achieve shared goals. People who are skilled at managing negotiations and resolving conflicts will be vital. People with technological skills that allow them to share knowledge equitably with many stakeholders will also be important. The classic

arrangement of people working independently on separate parts of a problem probably won't work well for One Health.⁸

To prepare a future workforce to be successful in using the One Health approach to solve global health issues, students need to be exposed to One Health content and methodologies at the high school and undergraduate levels.⁹ According to the One Health Commission, "One Health can provide the organizing framework for a curriculum that teaches young people how to look beyond immediate results and ask complex questions while seeking a deeper understanding of integrated problem solving."¹⁰ Unfortunately, so far, there has been very little produced in terms of One Health curriculum for high school students. The One Health Commission has developed three case studies for high school students that do require students to use critical thinking skills to analyze and interpret data. However, the case studies do not require students to work in interdisciplinary teams to solve a problem.¹¹

The National Academy of Medicine has taken a step in the right direction by proposing a set of One Health core competencies to help educators teach students to approach One Health issues in a coordinated fashion. There are twenty competencies that fall under three broad domains, including "Health Knowledge," "Global and Local Issues in Humans, Animals, Plants, and the Environment," and "Professional Characteristics." Aligning lesson plans to a common set of core competencies in academic programs nationally and internationally would help to produce more individuals who are ready to respond to global health emergencies in a way that maximizes shared information and resources.¹²

Case studies could be used to teach competencies in all three of the domains proposed by the National Academy of Medicine. In general, case studies present students with a realistic open-ended problem that requires research, critical thinking, and collaboration to solve.¹³ If

designed properly, a case study could be used to explicitly teach One Health concepts and terminology, introduce current One Health issues, and help students develop professional characteristics, such as the ability to work in interdisciplinary teams. The Association of American Veterinary Medical Colleges (AAVMC) has developed fifteen case studies that address many of the core competencies. However, they were designed to be used by veterinary students and require the reader to have knowledge and skills that high school students do not yet possess.¹⁴ Therefore, there is a need for One Health case studies that are developmentally appropriate for high school students and require them to work in interdisciplinary teams.

Purpose

The purpose of this report is to fill a need within the area of One Health education by creating an interdisciplinary case study that is suitable for high school students and is aligned with the core competencies established by the National Academy of Medicine. The case study addresses core competencies in the three major domains. It addresses the “Health Knowledge” domain by introducing students to One Health terminology. The case study also addresses the “Global and Local Issues in Humans, Animals, Plants, and the Environment” domain by requiring students to research Rift Valley fever virus, which is a zoonotic disease currently of global concern. Finally, the case study addresses the third domain of competencies, “Professional Characteristics,” by requiring students to work together in interdisciplinary teams to come to consensus about the best course of action to take during a theoretical global health emergency.

Chapter 2 – Case Study Design and Implementation

Content

The case study was designed to present high school students in the United States with a realistic zoonotic disease outbreak situation. Rift Valley fever virus (RVFV) was chosen as the disease for the outbreak situation for several reasons. RVFV is a zoonotic disease that can infect humans and multiple animal species, including cattle, sheep, and goats. In humans, symptoms can range from mild flu-like symptoms to blindness, hemorrhagic complications, meningoencephalitis, and death. In livestock, RVFV causes abortions in nearly 100% of pregnant females and widespread necrosis and hemorrhage of the liver in adults. The death and disease caused by RVFV in livestock can have dire economic consequences for affected countries.¹⁵ For example, livestock export bans placed by Arab countries in 1997 and 2001 due to a RVFV outbreak in Africa cost Somaliland an estimated \$109 million and \$326 million respectively.¹⁶ RVFV is transmitted by mosquitos and is, therefore, influenced by environmental factors that affect mosquito populations. The spread of RVFV involves human, animal, and environmental components, making it a perfect disease to approach from a One Health perspective.¹⁵

While RVFV has so far only been present in Africa, Madagascar, and the Saudi Arabian Peninsula, there is major concern that this disease could reach the United States. The insect vectors that transmit RVFV are found in the United States, making the country susceptible.¹⁵ One study by Kansas State University College of Veterinary Medicine demonstrated that white-tailed deer are highly susceptible to infection by RVFV, causing hemorrhagic enteritis, bloody diarrhea, and death. They can also transmit the virus through the fecal-oral route. This study

demonstrates that if RVFV were to enter the United States, it could possibly infect human, livestock, and wildlife populations,¹⁷ resulting in an estimated \$50 billion in economic losses.¹⁸

The fact that RVFV would affect so many species in the United States makes it an ideal disease for this case study assignment. If an outbreak of RVFV were to occur in this country, it would require professionals from multiple fields working together to contain it. Therefore, the case study requires students to assume the roles of various professionals (physician, veterinarian, environmental scientist, government official, wildlife biologist, and public health specialist) to address all aspects of the disease outbreak and develop a plan of action that will stop the spread of the disease and mitigate the associated economic losses. Working through this process as a team promotes critical thinking skills in a simulated real-life crisis situation. The ultimate goal of the activity is for students to learn how to work through a stressful situation calmly and methodically so they will be prepared to act in a similar manner when they encounter stressful situations as part of the future workforce.

Core Competencies

This case study addresses several of the core competencies in each of the three domains proposed by the National Academy of Medicine as outlined below.¹²

Table 1. Domain I - Health Knowledge

<i>Core Competency</i>	<i>Alignment with Case Study</i>
Characterize the etiology, evolution, and ecology of infectious disease agents of people, animals, and plants that are of importance to health.	Students will research the cause of Rift Valley fever and how the relationships between humans, animals, and the environment contribute to the spread of RVFV.
Describe the main transmission routes for toxins, pathogens, and resistance genes, including human-animal-plant-environmental exposures, as well as vector-borne, waterborne, and airborne cycles.	Students will research how RVFV is transmitted between people and animals through direct contact with contaminated materials and mosquito vectors.
Explain epidemiologic principles used to characterize problems that involve human, animal, plant, and environmental components.	Students will understand the agent, host, and environmental aspects (disease triad) of RVFV transmission.
Describe interventions used to prevent disease and improve human, animal, plant, and environmental health at the individual, community, and population levels.	Students will research plausible interventions that could be used to prevent the spread of RVFV and improve the health of humans, animals, and the environment at the individual, community, and population levels.

Table 2. Domain II - Global and Local Issues in Humans, Animals, Plants and the Environment

<i>Core Competency</i>	<i>Alignment with Case Study</i>
Compare and contrast health and non-health consequences of diseases and exposures, including social and behavioral, economic, and political effects across global regions.	Students will research and brainstorm possible medical, social, economic, and political consequences of an RVFV outbreak in the United States.
Describe the relationship among various key One Health stakeholders locally and globally.	Students will play the roles of professionals in different careers or different stakeholders during a RVFV outbreak. They will consider the needs of additional stakeholders while formulating a plan to contain the outbreak.

Table 3. Domain III - Professional Characteristics

<i>Core Competency</i>	<i>Alignment with Case Study</i>
Describe the benefits and challenges of a multidisciplinary, integrative approach when implementing studies regarding health concerns at the human-animal-plant-environment interface.	Students will reflect on the experience of using a multidisciplinary approach to addressing health concerns as part of their Final Report.
Demonstrate the ability to build and manage a transdisciplinary team and apply principles to conduct ethical, scientifically sound research that will inform policy.	Students will manage themselves throughout the process of acting as a transdisciplinary team, while using research to make decisions that would inform policy in a real-life situation.
Develop a plan to translate research findings and new discoveries into health policies, community programs, interventions, and public education in a manner that is sustainable, culturally relevant, and economically feasible.	Students will use research findings to develop a plan for mitigating the effects of a RVFV outbreak, which will include sustainable, feasible ideas for health policies, community programs, interventions, and public education.

Intended Audience

This case study is appropriate for high school students in grades 9 through 12. It would be most appropriately used within the context of a biology, animal science, or human health course. Students will be most successful with the assignment if they have already been exposed to basic content regarding agents of disease, modes of disease transmission, and methods of disease prevention and treatment.

Implementation

The case study begins with an introduction, which presents students with basic terminology, including the terms “One Health,” “zoonotic disease,” and “interdisciplinary.” The goal of the introduction is to help students obtain a basic understanding about the One Health approach to addressing public health crises. The next part of the case study is the outbreak scenario. The goal of the scenario is to provide students with an open-ended, real-life problem that will require critical thinking and cooperation to solve. Instructors can either read through the introduction and scenario with their students or have students read the information individually. After reading through the opening information, it would be helpful for instructors to lead a discussion to help students begin to think about the possible medical, social, political, and economic impacts an outbreak of RVFV would have on the United States.

Next, the instructor should break students into groups, preferably with six students per group. Within each group, students should either be assigned or should choose one of the six professions (physician, veterinarian, environmental scientist, government official, wildlife biologist, or public health specialist) and fill out the corresponding worksheet from the perspective of someone in that career. Students will need to do research on RVFV to complete the career worksheets. Instructors can either provide their students with appropriate current

articles on the topic or allow students to do independent research online to find their own sources. The goal of the individual career worksheets is for students to develop an understanding about the disease itself and to formulate their own opinions on the best course of action from the perspective of one stakeholder in the scenario.

The six professions represented in the case study were chosen to give students a variety of perspectives on the outbreak scenario and stimulate conversation not only about health but also about policy and economics. Specifically, the physician, veterinarian, and environmental scientist were chosen to cover the human, animal, and environmental aspects of any One Health scenario. RVFV can infect wildlife species so the Wildlife Biologist was added to specifically address this aspect of the disease. Quick and efficient policy-making and a focus on economics become very important during a public health crisis so the government official was included to address these aspects of the outbreak. Finally, all stakeholders must be willing and able to accept guidance from public health specialists, such as members of the Centers for Disease Control (CDC) or World Health Organization (WHO), so the public health specialist plays a vital role in the case study. Other careers can easily be added to the case study to meet individual teachers' needs.

Once students have had a chance to research the disease and its possible consequences from the perspective of someone in their chosen or assigned career, they should work together as a group to complete the "Final Report" worksheet. First, students should establish their own rules of conduct by which they will abide while engaging in group discussion. Students should feel comfortable to point out to each other when a rule has been broken and to revisit and make modifications to the rules as they progress through the activity. The instructor should be present to monitor group discussions and ensure that all discussions remain respectful and productive.

Students should begin the discussion by sharing their own thoughts on the outbreak scenario from the perspective of someone in their career and explain what actions they would choose to take and why. Students will then need to discuss each question on the Final Report worksheet and come to a consensus before recording their responses. The last item on the worksheet requires students to describe the steps they would take to contain and mitigate the consequences of the theoretical outbreak. All students on the team will need to contribute their own perspective on what they feel would be the best course of action in order for a well-rounded plan to be constructed. Instructors can facilitate this process by helping students to consider all aspects of the outbreak scenario, including disease containment and prevention, potential economic losses, political issues, and social unrest. The ultimate goal of this portion of the case study assignment is for students to communicate their own opinions effectively as well as listen to the opinions of others in order to construct a plan on which all stakeholders can agree.

Once students finish their final report, instructors can choose to have each group present their plan to the class. The goal of the presentations would be to give all students an opportunity to ask questions and assess the positive and negative aspects of their own and others' plans. After the individual group presentations, instructors could also have the entire class try to reach consensus about the best plan of action. During the presentations and following discussions, instructors should facilitate productive, respectful conversations. After consensus is reached, it would be worthwhile to have students reflect on the benefits and difficulties they encountered while taking a One Health approach to addressing a public health crisis. They can also reflect on what they would do differently to improve the experience for themselves and others if they had to repeat the activity.

The entire case study activity will take between six and nine 45 to 50-minute class periods to complete. Reading of the introduction and scenario, opening discussion, assigning of groups and careers, and establishment of expectations will take approximately one full class period. The research and individual career worksheet portion of the case study will take two or three class periods. The establishment of group rules, group discussion, and completion of the Final Report will take another two to three class periods, and the final presentations and wrap-up discussion will take an additional one to two class periods depending on how many groups are presenting.

Teachers can assess the performance of their students throughout the case study in several ways. Students can be assessed individually based on satisfactory completion of their individual career worksheets and as a group based on their Final Report worksheet. Group participation for each student can also be assessed using the rubric found in Appendix B. The rubric was designed to address commonly assessed aspects of group participation, including how much the individual contributed to the group, how well they problem-solved, their ability to work with other teammates, whether or not they maintained a positive attitude, and how well they stayed focused on the task. If the rubric will be utilized, it should be introduced to the students and explained before they begin their Final Report.

Chapter 3 – Future Plans

This case study will initially be implemented within a Wildlife Biology course for high school juniors (grade 11). Each year, students will be asked to provide feedback about the experience as part of their Final Report. The purpose of requesting their feedback is to determine which parts of the case study experience were valuable for students and which parts

need revision. The case study will then be edited and updated to improve the experience for the following year's students.

To add additional value to the experience, I hope to have local professionals provide feedback and guidance for students as they work through the case study. Ideally, a professional from each of the six careers represented in the case study would be available to answer questions for students and give feedback on their individual plans for dealing with the outbreak. Local public health officials could also observe the final presentations and provide feedback on the strengths and weaknesses of students' plans.

The full case study experience will hopefully help students grasp the seriousness of zoonotic disease outbreaks and understand the challenges associated with stopping their spread. Therefore, after the case study, I plan to expand upon their knowledge of zoonotic diseases by presenting a lecture on various other zoonotic diseases, including zoonotic influenza, salmonellosis, West Nile virus, plague, emerging coronaviruses, rabies, brucellosis, and Lyme disease. Students should be aware of common zoonotic diseases and the ways in which they are spread so they can avoid exposure and help educate others on how to do the same. By the end of the unit, students should be well-informed not only about common zoonotic diseases and associated risk-factors but also how a One Health approach can be utilized to effectively control zoonotic disease outbreaks.

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Appendix A – Case Study

RIFT VALLEY FEVER VIRUS: A ONE HEALTH CASE STUDY

Introduction

“**One Health**” is the concept that human, animal, and environmental health are all connected. **Zoonotic diseases**, which are diseases that can pass between animals and people, are included under the umbrella of One Health. Stopping the spread of these diseases requires an **interdisciplinary** approach, which means that it requires many people with different backgrounds working together. For example, physicians, veterinarians, environmental scientists, governmental officials, and public health specialists often work together to contain zoonotic disease outbreaks. For this assignment, you will be assigned a profession and will work as part of an interdisciplinary team to come up with a plan of action for containing a zoonotic disease outbreak. Read the following scenario and then answer the questions on your career worksheet using the background information and articles you are provided. Finally, work with your groupmates to come to a consensus about the steps that need to be taken to best handle this outbreak.

Scenario

The air was thick with humidity on a hot day in August as Stan Leroy was out for a walk with his old dog Buck on a stretch of wooded land just outside of a small farming community in rural Kansas. They hadn't gotten far when Stan noticed Buck stop in his tracks. When he looked to see what had caught Buck's attention, he noticed a deer staggering in their direction. Stan immediately recognized that the deer wasn't behaving normally. As he waited for the deer to get closer, it lost its balance and fell. He watched to see if it would get back up, but it never did.

Stan and Buck made their way slowly toward the animal, but Stan sensed something was wrong. The deer had streaks of bloody diarrhea coating the backs of its legs and a trail of bloody diarrhea could

be seen along the path the deer had traveled. He was careful not to touch the animal, but he didn't see any other obvious signs of disease. He had never seen a young deer just drop dead and wondered what might be the possible cause. He spied a farm in the distance so he decided to walk that direction to ask if anyone had noticed anything unusual going on with the wildlife in the area lately.

Stan knocked on the door to the farmhouse, but received no answer. He and Buck wandered around to the back of the house to find a man standing over a dead calf with a very serious look on his face. Stan introduced himself and asked what had happened to the calf. The man explained that this was the third calf to be aborted on his farm this month. Stan was stunned and described to the farmer what he had just observed with the deer. "Do you think the two might be related?" Stan asked. The farmer replied, "I'm not sure, but I had a doctor's appointment earlier today, and they said they've had five people report with flu-like symptoms just this week. Seems a little odd for August, don't you think? I think something strange is going on in this town. The veterinarian is on her way, so maybe she can explain it."

A few minutes later, the veterinarian pulled up in her truck and hopped out. Buck ran up to greet her, and she patted him on the head. Stan once again introduced himself and watched as the vet examined a few of the cows and took blood samples. When she walked back over to the men she said, "I can't be certain what's causing these abortions in your cattle, but we definitely need to do some testing. I'll send these samples off for analysis and let you know what I find as soon as possible."

Stan walked with the vet as she was headed back to her truck. He told her about the deer he had just seen. "Could they be related?" he asked. Her face looked very serious. She replied, "I don't know, but I'm going to go take a blood sample so we can find out." Stan offered to show her where to find the deer so they headed off toward the woods together with Buck trotting behind.

Two days later, Stan was watching the evening news when a local story caught his attention. The CDC had determined that there was an outbreak of Rift Valley fever virus in the area, which was the first outbreak ever recorded in the United States. The virus had already infected humans, cattle, and wildlife.

An interdisciplinary team of top scientists, government officials, and public health specialists from across the country were being assembled to come up with a plan for containing the outbreak.

Stan was shocked. How did this virus get to the United States and how was it being transmitted between people and animals? Had he been exposed? How would this disease impact his community and the nation? He had so many questions and was certain that other members of his community would be panicking as well. He hoped that the team assigned to the case would be able to bring the outbreak to a quick end while helping to keep the community calm and informed.

Name: _____

Physician Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as a physician is to keep humans healthy so you will need to figure out the best way to deal with those individuals who are already infected and prevent the virus from spreading and infecting more people. This virus can also infect various animals and can be transmitted by mosquitos so you will need to take these factors into account. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How is it spread? What species can it affect?
2. What are the symptoms in people? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as a physician? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread in humans both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to animals or the environment?
5. What other team members will be vital in helping you, as a physician, ensure that people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

Name: _____

Veterinarian Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as a veterinarian is to keep animals healthy so you will need to figure out the best way to deal with those animals who are already infected and prevent the virus from spreading and infecting more animals. This virus can also infect humans and can be transmitted by mosquitos so you will need to take these factors into account. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift Valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How is it spread? What species can it affect?
2. What are the symptoms in animals? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as a veterinarian? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread in animals both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to humans or the environment?
5. What other team members will be vital in helping you, as a veterinarian, ensure that people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

Name: _____

Environmental Scientist Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as an environmental scientist is to consider the environmental factors that are contributing to the spread of the disease and find ways to mitigate those causes. This virus can infect both humans and animals and can be transmitted by mosquitos so you will need to take these factors into account. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift Valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How do environmental factors contribute to its spread? What species can it affect?
2. What are the symptoms in people and animals? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as an environmental scientist? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread through the environment both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to people or animals?
5. What other team members will be vital in helping you, as an environmental scientist, ensure that people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

Name: _____

Government Official Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as a government official is to keep your citizens safe and calm during a crisis. You also need to try to lessen the economic impact this outbreak will have on the local area, state, and country. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift Valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How does it spread? What species can it affect?
2. What are the symptoms in people and animals? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as a government official? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to people, animals, or the environment?
5. What other team members will be vital in helping you, as a government official, ensure that people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

Name: _____

Wildlife Biologist Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as a wildlife biologist is to study how this virus is affecting wildlife species and ways to stop the spread. This virus can also infect people and can be transmitted by mosquitos so you will need to take these factors into account. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift Valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How does it spread? What species can it affect?
2. What are the symptoms in wildlife animals? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as a wildlife biologist? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to people, animals, or the environment?
5. What other team members will be vital in helping you, as a wildlife biologist, ensure that you and other people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

Name: _____

Public Health Specialist Handout

You have been contacted to be a part of the interdisciplinary team tasked with containing the current outbreak of Rift Valley fever virus. Your job as a public health specialist is to monitor the outbreak and how the disease is spreading, educate the public, and connect the community with needed resources. This virus can also infect animals and can be transmitted by mosquitos so you will need to take these factors into account. You won't be able to solve this problem on your own so you will need to listen to the other members of your team to come up with the best course of action. Please research Rift Valley fever virus and answer the following questions.

1. What is the cause of Rift Valley fever? How does it spread? What species can it affect?
2. What are the symptoms in people and animals? How long does the illness last? Can it be fatal?
3. What are your biggest concerns as a public health official? What could be some of the impacts on the country (health, social, economic) if the disease continues to spread, both to people and animals?
4. What measures can you take to stop the spread both immediately and long-term? Are these measures reasonably easy to carry out? Are these measures financially feasible? Do they pose any risks to people, animals, or the environment?
5. What other team members will be vital in helping you, as a public health official, ensure that you and other people in the community are safe from this disease? Why?
6. What would be your top 5 suggestions to your team for the steps that need to be taken to get this outbreak under control?

RIFT VALLEY FEVER VIRUS CASE STUDY FINAL REPORT

Directions: Work together as a group to answer the questions below in complete sentences. You will need to discuss each question and come to a consensus before recording your answers. Each individual should consider the questions from the perspective of their assigned career but also consider other group members' perspectives.

1. What is "One Health" and what might be challenging about taking a One Health approach to solving global health issues?
2. Based on what you learned about Rift Valley fever virus, why is it considered a One Health issue?
3. When working as part of an interdisciplinary team, should one person be the leader or should everyone have equal say? If you think one person should be the leader, who should it be and why? If you think everyone should have equal say, how will meetings be run in an organized fashion so progress is made?
4. What other stakeholders or careers should have been represented in this exercise? Why?

5. What do you think is the general purpose of engaging in tabletop exercises, such as this case study? What are the strengths of case studies in helping participants prepare for real-life events? What are their weaknesses?

6. In your opinion, what were the strengths of this particular case study? What were the weaknesses? Were there any areas that you feel could or should be revised to make it more beneficial for student learning?

7. Now work together as a group to come up with a final plan of action to contain this disease outbreak. You must consider the fastest and safest ways to keep humans, animals, and the environment healthy. How will you deal with those individuals (both people and animals) who already have the disease? How will you stop the spread of the disease? How will you pay for these interventions? How will you keep the general population calm during this crisis? What information do people need to know and how will you share it? Is there any information that should not be shared? Please give a detailed explanation of the steps your group would take and in what order you would take them. Also explain WHY you have made these choices. Your answer should be at least four paragraphs in length.

Appendix B - Rubric

ONE HEALTH CASE STUDY PARTICIPATION RUBRIC

CATEGORY	4	3	2	1
Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Problem-solving	Actively looks for and suggests solutions to problems.	Refines solutions suggested by others.	Does not suggest or refine solutions, but is willing to try out solutions suggested by others.	Does not try to solve problems or help others solve problems. Lets others do the work.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.