Be a Detective:
Understanding Disease Outbreaks

Overview:
Be a Detective: Understanding Disease Outbreaks is a lesson plan designed to provide additional resources for the Center for Disease Control's graphic novel *The Junior Disease Detectives – Operation: Outbreak*. As a group, and after reading the graphic novel, participants will discuss the principles of epidemiology, common epidemiologic terms and the steps epidemiologists take to investigate a disease outbreak.

Objectives:
After completing this activity, participants will be able to:
- Describe the steps of an outbreak investigation.
- Identify the group or groups at higher risk for variant influenza.
- Identify the source and risk factors for disease transmission in a story.
- Describe the outbreak in a story in terms of time, place and affected population.

Skill Level:
Advanced

Life Skills:
Communication, critical thinking, cooperation and disease prevention

Setting:
Classroom

Time:
90 minutes

Materials:
- ❏ *The Junior Disease Detectives – Operation: Outbreak* graphic novel: https://www.cdc.gov/flu/resource-center/freeresources/graphic-novel/index.html
- ❏ "Vocabulary" handout
- ❏ "Questions" handout
- ❏ "Answers for Large Group Questions" handout
- ❏ Tape
- ❏ Writing and drawing utensils such as markers, crayons, colored pencils (optional)
- ❏ Cardstock
- ❏ Scissors
- ❏ "Graphic Novel Storyboard" handout (optional)
- ❏ "Speech Balloons" handout (optional)

PROCEDURE:

Before the meeting:

1. Have participants download and read *The Junior Disease Detectives – Operation: Outbreak* (https://www.cdc.gov/flu/resource-center/freeresources/graphic-novel/index.html).

2. Print the "Questions" handout for each group. Group size for answering questions should be three to four people. The answers are given for the facilitator on the "Answers for Large Group Questions" handout.

3. On cardstock, print off and cut out the vocabulary words.

4. If you choose to do the optional activity described in "Adaptations and Extensions," print out one copy of the "Graphic Novel Storyboard" handout and the "Speech Balloons" handout for each participant.

During the meeting:

As a large group:

1. Ask the participants to talk to their neighbor and try to come up with a definition for an epidemiologist.
   a. Let each pair state what they think an epidemiologist does.
   b. Acknowledge they all had great ideas and thoughts. Then read aloud or paraphrase the following:

      Epidemiologists are people who search for the cause of disease, identify people who are at risk of that disease and determine how to control, stop the spread of or prevent the disease from happening again.

2. To explain the role of the Centers for Disease Control and Prevention (CDC), please read aloud or paraphrase the following:

   The Centers for Disease Control and Prevention (or CDC) serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and health education activities designed to improve the health of the people of the United States.

   a. Ask students to turn and talk to each other about why it is important for there to be a CDC.

3. Give each pair one-vocabulary card to try to define or explain how it connects to the work of the CDC. Do not hand out the "CDC" card.
   a. If you have space, tape the "CDC" card to the center of a wall.
   b. Then ask each pair, one at a time, to tape their card (touching another related card) explaining how it connects to the CDC card or other word.

4. Ask a participant to summarize the graphic novel that was assigned before arriving at the meeting.
5. Discuss the "Questions for the Large Group" in the "Questions" handout.

TALKING IT OVER:

- Have participants break into groups of three to five people to discuss the "Questions for Small Groups" in the "Questions" handout.

ADAPTATIONS & EXTENSIONS:

For younger or less experienced participants:

- Provide participants with markers, crayons, colored pencils and the "Graphic Novel Storyboard" and "Speech Balloon" handouts, so they can make their own graphic novels about epidemiology.
- Make sure to discuss and have the youth address the following key points to a potential epidemiological outbreak. The page number reflects where the topic can be found in *The Junior Disease Detectives – Operation: Outbreak* graphic novel.
  - Preparing for field work (pg. 32)
  - Establishing the existence of an outbreak (pg. 34)
  - Verifying the disease (pg. 42)
  - Developing a hypothesis (pg. 43)
  - Developing a description (pg. 43)
  - Finding case record information (pg. 43)
  - Implementing control measures (pg. 49)
  - Communicating findings (pg. 53)

ALIGNMENT TO SCIENCE AND ENGINEERING PRACTICES:

How does 4-H increase science literacy?

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry-based. The lessons in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education. The lesson activities are aligned with the eight Science and Engineering Practices from *A Framework for K–12 Science Education* (National Research Council, 2012, p. 42).

The activities in the 4-H Animal Science Anywhere: *Be a Detective: Understanding Disease Outbreaks* were evaluated for their alignment with the Science and Engineering Practices by Michigan State University Extension Educator Tracy D'Augustino in 2019.

Table 1. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practice	Action	Activity Step
▸ Asking questions and defining problems	▸ Youth explore what the CDC is and the role of epidemiologists.	1-3
▸ Developing and using models	▸ Youth read the graphic model.	Pre-meeting assignment
▸ Planning and carrying out investigations		
▸ Analyzing and interpreting data		
▸ Using mathematics and computational thinking	▸ Youth explain the series of steps the CDC makes when dealing with an outbreak.	Large group questions 2–6 & 9
▸ Constructing explanations and designing solutions	▸ Youth explain how diseases can be spread and discuss ways we can help slow or stop the spread.	Large Group Questions 7-8 & 10
▸ Engaging in argument from evidence	▸ Youth use information from in the story to explain how we can help slow or stop the spread of diseases.	Small group questions
▸ Obtaining, evaluating, and communicating information	▸ Youth are able to share with others the value of the CDC, epidemiologists and our own biosecurity practices.	Whole lesson

REFERENCES & RESOURCES:

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.

ACKNOWLEDGMENTS:

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Be a Detective: Understanding Disease Outbreaks Handout

Vocabulary

Centers for Disease Control and Prevention (CDC) – federal agency responsible for developing and applying disease prevention and control, and education activities to improve the health of the people of the United States	**epidemic –** having more cases of disease than would normally be expected in a specific place or group of people over a given time (Epidemics may also be called outbreaks.)
determinants – behavioral, biological or social factors that influence the occurrence of disease or other health events	**epidemiology –** the study of the distribution and determinants of diseases in populations
distribution – the frequency and pattern (that is, person, place and time) of health-related events in a population	**foodborne diseases –** illnesses caused by food that have been contaminated with bacteria, parasites or viruses (Harmful toxins and chemicals can also contaminate food and cause foodborne illness.)
EIS officer – an Epidemic Intelligence Service (EIS) officer works for the Centers for Disease Control and Prevention (CDC) to investigate potential epidemics	**host –** A living organism (human or animal) that can be infected by an infectious pathogen

mode of transmission – the way a disease spreads from one host to another	**risk factors –** characteristics of people, or their behavior, that lead to a greater likelihood of illness
outbreak – another term for epidemic	**surveillance –** gathering and studying health-related information from a group of people
pandemic – a worldwide epidemic of a new disease	**zoonotic diseases –** illnesses caused by infectious agents that are spread between animals and people
pathogen – an organism, such as a virus or bacterium, that causes diseases	

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Questions

Questions for the Large Group

1. Based upon *The Junior Disease Detectives – Operation: Outbreak* graphic novel, what do you think epidemiologists do?
2. What did the Epidemic Intelligence Service (EIS) officers discuss when preparing to go to the school?
3. Whom did the EIS coordinate communications with to see if there had been other unusual respiratory cases recently? What groups did they call to gather this information?
4. What two labs verified the virus that the team was dealing with?
5. Using the lab results, what hypothesis did the team of EIS officers make regarding the virus while working at the Health Department?
6. What steps did the EIS officers take to find other possible cases?
7. What were the control measures implemented to protect humans from the spread of the disease?
8. What groups of people are considered to be high risk and more likely to get complications from the flu?
9. How did the EIS officers communicate their findings following the fair and what news did they share?
10. Why might fairs be a place where animals and humans could get sick?

Questions for Small Groups

1. How would you detect a disease outbreak (either animal or human) at your fair?
2. Do you know whom to contact if you suspect a disease outbreak at your fair?
3. What biosecurity measures do you have at your fairgrounds or in your barn? Is there anything you would recommend to the fair or change at home?
4. How do you balance biosecurity with allowing the public to see the animals and learn about agriculture at the fair? Are there any good ways to both protect the health of animals and the public and still allow for viewing of animals?
5. Has there ever been a disease outbreak at your fair or at one in a neighboring county? How was it discovered? What was done about it?
6. Does your fair have a plan in place if there is either a human or animal disease outbreak? If so, how are fair participants educated about it? If not, what would you recommend?

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Answers for Large Group Questions

Note: Underlined words and phrases are the key responses that facilitators should be looking for.

1. Based upon *The Junior Disease Detectives – Operation: Outbreak* graphic novel, what do you think epidemiologists do? ***They are scientists who study disease within populations of people and animals and the ways disease can be prevented.***

2. What did the Epidemic Intelligence Service (EIS) officers discuss when preparing to go to the school? ***They have an un-identifiable virus not seen before. They were dealing with a 17-year-old male with severe respiratory illness. They would know more information once the results come back from the lab (pg. 32).***

3. Whom did the EIS officers coordinate communications with to see if there had been other unusual respiratory cases recently? What groups did they call to gather this information? ***They coordinated communications with the Health Department. They contacted local hospitals and doctors' offices (pg. 34). They contacted the fair organizer and fair veterinarian (pg. 40).***

4. What two labs verified the virus that the team was dealing with? ***The results were first verified at the CDC Laboratory and then with the United States Department of Agriculture (USDA) Laboratory (pg. 42).***

5. Using the lab results, what hypothesis did the team of EIS officers make regarding the virus while working at the Health Department? ***The virus has the potential to be a pandemic, meaning that the majority of the world population does not have existing immunity (pg. 43).***

6. What steps did the EIS officers take to find other possible cases? ***They followed up with the State Public Health Department, state public health partners and health care providers (pg. 43).***

7. What were the control measures implemented to protect humans from the spread of the disease? ***They advised that people at high risk of serious flu illness who are at fairs should avoid entering the swine barn and avoid pigs at the fair (pg. 49). They advised that everyone should wash their hands before and after contact with pigs and should not eat or put anything in their mouths when around pigs (pg 50).***

8. What groups of people are considered to be high risk and more likely to get complications from the flu? ***People considered to be high risk are those with asthma, children younger than 5 years old, pregnant women and others with long-term health conditions (pg. 50).***

9. How did the EIS officers communicate their findings following the fair and what news did they share? ***They communicated their findings through a news story on TV. They shared that more people got sick as well as more pigs tested positive for having the disease (pg. 53).***

10. Why might fairs be a place where animals and humans could get sick?

    a. Animals from distant areas are brought together in one place, providing many opportunities for disease transmission.

    b. Animals are housed closely together in an enclosed space (barn).

    c. Humans are brought into close contact with animals as they visit the barns.

    d. Children may have not yet learned good hygiene practices, such as washing their hands and not putting things in their mouths.

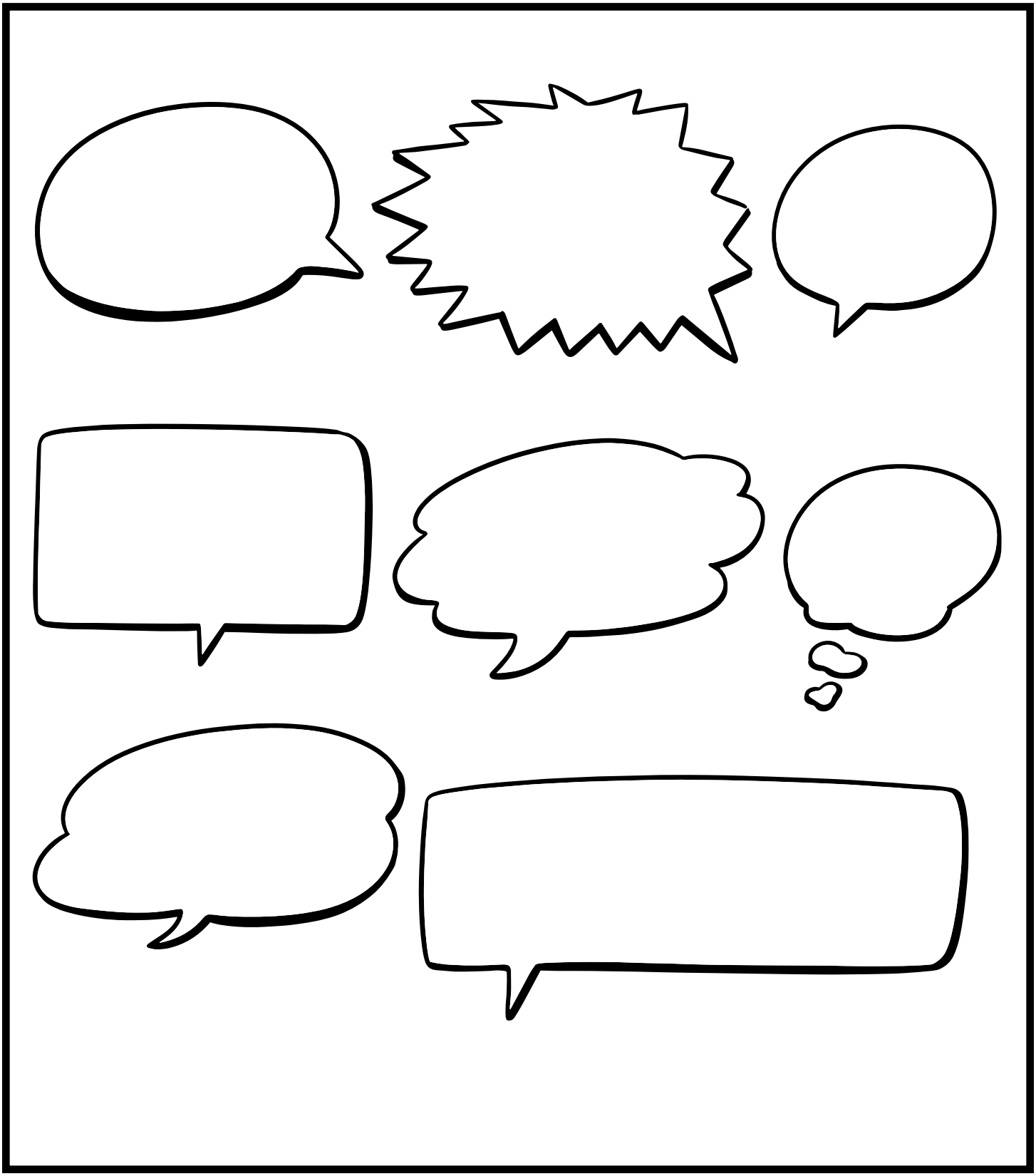
    e. Fair attendees may have risk factors for disease such as underlying health conditions and age.

Be a Detective: Understanding Disease Outbreaks Handout

Graphic Novel Storyboard

Be a Detective: Understanding Disease Outbreaks Handout

Speech Balloons



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