

Master of Public Health Applied Practice Experience

by

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MASTER OF PUBLIC HEALTH

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Chapter 1 - Portfolio Products

My Applied Practice Experience (APE) took place at the Kansas Department of Health and Environment (KDHE) in Topeka, Kansas. My APE was completed remotely and began in September 2022 and ended in July 2023. My experience over the past nine months resulted in three products: One Health lesson plans for kindergarten through 12th grade (K-12) Kansas students, a WebIZ Rabies Data Analysis project, and a manual review of the Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) rabies data. My responsibilities involved attending biweekly meetings with Dr. Erin Petro, monthly meetings with an advisory team, monthly Centers for Disease Control and Prevention (CDC) meetings and any other meetings that pertained to my role with KDHE. The first project I was involved in was creating One Health lesson plans for K-12 students across Kansas for the CDC Grant for Public Health Emergency Response: Public Health Response. This grant was awarded to KDHE and consisted of three components: One Health lesson plans, a mobile lab, and a museum exhibit. I had the opportunity to contribute to the lesson plan development alongside educators and my preceptor, Dr. Erin Petro. The lesson plans I was responsible for creating included a lesson on the Spread of Infectious Diseases and a lesson on the Human-Animal Bond. For the second project, I had the opportunity to contribute to an analysis of Rabies Post-Exposure Prophylaxis (PEP) data, which is a vaccination series given to patients that had an exposure to rabies and includes a dose of human rabies immune globulin and a series of rabies vaccinations given on day one of rabies exposure and then on a schedule thereafter. I was able to shadow and work alongside a KDHE epidemiologist, Stephanie Lindemann, throughout this project. We extracted data from the Kansas WebIZ (KSWebIZ) database, an immunization registry system also used in most states, that all medical facilities/professionals administering a Rabies vaccine are required to report in. Stephanie guided me through the steps she took to import into the Statistical Analysis Software (SAS Version 9.4). I was able to see the process of “cleaning up the data,” which removed any duplicate entries and entries that contained any of the pre-determined exclusions. These exclusions included patients that did not receive the full series of vaccines or patients that received more than one series of the vaccine. These analyses were shared at a rabies vaccination conference in June 2023, which provided health departments, health clinics, and health professionals information about vaccinations in Kansas. The information shared included the number of doses administered by month over a five-year span, demographics such as doses given by sex, age group, and funding status, and number of doses given per county. For the third project, I had the opportunity to work alongside

a team of three epidemiologists to manually review emergency department rabies visit from ESSENCE, a surveillance system that allows you to monitor and analyze syndromic data. The main areas we were exploring included the burden of animal bites in emergency departments, the number of rabies related emergency department visits, and the number of patients receiving PEP. I was responsible for analyzing about 300 of the data entries from hospitals across Kansas, where I recorded the number of emergency room visits that were a potential rabies exposure due to an animal bite and recorded if PEP was administered. The information gathered from the analysis was then used in a rabies-related emergency room department presentation in July 2023, presented by one of the epidemiologists on the project.

Table 1.1 Summary of Portfolio Products

Portfolio Product		Description
1	Spread of Infectious Diseases Lesson Plans K-12	These lesson plans focus on the spread of infectious diseases for elementary, middle, and high school. Each lesson plan highlights a hands-on activity where students learn more about how infectious diseases spread and the ways to prevent disease transmission.
2	Human-Animal Bond Lesson Plans K-12	These lesson plans highlight the human-animal bond for elementary, middle, and high school students. Each lesson includes links to educational videos and activities that share more information about the benefits and drawbacks to this bond.
3	WebIZ Data Analysis Graph and Tables	A project that highlighted rabies PEP administration in Kansas using immunization data provided by KSWebIZ. Data was analyzed based on age group, sex, funding, doses per month, and doses administered by county. The data was then graphed or placed in tables, and a portion

		of this product was later used in an immunization presentation.
4	WebIZ Procedure for Data Analysis and Table Creation	A document that provides the steps needed to analyze the Kansas WebIZ data and create tables and graphs using the Pivot Table function in Microsoft Excel Version 230.
5	Rabies Immunization Presentation	A title slide of a rabies presentation presented by Stephanie Lindemann, an epidemiologist at KDHE. Some of the data utilized in the presentation was developed by my data analysis graphs and tables product from the WebIZ project.
6	Manual Review of ESSENCE Rabies Data	A project that explored emergency room department animal bite visits to find the burden of animal bites in Kansas, the number of rabies-related emergency department visits, and the number of patients in emergency departments receiving PEP.
7	Rabies-related Emergency Department Visits Presentation	A title slide of a rabies-related emergency room department presentation that was presented by Henri Menger, an epidemiologist at KDHE. A portion of the data presented was a result of my product from the manual review of ESSENCE rabies data.

Table 1.2 Portfolio Products and Competency Addressed

Portfolio Product		Number and Competency Addressed	
1	Spread of Infectious Diseases K-12 Lesson Plans	18	Select communication strategies for different audiences and sectors

		19	Communicate audience-appropriate public health content, both in writing and through oral presentation
		21	Perform effectively on interprofessional teams.
2	Human-Animal Bond K-12 Lesson Plans	18	Select communication strategies for different audiences and sectors
		19	Communicate audience-appropriate public health content, both in writing and through oral presentation
		21	Perform effectively on interprofessional teams.
3	WebIZ Data Analysis Graph and Data Tables	3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate.
		4	Interpret results of data analysis for public health research, policy, or practice.
		19	Communicate audience-appropriate public health content, both in writing and through oral presentation.
		21	Perform effectively on interprofessional teams.
4	WebIZ Procedure for Data Analysis and Table Creation	3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate.
		19	Communicate audience-appropriate public health content, both in writing and through oral presentation.
5	Rabies Immunization Presentation	3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate.
		4	Interpret results of data analysis for public health research, policy, or practice.
6	Manual Review of ESSENCE Rabies Data	3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate.
		21	Perform effectively on interprofessional teams.
7	Rabies-related Emergency Department Visits Presentation	3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming, and software, as appropriate.
		21	Perform effectively on interprofessional teams.

Chapter 2 - Competencies

Table 2.1 Summary of MPH Foundational Competencies

Number and Competency		Description
3	Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate.	This competency was attained in the Rabies WebIZ project and ESSENCE project. In the first project, data was pulled from KSWebIZ and then analyzed in SAS as well as Microsoft Excel. Information such as doses administered per age group, county, sex, and funding source were highlighted as well as doses per month over a five-year period. In the second project, emergency room data was pulled from ESSENCE and then analyzed in Microsoft Excel. Information including the burden of animal bites visits, number of rabies-related emergency department visits, and the number of patients receiving PEP.
4	Interpret results of data analysis for public health research, policy, or practice.	This competency was attained in the Rabies WebIZ project as well, where the data mentioned above was used to find trends in demographic data and seasonality of rabies cases.
18	Select communication strategies for different audiences and sectors.	This competency was attained in the One Health lesson plan project where my job was to determine the best way to present One Health information, specifically on the spread of infectious diseases and the human-animal bond, to a wide age-range audience.
19	Communicate audience-appropriate public health content, both in writing and through oral presentation.	This competency was attained in the One Health lesson plan project, where I had to take topics that can be highly scientific and technical and make them easily accessible and comprehensible for teachers and students.
21	Perform effectively on interprofessional teams.	This competency was attained in all three projects: the One Health lesson plan project, Rabies WebIZ project, and ESSENCE project. While on these projects, I worked alongside many professionals with diverse backgrounds. These backgrounds included areas such as educators, Public Health veterinarian, epidemiologists, and project managers. To ensure the success

		of the projects, it was important to work effectively together as a team and it was interesting to be able to gain perspective from the many different areas of backgrounds that each team member brought to both projects.
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Competency three involves analyzing quantitative and qualitative data which was achieved during the Rabies KSWebIZ and ESSENCE rabies project. The first project consisted of extracting rabies immunization data over a 5-year period, from 2018-2022, from KSWebIZ. The data was imported into the Statistical Analysis Software (SAS version 9.4), which was used to analyze the data allowing us to observe the differences in age groups, sex, funding source, and doses administered per month. The data were also imported from SAS to Microsoft Excel version 230, where charts and graphs were created to further understand the data. In the second project, we used two different queries, or codes used to extract data, to extract emergency room department visit data relating to animal bites and import the data into Microsoft Excel. From there, we were able to manually review the emergency room department data to gather information on the burden of animal-bite visits, the number of rabies-related emergency department visits, whether justified or not, and the number of patients receiving PEP at these visits.

Competency four highlights interpreting results of data analysis for public health practice. This competency was satisfied in the Rabies WebIZ project as well. I was able to work alongside an epidemiologist to draw conclusions from the data about the effectiveness of administering rabies vaccines. This information was then presented at an immunization conference with other health departments and physicians to better understand rabies and rabies immunization trends throughout Kansas.

Competency 18 involves using different communication strategies based on the audience you are trying to reach. This competency was achieved in the One Health lesson plans project. The goal of creating the One Health lesson plans was to be able to share information on infectious diseases and the human-animal bond with a wide age-range audience. I had to take at times highly technical and scientific terminology and concepts and find different activities that would best communicate this information to students of all ages, including videos highlighting the spread of disease and the human-animal bond, class discussions, hands-on lab-type activities to simulate the spread of disease, or epidemiological type activities.

Competency 19 highlights using audience-appropriate communication in writing and presentation. This competency was addressed during the One Health lesson plan projects as

well. When working with the advisory team and working on the lesson plans individually it was imperative to keep the audience in mind to ensure the ease of delivery of information. The audience that we were looking to reach not only included students, K-12, but the teachers that would be using the information in their classrooms as well. The goal was to make these One Health lessons easily accessible and comprehensible. I included background information on One Health; this included information on infectious diseases, the diverse ways diseases spread, pandemics, endemics, and epidemics, history of the human-animal bond, and benefits and drawbacks to the human-animal bond among many others.

Competency 21 involves working effectively with an interdisciplinary team. This competency was addressed in all three projects during my internship. On the One Health lesson plan project, I worked alongside an advisory team made up of educators, project managers, and Public Health Veterinarians. It was interesting to be able to work with such a diverse team and gain perspective and direction from all areas of background when approaching these One Health Lesson plans. On the WebIZ Rabies and ESSENCE Rabies Project, I had the opportunity to work with multiple epidemiologists with wide ranges of backgrounds. I enjoyed learning more about their work and their approaches. Working with these different professionals further opened my eyes to the importance of taking an interdisciplinary approach, which allows you to gain new insights and ideas about problems that you may not have had before.

Table 2.2 MPH Foundational Competencies Course Mapping

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	MPH 802	MPH 818
Evidence-based Approaches to Public Health					
1. Apply epidemiological methods to the breadth of settings and situations in public health practice	x		x		
2. Select quantitative and qualitative data collection methods appropriate for a given public health context	x	x	x		
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	x	x	x		
4. Interpret results of data analysis for public health research, policy or practice	x		x		

Public Health and Health Care Systems					
5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings		x			
6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels					x
Planning and Management to Promote Health					
7. Assess population needs, assets and capacities that affect communities' health		x		x	
8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs					x
9. Design a population-based policy, program, project or intervention			x		
10. Explain basic principles and tools of budget and resource management		x	x		
11. Select methods to evaluate public health programs	x	x	x		
Policy in Public Health					
12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence		x	x	x	
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes		x		x	x
14. Advocate for political, social or economic policies and programs that will improve health in diverse populations		x			x
15. Evaluate policies for their impact on public health and health equity		x		x	
Leadership					
16. Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making		x			x
17. Apply negotiation and mediation skills to address organizational or community challenges		x			
Communication					
18. Select communication strategies for different audiences and sectors	DMP 815, FNDH 880 or KIN 796				
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	DMP 815, FNDH 880 or KIN 796				
20. Describe the importance of cultural competence in communicating public health content		x			x
Interprofessional Practice					
21. Perform effectively on interprofessional teams		x			x
Systems Thinking					
22. Apply systems thinking tools to a public health issue			x	x	

Appendix 1 - Spread of Infectious Diseases K-12 Lesson Plans and Activities

Appendix 1.1 – Spread of Infectious Diseases Elementary School Lesson Plan

LESSON NAME: Stop the Spread!		
ONE HEALTH TOPIC Spread of Infectious Diseases GRADE LEVEL Elementary School	STATE STANDARDS ELA: W.K.2, SL.1.1, SL.1.2, SL.2.1, SL.2.2 Science – K.ESS3.1 History – Standard 1 Choices Have Consequences	SUBJECT AREA  English Language Arts  Science  Social Studies
LEARNING GOALS/OBJECTIVES: Students will be able to: • Define "germs" and understand their effects on humans. • Identify the ways germs spread • Identify ways to prevent the spread of germs		
MATERIALS NEEDED: Introduction • Access to internet and video player/projector Where to Find Germs Collage Activity • Magazines/Access to online images and printer • Age-appropriate scissors • Large piece of construction paper or poster board • Glue Other: • Crayons • Colored Pencils		
LESSON INTRODUCTION: This lesson will focus on what germs are, how they spread, and ways to prevent them from spreading. Divide students into small groups of 2-3 students and ask them to share one thing that they already know about germs. Invite groups to share ideas with the larger classroom group.		

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LEARNING ACTIVITIES:

Activity Option #1: (for younger grade levels)

(Meets Standards SL.1.1, SL.1.2, SL.2.1, SL.2.2, K.ESS3.1, and Choices have Consequences)

View read along video "Germs, Germs, Germs" https://www.youtube.com/watch?v=BgozL-9WYqM&t=71s&ab_channel=StoriesForKids with the students that explains what germs are and the different ways they spread from one to another. *Running Time 00:04:02*

Following the video, engage students in a class discussion regarding what they saw/heard. Sample questions include:

- What are germs?
- Where can we find germs?
- What are ways germs can spread?
- What are ways that germs can get into our bodies?
- What are some things we can do to protect ourselves from germs?

Activity Option #2: Draw or Color a Picture of a Germ

(Meets Standards W.K.2, SL.1.2, SL.2.2)

- Ask students to draw or color a picture of what a germ looks like.
- Have students write 1-2 sentences or a paragraph about what they learned about germs in the lesson. Questions in Activity #1 may be used as a guide.

Activity Option #3: Create a Collage

(Meets Standards W.K.2, SL.1.1, SL.1.2, SL.2.1, SL.2.2, K.ESS3.1, and Choices have Consequences)

- Ask students to create a collage using pictures from magazines or online photos that are examples of where germs may be hiding. Examples might include gardens/dirt, garbage cans, toilets, human hands, tables, etc.
- Engage students in a discussion related to their ideas and pictures.

Activity Option #4: Word Search Vocabulary Lesson

(Meets Standards SL.1.2 and SL.2.2)

- Ask students to complete the "Staying Well" Wordsearch puzzle as part of a vocabulary lesson. See the supplemental handout entitled *Staying Well Wordsearch*.

ASSESSMENT:

Create an age-appropriate rubric for evaluating collages.

Check the number of words located in the Wordsearch puzzle.

RESOURCES:

Centers for Disease Control and Prevention – Introduction to Epidemiology: Section 8 Concepts of Disease Occurrence

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section8.html#:~:text=The%20triad%20consists%20of%20an,a%20source%20to%20that%20host,>

Germ Coloring Pages: bit.ly/3Zi2eqU

Mayo Clinic – Causes of Infectious Diseases

<https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/svc-20351173#:~:text=Infectious%20diseases%20commonly%20spread%20through someone%20who%20isn't%20infected,>

Videos

Sesame Street in Communities: *What are Germs?*

https://www.youtube.com/watch?v=ACDLuToE0UI&ab_channel=SesameStreetinCommunities

Running Time: 00:02:13

Sid the Science Kid – The Jim Henson Company: *Germs!*

https://www.youtube.com/watch?v=ghLkwSIW5Xw&ab_channel=TheJimHensonCompany

Running Time: 00:03:17

WonderGrove Kids: *Germs, Germs, Germs*

https://www.youtube.com/watch?v=uMbCZfb5k3M&ab_channel=WonderGroveKids

Running Time: 00:03:20

Learn Bright: *Germs for Kids | Learn all about bacteria, viruses, fungi, and protozoa*

<https://www.youtube.com/watch?v=z6n-37RTKRQ>

Running Time: 00:09:39

Appendix 1.2 – Spread of Infectious Diseases Middle School Teacher Notes

Teacher Notes: Spread of Infectious Disease (MS)

This lesson is an introduction to the spread of infectious diseases. **Infectious diseases** are diseases caused by microorganisms that we can't see with the naked eye, which are also called pathogens. **Zoonotic diseases** are diseases that are spread between animals and people. Many of the sick days we see are due to infectious diseases, like the common cold and influenza. These pathogens that infect us can include bacteria, viruses, fungi, or parasites.

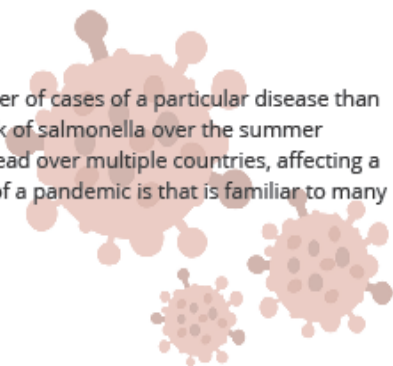
Infectious diseases can spread in several ways. The first is via **direct contact** (or person to person) like if someone coughs or sneezes on someone else. In relation to direct contact, a person can be **asymptomatic**, show no signs of disease or illness, and still be able to spread the disease to another person. A second way disease can spread is via **indirect contact**, like touching a doorknob that has been contaminated by germs. Two other ways disease is transmitted is through contaminated **food or water**. Lastly, diseases can be transmitted from a **vector** (carrier) to a human. For instance, diseases like Malaria or Lyme disease are transmitted to humans via mosquitos and ticks respectively.

The microorganisms that cause disease can change and adapt over time, which can lead to a resistance to once effective treatments. This is what we call **antimicrobial resistance**, which is a serious issue the world faces today. This is also why it is important to know whether a disease is caused by bacteria or a virus, to ensure antibiotics are being prescribed correctly.

The **disease triad** is a model that can help to understand how diseases spread. The disease triad has three corners:

- The "agent" which is the microorganism that causes the disease.
 - These can be germs, bacteria, virus, fungi, or parasites.
- The "host" which is the organism that is exposed to and harbors the disease.
 - This can be an animal or human
- he "environment" which is the surroundings and conditions that allow for the disease to spread.
 - Temperature
 - Dry or wet areas
 - Seasons

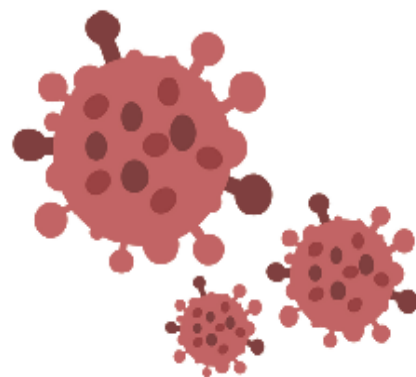
An **outbreak** or epidemic is a sudden increase in the number of cases of a particular disease than what is typical in an area. An example would be an outbreak of salmonella over the summer months in Kansas. A **pandemic** is an epidemic that has spread over multiple countries, affecting a much larger population of people. A most recent example of a pandemic is that is familiar to many is COVID-19.



Teacher Notes: Spread of Infectious Disease (MS)

Activity #2 Instructions:

- Gather enough plastic cups for the entire class and number each one. Fill all but one with distilled water to the halfway point.
- For the last cup, make a saturated solution of baking soda in water by adding baking soda to distilled water, while mixing or stirring, until no more will dissolve. Let it sit and then add to last cup. Note the number of the cup with the baking soda.
- You will need Phenolphthalein for this activity. If you don't have access to this, you can prepare your own using red cabbage. Here are the steps to prepare using red cabbage:
 - Boil a half of a head of red (purple) cabbage in a large pot of distilled water. Strain out the cabbage and keep the water. The water should turn purple. Refrigerate any portion that you do not use immediately. This can be kept refrigerated for 1-2 days.



Appendix 1.3 – Spread of Infectious Diseases Middle School Lesson Plan

LESSON NAME: Stop the Spread!		
ONE HEALTH TOPIC Spread of Infectious Diseases GRADE LEVEL Middle School	STATE STANDARDS ELA: SL.6.1, SL.7.1, SL.8.1 Science: MS-LS2-2 HGSS: Choices have Consequences	SUBJECT AREA  Science  English Language Arts  Social Studies
LEARNING GOALS/OBJECTIVES: Students will be able to: • Identify ways disease spread from person to person • Differentiate between direct and indirect disease transmission • Identify ways to prevent the spread of disease		
MATERIALS NEEDED: Direct Contact Disease Transmission • Notecards • Pens/pencils • <i>Optional: Glogerm gel or oil and UV light</i> Indirect Contact Disease Transmission • Plastic cups • Distilled water • Indicator (phenolphthalein or cabbage water) • <i>Optional: Vinegar</i> Community Response • Paper and pen/pencil		
LESSON INTRODUCTION: Divide students into small groups of 2-3 and ask them to think back to the most recent time that they were sick. In their small groups, they will discuss: • What were your symptoms? • How long were you sick? • How do you think you got sick? • What are some things that you did that helped you feel better? Following the discussion, ask for volunteers to share what they heard with the class.		

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LEARNING ACTIVITIES:

Utilizing information from the supplemental material titled, "Teachers Notes", share background information and terms with students so they gain a better understanding of how diseases spread.

Activity Option #1: Direct Contact Disease Transmission

(Meets Standards SL.6.1, SL.7.1, SL.8.1, MS-LS-2, Choices Have Consequences)

- Give each student a notecard and have all students number off 1-12.
- Ask students to walk around the room, stopping to high-five (or air high-five) other students as they pass each other. Each time they high-five someone, they will write each other's numbers down on their notecards. When all students have had a chance to gather numbers from at least five of their classmates, ask students to sit down.
- Choose a number from 1 to 12 and inform students that if they have the number you chose on their card, they have become infected with an illness. Ask students with that number on their cards to raise their hands to gain a clear picture of the number of students that were infected.
 - *Alternative option - Incorporate the use of Glogerm:* Instead of numbering students and choosing a number at random, choose one student to be "infected" (use the Glogerm). To keep the identity hidden, have other students apply something with similar consistency on their hands (such as unscented lotion or hand sanitizer). At the end of the activity, use a UV light to show which students have been "infected" and reveal who the original "infected" person was.
- As a class, discuss the concept of direct transmission and asymptomatic transmission. Invite students to turn to a partner and discuss their answers to the following questions:
 - What diseases or sicknesses do you think spread this way?
 - What could you do to help stop the spread?
- Following partner discussion, ask students to use terms they learned from this lesson to write a paragraph on their notecard answering the following questions:
 - Think of the last time you were sick. How do you think you got sick (how did it spread)?
 - Who else did you spread the sickness to?
 - If this sickness ended up being a part of an outbreak, what are some measures that could be taken to help stop the spread?

Activity Option #2: Indirect Contact Disease Transmission

(Meets Standards SL.6.1, SL.7.1, SL.8.1, MS-LS-2, Choices Have Consequences)

Teacher instructions (complete prior to the beginning of the activity):

- Gather enough plastic cups for the entire class and number each one. Fill all but one with distilled water to the halfway point.
- For the last cup, make a saturated solution of baking soda in water by adding baking soda to distilled water, while mixing or stirring, until no more will dissolve. Let it sit and then add it to the last cup. Note the number of the cup with the baking soda, as it will be the "infected" cup.
- You will need Phenolphthalein for this activity. If you don't have access to this, you can prepare your own using red cabbage. Here are the steps to prepare using red cabbage:
 - Boil half of a head of red (purple) cabbage in a large pot of distilled water. Strain out the cabbage and keep the water. The water should turn purple. Refrigerate any portion that you do not use immediately. This can be kept refrigerated for 1-2 days.

LEARNING ACTIVITIES, cont.:

Activity Option #2: Indirect Contact Disease Transmission, continued

(Meets Standards SL.6.1, SL.7.1, SL.8.1, Science: MS-LS-2, and Choices Have Consequences)

Day of the activity:

- Without revealing who has the “infected” cup (the one with the baking soda mixture), give each student one of the numbered cups.
- Invite students to walk around the room and visit four of their classmates (one at a time).
 - With each visit, ask students to mix the liquid in their cups by pouring all of the liquid from one cup into the other, and then pouring half of the liquid into the empty cup. A demonstration of this transaction could be helpful.
 - *Note: The cup represents air particles or a vehicle (inanimate object) for disease transfer*
- Once each student has made contact with four of their classmates, ask them to stand in a line with their cups. Explain to them that you have an indicator (phenolphthalein or cabbage water) that will change color in the presence of acids and bases.
 - **If using phenolphthalein:** For this activity, those that are infected will have solutions that turn pink. (In acids, phenolphthalein will be colorless, while in bases, it will turn pink.)
 - **If using cabbage water:** For this activity, those that are infected will have solutions that turn blue-green. (In acids, cabbage water will change from purple to pink, while in bases it will change from purple to a blue-green color).
- ***Optional Step – Incorporating “Vaccines”***
 - Before adding the indicator to each of their cups, choose a few students (by cup number) to receive a “vaccination” for this particular disease. Add 20 mL of vinegar to their cups, and let them know that they have been vaccinated. Note that typically, vaccinations occur before encountering a disease, but for the purposes of this activity, the “vaccination” occurred after exposure
- Go down the line and add a few drops of the indicator to each of the cups. Invite all “infected” students to move to one side of the room. Record the number of “infected” students on the board and have students determine which student was the source of the infection (their solutions will be a much brighter pink or blue-green).

After the activity, discuss the following with students:

- Go over the numbers with the students, including the total number of students, the number of infected students at the start, and the total number now infected.
- How this model reflects many real-world situations with disease spread.
- How this model differs from some real-world situations (If you get a cold, does everyone in your family also get a cold every time? Why not?)
- What diseases or sicknesses do you think spread this way? What could you do to help stop the spread?
- Other ways infectious diseases can spread (vector, water, food)
- Ways communities may respond to outbreaks of infectious diseases.
- When an outbreak happens in a community, what questions would you ask that could help you stop the spread of the sickness (e.g. How many people are sick? Where are the people getting sick? What are the symptoms? How long are people sick for? Who needs to know about this?)

LEARNING ACTIVITIES, cont.:

Activity Option #3: Community Response *(Meets Standards SL.6.1, SL.7.1, SL.8.1, Choices Have Consequences)*

Engage students in a brief discussion on ways communities may respond to outbreaks of infectious diseases.

Have students write a paragraph answering the following:

- Imagine the disease from the activity is considered to be an outbreak in your community. What questions would you ask that could help you stop the spread of sickness? Explain why you would ask those questions.
 - Examples: How many people are sick? Where are the people getting sick? What are the symptoms? How long are people sick for? Who needs to know about this?

ASSESSMENT:

Create an age-appropriate rubric for participation and writing activity.

RESOURCES:

National Geographic – “There’s an Outbreak!”

<https://www.nationalgeographic.org/lesson/theres-outbreak/print/> *(Note: The first activity was adapted from this site and there are many other great activities and ideas available here)*

Centers for Disease Control and Prevention – Introduction to Epidemiology: Section 8 Concepts of Disease Occurrence

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section8.html#:~:text=The%20triad%20consists%20of%20an,a%20source%20to%20that%20host.>

Mayo Clinic – Causes of Infectious Diseases

<https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/syc-20351173#:~:text=infectious%20diseases%20commonly%20spread%20through,someone%20who%20isn't%20infected.>

Appendix 1.4 – Spread of Infectious Diseases High School Teacher Notes

Teacher Notes: Spread of Infectious Disease (HS)

This lesson is an introduction to the spread of infectious diseases. **Infectious diseases** are diseases caused by microorganisms that we can't see with the naked eye, which are also called pathogens. **Zoonotic diseases** are diseases that are spread between animals and people. Many of the sick days we see are due to infectious diseases, like the common cold and influenza. These pathogens that infect us can include bacteria, viruses, fungi, or parasites.

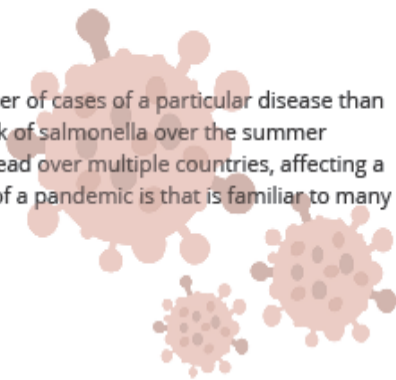
Infectious diseases can spread in several ways. The first is via **direct contact** (or person to person) like if someone coughs or sneezes on someone else. In relation to direct contact, a person can be **asymptomatic**, show no signs of disease or illness, and still be able to spread the disease to another person. A second way disease can spread is via **indirect contact**, like touching a doorknob that has been contaminated by germs. Two other ways disease is transmitted is through contaminated **food or water**. Lastly, diseases can be transmitted from a **vector** (carrier) to a human. For instance, diseases like Malaria or Lyme disease are transmitted to humans via mosquitos and ticks respectively.

The microorganisms that cause disease can change and adapt over time, which can lead to a resistance to once effective treatments. This is what we call **antimicrobial resistance**, which is a serious issue the world faces today. This is also why it is important to know whether a disease is caused by bacteria or a virus, to ensure antibiotics are being prescribed correctly.

The **disease triad** is a model that can help to understand how diseases spread. The disease triad has three corners:

- The “agent” which is the microorganism that causes the disease.
 - These can be germs, bacteria, virus, fungi, or parasites.
- The “host” which is the organism that is exposed to and harbors the disease.
 - This can be an animal or human
- The “environment” which is the surroundings and conditions that allow for the disease to spread.
 - Temperature
 - Dry or wet areas
 - Seasons

An **outbreak** or epidemic is a sudden increase in the number of cases of a particular disease than what is typical in an area. An example would be an outbreak of salmonella over the summer months in Kansas. A **pandemic** is an epidemic that has spread over multiple countries, affecting a much larger population of people. A most recent example of a pandemic is that is familiar to many is COVID-19.



Teacher Notes: Spread of Infectious Disease (HS)

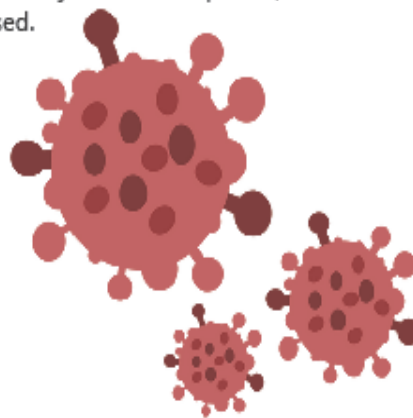
"What Happened to Jack Activity" Instructions:

- Divide students into groups of 4 and provide each group with a copy of Part I of the "What Happened to Jack?" activity. In these groups, students will work to assume the role of an epidemiologist to determine the source of an outbreak. Students should work within the small group to answer Questions 1 & 2 of the activity.
- Once the small groups have completed Question 2, discuss Question 3 as a class.
- Next, distribute the handout "Possible Infectious Diseases and Symptoms Chart" and ask each small group to complete Questions 1 & 2.
- When ready, each group will request a set of envelopes from the teacher, one containing potential questions and the other containing their answers. (See list of Questions and Answers to be listed on premade index cards below.)
- Students will first open the envelope of Interview Questions and follow the instructions in Question 3.
- Utilizing the envelope containing the answers to the Interview Questions, each small group will follow the instructions in Question 4 to answer parts a. and b.
- Once the group has completed their "investigation", distribute Part II of the activity titled, "What is the Source?"

Lesson Wrap Up

Once students are done with the activity (Part I and Part II) engage the students in a discussion around what they found was the illness and the source. Call on groups to share their findings. Students should have found that Jack was infected with Salmonella and the source of infection was the little turtle his family owned as a pet.

During the 1970's, small turtles were a source of Salmonella infections in the U.S., especially in Kansas. A significant number of children were becoming infected with Salmonella. In 1975, the Food and Drug Administration banned the distribution of small turtles and there were many states, Kansas included, that banned the sale of them completely. This helped to prevent hundreds of thousands of cases of salmonellosis among children. However, as we can still see today, reptiles, turtles especially, are popular pets. But this increase in popularity has a consequence, and the number of reptile-related salmonella infections has increased.



Teacher Notes: Spread of Infectious Disease (HS)

Interview "Questions and Answers" (To be listed separately on index cards and kept in two separate envelopes – 1 full set per group).

Questions

1. What was Jack's temperature?
2. What did Jack's throat look like?
3. A swab was taken of Jack's throat. Is there strep throat causing bacteria present?
4. What was Jack's blood pressure?
5. Has Jack vomited in the past 24 hours?
6. Does Jack have shortness of breath?
7. Has Jack had diarrhea over the past 24 hours?
8. What was Jack's weight?
9. Does Jack have body aches?
10. What is Jack's height?
11. Has Jack taken any type of medicine over the past 24 hours?
12. What are some foods that Jack has eaten over the past couple of days?
13. Does Jack have a cough?
14. What is the weather like where Jack and his family live?

Answers

1. 102.3 degrees F
2. Jack does not have redness or white bumps in his throat.
3. There is no *Streptococcus pyogenes* (strep throat causing bacteria) present in the sample taken from Jack's throat
4. Jack's blood pressure is 120 over 80 which is a normal blood pressure.
5. Yes, Jack has vomited in the past 24 hours.
6. No, Jack does not have shortness of breath.
7. Yes, Jack has had diarrhea over the past 24 hours.
8. Jack weighs 44.8 pounds.
9. Jack does not have body aches.
10. Jack is 45 inches tall.
11. No, Jack has not taken any medication over the past 24 hours.
12. Yesterday Jack had Oatmeal, chicken tenders, macaroni and cheese, spaghetti, banana, and strawberries. Today, Jack has not eaten or drank anything.
13. No, Jack does not have a cough.
14. The weather has been a bit cold, and it has been raining off and on over the past few days.



Appendix 1.5 – Spread of Infectious Diseases High School Lesson Plan

LESSON NAME: Stop the Spread!		
ONE HEALTH TOPIC Spread of Infectious Diseases GRADE LEVEL High School	STATE STANDARDS ELA: W.9-10.7, W.11-12.7 Science: LS4.C HGSS: Standard 1 Choices have Consequences	SUBJECT AREA  English Language Arts  Science  Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify the five ways diseases spread throughout a population.
- Define and provide an example of asymptomatic disease transmission
- Define and provide an example of vector-borne diseases
- Define "indirect" and "direct" transmission.
- Identify and provide examples of the disease triad.

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

What's Happened to Jack? Activity

- Copies of Handouts:
 - Part 1: What Happened to Jack?
 - Possible Infections Diseases and Symptoms Chart
 - Part 2: What is the source?
- Premade Index Cards listing interview questions and answers, each on a separate card. One full set per group.
- Envelopes – two per group. One contains set of Question index cards, the other for Answers

LESSON INTRODUCTION:

View TEDEd video titled "How Pandemics Spread".
https://www.youtube.com/watch?v=UG8YbNbdaco&ab_channel=TED-Ed Running Time: 00:7:59

Following the video, ask students to turn to a partner nearest them and discuss the following questions:

- What makes a "pandemic" different than an "epidemic"?
- Which facts surprised you the most?

This project was funded by CDC Grant # NU90TP22155-01 Public Health Emergency Response: Public Health Crisis

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LEARNING ACTIVITIES:

Using information from the supplemental material titled, "Teachers Notes", share background information and terms with students so they gain a better understanding of how diseases spread.

Activity Option #1: What Happened to Jack? (Meets Standards LS4.C and Choices Have Consequences.)
(See supplemental materials for handouts and instructions)

Students work in small groups of four to determine the type and source of illness in a small child.

Activity Option #2: Small Group Research Project (Meets Standards W.9-10.7, W.11-12.7, and Choices Have Consequences)

Students work in pairs or small groups to research an infectious disease of their choosing. Examples include plague, influenza, malaria, and tuberculosis. Questions to guide this research include:

- What is the history of the disease?
- How does the disease spread? Is it vector-borne?
- What steps were taken or could be taken to help stop the spread of this disease?

ASSESSMENT:

Use the provided rubric for the *What Happened to Jack* activity,

Create a rubric for the small group research project.

RESOURCES:

BioEd Online: Infectious Disease Case Study

<https://www.bioedonline.org/lessons-and-more/lessons-by-topic/microorganisms/microbes/infectious-disease-case-study/>

Centers for Disease Control and Prevention – Introduction to Epidemiology: Section 8 Concepts of Disease Occurrence

<https://www.cdc.gov/csels/dsepd/ss1978/lesson1/section8.html#:~:text=The%20triad%20consists%20of%20an,a%20source%20to%20that%20host>

Mayo Clinic – Causes of Infectious Diseases

<https://www.mayoclinic.org/diseases-conditions/infectious-diseases/symptoms-causes/svc-20351173#:~:text=Infectious%20diseases%20commonly%20spread%20through,someone%20who%20isn't%20i,nfected>

Appendix 1.6 – Infectious Diseases High School Case Study Activity



What Happened to Jack? (Part 1)

Jack is a healthy and active six-year-old that loves to play outside, especially now that it is fall. He loves to follow his older brother around and copy everything he is doing. They recently got a new turtle as a pet that they have been playing with non-stop. Jack also loves to have playdates with his friends that live a few houses down.

This morning when he woke up, Jack wasn't acting like his usual self. He was very upset, complained about having a stomachache and did not want to eat or drink anything. Jack's mother also noticed that he felt very warm. Jack's mother was very concerned because one of the neighbor's children that they went on a playdate with late last week had a bad cold. Based on this, Jack's mother decides to take him to the doctor just to be safe.

You and your teammates work as epidemiologists at an agency that helps doctors identify the source of illnesses like Jack's. Recently there have been a significant number of other cases of young children between the ages of 3-8 years old that went to the doctor with similar symptoms a few towns away. Therefore, you and your team have been hired to work with Steve Paige, a fellow epidemiologist and director at Kansas Department of Health and Environment, to investigate what is happening and ensure this isn't the beginning of an outbreak. However, before you can find the cause, you will need to identify what illness Jack has.

As a small group, answer the following questions:

1. Based on the information that you have so far, what do you think could be causing Jack's symptoms?
2. What are four questions that the team feels would be important to ask Jack's mother to help lead the doctors to a diagnosis and, ultimately, the source of illness?

As a class, discuss diseases and illnesses that you may have had in the past or know of that match the symptoms that Jack is displaying.

3. Based on this discussion, what are some possible diseases/illnesses that Jack may have?



What Happened to Jack? (Part 1 cont.)

The following chart lists common infectious diseases that are possible diagnoses for Jack. Your team will work to identify which of these is the most likely to be the one he is currently experiencing.

Infectious Disease	Symptoms	Causes	Treatment	How does it spread?
Influenza (Flu)	Headache Sore Throat Body Aches High Fever Diarrhea and/ or vomiting		Rest Stay hydrated May be prescribed antiviral medication	
Strep Throat	Headache Red and painful throat White patches on back of throat Stomach pain Fever		Rest Stay hydrated Prescription antibiotics	
Salmonellosis	Headache Chills Fever Stomach Cramps Diarrhea Vomiting		Rest Stay hydrated with extra fluids Antibiotics available for extreme cases	
Coronavirus	Headache Body aches Fever Sore throat Nausea or vomiting Diarrhea Shortness of breath		Rest Stay hydrated	

See Back for Next Steps

1. Complete missing elements of the chart by identifying the microorganism that causes each disease/illness and how it spreads. (Is it through direct or indirect contact? Is it food-, air-, or water-borne?)

2. Based on this information, what are some possible questions that the team thinks would be most important to ask Jack and his mother to help determine which illness he is experiencing?

3. Once you have your questions, ask your teacher for a set of question and answer index cards. Open the envelope labeled, "Questions" and review each question with your team. As a team, decide which of these questions would be most important to ask Jack and his mother and write down the number of each question.

4. Open the envelope labeled, "Answers", and find the answers that match the questions you have chosen to ask.

a. According to your investigation, which illness does Jack likely have?

b. Which sets of questions/answers were most helpful in identifying Jack's illness? Why?



What Happened to Jack? (Part 2: What is the Source?)

Now that you have identified Jack's illness, the next step is to identify the source.

Salmonella is a common bacterial illness, and this bacterium can be found in the intestines of both animals and humans and spreads via fecal-oral route. This means that the bacterium is shed in the stool of a host and enters the mouth of the next host by some means. It is primarily transmitted through contaminated food and/or water, but it can also be transmitted by direct contact with the animal.

Salmonella outbreaks are much more common in the summer months when the weather is warmer and there are more outdoor activities where food is not refrigerated, which is why your team has been brought in to investigate. You did a bit more digging and found many more cases of children with Salmonella throughout Kansas within just the past couple of weeks.

1. Given this information, identify a few additional questions that the team might ask Jack and his mother in order to get more information.

Your team decides to conduct an interview process and visit the homes of Jack and some of the other children. On the back of this handout are the notes that your team has gathered from these interviews and home visits. Study this information to find any clues as to what could be causing illness in these children.

2. Based on what you learned, what does the team think is the source of Jack's illness? Why?

Cases	Any contact with animals that pose a high-risk for salmonella such as cattle, pigs, or poultry?	Foods they've eaten over the 24 hours	What pets are in the home?	Anyone else in the home have the same symptoms?
Case # 1 (Jack)	No	Chicken tenders, macaroni & cheese, spaghetti, oatmeal, strawberries, banana	2 dogs, 1 cat, 2 little turtles	No
Case #2	Yes, visited grandparents' farm	Canned soup, pasta, tacos, waffles	1 dog	No
Case #3	No	Peanut butter & jelly sandwich, cereal, pasta, baked chicken	1 little turtle	No
Case #4	No	Oatmeal, salad, macaroni & cheese, tacos	2 cats, 1 little turtle	No
Case #5	Yes, visited a petting zoo	Pancakes, sandwich, tacos, jello	1 dog, 1 little turtle	No

Appendix 2 – Human-Animal Bond K-12 Lesson Plans and Activities

Appendix 2.1 – Human-Animal Bond Teacher Notes

Teacher Notes: Human-Animal Bond

This lesson introduces the human and animal bond and the benefits it can bring to both humans and animals. Humans have been drawn to animals since the beginning of time. When the first tools were developed to draw, animals were one of the first things humans drew on walls.

The human-animal bond is a mutually beneficial and dynamic relationship between people and animals. This relationship is influenced by behaviors that are essential to the health and well-being of both humans and animals. The relationship influences both the psychological and physiological state of both animals and humans.

Animals can offer social support to humans, which is necessary for well-being. They can buffer stressful events, allow for better coping and adaptive behavior, and improve the health and survival of humans. Similar benefits can be seen in animals too. Many studies have been conducted where data reveals animals' positive benefits on human health, like reducing the risk of health issues.

However, it is also important to note that the human-animal bond can negatively impact humans and animals. An example could be in times of evacuation when pet owners do not want to leave their pets behind. This puts themselves and their animals in danger by staying in unsafe conditions. Another example could be a dirty and unkept environment with animals that could spread infectious diseases (hoarder that has animals at home).

Often referred to as sentinel species, animals can be used to identify risks by providing warning of a danger that humans may face. One famous example of disease sentinels is canaries in a coal mine. Miners used canaries to help detect carbon monoxide gas. A canary's breath is much more rapid than a human's, causing them to breathe more air. If carbon monoxide were in the air, they would become sick much faster than humans; therefore, the miners would know to leave the mine.



Appendix 2.2 – Human-Animal Bond Elementary Lesson Plan

LESSON NAME: The Bond That Can't Be Broken

ONE HEALTH TOPIC

Human-Animal Bond

GRADE LEVEL

Elementary School

STATE STANDARDS

ELA: W.3.2, W.4.2 W.5.2, W.6.2, W.3.3, W.4.3, W.5.3, W.6.3

Science – LS2.A, LS2.D

History – Standard 1 Choices Have Consequences

SUBJECT AREAS



English Language Arts



Science



Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and present

MATERIALS NEEDED:

Lesson Introduction

- Access to the internet and video player/projector

Drawing and Describing the Human-Animal Bond

- Markers, crayons, or colored pencils

Canaries in a Coal Mine

- Copies of the article entitled "Canaries in a Coal Mine"
- Notebook paper
- Pen or pencil

Journal Entry (ELA and Social Studies)

- Notebook paper
- Pen or pencil

Mini Poster (Science)

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

LESSON INTRODUCTION:

View the following videos with students.

- **"The Human-Animal Bond"** Running Time: 00:01:47
https://www.youtube.com/watch?v=WSFdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- **"5 Unbelievable Cases of Human-Animal Bond"** Running Time: 00:06:58
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak

Following the videos, begin a class discussion about the human-animal bond. The following questions may be used to help guide discussion:

- What is the human-animal bond?
- What are the benefits of this relationship?

LEARNING ACTIVITIES:

Activity Option #1: Drawing and Describing the Human-Animal Bond (Meets standards W.3.3, W.4.3, W.5.3, W.6.3, LS2.A, LS2.D, and Standard 1 Choices Have Consequences)

Have students create a picture of a pet or their favorite animal. Instruct them to write a paragraph (or words for the younger grades) about the relationship they have with that animal, how that animal makes them feel, what benefits they get from that relationship, and how they know how to interact with that animal.

Once students are finished, have them turn to their neighbors to share their pictures (or if they are in a group, take turns). Call on a few students to share with the entire class and write some of the responses on the board.

Continue discussing with the class the benefits as well as negative consequences of the human-animal bond and mention the different ways animals are present in our lives (e.g., law enforcement animals, therapy animals, etc.). See reference material entitled **"Human-Animal Bond: Teacher Notes"** for details.

Activity Option #2: Canaries in a Coal Mine (Meets standard 1 Choices Have Consequences)

Provide students with a copy of the paper entitled **"Canaries in a Coal Mine"**, and read the article together as a class. Invite students to turn to a partner or take turns in their groups and answer the following question:

- What are other animals that have been used or have helped us to identify dangers before they happen?

Activity Option #3: Write a Journal Entry (Meets standards W.3.2, W.4.2, W.5.2, W.6.2, W.3.3, W.4.3, W.5.3, W.6.3, and Standard 1)

- Have students write 1-2 sentences or a paragraph about what they learned about the relationship between humans and animals.

Activity Option #4: Mini Poster (Meets standards LS2.A, LS2.D)

- Ask students to create a small poster using pictures and descriptions that summarize what they learned about the relationship between humans and animals, including the benefits and negative consequences, and animals as disease sentinels.

ASSESSMENT:

Create an age-appropriate rubric for evaluating journal entries.

Create an age-appropriate rubric for evaluating posters.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSEdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health. Dr. Takashima*
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>

Appendix 2.3 – Human-Animal Bond Middle School Lesson Plan

LESSON NAME: The Bond That Can Never Be Broken		
<u>ONE HEALTH TOPIC</u> Human-Animal Bond	<u>STATE STANDARDS</u> ELA: W.7.7, W.8.7, W.7.8, W.8.8 HGSS: Standard 1 Choices have Consequences, Standard 5 Relationships between people, places, ideas, and environment are dynamic	<u>SUBJECT AREA</u>  English Language Arts  Social Studies
<u>GRADE LEVEL</u> Middle School		

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and in future

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

Small Group Research Activity

- Access to the internet and a computer/computer lab

Poster Activity

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

LESSON INTRODUCTION:

View the video "*Sentinels of the Sea*" with students to introduce the topic of disease sentinels. Note that the video is approximately 27 minutes long, but the first 3 minutes and 28 seconds summarize the concept well. If time permits, feel free to watch the entirety of the video with students.

Following the video, discuss the topic of disease sentinels. Use the following questions to help guide the class discussion:

- Are there other examples of disease sentinels you can think of? (See teacher notes for example about canaries in coal mines)
- Do you feel that using animals, such as canaries in mines to detect carbon monoxide, as disease sentinels is ethical? Why or why not?
- What are some potential consequences of the human-animal bond?

This project was funded by CDC Grant # NU90TP22155-01 Public Health Emergency Response: Public Health Crisis

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LEARNING ACTIVITIES:

Activity #1: Small Group Research Project (Meets Standards W7.7, W8.7, W.7.8, W.8.8, Standard 1 and Standard 5)

Split students into five equal groups to research the following topics:

- Benefits (health, social, emotional) to humans from Human-Animal Bond
- Benefits (health, social, emotional) to animals from Human-Animal Bond
- Evolution of wolves/dogs: The history of the Human-Animal Bond
- Service dogs for PTSD, disaster relief, prisoner rehabilitation
- Law enforcement animals

Once students have had time to gather their research, invite them to present their findings to the class with either a poster or a PowerPoint presentation.

Activity #2: Written Assignment (Meets Standards W7.7, W8.7, W.7.8, W.8.8, Standard 1 and Standard 5)

Ask students to write a short summary of what they learned from their classmates' presentations and their own research. The following questions may be used as a guide:

- What are the benefits to humans from the human-animal bond?
- What are the benefits to animals from the human-animal bond?
- What are disease sentinels? Why are they important?

ASSESSMENT:

Develop an age-appropriate rubric for student presentations/posters, or use the provided rubric as a guide.

Develop an age-appropriate rubric for students' written assignments.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSFdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health. Dr. Takashima*
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>
- *Sentinels of the Sea*
https://www.youtube.com/watch?v=Ar4QpyQG1F4&ab_channel=ChangqingSeasTV

LESSON NAME: The Bond That Can Never Be Broken

ONE HEALTH TOPIC

Human-Animal Bond

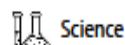
GRADE LEVEL

Middle School

STATE STANDARDS

Science: MS-LS2-1

SUBJECT AREA



LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

Small Group Research Activity

- Access to the internet and a computer/computer lab

Mini Poster Activity

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

LESSON INTRODUCTION:

View the video "*Sentinels of the Sea*" with students to introduce the topic of disease sentinels. Note that the video is approximately 27 minutes long, but the first 3 minutes and 28 seconds summarize the concept well. If time permits, feel free to watch the entirety of the video with students.

Following the video, discuss the topic of disease sentinels and highlight key points and terms (e.g., disease sentinels, animals warning against disease). See the reference material entitled "*Human-Animal Bond: Teacher Notes*" for more information. Use the following questions to help guide the class discussion:

- Are there other examples of disease sentinels you can think of?
- Do you feel that using animals, such as canaries in mines, as disease sentinels is ethical? Why or why not?
- What are some potential consequences of the human-animal bond?

LEARNING ACTIVITIES:

Activity #1: Small Group Research Project (Meets standards MS-LS2-1)

Split students into five equal groups to research the following topics:

- Benefits (health, social, emotional) to humans from Human-Animal Bond
- Benefits (health, social, emotional) to animals from Human-Animal Bond
- Evolution of wolves/dogs: The history of the Human-Animal Bond
- Service dogs for PTSD, disaster relief, prisoner rehabilitation
- Law enforcement animals

Once students have had time to gather their research, invite them to present their findings to the class.

Activity #2: Mini Poster (Meets standards MS-LS2-1)

Ask students to create a small poster using pictures and descriptions that summarize disease sentinels and what they learned from their peer's presentations. The poster should include the main takeaways from each of the presentations.

ASSESSMENT:

Develop an age-appropriate rubric for student presentations, or use the provided rubric as a guide.

Develop an age-appropriate rubric for students' mini-posters, or use the provided rubric as a guide.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSEdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health. Dr. Takashima*
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>
- *Sentinels of the Sea*
https://www.youtube.com/watch?v=Ar4QpyQG1F4&ab_channel=ChangingSeasTV

Appendix 2.4 – Human-Animal Bond High School Lesson Plan

LESSON NAME: The Bond That Can't Be Broken		
ONE HEALTH TOPIC Human-Animal Bond GRADE LEVEL High School	STATE STANDARDS ELA: W.9-10.7, W.11-12.7, W.9-10.8, W.11-12.8 HGSS: Standard 1 Choices Have Consequences, Standard 5 Relationships among people, places, ideas, and environment are dynamic.	SUBJECT AREAS  English Language Arts  Social Studies

LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and in future

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

Small Group Research Activity

- Access to the internet and a computer/computer lab

LESSON INTRODUCTION:

Choose at least one of the following videos and view them with students.

- "Canaries in the Coal Mine"* TedTalk.
 Running Time: 00:03:01
https://www.youtube.com/watch?v=qm8NnL582uc&ab_channel=TEDxTalks
- "How Animal Disease Surveillance Protects Human Health: COVID-19 and Beyond".*
 Running Time: 00:10:20
<https://edhub.ama-assn.org/in-learning/video-player/18713194>

Following the video, discuss the topic of disease sentinels and highlight key points and terms (e.g., disease sentinels, animals warning against disease). See the reference material entitled *"Human-Animal Bond: Teacher Notes"* for more information. Use the following questions to help guide the class discussion:

- Are there other examples of disease sentinels you can think of?
- Do you feel that using animals, such as canaries in mines to detect carbon monoxide, as disease sentinels is ethical? Why or why not?
- What are some potential consequences of the human-animal bond?

This project was funded by CDC Grant # NU90TP22155-01 Public Health Emergency Response: Public Health Crisis

Page 1

LEARNING ACTIVITIES:

Activity #1: Small Group Research Project (Meets standards W.9-10.7, W.11-12.7, W.9-10.8, W.11-12.8, and Standard 1 Choices Have Consequences)

Split students into six equal groups to research the following topics:

- Benefits (health, social, emotional) to humans from Human-Animal Bond and possible negatives
- Benefits (health, social, emotional) to animals from Human-Animal Bond and possible negatives
- Evolution of wolves/dogs: The history of the Human-Animal Bond
- Service dogs for PTSD, disaster relief, prisoner rehabilitation
- Law enforcement Animals
- Animals as Disease Sentinels

Once students have had time to gather their research and develop a presentation, invite them to present their findings to the class.

Activity #2: Written Assignment (Meets standards 1 Choices Have Consequences and 5 Relationships among people, places, ideas, and environments are dynamic)

Ask students to write a short summary of what they learned from their classmates' presentations and their own research. The following questions may be used as a guide:

- What is the human-animal bond and why is it important?
- What are some negative consequences to this bond?
- What is the importance of disease sentinels?

ASSESSMENT:

Develop an age-appropriate rubric for student presentations, or use the provided rubric as a guide.

Develop an age-appropriate rubric for students' written assignments.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSEdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CB6fWJZW5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health. Dr. Takashima*
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>
- *History and Science of the Human-Animal Bond*
<https://todaysveterinarynurse.com/personal-professional-development/history-and-science-of-the-human-animal-bond/>
- *Sentinels of the Sea*
https://www.youtube.com/watch?v=Ar4OqvOG1F4&ab_channel=ChangingSeasTV

LESSON NAME: The Bond That Can't Be Broken

ONE HEALTH TOPIC

Human-Animal Bond

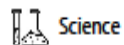
GRADE LEVEL

High School

STATE STANDARDS

Science: LS4.D

SUBJECT AREA



LEARNING GOALS/OBJECTIVES:

Students will be able to:

- Identify human and animal bonds and their benefit on both humans and animals
- Identify negative impacts that animal and human bonds have on each other
- Define disease sentinel
- Identify examples of disease sentinels in the past and in future

MATERIALS NEEDED:

Introduction

- Access to the internet and video player/projector

Small Group Research Activity

- Access to the internet and a computer/computer lab

Mini Poster Activity

- Magazines/Access to online images and printer
- Age-appropriate scissors
- Large piece of construction paper or poster board
- Glue

LESSON INTRODUCTION:

Choose at least one of the following videos and view them with students.

- **"Canaries in the Coal Mine"** TedTalk.
Running Time: 00:03:01
https://www.youtube.com/watch?v=qm8Nnl582uc&ab_channel=TEDxTalks
- **"How Animal Disease Surveillance Protects Human Health: COVID-19 and Beyond".**
Running Time: 00:10:20
<https://edhub.ama-assn.org/in-learning/video-player/18713194>

Following the video, discuss the topic of disease sentinels and highlight key points and terms (e.g., disease sentinels, animals warning against disease). See the reference material entitled **"Human-Animal Bond: Teacher Notes"** for more information. Use the following questions to help guide the class discussion:

- Are there other examples of disease sentinels you can think of?
- Do you feel that using animals, such as canaries in mines, as disease sentinels is ethical? Why or why not?
- What are some potential consequences of the human-animal bond?

LEARNING ACTIVITIES:

Activity #1: Small Group Research Project (Meets standards LS4.D)

Split students into five equal groups to research the following topics:

- Benefits (health, social, emotional) to humans from Human-Animal Bond
- Benefits (health, social, emotional) to animals from Human-Animal Bond
- Evolution of wolves/dogs: The history of the Human-Animal Bond
- Service dogs for PTSD, disaster relief, prisoner rehabilitation
- Law enforcement animals

Once students have had time to gather their research, invite them to present their findings to the class.

Activity #2: Mini Poster (Meets standards LS4.D)

Ask students to create a small poster using pictures and descriptions that summarize disease sentinels and what they learned from their peer's presentations. The poster should include the main takeaways from each of the presentations.

ASSESSMENT:

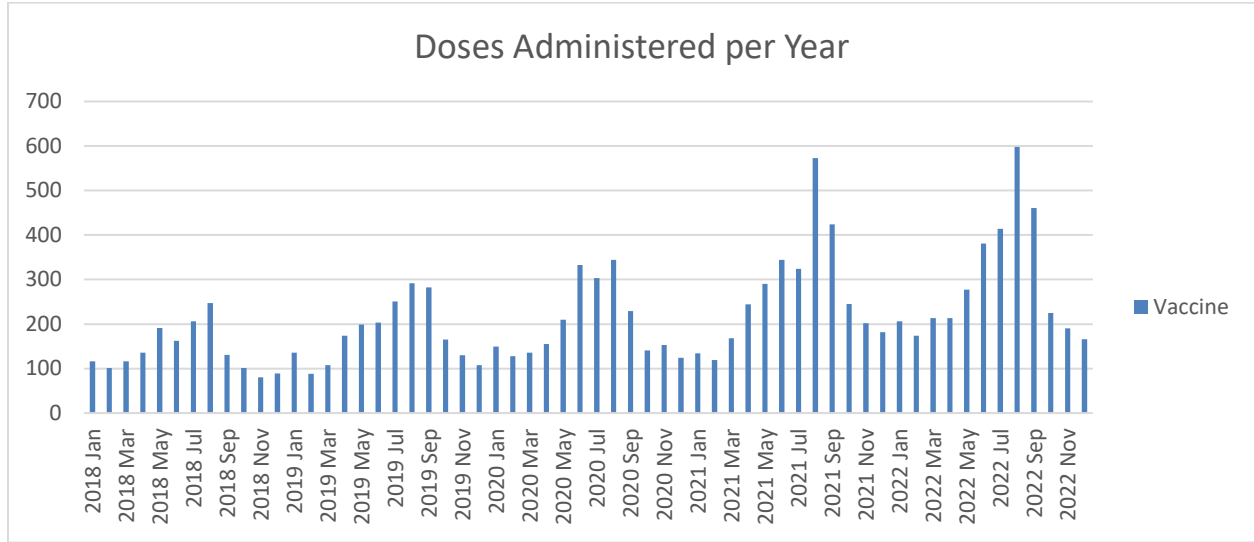
Develop an age-appropriate rubric for student presentations, or use the provided rubric as a guide.

Develop an age-appropriate rubric for students' mini-posters, or use the provided rubric as a guide.

RESOURCES:

- *The Human-Animal Bond*
https://www.youtube.com/watch?v=WSEdpazmMek&t=1s&ab_channel=TheAnimalMuseum
- *5 Unbelievable Cases of The Human-Animal Bond*
https://www.youtube.com/watch?v=CB6fWJ7W5G4&t=87s&ab_channel=bodhispeak
- *Human-Animal Bond and One Health. Dr. Takashima*
<https://echo360.org/media/f5c6b726-faba-436f-87b6-e808f00ccb53/public>
- *History and Science of the Human-Animal Bond*
<https://todaysveterinarynurse.com/personal-professional-development/history-and-science-of-the-human-animal-bond/>
- *Sentinels of the Sea*
https://www.youtube.com/watch?v=Ar4QpyQG1F4&ab_channel=ChangingSeasTV

Appendix 3 – Kansas WebIZ Graphs and Data Tables



Graph of Number of Doses of Vaccine Administered per Year

Table of Number of Doses of Vaccine Administered by Sex

<i>Doses Administered by Sex</i>			
Sex	Vaccination Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
Male	697	7231	7928
Female	672	5738	6410
Total	1369	12969	14338

Table of Number of Doses of Vaccine Administered by Age Group

<i>Doses of Rabies Vaccine and Immune Globulin Administered by Age Group</i>			
Age Group	Vaccination Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
0 to 9 years old	137	1803	1940
10 to 18 years old	175	1688	1863
19 to 29 years old	273	3084	3357
30 to 39 years old	254	2054	2308
40 to 49 years old	151	1279	1430
50 to 59 years old	155	1305	1460
60 to 69 years old	104	981	1085
70 years or older	120	775	895
Total	1369	12969	14338

Table of Number of Doses of Vaccine Administered by Funding Source

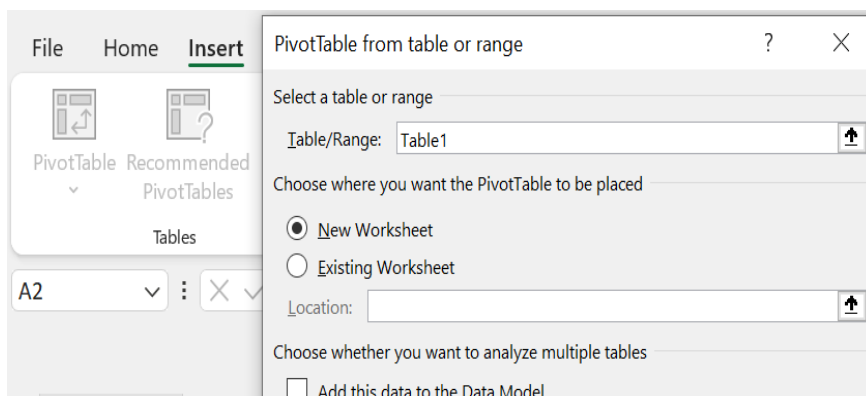
<i>Funding Source by Vaccination Type</i>			
Funding Source	Vaccine Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
Private	177	5334	5511
Public	0	342	342
Total	177	5676	5853

Table of Number of Doses of Vaccine Administered by Region

<i>Doses of Rabies Vaccine and Immune Globulin Administered by Region</i>			
Region	Vaccine Type		
	Rabies Immune Globulin	Rabies Vaccine	Total
Northeast Kansas	621	6168	6789
Southeast Kansas	60	431	491
North Central Kansas	79	967	1046
South Central Kansas	403	2407	2810
Northwest Kansas	25	419	444
Southwest Kansas	33	195	228
Total	1221	10587	11808
Frequency Missing = 2530			

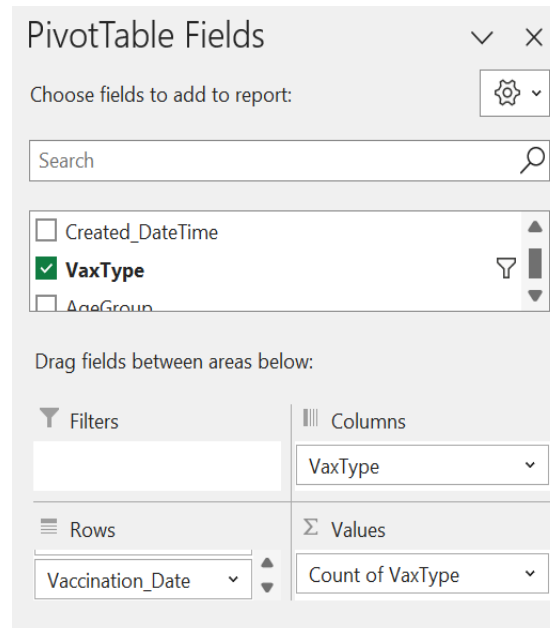
Appendix 4 - Procedure for Data Analysis and Table Creation using Pivot Table Function on Microsoft Excel Version 230

1. Export 2018 to 2022 rabies immunization data, including unique patient id, vaccination date, vaccination code, age, gender, patient zip code, patient county, funding source, vaccination type, age group, and region from KSWebIZ and import into SAS Version 9.4. Once in SAS, export data to Microsoft Excel.
2. Once the data is imported to Excel, click Insert and click Pivot Table. Then, click the option “from table/range”. A new box will pop up and ensure that Table 1 is selected in the box as the range and new worksheet should be checked in under the “choose where you want the PivotTable to be placed” section in the box (example below).



3. Once the new sheet opens, click on the Pivot Table fields section on the right side of the screen (example below). To create a table for the number of doses each month over the 5-year span, check in the boxes for vaccination type, vaccination date, and years. Ensure to click the drop-down arrow next to vaccination type, which will bring up a separate filter box. Uncheck “unknown” in the box and click “OK.” These steps should auto-populate all three fields into the rows section directly below the Pivot Table Fields. Click and drag the vaccination type from the rows section to the columns section and leave the years and vaccination date in the rows section as is. A table should begin to appear in the field to the left. Go back to the top to the “choose fields to add to report” section. Then, click and drag the vaccination type to the values section. This should automatically convert vaccination type to count of vaccination type. The table should be completed after this step.

4. To create a graph of the data, click insert from the top bar and click recommended charts. Click on the columns cluster option and then click “OK.” This will display the years, months, and count of vaccination in a clustered bar graph.



5. Repeat step three to create a table for doses administered by sex, doses administered by age group, doses administered by funding source, and doses administered by region.
 - a. by checking the boxes for vaccination type and gender. Ensure to click the drop-down arrow next to vaccination type, which will bring up a separate filter box. Uncheck “unknown” in the box and click “OK.” Click and drag the vaccination type to columns section and leave sex in the rows section. Then, drag the vaccination type from the “choose fields to add to report” section to the values section to get the count of the vaccination type. The table should be complete after this step.
 - b. For the doses administered by age group, ensure to check the boxes for vaccination type and the age group. Ensure to click the drop-down arrow next to vaccination type, which will bring up a separate filter box. Uncheck “unknown” in the box and click “OK.” Then, click and drag the vaccination type to the columns section and leave the age group in the rows section. Click the vaccination type from the “choose fields to add to report” section and drag it to the values section to get the count of the type. The table should be complete after this step.
 - c. For the doses administered by funding source, check the boxes for vaccination type and the funding source. Ensure to click the drop-down arrow next to

vaccination type, which will bring up a separate filter box. Uncheck “unknown” in the box and click “OK.” Then, click and drag the vaccination type to the columns section and leave the funding source in the rows section. Click the vaccination type from the “choose fields to add to report” section and drag it to the values section to get the count of the type. The table should be complete after this step.

- d. For the doses administered by region, check the boxes for the vaccination type and the regions. Ensure to click the drop-down arrow next to vaccination type, which will bring up a separate filter box. Uncheck “unknown” in the box and click “OK.” Then, click and drag the vaccination type to the columns section below and leave the region in the rows section. Click the vaccination type from the “choose fields to add to report” section and drag it to the values section to get the count of the type. The table should be complete after this step.

Appendix 5 – Rabies Immunization Presentation (Presented by Stephanie Lindemann but data utilized in presentation was partially produced by my project)



Be PrEP-ared – Don't get bit by this 100% preventable disease!

Indications and Proper Administration of Rabies PrEP and PEP

June 15, 2023 | Stephanie Lindemann, MPH



Appendix 6 - Sample of ESSENCE Rabies Records Manual Review for 2022

Rabies Y/N	PEP Y/N	Notes if questionable	Zipcode	Sex	Age	Chief_Complaint_Combo	Diagnosis_Combo
Y	Y	bit by stray dog, getting next do	67135	Female	14	pt bit by stray dog 2 weeks ago needing 3rd rabies vaccination.;General medical	Z20.3 Contact with and (suspected) exposure to
Y	Y	pt went in for next dose of rabie	67135	Female	14	Patient states she is here for a rabies vaccine.;Vaccination	Z23 Encounter for immunization;Z23
Y	Y	Dog bite	67135	Female	14	Dog bite/scratch;Dog bite	A82.9 Rabies unspecified;Z23
Y	N		67217	Male	29	mother's cat attacked by dogs. pt rescued cat but cat bit his R hand and scratched Pt to the ER with c/o a bite from a racoon	W55.01XA Bitten by cat initial encounter
Y	Y	racoon bite	67208	Male	17	3 days ago. Pt states the tooth of the Laceration on forehead left side of face	S83.92XA Sprain of unspecified site of left
Y	N	bat encounter, no mention of r	67152	Female	13	when patient was hit in the head by a bat Pt returning for 4th and final rabies	S09.90XA Unspecified injury of head initial
Y	Y	pt receiving last dose of PEP, ca	67501	Female	13	vaccine after a previous cat bite.;General Patient was bit on the 6th by a feral cat	Z23 Encounter for immunization
Y	Y	feral cat bite	67501	Female	13	here for her third rabies shot.;Vaccination pt being seen for repeat rabies shot. pt	Z23 Encounter for immunization
Y	Y	returning for vaccine series	67501	Female	13	denies any issues.;General medical Pt is here for rabies shot.;Contact with and (suspected) exposure to rabies	Z20.3 Contact with and (suspected) exposure to
Y	Y	dog bite	67211	Male	15	needs 3rd rabies injection;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	pt getting 3rd rabies vaccine	67211	Male	15	here for rabies shot;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	dog bite	67211	Male	15	dog bite to left forearm at 0730;Open bite of left forearm initial encounter	Z23 Encounter for immunization;S51.852A
N	N	metal bat mentioned	67401	Male	25	pt arrives w reports bilateral arm pain following assault w a metal bat. reports Pt to the ER for last rabies vaccine. Pt	M79.601 Pain in right arm;M54.9 Dorsalgia
Y	Y	bitten by bat, last rabies vaccine	67205	Female	55	states she was bit by a bat and has Bit by a bat in St Louis Mo. Lives here	T14.8XXA Other injury of unspecified body region
Y	Y	bitten by bat, next rabies vaccin	67205	Female	55	came in for 2 vaccine. Reported no side Pt c/o shaking and chills. Hypertensive for	R68.83 Chills (without fever);E11.9 Type 2
N	N		67203	Female	66	EMS has not taken BP meds today. BSG Pt to the ER with c/o a cat bite to the left	S81.852A Open bite left lower leg initial
Y	N	cat bite, no mention of vaccinat	67060	Female	71	lateral lower leg. Pt states the cat is a Pt presents to triage via EMS for a dog	S51.852A Open bite of left forearm initial
Y	N	dog bite	67213	Male	35	bite. Onset of injury PTA. Pt knows dog pt presents for the third rabies	Z23 Encounter for immunization
Y	Y	pt returning for 3rd rabies vacci	67217	Male	14	vaccine.;General medical Pt bitten by dog on Wed. Needs second	Z23 Encounter for immunization
Y	Y	dog bite, returning for next rabi	67217	Male	14	rabies shot. No new problems. bite to left Pt presents to ED for 2nd rabies shot	Z23 Encounter for immunization
YY	Y	dog bite, returning for next rabi	67213	Male	11	after suffering a dog bite on wed.;Dog right hand dog bite 3rd knuckle. per pt	S61.459A Open bite of unspecified hand initial
Y	N	unknown dog bite, no mention	67207	Male	55	unknown rabies vaccine of dog.;Dog bite rabies vaccination;Encounter for	Z23 Encounter for immunization;Z20.3
Y	Y	encounter for rabies vaccine	67110	Female	67	rabies shot #3;Contact with and (suspected) exposure to rabies	Z23 Encounter for immunization;Z20.3
Y	Y	returning for rabies shot #3	67110	Female	67	Pt presents to ED today for her second dose of rabies shot. She reports no	Z23 Encounter for immunization;Z20.3
Y	Y	returning for rabies shot #2	67110	Female	67	dose of rabies shot. She reports no	A82.9 Rabies unspecified;Z23
Y	Y	rabies shot	67110	Female	67	RABIES SHOT;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	returning for last rabies vaccine	67056	Male	27	last rabies shot;Encounter for immunization	Z23 Encounter for immunization;Z23
Y	Y	rabies vaccine	67056	Male	27	rabies vaccine;Vaccination	Z23 Encounter for immunization

**Appendix 7 - Rabies-related Emergency Department Visits
Presentation (Presented by Henri Menger but data utilized
was partially produced by my project)**



**Rabies-related ED Visits in Kansas: Update
Henri Ménager | 2023-06-22**