ScienceNews

# Activity Guide for Students: Visual Models for How a Virus Spreads

**Directions:**
In this activity, you will analyze three visual displays of data about clusters of coronavirus cases. You will work in groups to develop a visual model to illustrate how the virus spread within a set of connected clusters. Then, you will discuss as a class how the way data are displayed affect data interpretation and how the displays might inform public health decisions.

**The setup**
After reading the *Science News* article "COVID-19 case clusters offer lessons and warnings for reopening," answer the following two questions as a class. A print version of the article, "Lessons from COVID case clusters," appears in the August 15, 2020 issue of *Science News*.

1. How do analyzing clusters and contact tracing help identify the processes and factors involved in viral spread?

2. How did studying the restaurant cluster in Guangzhuo, China, help scientists learn about how the virus spreads?

Look at the interactive cluster bubble model included in the *Science News* article "COVID-19 case clusters offer lessons and warnings for reopening." The model shows clusters of coronavirus cases that occurred in different settings. Begin by comparing the data presented in the "All Settings" category. Then, select a couple of settings and compare clusters within each setting. Compare the information that is included in the model at the "All Settings" level and at the individual setting level. Then, answer questions No. 3–6 as a class.

3. What do the known coronavirus clusters reveal about the environmental factors most likely to lead to larger clusters and outbreaks?

4. What information is presented in the bubble diagrams to describe and compare outbreak clusters? What information is not included in that model?

5. What are the benefits and limitations of using the bubble diagram? Why do you think the authors chose to use that cluster model?

6. Why is the way data are presented important to scientific understanding of a phenomenon?

**Data analysis**

With your group, you will now explore three visual displays of data related to clusters of coronavirus cases in Cheonan, South Korea. Start by analyzing the set of Cheonan fitness class clusters in the bubble diagram's Sport setting from the *Science News* article. Then, review the article "Cluster of coronavirus disease associated with fitness dance classes, South Korea," and study the Figure from the main article and Table 2 in the linked Appendix. Follow your teachers instructions for how to work virtually as a group, and answer questions No. 7–15 as a group.

**Data analysis: *Science News* bubble diagram**

7. Locate the Sport setting category in the interactive bubble diagram presented in the *Science News* article. How would you describe the clusters in the Sport setting in terms of average size? What other conclusions can you draw about the spread of the coronavirus in the Sport setting?

8. Hover over each bubble in the Sport setting to identify the clusters in Cheonan, South Korea. What does this display of data communicate about how the disease was spread within the Cheonan clusters, and what information is left out of this diagram?

9. Who was the index case in each cluster in Cheonan, South Korea? About how many people total were infected during fitness classes in this set of clusters?

**Data analysis: Table 2**

10. Read the abstract of the article "Cluster of coronavirus disease associated with fitness dance classes, South Korea." Review Table 2 in the linked Appendix, which describes the "attack rate," or the percentage of people exposed to infection who contracted the disease. Was the disease transmitted at the same rate in all of the classes and by all of the instructors? What was the overall infection rate within the cluster set?

11. Based on Table 2, what information can you easily identify about how the disease spread within the clusters? How does this differ from the information you could identify in the bubble diagram?

**Data analysis: Article figure**

12. Analyze the Figure in the main article. This diagram is a case map of the Cheonan clusters. It organizes the clusters by the index case (instructor shown as a red square) and the specific fitness class (cluster) as a vertical bar. It includes both a timeline for exposure and the relationship of the infected person to the index case and to other infected people. What information does this display have in common with the other two models?

13. What information is included in this graphic that makes it different from the others?

**Model analysis**

14. Which of the three models did you find most interesting? Which did you find easiest to interpret? Why?

15. Did your preferred model have not enough information, just enough information or too much information? How could you improve that model to make it more informative?

**Model construction**

Return to the interactive bubble diagram in the article. In the Sport setting, locate the bubble that represents the cluster that occurred in Codogno, Lombardy, Italy. Use the information provided in that bubble to trace this cluster to other related clusters from the same location but in different settings. Then, answer questions No. 16–19 in your group.

16. How many clusters are in the Codogno, Lombardy, Italy cluster set? What settings did these clusters occur in? How many people were infected?

17. How well does the interactive bubble diagram illustrate how the infection spread across clusters? How could you create a visual model of these clusters that displays more clearly how the virus was transmitted?

18. Is there any information missing that is necessary to construct a complete visual model of this set of clusters?

19. Construct a new visual model to describe how the virus spread within the Italy cluster set.

**Application of the model**

Present your model of the Italy cluster to your teacher and to at least one other group for feedback. After receiving feedback, revise the model as necessary. Then, discuss the following questions as a class.

20. How did developing a model of viral transmission within a set of clusters affect your understanding of the modes of transmission?

21. What are the benefits and limitations of the different types of visual models you used or developed for displaying data about an infection's spread?

22. How do scientists and public officials use data about a particular virus to inform public health decisions?

23. Which types of model do you think would be most informative for public health officials who are developing and evaluating plans to restrict or reopen communities? Support your selection with evidence and scientific reasoning.