

RESOURCE LIBRARY | ACTIVITY : 30 MINS

# Mapping the Cholera Epidemic of 1854

Students will create a basic web map of the 1854 John Snow cholera investigation using the Story Map Basic template.

## GRADES

6 - 12, Higher Ed

## SUBJECTS

*Biology, Health, Geography, Geographic Information Systems (GIS)*

## OVERVIEW

Students will create a basic web map of the 1854 John Snow cholera investigation using the Story Map Basic template.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/mapping-cholera-epidemic-1854/>

## DIRECTIONS

Dr. John Snow is regarded as one of the founding fathers of modern epidemiology. During a major cholera epidemic in 1854 London, he collected and mapped data on the locations (street addresses) where cholera deaths occurred. His process was laborious and slow, but ultimately very informative. His painstaking and detailed analysis led to the identification of the epidemic's source—a contaminated public water source. Today, John Snow's data has been geocoded, making it accessible in a GIS. In this lesson, you will create a heat map showing the locations that experienced the highest number of cholera deaths in the epidemic. You will share this heat map as a basic story map. [Note: You can watch a short overview of John Snow's work in Episode 4 of The Geospatial Revolution.]

Present the following scenario to your students and have them follow the steps to create a basic story map about the London cholera epidemic of 1854.

### Scenario

As part of a pre-med curriculum, you are taking a course in the history of epidemiology. Your first assignment is to prepare a presentation about Dr. John Snow's investigation of cholera during an 1854 outbreak in London. Luckily for you, John Snow's 19th-century data has been georeferenced and can be explored in a GIS. You have decided to include a web map in your presentation that reflects Dr. Snow's conclusion that contaminated public water pumps were responsible for the outbreak.

### Open the Map

1. Sign in to your ArcGIS organizational account.
2. Open [Disease Investigations: Cholera](#).
3. Use Save As to save the map to the Content section of your organizational account. Replace the word Copy with your initials in the map title (e.g., Disease Investigations: Cholera\_LM). It's good practice to save again each time you modify the tags and add a tag unique to the user. map. Remove all.
4. Click the Contents tab to see the map's layers. Turn on John Snow's 1854 map of cholera cases (Snow Map). Zoom in until you can see the little hash marks at points along the streets. These marks indicate the number of cholera cases at a particular address. As you can see, some addresses had only one or two cases, but many addresses had more.
5. Use the Soho bookmark (click Bookmarks, then select Soho).
6. Now turn on Cholera cases by address. These are the same addresses Snow mapped, but they have been geocoded to be accessible in a GIS. Each red dot is an address and has data associated with it called attributes. One of the attributes for this point layer is num\_cases. This is the number of cholera cases that Snow recorded at this address with his hand-drawn hash marks.
7. Click on any red dot to see its attributes in a pop-up window. The pop-up provides the address and the number of cases at that address.

### Create a Heat Map

Snow collected data and recorded it on his map so he could determine where the greatest number of cholera cases and deaths occurred. This was a laborious process for Snow, but GIS provides tools that help us answer this question quickly. Geocoding the addresses and cholera data opens the door to many analysis processes in GIS. We'll employ only one of these analysis processes today. We'll analyze the location of cholera cases by creating a heat map. Heat

maps use point layer data to calculate and display relative density. The colors are most intense where the most points are concentrated together. Here, we don't want to locate where the greatest number of dots is but rather the greatest number of cases.

1. Turn on Public water pumps
2. Hover your cursor over the name of the layer, Cholera cases by address. When you do this, you will see a series of icons appear beneath the layer name. If you hover over an icon, you will see what it does. Click the Change Style icon.
3. Now you will change the map style to a heat map. Under Choose an attribute to show, select Num\_Cases. In other words, we are telling the program that we want to create a map that focuses on the number of cases at any location.
4. Under Select a drawing style, select Heat Map, then Options.
5. Move the Area of Influence slider slightly to the right to enlarge the area of highest density on the map.
6. Click OK, then Done. Your map now looks like this. The yellow area indicates the part of Soho where the greatest number of cholera deaths occurred. As you move through orange, red, and purple to blue areas, the density of cholera cases drops off.
7. Click on the pump symbol in the center of the yellow area to learn its name. This is the famous Broad Street pump. Snow's painstaking analysis of the same data led him to the conclusion that the Broad Street pump was the source of the Soho epidemic. When the pump handle was removed, preventing people from using it, the epidemic came to an end. Through spatial analysis, many lives were saved and cholera was confirmed as a water-borne disease.
8. Before you create your story map, make the following adjustment to your map. Click the dots below John Snow's 1854 map of cholera cases and select Hide in Legend. This will simplify the legend in the story map you are about to create.
9. Save the map.

### **Create a Basic Story Map**

1. To create a story map, click Share (above the map) then click Create a Web App under Embed this map.
2. Click Build a Story Map.
3. Select Story Map Basic, then Create App.
4. In the web app dialog box, fill in the following information for your map.
5. Title: London Cholera Epidemic 1854, [your initials] Summary: Heat map of Cholera cases in the Soho District of London, 1854.
6. Click Done.

7. You now see a configurable version of your new story map. Under Settings, type in the title you just used when creating the story map.
8. Type the following in Display Map Title: London Cholera Epidemic 1854.
9. As you can see, you can change the subtitle (it defaults to the map summary), create links from the headers, set the color theme, and choose whether to include a legend or a search tool in your map.
10. Experiment with different settings. Click Save to see what your map will look like. You can continue to make changes to the Settings. Click save to see the result of each set of changes. When you are satisfied with your story map, click Done.

In this activity, students have created a basic web map of the 1854 John Snow cholera investigation using the Story Map Basic template.

Find the original activity at Esri [here](#).

## OBJECTIVES

# Subjects & Disciplines

### **Biology**

- Health

### **Geography**

- [Geographic Information Systems \(GIS\)](#)

# Learning Objectives

Students will:

- Use the ESRI Story Map Basic template to open a map, change the style of point data to create a Heat Map, and create a basic story map.

# Teaching Approach

- Learning-for-use

# Teaching Methods

- Hands-on learning

## Skills Summary

This activity targets the following skills:

- Critical Thinking Skills
  - Analyzing
  - Evaluating
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
  - Asking Geographic Questions
- Science and Engineering Practices
  - Analyzing and interpreting data

## National Standards, Principles, and Practices

### PREPARATION

## What You'll Need

### REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per learner, 1 computer per pair

### PHYSICAL SPACE

- Classroom
- Computer lab

### BACKGROUND & VOCABULARY

# Background Information

## Prior Knowledge

## Recommended Prior Activities

- None

## Vocabulary

| Term              | Part of Speech | Definition   |
|-------------------|----------------|--|
| cholera           | <i>noun</i>    | infectious, sometimes fatal disease that harms the intestines. |
| disease           | <i>noun</i>    | harmful condition of a body part or organ.                     |
| epidemic          | <i>noun</i>    | outbreak of an infectious disease able to spread rapidly.      |
| epidemiology      | <i>noun</i>    | study of how disease spreads and can be controlled.            |
| outbreak          | <i>noun</i>    | sudden occurrence or rapid increase.                           |
| qualitative data  | <i>noun</i>    | descriptive information that does not use numbers.             |
| quantitative data | <i>noun</i>    | measured information using numbers.                            |



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