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Mortality and the Transatlantic Slave Trade

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Contents

Lesson Plan

TITLE: Mortality and the Transatlantic Slave Trade

The Middle Passage is a term used to describe the transatlantic voyage taken from Africa to the New World by enslaved Africans on European cargo ships. This module will use that historical phenomenon as a framework to introduce various epidemiologic concepts to high school students.

SUBJECT AREA: We expect that this module on the Middle Passage could fit into a variety of required and elective courses: American history, world history, geography, African-American studies, political science, social studies, basic mathematics.

OBJECTIVES: By the end of this module, students will be able to:

- Define the term Middle Passage
- Understand that the Middle Passage is only one of the events that took place as part of the transatlantic slave trade
- Explain several epidemiologic concepts, including morbidity, mortality, mortality rate, rate ratio and hypothesis
- Understand the role of data sources in epidemiologic research.
- Calculate a rate ratio
- Use research data to generate preliminary hypotheses
- Identify epidemiology as a potential career path for those interested in careers in science and in the helping professions

TIME FRAME: One to two class periods (depending on inclusion of optional activities)

PREREQUISITE KNOWLEDGE: This lesson is based on the assumption that students have background knowledge of the motives for exploration and the key countries involved in the transatlantic slave trade. Students will also be expected to be familiar with basic graphing techniques (bar charts and line charts).

MATERIALS NEEDED:

- Overhead projector for classroom
- Chalkboard for classroom
- VCR for classroom and copy of movie *Amistad* (optional)

- Map of key slave trading ports, found at, for example, http://www.cr.nps.gov/delta/underground/africa.htm and http://www.liverpoolmuseums.org.uk/maritime/slavery/triangle.asp
- Drawing of slave ship, found at, for example, http://www.pbs.org/wgbh/aia/part1/1h295.html and http://www.pbs.org/wgbh/aia/part1/1h310b.html
- Graph paper for students (allow at least 10 sheets per group)

ALTERNATE LEVEL OF DIFFICULTY: For more advanced students provide data tables, but without step-by-step guidance on arriving at conclusions (i.e., omit the worksheet questions). In that way, students will need to compose the analytic strategy themselves, that is, deciding to examine the relationships numerically and graphically.

SOCIAL STUDIES STANDARDS:

- *Social studies programs should include experiences that provide for the study of the ways human beings view themselves in and over time.*
- Investigating, interpreting and analyzing multiple historical and contemporary viewpoints within and across cultures related to important events, recurring dilemmas and persistent issues, while employing empathy, skepticism and critical judgment.
- *Social studies programs should include experiences that provide for the study of people, places and environments.*
- Describing and assessing ways that historical events have been influenced by, and have influenced, physical and human geographic factors in local, regional, national and global settings.

MATHEMATICS STANDARDS:

Instructional programs from pre-kindergarten through grade 12 should enable all students to:

- Formulate questions that can be addressed with data and collect, organize and display relevant data to answer them.
- Recognize and apply mathematics in contexts outside mathematics.
- Create and use representations to organize, record and communicate mathematical ideas.

Bibliography

Klein HS, Engerman SL. Slave mortality on British ships 1791–1797. In: Anstey R, Hair PEH, eds. *Liverpool, the African Slave Trade, and Abolition: Essays to Illustrate Current Knowledge and Research*. England: Historic Society of Lancashire and Cheshire; 1976.

Teacher's Guide

1. Introduce (or reintroduce) the facets of the Triangle Trade across the Atlantic. *Optional:* Use clips from *Amistad* as an opening for the lesson. What are the students seeing? What part of the transatlantic slave trade does the clip depict?
2. Use maps of key trading ports. With a powerful visual, the idea of exchange can be introduced. Students can be given individual maps or a classroom map of the Atlantic can be projected on the board to highlight the various triangles of goods exchanged.
3. Introduce general information about the Middle Passage. Briefly place the Middle Passage in context—what happened to Africans before placement on the ships and what happened after?
4. Prompt a class discussion stemming from the following questions:
   - What are the reasons for this name (Middle Passage)?
   - What countries benefited most from these exchanges?
   - Consider the goods Europeans exchanged between Africa and the New World. Why were humans considered goods?
   - Think about the journey across the Atlantic. What dangers existed? What do you think the journey would have been like?
5. The students should now be moving toward a discussion about the conditions on the slave ships. If not, prompt, "What do you know about the conditions on the ships?"
6. Many of them will have seen the classic drawings. Show drawing of slave ship on the overhead. Graphic illustrates the tight packing of Africans on the ships.
7. Ask students to generate why, in the minds of the slave traders, it would have been beneficial to pack people so tightly on the ships (**increased income**). Then, think of why it would not have been beneficial (again, in the minds of the traders). Prompt and then highlight reasons related to mortality on ships.
8. At this point introduce the concept of epidemiology. Define epidemiology (**the study of disease and the causes of disease by examining patterns of disease occurrence in populations**). Determine which students have heard of epidemiology. Many may have heard of it through movies—*Outbreak*, *And the Band Played On*. Tell them that this module will introduce a mini-epidemiologic investigation. Even though epidemiology was an unknown science during the days of slavery, some of the basic methodologies and approaches that are used by epidemiologists are based on common sense and have been used by persons trying to solve problems since the beginning of time.

9. As an example, describe the classic case of illness after a large community picnic. If a person woke up with an upset stomach, diarrhea, nausea and other similar symptoms on the morning after a large picnic, what would that person do to try to determine why he or she was sick? Prompt until students suggest that they might ask others if they had similar symptoms, ask other attendees what they had eaten, ask others if they had eaten the same foods that they had eaten themselves, etc. Let students know that they are putting epidemiology into practice. They are beginning to think about conducting a research study in which we compare four groups (sick people who were exposed to a suspicious agent, sick people who were not exposed to the agent, well people who were exposed to the agent, and well people who were not exposed). Draw a 2 $\times$ 2 table on the board. Rows are for counts of exposed and unexposed, and columns are for counts of sick and well. Ask this question: "If the potato salad caused the sickness, what might the table numbers look like?" Prompt for a response such as the following: The proportions of sick people who ate the food item would be higher than the proportions of sick people who did not eat the item. Stress that this is an oversimplification and that epidemiology is much more complex, but the point to be made is that epidemiology and the epidemiologic approach are not new to them.

	Sick	**Well**
Exposed to suspected agent, i.e., ate the potato salad		
Did not eat the potato salad		

10. Now get back to the issue of slave ship mortality. The teacher should point out that mortality on the ships was a big problem. If necessary, define mortality (death) and contrast it with an often confused term, morbidity (illness). What we know about mortality comes from two main data sources: cargo logs and ship surgeons' journals. Ask students to think about whether those sources would be likely to have provided adequate information. Why or why not? In reality the data about numbers of deaths and causes of death during the slave trade are incomplete. However, in epidemiology, we are often required to make decisions with insufficient information when our data sources are incomplete.

11. What would account for the high mortality on the ships? Students may cite infectious diseases, poor nutrition, despair, and poor sanitation.

12. Note that in modern thinking we consider the problem of mortality as an abomination because of the loss of human life, but we recognize that for the slave traders mortality meant loss of income.

13. Mortality was high overall. The overall mortality rate was 5.7%. Mortality rate = number died on voyage/number onboard $\times$ 100. Similarly, in epidemiology we calculate mortality rates as the number who died in a given population divided by the number of persons in

the population. This number is usually presented as a percentage; hence we multiply the fraction by 100.

14. There was considerable variation in mortality from voyage to voyage. Thus certain voyages were, in slavers' minds, more successful. Indeed, Dolben's Act allowed for a special bonus for those voyages that were more successful, with £50 for shipmasters and £25 for ship surgeons whose vessels had a mortality rate below 3% (cited in Klein and Engerman, 1976).

15. One might wonder what would account for voyage-to-voyage mortality variations. Students should be asked to consider this question in small cooperative learning groups. Each group will be given some data tables and a worksheet of questions.
(Note: Students should work on worksheets at this time. If class time does not permit, students may do this as an out-of-class assignment.)

16. After completion of the worksheet activity, groups should then report their answers to the entire class. Have them write their responses on the board. Use these responses as fodder for discussion. Where are the similarities? Where are the differences?

17. Throughout the reporting period, or afterward, the teacher should be sure to highlight at least the following:

- The unknown category is omitted in our analyses because it is inconclusive.
- The ratios the students calculated were rate ratios, i.e., ratios of two mortality rates. In epidemiology we often calculate ratios comparing disease incidence in an exposed group with the disease incidence in the unexposed group. Ratios = 1.0 suggest that the exposure is not related to the disease. Ratios > 1.0 suggest that the exposure increases disease risk. Ratios < 1.0 suggest that the exposure or agent is associated with decreased disease risk or protects against disease—examples include vitamins, healthy eating, and physical activity.
- In this study there were no clear-cut answers or explanations for variations in mortality rates. Students should realize that the data allowed them to evaluate the possibility of the following five scenarios:
  - Mortality rates depended on the length of the voyage from England to Africa.
  - Mortality rates depended on the time the vessel spent on the African coast.
  - Mortality rates depended on the length of the voyage to the West Indies.
  - Mortality rates depended on the gender distributions on the ships.
  - Mortality rates depended on the country of origin.
- The authors of the chapter from which the data were obtained (Klein and Engerman, 1976) believe that country of origin is the most plausible reason for variations in mortality.

Do the students agree? What were other possible reasons? Why would the country of origin have caused the mortality variations?

- Many other factors that were not available to us could be alternative explanations for the patterns we saw—the most obvious explanation may not be correct. Could it be that there are some other factors of which we are unaware? What might those be? These guesses are called hypotheses, and they can be tested using appropriate data.
- The data that were provided were in aggregate form. Thus the students were able to conduct only an ecologic analysis. An ecologic study is one in which group-level, not individual-level, data are evaluated. The ecologic study design, although useful for generating hypotheses, is far less desirable than an individual-level study design because in aggregate form we have no way of knowing that the individuals with the suspected exposure (e.g., those with a specific gender or those from a particular country of origin) are actually those individuals with a given study outcome (death aboard the ship). And it is that linkage (individual exposure to individual outcome) that is of interest to us in an epidemiologic investigation. Only with those data can we have confidence in asserting that there is (or is not) a relationship between gender and mortality or country of origin and mortality, and so on. The erroneous assumption that relationships observed at the group level are equivalent to those at the individual level is not uncommon and is known as the **ecologic fallacy.** Please note that there is a Young Epidemiology Scholars (YES) instructional unit about the ecologic study design that can provide students with additional information about this topic.
- Had individual data been available, researchers would be able to use more powerful analytic tools to determine the exact nature of the relationships between the variables of interest. However, again, modern historians as well as fictitious ship doctors, would not have had access to such data.

18. Key ideas should be presented after the discussion, as follows:

- Epidemiology is a science with various methodologies, but it is based on the scientific method.
- Epidemiology can be used to address a myriad of problems related to present-day as well as historical disease patterns.
- Epidemiologists are often faced with inadequate or sketchy data sources. However, luckily in many cases, they will have more detailed information from which to draw conclusions.
- Epidemiologists often go through similar processes in their research. The students observed variations in mortality rates from voyage to voyage. They reviewed available data that might help to explain the variations, and then they tried to analyze those data and draw conclusions about the reasons for the mortality variations they observed. Epidemiologists routinely:

  - Observe disease patterns
  - Generate hypotheses about why the patterns exist
  - Collect and analyze data that may help to test those hypotheses
  - Draw conclusions about the reasons for the patterns
- Often when we conduct a research study (as in the study the students did today), we can draw only tentative conclusions or generate more hypotheses that will be useful in future research. In this way epidemiology is iterative, and invariably no single study will provide the definitive answer to a question.

WORKSHEET (Student's Version)

Suppose you were a very well known British physician. You were in demand by several slave ships who wanted you to join their crews as the ship's surgeon. You were aware of Dolben's Act, which allowed for a special bonus for those voyages that were more successful, with £50 for shipmasters and £25 for ship surgeons whose vessels had a mortality rate below 3%. You wanted to earn an extra £25 on every voyage that you took, so you wanted to join the voyages that were most likely to have low mortality rates. You did not know what caused voyages to have low mortality rates, but you had some ideas. So before deciding which employment offer to accept, you asked for some information and received the following data tables describing British voyages. (Please note that although your role is fictitious, the data are real.)

Data in the following tables are all taken from Klein HS, Engerman SL. Slave mortality on British ships 1791–1797. In: Anstey R, Hair PEH, eds. *Liverpool, the African Slave Trade, and Abolition: Essays to Illustrate Current Knowledge and Research*. England: Historic Society of Lancashire and Cheshire; 1976.

Table 1. Average Length of Voyage from England to Africa, 1791–1797

	Number of Ships	Mean Number of Days
Senegambia	5	64.2
Sierra Leone	41	74.0
Windward Coast	19	67.5
Gold Coast	30	81.1
Bight of Benin	3	100.3
Bight of Biafra	111	75.4
Congo-Angola	67	106.0
Unknown	55	99.5
Overall	**331**	**85.6**

These country or region names are those used in the late eighteenth century. In a contemporary map, these ports would be in the following general areas: Senegambia (Senegal-Gambia), Sierra

Leone (Sierra Leone), Windward Coast (Ivory Coast), Gold Coast (Ghana), Bight of Benin (Nigeria), Bight of Biafra (Nigeria), Congo-Angola.

Table 2. Average Length of Time Vessel Spent on African Coast, 1791–1797

	Number of Ships	Mean Number of Days
Senegambia	6	71.5
Sierra Leone	41	158.5
Windward Coast	18	175.7
Gold Coast	30	130.9
Bight of Benin	3	81.0
Bight of Biafra	113	99.9
Congo-Angola	69	95.2
Unknown	57	111.7
Overall	**337**	**114.2**

Table 3. Average Length of Voyage from Africa to the West Indies, 1791–1797

	Number of Ships	Mean Number of Days
Senegambia	6	28.3
Sierra Leone	41	45.2
Windward Coast	19	52.6
Gold Coast	31	55.1
Bight of Benin	3	62.3
Bight of Biafra	116	60.4
Congo-Angola	69	56.0
Unknown	61	57.3
Overall	**346**	**55.7**

Table 4. Percentage of Male Slaves on Ships, 1791–1797

	Percentage of Males
Senegambia	67.8
Sierra Leone	65.9
Windward Coast	65.5
Gold Coast	65.1
Bight of Benin	61.1
Bight of Biafra	56.6
Congo-Angola	65.4
Unknown	63.5
Overall	**62.3**

Table 5. Slave Mortality Rates on British Ships, 1791–1797

	Average Mortality Rate
Senegambia	2.91
Sierra Leone	3.71
Windward Coast	3.56
Gold Coast	2.75
Bight of Benin	4.30
Bight of Biafra	10.56
Congo-Angola	3.65
Unknown	1.56
Overall	**5.65**

1. What pieces of information did you request and why?

2. Rank African countries of origin by the length of the voyage from England. Draw a bar chart to display that information.

3. Rank African countries of origin by the average length of time the vessel spent on the coast. Draw a bar chart to display that information.

4. Rank African countries of origin by the average length of time to their West Indian ports of disembarkation. Draw a bar chart to display that information.

5. Rank African countries of origin by the proportions of male slaves onboard. Draw a bar chart to display that information.

6. Rank African countries of origin by mortality rates. Draw a bar chart to display that information.

7. Suppose your best friend had told you that the worst mortality rates were those from the Windward Coast voyages. You showed him your rankings from Question 6, which revealed that some were worse. He then scoffs, saying, "OK. Maybe they are worse, but not *that much* worse." You decide to respond by comparing the rates of Windward voyages with those of all other voyages. To do this you use the average rate for Windward Coast voyages as the denominator and each other country's rate as numerator. Draw a new column in Table 5 and label it rate ratios and include those calculated ratios. Then in the space below explain whether your friend is right or wrong.

8. Just as in our example of epidemiology, we had an agent or exposure (type of food eaten at the picnic) and we had a disease or outcome (gastrointestinal symptoms), so too in this investigation we have an exposure and an outcome.

   a. What is(are) the exposure(s)?
   b. What is(are) the outcome(s)?

9. To further explore the relationship between exposure and outcome, please again use your graph paper to draw line graphs, placing exposure on the *x*-axis and outcome on the *y*-axis for data shown in Tables 1–4. (Hint: Plot ranked data.)

10. What patterns have emerged? What have you learned?

11. What decisions have you made about becoming a ship's surgeon? Justify your decisions.

12. After making your decision, you think that others should be made aware of your findings. Write a letter to the head of the Surgeon's Society, telling him of what you have learned and making recommendations for what you think he should share with other Society members. Try to be creative and complete.

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Gold Coast	2.75
Bight of Benin	4.30
Bight of Biafra	10.56
Congo-Angola	3.65
Unknown	1.56
Overall	**5.65**

1. What pieces of information did you request and why?

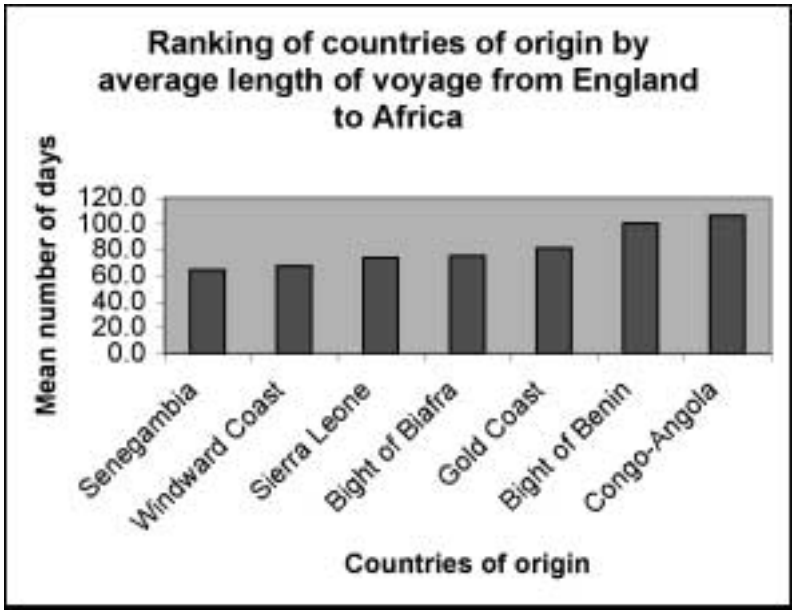
   Students should identify the following pieces of information:

   - **Length of voyage from England to Africa**
   - **Length of time the ship remained on the coast before sailing**
   - **Length of time the ship took to sail to the West Indies**
   - **Gender distribution on the ship**
   - **African country from which the slaves were taken**
   - **Mortality rates**

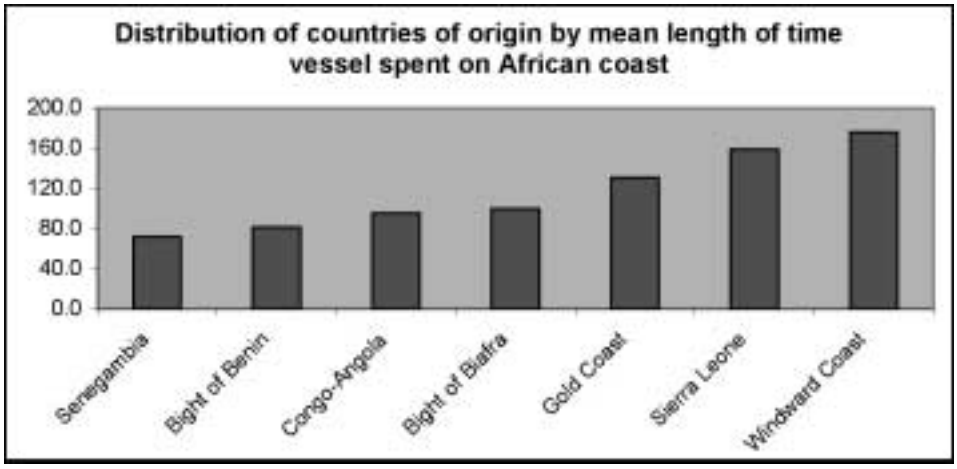
   The students may have various ideas for the physician's choices. The critical point to make is that the data were related to some hypotheses about what factors are related to ship mortality.

   The students may also note that the physician would have had to combine information from Tables 1 through 4 with Table 5 in order to compare mortality rates.

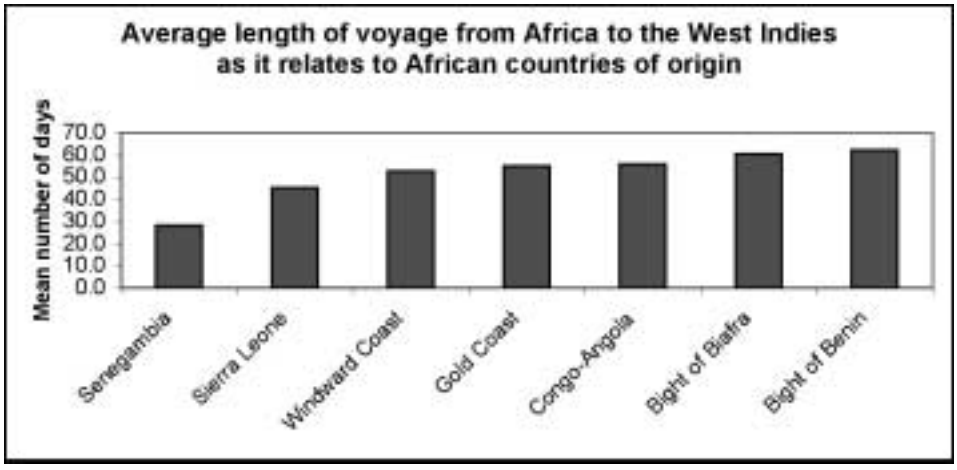
2. Rank African countries of origin by the length of the voyage from England. Draw a bar chart to display that information.



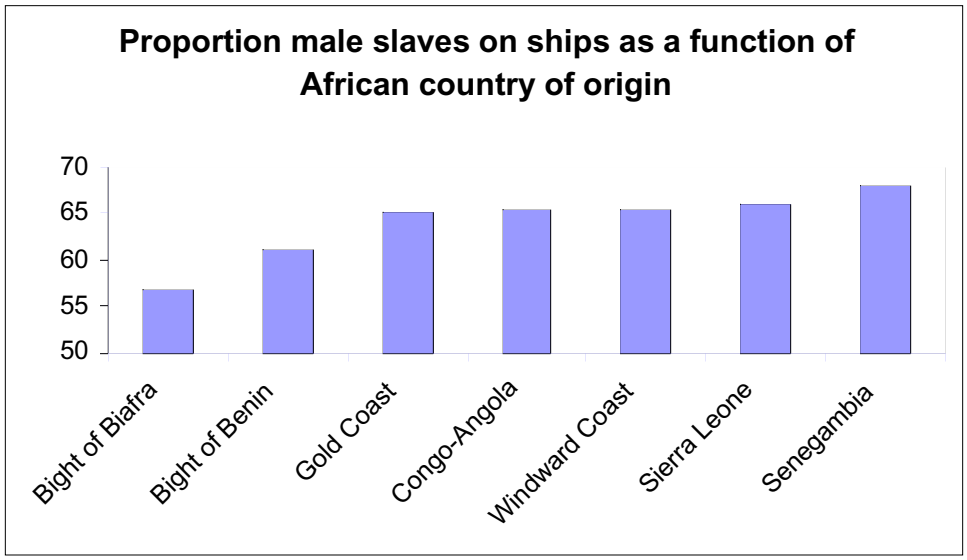
3. Rank African countries of origin by the average length of time the vessel spent on coast. Draw a bar chart to display that information.



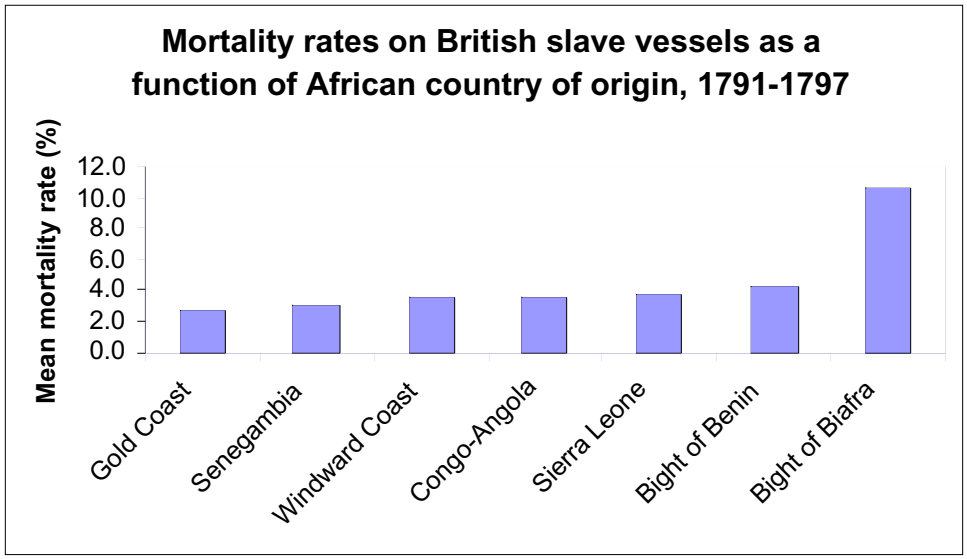
4. Rank African countries of origin by the average length of time to their West Indian ports of disembarkation. Draw a bar chart to display that information.



5. Rank African countries of origin by the proportions of male slaves onboard. Draw a bar chart to display that information.



6. Rank African countries of origin by mortality rates. Draw a bar chart to display that information.



7. Suppose your best friend had told you that the worst mortality rates were those from the Windward Coast voyages. You showed him your rankings from Question 6, which revealed that some were worse. He then scoffs, saying, "OK. Maybe they are worse, but not *that much* worse." You decide to respond by comparing the rates of Windward voyages with those of all other voyages. To do this, you use the average rate for Windward Coast voyages as the denominator and each country's rate as numerator. Draw a new column in Table 5 and label it rate ratios and include those calculated ratios. Then in the space below, explain whether your friend is right or wrong.

Table 5. Slave Mortality Rates on British Ships, 1791–1797

	Average Mortality Rate	Rate Ratios
Senegambia	2.91	2.91/3.56 = 0.82
Sierra Leone	3.71	3.71/3.56 = 1.04
Windward Coast	3.56	3.56/3.56 = 1.00
Gold Coast	2.75	2.75/3.56 = 0.77
Bight of Benin	4.30	4.30/3.56 = 1.21
Bight of Biafra	10.56	10.56/3.56 = 2.97
Congo-Angola	3.65	3.65/3.56 = 1.03
Unknown	1.56	
Overall	**5.65**	

Those rate ratios much greater than 1 indicate mortality rates that are much larger than the rate for the Windward Coast. So indeed at least one country was much worse than the Windward Coast, i.e., Bight of Biafra, whose rate was nearly three times that of the Windward Coast.

8. Just as in our example of epidemiology, we had an agent or exposure (type of food eaten at the picnic) and we had a disease or outcome (gastrointestinal symptoms), so too in this investigation we have an exposure and an outcome.

   a. What is(are) the exposure(s)?

   Length of voyage from England to Africa

   Length of time the ship remained on the coast before sailing

   Length of time the ship took to sail to the West Indies

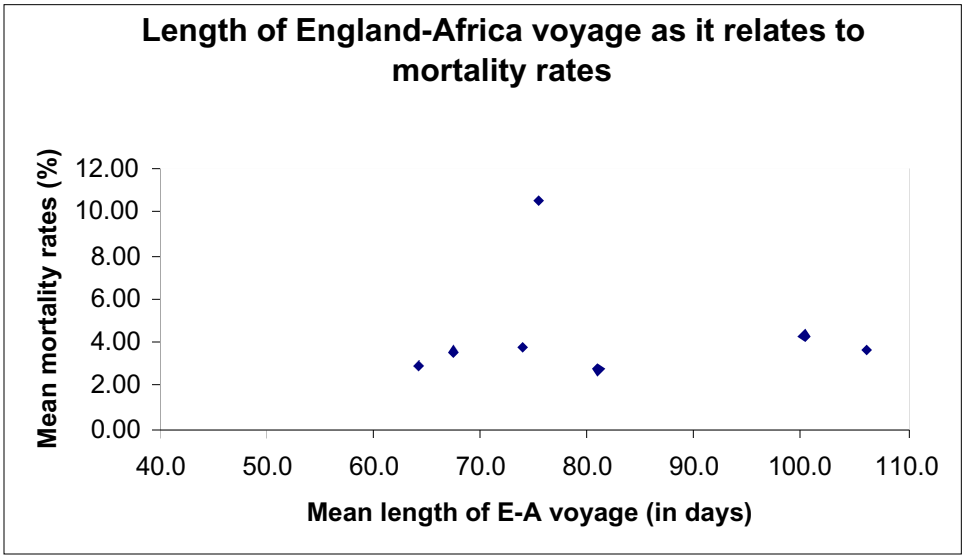
Gender distribution on the ship

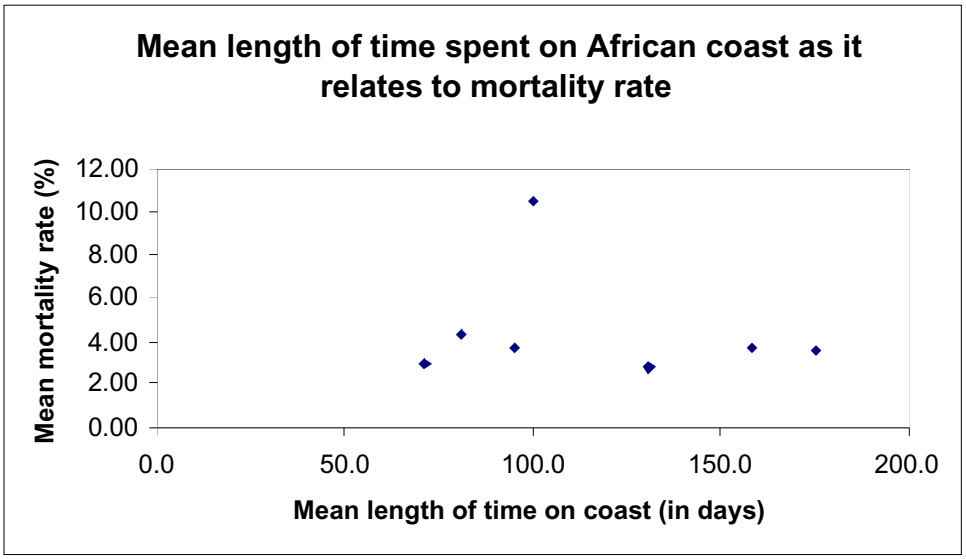
African country from which the slaves were taken

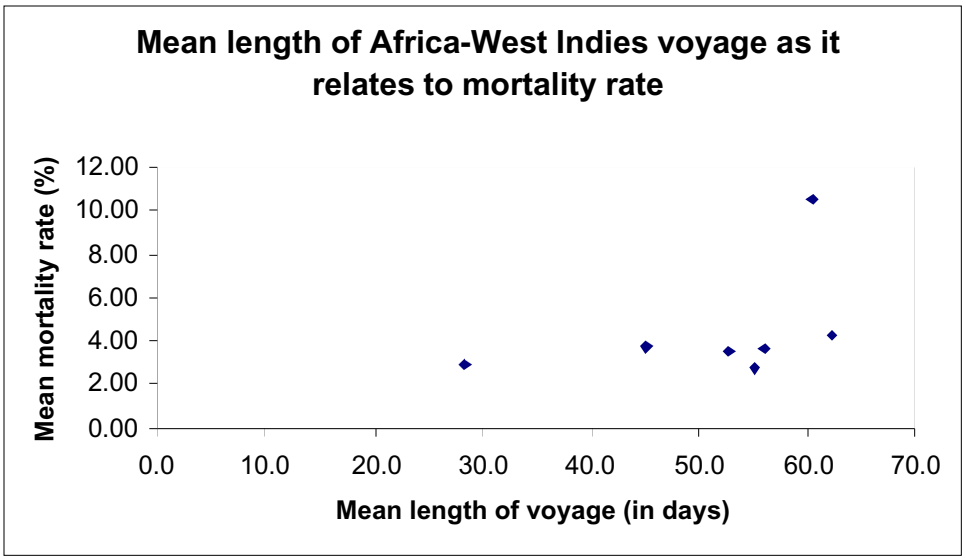
b. What is(are) the outcome(s)?

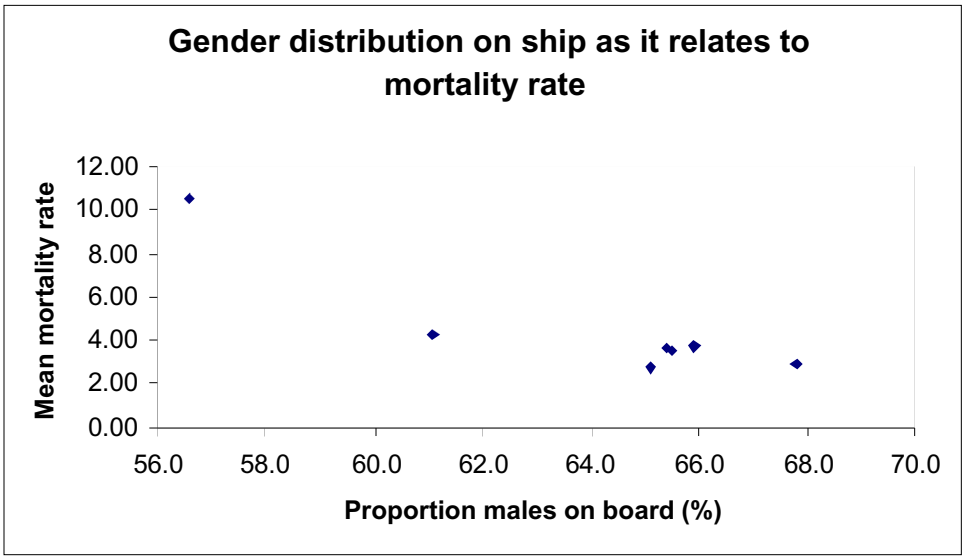
Mortality aboard ship

9. To further explore the relationship between exposure and outcome, please again use your graph paper to draw line graphs, placing exposure on the *x*-axis and outcome on the *y*-axis for data shown in Tables 1–4. (Hint: Plot ranked data.)









Students would need to combine information from Table 5 with Tables 1–4 in order to generate these graphs.

They should also note that it is not possible to create a line graph with the Table 5 data because the variable on the *x*-axis (country of origin) is discrete, not continuous. Furthermore, that information was already displayed in the graph generated for Question 6.

10. What patterns have emerged? What have you learned?

    - **The hypotheses that mortality rates were related to the length of voyage from England, time the vessel spent on the coast, the length of voyage to the West Indies, and gender distribution do not appear to be supported. Had those relationships been true, one may have expected to see graphs that were steadily increasing or decreasing.**
    - **There appears to be a wide range in mortality rates by country of origin, with Gold Coast having the lowest rates and Bight of Biafra having the highest.**
    - **These data are neither complete nor definitive. Ideally one would have wanted to have much more information with which to make a decision. However, in epidemiology, we are sometimes faced with incomplete data sources such as this and we do the best with what we have. This was a simple analysis based on using simple graphical displays and basic rates. Modern epidemiologists analyzing contemporary mortality patterns would ideally have much more detailed information with which to conduct more in-depth analyses. However, simple data tables such as these may be the first step toward highlighting patterns and generating hypotheses for further research.**

11. What decisions have you made about becoming a ship's surgeon? Justify your decisions.

    Students' responses to this question should follow from the results of their earlier analyses. The important points to note here are that: (1) we have incomplete information; (2) the length of the voyage from England, the time the vessel spent on the coast, the length of the voyage to the West Indies, and gender distribution appear to be irrelevant and need not be considered in the choice of ships for which to work; and (3) barring the availability of any additional information, the best factor to use in the decision-making process is country of origin.

12. After making your decision, you think that others should be made aware of your findings. Write a letter to the head of the Surgeon's Society, telling him of what you have learned and making recommendations for what you think he should share with other Society members. Try to be creative and complete.

    Students should use this letter to explain and summarize their results. Their recommendations might include suggestions for further research into reasons why country of origin might be an important factor or advocacy for collecting other data that might be helpful in explaining mortality rate differentials.