**Kuru Teacher’s Guide**

The inspiration for this activity came from watching a documentary called Kuru: The Science and the Sorcery which was shown on the Smithsonian Channel and is available for purchase. Due to the content (death, witchcraft, nudity), you should go through the activity and make sure it is appropriate for your students. This activity was done with Advanced Placement Environmental Science and Research Honors students. Many schools block Youtube, which affects the ability to complete the activity at school.

NGSSS covered:

- **SC.912.2.14.6** Explain the significance of genetic factors, environmental factors, and pathogen agents to health from the perspective of both individual and public health.
- **SC.912.N.1.1** Nature of science strands.
- **SC.912.N.1.2**
- **SC.912.N.1.3**
- **SC.912.N.1.4**
- **SC.912.N.1.5**
- **SC.912.N.1.6**
- **SC.912.N.1.7**
- **SC.912.N.2.1**
- **SC.912.N.2.2**
- **SC.912.N.2.3**
- **SC.912.N.2.4**

**Answers**

1. The Fore are in the pre-industrial stage, being primarily hunter/gatherers with little agriculture.
2. There is no sanitation, drinking water is suspect, exposed skin to parasites, no medical services, little education.
3. People smile/laugh, lose their balance and muscular coordination.
4. It was first thought to be psychosomatic.
5. The Fore were/are into sorcery/witchcraft and believe (many still to this day) that the disease is caused by casting spells.
6. They eventually lose the ability to swallow and starve to death.
7. A. Prepare for field work  
   B. Establish the existence of an outbreak  
   C. Verify the diagnosis  
   D. Define and identify cases  
   E. Describe and orient the data in terms of time, place and person  
   F. Develop hypotheses  
   G. Evaluate hypotheses  
   H. Refine hypotheses and carry out additional studies  
   I. Implement control and preventive measures  
   J. Communicate findings
8. A confirmed case will have clinical proof, like DNA identification of the bacteria, while a probable case has the symptoms/location/contact.
9. Take the percentage of sick people who interacted with an item and divide it by the percentage of people who were affected but did not interact with the item.
10. There are many more women affected, young people once were highly affected and then not affected at all, overall rates decreased.
11. Cannibalism
12. She describes how the body was prepared for consumption.
13. 1922
14. The incubation period can be longer than 45 years.
15. The chimpanzees developed Kuru like conditions within two years.
16. A prion is nonliving protein that affects other proteins, causing cells to produce more prions.
17. About 300
18. 28 years old
19. The prion that causes BSE also causes vCJD.
20. Items you consume today might not be manifested until many years later and the incubation period can last for decades. People might want to avoid eating brain/nervous tissue of mammals.
21. Information from a .gov site is from a government agency, which should be considered very reliable. Information on Wikipedia has many contributing authors and you don’t know their qualifications. When using Wikipedia, look at the citations at the bottom and go directly to those links for better sources.
22. Kuru would be density independent, as it doesn’t matter what the population levels are, merely whether or not an individual consumed flesh infected with the prion.
Kuru

**Introduction:** Papua New Guinea is a country occupying the eastern half of the island New Guinea, located just north of Australia. Although the island was once part of the British empire and under Australian rule until 1975, the interior parts are very difficult to travel to and many of the people retained their ancestral traditions.

In 1957, an American researcher was in New Guinea studying tribal cultures and came across sick children with a condition called Kuru amongst the Fore tribe. To see what life was like in the Fore tribe, go to [www.kuru-doco.com](http://www.kuru-doco.com), click on the video link and watch People of the Kuru Region Part 1 and Part 2.

1. In what stage of development would you classify the Fore people? Explain.________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________

2. Describe some aspects of Fore life that might make them more susceptible to disease.
   _______________________________________________________________________________________
   _______________________________________________________________________________________
   _______________________________________________________________________________________

Next, click on the video First Reports.

3. A disease is typically noticed by its symptoms. What are some of the symptoms of Kuru?
   _______________________________________________________________________________________

4. What did researchers first think was the cause of Kuru?
   _______________________________________________________________________________________
Next, click on the video A World of Sorcery.

5. What special problem did researchers have in regards to the cultural beliefs of the Fore? __________________________________________________________
________________________________________________________________
________________________________________________________________

Next, click on Gallery.

6. How did people with Kuru eventually die? ___________________________________
_____________________________________________________________________
_____________________________________________________________________

**Role of Epidemiologists:** The U.S. Centers for Disease Control (CDC) is part of the federal government in the Department of Health and Human Services. Its mission is to collaborate to create the expertise, information, and tools that people and communities need to protect their health. Go to [www.cdc.gov/excite/classroom/outbreak/steps.htm](http://www.cdc.gov/excite/classroom/outbreak/steps.htm) and list the 10 steps epidemiologists use to identify an outbreak quickly and correctly.

7. A. _______________________________________________________________
B. _______________________________________________________________
C. _______________________________________________________________
D. _______________________________________________________________
E. _______________________________________________________________
F. _______________________________________________________________
G. _______________________________________________________________
H. _______________________________________________________________
I. _______________________________________________________________
J. _______________________________________________________________

8. What is the difference between a confirmed case and a probable case? __________
_____________________________________________________________________
_____________________________________________________________________

9. Look at the chart “Attack Rates by Items Served at a Church Supper” under step 7. How is the relative risk calculated? ___________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Step 5 calls for organizing data. Use data from the following table to construct a line graph to include total deaths (red), female deaths (blue), male deaths (green), and deaths of people under 20 years old (yellow). Make sure you give the graph a title, label the x and y axis and use a smooth line to connect data points.

<table>
<thead>
<tr>
<th>Years</th>
<th>Total Deaths</th>
<th>Female Deaths</th>
<th>Male Deaths</th>
<th>Deaths &lt;20</th>
</tr>
</thead>
<tbody>
<tr>
<td>1957-1961</td>
<td>1,000</td>
<td>810</td>
<td>190</td>
<td>375</td>
</tr>
<tr>
<td>1962-1966</td>
<td>700</td>
<td>540</td>
<td>160</td>
<td>180</td>
</tr>
<tr>
<td>1967-1971</td>
<td>510</td>
<td>380</td>
<td>130</td>
<td>80</td>
</tr>
<tr>
<td>1972-1976</td>
<td>250</td>
<td>175</td>
<td>75</td>
<td>3</td>
</tr>
<tr>
<td>1977-1981</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>1982-1986</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>1987-1991</td>
<td>40</td>
<td>30</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>1992-1996</td>
<td>20</td>
<td>15</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>1997-2001</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2002-2006</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

ND= No data available during these years.

10. Describe a couple of features from the graph that would help an epidemiologist track the disease transmission. ____________________________________________

__________________________________________

__________________________________________
It would make sense that some cultural practices would determine the large difference in deaths between males and females. What could this practice be? Click on www.youtube.com/watch?v=tHbmedsTjF0 and watch.

11. What tradition was (maybe still is) practiced in parts of Papua New Guinea? 
______________________________________________________________________

Now go back to www.kuru-doco.com and click on characters.

12. What does Agusa Utigi say about mortuary feasts? __________________________________________
______________________________________________________________________

Women and children were more likely to eat the brains and internal organs of the deceased, while adult men typically abstained or only ate muscle.

Researchers will publish results of their studies in one of many peer reviewed journals. This means that a panel of scientists has examined the experiment for proper protocol, ethics and bias. To see such a paper, go to: http://rstb.royalsocietypublishing.org/content/363/1510/3679.full

Now researchers looked to find the first person, called the index case or patient zero, to die from Kuru. Under segment 4, Epidemiological Studies, click on table 2.

13. In what year did the first villager die of Kuru? __________________________________________

14. With the advent of Christian missionaries and the Australian government outlawing cannibalism in 1960, determine the longest incubation period for Kuru (assuming there has in fact been no cannibalism since 1960). __________________________________________

Look at the section of the paper title Student Beginnings. To determine if there was something infectious in the brain tissue, Gajdusek took brain tissue from a girl who died of Kuru, and injected it into two chimpanzees in the United States.

15. What was the result of this experiment? __________________________________________
______________________________________________________________________
**Prions:** Further studies found that Kuru was caused by a prion, which is the cause of a group of diseases called transmissible spongiform encephalopathies (TSEs).

Go to [www.kuru-doco.com](http://www.kuru-doco.com) and watch the prion video. Then go to Wikipedia and look up prion.

16. What is a prion? ______________________________________________________
______________________________________________________________________
______________________________________________________________________


17. How many people in the U.S. developed CJD in 2006? _________________

Click on variant CJD.

18. What is the average age of death of someone who dies of vCJD? ___________

19. How does Mad Cow Disease relate to vCJD? ______________________________
______________________________________________________________________
______________________________________________________________________

20. How can the story of Kuru from the 1960s affect your life today? ______________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

21. Of the sources used to complete this activity, which would be most/least trustworthy? Explain. ________________________________
______________________________________________________________________
______________________________________________________________________
______________________________________________________________________

22. Would you consider Kuru to be a density dependent or density independent limiting factor? Explain. ________________________________
______________________________________________________________________
______________________________________________________________________