

Arizona Electronic Atlas Learning Module

Investigating Health in Arizona

PURPOSE: To compare deaths from lung cancer and female breast cancer among Arizona counties. To analyze patterns of infant mortality among Arizona counties. To form a hypothesis to account for the variability (or lack thereof) discovered.

INTENDED AUDIENCE: Undergraduate students and advanced secondary students; interested members of the general public.

LEARNING OBJECTIVES:

1. Students will become aware of the mortality rates of lung cancer and female breast cancer in Arizona.
2. Students will be able to discuss differences in infant mortality across the counties of Arizona.
3. Students will be able to use the Arizona Electronic Atlas to make maps
4. Students will be able to use the Zoom In tool to manipulate maps.
5. Students will be able to use the Show Data tool.

OUTLINE AND SYNOPSIS:

The module should be done in sequence, as knowledge gained in Part I will be used in the other two sections of the module.

PART I: Students will compare the number of deaths due to lung cancer by county in Arizona. Explanations for differences will be explored.

PART II: Students will investigate the number of deaths due to breast cancer by county in Arizona.

PART III: Students will compare the total infant mortality rate by county in Arizona.

PART I:

1. Open the Arizona Electronic Atlas at <http://atlas.library.arizona.edu>
2. Select "Make a Map" at the top left of the screen.
3. Select the "Environment and Population" map theme.
4. Allow the map to load, then click "Refresh" (this will enlarge the map)
5. Click "Overview Off" to remove the inset map (it will get in the way as you progress)
6. Scroll down the legend on the right hand side of the map. Click on the folder "People By County."
7. Scroll down to find the box in front of "2000 Percent Total Deaths Lung Cancer By County" and click on it.
8. Click "Redraw Map."

9. Use the map legend (found next to the map on the right hand side of the screen) to interpret the map. You should notice that there is some variability in the incidence of lung cancer by county.

10. Since the legend only shows general patterns and not exact figures for each county, we will use the Show Data tool to get exact figures on selected counties.

11. Click on the Show Data tool on the top right of the map (note: nothing will happen yet-go to the next step)

12. Click directly on Mohave County on the map. A small pop up screen will appear which will give the percent of deaths due to lung cancer in 2000. The figure you obtain should be 8.1 %.

13. Use this procedure to obtain the figures for each county shown in the table below:

| COUNTY | 2000 % DEATHS LUNG CANCER |
|----------|---------------------------|
| MOHAVE | 8.1% |
| YUMA | |
| GILA | |
| PINAL | |
| NAVAJO | |
| APACHE | |
| GREENLEE | |
| GRAHAM | |

14. Looking at these figures, do you think they are statistically significant? In other words, do you think the variation in percentage is different enough that it could not have occurred by chance? (To really determine this a statistical test would have to be done-but it's good to consider the notion.)

15. If you don't believe that these differences arose solely by chance, then what may account for the differences? Are there more smokers in Mohave County than Greenlee County? More air pollution? A large number of people working in industries in which the lungs are exposed to carcinogens? Less doctors? An inferior health care system?

16. Which if any, of the causes proposed above do you believe are plausible? Why? How could you find out for sure?

FOR FURTHER INVESTIGATION

1. Investigate the causes of lung cancer.

2. Learn more about lung cancer in Arizona <http://www.hs.state.az.us/plan/index.htm>

3. Learn more about U.S. lung cancer statistics. See <http://seer.cancer.gov/faststats/sites.php?stat=Incidence&site=Lung+and+Bronchus+Cancer&x=14&y=16>

4. Investigate the prevalence and mortality of other types of cancer. <http://surveillance.cancer.gov/statistics/>

5. Investigate survival rates of various types of cancer. See <http://surveillance.cancer.gov/statistics/types/survival.html>

PART II

1. Now we will look at a female breast cancer rates across the state. Return to the map you created and click Refresh. This will reset the map.
2. Click "Overview Off" to remove the inset map (it will get in the way of your progress).
3. Scroll down the legend on the right hand side of the map. Click on the folder "People By County."
4. Scroll down and choose "2000 Total Percent Deaths-Female Breast Cancer by County."
5. Click "Redraw Map"
6. Use the legend to interpret the map. Notice, based on the fact that all three colors are showing on the map, that some counties look like they have very high breast cancer rates. However is this really true?
7. Use the Show Data tool (as explained in Part I) to find the county with the highest and lowest rate. Record the results below:

| COUNTY | 2000 % TOTAL DEATHS BREAST CANCER |
|--------|---|
| | |
| | |

8. Do you think that the figures above are statistically significant? Why or why not?
9. If the variability in rates is not due only to chance, what could account for it?

FOR FURTHER INVESTIGATION

1. There are some places in the U.S. that have statistically significant, high rates of breast cancer. Find out where they are. Search the literature to find out what explanations have been put forth for their existence.
2. Study the incidence, mortality, and survival rate of male breast cancer, a lesser known type of cancer.
3. Investigate the incidence, mortality, and survival rate of female breast cancer in the U.S.
<http://seer.cancer.gov/faststats/sites.php?stat=Incidence&site=Breast+Cancer&x=17&y=18>

PART III:

1. Return to the map you made in Part II and click "Refresh". This will reset the map.
2. Click "Overview Off" to remove the inset map (it will get in the way as you progress)
3. Scroll down the legend and click on the "People by County" folder.

4. Scroll down to find "2000 Total Infant Deaths by County" and click on the box in front of it.
5. Click "Redraw Map."
6. Use the legend to interpret the map. Notice that Maricopa, Pima, and Pinal Counties appear to have very high infant deaths.
7. To get the exact figures click on the "Show Data" tool on the top of the screen and then click on one of these counties.
8. A small pop-up screen will appear which lists the name of the county and total infant mortality . Repeat this process for each of the three counties mentioned in step 6 and record the data in the table below.

| COUNTY | 2000 TOTAL INFANT DEATHS |
|----------|--------------------------|
| MARICOPA | |
| PIMA | |
| PINAL | |

9. Several of the counties were shown on the map as having low infant mortality-Graham, Greenlee, La Paz, and Santa Cruz. Use the "Show Data" tool to determine the exact figure and record it in the table below:

| COUNTY | 2000 TOTAL INFANT DEATHS |
|------------|--------------------------|
| GRAHAM | |
| GREENLEE | |
| LA PAZ | |
| SANTA CRUZ | |

10. What can be made of this information? Should we take it at face value? Does the fact that Maricopa County had 353 more infant deaths than La Paz County mean that the problem is worse in Maricopa County?
11. What you should notice is that the statistic we are looking at is total infant deaths, and not a rate or percentage. That means that counties that have larger populations would be expected to have larger total infant death rates than smaller counties. Since Maricopa County is the main population center for Arizona, it makes sense that the greatest number of infant deaths would occur there. What we really need in order to examine this issue is to look at infant mortality rates.
12. Infant mortality rate (IMR) is computed as the number of infant deaths in a calendar year per 1,000 live births recorded for the same period (Arizona State Health Department). The Arizona State Department provides these figures at their website. Go to <http://www.hs.state.az.us/plan/report/ahs/ahs2002/pdf/290.pdf>
13. Within the document, use the data from 2000 (to stay consistent with the data we already have).

14. Which Arizona county had the highest rate of infant mortality in 2000? Where did it figure in the tables you did in step 8 and 9 above?

15. Fill out the table below starting with the county with the highest infant mortality rate:

| COUNTY | 2000 INFANT MORTALITY RATE |
|--------|----------------------------|
| | 16.3 |
| | 12.4 |
| | 9.6 |
| | 9.0 |
| | 8.9 |
| | 8.6 |
| | 6.8 |
| | 6.5 |
| | 6.5 |
| | 6.3 |
| | 6.1 |
| | 5.3 |
| | 3.8 |
| | 2.2 |
| | 0 |

16. Go back to your earlier figures from steps 8 and 9 and compare them to these rates. You should notice some surprising things. Summarize your findings.

17. In conclusion, some statistics can be misleading. Total number of infant deaths is one such statistic, because the figure is not placed within context. A rate or percentage is almost always more appropriate, since it allows for more realistic comparisons.

FOR FURTHER INVESTIGATION

1. Investigate infant mortality rates around the world.
2. Learn about the steps that have been taken to reduce the infant mortality rate.
3. Investigate differences in infant mortality rates between inner cities and other locations.
4. Explore infant mortality rates by ethnicity and race in Arizona. See <http://www.hs.state.az.us/plan/report/ahs/ahs2002/pdf/137.pdf>
5. Learn about the causes of infant mortality in Arizona. See <http://www.hs.state.az.us/plan/report/ahs/ahs2002/pdf/293.pdf>