

All answers should be submitted in a single PDF with explanations accompanying each graph

- 1) (20 points) Download the FoodSrvByCounty.txt file and create the following visualizations for this geographical data. The data is for the availability of food services by county in the U.S. It also has data by state (in the county field, some of them have the state names, and those rows hold the state totals, or you can aggregate by state). For each of these, think carefully about the map projection (I gave a suggestion about this in week 8's class if you are working in Tableau).
 - a. Graph food services by state as a choropleth for two of the years. The color schemes should be unified between the two graphs so that comparisons can be made. Put them next to each other (side-by-side or top-bottom) in your PDF. Note any patterns that arise. Your visualization should clearly display states that have high levels or low levels of food service availability, so think carefully about the color scheme. The color schemes should be the same (same data range) for the two. Include Alaska and Hawaii in your map, but be sure to take into account the map projection as discussed in class.
 - b. Build a tile cartogram (this is possible with either R or Tableau) and create a cartogram/tileogram of the state data from this dataset for two years. Analyze the difference in visual communication between your graphs in a) and b). What differences can you see? Is there anything that you can see easily in one graph that is more difficult to see in the other?
- 2) (20 pts) With the Chicago crime dataset from last week create the following graphs
 - a. Begin with your hex-bin plot from last week and add a map of Chicago underneath that is correctly scaled to the data. You can do this in one of two ways. You can acquire the map directly from google maps in R with the map libraries, or you can make sure that the hexbin variables you create in tableau have the proper geographic roles and values (because if you resize the bins by multiplying as we saw in class earlier, then the values will not be in the correct range on the map and you will have to correct for this in the hexbin variable formula). If you get the proper geographic roles for the hexbins, you will be able to plot them over the map of the Chicago area. Note, making the hexbin plot partially transparent will help with this a great deal.
 - b. The data for the crimes committed are coded by the "ward" of the city, which is a political subdivision in the city (kind of like neighborhoods are a social subdivision). Create a small-multiples table of choropleths (like you did with the rose-plots in the last homework) with at least 4 different crime types. The color schemes for the four crimes should be unified. To do this, you will need to merge the data file with the polygon data for the Chicago wards which is posted on D2L.

- 3) (20 pts) Download the terrain data from D2L (will be posted during week 9) and create the following maps of the data
- a. A heat map of the terrain data mapped by color. You can use the “terrain colors” that are built into R that are good for such applications. The color map goes through blues to yellows to browns to whites for mountain tops.
 - b. A contour plot of the same data. The contours should not be too dense to be unreadable, but they should be dense enough to be able to see the details and judge the steepness of the terrain. Overlay this plot over the heat map.
 - c. Compare the two plots for what they communicate.