Mapping Quantities: Choropleth Maps

Introduction

For the next several lectures we will be looking at different types of quantitative maps – that is, maps that are symbolized based on quantitative data, primarily ratio scale data. To start with, we will examine choropleth maps. Choropleth maps are simple, yet powerful cartographic representations of quantitative data. One of the most common forms of maps, they display quantitative data related to geographic areas. Today’s discussion will start with a definition of choropleth, and follow up with the different components of choropleth maps – enumeration units, data normalization, and data classification.

Choropleth Map:

From Greek – *Choros* = place  
*Plethein* = to fill

*A method of cartographic representation which employs distinctive color or shading applied to areas ... usually statistical or administrative areas.*  
*(International Cartographic Association)*

Although choropleth maps are 2 dimensional, it is helpful to think of them as 3 dimensional. The map below left symbolizes crop acres per square mile, state by state. The height of each state matches the shading to indicate greater and lesser acreage. The map below right presents the same data in a traditional choropleth format. It uses a color ramp with lighter shades indicating lower values and darker shades indicating higher values.
Enumeration Units:

The spatial extent, or area in which data were collected (enumerated). For example, US census data is collected in a variety of spatial units, including blocks, block groups, and tracts.

Choropleth maps require area geometry. Points and lines can be symbolized in a similar manner to polygons, e.g. different shades, but only polygon-based maps are choropleth maps. In the maps below, the same data are presented using different enumeration units. The map on the left uses states as the enumeration unit, the one on the right uses counties. The higher resolution of the county-based map provides additional detail about Hispanic population in the USA.

Data Normalization:

The process of dividing one numeric attribute value by another to minimize differences in values based on the size of areas or the number of features in each area. For example, normalizing (dividing) total population by total area yields population per unit area, or density. (ESRI – GIS Dictionary, www.esri.com)

The importance of data normalization is illustrated below. Here US population is compared to the US population/square mile. Significant differences between these maps reveal important information about the concentration of US population in the Northeast.
Data Classification:

The process of sorting or arranging entities into groups or categories; on a map, the process of representing members of a group by the same symbol, usually defined in a legend. (ESRI – GIS Dictionary, www.esri.com)

We covered data classification in the previous lecture, so today we will only provide reminders of what was discussed previously. Data classification improves the story telling ability of choropleth maps by reducing the number of data categories to a manageable number. There are a number of different classification schemes available in ArcGIS, including the most common types, Jenks (natural breaks), equal interval, quantile, and mean and standard deviations. The example below highlights the histogram and map for an equal area classification of farms per county in Indiana. For more information, see the summary for lecture 11.
Conclusion

In this discussion we have looked at the basics of choropleth maps. These maps are quantitative in nature, based on values tied to enumeration units.