

# Mapping Social Data with ArcGIS: An Introduction Part I

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- GIS is for display, analysis, storage, and retrieval of mapped information
  - thematic map using social data
- Download shapefile and data table:  
Open a web browser and go to:  
[http://www.colorado.edu/ibs/cupc/short\\_courses/env\\_demography/GIS\\_workshop\\_materials/](http://www.colorado.edu/ibs/cupc/short_courses/env_demography/GIS_workshop_materials/)  
right-click link -- “Data files for workshop” and “Save Link As”—  
create a new folder in My Documents called **GIS\_workshop** and save the file there  
unzip the file (GIS\_data\_files.zip) to that same folder
- Open ArcMap (**Programs>ArcGis>ArcMap**)  
Start with a New Empty Map
- Add layer – **states\_48.shp**  
(might have to connect to folder to get to My Documents)
- Map elements
  - Table of contents
  - Data view (map body)
  - Map layers
  - Toolbars

## Discussion—projection

The positions of objects on the earth’s spherical surface are measured in degrees of latitude and longitude, also known as *geographic coordinates*. Because the earth is round and maps are flat, getting information from the curved surface to a flat one involves a mathematical formula called a *map projection*. A map projection transforms latitude and longitude to x,y coordinates in a projected coordinate system.

This process of flattening the earth will cause distortions in one or more of the following spatial properties: distance, area, shape, and direction. No projection can preserve all these properties and, as a result, all flat maps are distorted to some degree. Fortunately, you can choose from many different map projections. Equal area projections preserve area; most thematic maps at small scale should use an equal area projection. The Albers Equal Area Conic projection is commonly used for the United States.

- Data projection—right-click **Layers**, click **Properties**, **Coordinate System** tab  
**Predefined>Projected>Continental>North America>USA Contiguous Albers Equal Area Conic**  
click **OK**
- Right-click on layer name and **Open Attribute Table**  
look at table, note **Hispanic**
- Terms
  - shapefile, layer,
  - data table, attribute table
- Display data—right-click layer name (**states\_48**) **Properties**, **Symbology** tab  
**Quantities>Graduated symbols**  
**Field value:** hispanic  
Click **OK** -- look at it  
Go back and **Normalize** on population 2000  
Click **Apply** – look at it  
Change **Number of classes** to 7  
Click **OK**

Join table – CDC Mortality

- Add table as layer (plus symbol) - **mortality\_2000-2002\_HDAA\_cancer.dbf**
- Right-click table name and **Open** – look at table, note ALL\_CANCER  
(values are rates per 100,000)
- Right-click **states\_48** choose join
- Choose fields--#1 STATE\_NAME #3 STATE\_NAME (automatic)
- Click **OK** (and **Yes** to index)
- Right-click **states\_48** and **Open Attribute Table**, note new attributes
- Right-click **states\_48** and **Properties**, **Symbology** tab  
**Quantities>Graduated colors**  
**Field value:** mortality\_2000-2002\_HDAA\_cancer.ALL\_CANCER  
**Normalization:** none  
Click **OK** -- look at it  
Go back and change **Classes** to 3  
Click **Apply** -- look at it  
Go back and change the **Classification Method** to **Equal Interval**  
Click **Apply** -- look at it

- Display—change colors of categories  
Change color ramp  
Change individual symbols (double-click on symbol)

< Experiment >

- Display Hispanic (normalized on population) with 5 natural breaks classes—using a browns color ramp
- Copy **states\_48** and paste it as a new layer--right-click layer name, select Copy, then Edit-paste to add the layer
- On the new **states\_48**, display the all cancer mortality variable without normalization--using graduated symbols, 4 classes, green circles sizes 4 to 15, background color set to “No Color”

#### Join table – TRI releases and HAP added cancer risk

- Add **states\_48** again as a new data layer
- Add the data table **TRI\_HAP\_scorecard.dbf**  
open it and look at variables (TRI released values are in pounds, cancer risk is average individual’s HAP added cancer risk, per 1,000,000)
- Join that data table to the map layer using state name as the join key,  
look at the attribute table
- Display the 3 TRI chemical release variables using graduated colors or symbols —  
**TRI\_HAP\_scorecard.TOTAL\_REL**  
**TRI\_HAP\_scorecard.AIR\_REL**  
**TRI\_HAP\_scorecard.LAND\_REL**
- Display added cancer risk variable using graduated symbols—  
use 5 classes, orange asterisks, background color set to “No Color”

#### Other features

- Use zoom, pan, global, and “i” (identify)
- Add labels to states  
Right-click **states\_48** and **Properties, Labels tab**  
Check **Label features in this layer**  
Text string label field—choose **states\_48.STATE\_ABBR**, set size to **10**  
Click **OK** -- look at it

< Experiment >

We have 2 views—Data and Layout

- Switch to Layout

- Add legend  
**Insert>Legend**

- Add title  
**Insert>Title**

< Experiment >

- Save project file – “Map” – GIS-1.mxd

## Mapping Social Data with ArcGIS: An Introduction Part II

- Open ArcMap (**Programs>ArcGis>ArcMap**)  
Start with a New Empty Map
- Add layer – **colorado\_tracts2000.shp**
- Review Map elements
  - Table of contents
  - Data view (map body)
  - Map layers
  - Toolbars
- Review Data projection, right-click **Layers**, click **Properties, Coordinate System** tab  
**Predefined>Projected Coordinate Systems>Utm>NAD 1983>NAD\_1983\_UTM\_Zone\_13N**
- Review Terms
  - shapefile, layer,
  - data table, attribute table
- Use identifier tool (“**i**”)
- Add cities to map – **co\_cities.shp**
- Add labels to cities  
Right-click **co\_cities.shp** and select **Label Features**  
or--  
Right-click **co\_cities.shp** and select **Properties, Labels** tab  
Check **Label features in this layer**  
Text string label field—choose **NAME**  
Click **OK**

### Add TRI data table

- Add TRI data as layer—**rtk\_rsei\_1999trimatch\_colorado.shp**
- Right-click the table name and **Open Attribute Table** – look at table, note **TOTAL\_RELE, WASTE\_GENE, and ACCURACY**
- Choose only sites with an accuracy measure of 150-500 meters.  
Open **Properties, Definition Query** tab  
Click the Query Builder button, create your query:  
**"ACCURACY" >=150 AND "ACCURACY" <=500**

Click **OK**, then **OK** again

- Display total toxins released—  
Right-click **rtk\_rsei\_1999trimatch\_colorado.shp** and **Properties, Symbology** tab  
**Quantities>Graduated symbols**  
Field value: **TOTAL\_RELE**  
Click **Apply** -- look at it
- Display total waste generated—  
Right-click **rtk\_rsei\_1999trimatch\_colorado.shp** and **Properties, Symbology** tab  
**Quantities>Graduated symbols**  
Field value: **WASTE\_GENE**  
Click **Apply** -- look at it  
Switch back to **TOTAL\_RELE**  
Click **OK**
- Display Hispanic for Colorado census tracts--  
Right-click on **colorado\_tracts2000** and **Properties, Symbology** tab  
**Quantities>Graduated colors**  
Field value: **P006002**  
Click **OK** -- look at it (**P006002** is number of Hispanics over 18)
- Zoom in to the area around Denver, thinking about whether there is a correlation between Hispanic population and the TRI locations. Reduce the tracts to Denver area records—
- For **colorado\_tracts2000**, open **Properties, Definition Query** tab
- Use the Query Builder to select AREAKEYS for Denver and Jefferson Counties--  
"AREAKEY" >= '08031000101' AND "AREAKEY" <= '08031013014'  
OR "AREAKEY" >= '08059009805' AND "AREAKEY" <= '08059012058'
- Click **OK**, then **OK** again
- Zoom to Denver area
- Reduce the number of categories in the Total Releases to 3, then look again.
- Save project file – “Map” – GIS-2.mxd
- **Export Map** to pdf

< Experiment >

### Create a new field in the data table using calculations

- Let's say we want to create a new field, such as other TRI releases
- Open your GIS-1 mapfile
- Open the **TRI\_HAP\_scorecard** attribute table
- Click **Options>Add Field**
- Name **OTHER\_REL**
- Choose **Double** for Type, use defaults for precision and scale (**0**), click **OK**
- Look at the field, note all set to "0"
- Right-click **OTHER\_REL**, click **Field Calculator**, set the query to **[TOTAL\_REL] - ([AIR\_REL] + [LAND\_REL])**, click **OK**
- Look at the field, display it.

### If time:

- Use zoom and pan tools for both data and layout views
- Add second data frame and look at another time period
- Add symbols and text
- Open Arc Toolbox
- Manuals

### Links:

**Course website:** [http://www.colorado.edu/ibs/cupc/short\\_courses/env\\_demography/](http://www.colorado.edu/ibs/cupc/short_courses/env_demography/)

**Geographic Data Sources IBS-CRS:**

[http://www.colorado.edu/ibs/crs/geographic\\_data\\_sources.html](http://www.colorado.edu/ibs/crs/geographic_data_sources.html)

**Scorecard:** <http://www.scorecard.org/>