

SOC 4650/5650: PS-03 - Veterans Unemployment in Missouri

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Directions

Using data from the M0Boundary folder, create a well-formatted map document that illustrates the unemployment rates of veterans by county in Missouri. Your entire project folder system, including notebook, data, map document, and output, should be uploaded to GitHub by Monday, February 12th at 4:15pm.

Scenario

For this assignment, you are asked to take on the role of a demographer for the [U.S. Department of Veterans Affairs](#), the federal agency that is charged with providing health and social services to retired members of the United States military.

Analysis Development (Review from Lectures 01 and 02)

The goal of this section is to create a self contained project directory with all of the data, code, map documents, results, and documentation a project needs.

1. In your course folder system, find the ProblemSets/PS-03 subdirectory. Add all necessary files for your project.
2. Copy and paste the data file M0Boundary from the course Data folder into the appropriate subfolder.
3. Create a new README.md file, R project and R notebook as well as a blank map document. Again, save these in the appropriate folders.

Clean the Veteran's Unemployment Data in R (Review from Lecture 03)

The goal of this section is to be able to create a cleaned sf object with only the required data for that map you will created in the next section.

4. In your R notebook, import the `MO_BOUNDARY_Counties.shp` data into a new simple features object.
5. In a pipeline:
 - (a) Subset these data so that you only have the following variables: `NAME`, `FIPS`, `POP_2010`, `NAMELSAD10`, `ALAND10`, `VET_POP`, `VET_LBRFOR`, `VET_UNEMPL`.
 - (b) Rename these variables en-masse to small camel case.
 - (c) Further rename `NAMELSAD10` to `countyName`.
 - (d) Create a new variable for square mileage that converts the existing `ALAND10` variable, which is measured in meters squared.
 - (e) Create a new variable that is the proportion of veterans who are unemployed relative to the number of veterans in the labor force.
6. Conduct a missing data analysis on these data.
7. Check for duplicate observations as well.

Map the Veteran's Unemployment Data in R

The goal of this section is to produce a map showing veterans unemployment per county in Missouri as well as the number of veterans per county normalized by square miles.

8. Using `ggplot2` and either `RColorBrewer` or `viridis` as well as the total number of veterans and the square miles variables, map the density of veterans per county. Export the map as a png file at 300 dpi.
9. Using `ggplot2` and either `RColorBrewer` or `viridis` as well as your new veterans unemployment variable, map the proportion of veterans who are unemployed per county. Export the map as a png file at 300 dpi.

Create a Basemap in ArcGIS

Unlike R, ArcGIS is better suited to more sophisticated mapping. For example, using ground layers is easier in ArcGIS. We'll begin by creating a basemap to create a map of unemployment among veterans on top of.

10. In a new map document, right click on the Layers data frame and select New Group Layer. Group layers are helpful organizational tools for your Table of Contents.
11. Right click on New Group Layer and select Properties ▸ General. Under Layer Name, rename the group layer to Basemap.
12. Add the Missouri state boundary shapefile to your map. In the Table of Contents, make sure that you drag the shapefile *under* the Basemap group layer.¹
13. Symbolize this layer with a white fill and no line. This will provide a background if certain counties are missing numeric data.
14. Add the remaining shapefiles for surrounding states to the Basemap group layer (Arkansas, Illinois, Iowa, Kansas, Kentucky, Nebraska, Oklahoma, and Tennessee).
15. Using [Colorhexa.com](https://colorhexa.com), identify three shades of gray that have significant contrast with each other because they vary in value. These will be your “ground” layers. To do this:
 - (a) Begin by searching for “Gray” in the homepage’s search bar. You should find the shade of the gray hue with the hexadecimal value #808080. Use the “Shades and Tints” section of that hue’s webpage to make color selections.
 - (b) Pick a light shade (i.e. a *high* value on the Munsell color model) for the surrounding states fill.
 - (c) Pick a darker shade (i.e. a *lower* value on the Munsell color model) for the surrounding states outline color.
 - (d) Pick a dark shade (i.e. a *low* value on the Munsell color model) for the surrounding state labels.
 - (e) For each selected shade, hover your mouse over it to reveal the RGB color values. Note these down so you can reference them later.
16. For each surrounding state layer, set the fill and boundary colors to the RGB values you have selected. Set the outline width to 0.4.
17. Assess how well these three shades of the gray hue work together. Make adjustments as needed.
18. For each surrounding state layer, turn labeling on. Use the attribute STATE_ABBR as the label field. For Illinois, use the attribute STUSPS as the label field. Use “Arial” for the label font and use size 12 point font size. Set the font hue to the RGB color value you have selected.

¹ *Hint:* You can confirm this by un-checking and re-checking the Basemap group layer. If the Missouri state boundary disappears and reappears when you turn the Basemap group layer off and on, you have done this successfully.

19. Zoom to the Missouri state boundary layer.
20. Use the small minus sign icon on the Table of Contents to collapse the Basemap group layer without turning it off.

Map the Veterans Unemployment Data in ArcGIS

Finally, we'll re-create our choropleth map of veterans unemployment that we already made in R. We're not using the cleaned data here, so you may have to search to find the appropriate variables for mapping.

21. Add the Missouri county boundaries shapefile *above* the Basemap layers on the Table of Contents.
22. Rename the layer Veteran Unemployment.
23. Use the VET_UNEMPL variable as your primary quantitative variable, normalized by VET_LBRFOR. Select either a Color Brewer or viridis color ramp for mapping these data.
24. Zoom to the Missouri state boundary layer, and export these data as a .pdf file at 300 dpi.

Where We're Heading

Right now, the process between data cleaning and final mapping in ArcGIS is divorced. What we are moving towards, however, is a system where we create and clean spatial data in R, export it, and then map it in ArcGIS. Where you should be at the end of this lab is more comfortable with cleaning data, and able to visualize the workflow that we are building towards.

Rubric

		No Credit	Improvement Needed	Satisfactory	Good	Excellent
Analysis Development	0	3.75	4.25	4.50	5.00	
Notebook Organization	0	2.25	2.55	2.70	3.00	
Literate Programming	0	2.25	2.55	2.70	3.00	
Part 1: Data Preparation	0	3.75	4.25	4.50	5.00	
Part 2: Map in R	0	5.25	5.95	6.30	7.00	
Parts 3 & 4: Map in ArcGIS	0	9.00	10.2	10.8	12.00	
Percent:	0%	75%	85%	90%	100%	

Analysis Development

Considerations: Is the project folder system used? Is a README.md file present?

Notebook Organization

Considerations: Is the class template used? Are code chunks named? Are headings used to separate content?

Literate Programming

Considerations: Is narrative text included with each section and subsection of the notebook? Is code introduced before it is run and then summarized afterwards? Are interpretations of maps included?

Substantive Sections

Considerations: Are each of the parts successfully completed? Are appropriate color ramps selected for maps?