

Project analysis maps and documentation

To start the project, I created a new project on ArcGIS and added a new folder connection to the folder where the dataset is stored.

1) WIC office location map with buffers (WIC office site selection MO.pdf)

First, I added the census lines 'tl_2022_29_tract.shp' and WIC office location files 'MO_WIC_Satellite_Offices.shp' to the map by dragging them into the workspace. I made sure that they are projected onto the same coordinate system. Next, I used the dissolve function with COUNTYFP field to dissolve the census tract lines on the map. After this, I wanted to check if the existing WIC office locations are accessible by all the population in the state. For this, I used pairwise buffer function with a buffer size of 15 miles and 'planar' method. I had also tried 10 miles and 20 miles but decided against it as in terms of average travel time in different counties of Missouri, 15 miles seems sensible (in close to 40 minutes by public transport or 30 minutes by car). I increased the transparency of buffer layer to be able to see the underlying county boundaries that I was going to use at inference time. Finally, I added this map to a new layout.

2) Poverty and unemployment map with WIC locations (WIC_LocationsANDPovertyRate.pdf)

For the initial data preparation in the poverty table's csv file, geoid_2 column is created by using the command 'right(A3,11)' where column A has the GEOID.

Only the GEOID, geoid_2, NAME and the following columns were retained in the final file:

S1701_C01_012E : Estimate!!Total!!Population for whom poverty status is determined!!SEX!!Female

S1701_C01_033E : Estimate!!Total!!Population for whom poverty status is determined!!EMPLOYMENT STATUS!!Civilian labor force 16 years and over!!Unemployed!!Female

S1701_C02_012E : Estimate!!Below poverty level!!Population for whom poverty status is determined!!SEX!!Female

S1701_C02_033E : Estimate!!Below poverty level!!Population for whom poverty status is determined!!EMPLOYMENT STATUS!!Civilian labor force 16 years and over!!Unemployed!!Female

After inserting a new map to the workspace, I added the 'ACSST5Y2020.S1701_poverty2020_female.csv' table and the 'tl_2022_29_tract.shp' file to the map by dragging them in. Next, I created a join between the census tract layer and the poverty table on the fields 'GEOID' and the newly created 'geoid_2'. Now, since there are census tracts with very small samples and the other hemoglobin data is at county level, I decided to dissolve the census tract boundaries and work with the county level data. I used 'COUNTYFP' as the field to dissolve and then used 'SUM' as the statistic for other demography (poverty in this case) related columns.

After this I used graduated colors as the primary symbology with the main field as 'S1701_C02_033E' (summed one) and the normalization field as 'S1701_C01_033E' (summed one). I used Natural Breaks (Jenks) method for creating the intervals.

For the WIC office locations, I copied the layer from the first map that is used for site selection and pasted it here. Finally, before adding the maps to layout, I checked if all the layers are in the same projected system or not.

3) Women who gave birth are only educated upto high school with WIC locations
(WICLocations AND EducationAmongMoms.pdf)

In the education table's csv file, geoid_2 column is created by using the command 'right(A3,11)' where column A has the GEOID.

Only the GEOID, geoid_2, NAME and the following columns were retained in the final file:

B13014_001E Estimate!!Total:

B13014_002E Estimate!!Total:!!Women who had a birth in the past 12 months:

B13014_004E Estimate!!Total:!!Women who had a birth in the past 12 months:!!Now married (including separated and spouse absent):!!Less than high school graduate

B13014_005E Estimate!!Total:!!Women who had a birth in the past 12 months:!!Now married (including separated and spouse absent):!!High school graduate (includes equivalency)

B13014_010E Estimate!!Total:!!Women who had a birth in the past 12 months:!!Unmarried (never married, widowed and divorced):!!Less than high school graduate

B13014_011E Estimate!!Total:!!Women who had a birth in the past 12 months:!!Unmarried (never married, widowed and divorced):!!High school graduate (includes equivalency)

I also added a new column with name 'B13014_04_05_10_11Sum' that had the sum of values in columns 'B13014_004E', 'B13014_005E', 'B13014_010E', and 'B13014_011E'. This was done because there are two separate columns for women who didn't go to or didn't complete high school and the ones who passed high school.

After inserting a new map in the workspace, I added the 'ACSDT5Y2020.B13014-HighSchoolGrad_WomenBirthrate2020.csv' table and the 'tl_2022_29_tract.shp' file to the map by dragging them in. Next, I created a join between the census tract layer and the poverty table on the fields 'GEOID' and the newly created 'geoid_2'. Now, since there are census tracts with very small samples and the other hemoglobin data is at county level, I decided to dissolve the census tract boundaries and work with the county level data. I used 'COUNTYFP' as the field to dissolve and then used 'SUM' as the statistic for other demography (education among women who gave birth in past year) related columns.

In the symbology I used graduated colors to represent the education level of women who gave birth in 2020. To be exact, I used the field value as the column 'B13014_04_05_10_11Sum' and normalized it with 'B13014_002E' field. These fields have their name also starting with SUM due to the dissolve function. I used the Natural Breaks (Jenks) methods of creating the classes.

For the WIC office locations, I copied the layer from the first map that is used for site selection and pasted it here. Finally, before adding the maps to layout, I checked if all the layers are in the same projected system or not.

4) Low hemoglobin data map with WIC locations: Prenatal 2019 and 2020
(Prenatal_2019_2020_comparison.pdf)

First, I imported the census tract layer and the hemoglobin table ('WIC_prenatal_postpartum_linked_2020_countywise_withFIPSCode1.csv') to the workspace. Also, I added the 'MO_WIC_Satellite_Offices.shp' file to the workspace and check whether they are in the same coordinate system as the tract lines.

Next, I applied the dissolve function on the tl_2022_29_tract layer with the dissolve field set to 'COUNTYFP'. After this, I added a new field called 'unique county code' of numeric datatype in the attribute table of the dissolved tl_2022_29_tract layer. Now, to fill this field I used the same numbers as in 'tl_2022_29_tract_COUNTYFP' field but without the zeros. After this, I join this new layer that has the dissolved tract lines with the table

'WIC_prenatal_postpartum_linked_2020_countywise_withFIPSCode1.csv' on the fields 'unique county code' and 'FIPS code' respectively. Next, I need to display the hemoglobin data for each county. In this map as I am showing the rate of low hemoglobin cases in each county for a fixed year, I select the 'Hematocrit/hemoglobin - low at postpartum visit-2019rate' or 'Hematocrit/hemoglobin - low at postpartum visit-2020rate' as the field to symbolize using the graduated colors. Since I wanted to make a comparison between the years, I decided to use the manual intervals with 5 classes that are same for maps in both years.

For the WIC office locations, I copied the layer from the first map that is used for site selection and pasted it here. Finally, I created a new layout and added the maps to it.

5) Low hemoglobin data map with WIC locations: Postpartum 2019 and 2020
(Postpartum_2019_2020_comparison.pdf)

First, I inserted a new map on the workspace. Then, I pasted the final layer from the prenatal case map that has county level data of the low hemoglobin cases in the postpartum women and WIC office location layer. Next, I used the 'Hematocrit/hemoglobin - low at postpartum visit-2019rate' or 'Hematocrit/hemoglobin - low at postpartum visit-2019rate' fields to symbolize the low hemoglobin cases while using graduated colors. Again, for comparison purposes, I use manual intervals with 5 classes. In this case, it was difficult to come up with the interval edges as the two years didn't have a completely overlapping range of rates.

6) Low hemoglobin data map with WIC locations: Prenatal and postpartum combined
(Combined_HG_PrePost.pdf)

For the combined case, I used the difference between the rates from two years for both prenatal and postpartum setup. For the sake of convenience, I had created two additional columns in the excel file directly with names as 'prenatal difference in low hemoglobin percent' and 'postpartum difference in

low hemoglobin'. Now, after inserting a new map, I pasted the final layer from the prenatal case map that has county level data and WIC office location layer. Next, I wanted to show both the patterns in the same map so decided to use the Bivariate colors as the primary symbology. I used the two fields as the differences mentioned earlier. I used the Natural Breaks (Jenks) method with a 3 by 3 grid. I tried to use the same colors for each field as I had used in the previous maps (prenatal and postpartum).

Common data sources:

- 1) WIC office locations are obtained from [Missouri Spatial Data Information Services website](#).
- 2) Census Tract files MO TIGER/Line (2020) from the [official census website](#).
- 3) Poverty and unemployment datasets: ACS (2020) [S1701 table](#).
- 4) Education of women who gave birth: ACS (2020) [B13014 table](#).
- 5) Hemoglobin data is obtained from the [MICA dashboard](#) for the years 2019 and 2020. The tables for the years 2019 and 2020 are queried separately and then added for side-by-side comparison and finally downloaded.