

## Using GIS Training to Address Blood Pressure Medication Adherence Generating useful composite measures

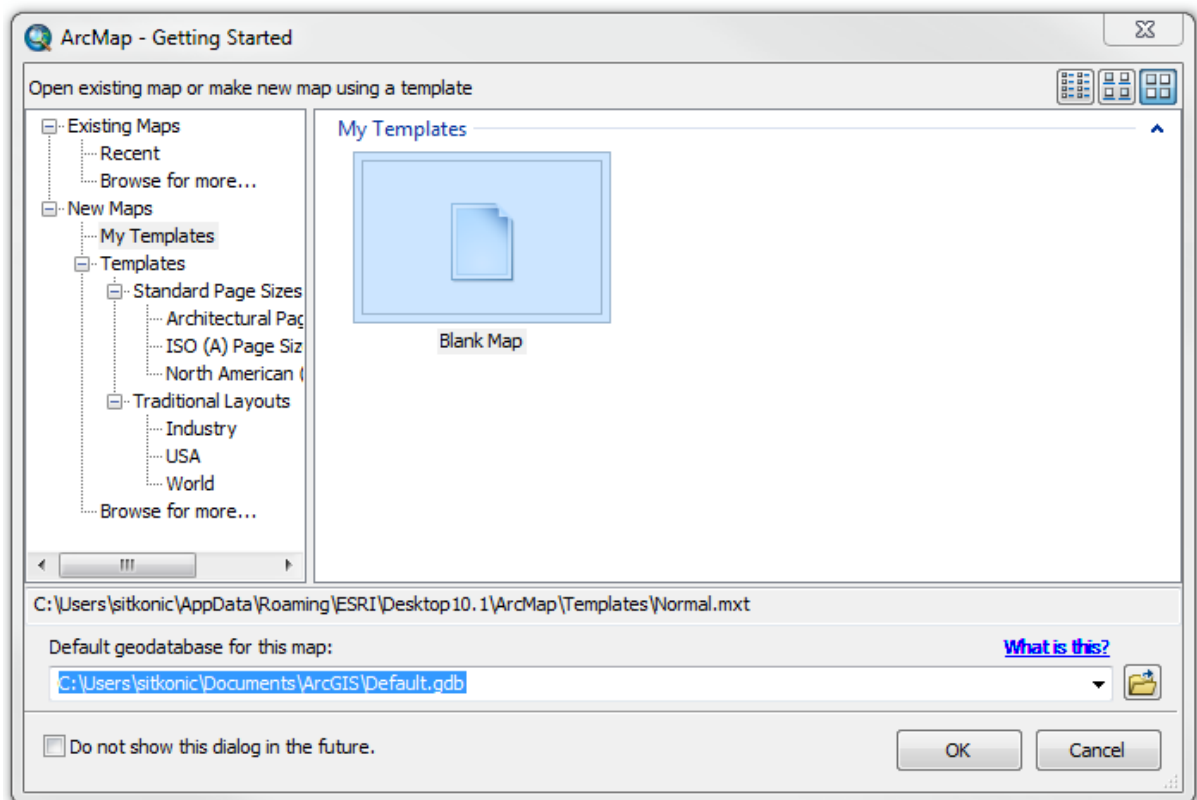
\*\*\* Files needed for exercise: *MT\_tract10\_prj\_carto.shp*, *MT\_Trct\_ACS2012.dbf*, *Census\_FieldMap.xlsx*, and *ACS20125US\_Trct\_Pop16.dbf*

**Goals:** The goal of this exercise is to generate an ACS based areal measure to understand the social makeup of a defined study area.

**Skills:** After completing this exercise you will have experience processing readily available US Census (tract level boundary files) and American Community Survey (Social-demographic-economic tables) to generate a composite measure that can begin to provide insight on some of the social drivers that may influence health outcomes for sub county areas of interest.


### Preparing Workspace

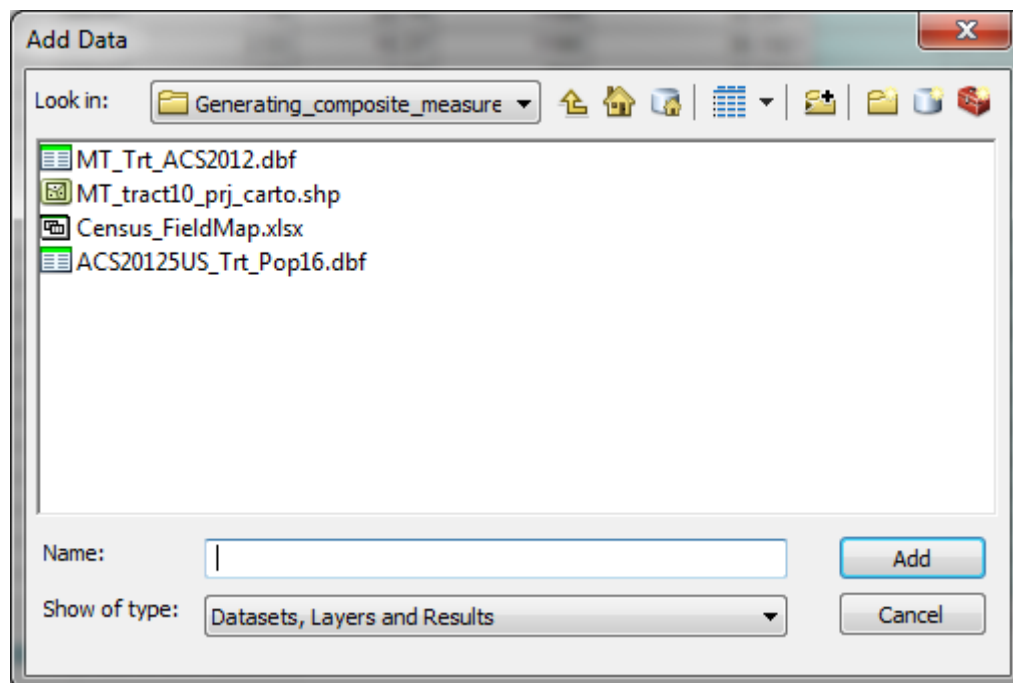
1. Open ArcMap. In the folder tree on the left side, browse to **New Maps > My Templates** and select a **Blank Map**. Click **OK**.



2. Click the **Add Data** icon  to add new data to the map.

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3. Click on the **Connect to Folder** button .
4. Browse to the data folder for this exercise (*Generating\_composite\_measures\_Exercise\_data*) and click **OK**. You now have a permanent connection to that folder making it quicker to find and add data.
5. From the folder, add the shapefile *MT\_tract10\_prj\_carto.shp*. This file is projected census boundaries for Montana.



6. Once you've selected the files, click **Add** and the data will appear in the **Table of Contents** as a layer.
7. Now you have your census boundary added into your workspace as a shapefile layer. Please check if your census boundary projected correctly.

### Finding the Right Variables for NSES Neighborhood Deprivation Index

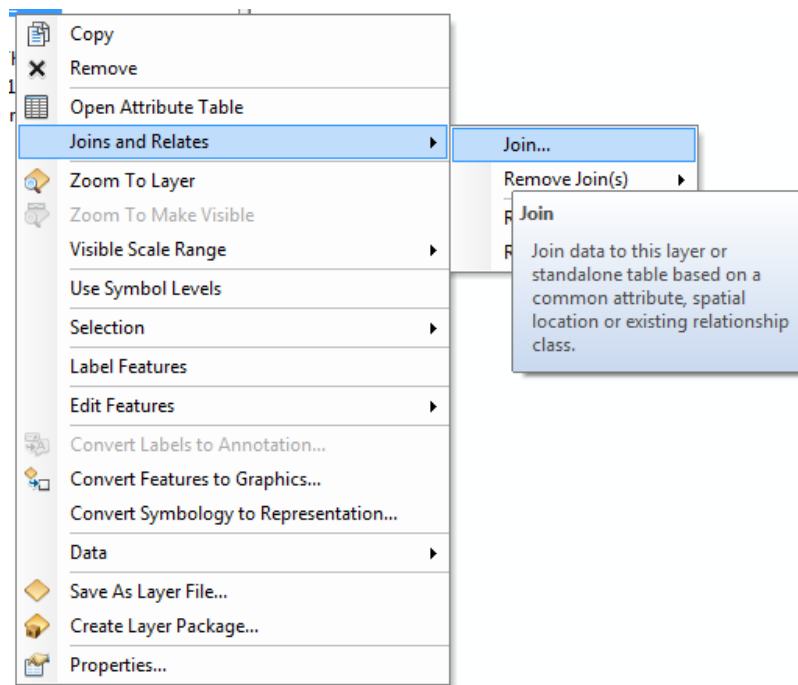
1. In order to generate a Neighborhood Deprivation Index (NDI) for census tracts, we need find the right variables. Gathering data from different locations is crucial for the calculation. You will need the following 6 variables to measure the NDI at census tract level: 1) % adults  $\geq$  25 with less than high school education; 2) % male unemployment; 3) % household below poverty; 4) % household receiving public assistance; 5) % household have only female header with children; 6) median household income.

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2. Open *Census\_FieldMap.xlsx*, this is the metadata for those available census fields in the datasets you have been provided. You want to locate all 6 variables that have been specified for the NSES NDI.
3. Variable 1) can be found under the education category; pct\_ltHS is the corresponding variable in the table.
4. Add *MT\_Tract\_ACS2012.dbf* into your workspace. Right click to **Open** the attribute table and you will see the pct\_ltHS field in the table. Similarly, you will identify all 6 variables used in the NSES NDI.
5. All matched fields are listed as below: 1) pct\_ltHS; 3) pct\_lt30; 4) pctPubAsst; 5) pctFemHH; 6) medHHinc. However, you won't find any variable that represents % male unemployment. The closest variable is TotEmpMale – the total male civilian employed, age 16+.
6. In order to generate variable 2), you need male population for age 16+. Let's say that you make a request to your data manager and receive a file containing male population over 16 years old for all census tract - *ACS20125US\_Tract\_Pop16.dbf*. Now you have everything you need to calculate the NSES NDI.

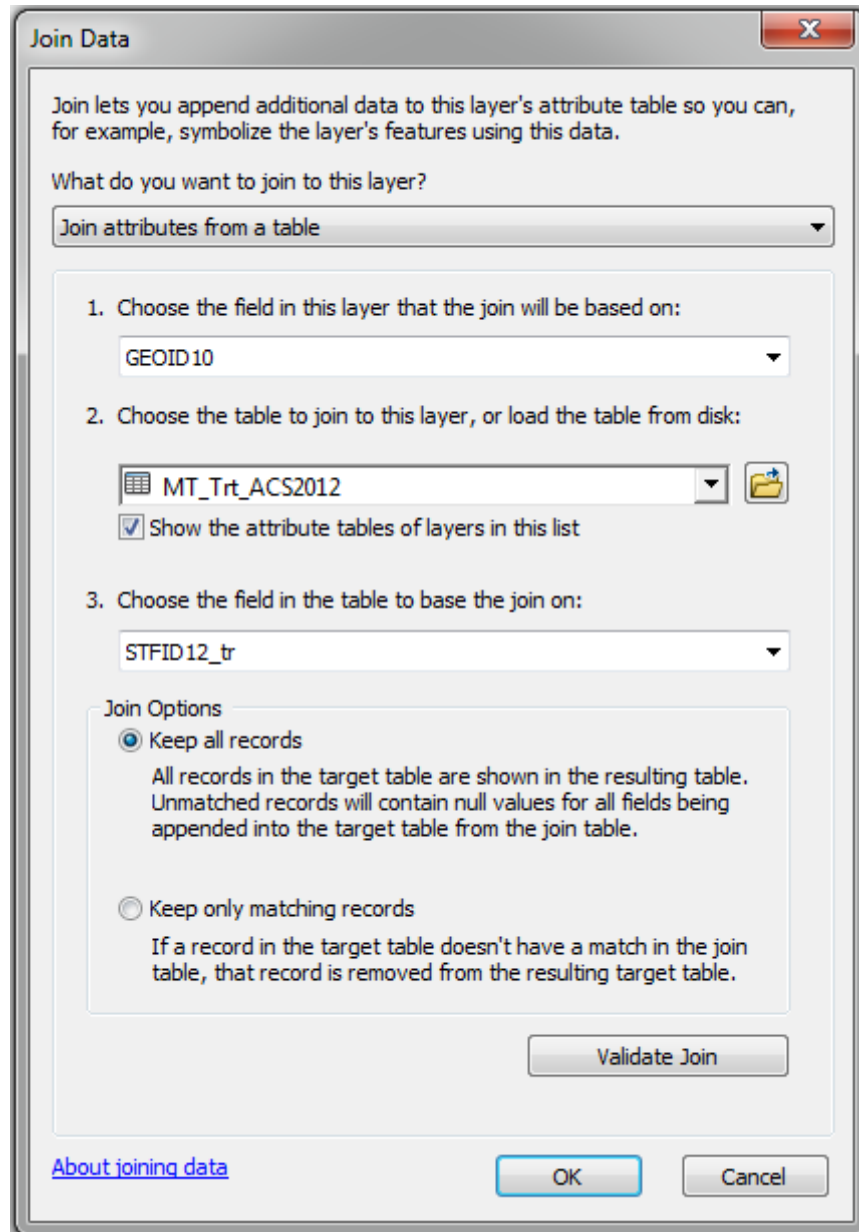
### Generating NSES Neighborhood Deprivation Index

1. First, you will join both census tables to the boundaries files. Right click on *MT\_tract10\_prj\_carto* under **Joins and Relates** click **Join**.



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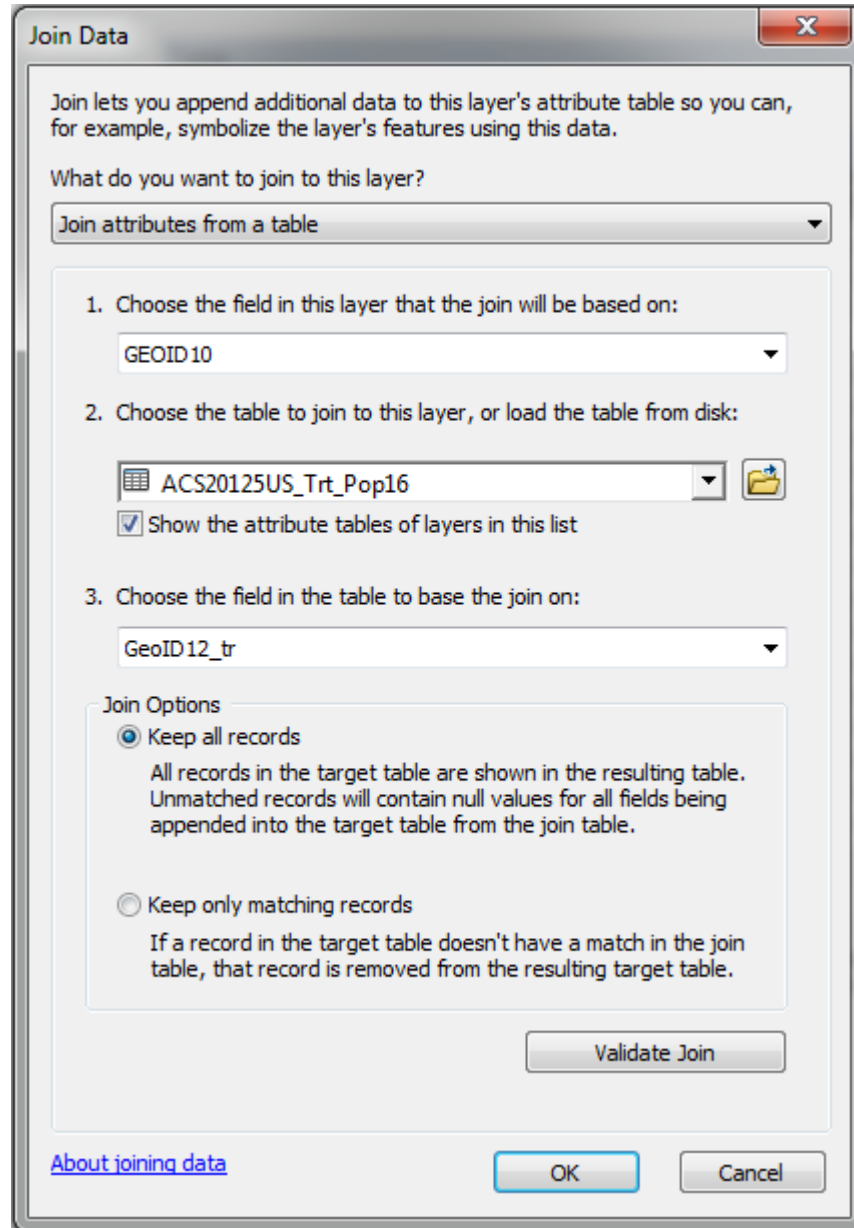
2. Select *GEOID10* as the common field in the census tract boundary; choose *MT\_Trct\_ACS2012* as the join table; and *STFID12\_tr* as the common field in the join table.  
You want to keep all records in this case.



3. After joining with ACS data, **Open Attribute Table** for *MT\_tract10\_prj\_carto* to check if ACS data was successfully appended to the table.

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- Next, join the male population table to the census boundary. Right click on *MT\_tract10\_prj\_carto* under **Joins and Relates** click **Join**. Set parameters as shown in the image below and click **OK**.



**Join Data**

Join lets you append additional data to this layer's attribute table so you can, for example, symbolize the layer's features using this data.

What do you want to join to this layer?

Join attributes from a table

- Choose the field in this layer that the join will be based on:  
GEOID 10
- Choose the table to join to this layer, or load the table from disk:  
ACS20125US\_Trtr\_Pop16  
 Show the attribute tables of layers in this list
- Choose the field in the table to base the join on:  
GeoID12\_tr

**Join Options**

Keep all records  
All records in the target table are shown in the resulting table. Unmatched records will contain null values for all fields being appended into the target table from the join table.

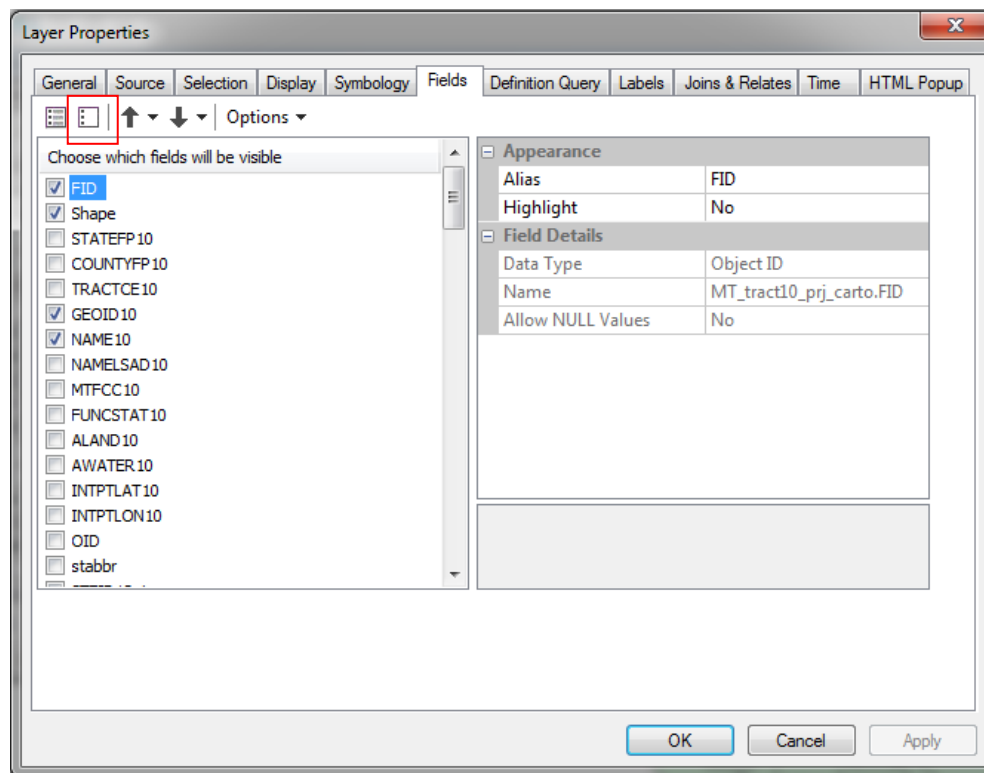
Keep only matching records  
If a record in the target table doesn't have a match in the join table, that record is removed from the resulting target table.

Validate Join

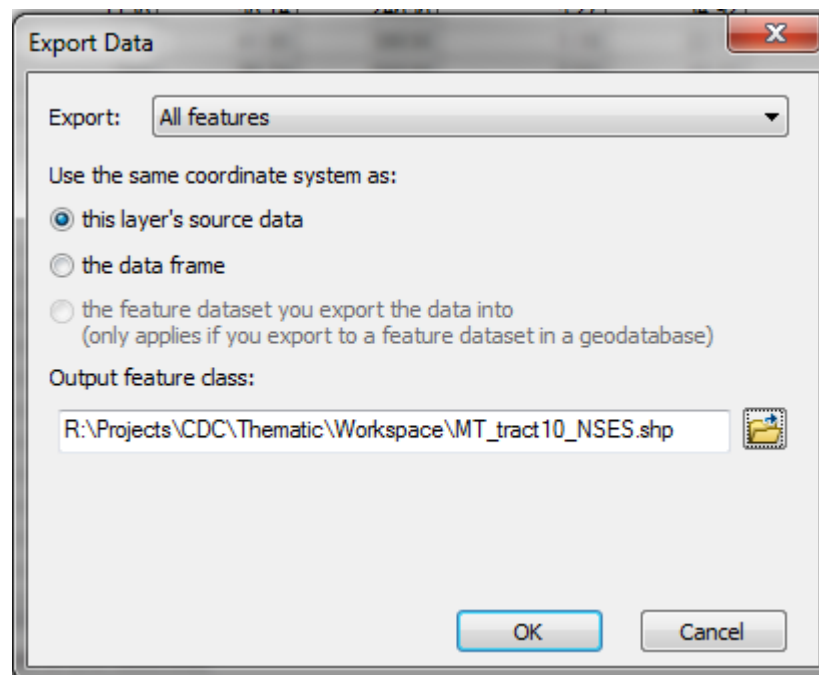
[About joining data](#) OK Cancel

- Now you have all the variables you need to do the calculation. You may want to do some housekeeping work to help ease the upcoming calculation process. Right click *MT\_tract10\_prj\_carto* and select **Properties**. Under **Fields** tab, turn all fields off and check only the fields you are interested in: census boundary identifiers, pct\_ItHS, TotEmpMale, pct\_It30, medHHinc, pctPubAsst, pctFemHH, and TotMale16.

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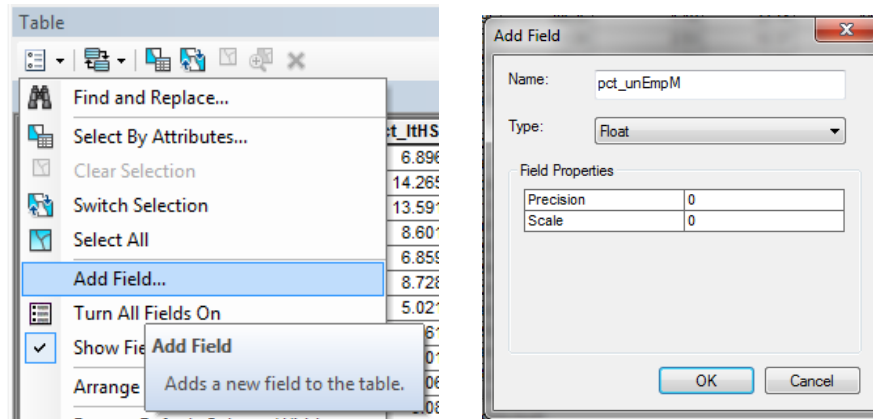


6. The data is cleaned now. Right click on *MT\_tract10\_prj\_carto*, **Export** the dataset under **Data** sub-menu. Click **Yes** to add *MT\_tract10\_NSES.shp* to your TOC.

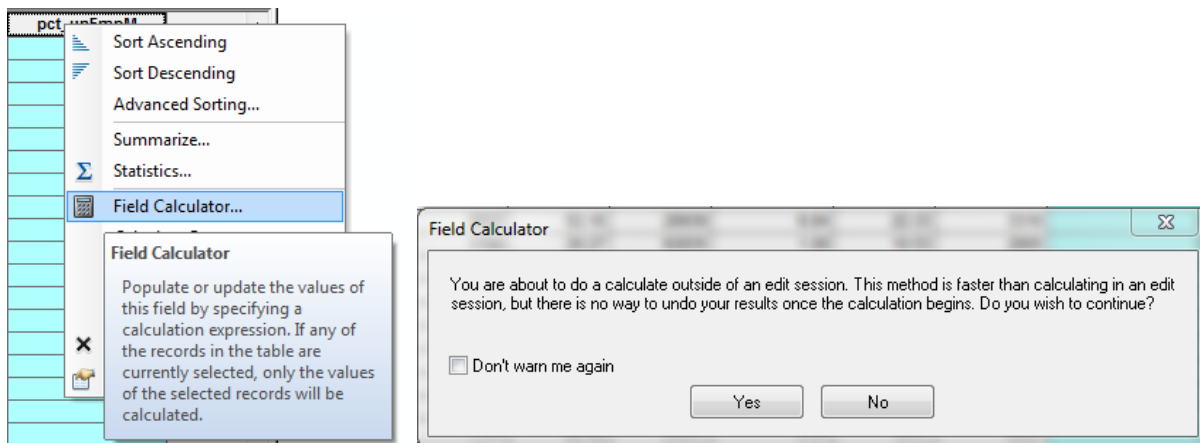


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7. **Open Attribute Table** for the newly exported shapefile. You need to derive 2) % male unemployment based on your requested data. Use **Add Field** under **Table options** to add a new field for % male unemployment.

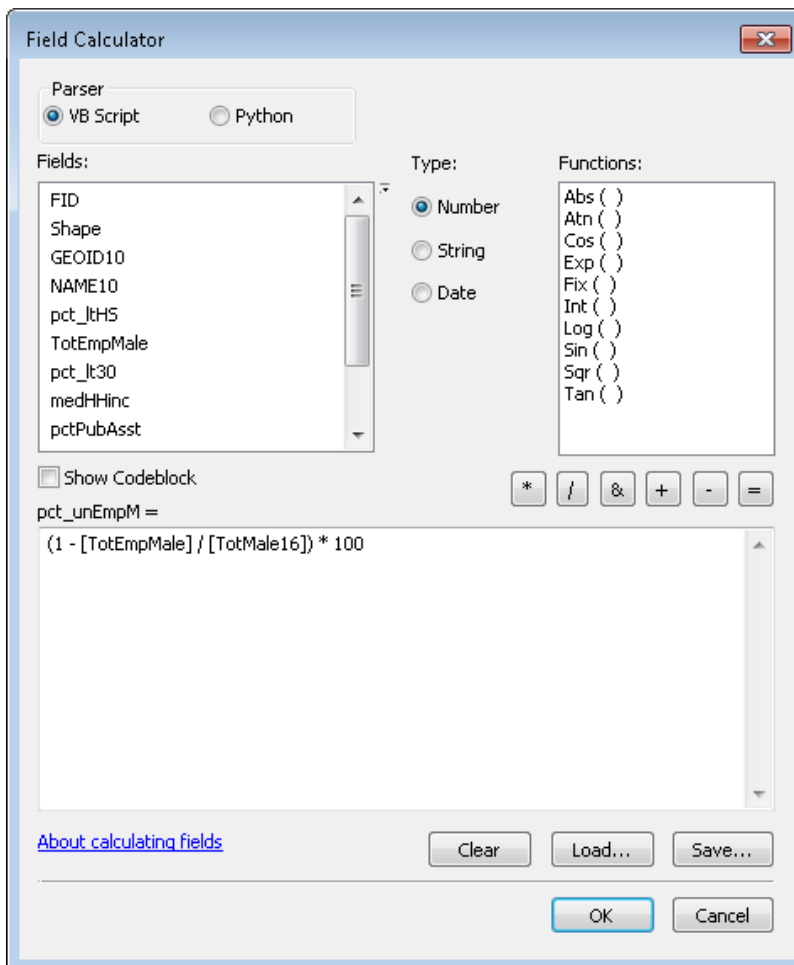


8. In the popup window, name the field as *pct\_unEmpM* and specify **Float** as the type of field.
9. Right click on *pct\_unEmpM* and select **Field Calculator**. Click **Yes** in the popup window to start the calculator.

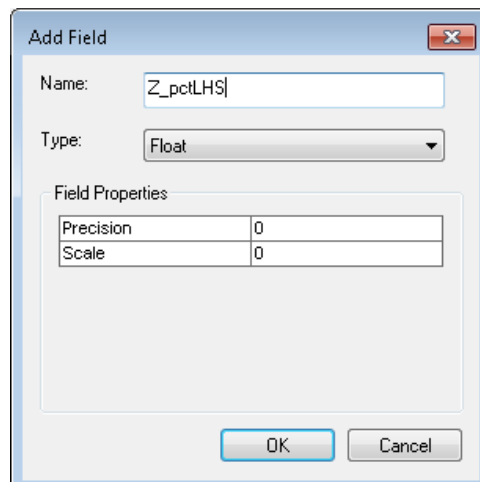


10. Use the following equation to calculate *pct\_unEmpM*:  $(1 - [\text{TotEmpMale}] / [\text{TotMale16}]) * 100$  and then click **OK**.

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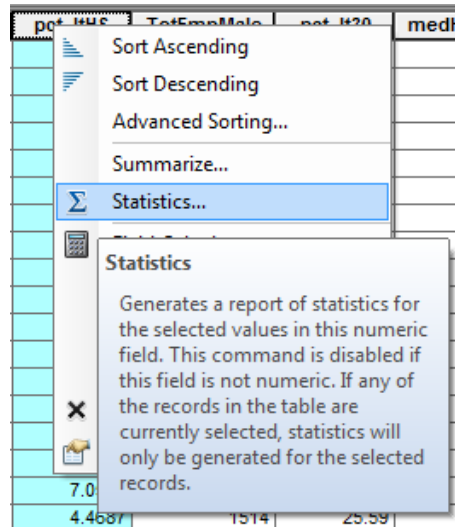
11. With all 6 variables ready, you can start to calculate the Z-score for each field. Z score (standard) indicates how many standard deviations an element is from the mean. Let's begin by calculating % less than high school. **Add Field** for the Z-score for % less than high school.



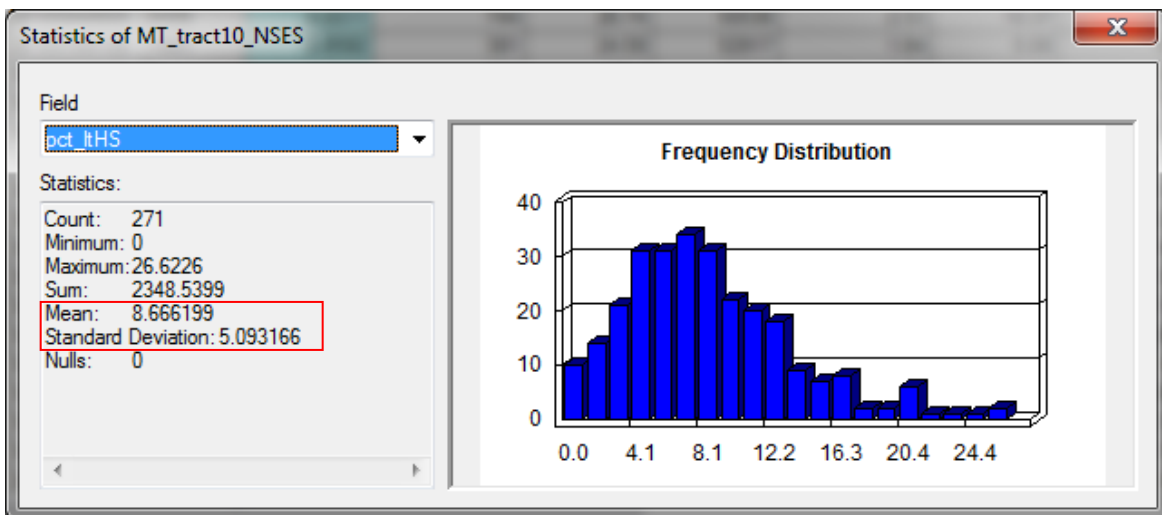


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12. To calculate Z score, we need the mean and standard deviations for the field. Right click on *pct\_lthS* and click **Statistics**.



13. Write down the **Mean** and the **Standard Deviation** of the field.



14. Right click on the newly created field *Z\_pctLHS* and select **Field Calculator**. Use the equation listed below to calculate Z-score:  $([pct\_lthS] - 8.67)/5.09$  and hit **OK**. Now you have the Z score for the first variable.
15. Similarly, calculate Z score for the remaining variables: *Z\_pctlt30*; *Z\_mHHinc*; *Z\_PubAss*; *Z\_pctFeHH*; and *Z\_pctUEM*.
16. Last, create new field named *NSES\_NDI* as float. Use the following equation to calculate the NDI:  $([Z\_pctLHS]+[Z\_mHHinc]+[Z\_pctlt30]+[Z\_PubAss]+[Z\_pctFeHH]+[Z\_pctUEM])/6$ .
17. Now you've successfully created the NSES NDI composite measure.



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### If you have time...

Try to use another method mentioned in the presentation for calculating a neighborhood deprivation index and compare the difference between them.

This time, base your calculation on the following set of variables:

Income/poverty:

% Poverty

% Female HH with Children

% <30K

% Public Assistance

Education: %Less than HS education

Employment: % Unemployment

Housing: % Crowding

Occupation: % Management (male)