EARTH SC/ENVIR SC/GEOG 2GI3: GEOGRAPHIC INFORMATION SYSTEMS

EXERCISE 5: TABLES AND LAYOUTS

Introduction

The objective of this exercise is to further acquaint you with tools for working with tables in ArcMap and to introduce you to map making using the GIS software. The data for this exercise are contained in a zip file called EX5. This file contains a shapefile of Hamilton dissemination areas, a waterbody shapefile, and an Excel workbook called HealthData. This workbook contains two spreadsheets. The first pertains to health data measured for census tracts and the other contains variable definitions. Your goal is to create a map that shows the rate of respiratory emergency room visits per 1000 people residing in census tracts.

Due: Beginning of your lab period on Week 12.
Instructions: Answers must be typed using MS Word, OpenOffice, or some other word-processing package.
Grading: Style and format is worth 20% of your mark. 1 mark is deducted for each mistake up to a total of
                5 marks since your exercise is worth 23 marks. Please consult lab notes for Exercise 5 (Exercise 5:
                Overview, which is found under Exercises) for style and format.

Exercise (23 marks)

Part A: Working with Shapefiles and Tables

The health data for this exercise are measured for census tracts (CTs) while the HamDA shapefile contains dissemination areas (DAs) – a finer level of geography than CTs. Your first task is to create a census tract shapefile from the dissemination area shapefile. After creating the CT shapefile, you need to join the health data to it and save the result as another new shapefile. The coordinate system of this shapefile must be NAD_1983_UTM_Zone_17N. It is this shapefile that will be used for mapping in Part B.

A.   Start ArcMap and set up your workspaces.
B.   Add HamDA.shp to the data frame. The shapefile's coordinate system is GCS_North_American_1983, which means that the data frame's coordinate system is also GCS_North_American_1983.
C.   Change the coordinate system of the data frame to NAD_1983_UTM_Zone_17N (remember, this is referred to as soft projection).
D.   Open HamDA's attribute table. In the table, you will find 5 fields and 874 records. Two fields contain census geography identifiers: DAUID contains the IDs of dissemination areas, and FIRST_CTUI contains the IDs for census tracts. As mentioned, the goal of this part of the exercise is to join the health data to a census tract shapefile, which does not yet exist (you will create it).
E.   To join tables together you need to ensure that there is a common field in both tables. In order to be common, they must both be of the same data type. In this particular case, the two census geography identifiers in the shapefile are stored as text (string), while the CTUID field in the HealthData file is numeric. You need to add a new field in the shapefile that is numeric so that you can join it to the correspondence file. To do so, first add HealthData to the data frame. Right click on HealthData and select Properties. Under the Fields tab, note the data type, precision, and scale of CTUID. Create a new field in HamDA's attribute table called CTUID. Make sure that the field's data type and properties match those you noted for CTUID in HealthData (note: the properties do not need to be exactly the same, but scale must have at least two decimal places to account for the fact that

some census tracts have been split over time and are designated as such by a decimal component in the identifier, and precision must be sufficiently large so as not to truncate any values).

F.   Once the field is created, use the Field Calculator to populate CTUID with the values from FIRST_CTUI. You can always tell if a field is numeric based on the column justification. Text fields are always left-justified. Numeric fields are always right-justified.

G.   Delete FIRST_CTUI.

H.   Open HealthData. You will see that it contains only 130 records meaning that there are only 130 census tracts. HamDA, on the other hand, contains 874 records. Close HealthData.

I.   To create a CT shapefile from HamDA, you need to merge together DAs comprising a census tract. This is easily done using the Dissolve tool. To access the tool, go to ArcToolbox | Data Management Tools | Generalization. Choose Dissolve. For the Input Features, select HamDA, and for the Output Feature Class, rename the default to HamCT.shp (make sure that you save this file to your flash drive). For the Dissolve Fields, select CTUID. Press OK.

J.   Open HamCT's attribute table.

Questions (2 marks)
1.   How many features comprise HamCT? (1)
2.   What is the coordinate system of HamCT? (1)

K.   Now that you have created the CT shapefile, you need to join the health data to it. To do so, right click on HamCT, and select Joins and Relates | Join. Structure the join so that you add the data from HealthData to the shapefile (for join options, make sure that Keep All Records is selected). After executing the join, you should see the fields from HealthData added to HamCT's attribute table.

Questions (3 marks)
3.   In HamCT's attribute table, what field serves as the foreign key in the join? (1)
4.   In HealthData, what field serves as the primary key in the join? (1)
5.   What type of relationship was executed between the two tables? (1)

L.   Close HamCT's attribute table.

M.   Create a new shapefile called HamHealth. This is done by right clicking on HamCT and selecting Data | Export Data. Export all features using the coordinate system of the data frame (i.e., NAD_1983_UTM_Zone_17N). Also be sure to save the new shapefile to your flash drive.

N.   Open HamHealth's layer properties and verify that that coordinate system is NAD_1983_UTM_Zone_17N. If it is not, redo step M.

O.   Save your map document as Ex5PartA.

Part B: Making a Map

An important function of a GIS is mapping information. To communicate information effectively, maps must be designed carefully following cartographic conventions. In ArcMap, maps are created by means of layouts. For this part of the exercise, you will create a map that shows the rate of respiratory emergency room visits per 1000 people residing in census tracts. The steps below outline a procedure for creating maps in ArcMap:

1.   Switch from Data View to Layout View (View | Layout View or click the Layout View button on the lower left of the map display). You can change the orientation (portrait or landscape) of your map via File | Page and Print Setup.

2.   Provide a descriptive name for each shapefile that you want included in your map by right clicking on the shapefile name, selecting Properties and entering a name to the right of Layer Name under the General tab. This name will become a legend heading on your map. You must never include the word "legend" as part of the legend heading. Another cartographic convention is to incorporate units of measurement in such headings.

3.   Provide a title for your map (Insert | Title). You must never include the word "map" as part of the title. The title must describe what is being mapped, along with the location and, in some circumstances, time (e.g., year).

Once you have created a title, you can position it on your layout by left clicking on it and holding down the left mouse button.

4. Create a legend for your map as follows:

   4.1. First, decide on how you will represent values associated with a particular shapefile attribute that is to appear as part of your legend.

   4.2. Right click on the shapefile name and select Properties. Click on the Symbology tab. You are now presented with various options for symbolizing features comprising a shapefile (e.g., CTs, water).

   4.3. If you wish to classify your features by a particular attribute, you must select Quantities. For ratio-level data mapped for areas, you should use Graduated Colors. You can then enter the attribute you want to classify, the number of classes (optimum is 5 or 6; there should be no less than 4), the classification method (the default is natural breaks), classification labels, etc. Cartographic convention states that classes cannot overlap (i.e., values cannot appear in two classes). You can also reverse sort labels and ranges (click on Label and Range, respectively) and flip symbols (click on Symbol) if you want legend values to appear in descending order rather than the default, which is ascending order. Finally, you can format labels by clicking on Label |Format Labels.

   4.4. Change the color of your symbols by clicking on each symbol individually and choosing a color from the color palette or by changing the color ramp.

   4.5. When you are satisfied with how you will symbolize each shapefile on your map, create your legend by clicking on Insert | Legend. The Legend Wizard will guide you in setting up your legend.

   4.6. If you wish to further edit your legend, you may do so by right clicking on it and selecting Convert to Graphics. You then right click on the legend again and select Ungroup. You can then edit any component of the legend, move legend items around, and delete legend items.

5. All maps should have a north arrow, a scale bar, and a neatline. You can insert these items onto your map via Insert on the menu bar.

6. Add additional text information by clicking on the Insert | Text.

7. Move features into desired positions.

8. Edit properties of features on the layout by right clicking on them and selecting Properties.

9. Print or export the layout (File | Print or Export Map).

A. Create a new map document and add HamHealth and Water to it.

B. Save the map document as EX5PartB and create a map showing the rate of respiratory emergency room visits per 1000 people residing in census tracts (the variable you will classify is RDRt1000). Follows the steps outlined above to create this map (also see Questions 6 and 7 for further details on what is expected).

C. Make sure that you save your map document periodically and especially when you complete this part of the exercise.

D. Export your map as a JPEG and insert it in your report (see Question 6).

Questions (18 marks)

6. Provide a copy of the map that you exported in step D. Your map must include a north arrow, legend (labels must be rounded to one decimal place and shown in descending order; darker color shades must indicate higher values; water must also be shown and colored appropriately), title, scale bar (distance expressed in kilometers and intervals expressed in multiples of five with no decimal points), a neatline placed around all features, and a textbox containing your name and the map's coordinate system. (15)

7. What classification scheme did you choose to classify RDRt1000? (1) Why did you choose it? (2)