Visualizing Data with Excel
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This hands-on computer training introduces participants to five visualization tools built into Excel 2016: conditional formatting; charts, pivot tables and charts, 3D maps, and PowerView. These are out-of-the-box tools that require no add-ins.

We will also discuss some options for sharing the visualizations. However, publishing interactive maps and views requires the use of SharePoint software. That software and process is beyond the scope of this presentation.

Data
- Download the data files from: **https://tinyurl.com/y94o9vr3**
- Open the worksheet: development-districts.xlsx.

The worksheet DDdata contains four years of data from the American Community Survey 5-year estimates (2009-2013, 2010-2014, 2011-2015, and 2012-2016). Each line of data contains a date, county, state, development district, and 16 additional fields of data about population, housing, and economic indicators.

To use the Excel visualization tools, data should be formatted with one row of field names at the top and with no empty rows, columns, and cells in the data. It is sometimes helpful to filter the data before visualizing.

Filtering data

EXERCISE 1
- Select the first row.
- Select Data > Filter.

CONDITIONAL FORMATTING

Conditional formatting is one of the easiest ways to help the user see patterns in the data or to bring attention to important values in a large table of data.

EXERCISE 2
- Filter **Year** to 2016.
- Select the **Population under 18** column.

- Select Home > Conditional Formatting > Data Bars > Choose any option.
- Sort the column smallest to largest to create a ranking.
- Select the **Population 65 and over** column.
- Select Home > Conditional Formatting > Color Scales > Choose any option.
- Select the **Minority Population** column.
- Select Home > Conditional Formatting > Top/Bottom Rules > Top 10%. Leave the default options. Click OK.
- Select Home > Conditional Formatting > Top/Bottom Rules > Bottom 10%. Change the options to Green Fill. Notice that the previous Top 10% formatting is still there.

CHARTS

Simple Chart

Let's create a simple column chart with educational attainment information for a few counties.

Exercise 3
- Open filter for **County**. Select a few counties.
- Select the columns for **Year**, **County**, **High school graduate**, and **Bachelor's degree**.
- Press F11. Note: F11 creates a chart in a new worksheet. Alt+F1 creates a chart in the same worksheet.

Note that the data is grouped by **Year** because our data is currently sorted by **Year**. To change the grouping to **County**, return to the data worksheet, sort **County** by A-Z, select worksheet columns again, and Press F11.

Note that the design ribbon is open. There are several functions here that allows you to format or manipulate the chart.

EXERICSE 4
- Open the dropdown for Quick Layout and move cursor over each option to see how it changes the look of the chart. Select one.
- Open the dropdown for Change Colors. Select one.
- Click on the different Chart Styles. Select one.
- Click on Change Chart Type. The tab for All Charts will open. Click through the different charts to see how each would look.

- Click on the Recommended Charts tab to see which charts are most appropriate for your data.
- Select the Clustered Column Chart.

Combination Chart

<u>**EXERCISE 5**</u>
- Open Change Chart Type.
- Under All Charts tab, select Combo.
- Change the Chart Type for ***Bachelor's Degree*** to Line.
- Select the first option under Line, also called Line. Click OK.

Let's add some additional formatting.

- Click the title to change the text.
- Double-click the legend to change the location and other formatting.
- To change text on the legend, return to the data worksheet and change the field name.

Copying, Linking, and Embedding Charts

Charts can be either copied to, linked to, or embedded in other documents. To copy, link, or embed, select the chart, then cut and paste as usual, selecting the appropriate paste options, which include whether to retain the formatting from Excel or to use the formatting of the new document.

Copying creates a static image of the chart. Linking creates a one-way link to the Excel worksheet to the new document. Changes to the Excel worksheet will make changes to the chart in the new document. Embedding the chart copies the entire Excel file into the new document. To make changes to the chart, edit the data in the new document. These changes will not be saved in the original Excel file.

PIVOT TABLES AND CHARTS

A pivot table is a way to easily summarize and manipulate data. For example, using a pivot table with our data, we can group the counties together by Development District and look at data for the district.

Pivot Table

EXERCISE 6
- Go to Insert > Recommended Pivot Tables (in Tables group).
- Look at the thumbnails of recommended pivot tables.
- Click Cancel to close the Recommended Pivot Tables menu.

Instead of selecting a recommended table, let's create our own table of the change in the percent of population 65 years and over by development districts over time.

- Select Insert > PivotTable (in Tables group). This will automatically select the entire range. This can be changed, but don't change it for this exercise.
- Make sure New Worksheet option is selected.
- Click OK.

On the right is a list of fields on the top with areas of the table listed below. Drag fields from the list to the appropriate areas to create a table.

- Drag **Year** to Columns.
- Drag **Development District** to Rows.
- Drag **Population 65 and over** to Values.

Note that when we move a field to Values it sums the data, by default. In this situation, we want an average not a sum so we need to change the formula.

- Open the dropdown of **Sum of Population 65 and over**.
- Select Value Field Settings.
- Select Average. Click OK.

Now that we have a nice summary table, we can create a chart using the same steps as above.

- Select range and press F11.

The chart can be formatted in the same way as other charts using options under PivotChart Tools > Design and PivotChart Tools > Format. Right-click on a field button to get an option to hide them and for other options.

Note: Selecting PivotChart from Charts group will give you a slightly different screen and menu options. But the same basic procedures apply.

3D MAP

As the name implies, this is a tool used to create maps. It is located on the Insert tab.

Values Map

> **EXERCISE 7**
> - Highlight the entire range on the DDdata worksheet.
> - Select Insert > 3D Map > Open 3D Maps.
>   - o If a menu listing Tours opens, Select New Tour.
> - This shows a globe a field list, and a menu.
>   - o If the field list is not visible, click on Home > Field List.
> - 3D Map may insert the location information automatically, but if not drag **County** and **State** to Location.
> - Make the map bigger by clicking on + sign.
> - Data can be visualized in several ways. Click through the icons under Data to see options: stacked columns, columns, bubbles, heat map, and region.

Let's make a map showing means-tested health insurance coverage by county.

> **EXERCISE 8**
> - Select Data > Region.
> - Drag **Population with means-tested health insurance coverage** to Value.
> - Use the dropdown to change this from a sum to an average.
> - Drag **Year** to Time.
> - Use the dropdown to change the setting of **Year** to Year.
> - A motion bar appears at the bottom of the map. Click on the go arrow to see how the values for each county changes over time.

The color changes in the counties is very subtle since we are using the region setting in Data. Let change it to a heat map to see a more dramatic showing of the change over time.

> **EXERCISE 9**
> - Select Data > Heat map.
> - Open Layer Options and change Radius of Influence to 250.
> - Click on the go arrow to see how the values change over time.

For maps with a time element, you can create an .mp4 videos of the tour by clicking on Create Video. (Don't do this now because it does take a few minutes to complete.)

Category/Thematic/Choropleth Map

Instead of values, we can also map categories. Let's create a map of the Development Districts.

> <u>**EXERICSE 10**</u>
> * Select Home > New Scene > World Map.
> * Drag *County* and *State* to location, if not already there.
> * Select Data > Region.
> * Drag *Development District* to Category.
> * Click the + sign to make the map bigger.

Formatting a map

There are lots of ways to format the map. Here are a few options. Try a few.

* Hover over a county and select the settings icon to edit the data card (aka, tool tip).
* Select Map Labels from the tool bar to add labels to the background map.
* If there is no legend, add it by clicking on Legend in tool bar.
* To edit title of legend, edit the Layer name in the menu, using the pencil edit.
* To change how categories are represented on legend, change the shading of regions by clicking on the dropdown above the category field fox and selecting no shading.
* To resize and reposition the legend click on it. Then drag to reposition. Use drag icons in the corner to resize.
* To change text font, size, color, and attributes double-click legend.
* Themes are available from the ribbon. Click on a few to see what is available.

For any of the maps you can use the Capture Screen function to copy a static picture of the current map to paste into another document.

POWERVIEW

PowerView is a data visualization technology that lets you create interactive charts, graphs, and maps. It is available in Excel 2013 and 2016. It is located on the Insert tab.

Note: It appears that Microsoft intends to continue supporting PowerView in Excel 2013 and 2016. However, PowerView will not be included in future versions and is being replaced by Power BI a separate, stand-alone visualization and analytics product from Microsoft.

Let's create an economic profile for a county, with information about housing costs, employment data, and poverty data. First we create tables, turn those tables into visualizations, add filters, then arrange them in the view.

EXERCISE 11
- Click on the tab for the data.
- Select the entire range.
- Select Insert > PowerView.

PowerView may try to be helpful by creating a table. You can use the field list to the right select and deselect the fields you want on your table or you can start a table from scratch. Let's start a table from scratch.

- Select and delete the table automatically created by PowerView.

Create Employment Data Chart

- Drag *County* to the view.
- Select *Labor force participation* and *Unemployment rate* from the field list.
- Change the calculated field data from Sum to Average using the dropdown in the fields box.
- Select the table.
- Select Design > Column Chart > Clustered Column.
- Select Layout > Legend > Show legend at bottom
- Select the chart and resize it smaller to make room for other charts.

Create Poverty Information Chart

- Create another table by dragging *County* to the view.

- Select ***Population below poverty*** and ***Population under 18 below poverty*** from the field list.
- Change the calculated fields from Sum to Average.
- Select the table.
- Select Design > Bar Chart > Clustered Bar.
- Select Design > Layout > Legend > Show Legend at Bottom.

Create Housing Cost Cards

- Create another table by dragging ***Count***y to the view.
- Select ***Housing cost to income ratio*** from the field list.
- Change the calculated field from Sum to Average.
- Select the table.
- Select Design > Table > Card.

Filtering and Formatting View

Adding filters will make the view interactive.

- Drag ***County*** and ***Year*** to the Filters area. These filters will apply to all of the visualizations in the view.
- Select a few counties.
- Select a year.

Formatting the view will make it more appealing.

- Resize and move the visualizations around the view until they fit nicely.
- Click on the title area to edit the title.
- Close the PowerView Fields menu.
- Select PowerView > Fit to Window.
- Select PowerView > Themes to pick automatic formatting. Or change the font, text size, or background.
- Select Insert > Text Box to add instructions or other information, then resize and reposition the text box.

How to Insert/Show 3D Map and PowerView on Insert Ribbon in Excel 2016

Step 1
- Open File > Options > Add-Ins.
- At the bottom of the screen, using the Manage dropdown, select COM Add-ins. Click Go…
- Check the boxes for Microsoft Power Map for Excel and Microsoft Power View for Excel. Click OK.

Step 2
- Open File > Options > Customize Ribbon.
- Using the Choose commands from dropdown, select All Commands > PowerView.
- Using the Customize the Ribbon dropdown, select Main Tabs > Insert.
- Click New Group. Rename the group, if desired.
- Click Add. Click OK. The PowerView function should appear on your Insert tab.

Repeat Step 2 for 3D Map.

You may need to restart Excel or your computer for these to show on the ribbon. When you first use PowerView it may ask you to install Silverlight and to click Reload. You make need to restart your computer.

information, veteran status, marital status, and/or political affiliation in its programs,
activities, or employment.