Power BI

Lab 02

Exploring Power Query in Excel 2013

Jump to the Lab Overview
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Document Revisions

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Lab Overview

Introduction

**Note:** This lab is the second in a series of seven labs, which explore self-service BI with Excel 2013 and Office 365 Power BI. If you plan to complete all of the labs, we recommend that you complete them in the order in which they were designed, although the labs can be completed in any order you choose.

This lab was produced by using the [Microsoft Power Query for Excel version 2.16.3785.242 published 29 September, 2014](#).

In this lab, you will extend the Power Pivot workbook created in **Lab 01** with additional data to enable the analysis of sales per capita. The additional data will consist of population by state, sourced from a web page based on data from the United States Census Bureau.

The principal goal of this lab is to query and transform the web data by using Power Query, and to add the query to the existing workbook data model (created in **Lab 01**). Once added, the query result – in the form of data model table – will be used to extend the data model with new calculated fields to enable the sales per capita analysis.

Finally, you will create a PivotTable report. The final report will look like the following.

![Figure 1 Previewing the PivotTable Report](#)
Objectives

The objectives of this exercise are to:

- Enable the Power Pivot Add-in
- Query and transform web data by using Power Query
- Extend an existing workbook data model with a Power Query query
- Enrich the workbook data model with new calculated fields
- Create a PivotTable report

Exercises

This hands-on lab comprises the following exercise:

1. Exploring Power Query

Estimated time to complete this lab: 30 minutes
Exercise 1: Exploring Power Query

In this exercise, you will extend the Power Pivot workbook created in Lab 01 with additional data to enable the analysis of sales per capita.

Task 1 – Opening and Exploring the Excel Workbook

1. To open Excel, on the taskbar, click the Excel program shortcut.
2. In Excel, click Open Other Workbooks (located at the bottom of the left panel).
3. Select Computer, and then click Browse.
4. In the Open window, navigate to the D:\PowerBI\Lab02\Starter folder.
5. Select the Sales Analysis.xlsx file, and then click Open.

   Note: This is the workbook completed in Lab 01.

6. If prompted with a security warning, click Enable Content.

7. On the File ribbon tab (also known as the backstage view), select Save As, select Computer, and then click Browse.
8. In the Save As window, navigate to the D:\PowerBI\Lab02 folder.
9. Click Save.
Task 2 – Enabling the Power Pivot Add-In

In this task, if necessary, you will enable the Power Pivot Add-in. In Excel 2013, by default, the Power Pivot Add-in is disabled.

1. If the **PowerPivot** ribbon tab is not available, on the **File** ribbon tab, select **Options**.

   **Note:** If the **PowerPivot** ribbon tab is available, there is no need to complete the steps in this task; continue the lab from Task 3.

2. In the **Excel Options** window, select the **Add-Ins** page.

3. In the **Manage** dropdown list, select **COM Add-Ins**, and then click **Go**.

4. In the **COM Add-Ins** window, select the **Microsoft Office PowerPivot for Excel 2013** add-in, and then click **OK**.

5. Notice the addition of the **PowerPivot** ribbon tab.
Task 3 – Exploring the Power Pivot Data Model

In this task, you will explore the design of the Power Pivot data model created in Lab 01.

1. On the PowerPivot ribbon tab, click Manage.

![Figure 6](image)

*Launching the Power Pivot Window*

2. If necessary, maximize the Power Pivot window.

3. To switch to Diagram View, on the Home ribbon tab, from inside the View group, click Diagram View.

4. Review the design of the data model, and in the State table, notice the absence of any population data to support the required sales per capita analysis.

5. To close the Power Pivot window, click the X button located at the top right corner.

Task 4 – Exploring Web Data

In this task, you will open a web page consisting of US Census sourced population data by state.

1. To open Internet Explorer, on the taskbar, click the Internet Explorer program shortcut.

2. Click the Favorites icon (located at the top right corner), and then select US Resident Population – July 2009.

![Figure 7](image)

*Locating the Favorites Icon*
3. Review the web page, and notice that it presents a table of US states together with population and rank columns. Notice also that the first row in the table is for the United States and so represents a total of all states.

4. To copy the web page URL to the clipboard, in the URL box, right-click the URL, and then select Copy.

**Task 5 – Creating a Power Query Query**

In this task, you will create a Power Query query to source data from the web page. You will then configure a series of steps to shape and filter the query. Finally, you will configure the query to load to the workbook data model.

1. Switch to the Excel.

2. On the **Power Query** ribbon tab, from inside the **Get External Data** group, click **From Web**.

   ![Figure 8](image)

   **Figure 8**
   **Retrieving Data From the Web**

3. In the **From Web** window, to paste in the copied URL, right-click inside the **URL** box, and then select **Paste**.

4. Click **OK**.

5. In the **Navigator** pane, hover over the **Table 0** item to show the peek at the data preview.

   **Note:** The **Document** item represents the entire HTML document, and this can be queried also.

6. To create a Power Query sourced from an item, right-click the **Table 0** item, and then select **Edit**.

7. If necessary, maximize the **Query Editor** window.
8. In the **Query Editor** window, in the **Query Settings** pane (located at the right), in the **Name** box, replace the text with **StatePopulation**.

9. In the **Query Settings** pane, beneath the **Name** box, notice the **Applied Steps** list.

   **Note:** The query already consists of three steps. The first step retrieves the data from the web page source. The second step retrieves the data from the first item (**Table 0**), and the third step uses in-built intelligence to detect and transform data types.

10. In the **Applied Steps** list, notice that the **Changed Type** step is selected.

11. To show the formula bar, on the **View** ribbon tab, check **Formula Bar**.

12. Notice that the formula bar (located below the ribbon) includes an expression for the selected step to transform the column data types.

   **Note:** It is not important to understand the details of the formula.

13. Notice also that the data is available for data preview.

14. To remove the United States row (representing the total of all states), in the **State** column header, click ![United States filter icon](united-states.png), and then in the filter box, commence typing the word **United**.

15. When the list reveals the **United States** item, uncheck the item, and then click **OK**.

16. Review the expression in the formula bar, and notice that the number of steps has increased to four.

   **Note:** You will notice that each shaping and filter activity applied to the query will result in a step. You will review and explore the steps in the **Applied Steps** list later in this task.
17. To rename the second column, right-click the **Number** column header, and then select **Rename**.

   **Note:** Transformation commands are also located on the ribbon. You can choose to apply the commands by using the technique that you prefer: From the ribbon, or by using a right-click to open a context-sensitive menu.

18. Replace the column name text with **CensusPopulation**, and then press **Enter**.

19. To remove the third column, right-click the **Rank** column header, and then select **Remove**.

20. In the **Query Settings** pane, review the applied steps.

21. Select the **Source** step, and then review the expression in the formula bar, and the data.

22. Select each subsequent step to review the step expressions and preview of data.

   **Note:** It is possible to delete any step (although, take care not to delete a step that a downstream steps depend on). It is also possible to modify the filters for a **Source** or **Filtered Rows** step.

   The steps reinforce that Power Query procedurally filters and shapes data to produce a transformed query result.

23. To close the query, on the **Home** ribbon tab, from inside the **Query** group, click the **Close & Load** dropdown arrow, and then select **Close & Load To**.

![Figure 10](image)

*Figure 10*

*Locating the Close & Load To Command*
24. In the **Load To** window, select the **Only Create Connection** option, and then check the **Add this Data to the Data Model** checkbox.

![Figure 11](image)

*Reviewing the Load Settings*

25. Click **Load**.

26. In Excel, in the **Workbook Queries** pane, notice the addition of the **StatePopulation** query, and notice also that 51 rows were loaded (consisting of the 50 states and the District of Columbia).

27. Hover over the **StatePopulation** query to show the peek at the data preview.

28. Review the preview data and notice the last refresh time, load settings and data sources.

**Task 6 – Integrating the Power Query Table with the Workbook Data Model**

In this task, you will integrate the Power Query **StatePopulation** table data with the **State** table. You will also investigate a data quality issue that will be addressed by using a Power Query transformation in the next task.

1. On the **PowerPivot** ribbon tab, click **Manage**.

2. In the PowerPivot window, to switch to Diagram View, on the **Home** ribbon tab, from inside the **View** group, click **Diagram View**.
3. Notice the addition of the **StatePopulation** table (you may need to scroll to the far right of the diagram).

4. To review the data, right-click the **StatePopulation** table, and then select **Go To**.

5. In the record navigator (located at the bottom left of the window), notice the record count of **51**.

6. In the Power Pivot window, select the **State** table (not the **StatePopulation** table).

   ![Figure 12 Locating the State Table](image)

7. To add a calculated column, on the **Design** ribbon tab, from inside the **Columns** group, click **Add**.

8. In the formula bar (located above the table grid), enter the following expression.

   ![Figure 13 Locating the Formula Bar](image)

   **Note:** For convenience, the expression can be copied from the file `D:\PowerBI\Lab02\Assets\Snippets.txt`.

   ```DAX
   =LOOKUPVALUE(StatePopulation[CensusPopulation], StatePopulation[State], [StateName])
   ```

   **Note:** This formula uses the **LOOKUPVALUE** function to retrieve the value in the **CensusPopulation** column where the state names match.

9. Press **Enter**.

10. Right-click the header of the new column, and then select **Rename Column**.

11. Replace the column name text with **CensusPopulation**, and then press **Enter**.
12. To filter the table, in the **CensusPopulation** column header, click ▼.

13. Uncheck *(Select All)*, then scroll to the bottom of the item list, and then check the *(Blanks)* item.

![Figure 14](image)

**Figure 14**
*Isolating Records with Missing CensusPopulation Values*

14. Click OK.

15. Notice that there are 11 records that do not have a census population value.

16. Investigation reveals that the web page source stores state names that consist of more than one word by using non-breaking spaces (represented in HTML as &nbsp;).

   `<tr><td>Nebraska</td><td style='text-align:right'></td></tr>`
   `<tr><td>Nevada</td><td style='text-align:right'>2</td></tr>`
   `<tr><td>New Hampshire</td><td style='text-align:right'>,</td></tr>`
   `<tr><td>New Jersey</td><td style='text-align:right'></td></tr>`
   `<tr><td>New Mexico</td><td style='text-align:right'></td></tr>`
   `<tr><td>New York</td><td style='text-align:right'></td></tr>`
   `<tr><td>North Carolina</td><td style='text-align:right'></td></tr>`
   `<tr><td>North Dakota</td><td style='text-align:right'></td></tr>`
   `<tr><td>Ohio</td><td style='text-align:right'>11,5</td></tr>`
   `<tr><td>Oklahoma</td><td style='text-align:right'></td></tr>`

**Figure 15**
*Reviewing the HTML Fragment Showing Inconsistent Space Characters*

**Note:** A regular space character is different to a non-breaking space character. The first is represented by the ASCII decimal value 32 (hex 20), and for the non-breaking space it is represented by the ASCII decimal value 160 (hex A0).

The DAX LOOKUPVALUE function can only lookup a value where there is an exact character-for-character match of text values.
Task 7 – Modifying the Power Query Query

In this task, you will add a new step to the Power Query query to address the inconsistent space issue identified in the previous task.

1. Switch to Excel.
2. In the Workbook Queries pane, right-click the StatePopulation query, and then select Edit.
3. In the Query Editor window, select the State column header.
4. On the Home ribbon, from inside the Transform group, click Replace Values.

![Image](image.png)

**Figure 16**
*Locating the Replace Values Command*

5. In the Replace Values window, in the Value To Find box, enter #(00A0). (All 0’s are zeros).

   **Note:** 00A0 is the hexadecimal ASCII character code for a non-breaking space.

6. In the Replace With box, enter a single space.
7. Click OK.
8. Review the expression in the formula bar, and notice that the entered hexadecimal value has been altered.

   **Note:** This behavior occurs by design. The value you entered was escaped with the # symbol.

9. In the formula bar, edit the formula to remove the inserted three characters (#), and then press Enter.
10. Ensure that the expression is the same as the following.

```
Power Query Formula Language
=Table.ReplaceValue("Removed Columns","\0"," ",Replacer.ReplaceText{"State"})
```

11. On the **Home** ribbon, from inside the **Query** group, click the **Close & Load** dropdown arrow, and then select **Close & Load**.

   **Note:** The Power Query query is refreshed and the corresponding table in the workbook data model is also be refreshed.

12. Switch to the **Power Pivot** window, and then review the data in the **State** table.

13. Notice that no records are visible in the **State** table, because all records now have a census population value.

14. On the **Home** ribbon tab, from inside the **Sort and Filter** group, click **Clear All Filters**.

   ![Clear All Filters](image)

**Figure 17**

*Clearing All Filters*
**Task 8 – Completing the Data Model Enhancements**

In this task, you will add two calculated fields and then hide a column and the Power Query table.

1. To add a calculated field based on the **CensusPopulation** column, select the **CensusPopulation** column header, and then on the **Home** ribbon tab, from inside the **Calculations** group, click the **AutoSum** dropdown arrow.

   ![Figure 18: Locating the AutoSum Dropdown Arrow](image)

2. In the dropdown list, select **Sum**.

3. In the calculation area (located at the bottom of the table grid), notice the calculated field. You may need to widen the **CensusPopulation** column to fully view the cell content, which consists of the calculated field name and value (based on the sum aggregation of the table rows).

4. In the formula bar, notice the DAX expression that was automatically generated.

5. To rename the calculated field to **Population**, in the formula bar, modify the first portion of the expression as follows.

   ```DAX
   Population:=SUM([CensusPopulation])
   ```

6. Press **Enter**.

7. To format the calculated field, in the calculation area, right-click the calculated field, and then select **Format**.

8. In the **Formatting** window, in the **Category** list, select **Number**.

9. In the **Format** dropdown list, select **Whole Number**.
10. Check the **Use 1000 Separator** checkbox.

![Formatting dialog box](image)

**Figure 19**
*Reviewing the Calculated Field Formatting*

11. Click **OK**.

12. Notice the formatting applied to the calculated field value.

13. To hide the **CensusPopulation** column, right-click the **CensusPopulation** column header, and then select **Hide From Client Tools**.

14. Select the **Sales** table.

![Sales table](image)

**Figure 20**
*Locating the Sales Table*

15. In the calculation area, select the cell directly beneath the **Sales** calculated field.
16. In the formula bar, enter the following expression.

Note: For convenience, the expression can be copied from the D:\PowerBI\Lab02\Assets\Snippets.txt file.

DAX
Sales per Capita:=DIVIDE([Sales], [Population])

Note: The DIVIDE function divides two expressions, providing that the second argument results in a non-zero number. If the second expression results in zero or blank (missing), then the function will return blank.

17. Format the calculated field by using the Currency category (with default symbol and decimal places).

18. To hide the StatePopulation table, right-click the StatePopulation table tab, and then select Hide From Client Tools.

Task 9 – Creating a PivotTable Report

In this task, you will add and configure a PivotTable report to the workbook.

1. In the Power Pivot window, on the Home ribbon tab, click the arrow beneath PivotTable, and then select PivotTable.
2. In the Create PivotTable window, to create a new worksheet, click OK.

3. Notice that a PivotTable has been added to an Excel worksheet, and that the PivotTable Fields pane is open (located at the right).

4. To close the Workbook Queries pane, on the Power Query ribbon tab, from inside the Manage group, click Workbook Queries.

5. To rename the worksheet, right-click the Sheet1 worksheet tab, and then select Rename.

6. Rename the worksheet to Sales per Capita, and then press Enter.

7. To add a report filter, in the PivotTable Fields pane, expand the Date group, and then drag the Calendar hierarchy into the Filters drop zone.

8. In the PivotTable report filter (cell C1), click , expand the All member, select CY2013, and then click OK.

9. In the PivotTable Fields pane, expand the Sales group, and then check the Sales and Sales per Capita fields.

10. To introduce row labels, in the PivotTable Fields pane, expand the State group, expand the More Fields folder, and then check the StateName field.

11. To sort the states in descending order of sales per capita, in the PivotTable, right-click any cell in the Sales per Capita column, and then select Sort | Sort Largest to Smallest.
12. To apply conditional formatting, select any **Sales per Capita** value cell.

13. On the **Home** ribbon tab, from inside the **Styles** group, click **Conditional Formatting**, select **Data Bars**, and then select any of the gradient fill data bar styles.

14. Click the smart tag that appears to the right of the formatted cell, and then select **All Cells Showing “Sales per Capita” Values for “StateName”**.

![Figure 23](image.png)

*Figure 23*  
Applying Conditional Formatting to All Sales per Capita Cells

**Task 10 – Finishing Up**

In this task, you will finish up by closing Excel.

1. To save the workbook, on the **File** ribbon tab, click **Save**.

2. To close Excel, click the X button located at the top right corner.

3. Close the Internet Explorer window.

**Summary**

In this lab, you extended the Power Pivot workbook created in **Lab 01** with a Power Query query to enable the analysis of sales per capita. The additional data consisted of population by state, sourced from a web page based on data from the United States Census Bureau.