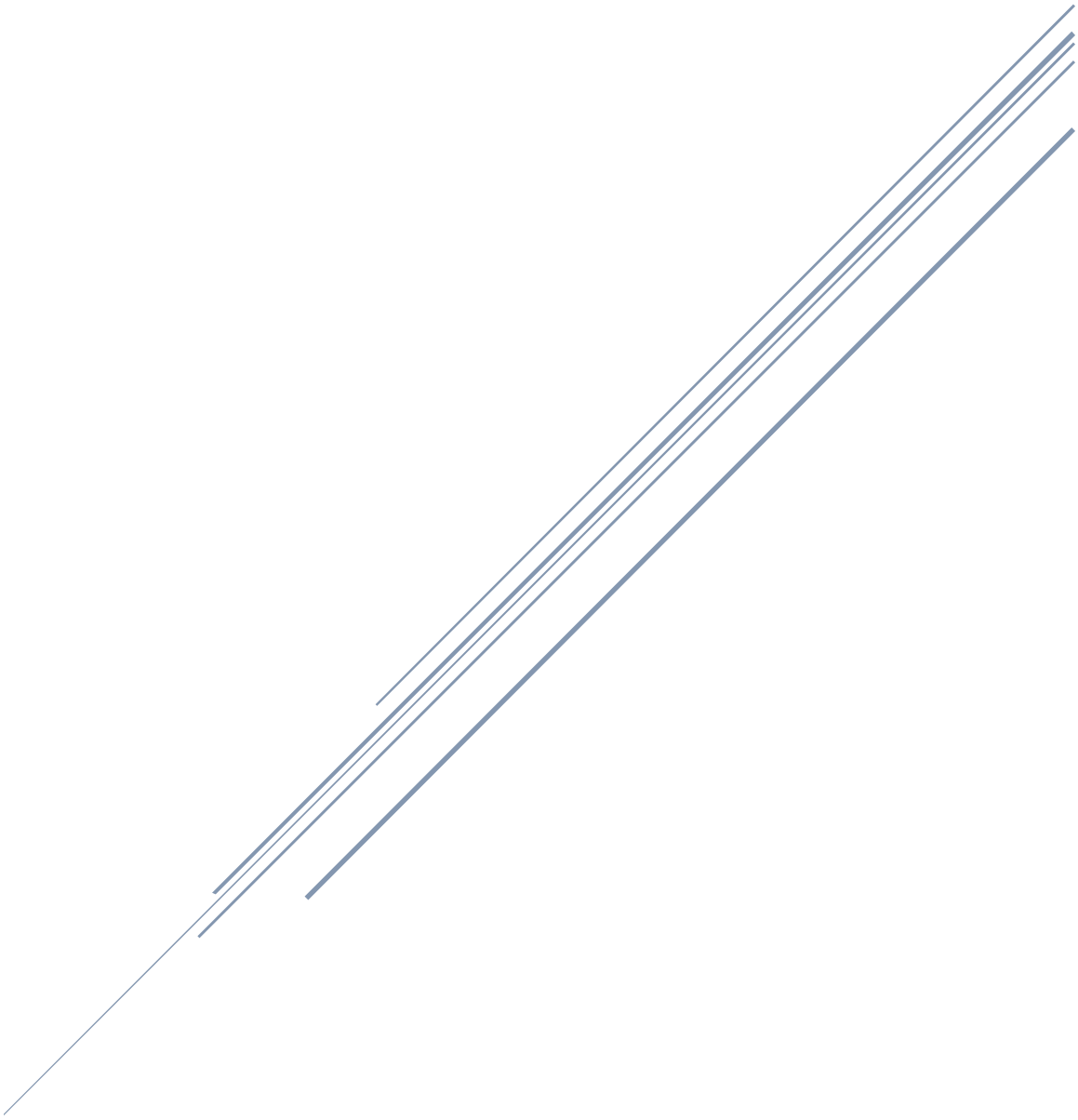
EXCEL POWERPIVOT



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Module 1: Import Data into Excel, and Create a Data Model

Abstract: This is the first module in a series designed to get you acquainted and comfortable using Excel and its built-in data mash-up and analysis features. **We have to review PivotTables and models before we got o PowerPivot.** These modules build and refine an Excel workbook from scratch, build a data model, then create amazing interactive reports using Power View. The modules are designed to demonstrate Microsoft Business Intelligence features and capabilities in Excel, PivotTables, Power Pivot, and Power View.

Note: This module describes data models in Excel 2013. However, the same data modeling and Power Pivot features introduced in Excel 2013 also apply to Excel 2016.

In these modules you learn how to import and explore data in Excel, build and refine a data model using Power Pivot, and create interactive reports with Power View that you can publish, protect, and share.

The modules in this series are the following:

1. **Import Data into Excel 2013, and Create a Data Model**
2. Extend Data Model relationships using Excel, Power Pivot, and DAX
3. Create Map-based Power View Reports
4. Incorporate Internet Data, and Set Power View Report Defaults
5. Create Amazing Power View Reports - Part 1
6. Create Amazing Power View Reports - Part 2

In this module, you start with a blank Excel workbook.

The sections in this module are the following:

Import data from a database

Import data from a spreadsheet

Import data using copy and paste

Create a relationship between imported data

At the end of this module is a quiz you can take to test your learning.

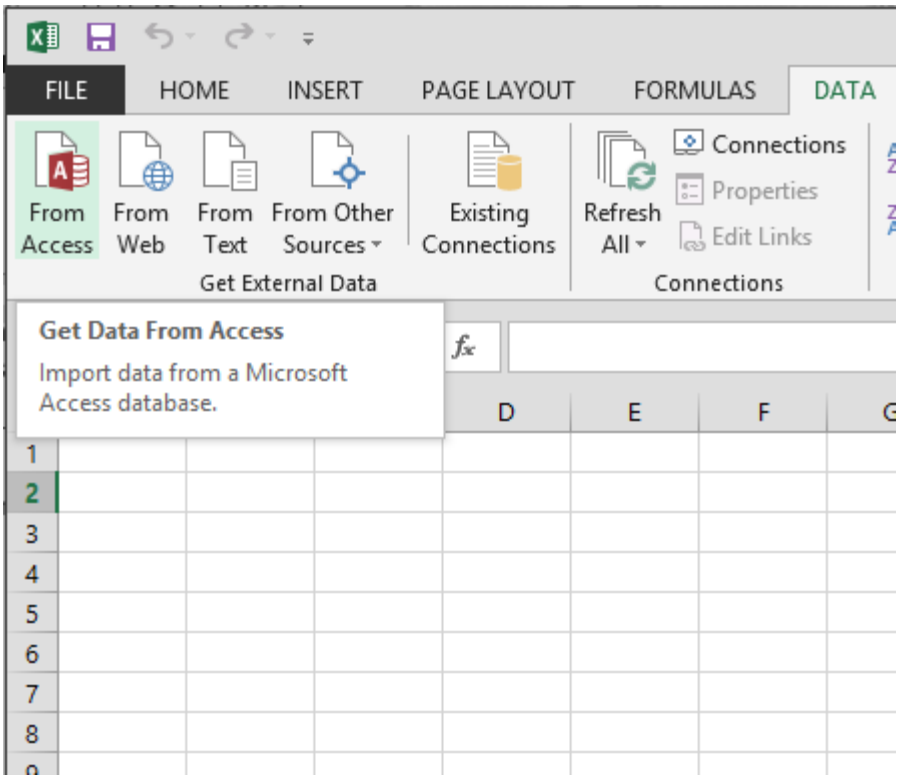
This module series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. We suggest you go through each module in order. Also, modules use Excel 2013 with Power Pivot enabled.

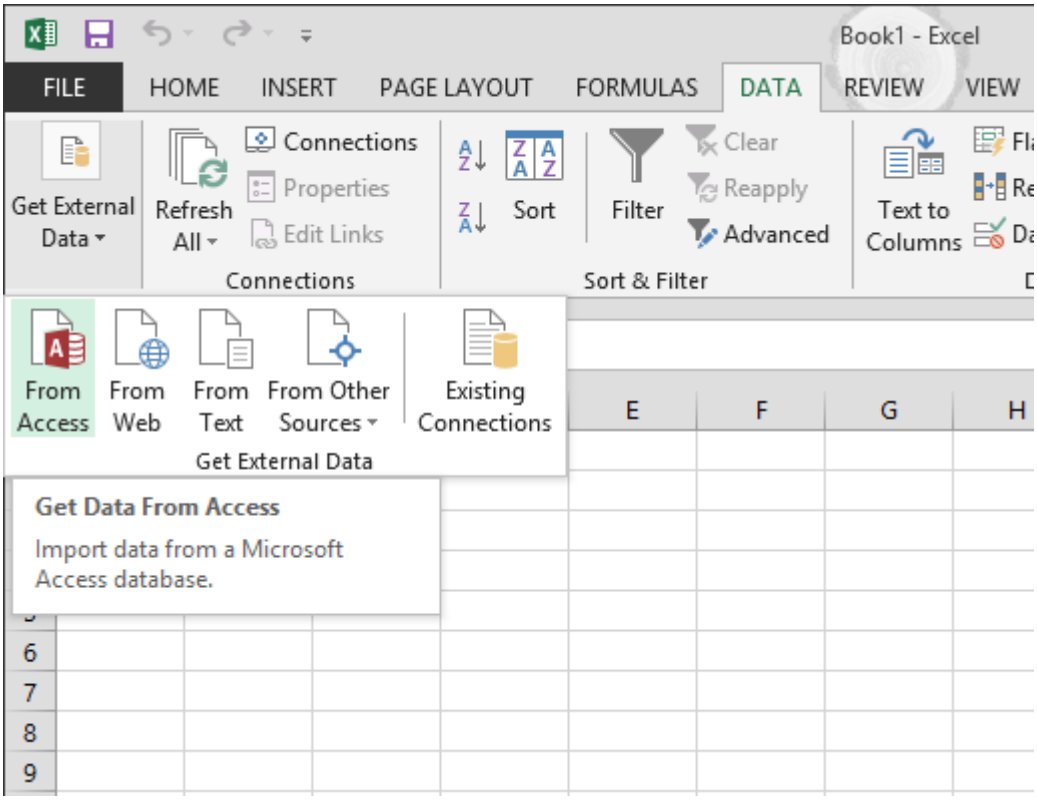
Import data from a database

We start this module with a blank workbook. The goal in this section is to connect to an external data source, and import that data into Excel for further analysis.

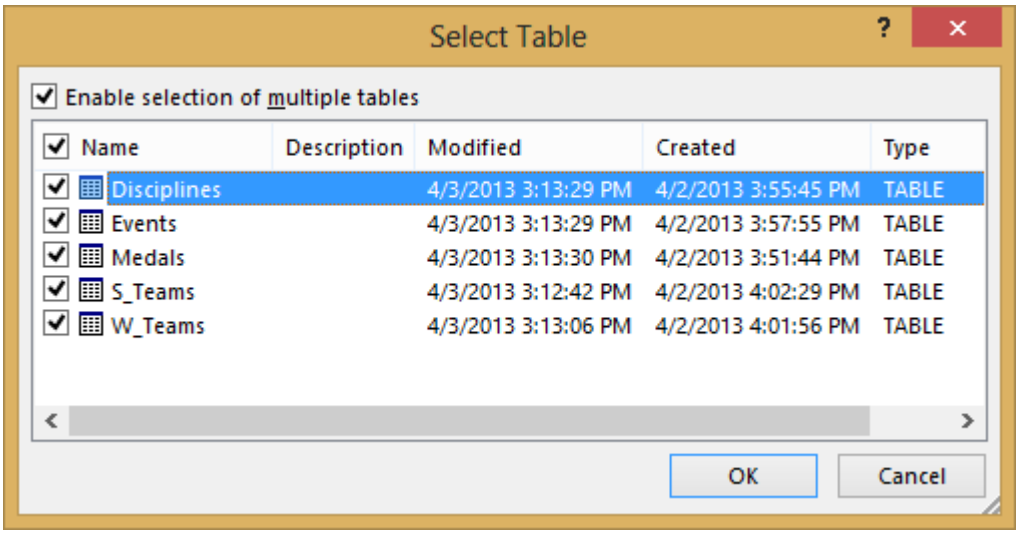
Let's start by downloading some data from the Internet. The data describes Olympic Medals, and is a Microsoft Access database.

1. Locate these files within your C:\StudentWork folder:
   > *OlympicMedals.accdb Access database*
   > *OlympicSports.xlsx Excel workbook*
   > *Population.xlsx Excel workbook*
   > *DiscImage_table.xlsx Excel workbook*
2. In Excel 2013, open a blank workbook.
3. Click **DATA > Get External Data > From Access**. The ribbon adjusts dynamically based on the width of your workbook, so the commands on your ribbon may look slightly different from the following screens. The first screen shows the ribbon when a workbook is wide, the second image shows a workbook that has been resized to take up only a portion of the screen.





4. Select the OlympicMedals.accdb file you downloaded and click **Open**. The following Select Table window appears, displaying the tables found in the database. Tables in a database are similar to worksheets or tables in Excel. Check the **Enable selection of multiple tables** box, and select all the tables. Then click **OK**.

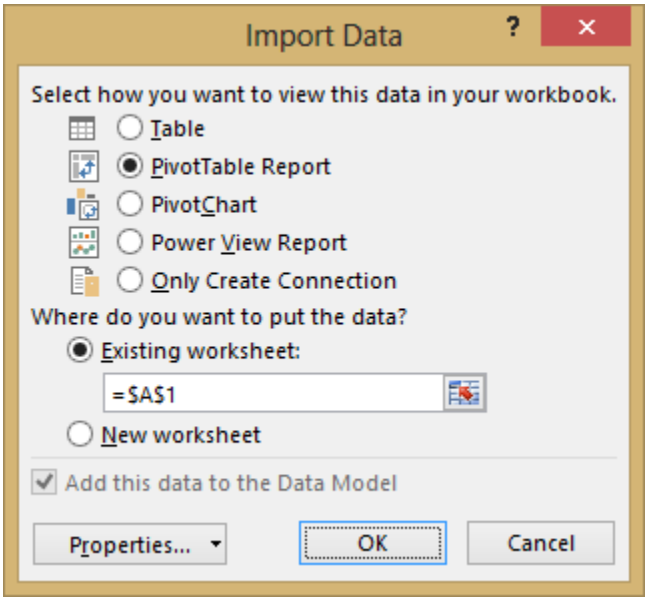


5. The Import Data window appears.

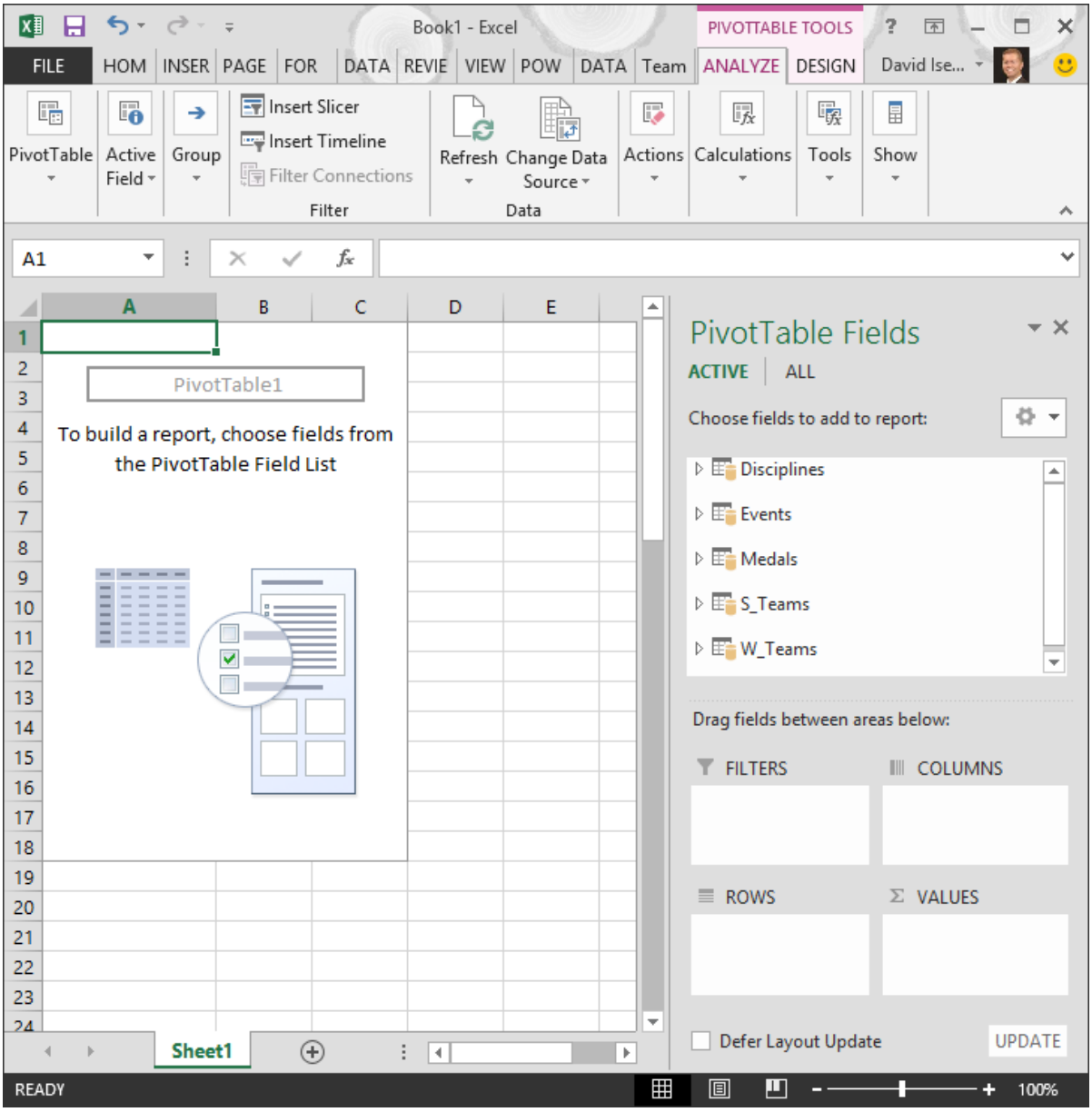
Note: Notice the checkbox at the bottom of the window that allows you to **Add this data to the Data Model**, shown in the following screen. A Data Model is created

automatically when you import or work with two or more tables simultaneously. A Data Model integrates the tables, enabling extensive analysis using PivotTables, Power Pivot, and Power View. When you import tables from a database, the existing database relationships between those tables is used to create the Data Model in Excel. The Data Model is transparent in Excel, but you can view and modify it directly using the Power Pivot add-in. The Data Model is discussed in more detail later in this module.

Select the **PivotTable Report** option, which imports the tables into Excel and prepares a PivotTable for analyzing the imported tables, and click **OK**.



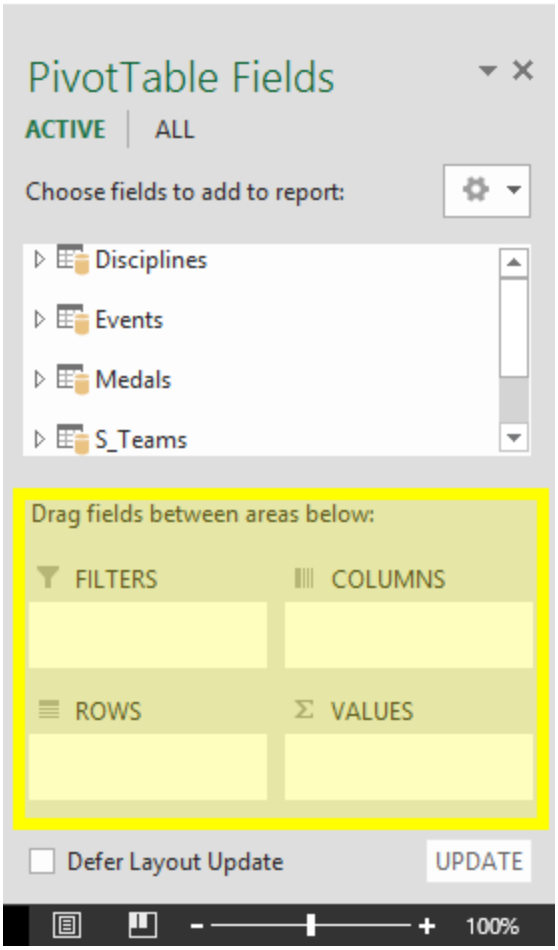
6. Once the data is imported, a PivotTable is created using the imported tables.



With the data imported into Excel, and the Data Model automatically created, you're ready to explore the data.

Explore data using a PivotTable

Exploring imported data is easy using a PivotTable. In a PivotTable, you drag fields (similar to columns in Excel) from tables (like the tables you just imported from the Access database) into different **areas** of the PivotTable to adjust how it presents your data. A PivotTable has four areas: **FILTERS**, **COLUMNS**, **ROWS**, and **VALUES**.



It might take some experimenting to determine which area a field should be dragged to. You can drag as many or few fields from your tables as you like, until the PivotTable presents your data how you want to see it. Feel free to explore by dragging fields into different areas of the PivotTable; the underlying data is not affected when you arrange fields in a PivotTable.

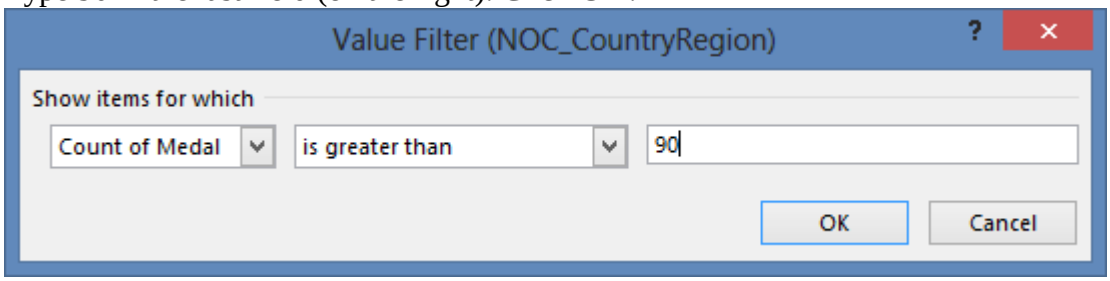
Let's explore the Olympic Medals data in the PivotTable, starting with Olympic medalists organized by discipline, medal type, and the athlete's country or region.

1. In **PivotTable Fields**, expand the **Medals** table by clicking the arrow beside it. Find the NOC_CountryRegion field in the expanded **Medals** table, and drag it to the **COLUMNS** area. NOC stands for National Olympic Committees, which is the organizational unit for a country or region.
2. Next, from the **Disciplines** table, drag Discipline to the **ROWS** area.
3. Let's filter Disciplines to display only five sports: Archery, Diving, Fencing, Figure Skating, and Speed Skating. You can do this from within the **PivotTable Fields** area, or from the **Row Labels** filter in the PivotTable itself.
    a. Click anywhere in the PivotTable to ensure the Excel PivotTable is selected. In the **PivotTable Fields** list, where the **Disciplines** table is expanded, hover over its Discipline field and a dropdown arrow appears to the right of the field. Click the

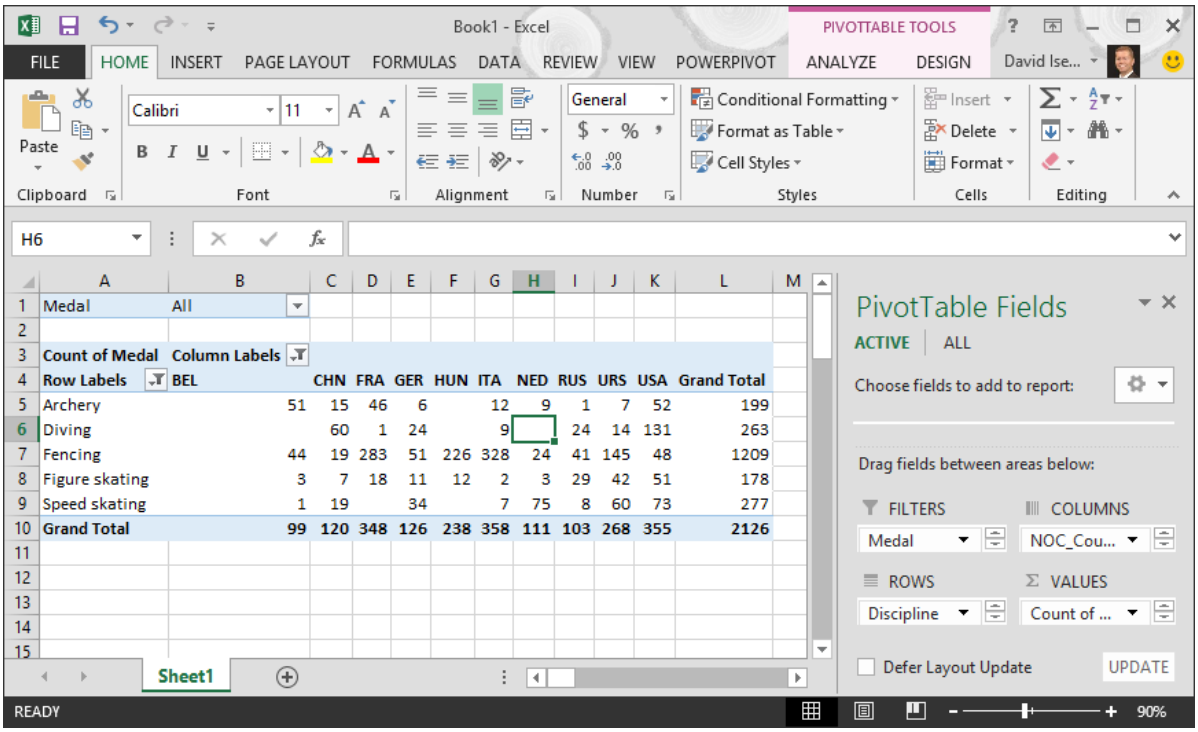
dropdown, click **(Select All)**to remove all selections, then scroll down and select Archery, Diving, Fencing, Figure Skating, and Speed Skating. Click **OK**.

b. Or, in the **Row Labels** section of the PivotTable, click the dropdown next to **Row Labels** in the PivotTable, click **(Select All)** to remove all selections, then scroll down and select Archery, Diving, Fencing, Figure Skating, and Speed Skating. Click **OK**.

4. In **PivotTable Fields**, from the **Medals** table, drag Medal to the **VALUES** area. Since Values must be numeric, Excel automatically changes Medal to **Count of Medal**.
5. From the **Medals** table, select Medal again and drag it into the **FILTERS** area.
6. Let's filter the PivotTable to display only those countries or regions with more than 90 total medals. Here's how.
   a. In the PivotTable, click the dropdown to the right of **Column Labels**.
   b. Select **Value Filters** and select **Greater Than….**
   c. Type **90** in the last field (on the right). Click **OK**.



Your PivotTable looks like the following screen.



Medal	All										
Count of Medal	Column Labels										
Row Labels	BEL	CHN	FRA	GER	HUN	ITA	NED	RUS	URS	USA	Grand Total
Archery	51	15	46	6		12	9	1	7	52	199
Diving		60	1	24		9		24	14	131	263
Fencing	44	19	283	51	226	328	24	41	145	48	1209
Figure skating	3	7	18	11	12	2	3	29	42	51	178
Speed skating	1	19		34		7	75	8	60	73	277
Grand Total	99	120	348	126	238	358	111	103	268	355	2126

With little effort, you now have a basic PivotTable that includes fields from three different tables. What made this task so simple were the pre-existing relationships among the tables.

Because table relationships existed in the source database, and because you imported all the tables in a single operation, Excel could recreate those table relationships in its Data Model.

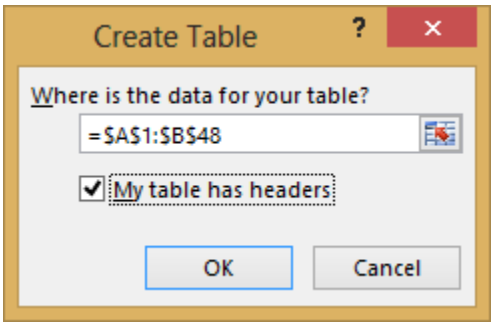
But what if your data originates from different sources, or is imported at a later time? Typically, you can create relationships with new data based on matching columns. In the next step, you import additional tables, and learn how to create new relationships.

Import data from a spreadsheet

Now let's import data from another source, this time from an existing workbook, then specify the relationships between our existing data and the new data. Relationships let you analyze collections of data in Excel, and create interesting and immersive visualizations from the data you import.

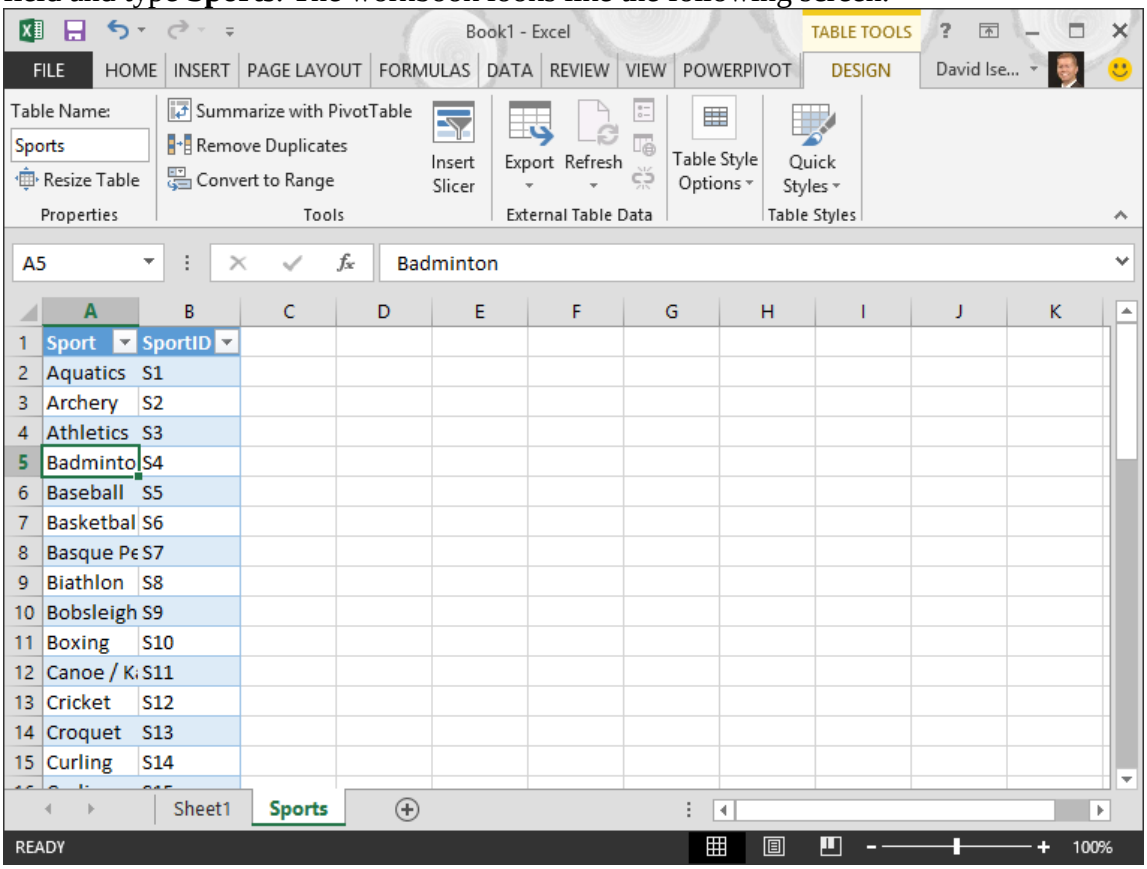
Let's start by creating a blank worksheet, then import data from an Excel workbook.

1. Insert a new Excel worksheet, and name it **Sports**.
2. Browse to the folder that contains the downloaded sample data files, and open **OlympicSports.xlsx**.
3. Select and copy the data in **Sheet1**. If you select a cell with data, such as cell A1, you can press Ctrl + A to select all adjacent data. Close the OlympicSports.xlsx workbook.
4. On the **Sports** worksheet, place your cursor in cell A1 and paste the data.
5. With the data still highlighted, press Ctrl + T to format the data as a table. You can also format the data as a table from the ribbon by selecting **HOME > Format as Table**. Since the data has headers, select **My table has headers** in the **Create Table** window that appears, as shown here.



Formatting the data as a table has many advantages. You can assign a name to a table, which makes it easy to identify. You can also establish relationships between tables, enabling exploration and analysis in PivotTables, Power Pivot, and Power View.

6. Name the table. In **TABLE TOOLS > DESIGN > Properties**, locate the **Table Name** field and type **Sports**. The workbook looks like the following screen.



7. Save the workbook.

Import data using copy and paste

Now that we've imported data from an Excel workbook, let's import data from a table we find on a web page, or any other source from which we can copy and paste into Excel. In the following steps, you add the Olympic host cities from a table.

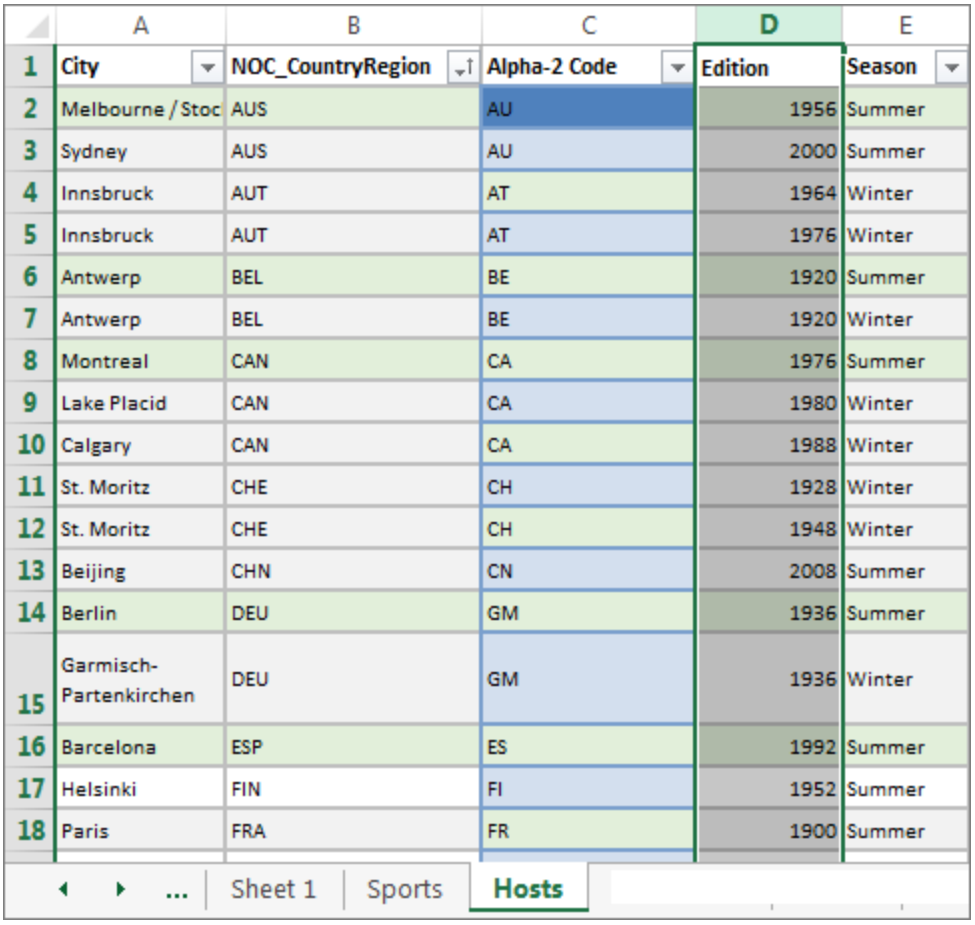
1. Insert a new Excel worksheet, and name it **Hosts**.
2. Select and copy the following table, including the table headers.

City	NOC_CountryRegion	Alpha-2 Code	Edition	Season
Melbourne / Stockholm	AUS	AS	1956	Summer
Sydney	AUS	AS	2000	Summer
Innsbruck	AUT	AT	1964	Winter
Innsbruck	AUT	AT	1976	Winter
Antwerp	BEL	BE	1920	Summer
Antwerp	BEL	BE	1920	Winter
Montreal	CAN	CA	1976	Summer

City	NOC_CountryRegion	Alpha-2 Code	Edition	Season
Lake Placid	CAN	CA	1980	Winter
Calgary	CAN	CA	1988	Winter
St. Moritz	SUI	SZ	1928	Winter
St. Moritz	SUI	SZ	1948	Winter
Beijing	CHN	CH	2008	Summer
Berlin	GER	GM	1936	Summer
Garmisch-Partenkirchen	GER	GM	1936	Winter
Barcelona	ESP	SP	1992	Summer
Helsinki	FIN	FI	1952	Summer
Paris	FRA	FR	1900	Summer
Paris	FRA	FR	1924	Summer
Chamonix	FRA	FR	1924	Winter
Grenoble	FRA	FR	1968	Winter
Albertville	FRA	FR	1992	Winter
London	GBR	UK	1908	Summer
London	GBR	UK	1908	Winter
London	GBR	UK	1948	Summer
Munich	GER	DE	1972	Summer
Athens	GRC	GR	2004	Summer
Cortina d'Ampezzo	ITA	IT	1956	Winter
Rome	ITA	IT	1960	Summer
Turin	ITA	IT	2006	Winter
Tokyo	JPN	JA	1964	Summer
Sapporo	JPN	JA	1972	Winter
Nagano	JPN	JA	1998	Winter
Seoul	KOR	KS	1988	Summer
Mexico	MEX	MX	1968	Summer
Amsterdam	NED	NL	1928	Summer
Oslo	NOR	NO	1952	Winter
Lillehammer	NOR	NO	1994	Winter
Stockholm	SWE	SW	1912	Summer
St Louis	USA	US	1904	Summer
Los Angeles	USA	US	1932	Summer
Lake Placid	USA	US	1932	Winter
Squaw Valley	USA	US	1960	Winter
Moscow	URS	RU	1980	Summer
Los Angeles	USA	US	1984	Summer

City	NOC_CountryRegion	Alpha-2 Code	Edition	Season
Atlanta	USA	US	1996	Summer
Salt Lake City	USA	US	2002	Winter
Sarajevo	YUG	YU	1984	Winter

1. In Excel, place your cursor in cell A1 of the **Hosts** worksheet and paste the data.
2. Format the data as a table. As described earlier in this module, you press Ctrl + T to format the data as a table, or from **HOME > Format as Table**. Since the data has headers, select **My table has headers** in the **Create Table** window that appears.
3. Name the table. In **TABLE TOOLS > DESIGN > Properties** locate the **Table Name** field, and type **Hosts**.
4. Select the Edition column, and from the **HOME** tab, format it as **Number** with 0 decimal places.
5. Save the workbook. Your workbook looks like the following screen.



	A	B	C	D	E
1	City	NOC_CountryRegion	Alpha-2 Code	Edition	Season
2	Melbourne / Stoc	AUS	AU	1956	Summer
3	Sydney	AUS	AU	2000	Summer
4	Innsbruck	AUT	AT	1964	Winter
5	Innsbruck	AUT	AT	1976	Winter
6	Antwerp	BEL	BE	1920	Summer
7	Antwerp	BEL	BE	1920	Winter
8	Montreal	CAN	CA	1976	Summer
9	Lake Placid	CAN	CA	1980	Winter
10	Calgary	CAN	CA	1988	Winter
11	St. Moritz	CHE	CH	1928	Winter
12	St. Moritz	CHE	CH	1948	Winter
13	Beijing	CHN	CN	2008	Summer
14	Berlin	DEU	GM	1936	Summer
15	Garmisch-Partenkirchen	DEU	GM	1936	Winter
16	Barcelona	ESP	ES	1992	Summer
17	Helsinki	FIN	FI	1952	Summer
18	Paris	FRA	FR	1900	Summer

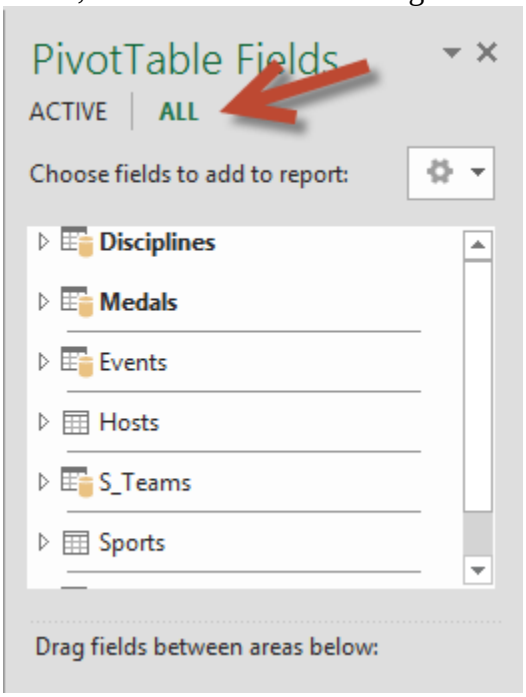
Sheet 1 | Sports | Hosts

Now that you have an Excel workbook with tables, you can create relationships between them. Creating relationships between tables lets you mash up the data from the two tables.

Create a relationship between imported data

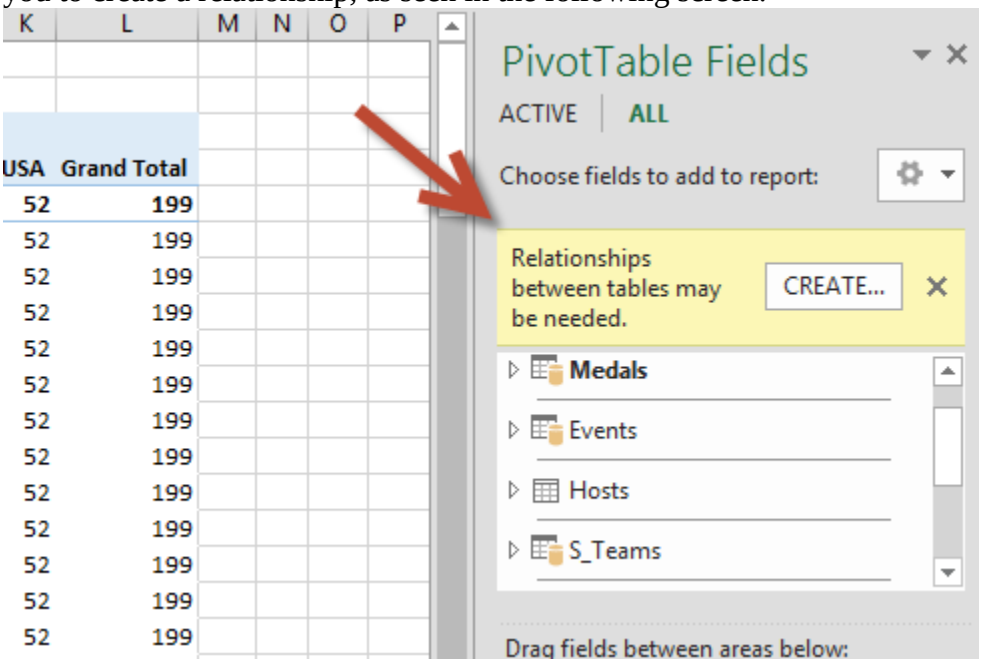
You can immediately begin using fields in your PivotTable from the imported tables. If Excel can't determine how to incorporate a field into the PivotTable, a relationship must be established with the existing Data Model. In the following steps, you learn how to create a relationship between data you imported from different sources.

1. On **Sheet1**, at the top of**PivotTable Fields**, click**All** to view the complete list of available tables, as shown in the following screen.



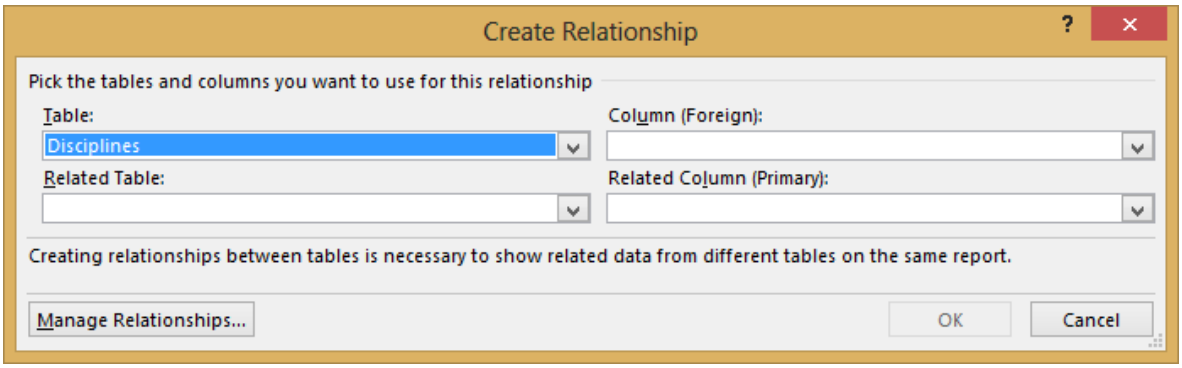
2. Scroll through the list to see the new tables you just added.

3. Expand **Sports** and select **Sport** to add it to the PivotTable. Notice that Excel prompts you to create a relationship, as seen in the following screen.



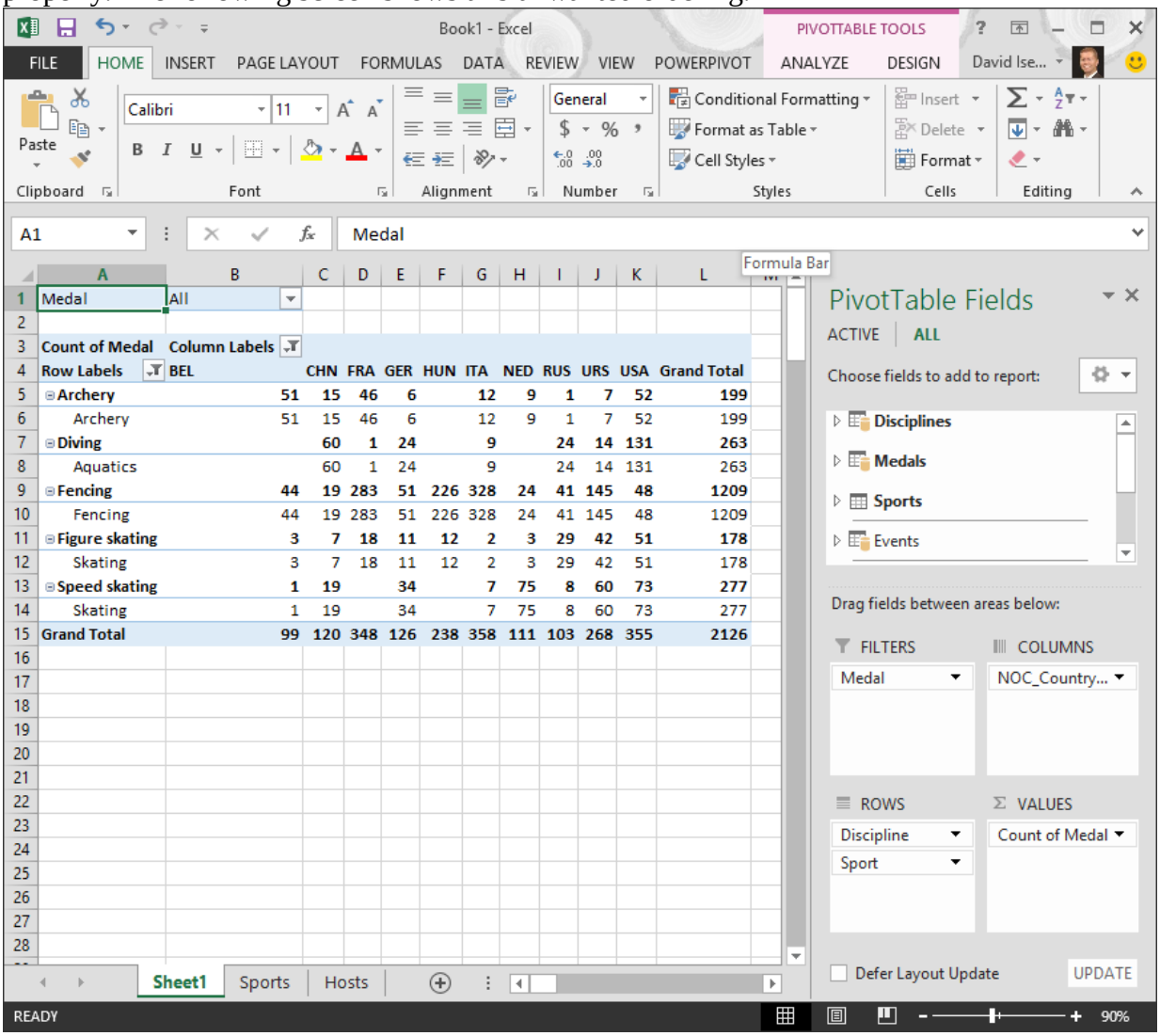
This notification occurs because you used fields from a table that's not part of the underlying Data Model. One way to add a table to the Data Model is to create a relationship to a table that's already in the Data Model. To create the relationship, one of the tables must have a column of unique, non-repeated, values. In the sample data, the **Disciplines** table imported from the database contains a field with sports codes, called SportID. Those same sports codes are present as a field in the Excel data we imported. Let's create the relationship.

4. Click **CREATE...** in the highlighted **PivotTable Fields** area to open the **Create Relationship** dialog, as shown in the following screen.

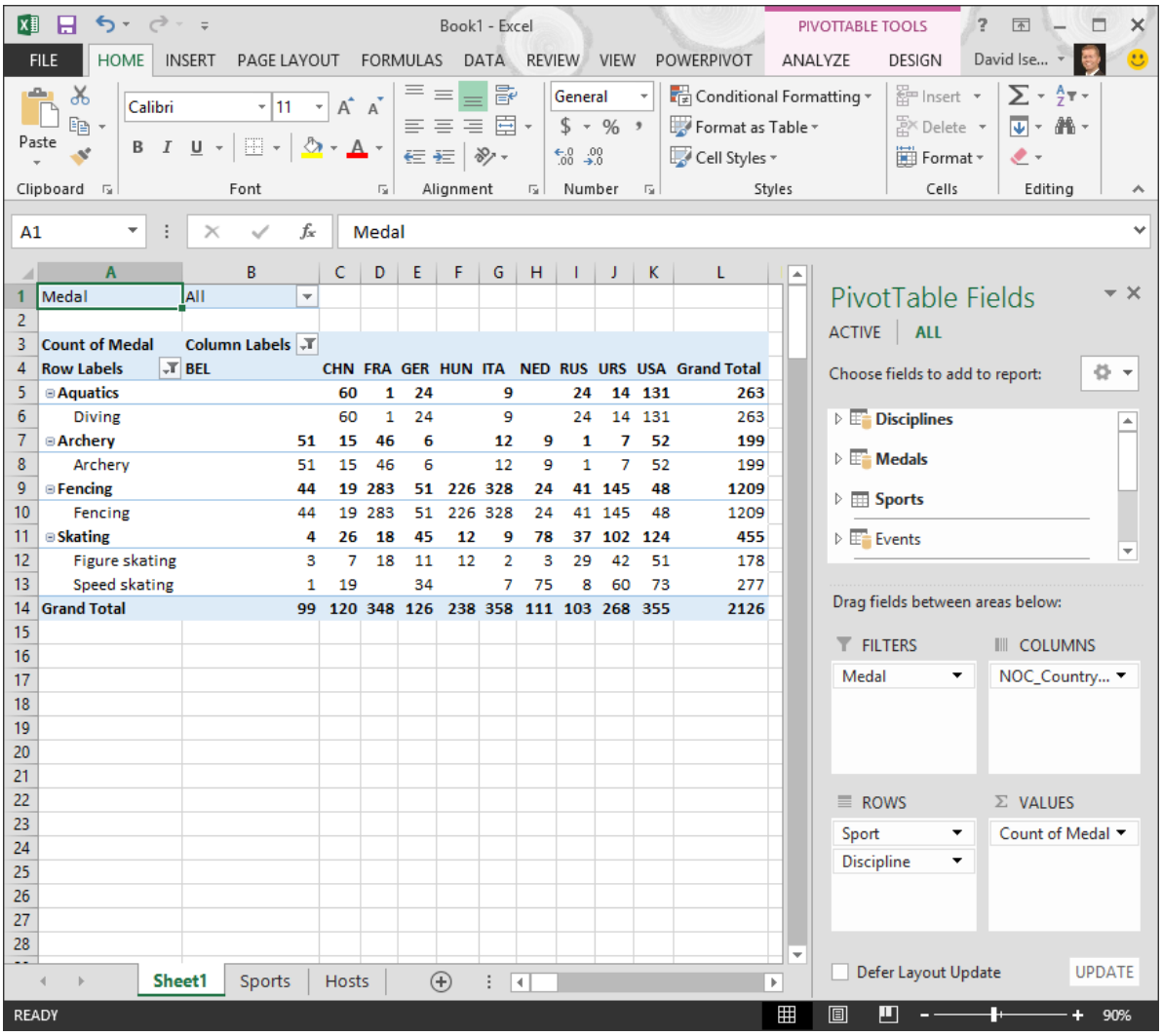


5. In **Table**, choose **Disciplines** from the drop down list.
6. In **Column (Foreign)**, choose **SportID**.
7. In **Related Table**, choose **Sports**.
8. In **Related Column (Primary)**, choose **SportID**.
9. Click **OK**.

The PivotTable changes to reflect the new relationship. But the PivotTable doesn't look right quite yet, because of the ordering of fields in the **ROWS** area. Discipline is a subcategory of a given sport, but since we arranged Discipline above Sport in the **ROWS** area, it's not organized properly. The following screen shows this unwanted ordering.



1. In the **ROWS** area, move Sport above Discipline. That's much better, and the PivotTable displays the data how you want to see it, as shown in the following screen.



Behind the scenes, Excel is building a Data Model that can be used throughout the workbook, in any PivotTable, PivotChart, in Power Pivot, or any Power View report. Table relationships are the basis of a Data Model, and what determine navigation and calculation paths.

In the next module, **Extend Data Model relationships using Excel 2013,** Power Pivot**, and DAX**, you build on what you learned here, and step through extending the Data Model using a powerful and visual Excel add-in called Power Pivot. You also learn how to calculate columns in a table, and use that calculated column so that an otherwise unrelated table can be added to your Data Model.

Checkpoint and Quiz

Review What You've Learned

You now have an Excel workbook that includes a PivotTable accessing data in multiple tables, several of which you imported separately. You learned to import from a database, from another Excel workbook, and from copying data and pasting it into Excel.

To make the data work together, you had to create a table relationship that Excel used to correlate the rows. You also learned that having columns in one table that correlate to data in another table is essential for creating relationships, and for looking up related rows.

Module 2: Extend Data Model relationships using Excel, Power Pivot, and DAX

Applies To: Excel 2013

Abstract: This is the second module in a series. In the first module, Import Data into and Create a Data Model, an Excel workbook was created using data imported from multiple sources.

In this module, you use Power Pivot to extend the Data Model, create hierarchies, and build calculated fields from existing data to create new relationships between tables.

The sections in this module are the following:

Add a relationship using Diagram View in Power Pivot

Extend the Data Model using calculated columns

Create a hierarchy

Use hierarchies in PivotTables

Checkpoint and Quiz

At the end of this module is a quiz you can take to test your learning.

This series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. The modules in this series are the following:

1. Import Data into Excel , and Create a Data Model
2. **Extend Data Model relationships using Excel,** Power Pivot**, and DAX**
3. Create Map-based Power View Reports
4. Incorporate Internet Data, and Set Power View Report Defaults
5. Create Amazing Power View Reports - Part 1
6. Create Amazing Power View Reports - Part 2

We suggest you go through them in order.

These modules use Excel 2013 with Power Pivot enabled

Add a relationship using Diagram View in Power Pivot

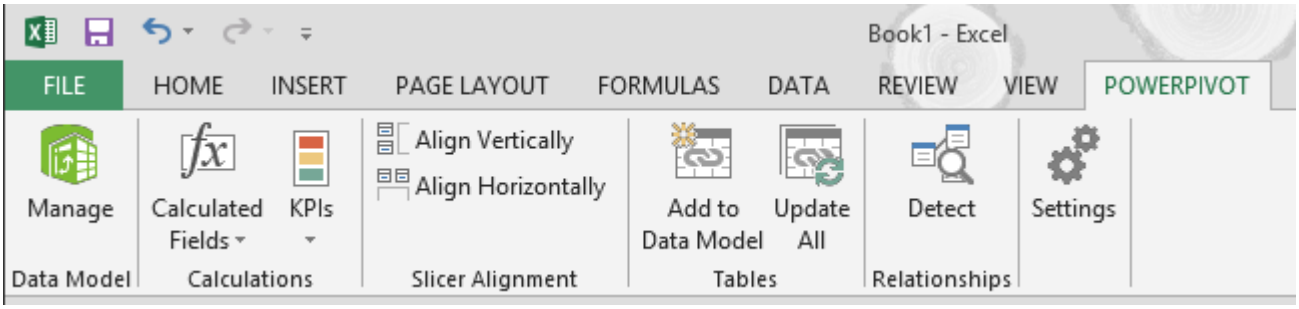
In this section, you use the Microsoft Office Power Pivot in Excel 2013 add-in to extend the model. Using **Diagram View** in Microsoft SQL Server Power Pivot for Excel makes creating relationships easy. First, you need to make sure you have the Power Pivot add-in enabled.

Add Power Pivot to the Excel ribbon by enabling the Power Pivot add-in

When Power Pivot is enabled, you see a ribbon tab in Excel 2013 called **POWER PIVOT**. To enable Power Pivot, follow these steps.

1. Go to **FILE > Options > Add-Ins**.
2. In the **Manage** box near the bottom, click **COM Add-ins> Go**.
3. Check **the Microsoft Office Power Pivot in Microsoft Excel 2013** box, and then click **OK**.

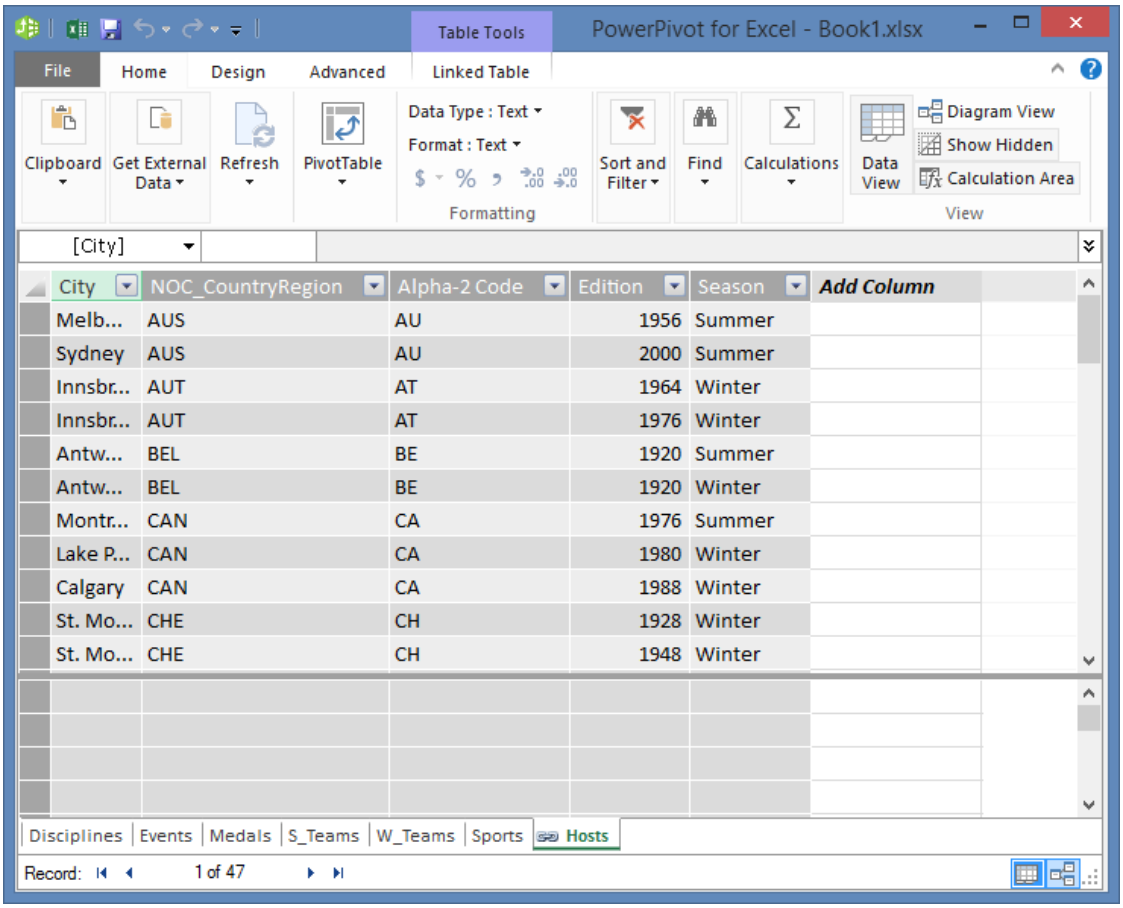
The Excel ribbon now has a **POWER PIVOT** tab.



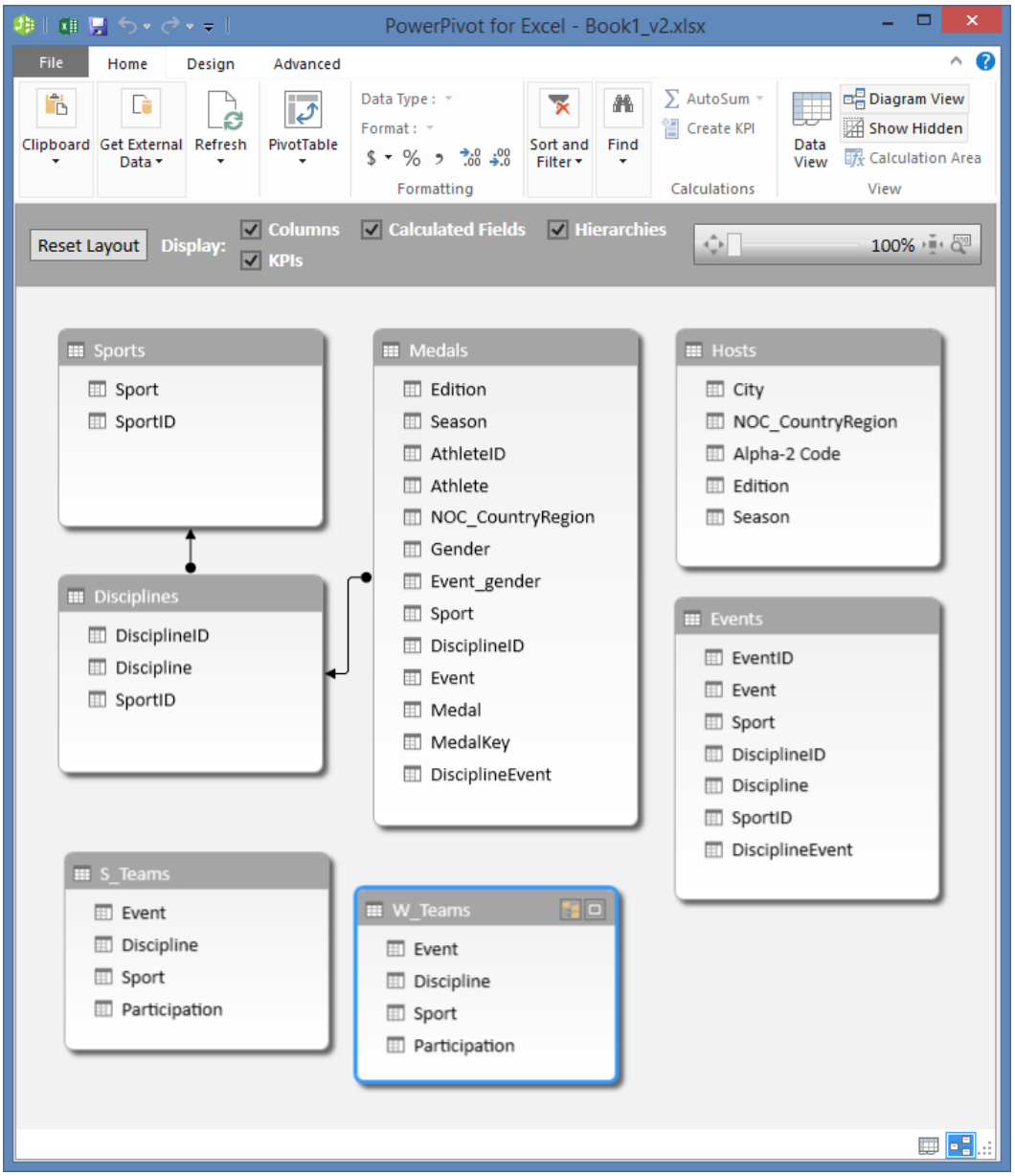
Add a relationship using Diagram View in Power Pivot

The Excel workbook includes a table called **Hosts**. We imported **Hosts** by copying it and pasting it into Excel, then formatted the data as a table. To add the **Hosts** table to the Data Model, we need to establish a relationship. Let's use Power Pivot to visually represent the relationships in the Data Model, and then create the relationship.

1. In Excel, click the **Hosts** tab to make it the active sheet.
2. On the ribbon, select **POWER PIVOT > Tables > Add to Data Model**. This step adds the **Hosts** table to the Data Model. It also opens the Power Pivot add-in, which you use to perform the remaining steps in this task.
3. Notice that the Power Pivot window shows all the tables in the model, including **Hosts**. Click through a couple of tables. In Power Pivot you can view all of the data that your model contains, even if they aren't displayed in any worksheets in Excel, such as the **Disciplines**, **Events**, and **Medals** data below, as well as **S_Teams,W_Teams,** and **Sports**.



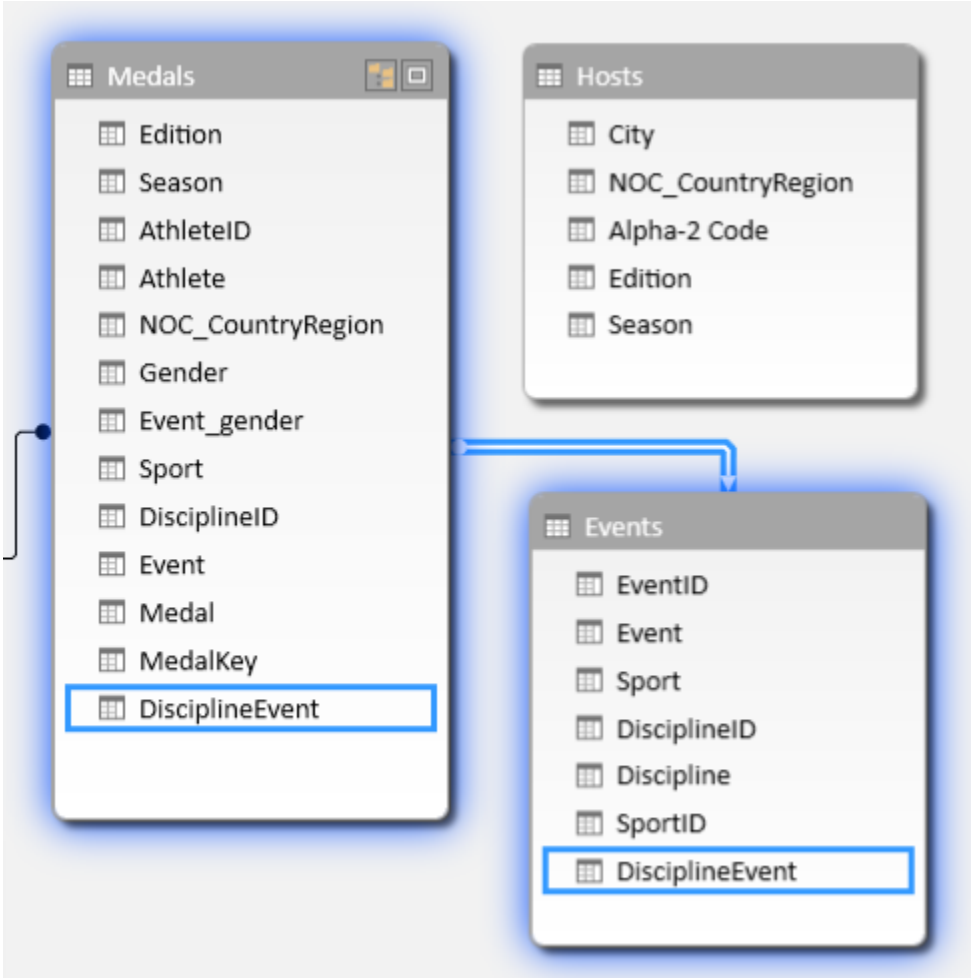
4. In the Power Pivot window, in the **View** section, click **Diagram View**.
5. Use the slide bar to resize the diagram so that you can see all objects in the diagram. Rearrange the tables by dragging their title bar, so they're visible and positioned next to one another. Notice that four tables are unrelated to the rest of the tables: **Hosts**, **Events**, **W_Teams**, and **S_Teams**.



6. You notice that both the **Medals** table and the **Events** table have a field called DisciplineEvent. Upon further inspection, you determine that the DisciplineEvent field in the **Events** table consists of unique, non-repeated values.

Note: The DisciplineEvent field represents a unique combination of each Discipline and Event. In the **Medals** table, however, the DisciplineEvent field repeats many times. That makes sense, because each Discipline+Event combination results in three awarded medals (gold, silver, bronze), which are awarded for each Olympics Edition the Event is held. So the relationship between those tables is one (one unique Discipline+Event entry in the Disciplines table) to many (multiple entries for each Discipline+Event value).

1. Create a relationship between the **Medals** table and the **Events** table. While in Diagram View, drag the DisciplineEvent field from the **Events** table to the DisciplineEvent field in **Medals**. A line appears between them, indicating a relationship has been established.
2. Click the line that connects **Events** and **Medals**. The highlighted fields define the relationship, as shown in the following screen.



3. To connect **Hosts** to the Data Model, we need a field with values that uniquely identify each row in the **Hosts** table. Then we can search our Data Model to see if that same data exists in another table. Looking in Diagram View doesn't allow us to do this. With **Hosts** selected, switch back to Data View.
4. After examining the columns, we realize that **Hosts** doesn't have a column of unique values. We'll have to create it using a calculated column, and Data Analysis Expressions (DAX).

It's nice when the data in your Data Model has all the fields necessary to create relationships, and mash up data to visualize in Power View or PivotTables. But tables aren't always so cooperative, so the next section describes how to create a new column, using DAX, that can be used to create a relationship between tables.

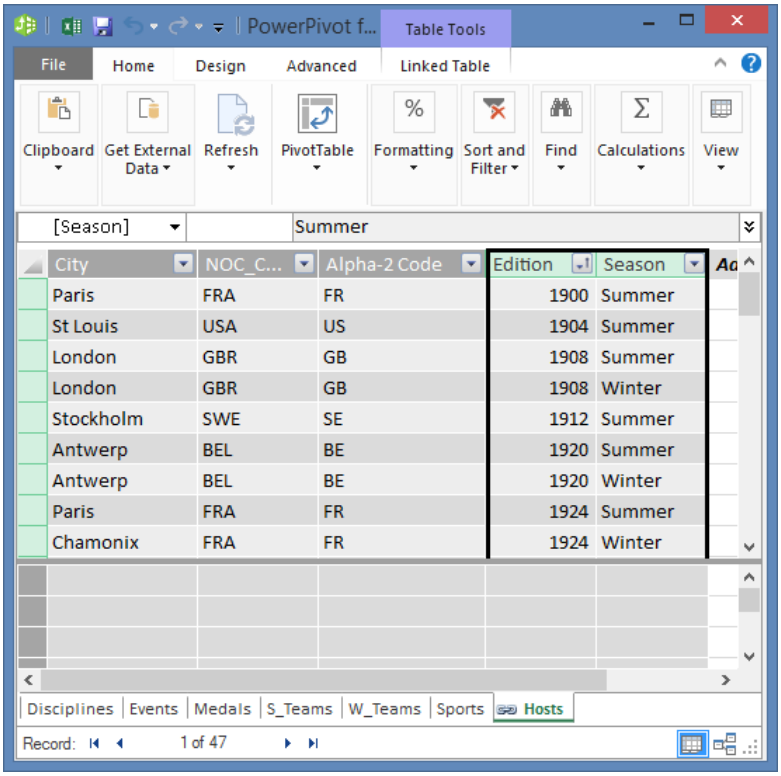
Extend the Data Model using calculated columns

To establish a relationship between the **Hosts** table and the Data Model, and thereby extend our Data Model to include the **Hosts** table, **Hosts** must have a field that uniquely identifies each row. In addition, that field must correspond to a field in the Data Model. Those corresponding fields, one in each table, are what enables the tables' data to be associated.

Since the **Hosts** table doesn't have such a field, you need to create it. To preserve the integrity of the Data Model, you can't use Power Pivot to edit or delete existing data. You can, however, create new columns by using calculated fields based on the existing data.

By looking through the **Hosts** table, then looking at other Data Model tables, we find a good candidate for a unique field we could create in **Hosts**, and then associate with a table in the Data Model. Both tables will require a new, calculated column in order to meet the requirements necessary to establish a relationship.

In **Hosts**, we can create a unique calculated column by combining the Edition field (the year of the Olympics event) and the Season field (Summer or Winter). In the **Medals** table there is also an Edition field and a Season field, so if we create a calculated column in each of those tables that combines the Edition and Season fields, we can establish a relationship between **Hosts** and **Medals**. The following screen shows the **Hosts** table, with its Edition and Season fields selected

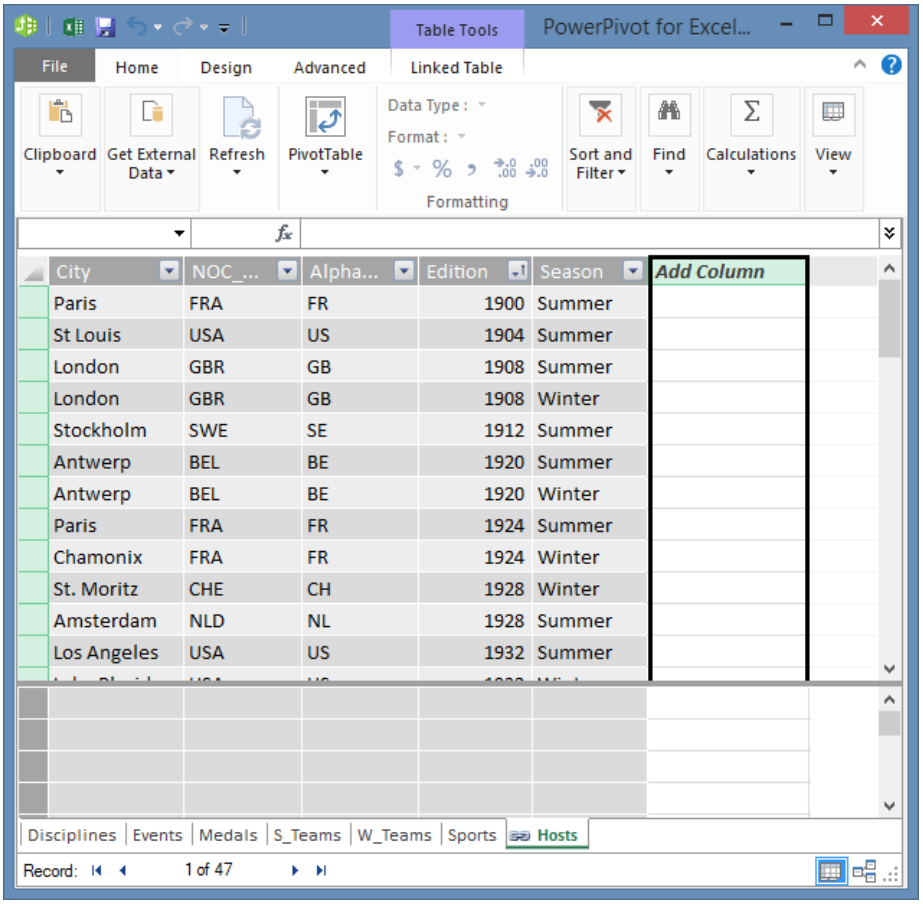


Create calculated columns using DAX

Let's start with the **Hosts** table. The goal is to create a calculated column in the **Hosts** table, and then in the **Medals** table, which can be used to establish a relationship between them.

In Power Pivot, you can use Data Analysis Expressions (DAX) to create calculations. DAX is a formula language for Power Pivot and PivotTables, designed for the relational data and contextual analysis available in Power Pivot. You can create DAX formulas in a new Power Pivot column, and in the Calculation Area in Power Pivot.

1. In Power Pivot, select **HOME > View > Data View** to make sure Data View is selected, rather than being in Diagram View.
2. Select the **Hosts** table in Power Pivot. Adjacent to the existing columns is an empty column titled *Add Column*. Power Pivot provides that column as a placeholder. There are many ways to add a new column to a table in Power Pivot, one of which is to simply select the empty column that has the title *Add Column*.

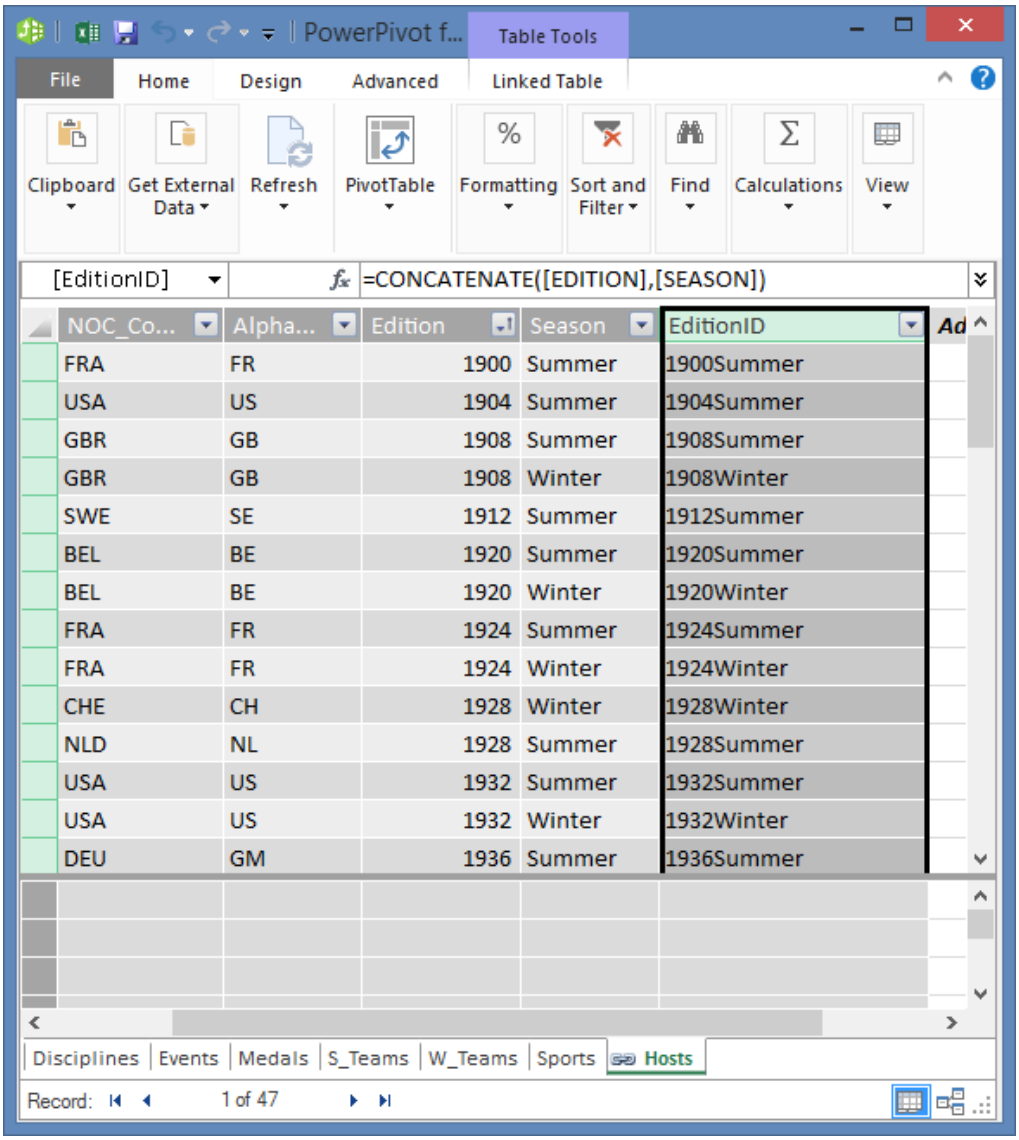


3. In the formula bar, type the following DAX formula. The CONCATENATE function combines two or more fields into one. As you type, AutoComplete helps you type the fully qualified names of columns and tables, and lists the functions that are available. Use tab to select AutoComplete suggestions. You can also just click the column while typing

your formula, and Power Pivot inserts the column name into your formula.

=CONCATENATE([Edition],[Season])

4. When you finish building the formula, press Enter to accept it.
5. Values are populated for all the rows in the calculated column. If you scroll down through the table, you see that each row is unique – so we've successfully created a field that uniquely identifies each row in the **Hosts** table. Such fields are called a primary key.
6. Let's rename the calculated column to EditionID. You can rename any column by double-clicking it, or by right-clicking the column and choosing **Rename Column**. When completed, the **Hosts** table in Power Pivot looks like the following screen.



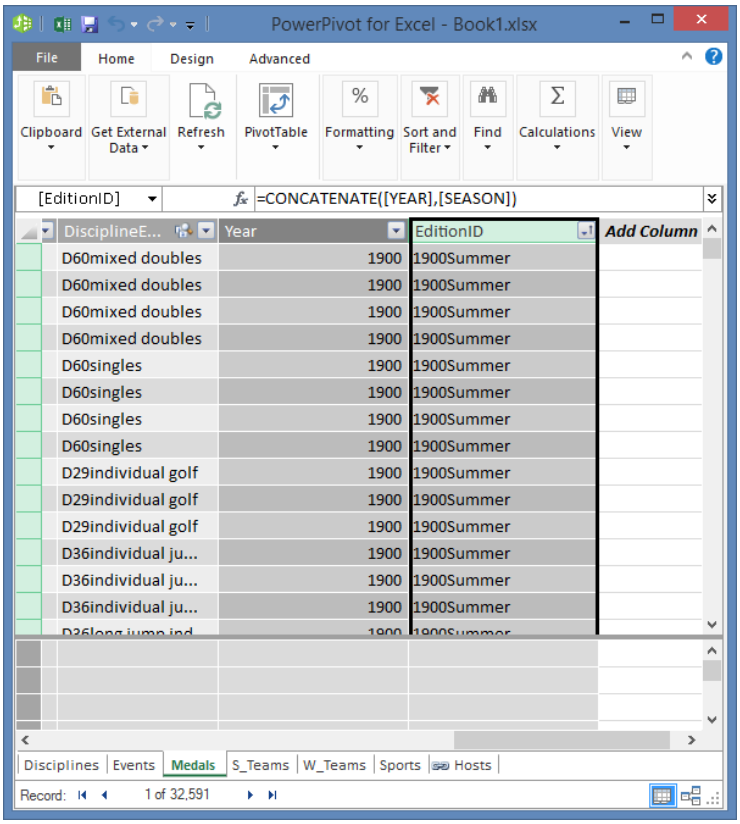
The **Hosts** table is ready. Next let's create a calculated column in **Medals** that matches the format of the EditionID column we created in **Hosts**, so we can create a relationship between them.

1. Start by creating a new column in the **Medals** table, like we did for **Hosts**. In Power Pivot select the **Medals** table, and click **Design > Columns > Add**. Notice that *Add Column* is selected. This has the same effect as simply selecting *Add Column*.
2. The Edition column in **Medals** has a different format than the Edition column in **Hosts**. Before we combine, or concatenate, the Edition column with the Season column to create the EditionID column, we need to create an intermediary field that gets Edition into the right format. In the formula bar above the table, type the following DAX formula.

   ```
   = YEAR([Edition])
   ```

3. When you finish building the formula, press Enter. Values are populated for all the rows in the calculated column, based on the formula you entered. If you compare this column to the Edition column in **Hosts**, you'll see that these columns have the same format.
4. Rename the column by right-clicking CalculatedColumn1 and selecting **Rename Column**. Type Year, and then press Enter.
5. When you created a new column, Power Pivot added another placeholder column called *Add Column*. Next we want to create the EditionID calculated column, so select *Add Column*. In the formula bar, type the following DAX formula and press Enter.

   =CONCATENATE([Year],[Season])
6. Rename the column by double-clicking CalculatedColumn1 and typing EditionID.
7. Sort the column in ascending order. The **Medals** table in Power Pivot now looks like the following screen.



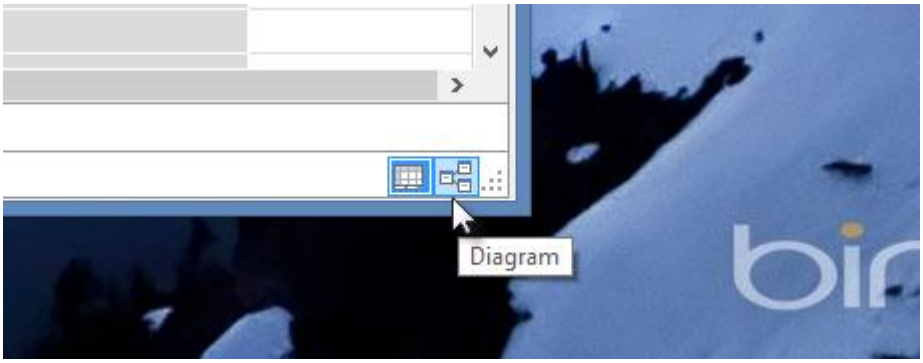
Notice many values are repeated in the **Medals** table EditionID field. That's okay and expected, since during each edition of the Olympics (now represented by the EditionID value) many medals were awarded. What is unique in the **Medals** table is each awarded medal. The unique identifier for each record in the **Medals** table, and its designated primary key, is the MedalKey field.

The next step is to create a relationship between **Hosts** and **Medals**.

Create a relationship using calculated columns

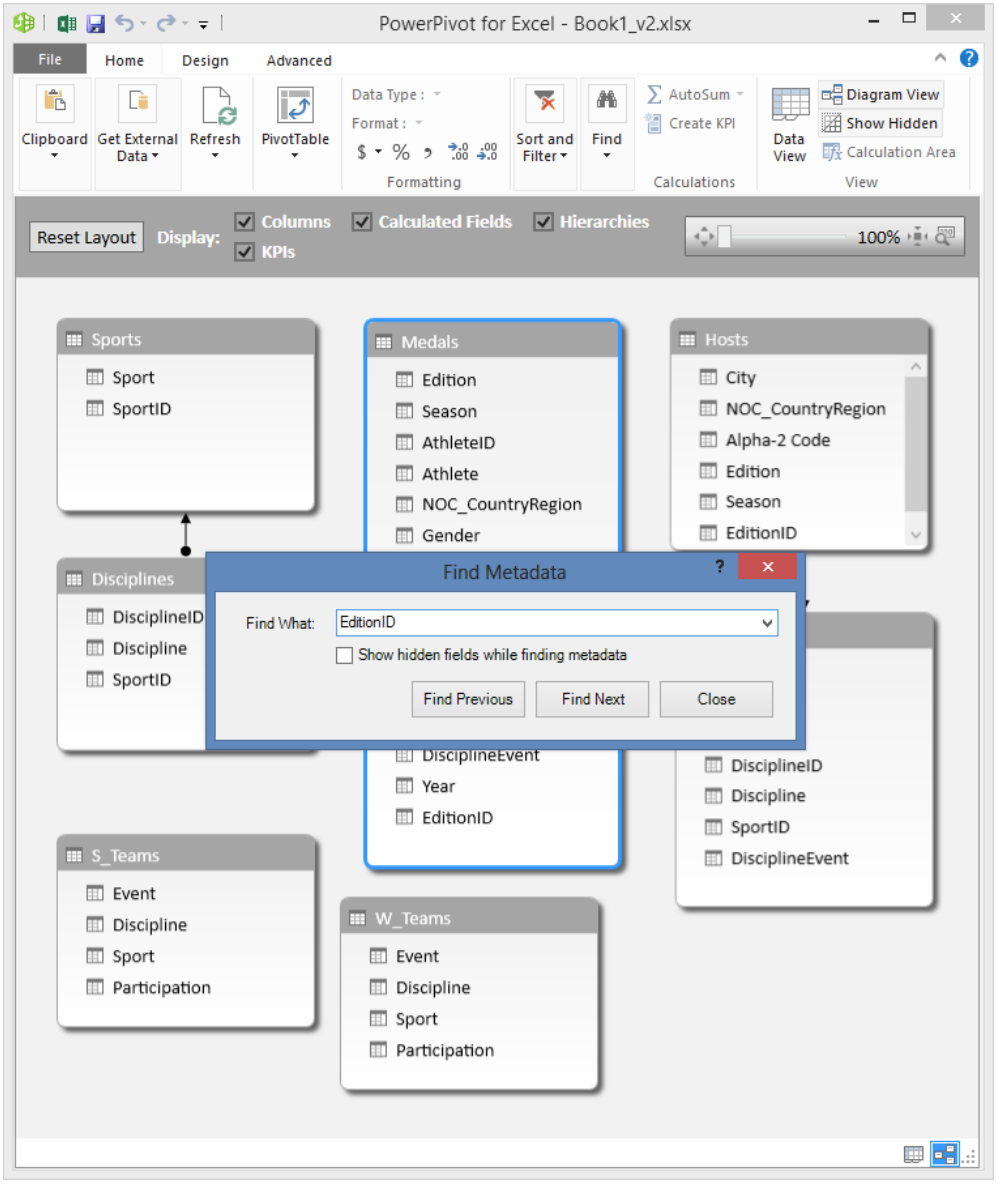
Next let's use the calculated columns we created to establish a relationship between **Hosts** and **Medals**.

1. In the Power Pivot window, select **Home > View > Diagram View** from the ribbon. You can also switch between Grid view and Diagram view using the buttons at the bottom of the PowerView window, as shown in the following screen.

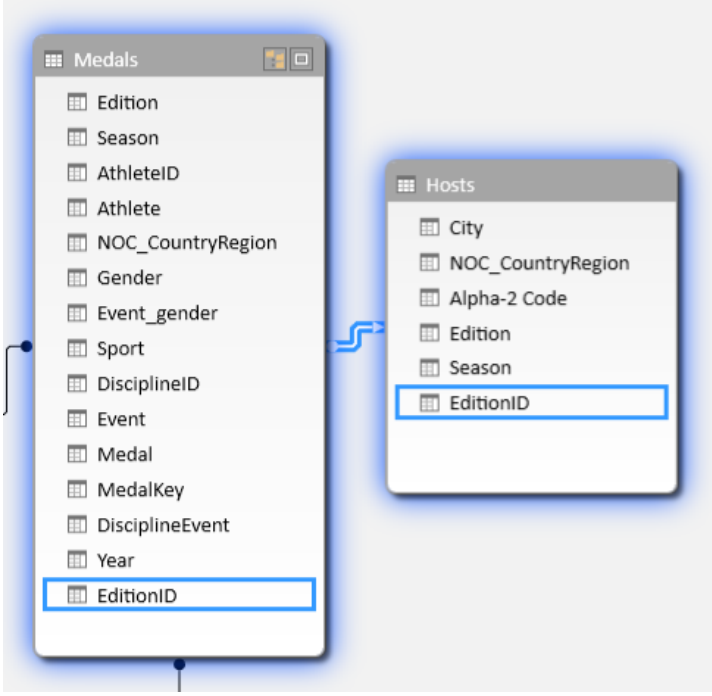


2. Expand **Hosts** so you can view all of its fields. We created the EditionID column to act as the **Hosts** table primary key (unique, non-repeated field), and created an EditionID column in the **Medals** table to enable establishment of a relationship between them. We need to find them both, and create a relationship. Power Pivot provides a **Find** feature on the ribbon, so you can search your Data Model for corresponding fields. The following screen shows the **Find Metadata** window, with EditionID entered in the **Find What**

field.



3. Position the **Hosts** table so that it is next to **Medals**.
4. Drag the EditionID column in **Medals** to the EditionID column in **Hosts**. Power Pivot creates a relationship between the tables based on the EditionID column, and draws a line between the two columns, indicating the relationship.

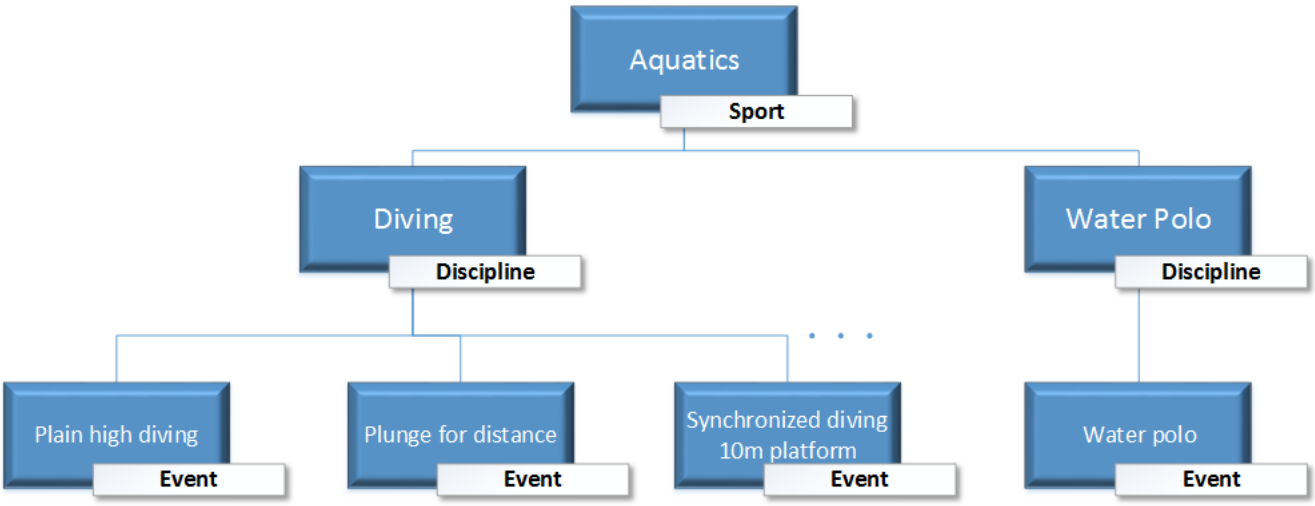


In this section, you learned a new technique for adding new columns, created a calculated column using DAX, and used that column to establish a new relationship between tables. The **Hosts** table is now integrated into the Data Model, and its data is available to the PivotTable in **Sheet1**. You can also use the associated data to create additional PivotTables, PivotCharts, Power View reports, and much more.

Create a hierarchy

Most Data Models include data that is inherently hierarchical. Common examples include calendar data, geographical data, and product categories. Creating hierarchies within Power Pivot is useful because you can drag one item to a report – the hierarchy – instead of having to assemble and order the same fields over and over.

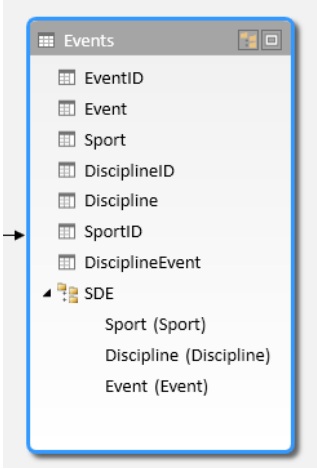
The Olympics data is also hierarchical. It's helpful to understand the Olympics hierarchy, in terms of sports, disciplines, and events. For each sport, there is one or more associated disciplines (sometimes there are many). And for each discipline, there is one or more events (again, sometimes there are many events in each discipline). The following image illustrates the hierarchy.



In this section you create two hierarchies within the Olympic data you've been using in this module. You then use these hierarchies to see how hierarchies make organizing data easy in PivotTables and, in a subsequent module, in Power View.

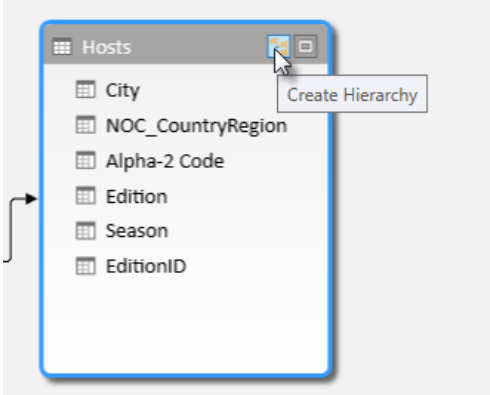
Create a Sport hierarchy

1. In Power Pivot, switch to **Diagram View**. Expand the **Events** table so that you can more easily see all of its fields.
2. Press and hold Ctrl, and click the Sport, Discipline, and Event fields. With those three fields selected, right-click and select **Create Hierarchy**. A parent hierarchy node, **Hierarchy 1**, is created at the bottom of the table, and the selected columns are copied under the hierarchy as child nodes. Verify that Sport appears first in the hierarchy, then Discipline, then Event.
3. Double-click the title, **Hierarchy1**, and type **SDE** to rename your new hierarchy. You now have a hierarchy that includes Sport, Discipline and Event. Your Events table now looks like the following screen.

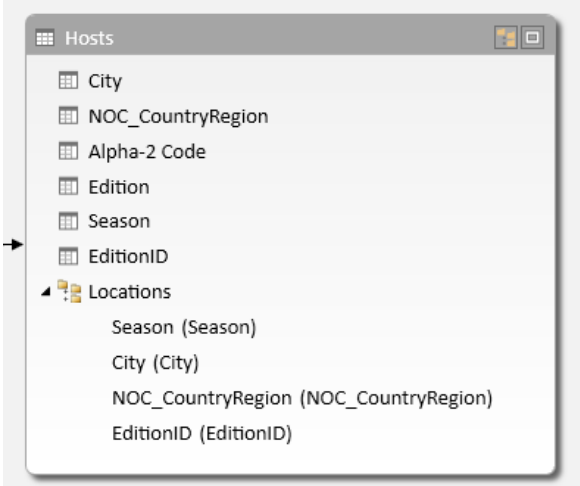


Create a Location hierarchy

1. Still in Diagram View in Power Pivot, select the **Hosts** table and click the Create Hierarchy button in the table header, as shown in the following screen.



   An empty hierarchy parent node appears at the bottom of the table.
2. Type **Locations** as the name for your new hierarchy.
3. There are many ways to add columns to a hierarchy. Drag the Season, City and NOC_CountryRegion fields onto the hierarchy name (in this case, **Locations**) until the hierarchy name is highlighted, then release to add them.
4. Right-click EditionID and select **Add to Hierarchy**. Choose **Locations**.
5. Ensure that your hierarchy child nodes are in order. From top to bottom, the order should be: Season, NOC, City, EditionID. If your child nodes are out of order, simply drag them into the appropriate ordering in the hierarchy. Your table should look like the following screen.



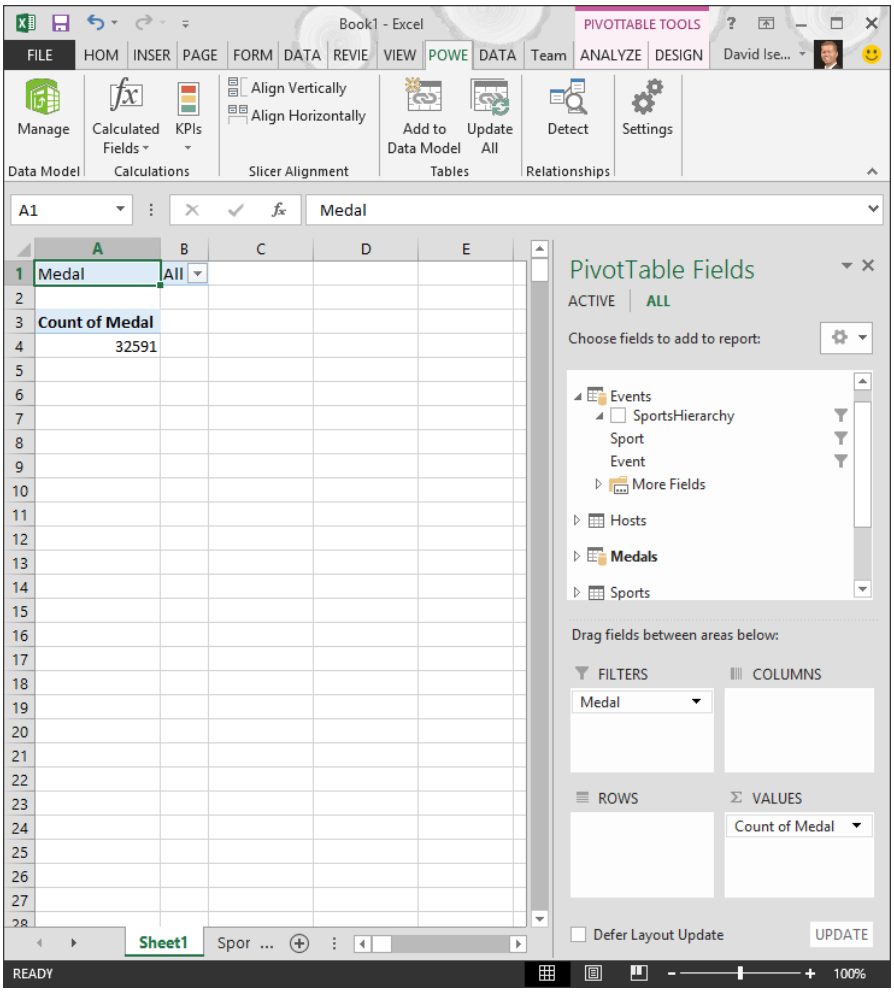
Your Data Model now has hierarchies that can be put to good use in reports. In the next section, you learn how these hierarchies can make your report creation faster, and more consistent.

Use hierarchies in PivotTables

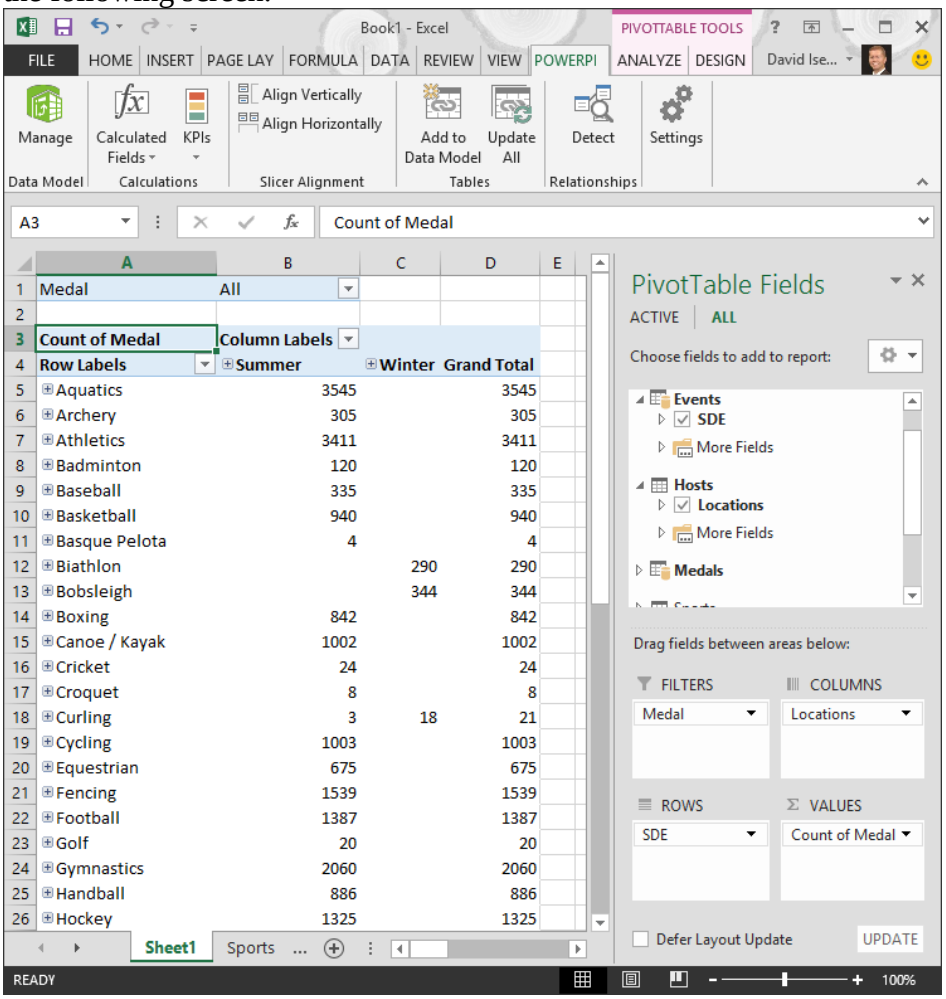
Now that we have a Sports hierarchy and Locations hierarchy, we can add them to PivotTables or Power View, and quickly get results that include useful groupings of data. Prior to creating hierarchies, you had to add individual fields to the PivotTable, and arrange those fields how you wanted them to be viewed.

In this section you use the hierarchies created in the previous section to quickly refine your PivotTable. Then, you create the same PivotTable view using the individual fields in the hierarchy, just so you can compare using hierarchies to using individual fields.

1. Go back to Excel.
2. In **Sheet1**, remove the fields from the ROWS area of **PivotTable Fields**, then remove all the fields from the COLUMNS area. Make sure the PivotTable is selected (which is now quite small, so you can choose cell A1 to make sure your PivotTable is selected). The only remaining fields in the PivotTable fields are Medal in the FILTERS area, and Count of Medal in the VALUES area. Your nearly empty PivotTable should look like the following screen.

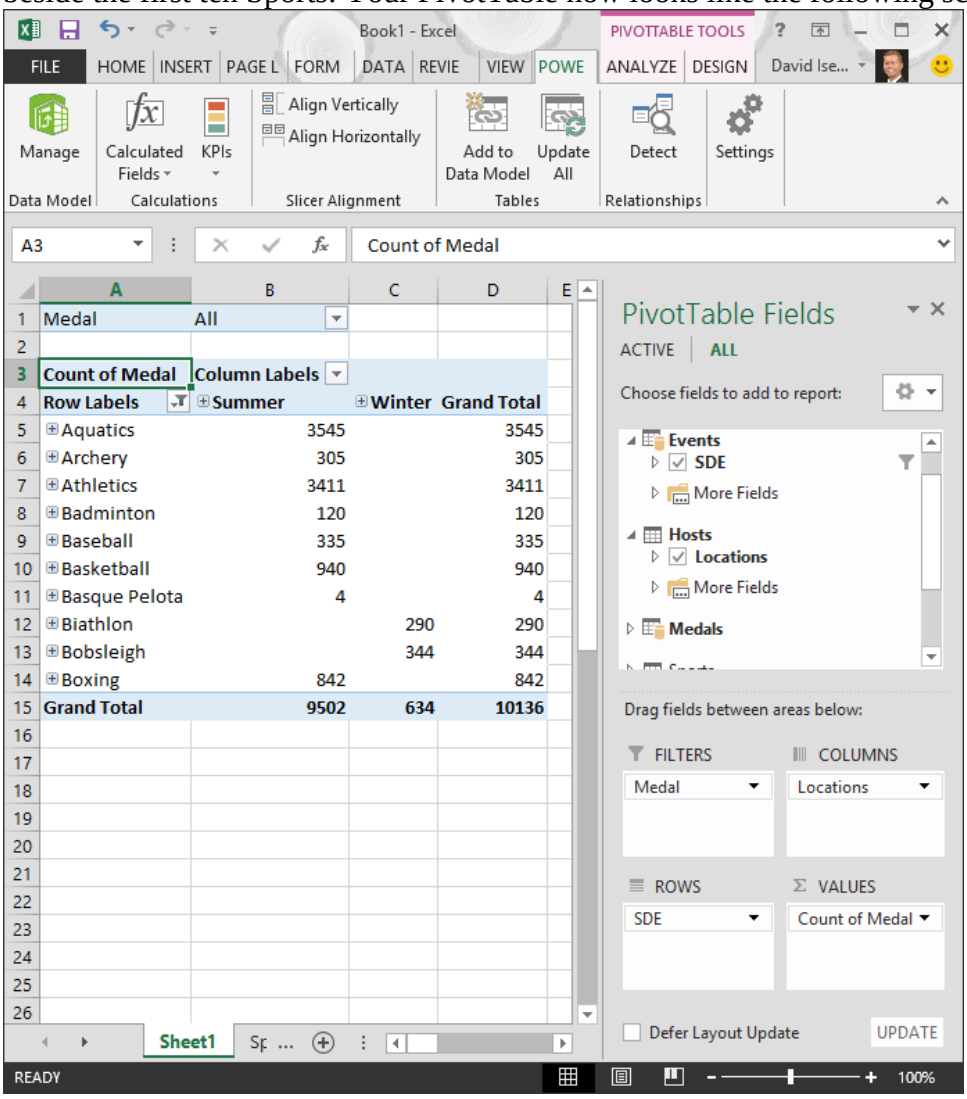


3. From the PivotTable Fields area, drag SDE from the **Events** table to the ROWS area. Then drag Locations from the **Hosts** table into the **COLUMNS** area. Just by dragging those two hierarchies, your PivotTable is populated with a lot of data, all of which is arranged in the hierarchy you defined in the previous steps. Your screen should look like the following screen.



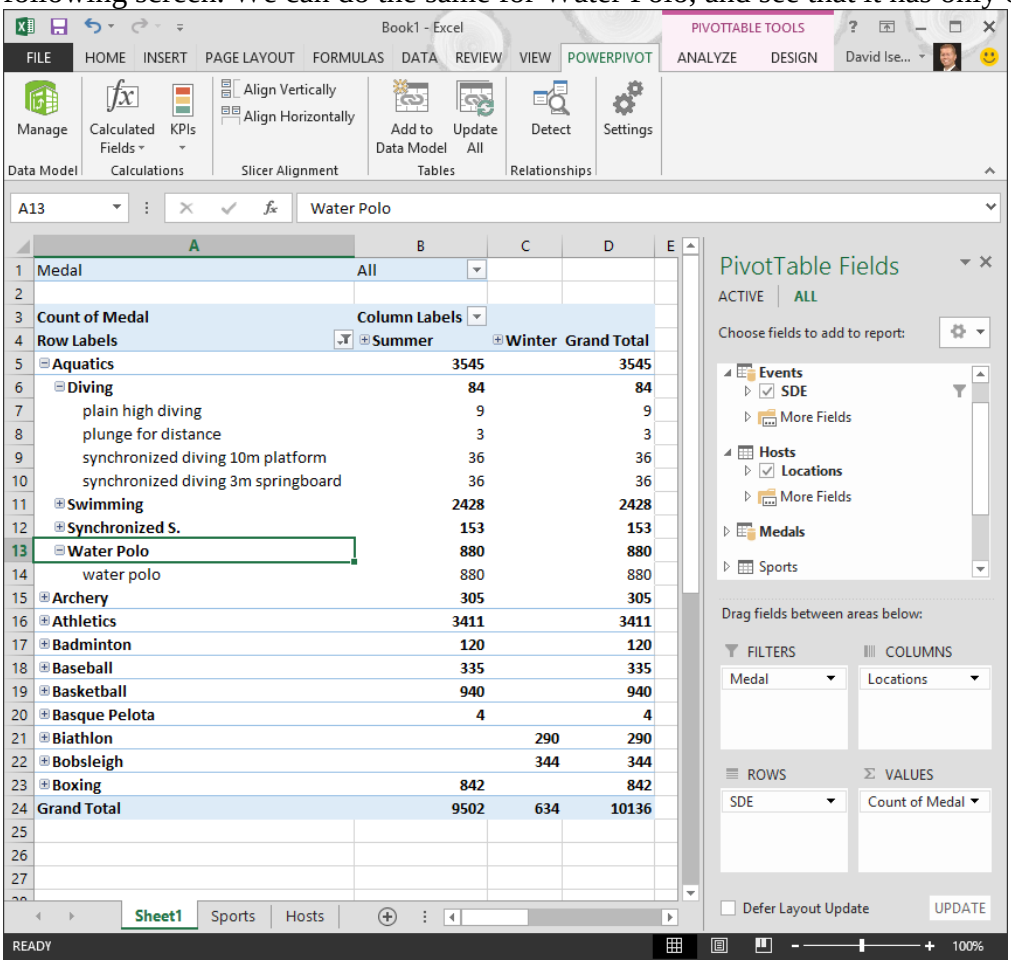
4. Let's filter that data a bit, and just see the first ten rows of events. In the PivotTable, click the arrow in **Row Labels,** click (Select All) to remove all selections, then click the boxes

beside the first ten Sports. Your PivotTable now looks like the following screen.



5. You can expand any of those Sports in the PivotTable, which is the top level of the SDE hierarchy, and see information in the next level down in the hierarchy (discipline). If a lower level in the hierarchy exists for that discipline, you can expand the discipline to see its events. You can do the same for the Location hierarchy, the top level of which is Season, which shows up as Summer and Winter in the PivotTable. When we expand the Aquatics sport, we see all of its child discipline elements and their data. When we expand the Diving discipline under Aquatics, we see its child events too, as shown in the

following screen. We can do the same for Water Polo, and see that it has only one event.

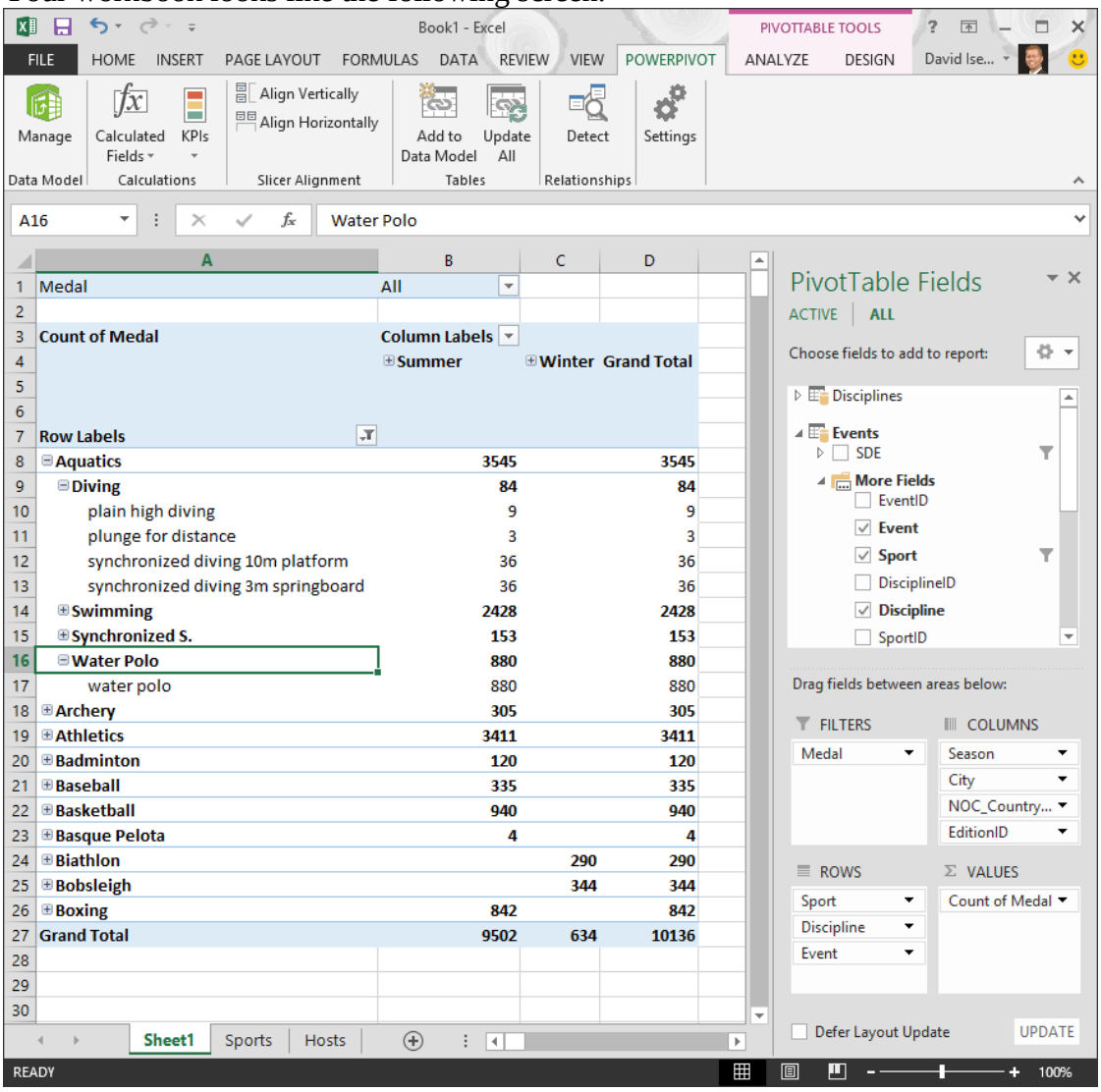


By dragging those two hierarchies, you quickly created a PivotTable with interesting and structured data that you can drill into, filter, and arrange.

Now let's create the same PivotTable, without the benefit of hierarchies.

1. In the PivotTable Fields area, remove Locations from the COLUMNS area. Then remove SDE from the ROWS area. You're back to a basic PivotTable.
2. From the **Hosts** table, drag Season, City, NOC_CountryRegion, and EditionID into the COLUMNS area, and arrange them in that order, from top to bottom.
3. From the **Events** table, drag Sport, Discipline, and Event into the ROWS area, and arrange them in that order, from top to bottom.
4. In the PivotTable, filter Row Labels to the top ten Sports.

5. Collapse all the rows and columns, then expand Aquatics, then Diving and Water Polo . Your workbook looks like the following screen.



	A	B	C	D
1	Medal	All		
2				
3	Count of Medal	Column Labels		
4		Summer	Winter	Grand Total
5				
6				
7	Row Labels			
8	Aquatics	3545		3545
9	Diving	84		84
10	plain high diving	9		9
11	plunge for distance	3		3
12	synchronized diving 10m platform	36		36
13	synchronized diving 3m springboard	36		36
14	Swimming	2428		2428
15	Synchronized S.	153		153
16	Water Polo	880		880
17	water polo	880		880
18	Archery	305		305
19	Athletics	3411		3411
20	Badminton	120		120
21	Baseball	335		335
22	Basketball	940		940
23	Basque Pelota	4		4
24	Biathlon		290	290
25	Bobsleigh		344	344
26	Boxing	842		842
27	Grand Total	9502	634	10136
28				
29				
30				

The screen looks similar, except that you dragged seven individual fields into the **PivotTable Fields** areas, instead of simply dragging two hierarchies. If you're the only person creating PivotTables or Power View reports based on this data, creating hierarchies might only seem convenient. But when many people are creating reports, and must figure out the proper ordering of fields to get the views correct, hierarchies quickly become a productivity enhancement, and enable consistency.

In another module, you learn how to use hierarchies and other fields in visually engaging reports created using Power View.

Checkpoint and Quiz

Review what you learned

Your Excel workbook now has a Data Model that includes data from multiple sources, related using existing fields and calculated columns. You also have hierarchies that reflect the structure of data within your tables, which make creating compelling reports quick, consistent, and easy.

You learned that creating hierarchies lets you specify the inherent structure within your data, and quickly use hierarchical data in your reports.

QUIZ

Want to see how well you remember what you learned? Here's your chance. The following quiz highlights features, capabilities, or requirements you learned about in this module. At the bottom of the page, you'll find the answers. Good luck!

Question 1: Which of the following views let you create relationships between two tables?

A: You create relationships between tables in Power View.

B: You create relationships between tables using Design View in Power Pivot.

C: You create relationships between tables using Grid View in Power Pivot

D: All of the above

Question 2: TRUE or FALSE: You can establish relationships between tables based on a unique identifier that is created by using DAX formulas.

A: TRUE

B: FALSE

Question 3: In which of the following can you create a DAX formula?

A: In the Calculation Area of Power Pivot.

B: In a new column in Power Pivotf.

C: In any cell in Excel 2013.

D: Both A and B.

Question 4: Which of the following is true about hierarchies?

A: When you create a hierarchy, the included fields are no longer available individually.

B: When you create a hierarchy, the included fields including their hierarchy can be used in client tools by simply dragging the hierarchy to a Power View or PivotTable area.

C: When you create a hierarchy, the underlying data in the Data Model is combined into one field.

D: You cannot create hierarchies in Power Pivot.

Quiz answers

1. Correct answer: D
2. Correct answer: A
3. Correct answer: D
4. Correct answer: B

Module 3: Create Map-based Power View Reports

Applies To: Excel 2013

Abstract: This is the third module in a series. In the first module, Import Data into Excel 2013, and Create a Data Model, you created an Excel workbook from scratch using data imported from multiple sources, and its Data Model was created automatically by Excel. The second module,Extend Data Model relationships using Excel 2013, Power Pivot, and DAX, you learned how to extend the Data Model and created hierarchies within the data.

In this module, you use that extended Data Model to build compelling reports that include multiple visualizations using Power View.

The sections in this module are the following:

Create a Power View report

Create calculated fields for Power View and PivotTables

Set field defaults, table behaviors, and data categories

Checkpoint and Quiz

At the end of this module is a quiz you can take to test your learning.

This series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. The modules in this series are the following:

1. Import Data into Excel 2013, and Create a Data Model
2. Extend Data Model relationships using Excel 2013, Power Pivot, and DAX
3. **Create Map-based Power View Reports**
4. Incorporate Internet Data, and Set Power View Report Defaults
5. Create Amazing Power View Reports - Part 1
6. Create Amazing Power View Reports - Part 2

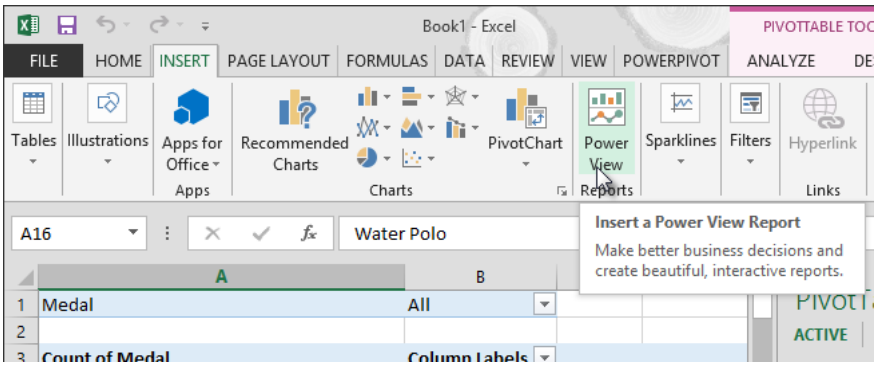
We suggest you go through them in order.

Create a Power View report

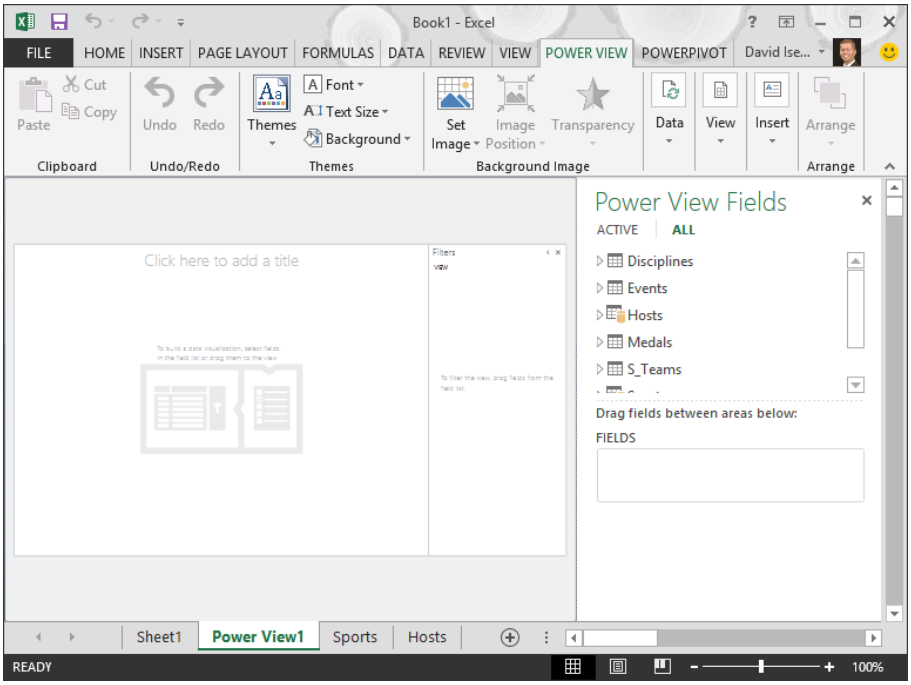
In the previous modules, you created an Excel workbook with a PivotTable containing data about Olympic medals and events. If you didn't complete the previous module, you can download the workbook from the end of the previous module from here.

In this section, you create a Power View report to visually represent the Olympics data.

1. In Excel, click **INSERT > Reports > Power View Reports**.

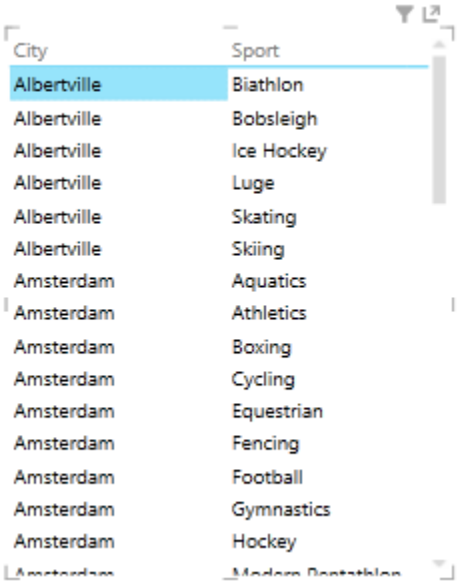


2. A blank Power View report appears as a sheet in the workbook.



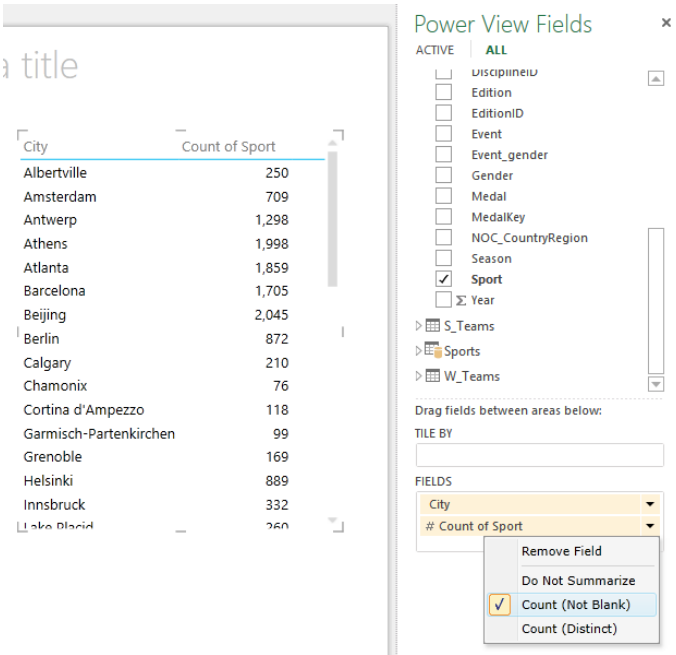
3. In the **Power View Fields** area, click the arrow beside **Hosts** to expand it, and click City.

4. Expand the **Medals** table, and click Sport. With this, Power View lists the Sport beside the city, as shown in the following screen.



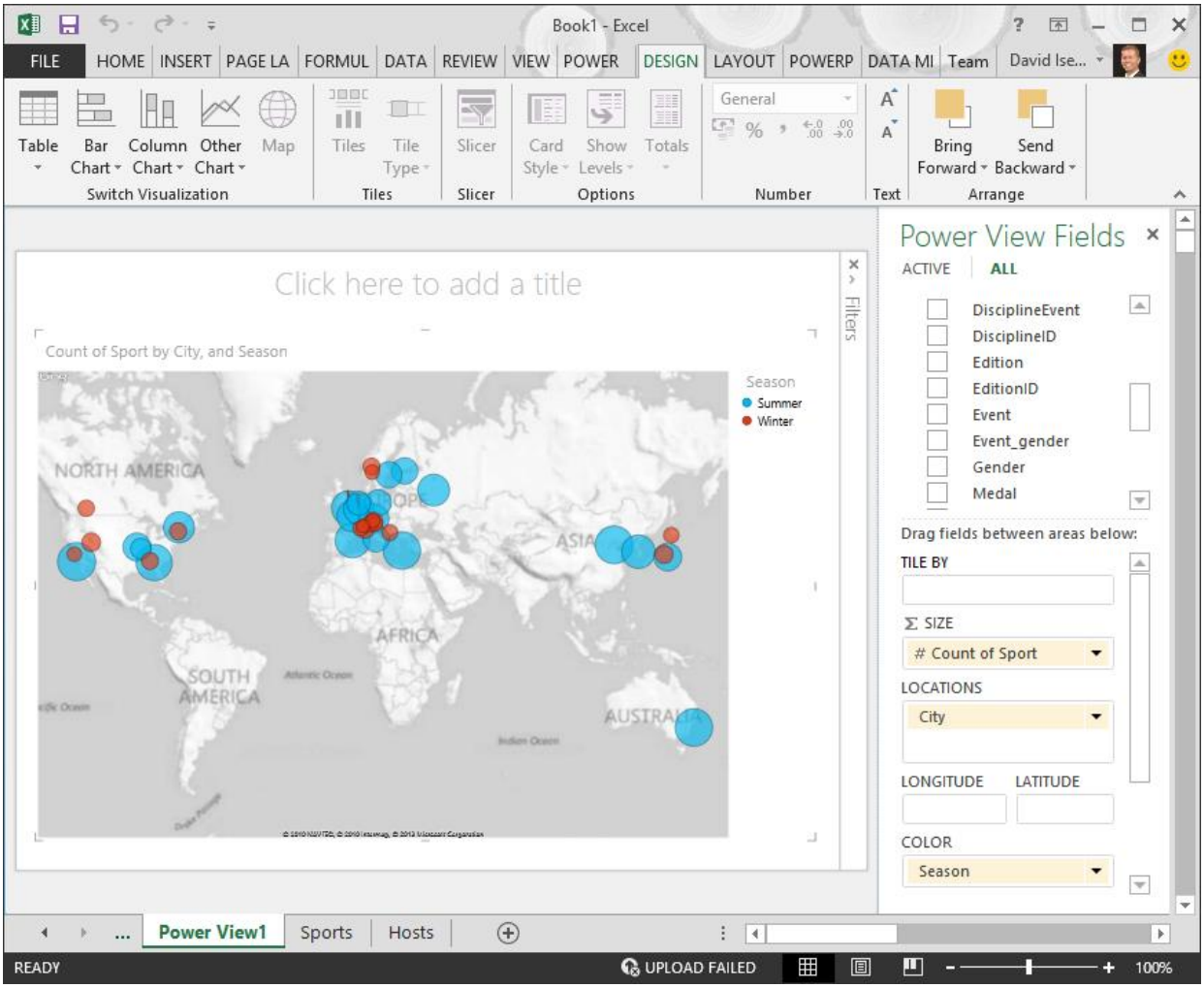
City	Sport
Albertville	Biathlon
Albertville	Bobsleigh
Albertville	Ice Hockey
Albertville	Luge
Albertville	Skating
Albertville	Skiing
Amsterdam	Aquatics
Amsterdam	Athletics
Amsterdam	Boxing
Amsterdam	Cycling
Amsterdam	Equestrian
Amsterdam	Fencing
Amsterdam	Football
Amsterdam	Gymnastics
Amsterdam	Hockey

5. In the FIELDS area of **Power View Fields**, click the arrow next to Sport and select **Count (Not Blank)**. Now Power View is counting the sports, rather than listing them, as shown in the following screen.



6. On the ribbon, select **DESIGN > Switch Visualization > Map**. The **DESIGN** tab is only available if the Power View table is selected. You may get a warning about enabling external content when you switch to the Map visualization.
7. A map replaces the table as the visualization. On the map, blue circles of varying size indicate the number of different sport events held at each Olympic Host location. But it might be more interesting to see which were summer events, and which were winter.

8. To make the most use of the report area, let's collapse the **Filters** area. Click the arrow in the upper right corner of the **Filters** area.
9. In **Power View Fields**, expand **Medals**. Drag the Season field down to the **COLOR** area. That's better: the map now displays blue bubbles for summer sports, and red bubbles for winter sports, as shown in the following screen. You can resize the visualization by dragging any of its corners.



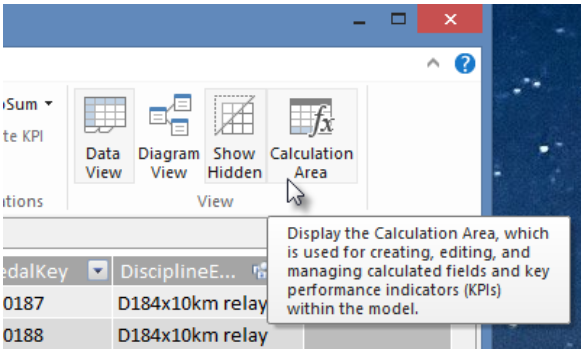
Now you have a Power View report that visualizes the number of sporting events in various locations, using a map, color-coded based on season. And it just took a few clicks.

Create calculated fields for Power View and PivotTables

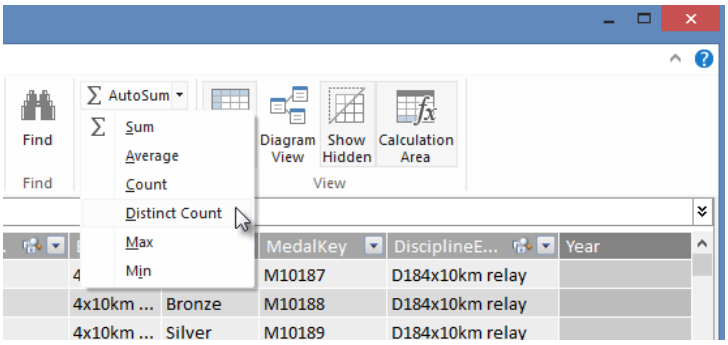
Power View uses the underlying Data Model to create visualizations. With Power Pivot and DAX, you can extend the Data Model by creating custom formulas, then create reports based on those formulas and calculations in PivotTables and in Power View.

Create a calculated field in Power Pivot

1. In Excel, click Power Pivot > Data Model > Manage to display the Power Pivot window.
2. Select the Medals table. Make sure the Calculation Area is displayed. The Calculation Area is found below the table data, and is used for creating, editing, and managing calculated fields. To view the Calculation Area, select Home > View > Calculation Area, as shown in the following screen.



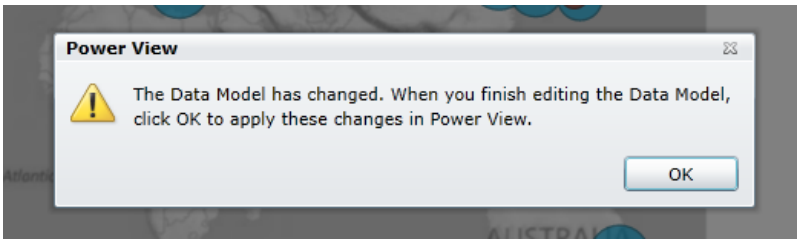
3. Let's calculate the number of Olympic editions. In the Calculation Area, select the cell directly below the Edition column. From the ribbon, select AutoSum > Distinct Count, as shown in the following screen.



4. Power Pivot creates a DAX expression for the active cell in the Calculation Area. In this case, Power Pivot automatically created the following DAX formula:

   Distinct Count of Edition:=DISTINCTCOUNT([Edition])

   Additional calculations in AutoSum are just as easy, such as Sum, Average, Min, Max, and others.
5. Save the Excel workbook. The Data Model is updated with the new calculated field. When you return to the Power View tab in Excel, a warning lets you know the Data Model has been updated, as shown in the following screen.

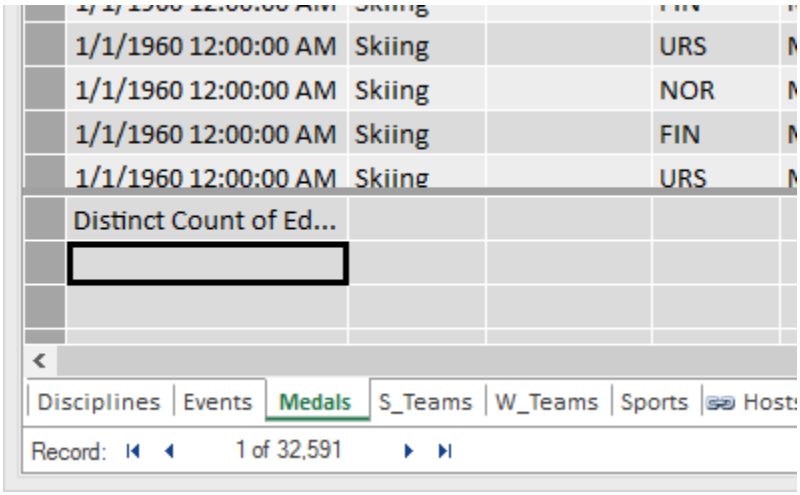


We'll use this Distinct Count of Edition calculated field later on in the modules.

Create a calculated field using DAX in Power Pivot

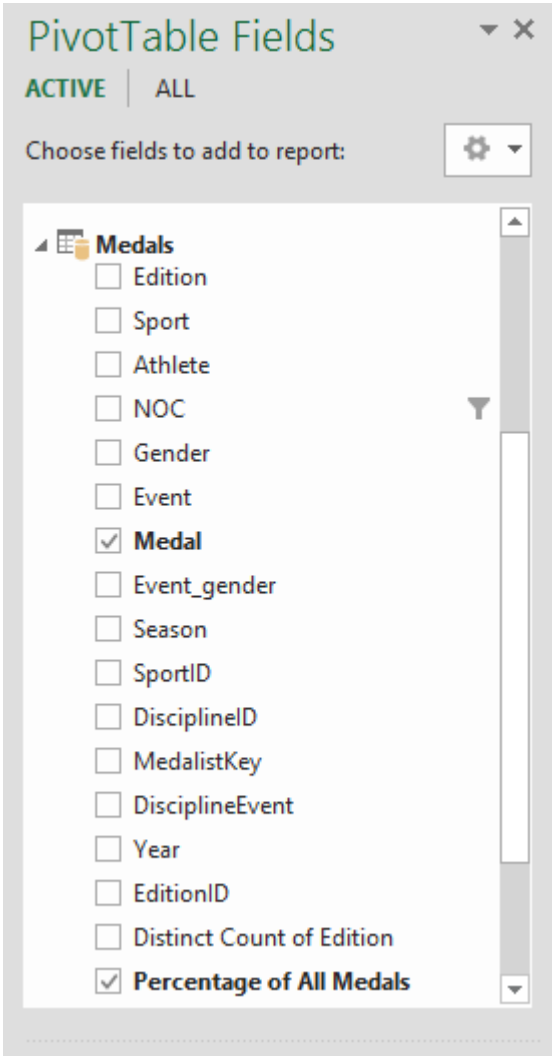
The AutoSum calculation is useful, but there are times when more customized calculations are required. You can create DAX formulas in the Calculation Area, just like you create formulas in Excel. Let's create a DAX formula and then see how it appears in our Data Model, and as a result, is available in our PivotTable and in Power View.

1. Open the Power Pivot window. In the Calculation Area, select the cell directly below the AutoSum calculation you completed in the previous section, as shown in the following screen.

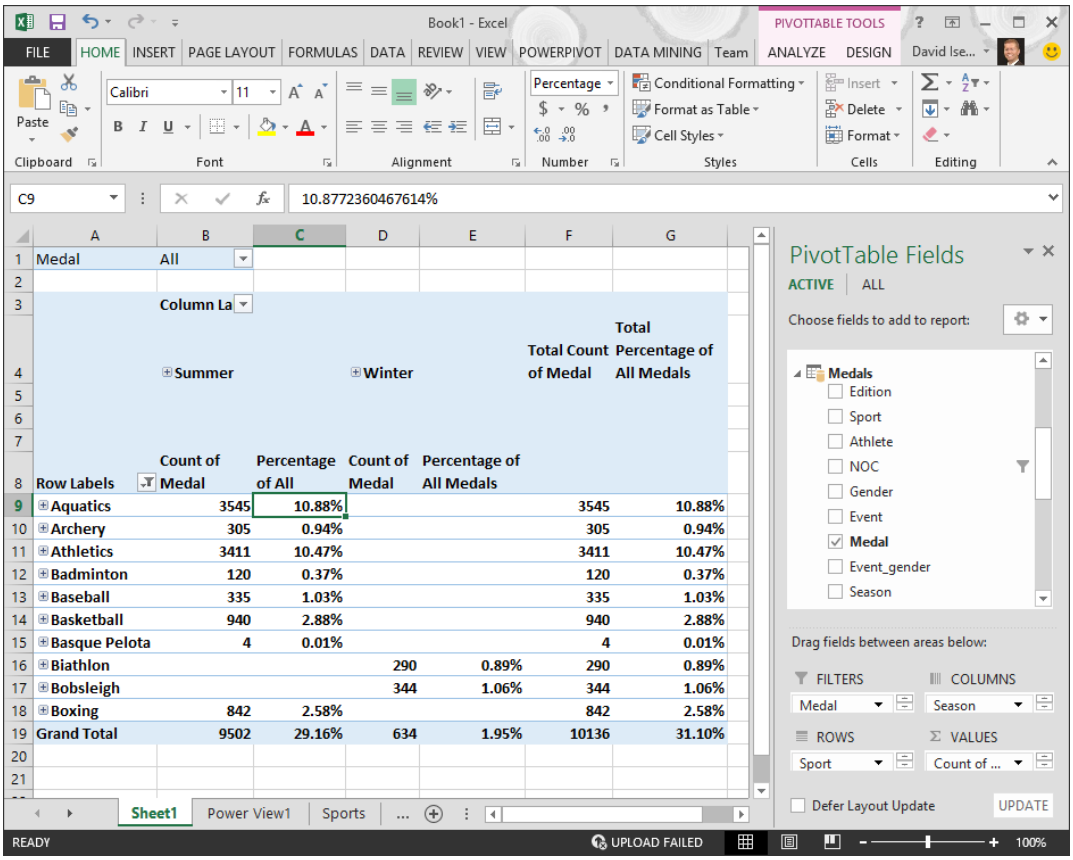


2. Let's calculate the percentage of all medals. In the formula bar, type the following DAX formula. IntelliSense provides available commands based on what you type, and you can press Tab to select the highlighted IntelliSense option.

   Percentage of All Medals:=[Count of Medal]/CALCULATE([Count of Medal],ALL(Medals))
3. When you switch back to the Excel window, Excel lets you know the Data Model has been updated. In Excel, select the PivotTable in Sheet1. In PivotTable Fields, expand the Medals table. At the bottom of the fields list are the two calculated fields we just created, as shown in the following screen. Select Percentage of All Medals.



4. In the PivotTable, the Percentage of All Medals field appears after Count of Medal. It's not formatted as a percentage, so select those fields (you can select them all at once, by hovering over the top of one of the Percentage of All Medals field, until the cursor becomes a down arrow, and then clicking). Once they're selected, click HOME > Number > Percentage. In the same section of the ribbon, adjust the number of decimal places to two. Your pivot table looks like the following screen.



In a previous module, we filtered the Sports field to only the first ten, alphabetically, which is why we only see Aquatics through Boxing, and why the percentage in the Grand Total is 29.16%, rather than 100%. What this does tell us, of course, is that these first ten sports account for 29.16% of all medals awarded in the Summer games. We also can see that Aquatics accounted for 10.88% of all medals.

Since the Percentage of All Medals field is in the Data Model, it's also available in Power View.

You can also create calculated fields from the Power Pivot tab while in Power View. Whether you create a calculated field in Power Pivot or while in Power View, the result is the same: the Data Model is updated to include the calculated field, and makes it available to all client tools.

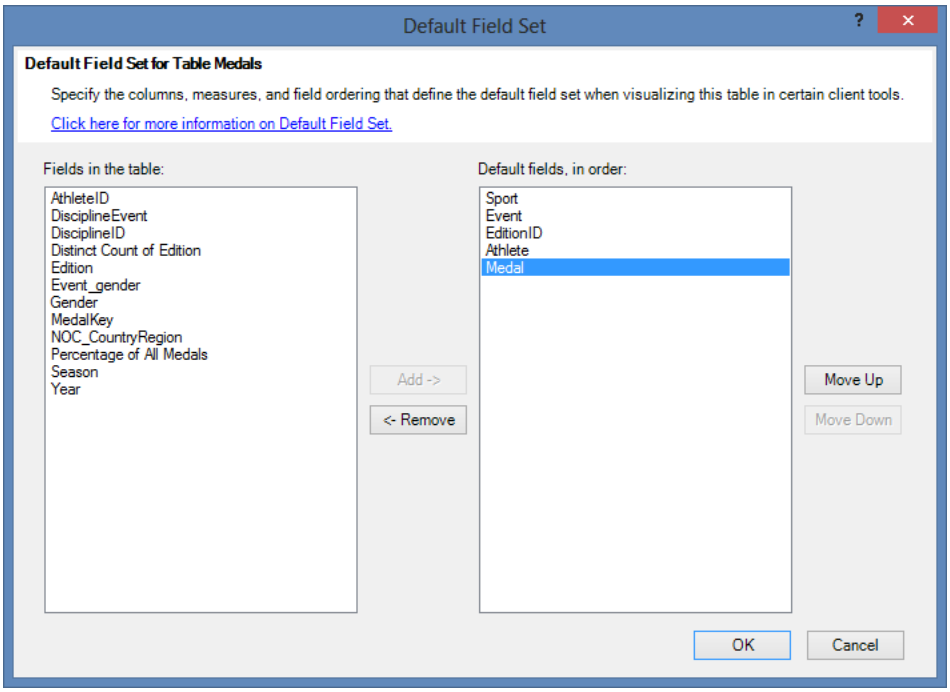
Set field defaults, table behaviors, and data categories

Another way to streamline report creation in Power View is by setting a default field set. When you set a default field set for a table, you can simply click that table in Power View, and the default set of fields is automatically added to a new report.

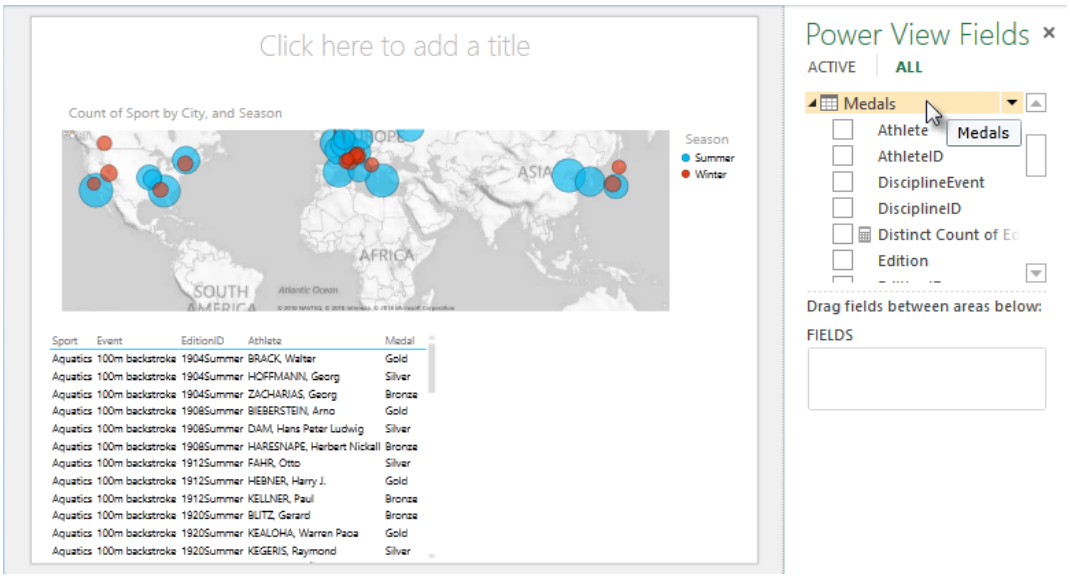
In this section, you set defaults for your workbook that will save you time when creating reports.

Create the Default Field Set for a table

1. The Power Pivot window should still be available. If not, click Power Pivot > Data Model> Manage. In Power Pivot, select Home > View > Data View to make sure Data View is selected. Select the Medals table.
2. On the Advanced tab, click Reporting Properties > Default Field Set. A window appears that lets you specify default fields for tables created using client tools such as Power View.
3. Select Sport, Event, EditionID, Athlete, and Medal in the left pane, and click Add -> to make them the default fields. Make sure they appear in the right pane, Default fields, in the order they were listed. The Default Field Set window looks like the following screen.



4. Click OK to save the default field set for the Medals table.
5. To see how this works, switch to the Power View sheet in Excel.
6. Click anywhere on the blank report canvas, to make sure you don't have an existing visualization selected. Your Power View sheet currently only has one visualization, which is the map you created earlier.
7. In the Power View Fields list, click the Medals table name. Power View creates a table and automatically adds the five default fields from the Medals table, in the order you specified, as shown in the following screen. If you accidentally click on the triangle beside Medals, the table simply expands, rather than adding a new table with default fields.

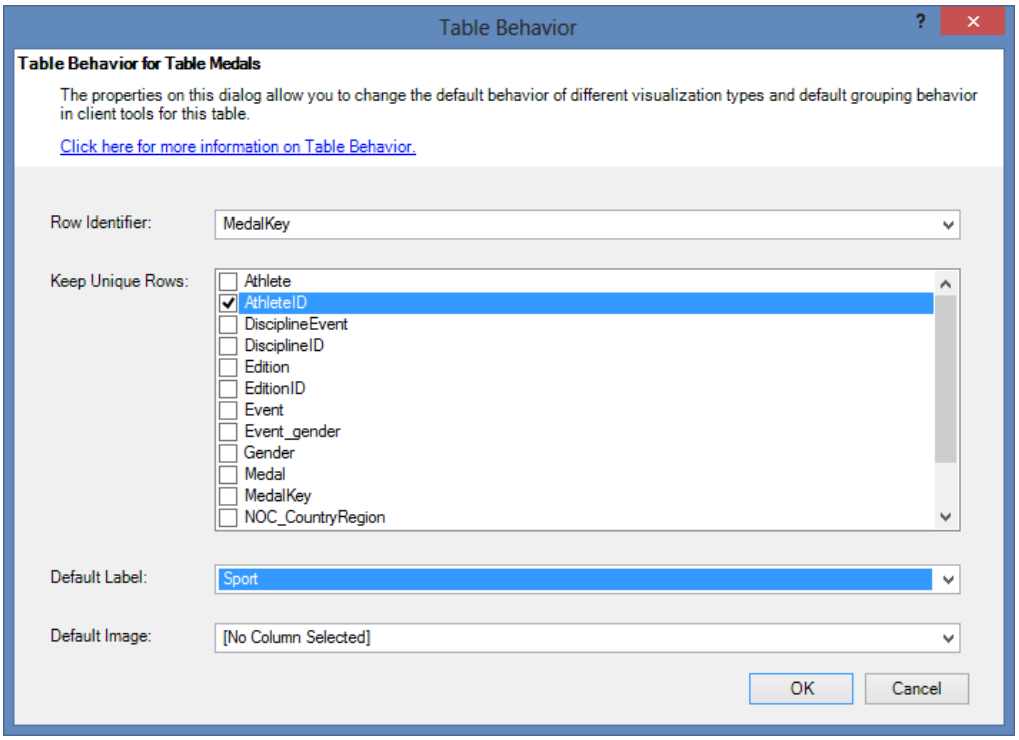


Set Table Behavior

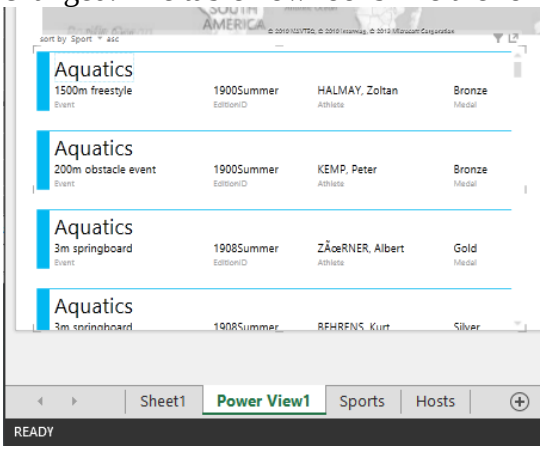
You can also set the default table behavior, which Power View uses to automatically create report labels for the table. This becomes useful when you create visualizations from the same table, perhaps for many different reports. We use default table behavior in the next few steps, so let's set it now.

1. Back in Power Pivot, with the Medals table selected, select Advanced > Reporting Properties > Table Behavior. A window appears where you can specify table behavior.
2. In the Table Behavior window, the Row Identifier is the column that contains only unique keys and no blank values. This is often the table's primary key, but doesn't have to be. You have to select a Row Identifier before making other selections in the window. Select MedalKey as the Row Identifier.
3. In the Keep Unique Rows section, select AthleteID. Fields you select here have row values that should be unique, and should not be aggregated when creating Pivot Tables or Power View reports.

   Note: If you have trouble with reports that don't aggregate how you want them to, ensure the field you want to aggregate is not selected in the Keep Unique Rows fields.
4. For Default Label, select a key that should be used as a default report label. Select Sport.
5. For Default Image, leave the selection as [No Column Selected], since you haven't added images yet. The Table Behavior window looks like the following screen.



6. Click OK. On the Power View sheet in Excel, select the table you created in the previous steps. From the ribbon, select DESIGN > Table > Card. The table you created changes into a collection of Cards; the data is the same, but the visualization of the data has changed. The table now looks like the following screen.

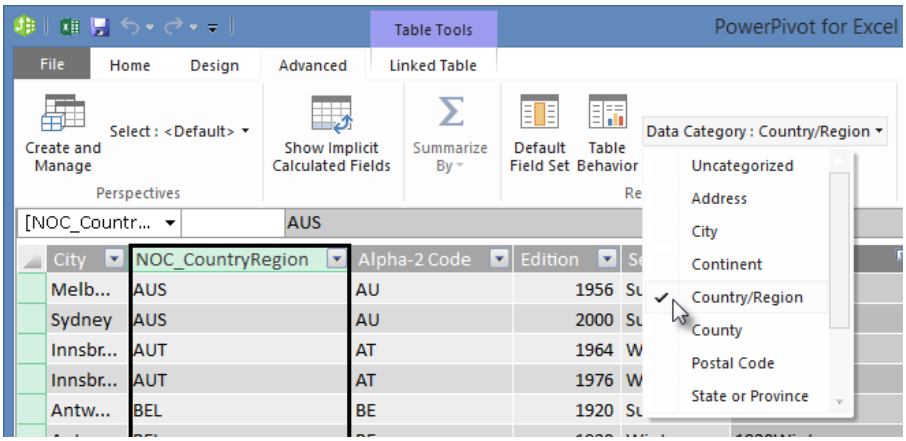


Notice that the Sport field is larger than the rest, and appears as a heading for each card. That's because you set Sport as the Default Label in the Table Behavior window when you were in Power Pivot.

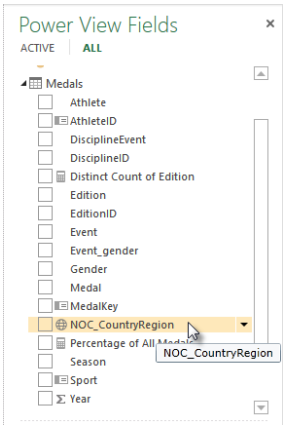
Set Data Categories for fields

In order for Power View to dynamically create reports based on underlying data, such as location, fields that contain such data must be properly categorized. For the Olympics data, let's specify the categories for a few fields.

1. In Power Pivot, select Hosts. Select the NOC_CountryRegion field. From Advanced > Reporting Properties > Data Category: click the arrow and select Country/Region from the list of available data categories, as shown in the following screen.



2. In Medals, select the NOC_CountryRegion column. Again, change the Data Category to Country/Region.
3. Return to Excel, and select the Power View sheet. Expand the Medals table in Power View Fields, and notice that the NOC_CountryRegion field now has a small globe icon beside it. The globe indicates that NOC_CountryRegion contains a geographic location, as shown in the following screen.



We'll use that geographic location in an upcoming module. It's time to save your work, review what you've learned, and then get ready to dive into the next module.

Checkpoint and Quiz

Review what you learned

In this module you learned how to create a map-based Power View visualization, then created calculated fields to extend your Data Model, and analyze the data in a different way. You also learned how to create default field sets for a table, which streamlined creating a new Power View table pre-populated with the default set of fields. You also learned how to define default table behavior, so the ordering and labeling of new tables was fast and consistent.

In the next module in this series, you build on what you learned here. There's a lot of data out there, and in the next module, you add Internet data into your Data Model, and bring in images so that your Power View reports can really shine.

QUIZ

Want to see how well you remember what you learned? Here's your chance. The following quiz highlights features, capabilities, or requirements you learned about in this module. At the bottom of the page, you'll find the answers. Good luck!

Question 1: Where does Power View get its data to create Power View reports?

A: Only from worksheets included in Excel.

B: Only from the Data Model.

C: Only from data imported from external sources.

D: From the Data Model, and from any data that exists in the worksheets in Excel.

Question 2: Which of the following is true about a default field set?

A: You can only create one default field set for the entire Data Model.

B: In Power View, clicking the table name in Power View Fields creates a table visualization that is automatically populated with the its default field set.

C: If you create a default field set for a table, all other fields in that table are disabled.

D: All of the above

Question 3: Which of the following is true about Calculated Fields?

A: When you create them in Power Pivot, they appear in Power View as fields available in the table in which they were created.

B: If you create them in the Calculation Area of Power Pivot, they are hidden from all client tools.

C: When you create them in Power Pivot, they each appear as individual tables in all client tools.

D: Both A and B.

Question 4: In the Default Behavior Table window, if you select a field in *Keep Unique Rows*, which of the following is correct?

A: You must explicitly select "Sum this field" from Power View Fields in order to aggregate the field.

B: The field is always aggregated in Power View or PivotTables.

C: The field is never aggregated in Power View or PivotTables.

D: Selecting *Keep Unique Rows* has no effect on the behavior of the field in Power View or PivotTables.

Quiz answers

1. Correct answer: B
2. Correct answer: B
3. Correct answer: A
4. Correct answer: C

Module 4: Incorporate Internet Data, and Set Power View Report Defaults

Applies To: Excel 2016 Excel 2013

Abstract: At the end of the previous module, Create Map-based Power View Reports, your Excel workbook included data from various sources, a Data Model based on relationships established using Power Pivot, and a map-based Power View report with some basic Olympics information. In this module, we extend and optimize the workbook with more data, interesting graphics, and prepare the workbook to easily create amazing Power View reports.

The sections in this module are the following:

Import Internet-based image links into the Data Model

Use Internet data to complete the Data Model

Hide tables and fields for easier report creation

Checkpoint and Quiz

At the end of this module is a quiz you can take to test your learning.

This series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. The modules in this series are the following:

1. Import Data into Excel 2013, and Create a Data Model
2. Extend Data Model relationships using Excel 2013, Power Pivot, and DAX
3. Create Map-based Power View Reports
4. **Incorporate Internet Data, and Set Power View Report Defaults**
5. Create Amazing Power View Reports - Part 1
6. Create Amazing Power View Reports - Part 2

Import Internet-based image links into the Data Model

The amount of data is constantly growing, and so is the expectation to be able to visualize it. With additional data comes different perspectives, and opportunities to review and consider how data interacts in many different ways. Power Pivot and Power View bring your data together – as well as external data – and visualize it in fun, interesting ways.

In this section, you extend the Data Model to include images of flags for the regions or countries that participate in the Olympics, and then add images to represent the contested disciplines in the Olympic Games.

Add flag images to the Data Model

Images enrich the visual impact of the Power View reports. In the following steps you add two image categories – an image for each discipline, and an image of the flag that represents each region or country.

You have two tables which are good candidates for incorporating this information: the **Discipline** table for the discipline images, and the **Hosts** table for flags. To make this interesting, you use images found on the Internet, and use a link to each image so it can render for anyone viewing a report, regardless of where they are.

1. After searching around the Internet, you find a good source for flag images for each country or region: the CIA.gov World Factbook site. For example, when you click on the following link, you get an image of the flag for France.

   https://www.cia.gov/library/publications/the-world-factbook/graphics/flags/large/fr-lgflag.gif

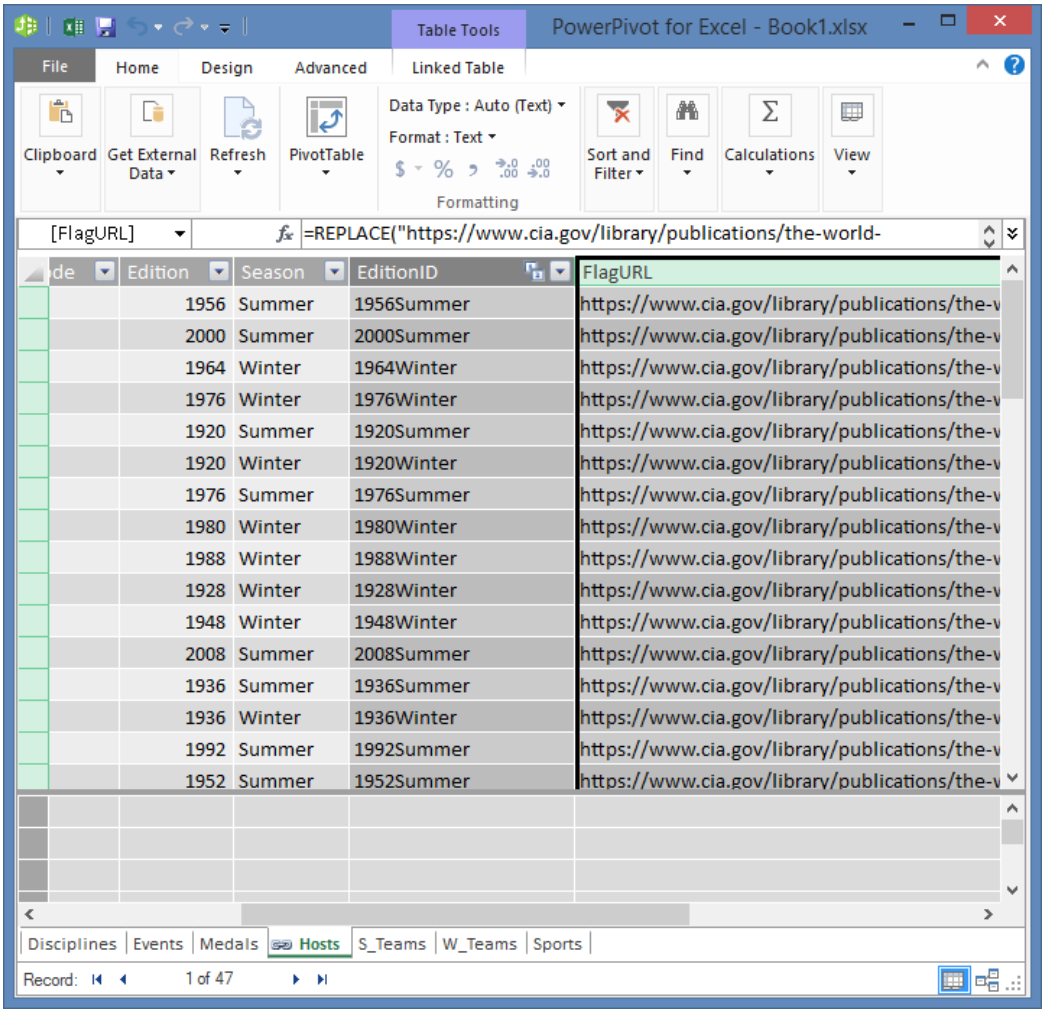
   When you investigate further and find other flag image URLs on the site, you realize the URLs have a consistent format, and that the only variable is the two-letter country or region code. So if you knew each two-letter country or region code, you could just insert that two-letter code into each URL, and get a link to each flag. That's a plus, and when you look closely at your data, you realize that the **Hosts** table contains two-letter country or region codes. Great.
2. You need to create a new field in the **Hosts** table to store the flag URLs. In an earlier module you used DAX to concatenate two fields, and we'll do the same for the flag URLs. In Power Pivot, select the empty column that has the title *Add Column* in the **Hosts** table. In the formula bar, type the following DAX formula (or you can copy and paste it into the formula column). It looks long, but most of it is the URL we want to use from the CIA Factbook.

   =REPLACE("https://www.cia.gov/library/publications/the-world-factbook/graphics/flags/large/fr-lgflag.gif",82,2,LOWER([Alpha-2 code]))

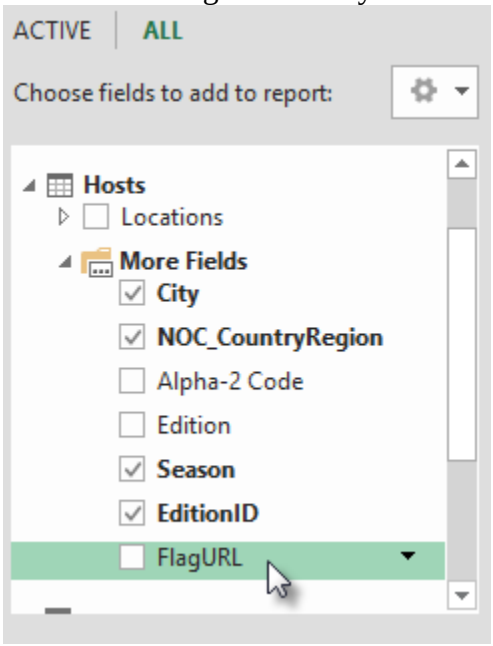
   In that DAX function you did a few things, all in one line. First, the DAX function

REPLACE replaces text in a given text string, so by using that function you replaced the part of the URL that referenced France's flag (fr) with the appropriate two-letter code for each country or region. The number 82 tells the REPLACE function to begin the replacement 82 characters into the string. The 2 that follows tells REPLACE how many characters to replace. Next, you may have noticed that the URL is case-sensitive (you tested that first, of course) and our two-letter codes are uppercase, so we had to convert them to lowercase as we inserted them into the URL using the DAX function LOWER.

3. Rename the column with the flag URLs to FlagURL. Your Power Pivot screen now looks like the following screen.



4. Return to Excel and select the PivotTable in **Sheet1**. In **PivotTable Fields**, select **ALL**. You see the FlagURL field you added is available, as shown in the following screen.



Notes: In some instances, the Alpha-2 code used by the CIA.gov World Factbook site doesn't match the official ISO 3166-1 Alpha-2 code provided in the **Hosts** table, which means some flags don't display properly. You can fix that, and get the right Flag URLs, by making the following substitutions directly in your **Hosts** table in Excel, for each affected entry. The good news is that Power Pivot automatically detects the changes you make in Excel, and recalculates the DAX formula:

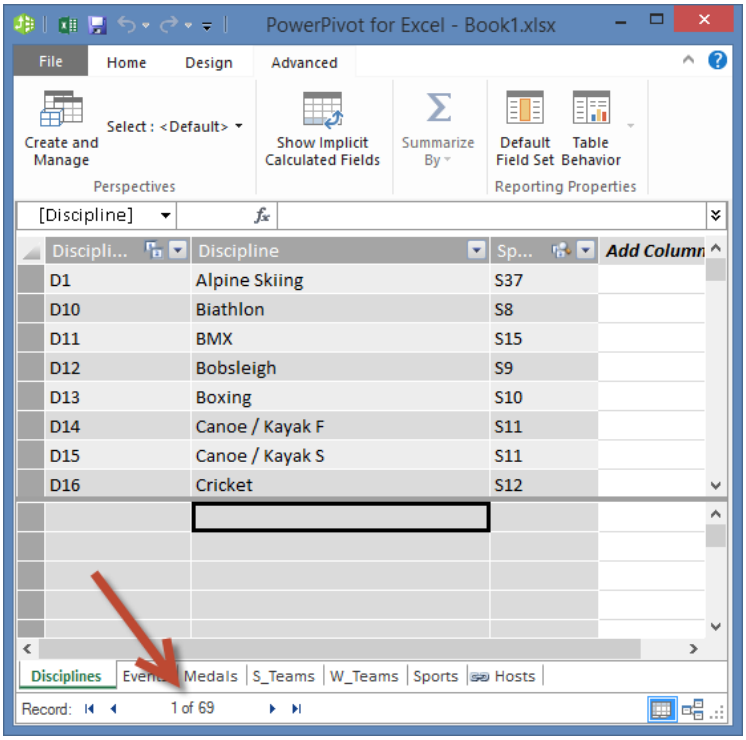
- change AT to AU

Add sport pictograms to the Data Model

Power View reports are more interesting when images are associated with Olympic events. In this section, you add images to the **Disciplines** table.

1. After searching the Internet, you find that Wikimedia Commons has great pictograms for each Olympic discipline, submitted by Parutakupiu. The following link shows you the many images from Parutakupiu.

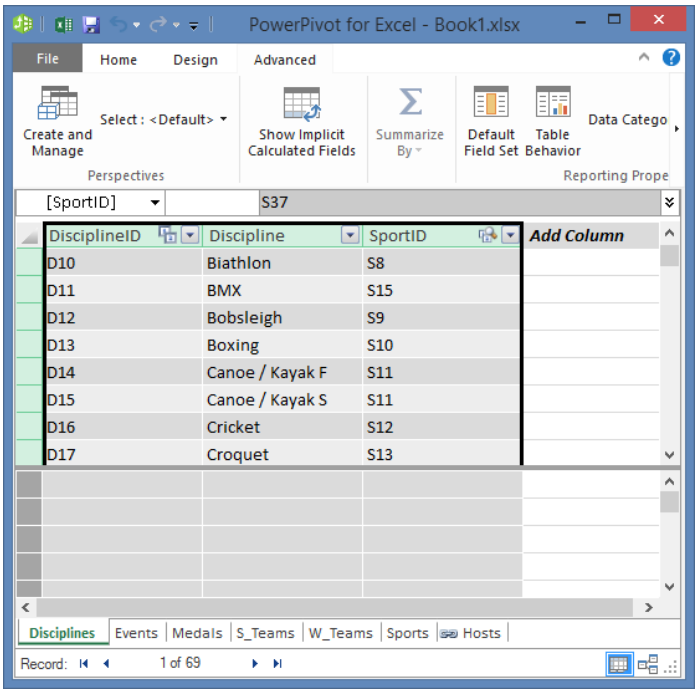
   http://commons.wikimedia.org/wiki/user:parutakupiu
2. But when you look at each of the individual images, you find the common URL structure doesn't lend itself to using DAX to automatically create links to the images. You want to know how many disciplines exist in your Data Model, to gauge whether you should input the links manually. In Power Pivot select the **Disciplines** table, and look at the bottom of the Power Pivot window. There, you see the number of records is 69, as shown in the following screen.



Disciplines	Discipline	Sports	Add Column
D1	Alpine Skiing	S37	
D10	Biathlon	S8	
D11	BMX	S15	
D12	Bobsleigh	S9	
D13	Boxing	S10	
D14	Canoe / Kayak F	S11	
D15	Canoe / Kayak S	S11	
D16	Cricket	S12	

You decide that 69 records is not too many to copy and paste manually, especially since they'll be so compelling when you create reports.

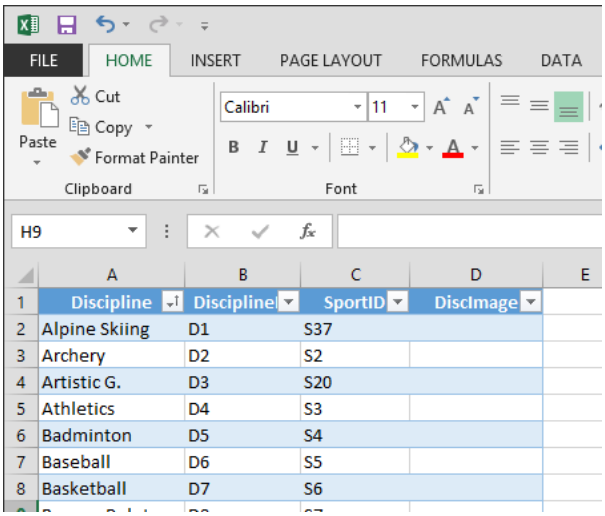
3. To add the pictogram URLs, you need a new column in the **Disciplines** table. That presents an interesting challenge: the **Disciplines** table was added to the Data Model by importing an Access database, so the **Disciplines** table appears only in Power Pivot, not in Excel. But in Power Pivot, you can't directly input data into individual records, also called rows. To address this, we can create a new table based on information in the **Disciplines** table, add it to the Data Model, and create a relationship.
4. In Power Pivot, copy the three columns in the **Disciplines** table. You can select them by hovering over the Discipline column then dragging across to the SportID column, as shown in the following screen, then click **Home > Clipboard > Copy**.



5. In Excel, create a new worksheet and paste the copied data. Format the pasted data as a table like you did in previous modules in this series, specifying the top row as labels, then name the table **DiscImage**. Name the worksheet DiscImage as well.

Note: A workbook with all the manual input completed, called DiscImage_table.xlsx, is one of the files you downloaded in the first module in this series. To make it easy, you can download it by clicking here. Read the next steps, which you can apply to similar situations with your own data.

1. In the column beside SportID, type DiscImage in the first row. Excel automatically extends the table to include the row. Your **DiscImage** worksheet looks like the following screen.

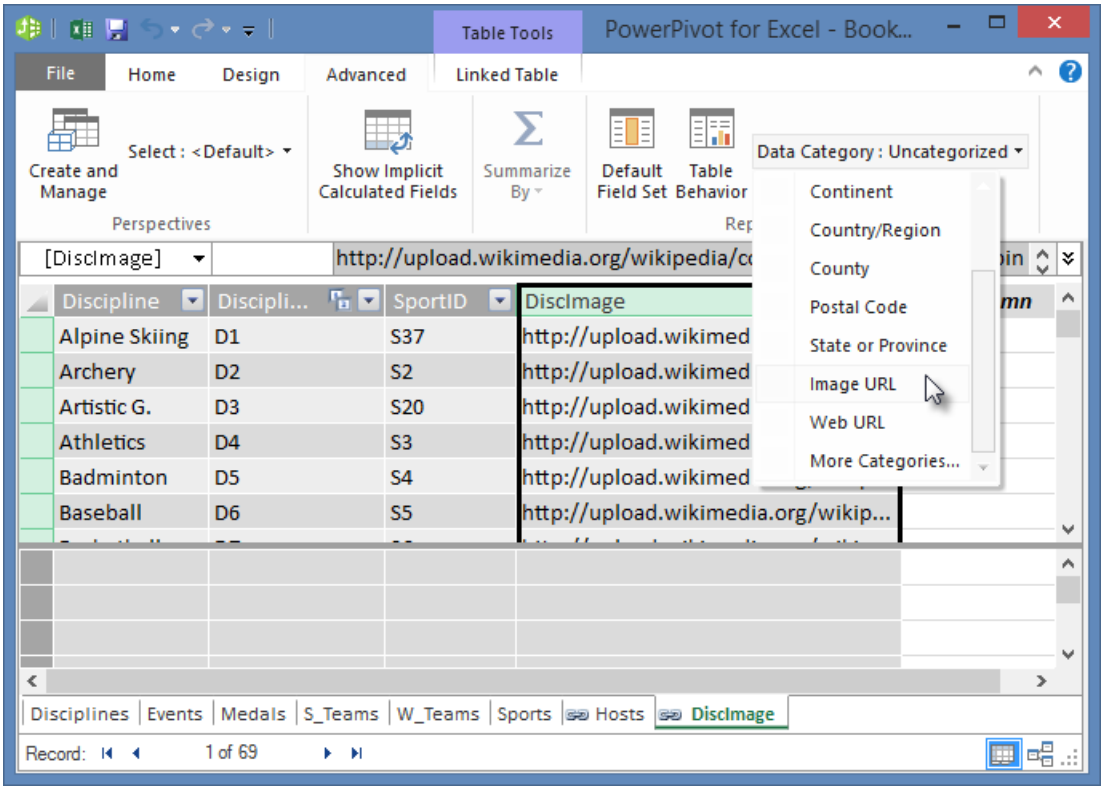


2. Enter the URLs for each discipline, based on the pictograms from Wikimedia Commons. If you've downloaded the workbook where they're already entered, you can copy and paste them into that column.
3. Still in Excel, choose **Power Pivot > Tables > Add to Data Model** to add the table you created to the Data Model.
4. In Power Pivot, in **Diagram View**, create a relationship by dragging the DisciplineID field from the **Disciplines** table to the DisciplineID field in the **DiscImage** table.

Set the Data Category to correctly display images

In order for reports in Power View to correctly display the images, you must correctly set the Data Category to Image URL. Power Pivot attempts to determine the type of data you have in your Data Model, in which case it adds the term (Suggested) after the auto-selected Category, but it's good to be sure. Let's confirm.

1. In Power Pivot, select the **DiscImage** table, and then choose the DiscImage column.
2. On the ribbon, select **Advanced > Reporting Properties > Data Category** and select **Image URL**, as shown in the following screen. Excel attempts to detect the Data Category, and when it does, marks the selected Data category as (suggested).



Your Data Model now includes URLs for pictograms that can be associated with each discipline, and the Data Category is correctly set to *Image URL*.

Use Internet data to complete the Data Model

Many sites on the Internet offer data that can be used in reports, if you find the data reliable and useful. In this section, you add population data to your Data Model.

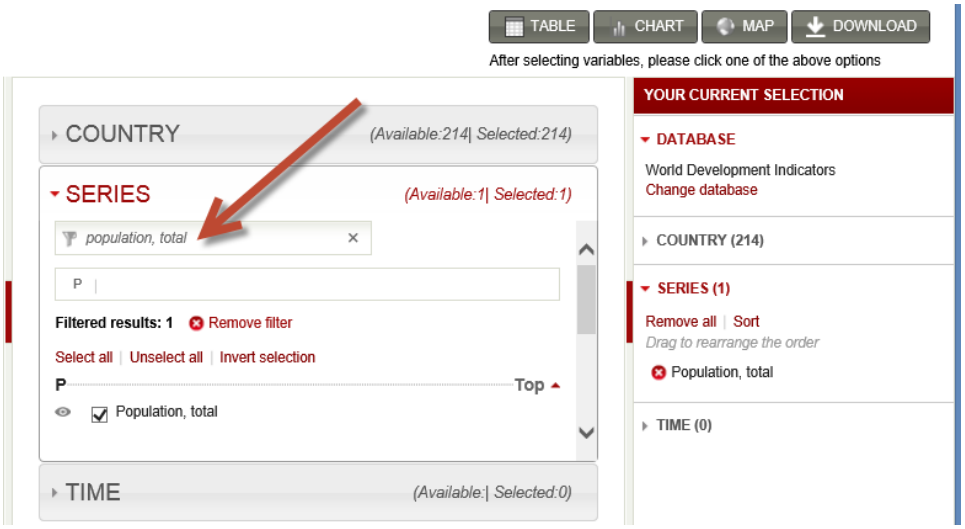
Add population information to the Data Model

In order to create reports that include population information, you need to find and then include population data in the Data Model. A great source of such information is the Worldbank.org data bank. After visiting the site, you find the following page that enables you to select and download all sorts of country or region data.

http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators

There are many options for downloading data from Worldbank.org, and all sorts of interesting reports you could create as a result. For now, you're interested in population for countries or regions in your data model. In the following steps you download a table of population data, and add it to your Data Model.

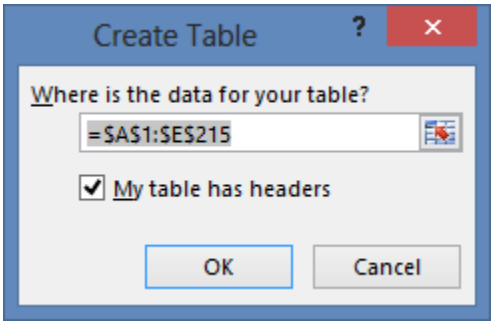
1. Navigate to the worldbank.org website from the link provided above.
2. In the center section of the page, under **COUNTRY**, click *select all.*
3. Under **SERIES**, search for and select *population, total*. The following screen shows an image of that search, with an arrow pointing to the search box.



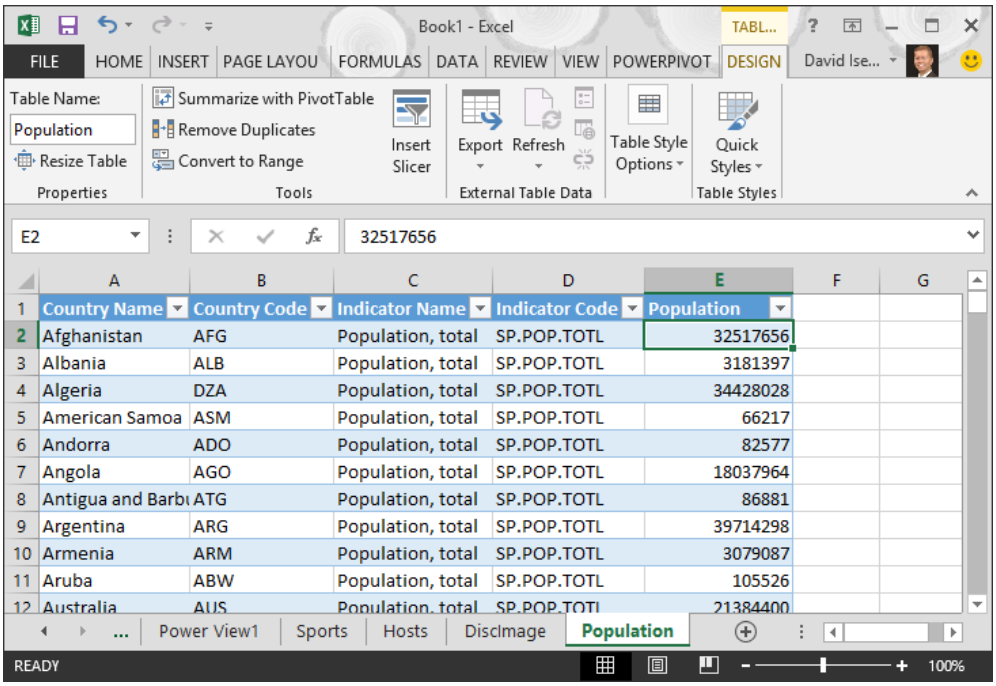
4. Under **TIME**, select 2008 (that's a few years old, but it matches the Olympics data used in these modules)
5. Once those selections are made, click the **DOWNLOAD** button, and then choose Excel as the file type. The workbook name, as downloaded, isn't very readable. Rename the workbook to **Population.xls**, then save it in a location where you can access it in the next series of steps.

Now you're ready to import that data into your Data Model.

1. In the Excel workbook that contains your Olympics data, insert a new worksheet and name it **Population**.
2. Browse to the downloaded **Population.xls** workbook, open it, and copy the data. Remember, with any cell in the dataset selected, you can press Ctrl + A to select all adjacent data. Paste the data into cell A1 in the **Population** worksheet in your Olympics workbook.
3. In your Olympics workbook, you want to format the data you just pasted as a table, and name the table **Population**. With any cell in the dataset selected, such as cell A1, press Ctrl + A to select all adjacent data, and then Ctrl + T to format the data as a table. Since the data has headers, select **My table has headers** in the **Create Table** window that appears, as shown here.



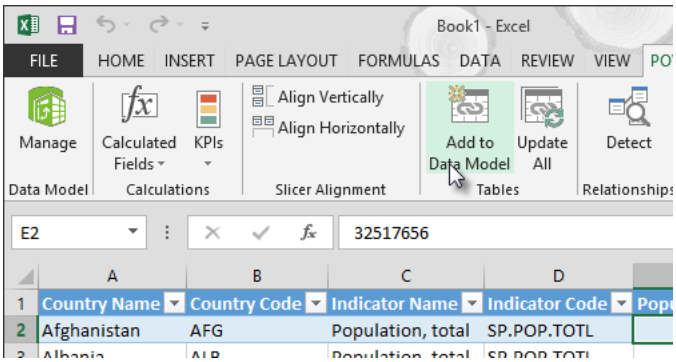
   Formatting the data as a table has many advantages. You can assign a name to a table, which makes it easy to identify. You can also establish relationships between tables, enabling exploration and analysis in PivotTables, Power Pivot, and Power View.
4. In the **TABLE TOOLS > DESIGN** tab, locate the **Table Name** field, and type **Population** to name the table. The population data is in a column titled 2008. To keep things straight, rename the 2008 column in the **Population** table to Population. Your workbook now looks like the following screen.



Notes: In some instances, the **Country Code** used by the Worldbank.org site doesn't match the official ISO 3166-1 Alpha-3 code provided in the **Medals** table, which means some countryregions won't display population data. You can fix that by making the following substitutions directly in your **Population** table in Excel, for each affected entry. The good news is that Power Pivot automatically detects the changes you make in Excel:

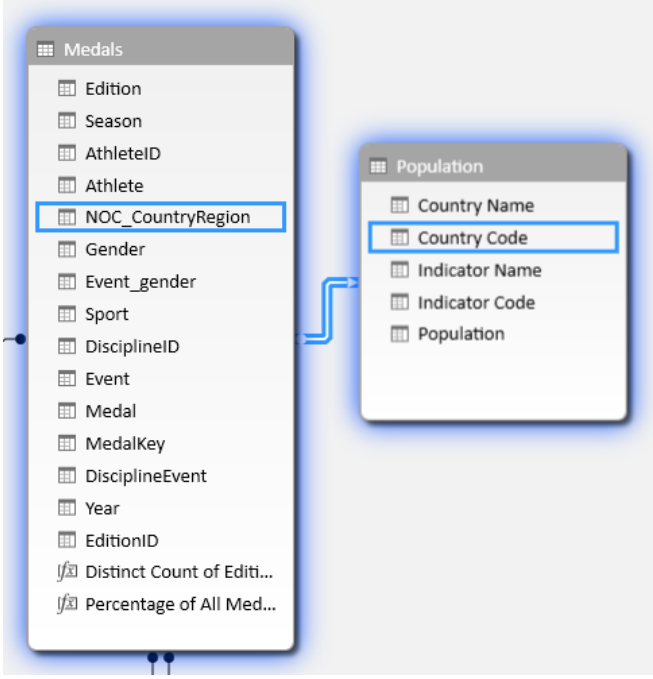
- change NLD to NED
- change CHE to SUI

5. In Excel, add the table to the Data Model by selecting **Power Pivot > Tables > Add to Data Model**, as shown in the following screen.



6. Next, let's create a relationship. We noticed that the Country or Region Code in **Population** is the same three-digit code found in the NOC_CountryRegion field of **Medals**. Great, we can easily create a relationship between those tables. In Power Pivot, in Diagram View, drag the **Population** table so it's situated beside the **Medals** table.

Drag the NOC_CountryRegion field of the **Medals** table onto the Country or Region Code field in the **Population** table. A relationship is established, as shown in the following screen.



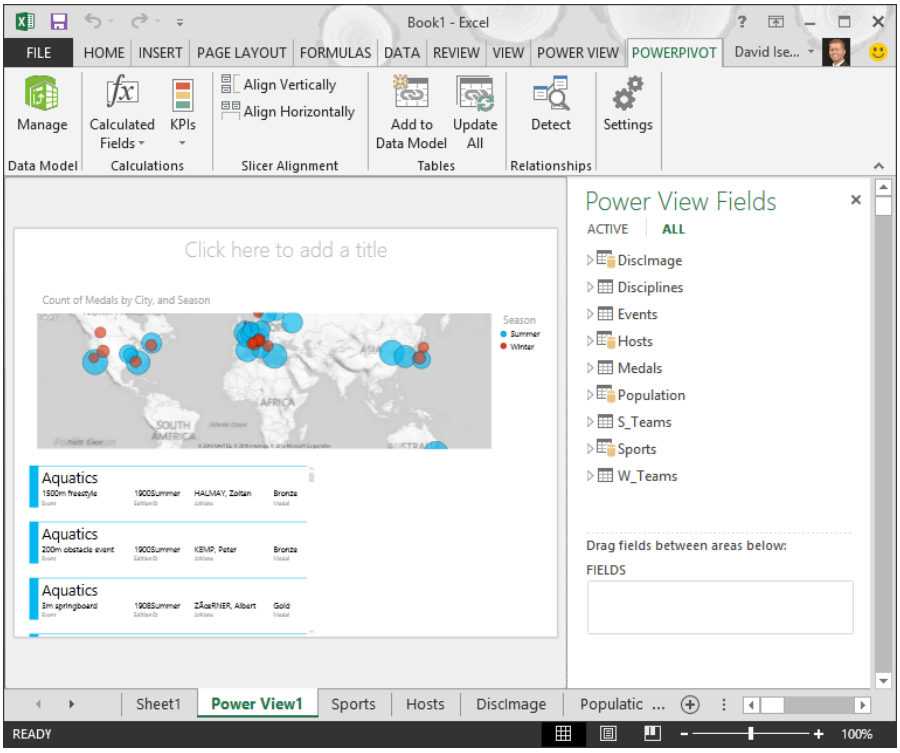
That wasn't too hard. Your Data Model now includes links to flags, links to discipline images (we called them pictograms earlier), and new tables that provide population information. We have all sorts of data available, and we're almost ready to create some compelling visualizations to include in reports.

But first, let's make report creation a little easier, by hiding some tables and fields our reports won't use.

Hide tables and fields for easier report creation

You may have noticed how many fields are in the **Medals** table. A whole lot of them, including many you won't use to create a report. In this section, you learn how to hide some of those fields, so you can streamline the report creation process in Power View.

To see this yourself, select the Power View sheet in Excel. The following screen shows the list of tables in **Power View Fields**. That is a long list of tables to choose from, and in many tables, there are fields your reports will never use.



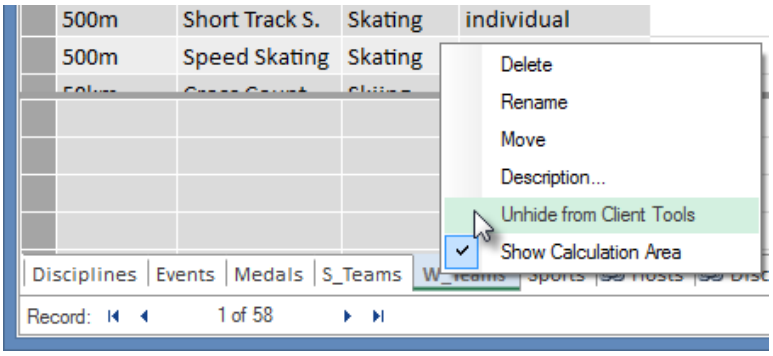
The underlying data is still important, but the list of tables and fields is too long, and maybe a little bit daunting. You can hide tables and fields from client tools, such as Pivot Tables and Power View, without removing the underlying data from the Data Model.

In the following steps, you hide a few of the tables and fields using Power Pivot. If you need tables or fields you've hidden to generate reports, you can always go back to Power Pivot and unhide them.

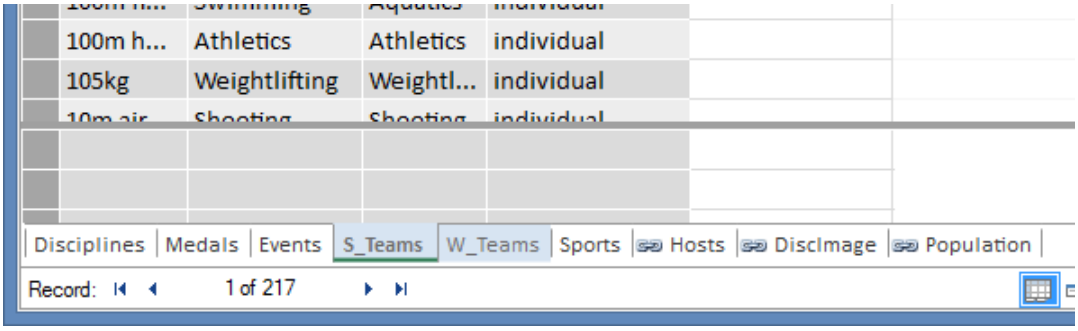
Note: When you hide a column or field, you won't be able to create reports or filters based on those hidden tables or fields.

Hide Tables using Power Pivot

1. In Power Pivot, select Home > View > Data View to make sure Data View is selected, rather than being in Diagram View.
2. Let's hide the following tables, which you don't believe you need to create reports: S_Teams and W_Teams. You notice a few tables where only one field is useful; later in this module, you find a solution to them as well.
3. Right-click on the W_Teams tab, found along the bottom of the window, and select Hide from Client Tools. The following screen shows the menu that appears when you right-click a hidden table tab in Power Pivot.



4. Hide the other table, S_Teams, as well. Notice that tabs for hidden tables are grayed out, as shown in the following screen.

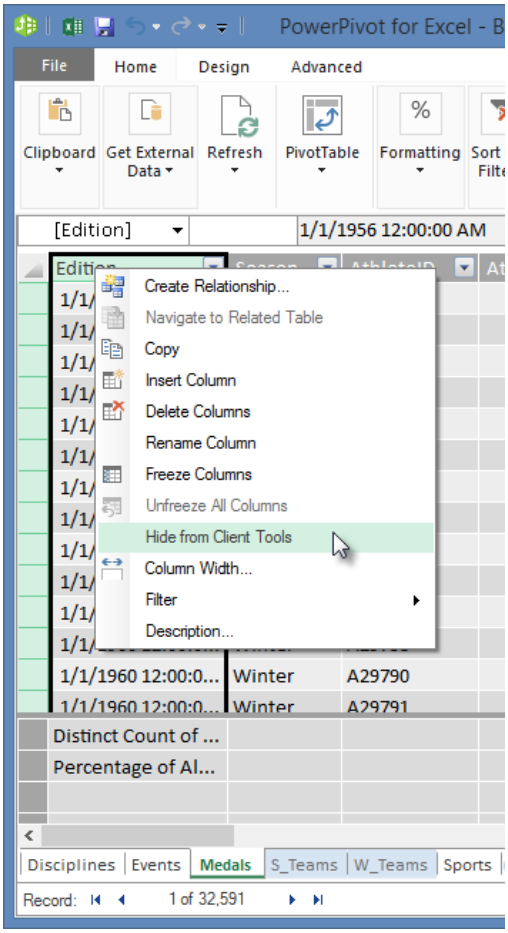


Hide Fields using Power Pivot

There are also some fields that aren't useful for creating reports. The underlying data may be important, but by hiding fields from client tools, such as PivotTables and Power View, the navigation and selection of fields to include in reports becomes clearer.

The following steps hide a collection of fields, from various tables, that you won't need in your reports.

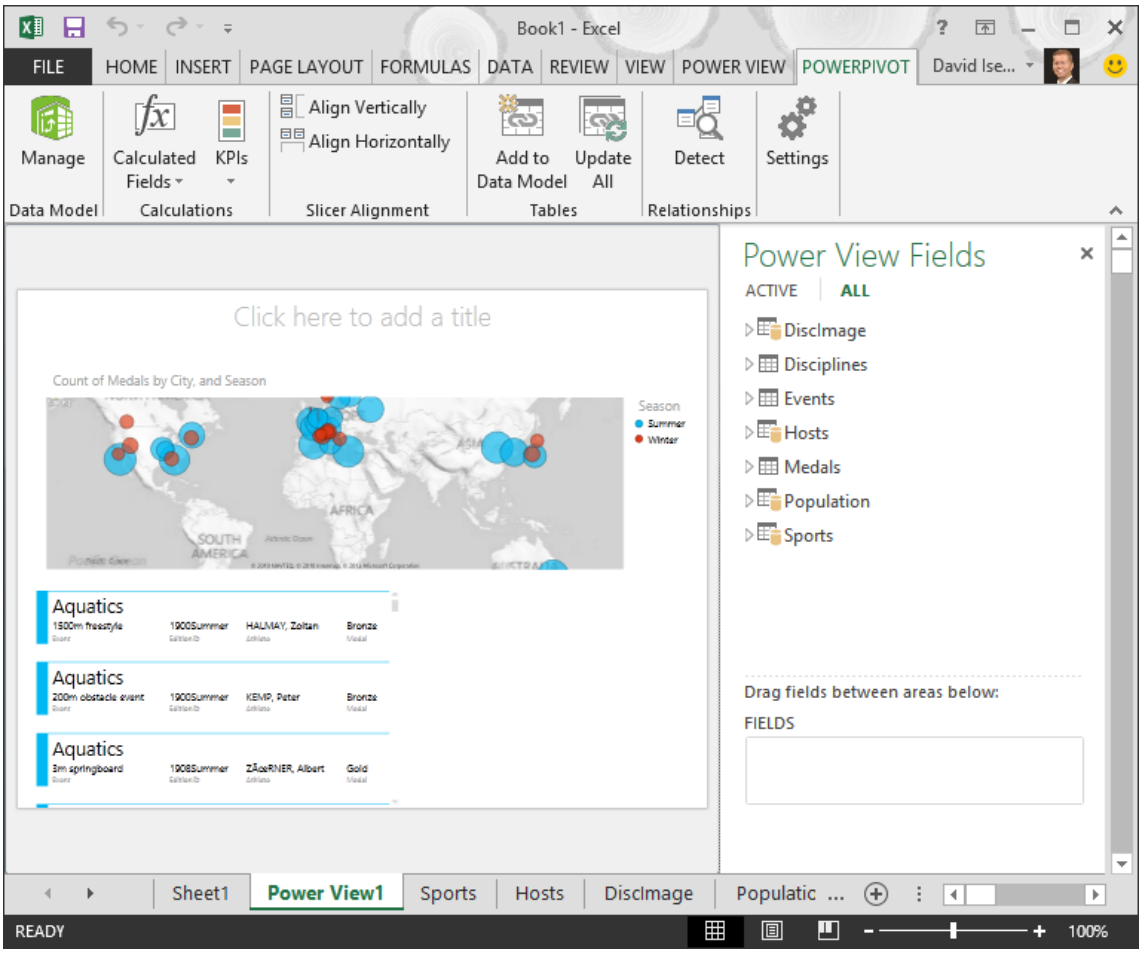
1. In Power Pivot, click on the Medals tab. Right-click the Edition column, then click Hide from Client Tools, as shown in the following screen.



Notice the column turns gray, similar to how the tabs of hidden tables are gray.

2. On the Medals tab, hide the following fields from client tools: Event_gender, MedalKey.
3. On the Events tab, hide the following fields from client tools: EventID, SportID.
4. On the Sports tab, hide SportID.

Now when we look at the Power View sheet and Power View Fields, we see the following screen. This is more manageable.



Hiding tables and columns from client tools helps the report creation process go more smoothly. You can hide as few or as many tables or columns as necessary, and you can always unhide them later, if necessary.

With the Data Model complete, you can experiment with the data. In the next module, you create all sorts of interesting and compelling visualizations using the Olympics data and the Data Model you've created.

Checkpoint and Quiz

Review what you learned

In this module you learned how to import Internet-based data to your Data Model. There's a lot of data available on the Internet, and knowing how to find it and include it in your reports is a great tool to have in your reporting knowledge set.

You also learned how to include images in your Data Model, and how to create DAX formulas to smooth the process of getting URLs into your data mash-up, so you can use them in reports. You learned how to hide tables and fields, which comes in handy when you need to create reports and

have less clutter from tables and fields that aren't likely to be used. Hiding tables and fields is especially handy when other people are creating reports from the data you provide.

In the next module in this series, you start creating amazing Power View reports. They're fun, interactive, and bounded only by your creativity and imagination. Even within the Olympics data set, the number and varied types of reports you can create is nearly boundless.

QUIZ

Want to see how well you remember what you learned? Here's your chance. The following quiz highlights features, capabilities, or requirements you learned about in this module. At the bottom of the page, you'll find the answers. Good luck!

Question 1: Which of the following methods is a valid way of including Internet data in your Data Model?

A: Copy and paste the information as raw text into Excel, and it is automatically included.

B: Copy and paste the information into Excel, format it as a table, then select Power Pivot > Tables > Add to Data Model.

C: Create a DAX formula in Power Pivot that populates a new column with URLs that point to Internet data resources.

D: Both B and C.

Question 2: Which of the following is true of formatting data as a table in Excel?

A: You can assign a name to a table, which makes it easy to identify.

B: You can add a table to the Data Model.

C: You can establish relationships between tables, and thereby explore and analyze the data in in PivotTables, Power Pivot, and Power View.

D: All of the above.

Question 3: Which of the following is true of hidden tables in Power Pivot?

A: Hiding a table in Power Pivot erases the data from the Data Model.

B: Hiding a table in Power Pivot prevents the table from being seen in client tools, and thus prevents you from creating reports that use that table's fields for filtering.

C: Hiding a table in Power Pivot has no effect on client tools.

D: You cannot hide tables in Power Pivot, you can only hide fields.

Question 4: True or False: Once you hide a field in Power Pivot, you cannot see it or access it any longer, even from Power Pivot itself.

A: TRUE

B: FALSE

Quiz answers

1. Correct answer: D
2. Correct answer: D
3. Correct answer: B
4. Correct answer: B

Module 5: Create Amazing Power View Reports - Part 1

Abstract: At the end of the previous module, Incorporate Internet Data, and Set Power View Report Defaults, your Excel workbook had a complete Data Model, and was ready to create reports. In this module, you create three different Power View reports, learn some tips along the way, and learn steps you can use to create many, many more.

The sections in this module are the following:

Create Interactive Map Charts

Create Interactive Pie Charts

Create Interactive Bar and Column Charts

Checkpoint and Quiz

At the end of this module is a quiz you can take to test your learning.

This series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. The modules in this series are the following:

1. Import Data into Excel 2013, and Create a Data Model
2. Extend Data Model relationships using Excel 2013, Power Pivot, and DAX
3. Create Map-based Power View Reports
4. Incorporate Internet Data, and Set Power View Report Defaults
5. **Create Amazing Power View Reports - Part 1**
6. Create Amazing Power View Reports - Part 2

Create Interactive Map Charts

Building reports in Power View is fun and easy. And the reports you create are interactive, allowing viewers of the report to click on data elements, and gain new insights into your data.

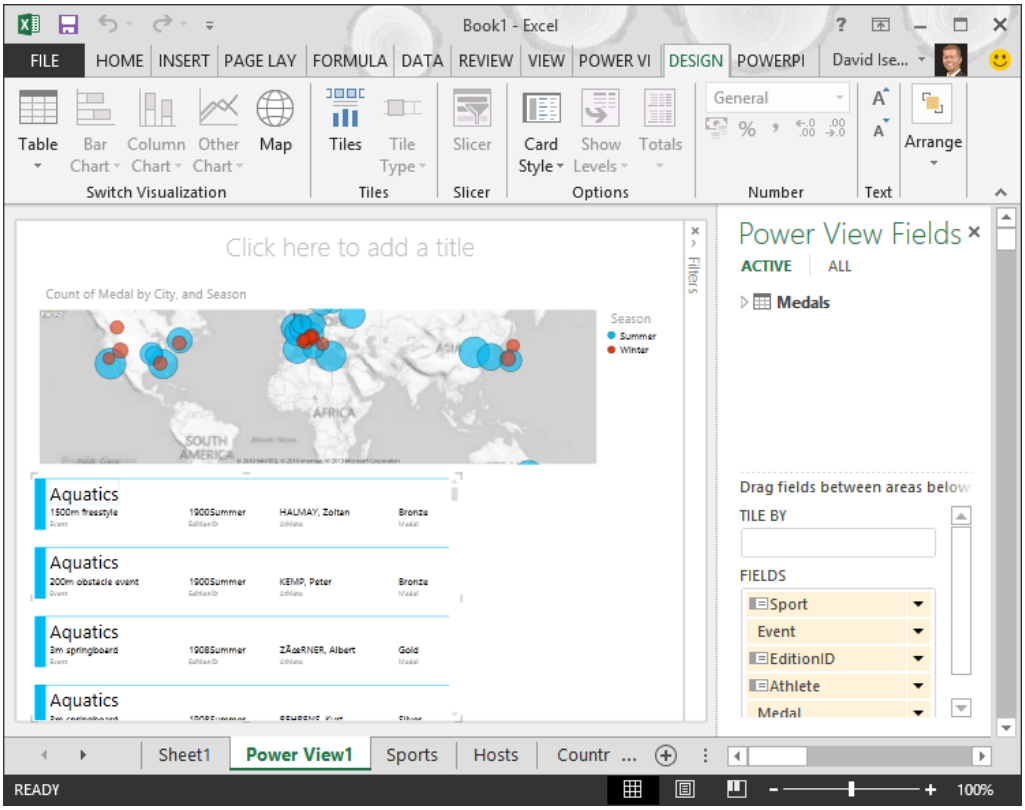
In this section, you build a new map chart and extend it, then you create bar charts and pie charts that present the data in interesting ways. Along the way, you add some new calculations to the Data Model so the reports look the way you want them. Let's get started.

Create an Interactive Map Chart

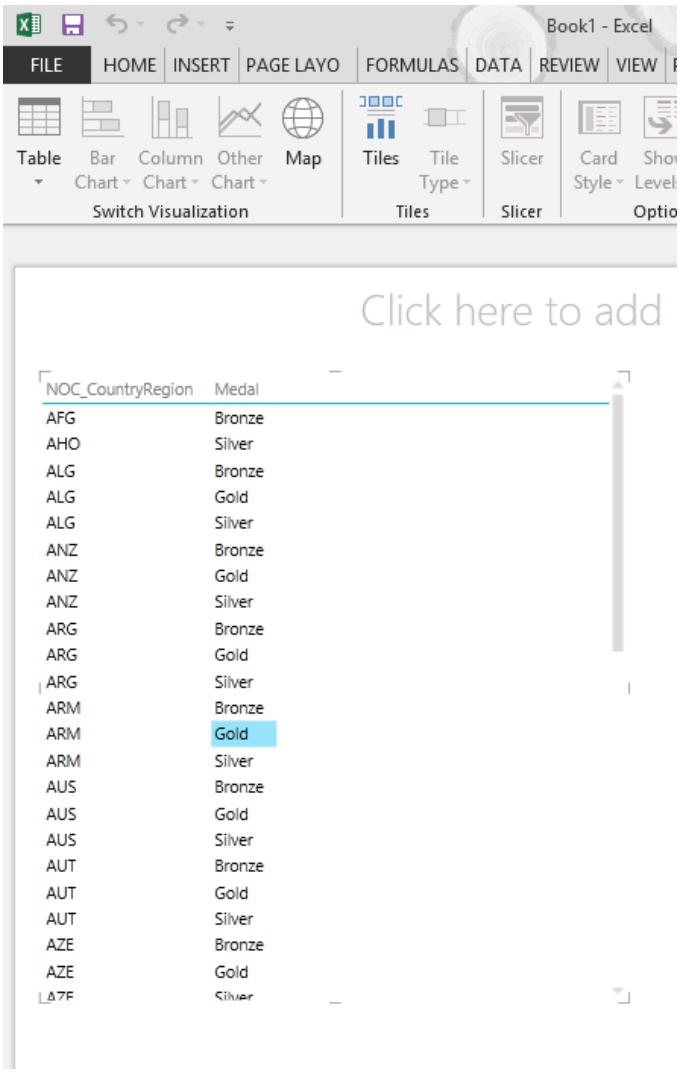
In a previous module, you created a basic map report to display the host cities for various editions of the Olympic Games. You decide there's more interesting information available in this

Data Model, and you want to see it in different ways. To begin, you want to create a new Power View map report, to display the count of medals won by each country or region, the medal type, and then, results by season.

1. In Excel, select the **Power View1** worksheet. Your sheet looks like the following screen, based on work completed in previous modules, and depending on where you click on the canvas.



   Create a new Power View report by selecting **POWER VIEW > Insert > Power View** from the ribbon. A blank Power View report sheet is created. Rename the report to **Map**, by right-clicking the tab along the bottom, and selecting **Rename** from the menu that appears.
2. Expand the **Medals** table in the Power View Fields, and select NOC_CountryRegion. To get information on medals, select the Medal field. The table Power View creates looks like the following screen.



Uh-oh. That's not what you want. This report displays the type of medal won by each country or region, and you want the count of medals. In a previous module, you used a DAX formula to determine the percentage of medals awarded, so you decide to use DAX to calculate the count of medals.

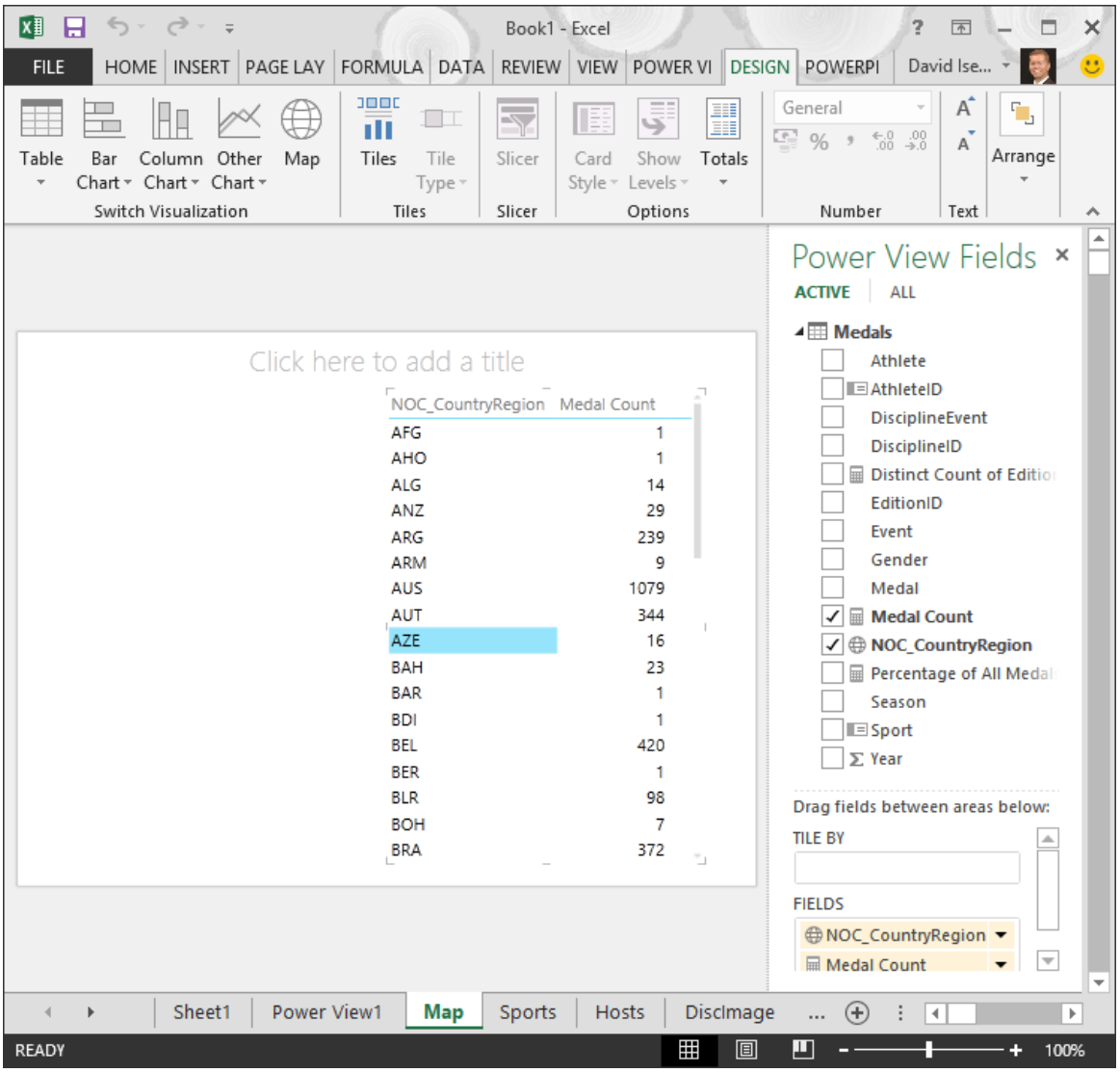
3. In Power Pivot, on the **Medals** tab, select the cell below the Medal column. If there are no cells available below the columns, the **Calculation Area** might not be displayed. To display the **Calculation Area**, select **Home > View > Calculation Area**. Type the following DAX formula into the cell.

   Medal Count:=COUNTA([Medal])

   Note:You can create DAX formulas in any cell in the Calculation Area, and have the calculated field available from that table in client tools, such as Power View or PivotTables. Selecting the cell below the Medal field is just a good way to keep track of which column it calculates.

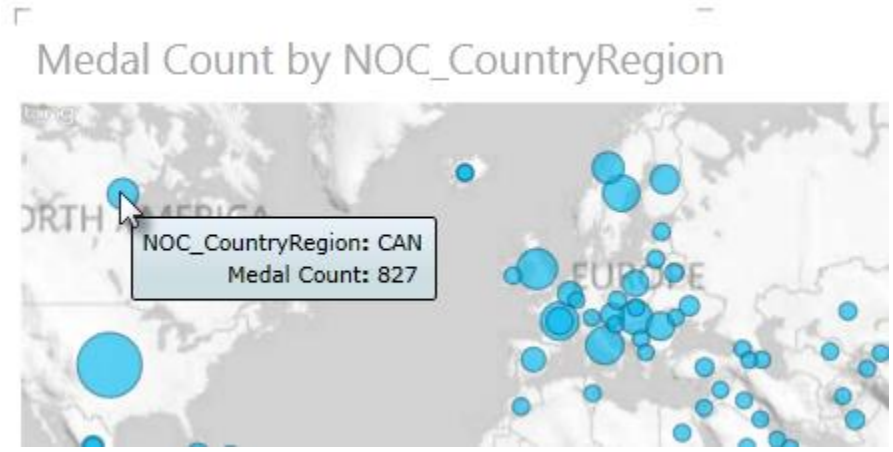
4. Back in Excel, your Data Model is updated. In the **Map** worksheet, your **Power View Fields** now shows the Medal Count field. Since Medal Count is a calculated field, a small

calculator icon is displayed next to the field. With the table you created in the previous step selected, unselect Medal, and select Medal Count. That's better. Your screen now shows how many medals were won by each country or region, as shown in the following screen.



5. Select **DESIGN > Switch Visualization > Map** to display the table as a map. Resize the map to make it larger. When you hover over any of the bubbles on the map, additional

information appears, as shown in the following screen. Try it for yourself.



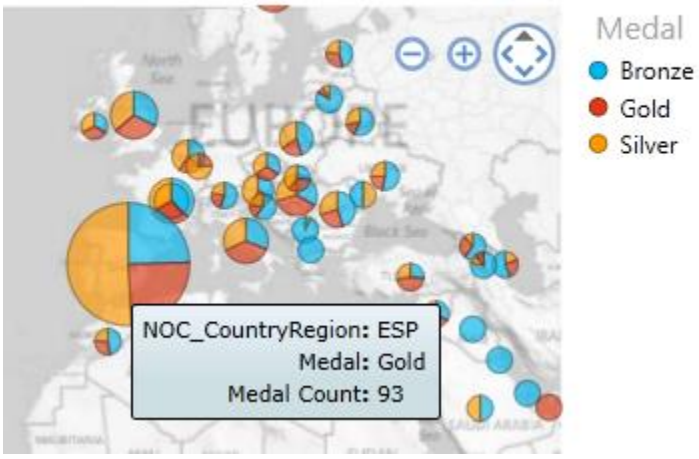
Create an Interactive Pie Chart in a Map

Now that you have the Map visualization, it's time to make it more interesting. In the following steps, you change the bubbles into interactive pie charts, with just a few clicks.

1. In Power View, from **Power View Fields**, drag Medal to the COLOR field. Now each bubble on the map becomes a pie chart, with each section sized based on the type of medal awarded. When you select the map, navigation tools appear that let you zoom in, or pan, as shown in the following picture.

2. Hover over any of the pie charts. Information is displayed based on which slice you hover over. In the following screen, I hover over the red slice for Spain (ESP), and the visualization displays information about that portion of the bubble. Notice, too, that the

bubble expands, to allow easier navigation to other slices.



You now have an interactive Map that allows you to zoom in, zoom out, and hover over data elements and get more information.

Notice the medals are ordered alphabetically, which is the default. You want the order to be the following: gold, silver, bronze. To do so, we need to sort Medal by another value.

Change the Sort Order of a Field

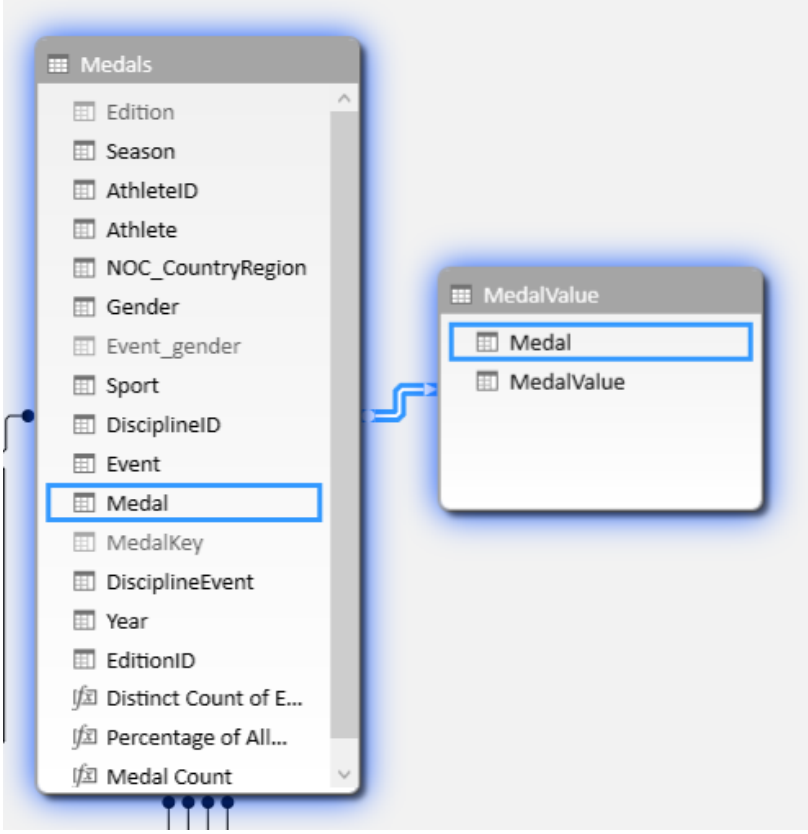
To change the sort order from the default, you need to associate the Medal field with another field, then sort by the associated field. There is no associated field at this point, but you can create one. There are a few steps involved in doing this, but once you complete them, you see how convenient and easy it is to make the Data Model behave the way you want.

1. In Excel, insert a new worksheet after **Population**. Rename the sheet **MedalValue**. Type the following data into the MedalValue worksheet. You can also copy and paste it in.

Medal	MedalValue
Gold	1
Silver	2
Bronze	3

1. Format the data as a table (while in one of the cells, you can press Ctrl + A, then Ctrl + T to format the data as a table). Make sure you select **My Table has headers** in the **Create Table** window. Under **DESIGN > Properties > Table Name**, name the table **MedalValue**.
2. Still in Excel, select **Power Pivot > Tables > Add to Data Model** to add the table to the Data Model.
3. In Power Pivot, select Diagram View. Move the **MedalValue** table beside the **Medals** table. It's okay to move other tables out of the way to make room. In the **Medals** table,

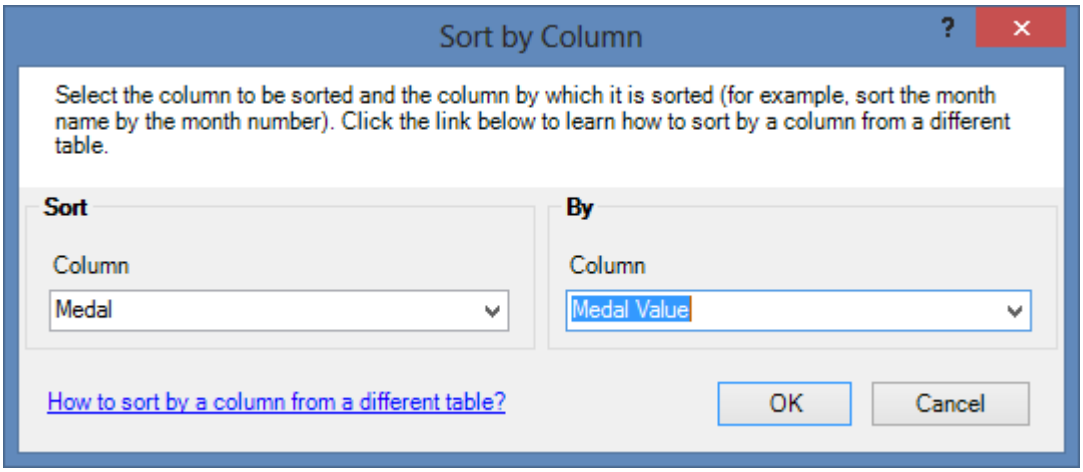
drag the Medal field to the Medal field in the **MedalValue** table, and create a relationship. Select the line between those tables to highlight the relationship you created. Your Diagram View looks like the following screen.



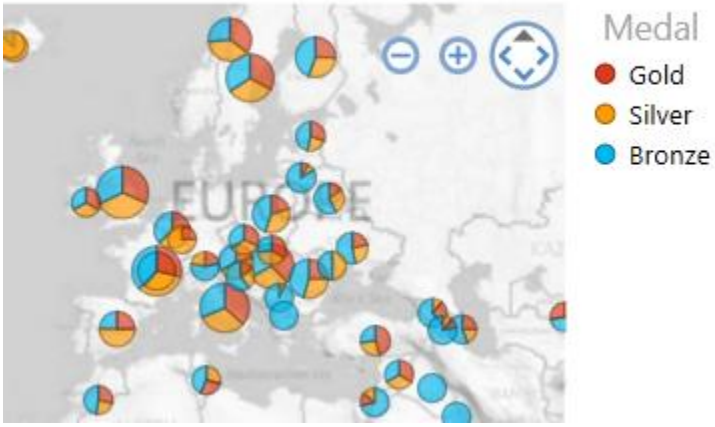
4. In **Data View** in Power Pivot, Select the **Medals** table. Scroll right and select the column titled *Add Column*. In the formula bar, type the following DAX formula.

   =RELATED(MedalValue[MedalValue])

   The RELATED function returns a value from another table in the Data Model. You can only sort with columns found in the same table, so we need the MedalValue values to exist in the **Medals** table. The RELATED function lets us pull a **MedalValue** field into the **Medals** table. Rename the column *Medal Value*.
5. Now we need to specify how Power View (and other client tools) should sort the Medal field. Select the Medal column, then select **Home > Sort and Filter > Sort by Column**. In the window that appears, select Medal Value as the column by which to sort Medal, as show in the following screen.



6. Back in Excel, the new sort order is automatically reflected in the Map visualization you created earlier, as shown in the following screen.

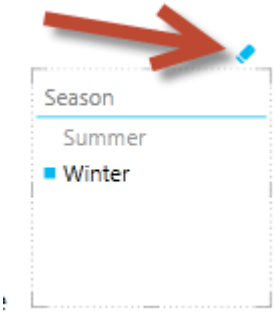


Filter Visualizations using a Slicer

Now that you have a Map visualization of Olympic events, you want to filter the results based on season. You can do that easily with Slicers.

1. In Power View, drag Season from the **Medals** table in **Power View Fields** onto the report canvas. A table is created with the Season fields. The table will likely overlap your map, so resize the map and move the Season table beside the map.
2. With the Season table selected, select **DESIGN > Slicer > Slicer** from the ribbon. The Map can now be filtered by the Season slicer. Try it out. On the slicer, click Summer, then Winter. Notice how the Map immediately updates the map to reflect the selection you make.
3. To clear the slicer and see all results, click the **Clear filter** icon that appears above the slicer table. It only appears when you hover over the visualization. The **Clear filter** icon

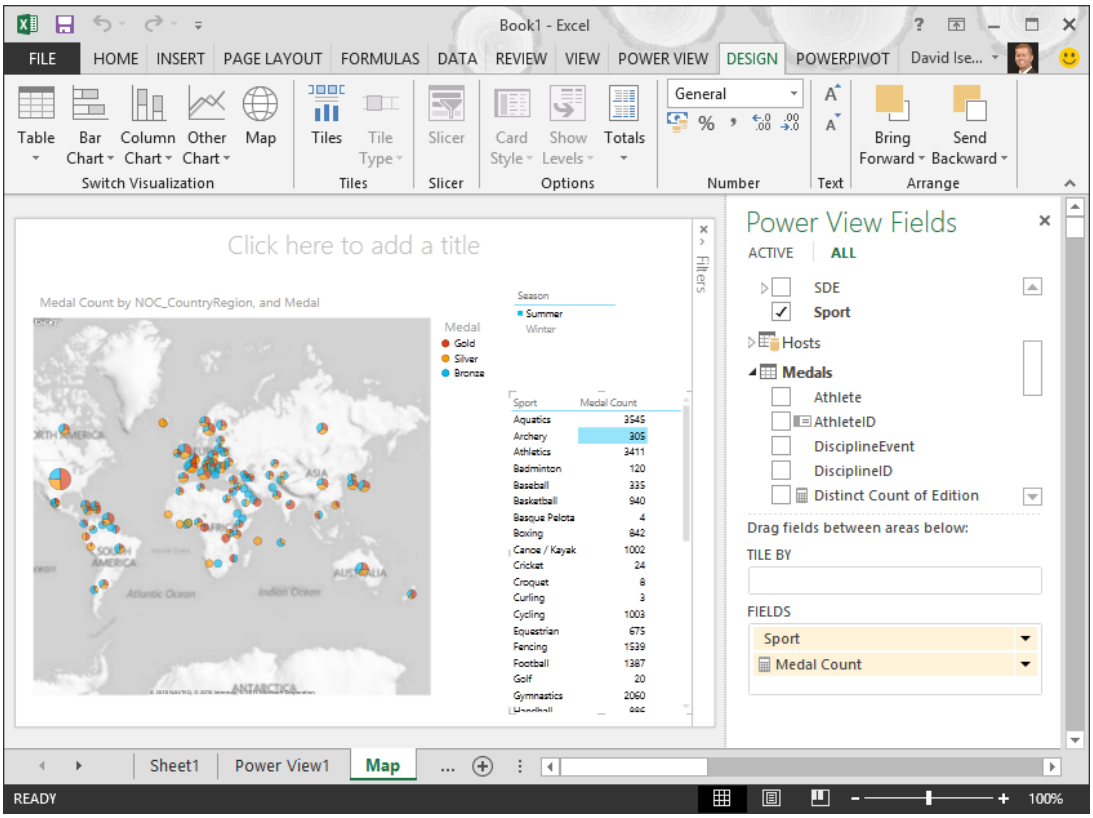
looks like small eraser, as shown in the following screen.



Filter other Visualizations using the Map

Not only can you use slicers to filter the map, you can use the map to interactively filter other tables you include in the report.

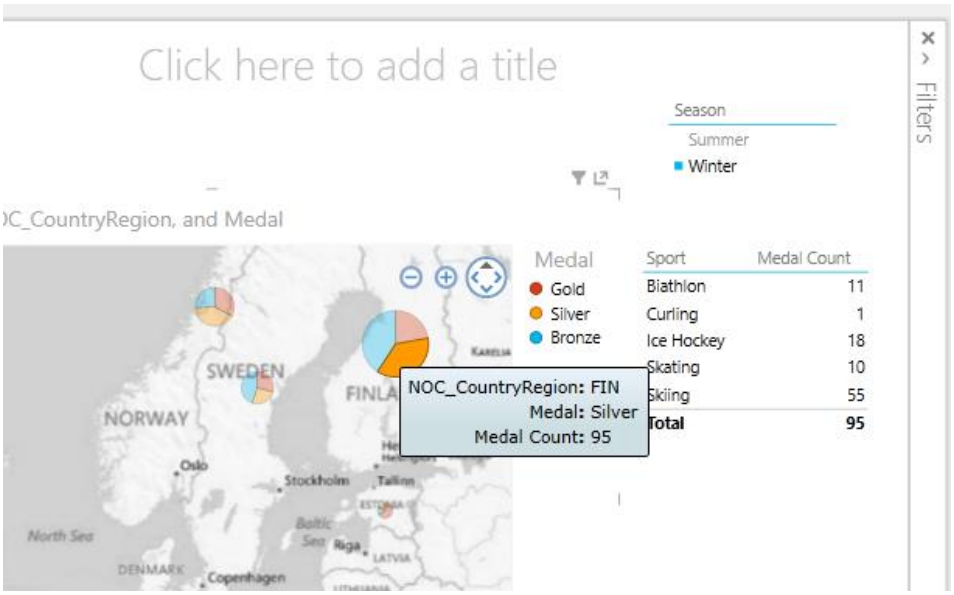
1. In Power View, from the **Events** table, drag Sport to the report canvas. A table called Sports is created. Drag Medal Count, from the **Medals** table, onto the Sports table as well. Your report looks like the following screen.



Note: If blanks appear in your data, and you want them removed, use the **Filters** pane. For example, you may want to remove blanks from **Sports**. If the Filters pane is

collapsed, expand **Filters**, then select the **Sports** table and click the arrow beside Sports, select **(All)** to select all, then **(Blank)** to exclude blanks from the visualization.

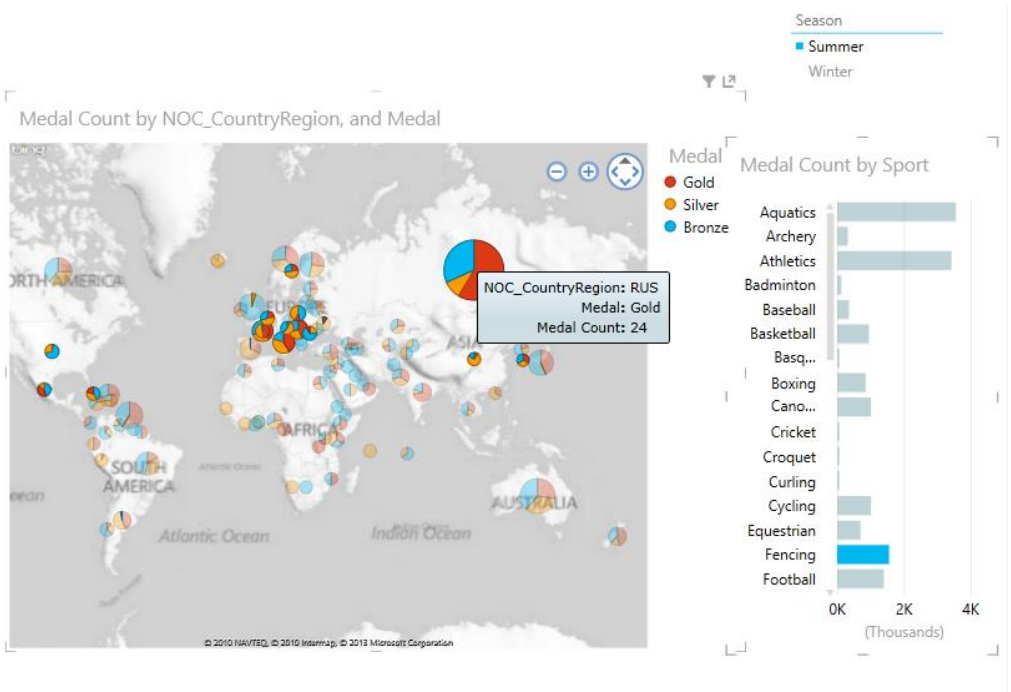
2. When you click on the pie charts in the map, the Sports table visualization is filtered based on your selection, and by any slicers that have been selected. Pie charts that are not selected are dimmed, as are slices of the same pie that are not selected. For example, click Winter in the Season slicer, then zoom in and click on the orange portion of Finland's pie chart, the Sports table adjust automatically, and immediately. Finland has won 95 silver medals, with 11 of them in the Biathalon, 18 in Ice Hockey, and so on. The following screen shows the results.



Create an Interactive Bar Chart

But wait, there's more. It might be interesting to see the distribution of medals, in the map visualization, based on the Sport table visualization. And rather than numbers, you want to see it as a bar chart.

1. Select the Sport table visualization. From the ribbon, select **DESIGN > Switch Visualization > Bar Chart > Clustered Bar**. The Sport visualization becomes a bar chart.
2. From the Season slicer, select Summer. Notice how the Sport bar chart changes to reflect the sports that are part of the Summer Olympic events.
3. On the Sport bar chart, click the bar next to Fencing. Notice that the other bars in the chart dim, but remain visible. Also notice that on the **Map** visualization, the Pie Charts change to reflect only medals awarded for the selection in the **Sport** bar chart. Countries or regions that have not won medals in fencing are dimmed. The following screen shows how your Power View report looks.



4. Click some of the other bars in Sports, and see how Power View immediately updates the Map and the Bar charts based on your selection.

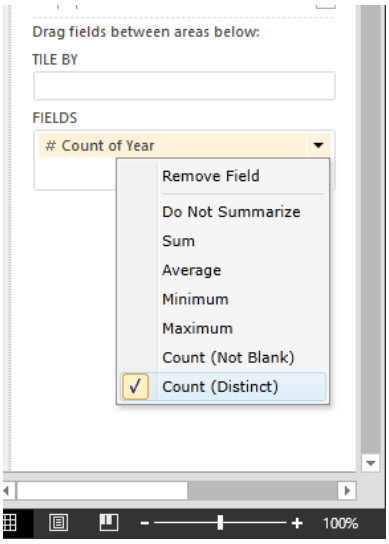
To see these visualization as a video, view the following video:

Create Interactive Pie Charts

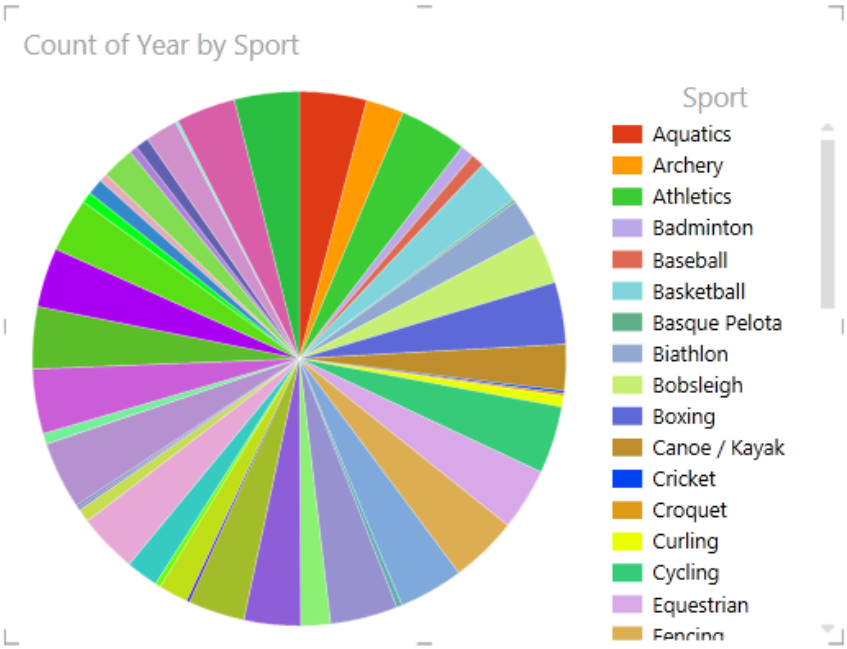
You saw how the map visualization can include pie charts, but you can also create interactive pie charts in Power View outside of maps. In this section, you learn how to create interactive pie charts, how to drill down into the data within each pie, and how to create slices. Let's get started.

Create an Interactive Pie Chart

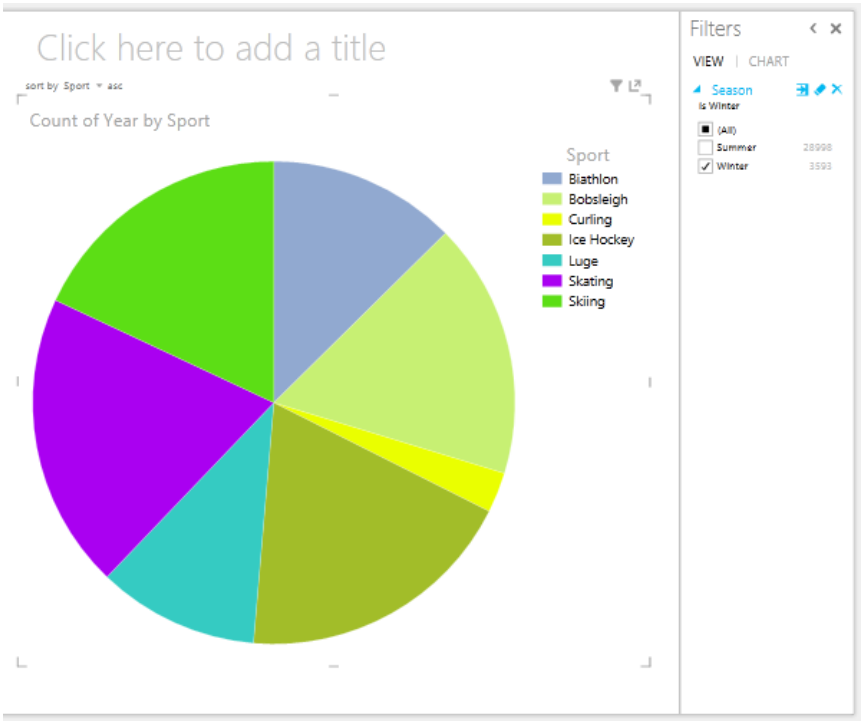
1. Select the Map tab in Excel, then click **POWER VIEW > Insert > Power View**. A new tab is created. Rename the tab **Pie**.
2. From **Power View Fields**, select Year from the **Medals** table. Power View sums the data, because they are numbers. To prevent this, click on the arrow beside Year in the **FIELDS** area, and select **Count (Distinct)**, as shown in the following screen.



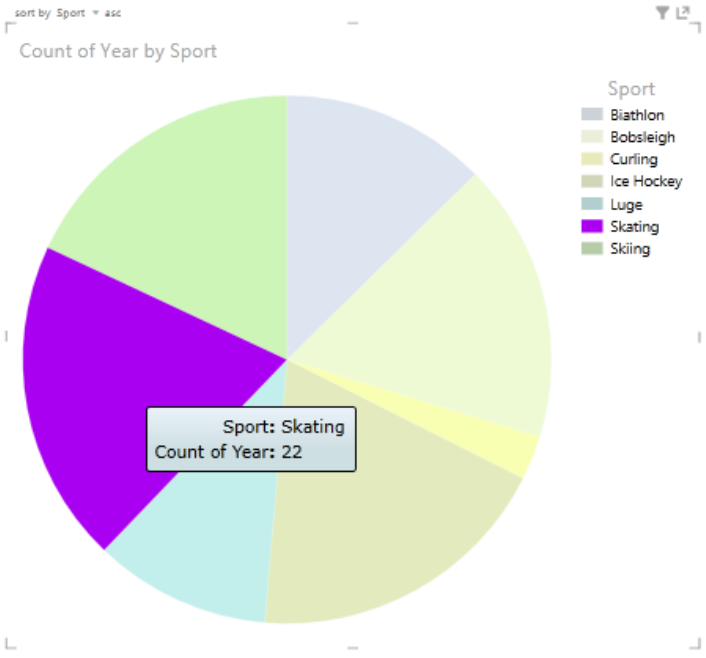
3. Next, from **Events**, select Sport. A table is created on the report canvas. To change the visualization to a Pie Chart, select **DESIGN > Switch Visualization > Other Chart > Pie**. The following screen shows your pie chart.



4. That pie chart is too busy. You decide you want to filter the results to only winter sports. First, click the arrow icon in the collapsed **Filters** pane. The **Filters** pane expands. Click **VIEW** on the **Filters** pane, so that any filters you drag there will apply to all reports in the view. Drag Season from the **Medals** table into the **Filters** pane. Select Winter from the Season filter, as shown in the following screen.



5. As with the **Map** visualization, the pie chart is interactive. Hover over any slice of the pie, and information is displayed. Clicking on any slice, or on any color in the legend, highlights that sport. In the following screen you click Skating, and its legend information and pie chart slice are highlighted, while all other slices and legend items are dimmed.



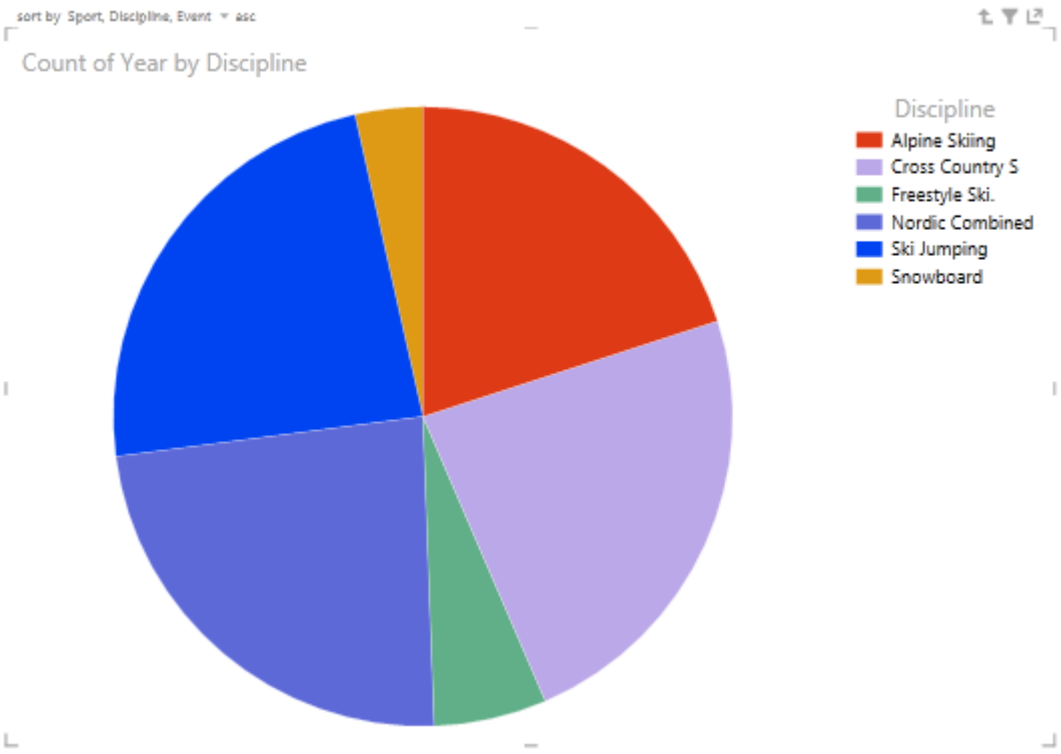
To clear the highlight, click again on the selected slice, or click the blank area in the visualization.

That's an interesting pie chart, and it was easy to create. But Power View can create more interesting pie charts by visualizing multiple levels of depth inherent in hierarchies.

Create a Drill-Down Pie Chart using Hierarchies

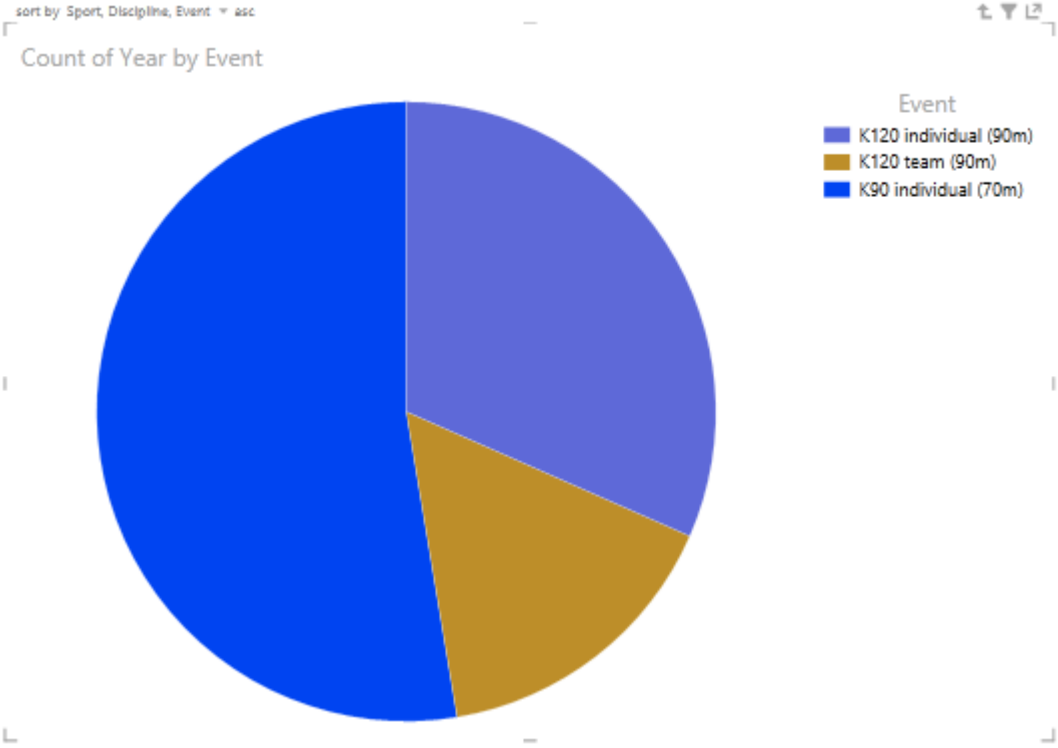
Let's create another pie chart, and use a hierarchy that you created in a previous module.

1. In **Power View Fields**, in the **Events** table, click Sport to deselect it, and then click SDE. SDE is the Sport/Discipline/Event hierarchy you created in a previous module.
2. The pie chart appears unchanged, but double-click on the Skiing slice of the Pie chart, and Power View drills down into the next level of the hierarchy. Now, the pie chart is based on the disciplines within the Skiing sport. Notice that the legend now lists the disciplines under the sport of skiing, as show in the following screen.

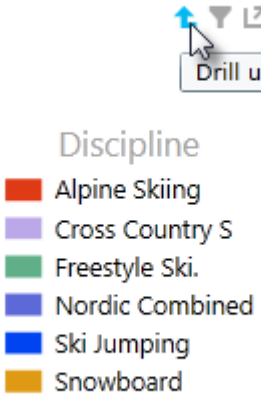


   Also notice the up arrow that appears to the left of the filter icon, in the upper-right corner of the visualization. Click on the up arrow to drill up in the hierarchy, which in this case displays a pie chart of Sports.
3. Double-click on the Ski Jumping slice, and the pie chart drills down another level into the hierarchy, which is Events. The events for Ski Jumping are displayed, and the legend

shows the chart is displaying Events, which is the lowest level in the hierarchy.



4. To return to higher levels in the hierarchy, also called drilling up, click the up arrow as shown in the following screen. When the highest level in the hierarchy is displayed, the up arrow is no longer displayed.

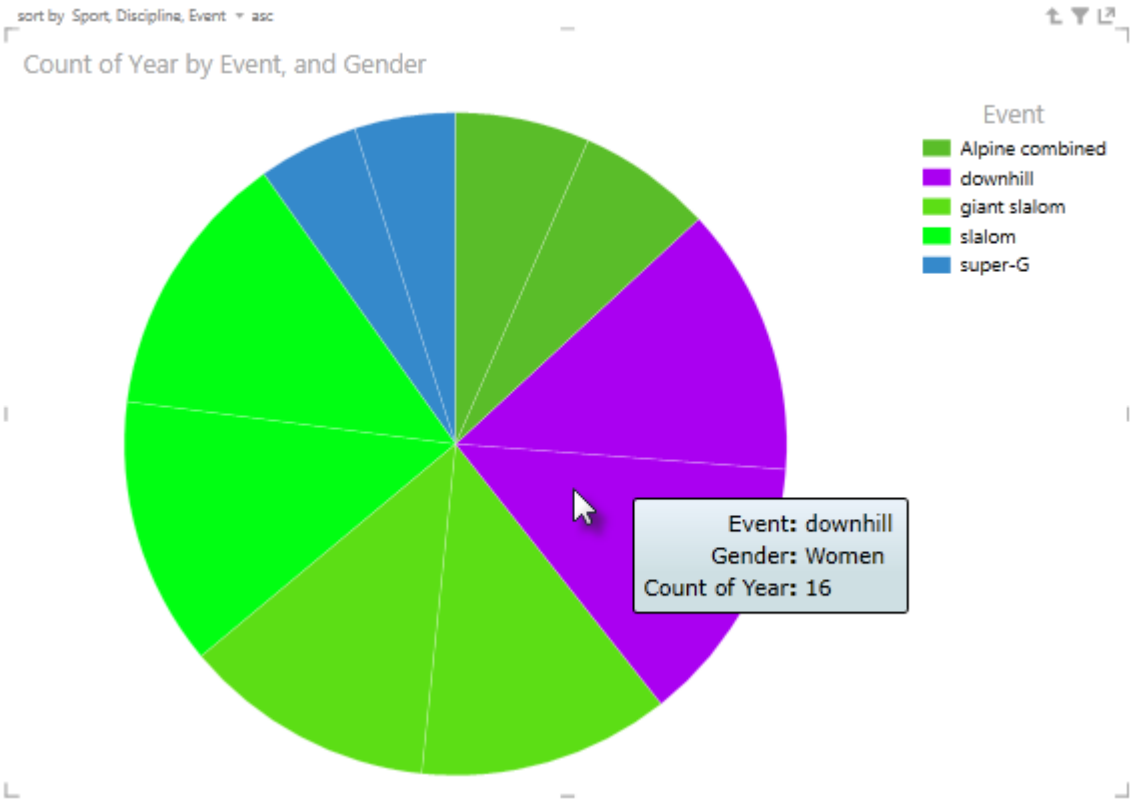


Use Slices to Display More Detail

You can display more detail in pie charts.

1. From the **Medals** table in **Power View Fields**, drag Gender to the **SLICES** area. Each slice in the pie chart is now sliced to reflect how the data is divided by Gender. Hover over any slice in the pie chart, and the information provided is displayed based on Gender.

2. Drill down into Skiing, then into Alpine Skiing. Hover over the lower slice of the downhill event, and you see that women's teams have participated in the downhill event on 16 occasions, as shown in the following screen.

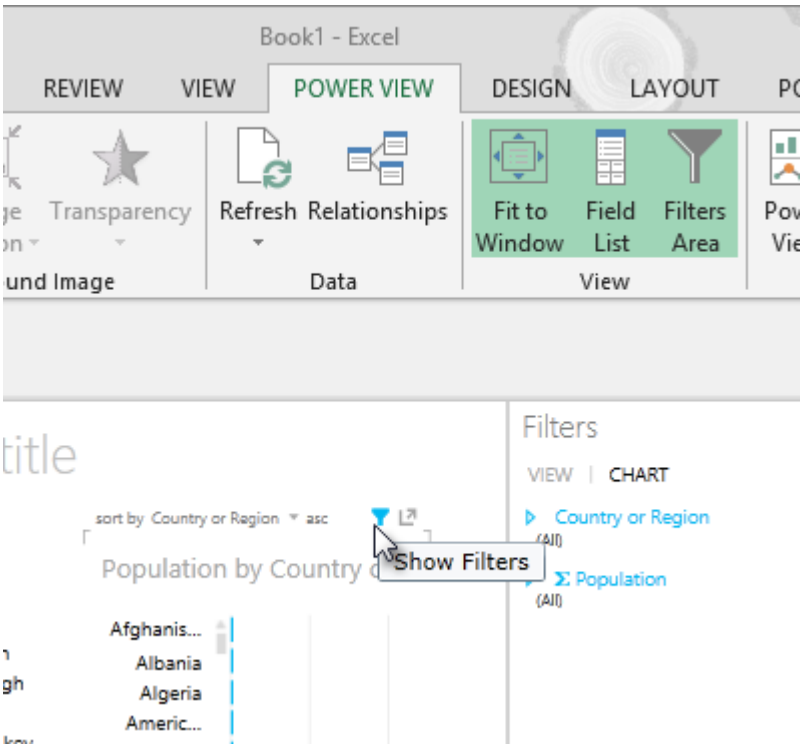


Cross-Filter Bar Charts with other Visualizations

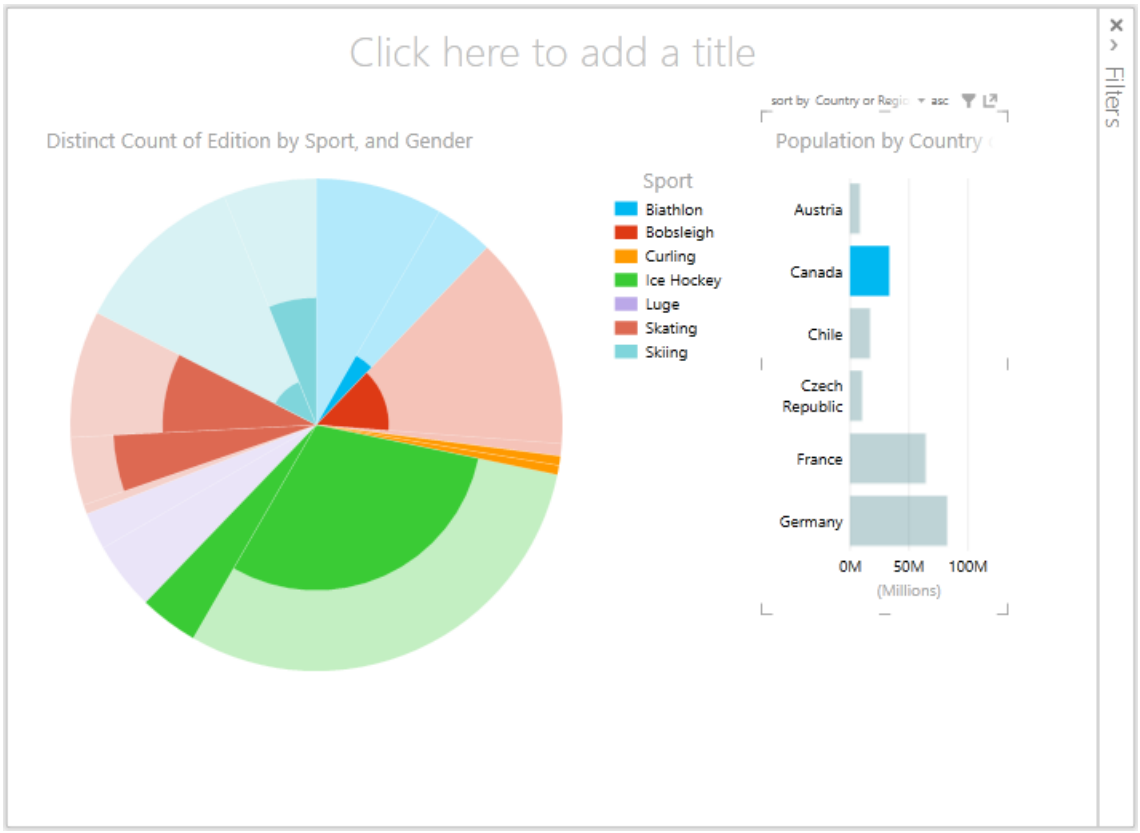
You can apply many different filters to pie charts. You can even use other visualizations to filter pie charts, with interaction possible on all charts in the view.

1. Click on the Power View report canvas outside the pie chart. From **Power View Fields**, select Population from the **Population** table, and then select Country Name from the **Population** table, to display the country or region name
2. Let's filter the view to just a handful of countries or regions. To display the Filters area, you can either select **Filters Area** from the **POWER VIEW** ribbon, or you can click the Filters icon that appears when you hover over a visualization, near the upper left corner. The **Filters Area** selection in the ribbon, and the Filters icon, are shown in the following

screen.

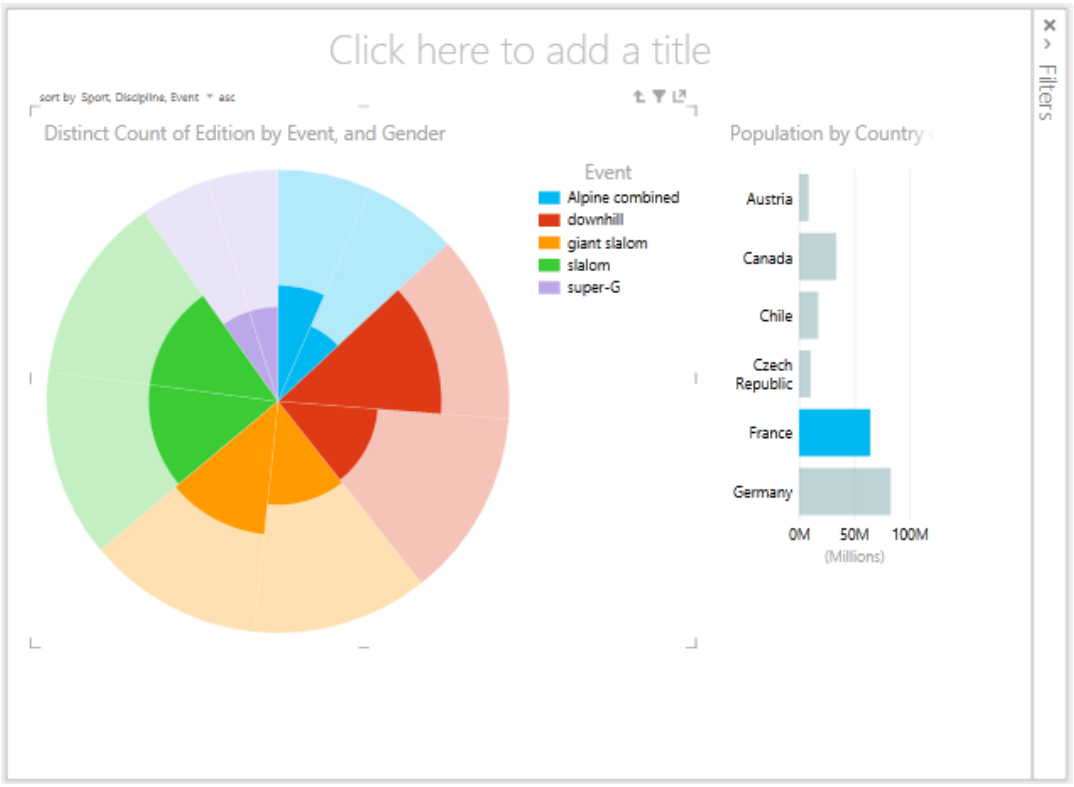


3. In **Filters**, select only the following Country or Regions: Austria, Canada, Chile, Czech Republic, France, and Germany.
4. Let's turn this into a Clustered Bar Chart. On the ribbon, click **DESIGN > Switch Visualization > Bar Chart > Clustered Bar Chart**.
5. Click on one of the bars in the Bar Chart. Notice how data in the pie chart updates based on your selection, highlighting the corresponding information. Click on Canada in the Bar Chart. Your report looks like the following screen.



Try clicking other selections, and see how the pie chart changes immediately with your selection.

6. You can also drill down into the data, just as you did before. Double-click on either Skiing slice in the pie chart, then double-click on the Alpine Skiing discipline, and the pie chart responds by displaying all Events in the Alpine Skiing discipline. Filtering results by clicking on the bar chart works the same at this level of the hierarchy. Click on France, and the pie chart filters Event results for France, as shown in the following screen.

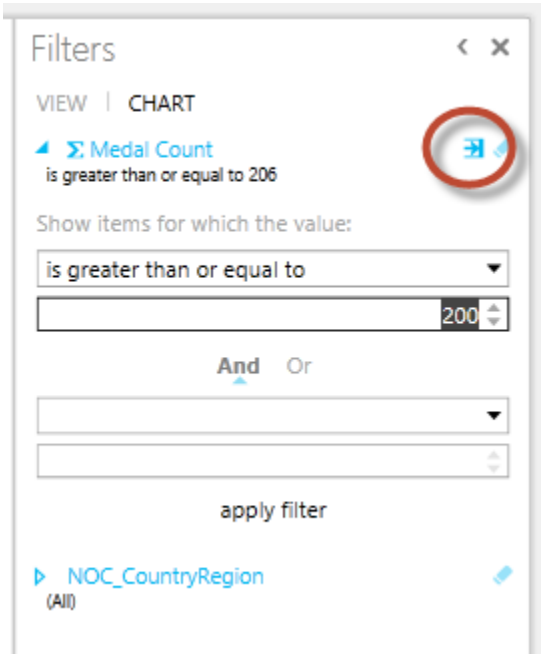


You can use many different types of visualizations to filter pie charts, and in Power View, they're all interactive. And when you post reports on a Business Intelligence [term] site on SharePoint, your Power View reports remain interactive to anyone with permission to view them.

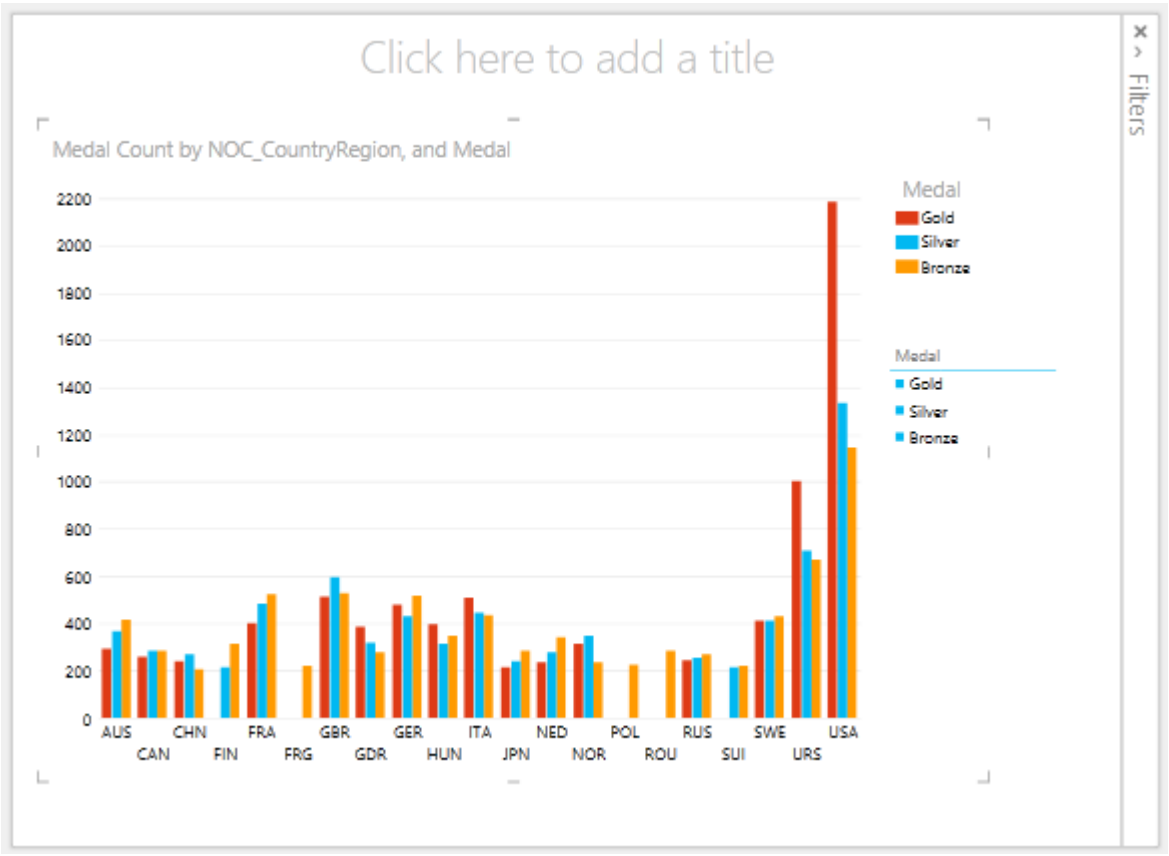
Create Interactive Bar and Column Charts

You saw how bar charts can be used to filter other visualizations, such as a pie chart. In this section, you learn how to create compelling bar and column charts that are interactive.

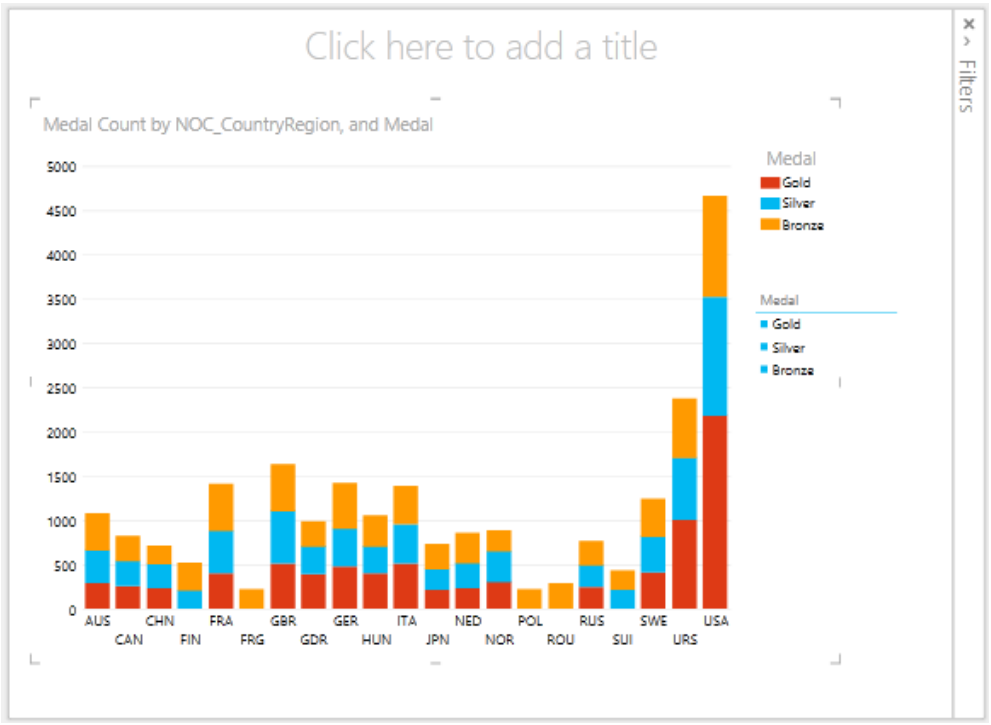
1. Select **POWER VIEW > Insert > Power View** to create a new Power View Report. Rename the report **Bar and Column**.
2. From the **Medals** table, choose Medal Count, then NOC_CountryRegion from the **Medals** table as well. From the ribbon, select **DESIGN > Switch Visualization > Column Chart > Clustered Column**. The visualization has too many entries, so let's filter the view to show only countries or regions that won 200 or more medals. To do that, click the Filter icon, and then change the mode of the filter to Advanced, by clicking the right-arrow icon beside the eraser, as shown in the following screen.



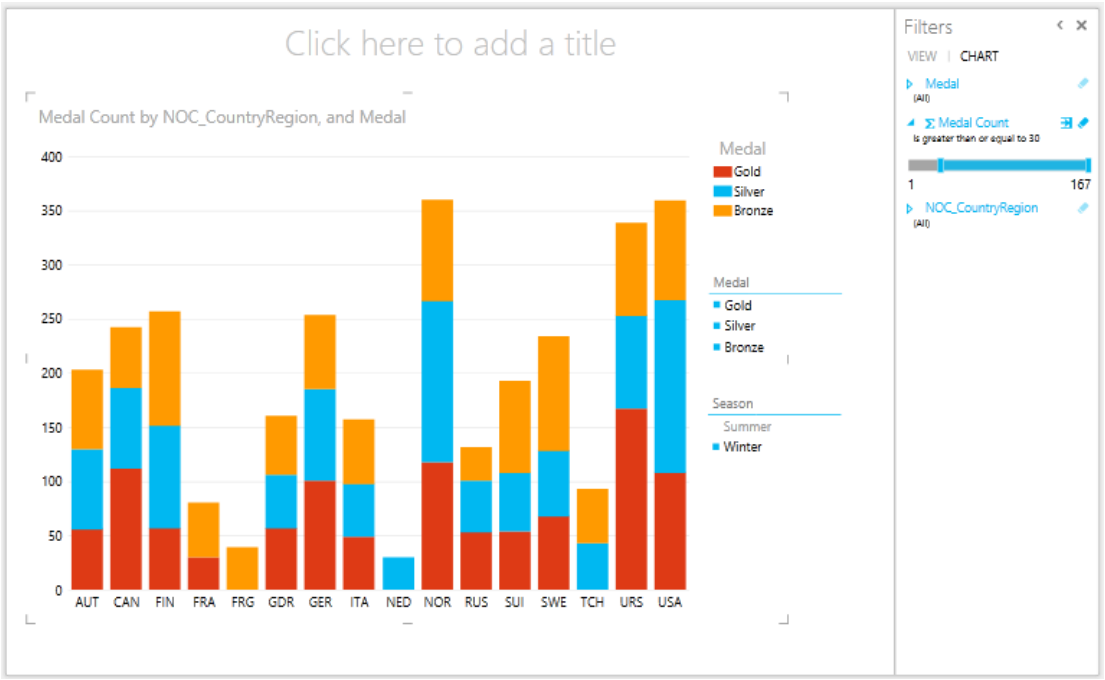
3. To make the chart more interesting, drag Medal from the **Medals** table onto the visualization.
4. Next, include a slicer. Click on the report canvas outside the chart, select Medal from the **Medals** table, and then select **DESIGN > Slicer** from the ribbon. Your report looks like the following screen.



5. That's interesting. But you decide it would be better as a stacked column. Select **DESIGN > Switch Visualization > Column Chart > Stacked Column**. That looks better, and your report now looks like the following screen.

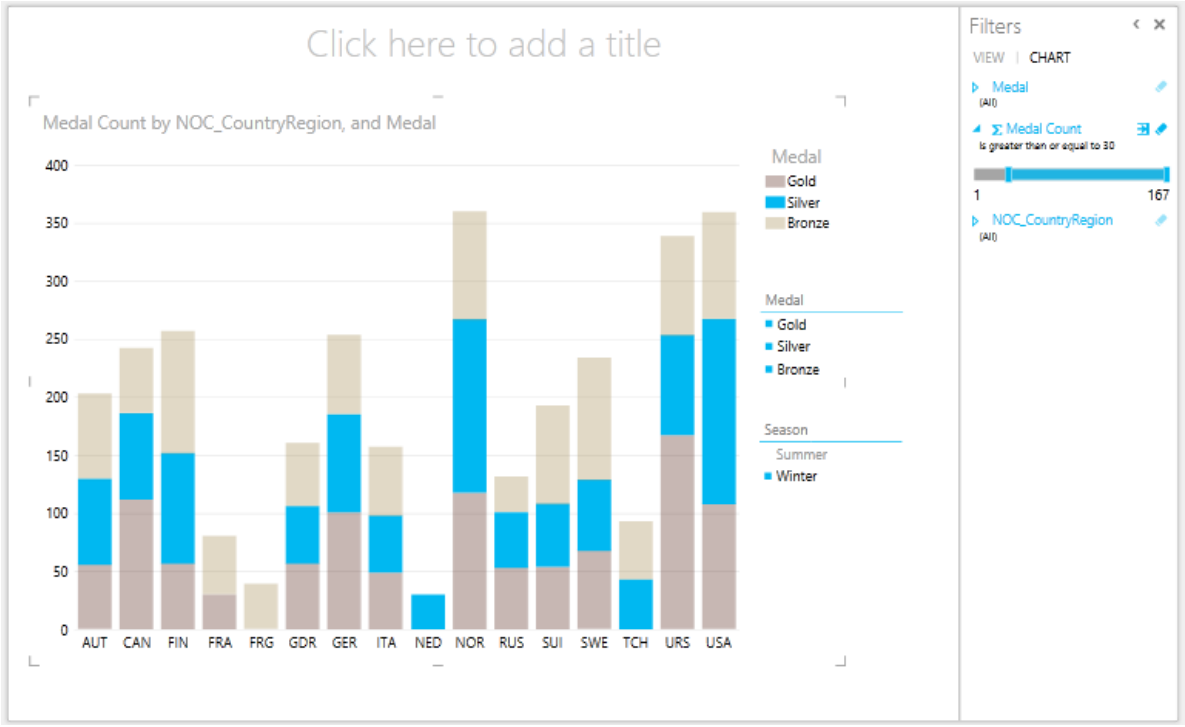


6. Now let's add another slicer, based on Season. Click a blank area on the report canvas, then select Season from the **Medals** table. Then select **Slicer** from the ribbon. When you click on Winter, you notice there are no entries – looks like no country or region won more than 200 medals in the Winter. In the Filters pane, click **CHART**, change the Medal Count filter to at least 30 medals, and you see the following results.



7. This chart is interactive, too. In the Medal legend, click on Silver. The Silver medal results are highlighted, and the rest of the results in the table are dimmed, as shown in the

following screen.



8. Although this is a Column Chart, it's easy to change it to a bar chart. Select **DESIGN > Switch Visualization > Bar Chart > Stacked Bar** from the ribbon. You get the same chart, turned on its side into a bar chart, as shown in the following screen. The bar chart is just as interactive as the other charts.

There are all sorts of ways to interact with these Bar and Column charts. Explore it yourself, and see.

Checkpoint and Quiz

Review what you learned

In this module you learned how to create interactive map, pie, bar, and column charts, with just a few clicks to create each. You also learned how hierarchies can make your reports more interactive, and enable viewers of your reports to become engaged with the report and its depth.

You also learned to put multiple visualizations into one report, and how those visualizations can filter, interact, and build on one another.

In the next module in this series, you create more amazing Power View reports… including reports that animate, and show how the Olympics data changed over time. It's pretty cool and easy to build, and even more fun to watch the reactions of people who see the reports you build.

QUIZ

Want to see how well you remember what you learned? Here's your chance. The following quiz highlights features, capabilities, or requirements you learned about in this module. At the bottom of the page, you'll find the answers. Good luck!

Question 1: Which of the following is true about the sort ordering of values in a field?

A: To change the sort order of a field, you must associate the field with another field, then delete the original field.

B: You cannot change the sort order of a field, no matter what.

C: If you want to sort by an associated field, the associated field must be in the Data Model.

D: None of the above.

Question 2: What functionality does a slicer provide?

A: Slicers duplicate data from one field to another.

B: Slicers cut data in half, and keep half the data for themselves.

C: Slicers filter visualizations based on data in the slicer field or fields.

D: None of the above.

Question 3: When you use a hierarchy in a report visualization, which of the following becomes possible?

A: Nothing – you cannot use hierarchies in visualizations.

B: You can drill down through levels of the hierarchy, and the visualization automatically changes to reflect the current level of the hierarchy.

C: You can drill down through levels of a hierarchy, but you cannot drill up.

D: Both B and C.

Question 4: In the **Filters** pane, which of the following is correct?

A: Dragging a field into the **CHART** area of the **Filters** pane filters all reports on the Power View sheet.

B: Dragging a field into the **VIEW** area of the **Filters** pane filters all reports on the Power View sheet.

C: You must drag the same field into both the **CHART** and **VIEW** areas of the **Filters** pane to filter all visualizations in the Power View sheet.

D: You cannot drag fields onto the **Filters** pane.

Quiz answers

1. Correct answer: C
2. Correct answer: C
3. Correct answer: B
4. Correct answer: B

Module 6: Create Amazing Power View Reports - Part 2

Applies To: Excel 2013

Abstract: At the end of the previous module, Create Amazing Power View Reports - Part 1, your Excel workbook had three Power View reports and many visualizations, including interactive Map, Pie, Bar, and Column Charts. In this module, you learn how to create additional interactive Power View reports.

Note, too, that when you publish these reports and make them available on SharePoint, these visualizations are just as interactive as they are in this module, for anyone viewing them.

The sections in this module are the following:

Create Multiples Charts

Build Interactive Reports using Cards and Tiles

Create Scatter Charts and Bubble Charts with Time-based Play Visualizations

Checkpoint and Quiz

At the end of this module is a quiz you can take to test your learning. You can also see a list of videos that show many of the concepts and capabilities of Power View in action.

This series uses data describing Olympic Medals, hosting countries, and various Olympic sporting events. The modules in this series are the following:

1. Import Data into Excel 2013, and Create a Data Model
2. Extend Data Model relationships using Excel 2013, Power Pivot, and DAX
3. Create Map-based Power View Reports
4. Incorporate Internet Data, and Set Power View Report Defaults
5. Create Amazing Power View Reports - Part 1
6. **Create Amazing Power View Reports - Part 2**

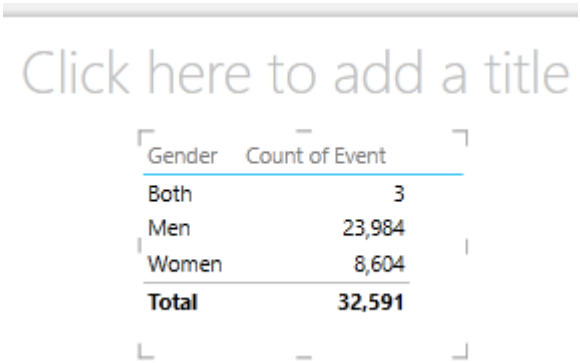
Create Multiples Charts

In this section, you continue creating interactive visualizations with Power View. This section describes creating a few different types of Multiples charts. Multiples are sometimes also called Trellis Charts.

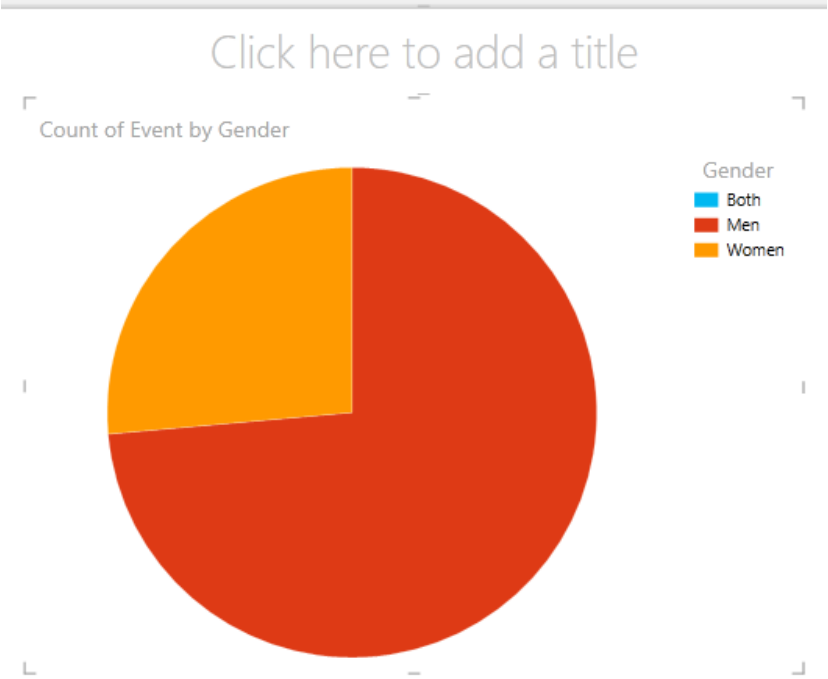
Create Interactive Vertical Multiples Charts

To create multiples charts, you begin with another chart, such as a pie chart or a line chart.

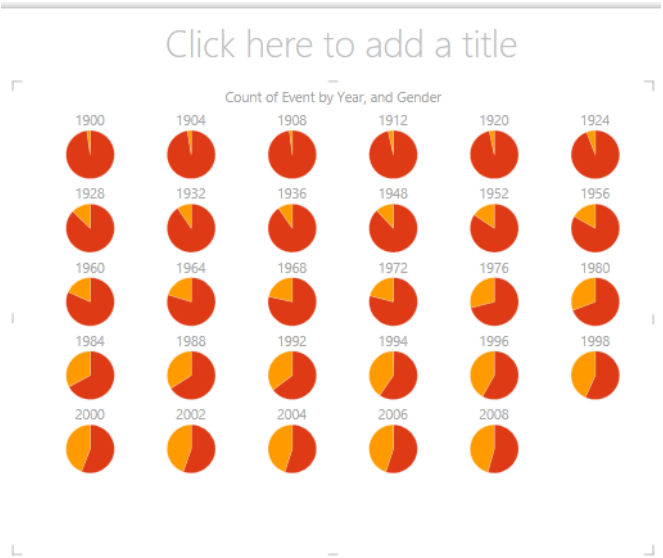
1. In Excel, select the **Bar and Column** worksheet. Create a new Power View report by selecting **POWER VIEW > Insert > Power View** from the ribbon. A blank Power View report sheet is created. Rename the report **Multiples**, by right-clicking the tab along the bottom and selecting **Rename** from the menu that appears. You can also double-click the tab to rename it.
2. Expand the **Medals** table in **Power View Fields** and select the Gender and then the Event fields. From the FIELDS area, select the arrow button beside Event, and select *Count (Not Blank)*. The table Power View creates looks like the following screen.



3. From the ribbon, select **DESIGN > Switch Visualization > Other Chart > Pie Chart**. Now your report looks like the following screen.

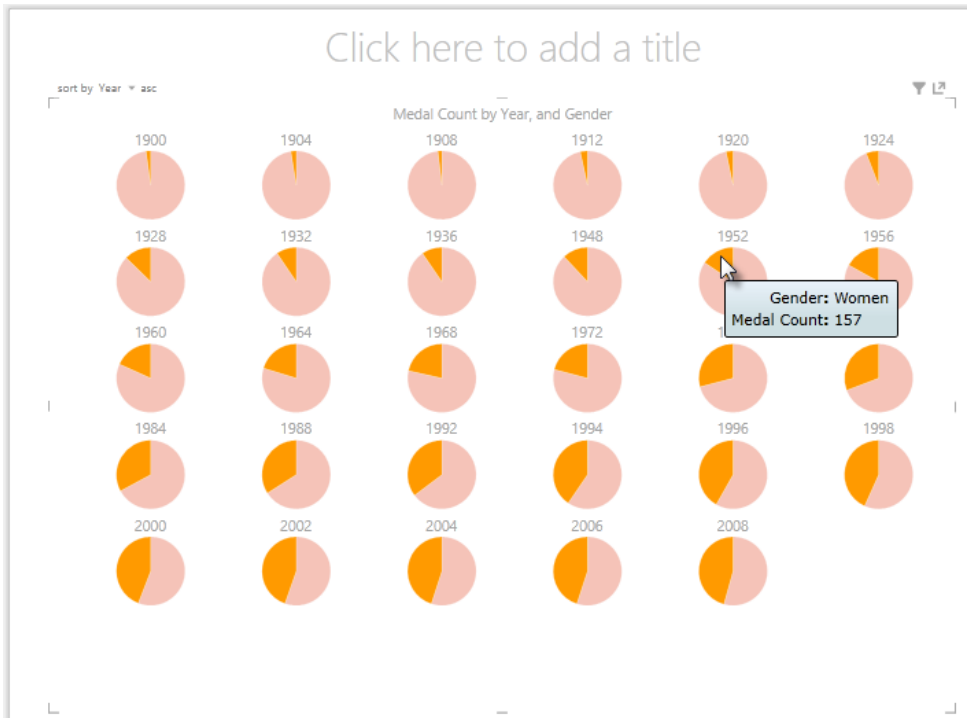


4. You decide it would be interesting to view the number of events by gender over time. One way to view that information is to use multiples. From the **Medal** table, drag Year to the VERTICAL MULTIPLES field. In order to view more multiples, remove the legend from the report by selecting **LAYOUT > Legend > None** from the ribbon.
5. Change the layout so the multiples grid shows six charts wide by six charts tall. With the chart selected, select **LAYOUT > Grid Height > 6** and then **LAYOUT > Grid Width > 6**. Your screen now looks like the following screen.



6. The multiples chart type is interactive too. Hover over any pie chart, and information about that slice is displayed. Click any pie slice in the grid, and that selection is highlighted for each chart in the multiple. In the screen below the yellow slice (women)

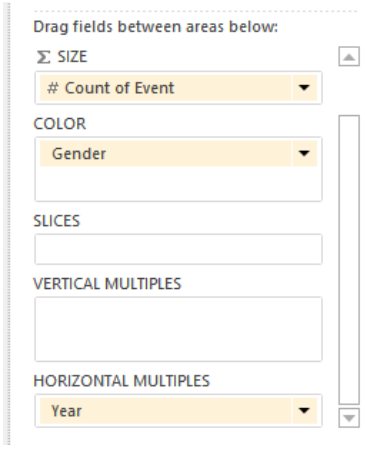
for 1952 was selected, and all other yellow slices are highlighted. When more charts are available than Power View can display in one screen, a vertical scroll bar is displayed along the right edge of the visualization.



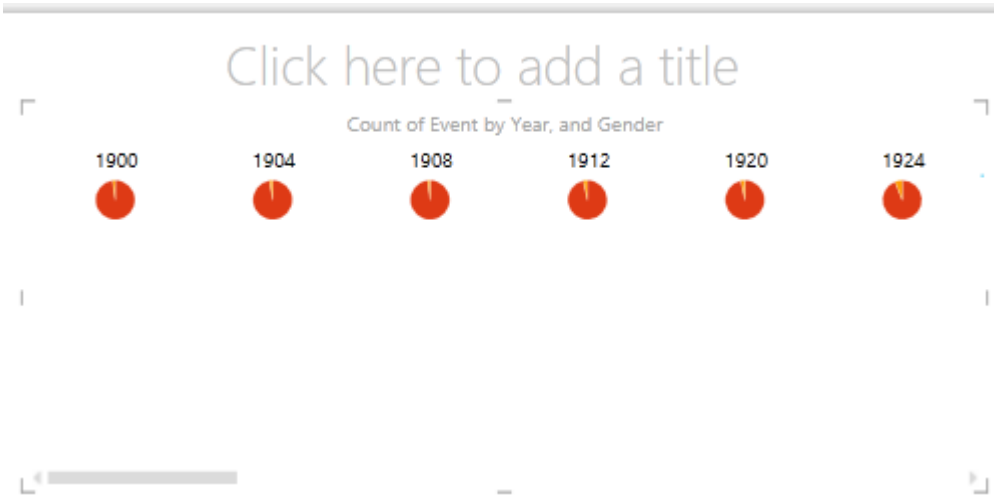
Create Interactive Horizontal Multiples Charts

Horizontal charts behave similar to Vertical Multiple Charts.

1. You want to change your Vertical Multiples Charts to Horizontal Verticals. To do so, drag the Year field from the VERTICAL MULTIPLES area into the HORIZONTAL MULTIPLES area, as shown in the following screen.



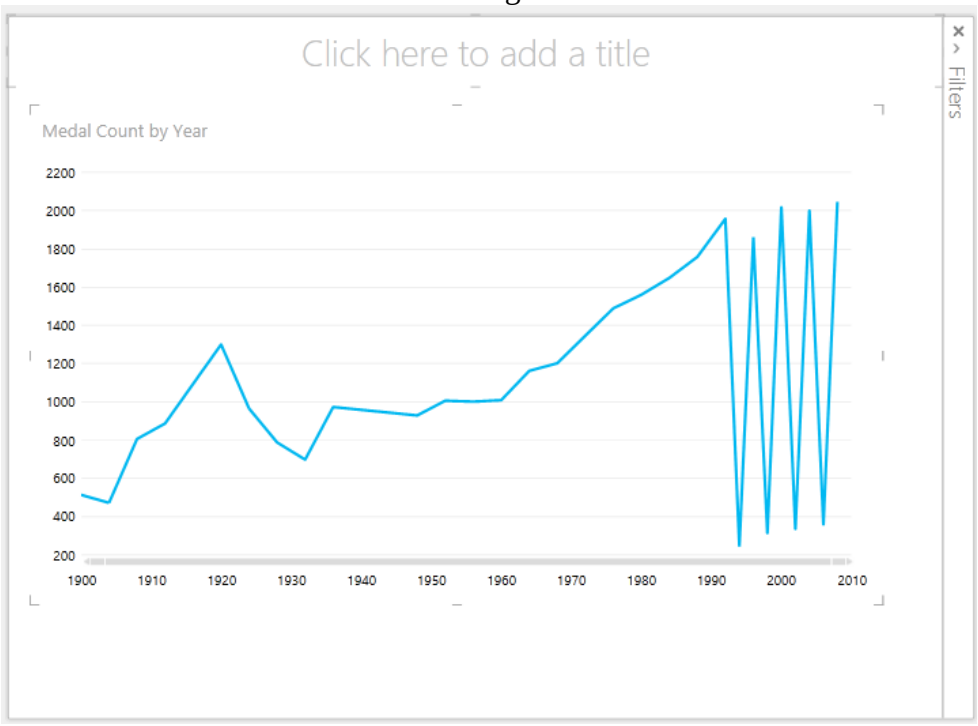
2. The Power View report visualization changes to a Horizontal Multiples Chart. Notice the scroll bar along the bottom of the visualization, shown in the following screen.



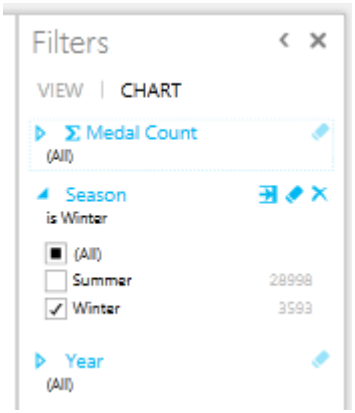
Create Multiples Line Charts

Creating line charts as multiples is easy, too. The following steps show you how to create multiple line charts based on the count of medals for each year.

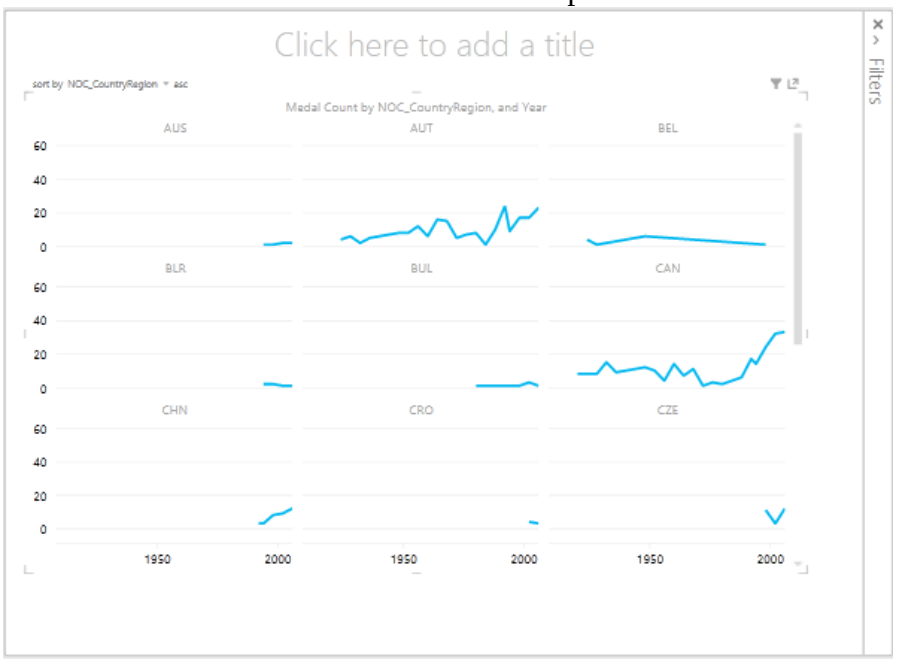
1. Create a new Power View sheet, and rename it **Line Multiples**. From **Power View Fields**, select Medal Count and Year from the **Medals** table. Change the visualization to a line chart by selecting **DESIGN > Other Chart > Line**. Now drag Year to the AXIS area. Your chart looks like the following screen.



2. Let's focus on Winter medals. In the **Filters** pane, select CHART, then drag Season from the **Medals** table into the Filters pane. Select Winter, as shown in the following screen.



3. To create the multiples line charts, drag NOC_CountryRegion from the **Medals** table into the VERTICAL MULTIPLES area. Your report now looks like the following screen.



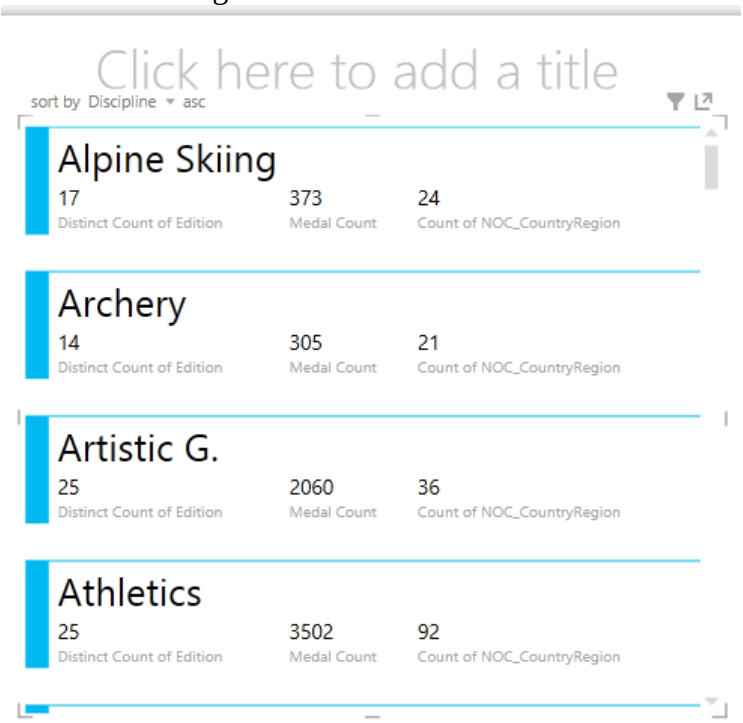
4. You can choose to arrange the multiple charts based on different fields, and in ascending or descending order, by clicking on the selections in the upper left corner of the visualization.

Build Interactive Reports using Cards and Tiles

Tiles and cards convert tables to a series of snapshots that visualize the data, laid out in card format, much like index cards. In the following steps, you use cards to visualize the number of medals awarded in various sports, and then, refine that visualization by tiling the results based on Edition.

Create Card Visualizations

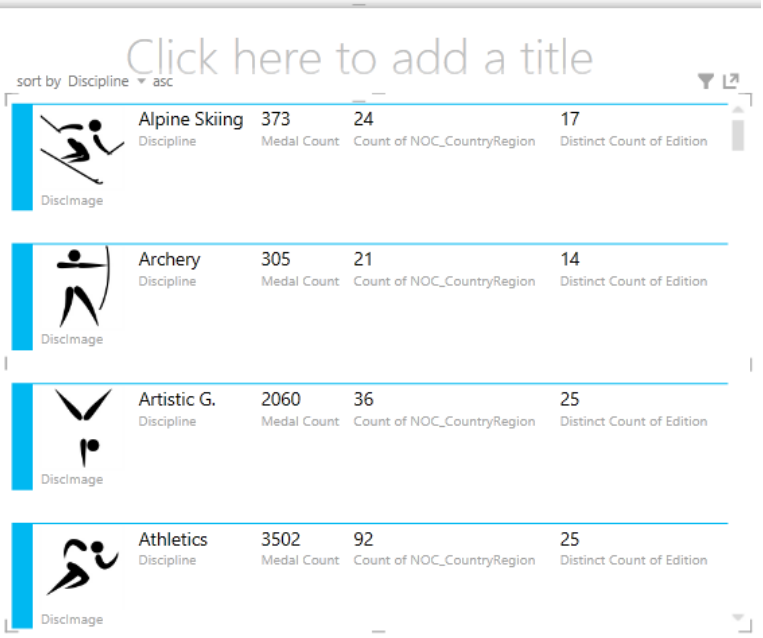
1. Create a new Power View Report, and rename it **Cards**. From **Power View Fields**, from the **Disciplines** table, select Discipline. From the **Medals** table, select Distinct Count of Edition, Medal Count, and NOC_CountryRegion. In the FIELDS area of **Power View Fields**, click the arrow next to NOC_CountryRegion, and select Count (Distinct).
2. In the ribbon, select **DESIGN > Switch Visualization > Table > Card**. Your table looks like the following screen.



3. With the card visualization selected, select DiscImage from the **DiscImage** table. You may get a security warning that prompts you to click a button to Enable Content in order to get the images to display, as shown in the following screen.

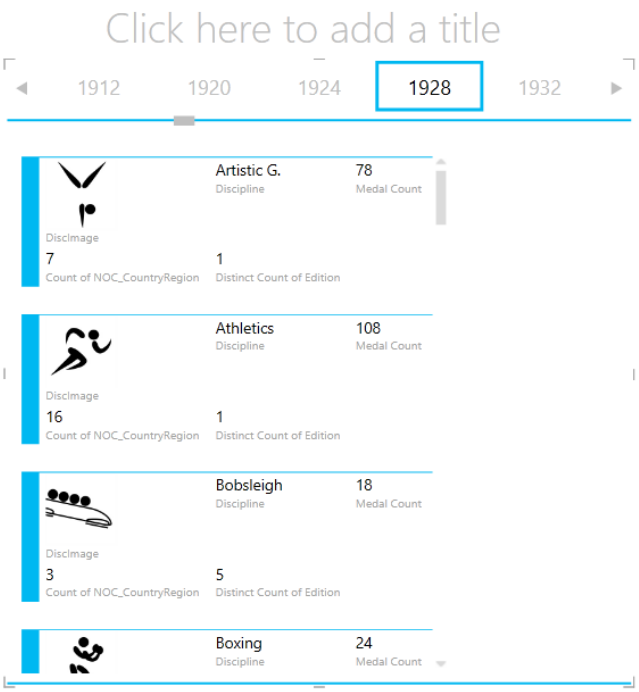
4. In the FIELDS area, arrange the fields in the following order: DiscImage, Discipline, Medal Count, Count of NOC_CountryRegion, and last, Distinct Count of Edition. Your

Cards now look similar to the following screen.



Use Tiles with Card Visualizations

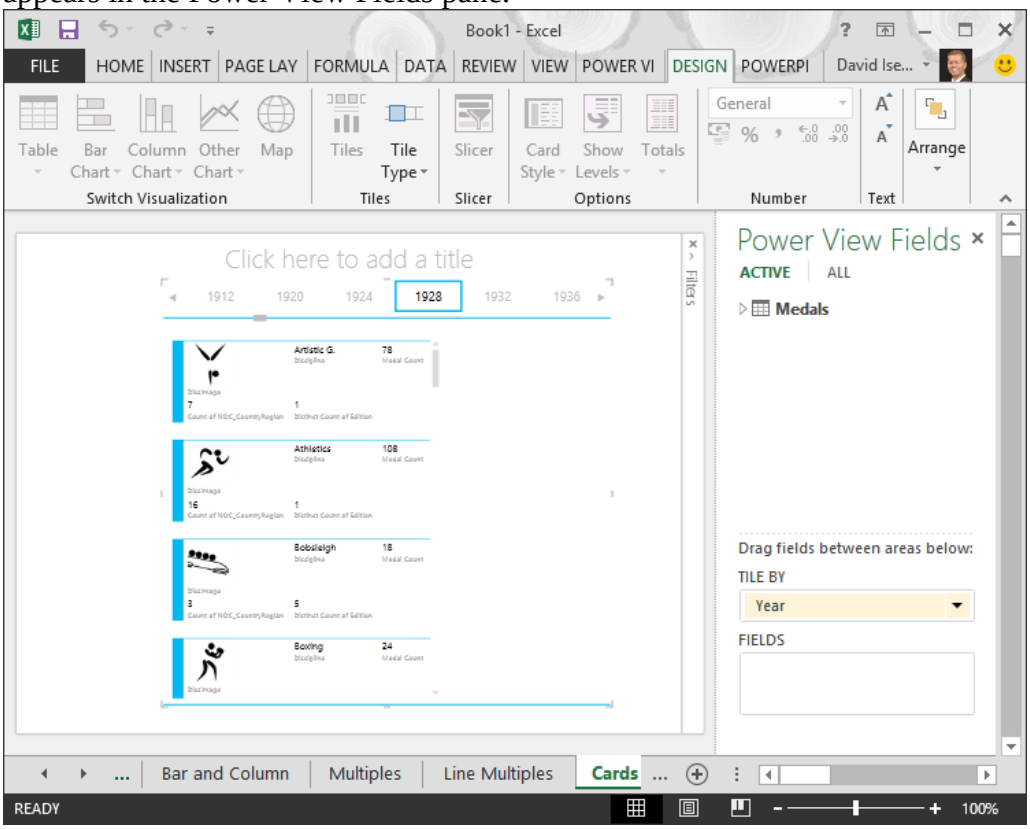
1. Reviewing these cards based on the year in which the medals were awarded is easy. In **Power View Fields**, from the **Medals** table, drag the Year field into the TILE BY area. Your visualization now looks like the following screen.



2. Now the cards are tiled by Year, but something else happened as well. The TILE BY field became a container, which at this point only contains the cards you created in the

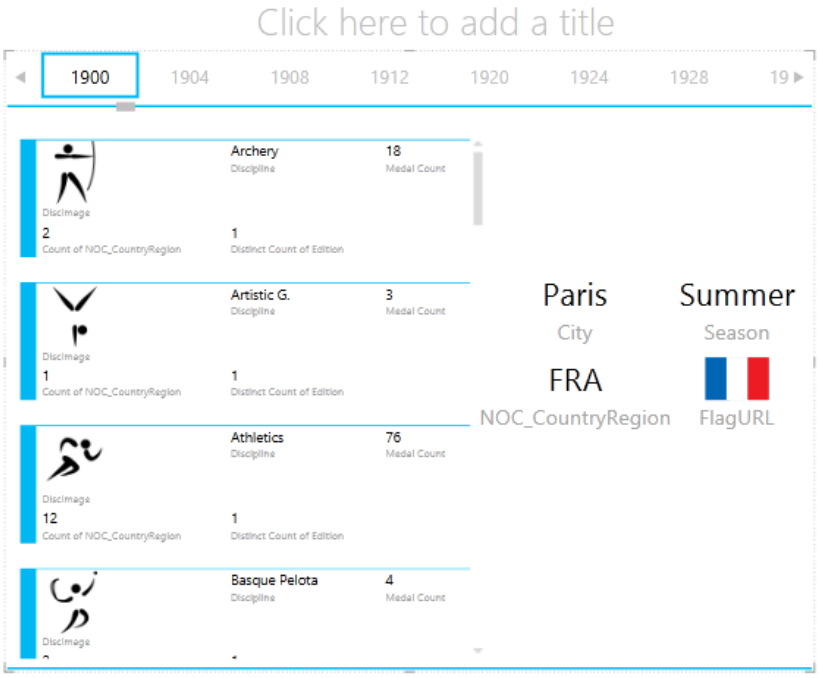
previous steps. We can add to that container, however, and see how using TILE BY can create interactive reports that coordinate the view of your data.

3. Click in the area beside the cards visualization, but still inside the TILE BY container. The **Power View Fields** pane changes to reflect that you are still in the TILE BY container, but you are not in the cards visualization. The following screen shows how this appears in the Power View Fields pane.

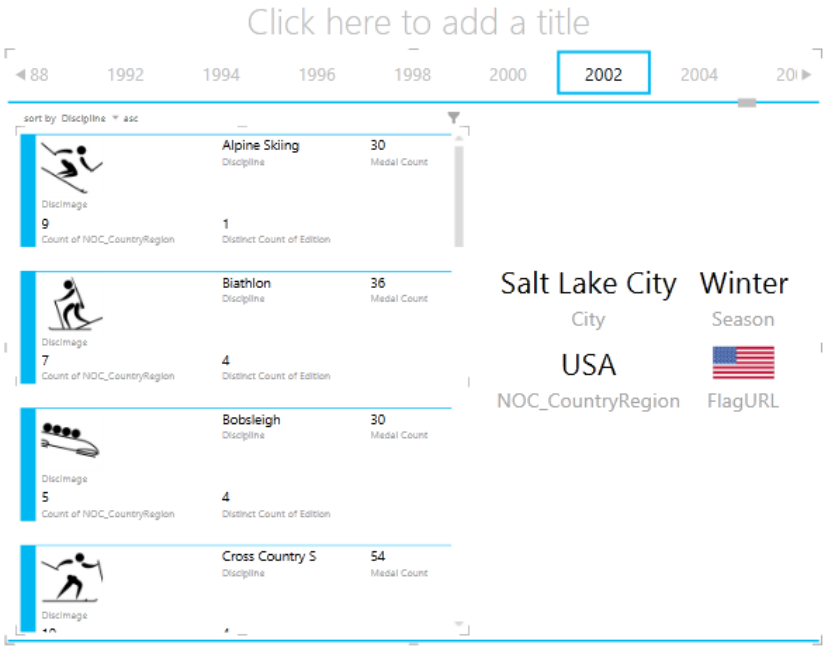


4. In **Power View Fields**, select ALL to show all available tables. From the **Hosts** table, select City, Season, NOC_CountryRegion, and FlagURL. Then from the ribbon, select **DESIGN > Switch Visualization > Table > Card**. You want the table you just created to fill up more of the available report space, so you decide to change the type of Card visualization. Select **DESIGN > Options > Card Style > Callout**. That's better. Your

report now looks like the following screen.

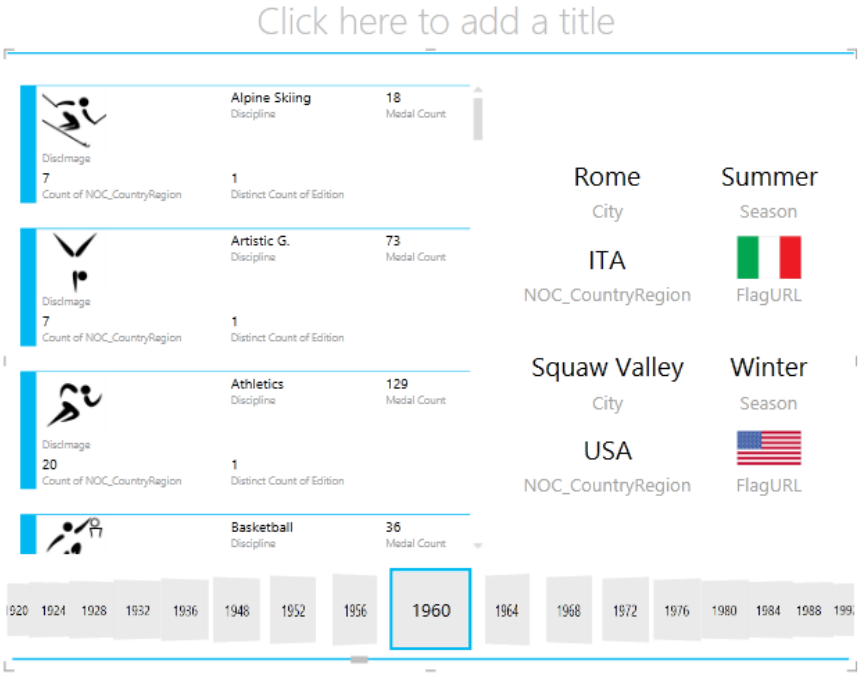


5. Notice how, when you select a different Year from the Tiles along the top of the TILE BY container, the callout card you just created is also synchronized with your selection. That's because both card visualizations reside within the TILE BY container you created. When you scroll the TILE BY selection and select 2002, for example, your report looks like the following screen.



6. You can also change the way Power View tiles information. From the ribbon, select **DESIGN > Tiles > Tile Type > Tile Flow**. The tile visualizations changes, and Power

View moves the tiles to the bottom of the tile container, as shown in the following screen.



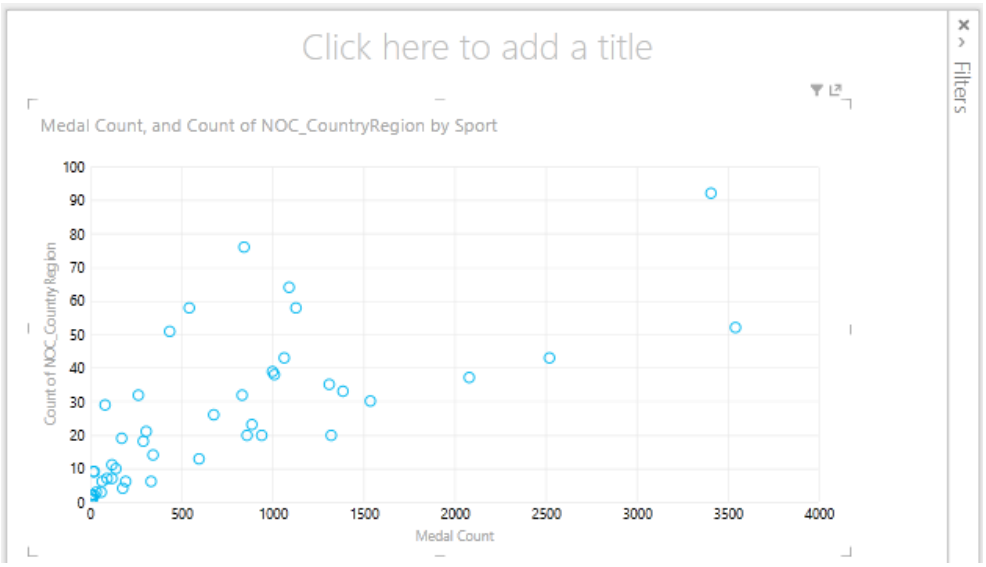
As mentioned previously, when you publish these reports and make them available on SharePoint, these visualizations are just as interactive for anyone viewing them.

Create Scatter Charts and Bubble Charts with Time-based Play Visualizations

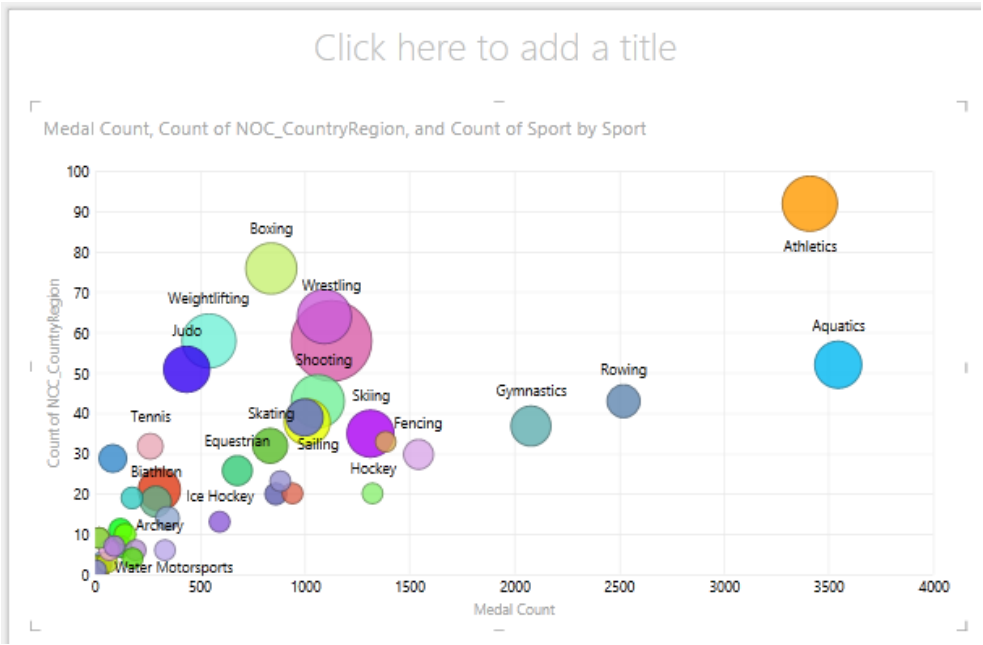
You can also create interactive charts that show changes over time. In this section you create Scatter Charts and Bubble Charts, and visualize the Olympics data in ways that will allow anyone viewing your Power View reports to interact with them in interesting and amazing ways.

Create a Scatter Chart and Bubble Chart

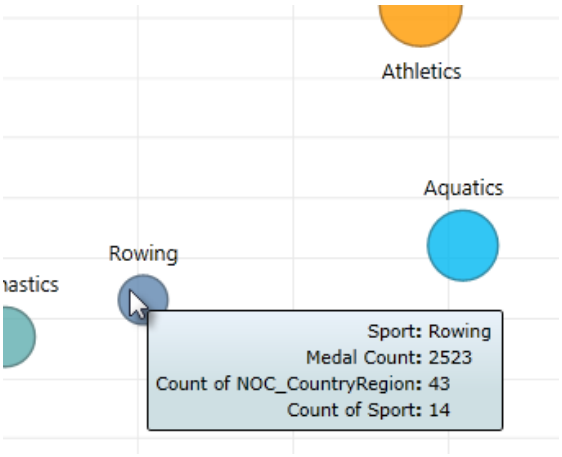
1. Create a new Power View report by selecting **POWER VIEW > Insert > Power View** from the ribbon. Rename the report **Bubbles**. From the **Medals** table, select Medal Count and NOC CountryRegion. In the FIELDS area, click the arrow beside NOC_CountryRegion and select Count (Distinct) to have it provide a count of country or region codes, rather than the codes themselves. Then from the **Events** table, select Sport.
2. Select **DESIGN > Switch Visualization > Other Chart > Scatter** to change the visualization to a scatter chart. Your report looks like the following screen.



3. Next drag Event from the **Events** table into the SIZE area of **Power View Fields**. Your report becomes much more interesting, and now looks like the following screen.



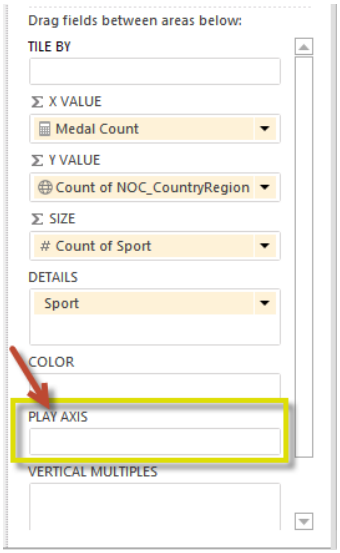
4. Your scatter chart is now a bubble chart, and the size of the bubble is based on the number of medals awarded in each sport.
5. Your bubble chart is interactive too. When you hover over the Rowing bubble, Power View presents you with additional data about that sport, as shown in the following image.



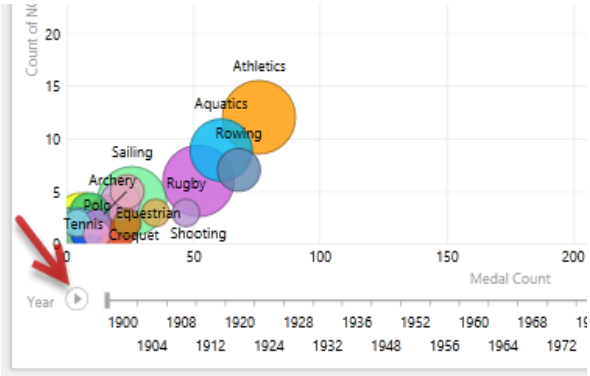
Create Time-Based Play Visualizations

Many of the visualizations you create are based on events that happen over time. In the Olympics data set, it's interesting to see how medals have been awarded throughout the years. The following steps show you how to create visualizations that play, or animate, based on time-based data.

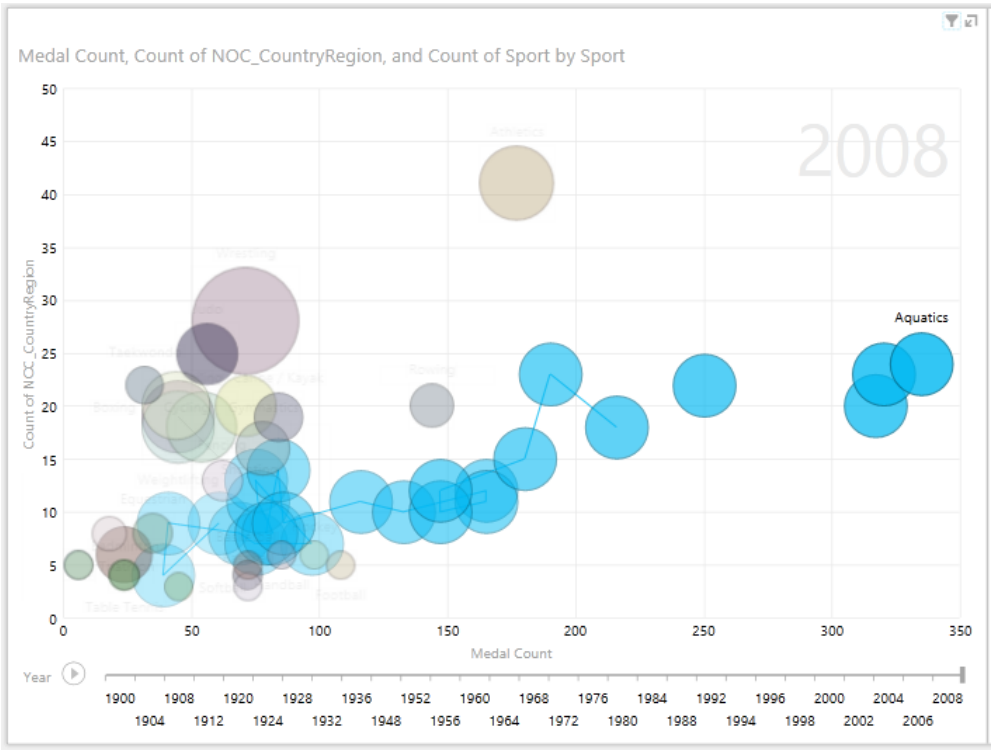
1. In the Scatter Chart you created in the previous steps, notice the PLAY AXIS area in Power View Fields, as shown in the following screen.



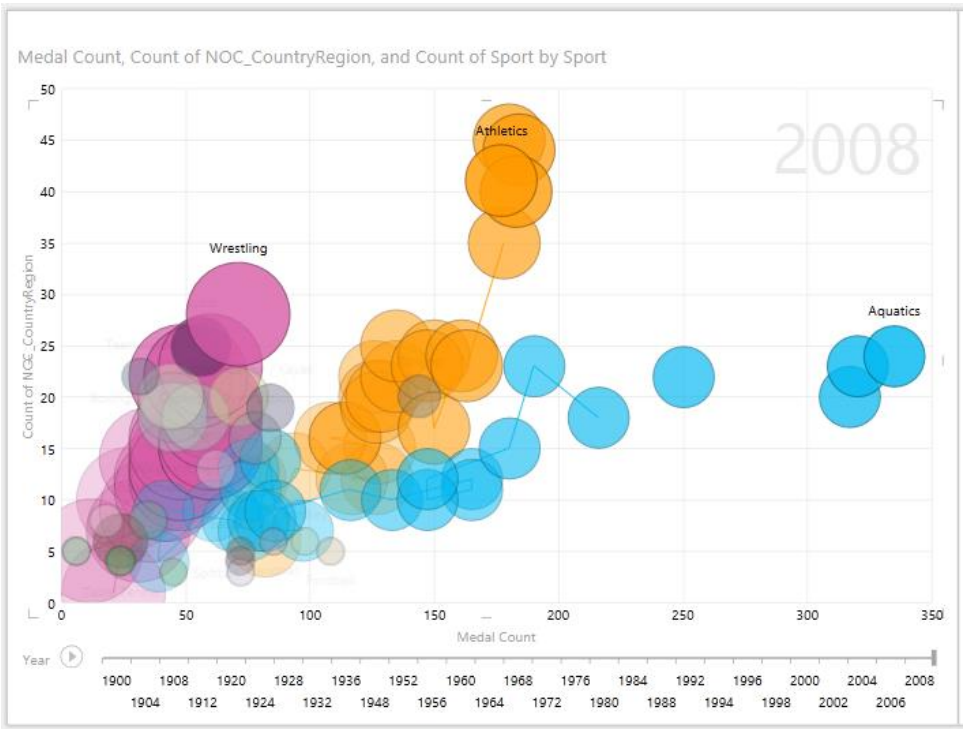
2. From the **Medals** table, drag Year to the PLAY AXIS area. Here comes the fun part. An axis is created along the bottom of the scatter chart visualization, and a PLAY icon appears beside it, as shown in the following screen. Press play.



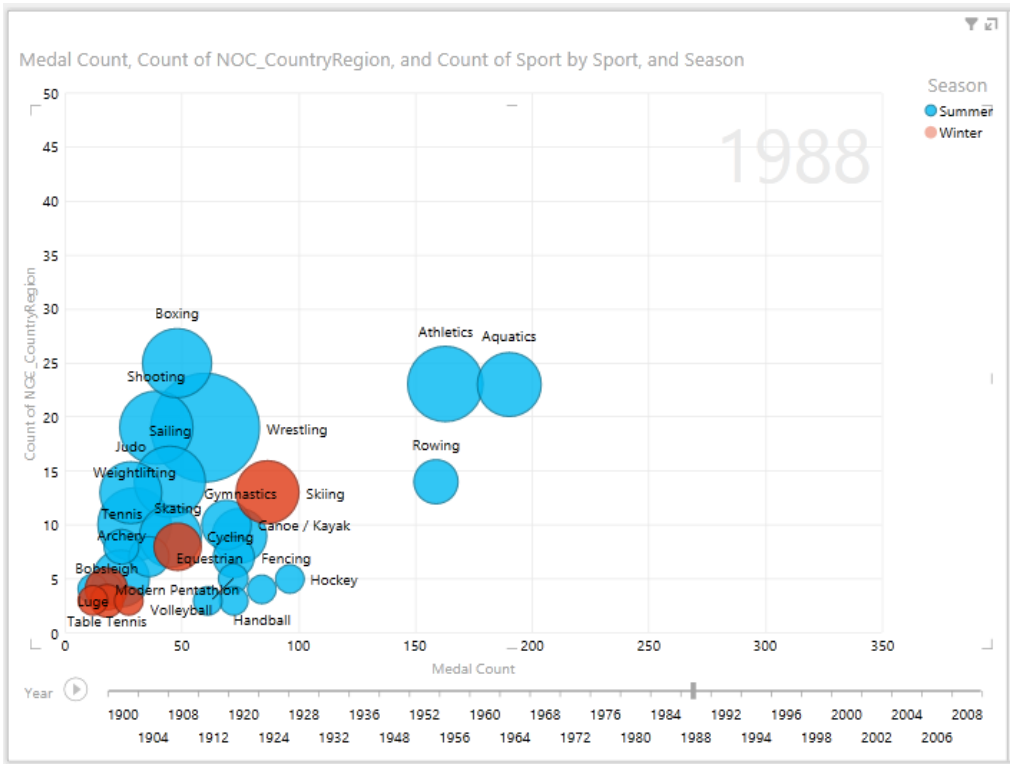
3. Watch as the bubbles move, grow, and contract as the years move along the Play axis. You can also highlight a particular bubble, which in this case is a particular Sport, and clearly see how it changes as the Play axis progresses. A line follows its course, visually highlighting and tracking its data points as the axis moves forward.
4. Select Aquatics, then click Play. Aquatics is highlighted, and a watermark in the upper right corner of the report displays the Year (the PLAY axis) as the PLAY axis moves ahead. At the end, the path Aquatics has taken is highlighted in the visualization, while other sports are dimmed. The following screen shows the report when the Play axis completes.



5. You can select more than one sport by holding the CTRL key and making multiple selections. Try it for yourself. In the following screen, three sports are selected: Wrestling, Athletics, and Aquatics.



6. Lastly, you can filter Scatter charts just like any other visualization. There are a lot of colors, because there are a lot of sports in the data set. From the **Medals** table, drag Season into the COLOR area of **Power View Fields**. Now only two colors are used, one for each Season (Summer or Winter). The following screen shows this, but to see how cool this looks, watch the video at the end of this module.



There are all sorts of amazing, compelling reports you can create with Power View. Each visualization brings a certain and distinct view onto your data. To provide even more compelling reports, you can combine different visualizations on a single report page, and make your data come alive.