

Blend Your Data

Version: 2020.3

Applies to: Tableau Desktop, Tableau Online, Tableau Server

Data blending is a method for combining data from multiple sources. Data blending brings in additional information from a secondary data source and displays it with data from the primary data source directly in the view.

There are several ways to combine data, each with their own strengths and weaknesses.

Relationships are the default method and can be used in most instances, including across tables with different levels of detail. Relationships are flexible and are adaptable to the structure of the analysis on a sheet by sheet basis. However, relationships cannot be formed between tables from data sources published to Tableau Server or Tableau Online. Relationships also can't be formed based on calculated fields.

Joins combine tables by adding more columns of data across similar row structures. This can cause data loss or duplication if tables are at different levels of detail, and joined data sources must be fixed before analysis can begin.

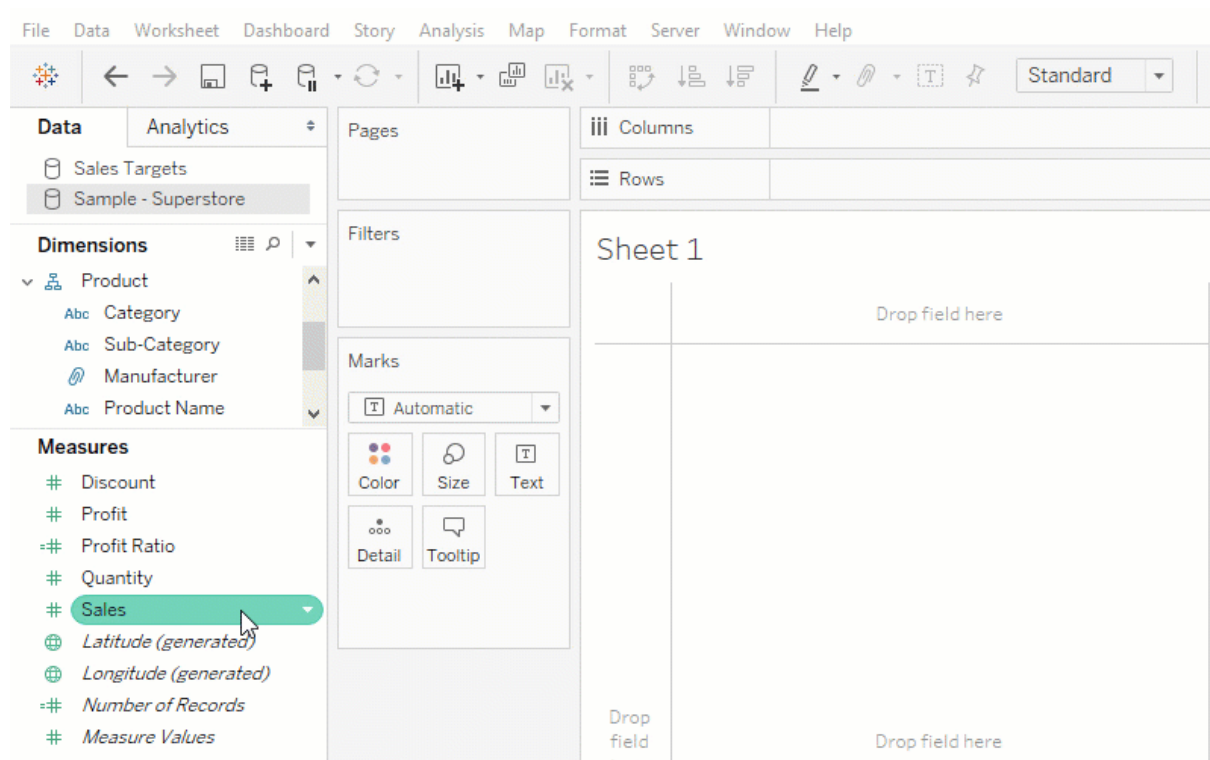
Blends, unlike relationships or joins, never truly combine the data. Instead, blends query each data source independently, the results are aggregated to the appropriate level, then the results are presented visually together in the view. Because of this, blends can handle different levels of detail and working with published data sources. **Blends are also established individually on every sheet and can never be published, because there is no true "blended data source", simply blended results from multiple data sources in a visualization.**

Data blending is particularly useful when the blend relationship—linking fields—need to vary on a sheet-by-sheet basis, or when combining published data sources.

Important: Prior to version 2020.2, data blending was often the best way to handle data sources at different levels of detail. These can now be combined with relationships. Relationships have fewer technical limitations than data blending and are the recommended way of combining data when possible. Blending is only encouraged when it is the best method for your data or relationships are not available.

Steps for blending data

Data blending is performed on a sheet-by-sheet basis and is established when a field from a second data source is used in the view. To create a blend in a workbook already connected to at least two data sources, bring a field from one data source to the sheet—it becomes the primary data source. Switch to the other data source and use a field on the same sheet—it becomes a secondary data source. An orange linking icon will appear in the data pane, indicating which field(s) are being used to blend the data sources.




Note: images in this topic have not been updated to reflect the most current UI. The Data pane no longer shows Dimensions and Measures as labels.

1. Ensure that the workbook has multiple data sources. The second data source should be added by going to **Data > New data source**.

Tip: Adding another *connection* to the first data source enables relationships and joins on the Data Source page. Blending requires two or more distinct data sources, listed independently in the Data pane.

2. Drag a field to the view. Whichever data source this first field comes from will become the primary data source.
3. Switch to another data source and make sure there is a blend relationship to the primary data source.
 - If there is an orange linking field icon (🔗), the data sources are automatically linked. As long as there is at least one active link,

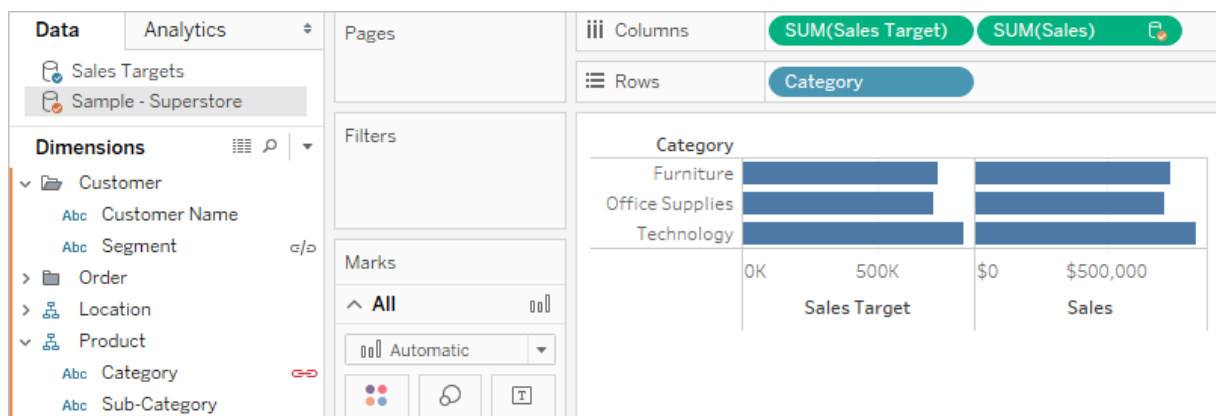
the data can be blended.

- If there are gray, broken link icons (), click the icon next to the field that should link the two data sources. It will turn orange, representing an active link.
- If a link icon does not appear next to the desired field, see [Define blend relationships for blending](#).

4. Drag a field into the view from the secondary data source.

As soon as this second data source is used in the same view, a blend is established. In the example below, our primary data source is **Sales Targets** and the secondary data source is **Sample - Superstore**

- The primary data source is indicated with a blue check mark on the data source. Fields from the primary data source used in the view have no indication.
- The secondary data source is indicated with an orange check mark on the data source and an orange bar down the side of the Data pane. Fields from the secondary data source used in the view have an orange check mark.



Understand primary and secondary data sources

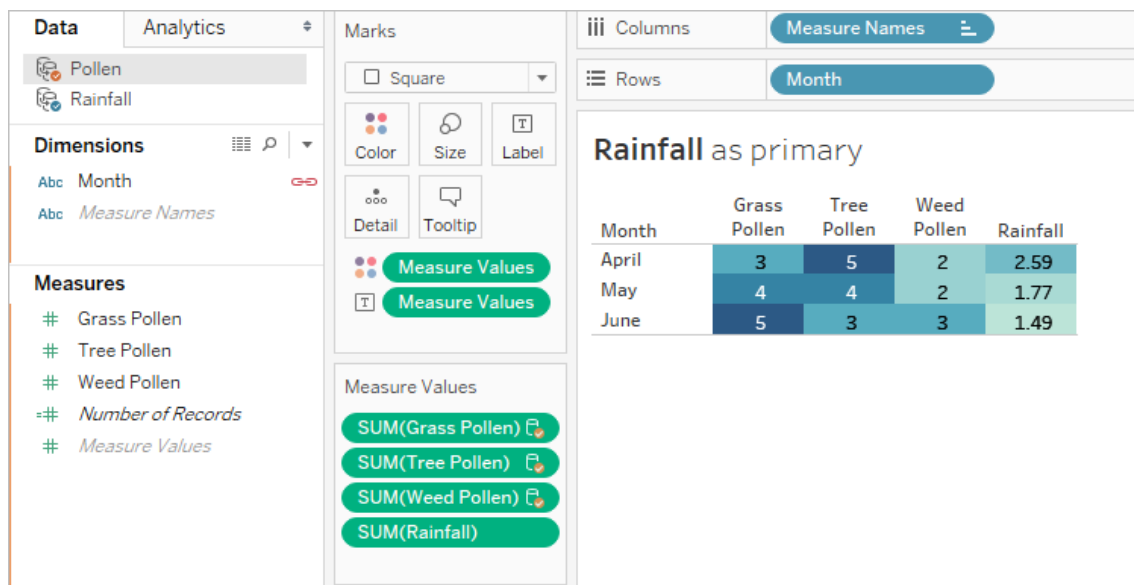
Data blending requires a primary data source and at least one secondary data source. The first data source used in the view becomes the primary data source and defines the view. This can restrict values from the secondary data source—only values that have corresponding matches in the primary data source appear in the view. This is comparable to a left join.

For example, if the primary data source has a Month field that only contains April, May, and June, any view built around months will only display April, May, and June, even if the secondary data source has values for twelve months. If the desired analysis involves all twelve months, try switching which data source is primary by rebuilding the sheet and using the other data source first.

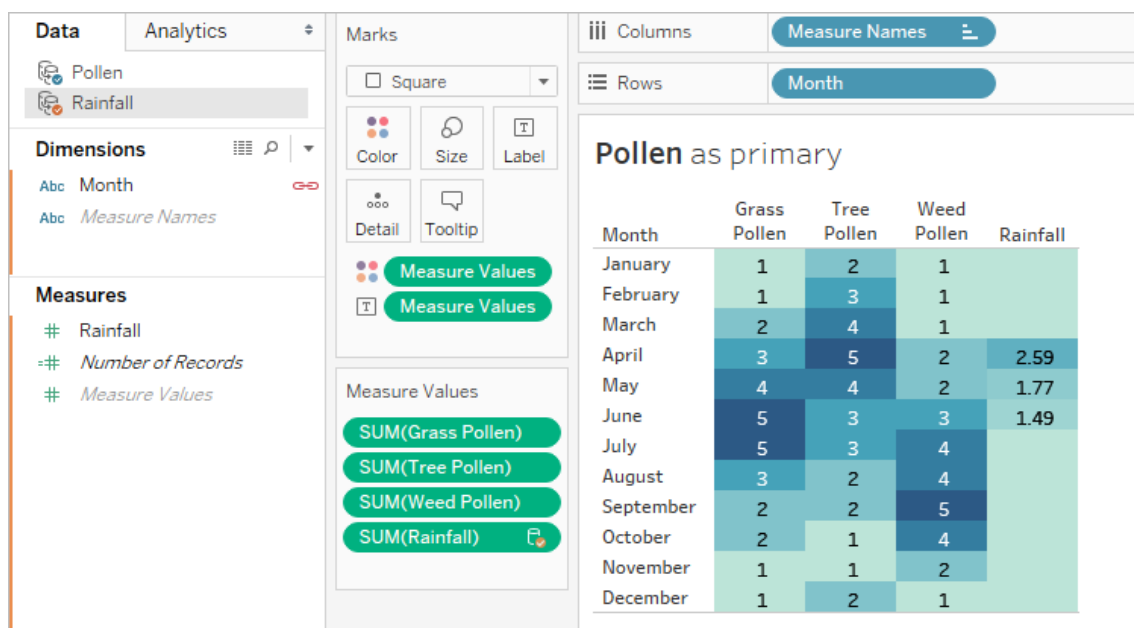
Learn more: the effects of data source order

The following examples below use the same data sources linked on the same field, and the viz is built the same way both times. The difference between the results is due to which data source is designated as the primary.

1. Here, the Month field from the **Rainfall** data source is brought into the view first. Because **Rainfall** only contains three months, when the **Pollen** data set is added as a secondary, only three months are brought into the view.



- On another sheet, the Month field from the **Pollen** data set is brought into the view first. All twelve months are displayed. When the **Rainfall** data set is added as a secondary, **Rainfall** is only available for the three months in that data set.



Work across blended data sources

Due to the nature of a data blend, there are some things to keep in mind when working across blended data sources.

Performing calculations with fields from more than one data source can be slightly different than an ordinary calculation. A calculation must be created in one data source; this is indicated at the top of the calculation editor.

- **Aggregation.** Any fields used from another data source will come in with an aggregation—by default, SUM, but this can be changed. Because calculations cannot mix aggregate and non-aggregate arguments, fields from the data source where the calculation is being made must also be aggregated. (In the images below, the **SUM** aggregation was added automatically and the **sum** aggregation was added manually.)
- **Dot notation.** Any field referenced in the calculation that belong to another data source will refer to its data source using dot notation. (In the images below, for the calculation built in **Sample - Superstore**, the Sales Target field becomes **[Sales.Targets].[Sales Target]**. When the calculation is built in **Sales Targets**, the Sales field becomes **[Sample - Superstore].[Sales]**.)
- These are equivalent versions of the same calculation built in each data source. In both cases, this is $\text{SUM}(\text{Sales}) / \text{SUM}(\text{Sales Target})$.

Percent of Target

Sample - Superstore

×

```
sum([Sales])/SUM([Sales Targets].[Sales Target])
```

The calculation is valid.

Apply

OK

Percent of Target

Sales Targets

×

```
SUM([Sample - Superstore].[Sales])/sum([Sales Target])
```



The calculation is valid.

Apply

OK

In addition to handling calculations slightly differently, there are some limitations on secondary data sources. You may not be able to sort by a field from a secondary data source, and action filters may not work as expected with blended data. For more information, see [Other data blending issues \(multipleconnections_troubleshooting.htm#other\)](#).

Define blend relationships for blending



In order for Tableau to know how to combine the data from multiple sources, there must be a common dimension or dimensions between the data sources. This common dimension is called the linking field. Active linking fields are identified in the Data pane for the secondary data source with an active link icon () and potential linking fields are identified with a broken link icon ().

For example, in a blend of transactional and quota data, a geographic field might be the desired the linking field so you can analyze a region's quota and performance towards that quota.

Note: In order for the blend to function, the linking fields must also share values or members. Tableau builds the view of blended data based on the shared values. For example, if **Color** is the linking field in both data sources, Tableau will match data on "Purple" from the primary and "Purple" from the secondary. But "Lt. Blue" will not map correctly to "Light Blue", so one of them would need to be realiaised. Like renaming fields to help Tableau identify linking fields, you can edit aliases for members in those fields. For more information, see [Create Aliases to Rename Members in the View](#) ([datafields_fieldproperties_aliases_ex1editing.htm](#)).


Establish a link

If the linking field in the primary and secondary data sources have the same name, Tableau automatically creates the relationship. When a primary data source has been established (that is, a field is in use in the view) and the secondary data source is selected in the Data pane, any fields with the same

name between the two data sources will display a link icon ( or ) in the *secondary* data source. If the related field from the primary data source is used in the view, the link becomes active automatically.

If there are no link icons on the secondary data source, you may need to help Tableau establish the link in one of two ways:

1. If common dimensions don't have the same name (such as "Region" and "Sales Region"), renaming one will let Tableau identify them as common dimensions and establish the link.
2. Alternatively, you can manually define a relationship between the fields in the primary and secondary data sources. See below for more information on creating manual link relationship

There can be as many active or potential linking fields as necessary. Click the broken link icon () in the data pane to make the relationship active.

Manually define a link relationship

If your common dimensions do not share the same name, you can map the relationship between them manually.

1. Select **Data > Edit Blend Relationships....**
2. In the Blend Relationships dialog box, verify that the primary data source is selected from the **Primary data source** drop-down list.
3. Select the secondary data source in the **Secondary data source** pane. Any existing, automatic blend relationships will be visible. Select **Custom** in the relationships list, and then click **Add**.

Blend Relationships [X]

Blend relationships determine how data from secondary data sources are joined with primary data sources.

Primary data source:
Edition

Secondary data source:
World Indicators

☐ Automatic ☒ Custom

Region	Region

Add... Edit... Remove

OK Cancel

4. In the Add/Edit Field Mapping dialog box, do the following:
 - a. Select a field from the primary data source.
 - b. Select a field from the secondary data source to establish the linking field or the blend relationship between the data sources even though the fields do not have the same name.
 - c. Click **OK**.

In this example, a mapping between **Segment** and **Cust Segment** is created.

Add/Edit Field Mapping

Primary data source field:

Enter search text

- Category
- City
- Country
- Customer Name
- Manufacturer
- Order Date
- > Order Date
- Order ID
- Postal Code
- Product Name
- Region
- Segment**
- Ship Date
- > Ship Date
- Ship Mode
- State
- Sub-Category

Secondary data source field:

Enter search text

- Category
- Cust Segment**
- > Date

OK Cancel

Tip: For dates, the relationship can be specified precisely. Expand the date field and select the desired aspect of the date, such as exact date, month, year, etc.

5. Create as many field mappings as desired, then click **OK**.

Multiple links

As with relationships or joins, there are times when the links between the data sources are defined by more than one field. For example, if regional sales quotas are monthly, a blend between transactional sales data and

quota data needs to be established on both region and month for the correct data to be brought together in the view. Multiple links can be active at the same time.

Learn more: the impact of multiple linking fields

When data is blended based on multiple fields, values are included in the view only where the combination of data from those fields matches across both data sets. Let's look at an example to understand this.

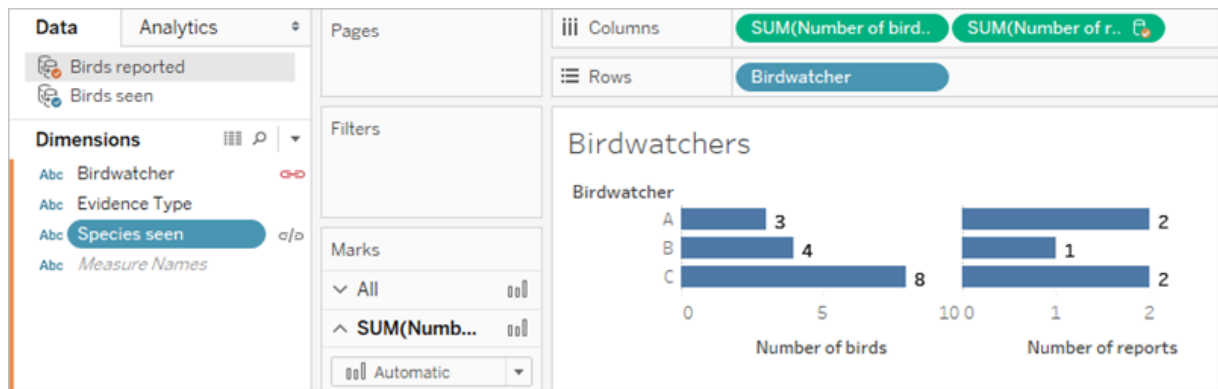
We have two tables, one for birds that were actually seen by birdwatchers, and one for birds that were reported as seen.

Birdwatcher	Species seen	Location	Number of birds
A	Grackle	Beach	1
	Oriole	Pier	2
B	Kiskadee	Beach	4
C	Kiskadee	Beach	5
	Oriole	Tree	3

 and

Birdwatcher	Species seen	Evidence Type	Number of reports
A	Kiskadee	journal entry	1
	Oriole	photograph	1
B	Grackle	journal entry	1
C	Grackle	journal entry	1
	Kiskadee	photograph	1

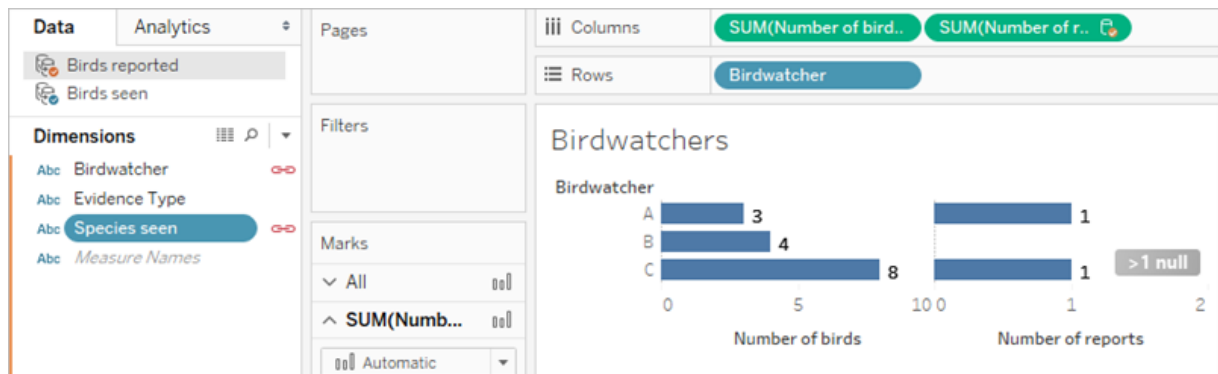
If we set up a blended view with the fields **Birdwatchers** and **Number of birds** from the primary data source (**Birds seen**) and bring in the field **Number of reports** from the secondary data source (**Birds reported**), Tableau automatically blends on **Birdwatcher**.



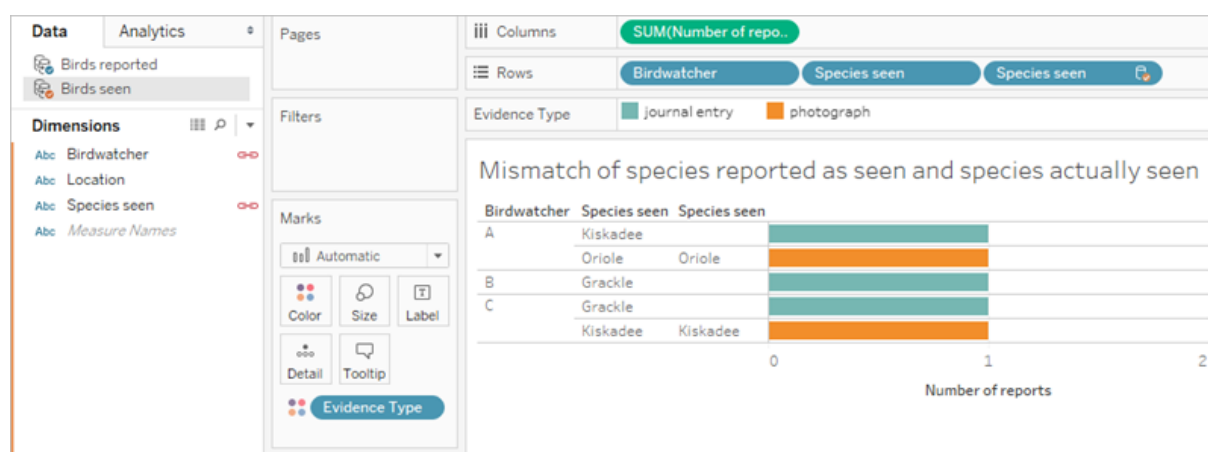
Note: images in this topic have not been updated to reflect the most current UI. The Data pane no longer shows Dimensions and Measures as labels.

We see that birdwatcher A saw three birds and made two reports, B saw four birds and made one report, and C saw 8 birds and made two reports.

But there's another possible linking field, **Species seen**. Why not blend on this, too? Will it make a difference?



It makes quite a dramatic difference. Now we see that there is only one report each for birdwatchers A and C, and B has a null. What's going on?



It turns out that these birdwatchers aren't very honest. When they only reported their sightings based on a journal entry (blue bars in the image above), the species they reported seeing didn't match what they actually saw (note the nulls in the second column, from the **Birds seen** secondary data source). When they backed up the report with a photograph (orange bars), they were honest (both columns of **Species seen** match). Because three reports did not match on species, those rows of data were dropped when the **Birdwatcher** and **Species seen** fields were used as a linking field. The view only shows data where values for both linking fields match.

Be careful when linking on multiple fields. Although it can be very easy to click the icon and establish an active link, over-linking or linking on undesired fields can have a serious impact on the analysis.

Differences between joins and data blending


Data blending simulates a traditional left join. The main difference between the two is when the aggregation is performed. A join combines the data and then aggregates. A blend aggregates and then combines the data.

Left join


When you use a left join to combine data, a query is sent to the database where the join is performed. A left join returns all rows from the left table and any corresponding rows from the right table. The results of the join are then sent back to Tableau and aggregated for display in the visualization.

A left join takes all rows from the left table. The common columns are **User ID** and **Patron ID**; where there is corresponding information from the right table, that data is returned. Otherwise, there is a null.

User ID	District	Level	Type
1	2	3	G
2	3	4	J
4	5	6	M
1	2	3	W




Branch	Patron ID	District	Level
A001	1	2	3
B001	2	3	4
C001	1	2	3




User ID	District	Level	Branch	Type
1	2	3	A001	G
1	2	3	A001	W
1	2	3	C001	G
1	2	3	C001	W
2	3	4	B001	J
4	5	6	null	M

Suppose you have the same tables, but flip the order. This new left join produces different results. Again, a left join takes all the data from the new left table, but essentially ignores a row from the right table. The row of data for User ID = 4 is not included because there is no row for Patron ID = 4 in the left table.

Branch	Patron ID	District	Level
A001	1	2	3
B001	2	3	4
C001	1	2	3



User ID	District	Level	Type
1	2	3	G
2	3	4	J
4	5	6	M
1	2	3	W



User ID	District	Level	Branch	Type
1	2	3	A001	G
1	2	3	A001	W
1	2	3	C001	G
1	2	3	C001	W
2	3	4	B001	J

Data blending

When you use data blending to combine data, a query is sent to the database for each data source that is used on the sheet. The results of the queries are sent back to Tableau as aggregated data and presented together in the visualization.

Note: Aggregating measures is straightforward—we can take the sum, average, maximum, or other aggregation of a number with ease.

Measure values are aggregated based on how the field is aggregated in the view. However, all fields from a secondary data source must be aggregated. How does that work for dimensions? Dimension values are aggregated using the **ATTR** aggregate function, which returns a single value for all rows in the secondary data source. If there are multiple values contained in those rows, an asterisk (*) is shown. This can be interpreted as "there are multiple values in the secondary data source for this mark in the view".

The view uses all values from the primary data source (functioning as the left table) and the corresponding rows from the secondary data source (the right table) based on the linking field(s).

Suppose you have the following tables. If the linking fields are **User ID** and **Patron ID**, not all values can be a part of the resulting table because of the following:

- A row in the left table does not have a corresponding row match in the right table, as indicated by the null value in the results.

- There are multiple corresponding values in the rows in the right table, as indicated by the asterisk (*) in the results.

User ID	District	Level	Type
1	2	3	G
2	3	4	J
4	5	6	M
1	2	3	W




Branch	Patron ID	District	Level
A001	1	2	3
B001	2	3	4
C001	1	2	3




User ID	District	Level	Branch	Type
1	2	3	*	G
2	3	4	B001	J
4	5	6	null	M
1	2	3	*	W

When measures are involved, they are also aggregated, as seen below:


Branch	Patron ID	District	Level	Fines
A001	1	2	3	10.00
B001	2	3	4	20.00
C001	1	2	3	30.00



User ID	District	Level	Type
1	2	3	G
2	3	4	J
4	5	6	M
1	2	3	W



Branch	Patron ID	District	Level	Fines
*	1	2	3	40.00
B001	2	3	4	20.00
*	1	2	3	40.00



User ID	District	Level	Type	Branch	Fines
1	2	3	G	*	40.00
2	3	4	J	B001	20.00
4	5	6	M	null	null
1	2	3	W	*	40.00

Important: an asterisk (*) in a view with blended data indicates multiple values. This can be resolved by ensuring there is only one matching value in the secondary data source for each mark in the primary data source, potentially by swapping the primary and secondary data sources. For more information, see [Troubleshoot Data Blending \(multipleconnections_troubleshooting.htm\)](#).

Data blending at a glance

- Data blending occurs on a sheet-by sheet basis.
- The order in which fields are used determines which data source is the primary versus the secondary data source.
- The primary data source is indicated with a blue check mark, any secondary data sources and fields from secondary data sources have an orange check mark.
- Linking fields can be automatically determined based on shared field names or the blend relationship can be manually created.
- Data blending behaves similarly to a left join, which may result in missing data from the secondary data source.
- Asterisks (*) may appear. This indicates multiple dimension values in a single mark, because data blending takes aggregated results and combines them in the view.
- A secondary data source can be used to re-alias the field values in a primary data source. For more information, see [Alias Field Values Using Data Blending](#) ([multipleconnections_edit_primary_aliases.htm](#)).

Data blending limitations

- There are some data blending limitations around non-additive aggregates, such as COUNTD, MEDIAN, and RAWSQLAGG. For more information, see [Troubleshoot Data Blending](#) ([multipleconnections_troubleshooting.htm](#)).
- Blended data sources cannot be published as a unit. Instead, publish each data source separately (to the same server) and then blend the published data sources.

- Data from secondary data sources must always be aggregated in calculations.
- If you are blending a cube data source, it must be the primary data source.

Other articles in this section

- [Alias Field Values Using Data Blending](#)
([multipleconnections_edit_primary_aliases.htm](#)).
- [Bring a Field into the Primary Data Source](#)
([multipleconnections_create_primary_group.htm](#)).
- [Troubleshoot Data Blending](#)
([multipleconnections_troubleshooting.htm](#)).
- [Blend on Summary Data](#) ([multipleconnections_summarydata.htm](#)).