

# Advanced Visualization Techniques

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# CLOUDERA

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## Trellis on dimensions

Trellising charts on dimensions produces multiple charts that focus on a distinct section of data.

### Trellising on one dimension

In this example, the field `un_region` becomes a trellising dimension when it is placed on the X shelf of a map visual.

The screenshot displays the 'VISUALS' configuration panel for a 'Map' visual. The visual is set to 'Map' and is trellised on the 'un\_region' dimension. The configuration is as follows:

- X Shelf:** `un_region`
- Y Shelf:** (Empty)
- Geo:** `country`
- Measures:** `avg(population)`
- Drill:** (Empty)
- Tooltips:** (Empty)
- Filters:** (Empty, with a prompt 'drag or click fields to add here')

A 'REFRESH VISUAL' button is located at the bottom of the configuration panel.

This setup produces a trellised version of a map visual, on one dimension.



You can trellis many of the charts where the X and Y shelves are optional, by placing the field that represents the partition there.

When using mandatory shelves, such as X Axis and Y Axis on bar visuals, place two dimensions on the shelf. Data Visualization uses the first field to trellis the visual, and the second field in the visual itself.

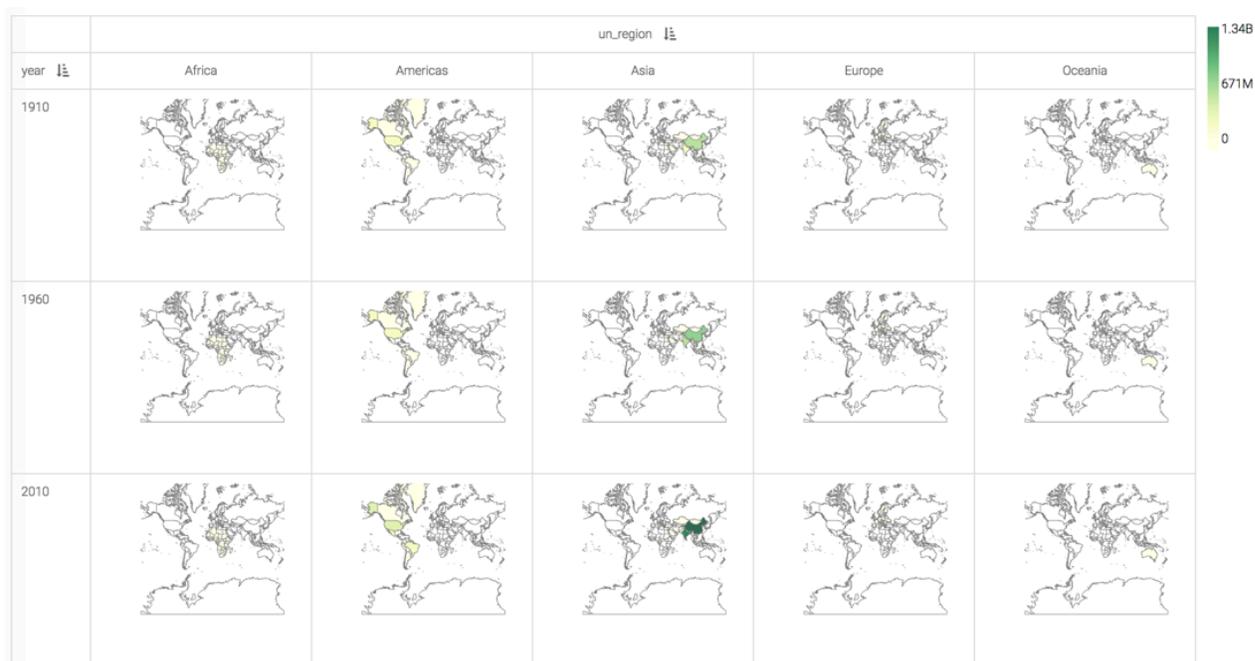
### Trellising on two dimensions

You can take it one step further, and define a secondary trellis for your visuals by placing yet another dimension on the Y shelf.

Here, the year field is used both on the Y shelf and on the Filters shelf, selecting years 1910, 1960, and 2010 to demonstrate the comparable populations across continents, and in 50-year increments.

The image shows a configuration panel for a 'Map' visual. At the top, the word 'VISUALS' is displayed with a close icon. Below it, the visual type is set to 'Map'. The configuration is organized into several sections: 'X' with 'un\_region', 'Y' with 'year', 'Geo' with 'country', 'Measures' with 'avg(population)', 'Drill' (empty), 'Tooltips' (empty), and 'Filters' with 'year in (1910, 1960, 2010)'. A blue 'REFRESH VISUAL' button is located at the bottom of the panel.

This setup produces a map visual that is trellised on two dimensions, UN Region and Year.



## Trellis on measures

Some visual types (bars, lines, areas, and grouped bars) may be trellised on measures, simply by adding more fields to the measurement shelf.

### About this task

You can change the chart developed in *Bars* (Country / Life Expectancy) into a visual trellised on three measures: Life Expectancy, Population, and GDP per Capita. You can accomplish this by placing all three measurements on the Y Axis shelf.

### Procedure

1. Click the Y Axis shelf. Life Expectancy is already on the shelf.
2. With the shelf active, click the population field in the DATA menu.
3. Click the `gdp_per_capita` field in the DATA menu.

## 4. Click REFRESH VISUAL.

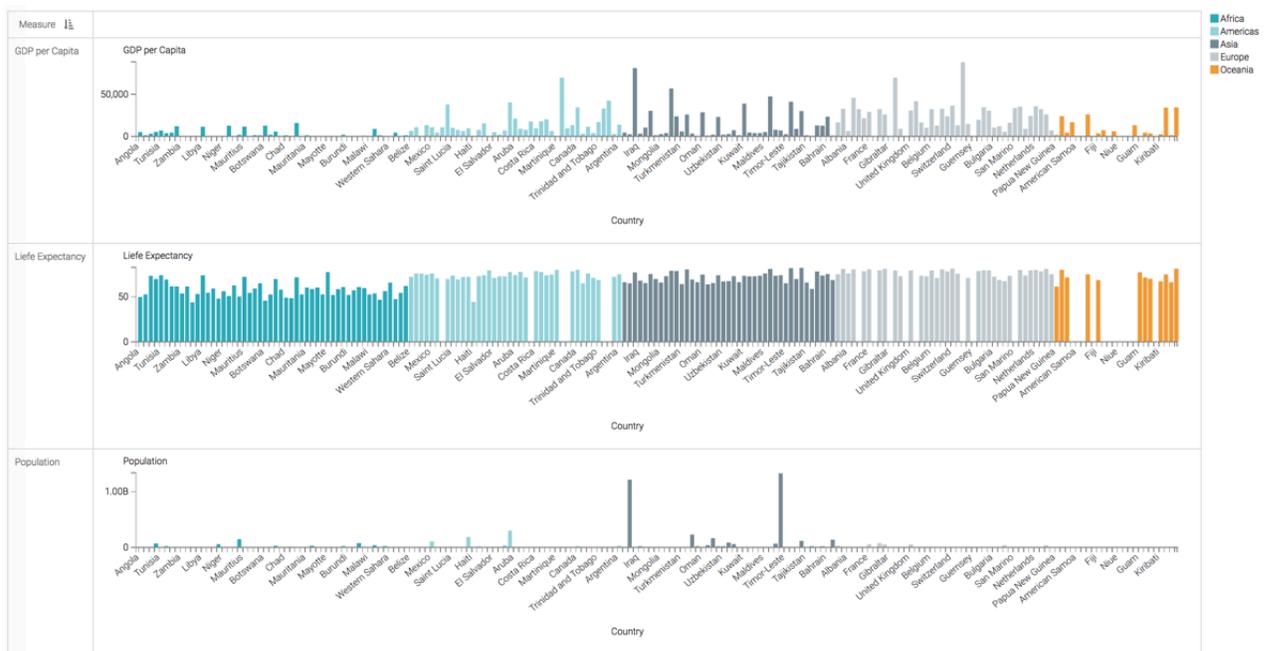
The screenshot shows the 'VISUALS' configuration panel for a 'Bars' chart. The X Axis is set to 'Country'. The Y Axis has three measures: 'avg(life\_expectancy)', 'avg(population)', and 'avg(gdp\_per\_capita)'. The Colors section is set to 'un\_region'. The Filters section has 'year in (2010)'. A blue 'REFRESH VISUAL' button is at the bottom.



**Note:** As the magnitudes of the measurements vary, Cloudera recommends that you specify independent measurements and then click REFRESH VISUAL again.

**Results**

This setup produces a measurement-trellised bar chart visual.



To compare this approach with plotting two measures onto the same line chart, see *Line visuals with dual axes*.

### Related Information

[Line visuals with dual axes](#)

[Bars](#)

## Multiple measure analysis

Cloudera Data Visualization supports measures in the trellis, for comparing multiple measures at the same time. This feature works in bar, line, area, and grouped bar visual types.

### About this task

To implement this feature, simply add all the required measurement fields to the trellising shelves of the visual.

Follow these steps to create a multi-measure representation of data in the World Life Expectancy dataset.

### Procedure

1. Start a new visual based on dataset World Life Expectancy [data source samples.world\_life\_expectancy].  
For more information, see [Creating a visual](#).
2. In the visuals menu, choose the Lines visual type.
3. Populate the shelves from the available fields (Dimensions, Measures, and so on) in the Data menu.
  - Under Dimensions, select year and place it on the X Axis shelf. Specify ascending order, and alias the field as 'Year'.
  - Under Measures, select `gdp_per_capita` and place it on the Y Axis shelf.
  - Under Measures, select `life_expectancy` and place it on the Y Axis shelf.
  - Under Measures, select `population` and place it on the Y Axis shelf.
  - Under Measures, select `un_region` and place it on the Colors shelf. Alias the field as 'UN Region'.

4. Change the calculations and alias for each of the fields on the Y Axis using the Expression Editor:

- Change `gdp_per_capita` to the following expression, and click Validate & Save.

```
sum([gdp_per_capita] * [population]) / sum([population]) as 'GDP per Capita'
```

- Change `life_expectancy` to the following expression, and click Validate & Save.

```
sum([life_expectancy] * [population]) / sum([population]) as 'Life Expectancy'
```

- Change `population` to the following expression, and click Validate & Save.

```
sum([population]) as 'Population'
```

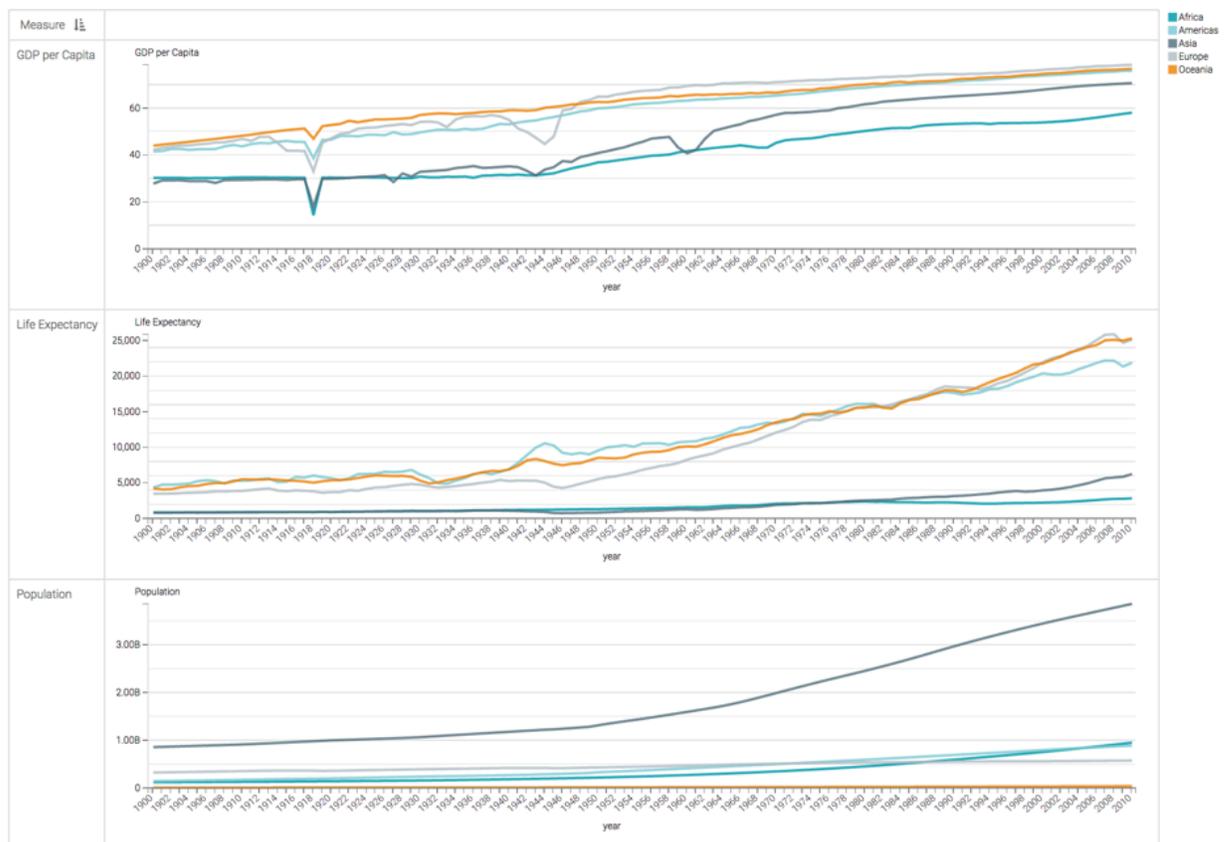
5. In the Settings menu, open the Axes group and select the Independent Aggregate Scale option.

6. In the Settings menu, open the Axes group and select the Gridlines Enables option.

7. In the Settings menu, open the Axes group and deselect the Include Y Axis Label option.

8. Click Refresh Visual.

The trellised line visual appears. This approach makes it easy to see the values of all measurements along the same horizontal dimension (in this case, year).



## Related Information

[Creating a visual](#)

## Line visuals with dual axes

It is often enlightening to see related dimensions on the same line chart; it clearly shows both correlation and pattern. However, values may be measuring completely different things, or the range of values (scale) is too different to show both lines clearly. Cloudera Data Visualization offers a dual axis option for situations like these.

### About this task

The following steps demonstrate how to create a line visual that uses a double axis; it is based on dataset World Life Expectancy [data source samples.world\_life\_expectancy].

### Procedure

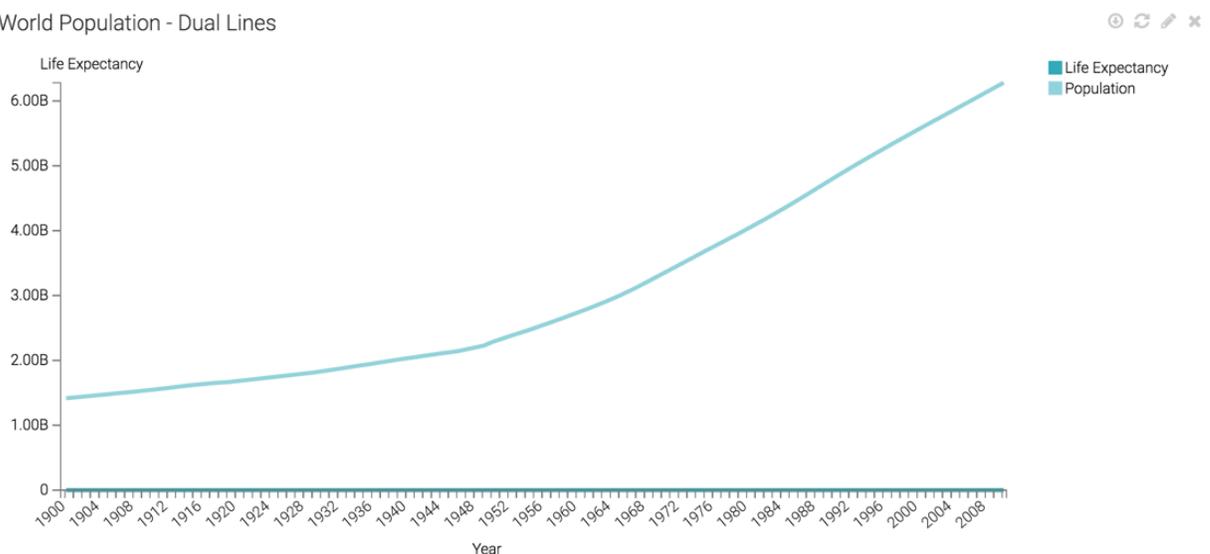
1. Start a new visual based on dataset World Life Expectancy [data source samples.world\_life\_expectancy].  
For more information, see [Creating a visual](#).
2. In the visuals menu, choose the Lines visual type.
3. Populate the shelves from the available fields (Dimensions, Measures, and so on) in the Data menu.
  - Under Dimensions, select year and place it on the X Axis shelf. Specify ascending order, and alias the field as 'Year'.
  - Under Measures, select life\_expectancy and place it on the Y Axis shelf. Alias it.
  - Under Measures, select Population and place it on the Colors shelf. Alias it, too.
4. Click Refresh Visual.

The line visual appears.

It is impossible to see the values on the life expectancy line because the population line sets the scale for the Y axis.

In this case, the label does not correspond to the scale shown, because this information comes from the Y axis shelf.

World Population - Dual Lines



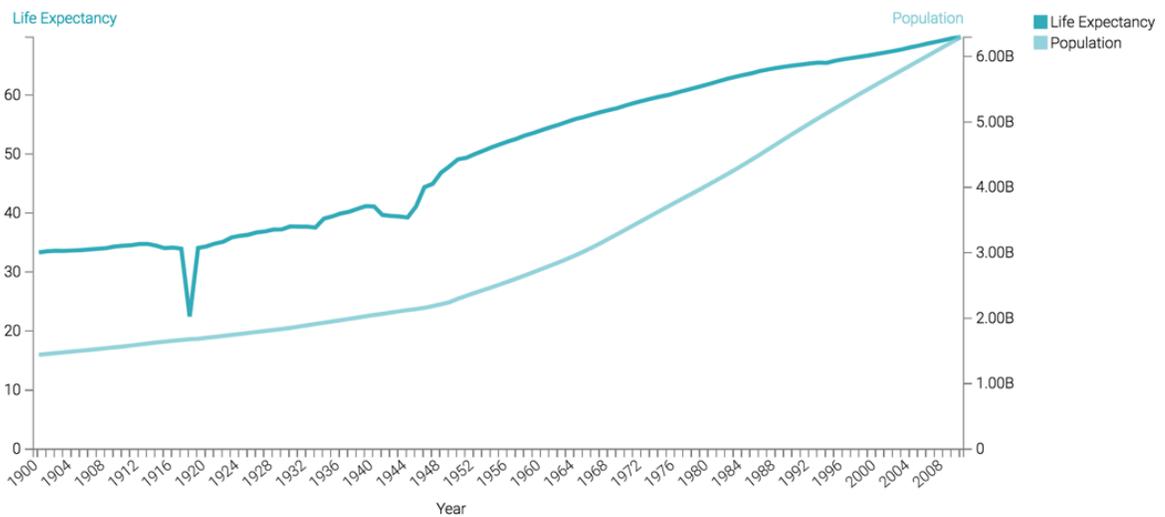
- On the Colors shelf, on sum(population) field, click the Down arrow icon, select Axis, and then select Secondary Axis.

- Click Refresh Visual.

The two lines can now be seen clearly.

There is now a vertical axis both on the left and the right side of the visual. For convenience, the color of the axis labels match the line.

World Population - Dual Lines



- Save the visual as World Population - Dual Lines.

To compare this approach with plotting multiple measures as trellised charts, see Trellis on measures.

### Related Information

[Trellis on measures](#)

[Creating a visual](#)

## Working with dimension hierarchies

Dimension hierarchies enable you to create complete visualizations with powerful drill down capability within a single visual, instead of relying on a complex interaction of two or more visuals inside an app.

### About this task

Dimension hierarchies can be used with bar, line, area, and grouped bar visual types.

Data Visualization also provides an alternate solution for hierarchical dimension representation in cross tabulation visuals. See, Working with Hierarchical Cross-Tabulation Visuals

The following steps demonstrate how to use Region, a dimensional hierarchy based on dataset World Life Expectancy [data source samples.world\_life\_expectancy], to build a bar chart that can switch between representations at three different levels of data granularity. To create this hierarchy, see Creating new dimension hierarchies.

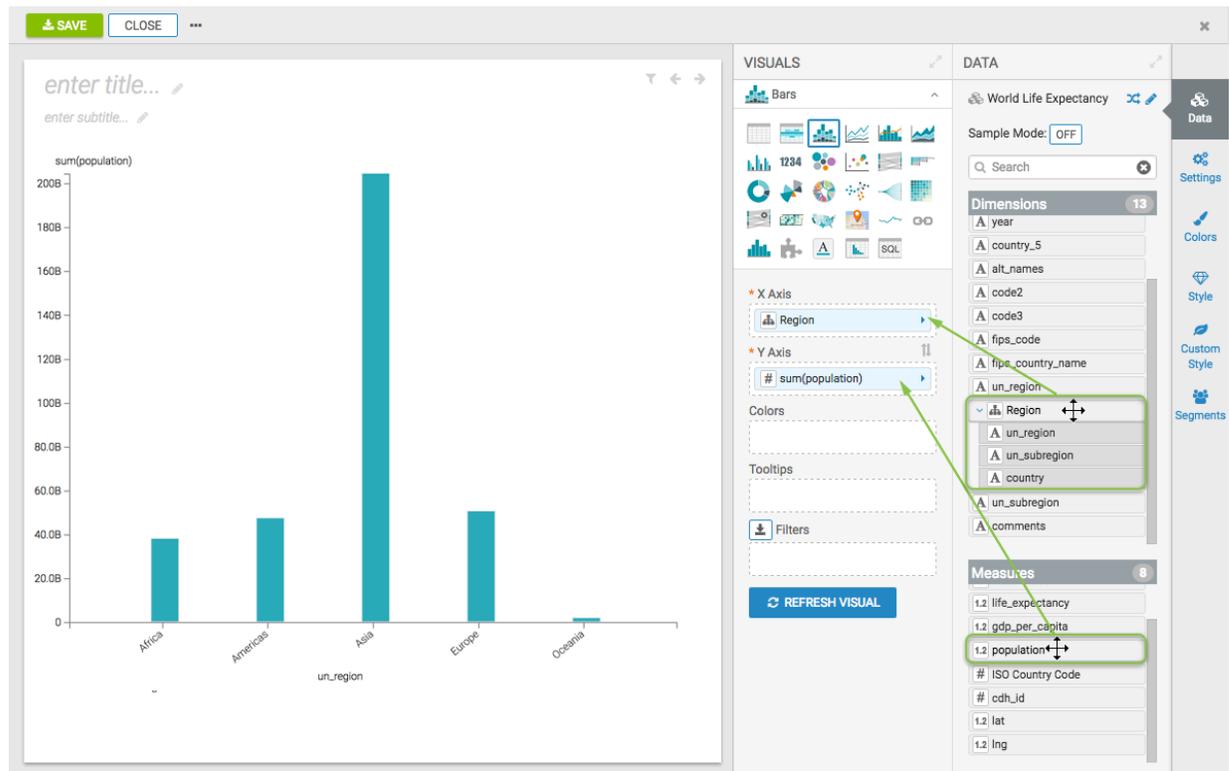
### Procedure

1. Start a new bar visual on the World Life Expectancy dataset.  
For more information, see Bars.
2. In the Visual Designer interface, populate the shelves of the visual:
  - Under Dimensions, select the field Region (which is a dimensional hierarchy), and drag it onto the X Axis shelf.
  - Under Measures, select population and drag it onto the Y Axis shelf.

3. Click Refresh Visual.

The bar chart appears.

The legend along the X axis corresponds to the top level of the Region hierarchy, un\_region.



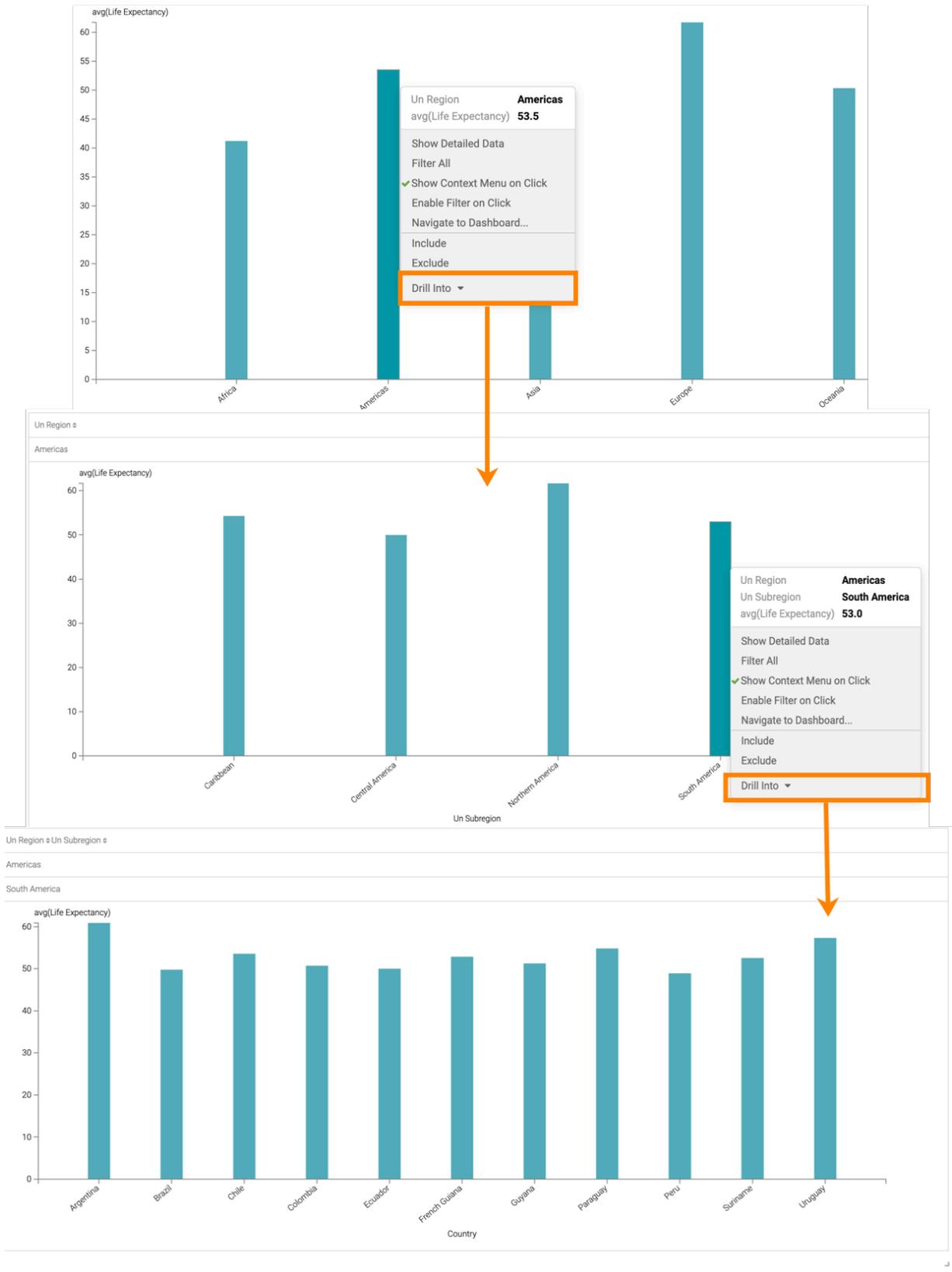
4. Change the title to World Population - Hierarchy.

5. Click Close to switch to View mode, so you can examine the operation of the dimensional hierarchy in the visual.

6. Put the pointer over one of the data labels along the horizontal axis, and note that it changes color; this is because the data labels are link-enabled. Click one of the choices to drill down to a lower level of the hierarchy.

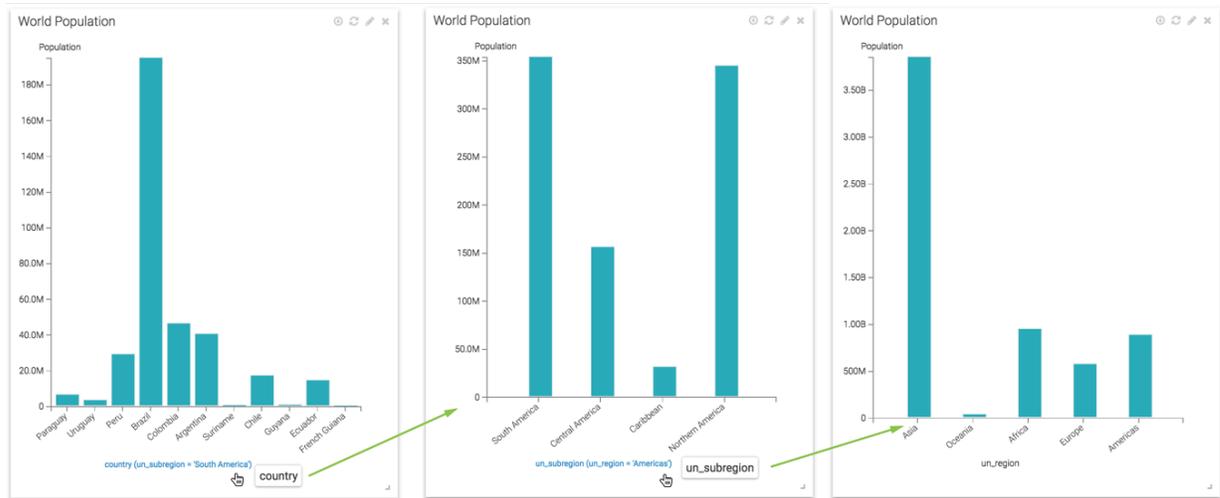
In the following graphic, we drilled down from Level 1: `un_region = 'Americas'`, to Level 2: `un_subregion = 'South America'`, and then to Level 3: `country`.

Every time you move between the hierarchy levels, the scale of the vertical axis adjusts automatically.



- Put the pointer over the label of the horizontal axis, and note that it change color; it is also link-enabled. You can click the horizontal axis label to go up the hierarchy levels.

In the following graphic, we moved from Level 3: country where un\_region = 'America' and un\_subregion = 'South America' to Level 2: un\_subregion = 'South America' where un\_region = 'America', and then to Level 1: un\_region.



### Related Information

[Hierarchical cross tabulation visuals](#)

[Creating new dimension hierarchies](#)

[Bars](#)

## Hierarchical cross tabulation visuals

Cloudera Data Visualization has an alternate solution for hierarchical dimension representation in cross tabulation visuals.

### About this task

The following steps demonstrate how to create and configure a de facto dimensional hierarchy on the shelves of a cross tabulation visual. We are using dataset World Life Expectancy [data source samples.world\_life\_expectancy], to build a cross tabulation table that can switch between representations at three different levels of data granularity.

### Procedure

- Start a new cross tabulation visual on the World Life Expectancy dataset.

For more information, see [Cross tabulation](#).

2. Populate the shelves from the available Fields under Dimensions and Measures in the Data menu.
  - Under Dimensions, select un\_region and drag it over the Dimensions shelf. Repeat with un\_subregion and country, adding them under un\_region. Note that your placement of these fields is from the largest to the smallest, top to bottom.
  - Under Measures, select population and drag it over Measures shelf. Ensure that the default aggregation is sum(population).

The screenshot displays the Cloudera Data Visualization interface for configuring a Cross Tabulation visual. The interface is divided into three main sections: VISUALS, DATA, and a right-hand sidebar.

**VISUALS Panel:**

- Visual Type:** Cross Tabulation (selected).
- Visual Gallery:** A grid of various visualization icons, with the Cross Tabulation icon highlighted.
- Column:** A dashed box labeled "drag fields to add here".
- Row:** A dashed box containing three fields: "un\_region", "un\_subregion", and "country".
- Measures:** A dashed box containing one field: "# sum(population)".
- Tooltips:** A dashed box labeled "drag fields to add here".
- Filters:** A dashed box labeled "drag fields to add here" with a download icon.
- Buttons:** A blue button labeled "REFRESH VISUAL" with a refresh icon.

**DATA Panel:**

- Dataset:** World Life Expectancy.
- Search:** A search bar with a magnifying glass icon and a close button.
- Dimensions:** A list of 13 dimensions, including "Segment", "country", "year", "country\_5", "alt\_names", "code2", "code3", "iso\_cc", "fips\_code", "fips\_country\_name", "un\_region", "un\_subregion", and "comments".
- Measures:** A list of 7 measures, including "# Record Count", "1.2 life\_expectancy", "1.2 gdp\_per\_capita", "1.2 population", "# cdh\_id", "1.2 lat", and "1.2 lng".

**Right-hand Sidebar:**

- Data:** A dark grey button with a data icon.
- Settings:** A gear icon.
- Colors:** A paintbrush icon.
- Style:** A diamond icon.
- Custom Style:** A leaf icon.
- Segments:** A group of people icon.

3. On the Row shelf, select the un\_region field and select Enable Expansion option in the Field Properties panel.

The screenshot displays the Cloudera Data Visualization interface. On the left, the 'VISUALS' panel shows a grid of visualization options, with 'Cross Tabulation' selected and highlighted. Below the grid, a 'Row' shelf contains three fields: 'un\_region', 'un\_subregion', and 'country'. A 'Measures' shelf is empty. A 'REFRESH VISUAL' button is at the bottom of the visual configuration area. On the right, the 'FIELD PROPERTIES' panel is open, showing a list of options for the selected field. The 'Enable Expansion' option is highlighted with a mouse cursor. Other options include Date/Time Functions, Text Functions, Change Type, Order and Top K, Enter/Edit Expression, Display Format, Alias, Description, Duplicate, Save Expression, and Remove.

4. On the Row shelf, on the un\_subregion and the country field, click the Down arrow icon, and select Enable Expansion.

5. Click Refresh Visual.

The cross tabulation table appears with a Plus icon in the un\_region, un\_subregion, and country columns. This indicates that you can expand the data in these columns.

The sum(population) column shows the combined population for all un\_regions.

un_region	un_subregion	country	sum(population)
+	+	+	342B

6. To see more details, expand the un\_region column of the visual by clicking the Plus icon under the column header.

un_region	un_subregion	country	sum(population)
+	+	+	342B

↓

un_region	un_subregion	country	sum(population)
+	+	+	342B
Africa	+	+	38.0B
Americas	+	+	47.4B
Asia	+	+	204B
Europe	+	+	50.5B
Oceania	+	+	1.88B

7. Expand the un\_subregion column of the visual by clicking the Plus icon in the field next to one of the un\_region. We chose to expand Africa.

When you expand Africa, it generates a complete tabulation aggregated by un\_subregion.

un_region	un_subregion	country	sum(population)
			342B
Africa			38.0B
Americas			47.4B
Asia			204B
Europe			50.5B
Oceania			1.88B



un_region	un_subregion	country	sum(population)
			342B
Africa			38.0B
Africa	Eastern Africa		10.9B
Africa	Middle Africa		4.43B
Africa	Northern Africa		8.92B
Africa	Southern Africa		2.60B
Africa	Western Africa		11.2B
Americas			47.4B
Asia			204B

8. Expand the country column of the visual by clicking the Plus icon in the field next to one of the un\_subregions.  
We chose to expand Middle Africa.

When you expand Middle Africa, it generates a complete tabulation aggregated by country.

un_region	un_subregion	country	sum(population)
			<b>342B</b>
Africa			<b>38.0B</b>
Africa	Eastern Africa		<b>10.9B</b>
Africa	Middle Africa		<b>4.43B</b>
Africa	Northern Africa		<b>8.92B</b>



un_region	un_subregion	country	sum(population)
			<b>342B</b>
Africa			<b>38.0B</b>
Africa	Eastern Africa		<b>10.9B</b>
Africa	Middle Africa		<b>4.43B</b>
Africa	Middle Africa	Angola	<b>723M</b>
Africa	Middle Africa	Cameroon	<b>767M</b>
Africa	Middle Africa	Chad	<b>405M</b>
Africa	Middle Africa	Congo	<b>2.43B</b>
Africa	Middle Africa	Equatorial Guinea	<b>28.6M</b>
Africa	Middle Africa	Gabon	<b>68.4M</b>
Africa	Middle Africa	Sao Tome and Principe	<b>8.56M</b>

9. Change the title to Hierarchical Cross Tabulation of Population.
10. At the top left corner of the Visual Designer, click Save.

### Related Information

[Cross tabulation](#)

## Adding highlights to visuals

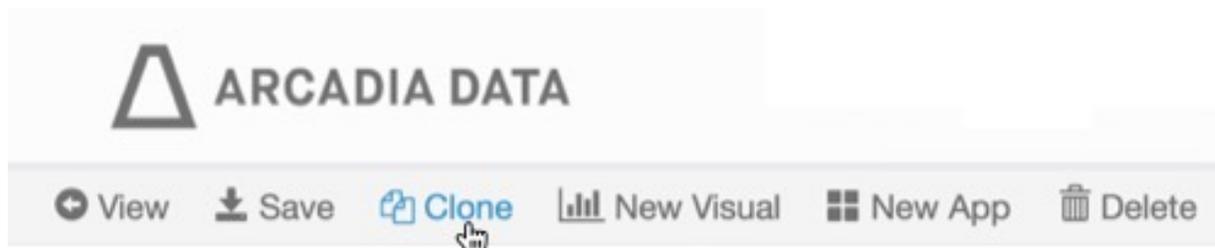
Highlights are a practical way to bring attention to values that exceed a particular threshold. Cloudera Data Visualization currently supports highlight marks at specific values on the combined bar/line chart type, and enables you to customize these highlights.

### About this task

The following steps demonstrate how add highlights to an existing chart. To start, we are using the visual World Population - Dual Bar and Line, developed on dataset World Life Expectancy [data source samples.world\_life\_expectancy]. For more information, see Combo visuals.

### Procedure

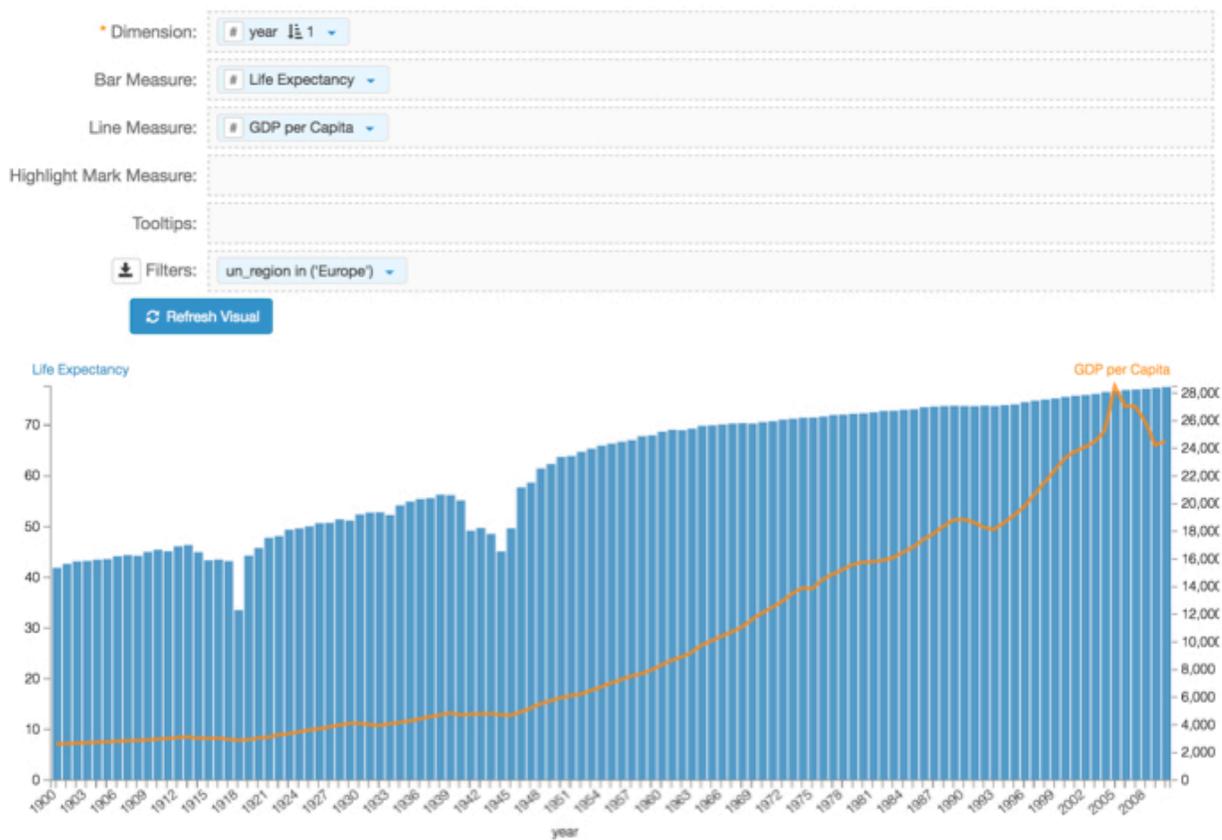
1. Open the visual World Population - Dual Bar and Line in Edit mode. For information on building this visual.
2. Clone the visual.



3. Click the Pencil icon next to the title of the visualization to edit it, and enter the new name.
4. Click the Pencil icon below the title of the visualization to add a brief description of the visual.
5. Change the title to World Population - Highlights on Dual Bar and Line.
6. At the top left corner of the Visual Designer, click Save.
7. Add the un\_region field to the Filters shelf, and select Europe from the list of possible values.

This graph has more variation than the unified World data.

## 8. Click Refresh Visual.



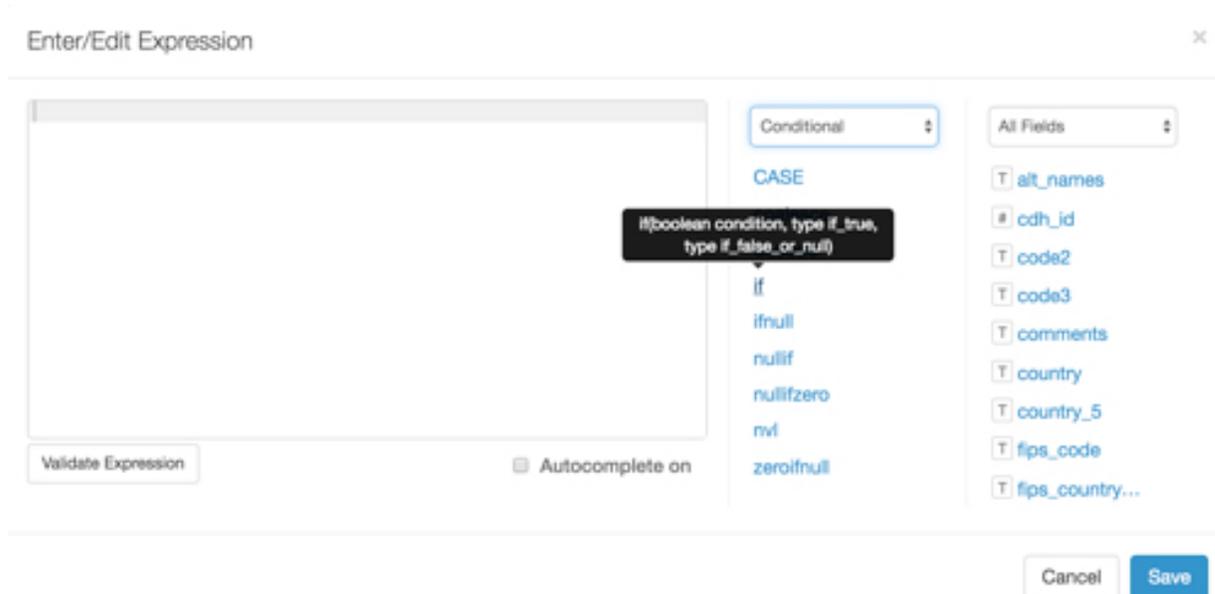
You can see the pronounced peak in the GDP per Capita line, centered around the year 2005.

9. Based on the graph, highlight the values where GDP per Capita is over \$25,000.
10. Place the field `gdp_per_capita` on the shelf Highlight Mark Measure.
11. On the same shelf, click the Down arrow icon on the `gdp_per_capita` field, and choose Enter/Edit Expression.

12. In the Enter/Edit Expression window modal, delete the text in the default expression, change the function groupings to Conditional, and select the if statement.

**Note:**

Depending on the SQL dialect of the connection you are using, the syntax of the if statement may be different.



13. Complete the expression template.

It should look similar to the following expression:

```
if(avg([gdp_per_capita])>=25000, avg([gdp_per_capita]), null)
```

Optionally, you can alias the highlight; see the bold font in the changed expression.

```
if(avg([gdp_per_capita])>=25000, avg([gdp_per_capita]), null)
  as 'GDP per Capita > 25K'
```

14. Click Save.

Enter/Edit Expression ✕

```
if(avg([gdp_per_capita])>=25000, avg([gdp_per_capita]), null) as  
'GDP per Capita > 25K'
```

Autocomplete on

Validation Successful! ✕

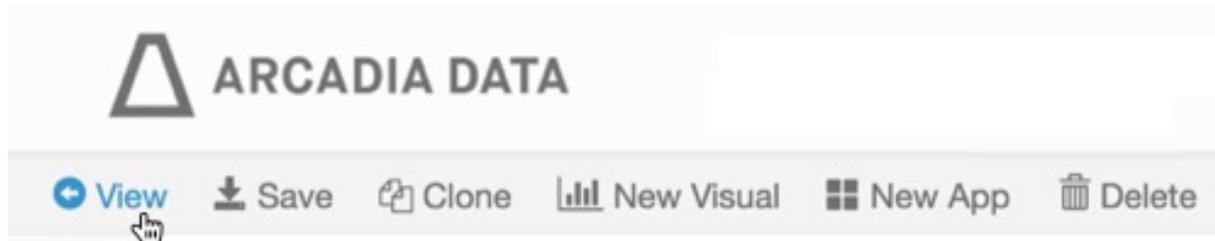
All Functions ▾

- abs
- acos
- add\_months
- adddate
- AND
- appx\_median
- ascii
- asin
- atan
- ...

All Fields ▾

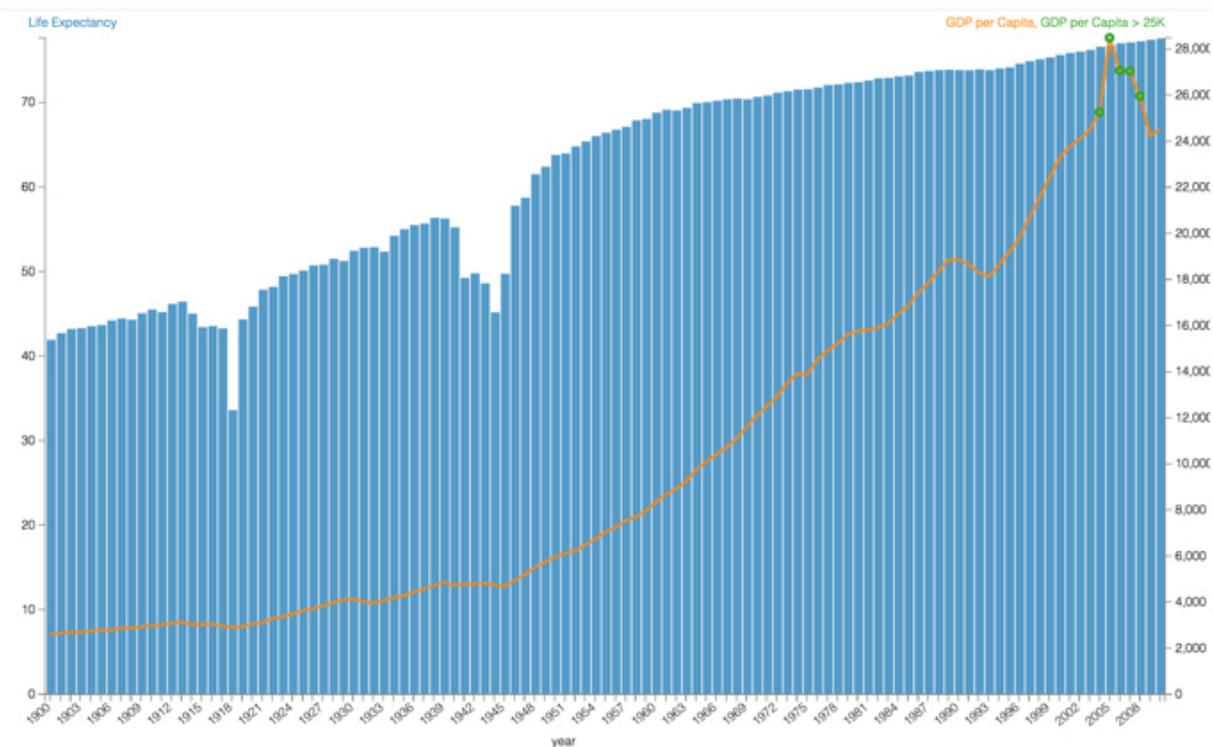
- T alt\_names
- # cdh\_id
- T code2
- T code3
- T comments
- T country
- T country\_5
- T fips\_code
- T fips\_country...

15. Save the visual, and then click View to change to View mode.



**Note:** The graph has green circle highlights when GDP per Capita values are equal or greater than 25,000.

World Population - Highlights on Dual Bar and Line



16. The default highlight mark is a circle. To convert it to another type, use the visual Settings interface, as described in Change highlight type. You can also change the relative size of the mark, as described in Change highlight type.

### Related Information

[Combo visuals](#)