FORM FOLLOWS FUNCTION: PICKING THE RIGHT CHART FOR DIFFERENT DATA

A DATA DOZEN WORKSHOP

DATA DOZEN

DATA VISUALIZATION EDUCATION

LET'S GET STARTED

This hands-on, one hour workshop will start to demystify Tableau Software by introducing its key functionalities and practical applications. As we build a sample of essential chart types, we'll explore the decision-making process that underpins identifying which right chart is the right fit for different types of data. This step-by-step guide documents how to build each chart in Tableau and the corresponding circumstances in which they are most effective.

DATA + TABLEAU

CONNECT TO DATA

Before we can build any visualizations, we need to connect our data to Tableau. We will be using Kansas City's 311 Service Request data from 2018. The original data set can be found here. Thanks to Open Data KC for making this data public! We will open a new Tableau Public workbook, connect it to the data set we've downloaded, and then go to our first sheet.

- Download the data
- Launch Tableau Public
- Under Connect, To a File, click Microsoft Excel
- Select the downloaded data set file and click Open
- A portion of the data will load in the preview area
- Click the orange tab labeled Sheet 1

TABLEAU WORKSHEET ENVIRONMENT

Welcome to Tableau's worksheet environment! This is where we build all our visualizations. On the left side of the screen, you'll see all of your variables are now data pills sitting in the data pane. There are three things to note about these data pills and three places we'll talk about dragging and dropping them in order to create visualizations. (If the Show Me menu is showing on the right hand side, just click the words to collapse the menu. That will make it easier to see.)

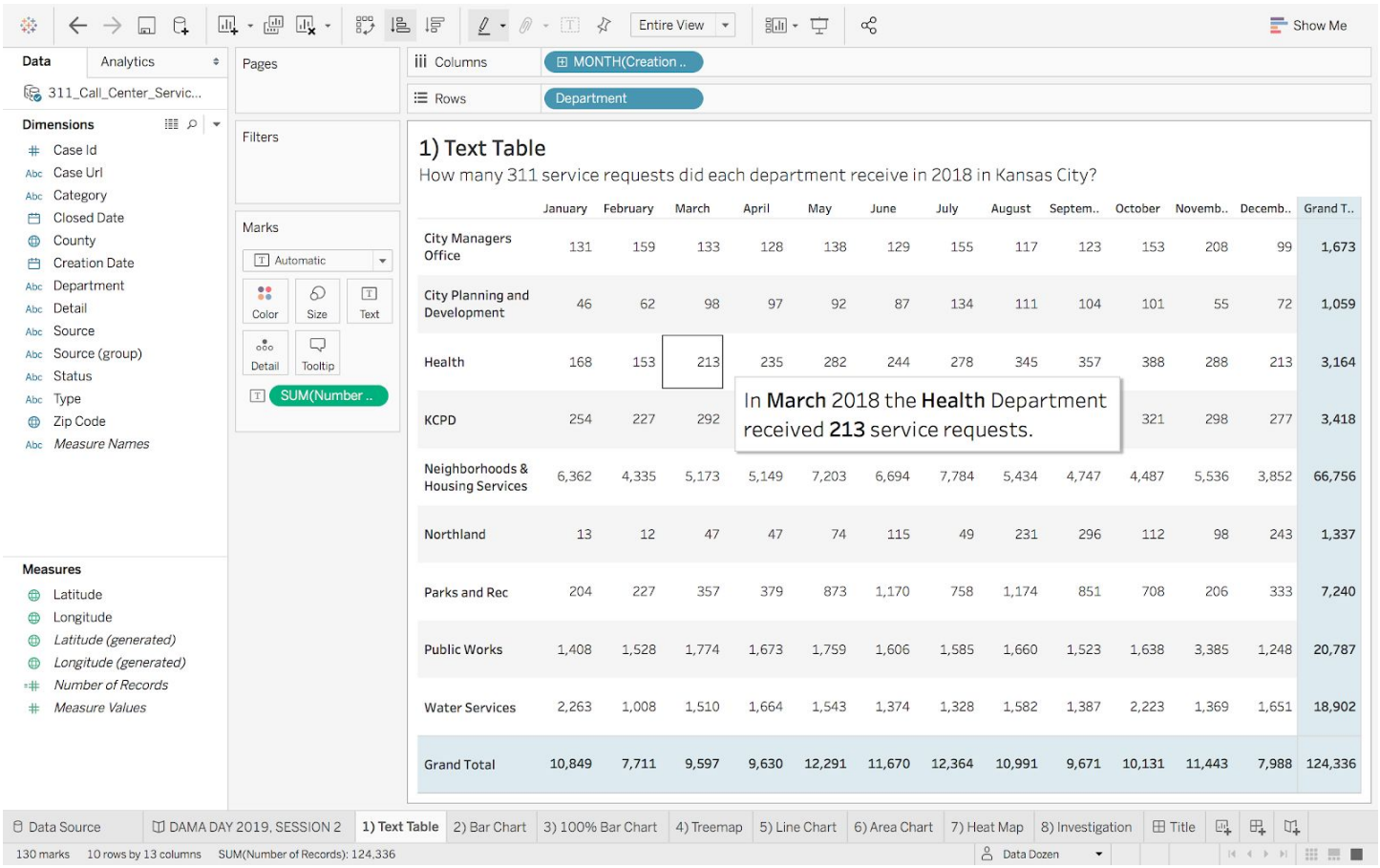
- Data Pane
  - Dimensions vs. Measures: Tableau has split up your variables into dimensions, which are descriptive pieces of data, and measures, which are the numbers that you would do math on.
  - Discrete vs. Continuous: You'll notice some of the data pills are blue, indicating they're discrete pieces of data, think categorical boxes, as opposed to the green pills, which represent continuous data, or data that exists on some sort of pre-existing spectrum, like numbers do.
  - Data Types: Tableau has made it's best guess about each variable's correct data type: number (decimal), number (whole), date and time, date, string, or geographic data.

- Where to Drag-and-Drop
  - Columns and Rows: Placing data pills here function as your typical x and y axes.
  - Filters Card: Placing data pills here allow you to filter your visualization by different variables.
  - Marks Card: This is Tableau's secret sauce. By adding variables to color, size, text, detail, and tooltips, Tableau enables you to layer additional information on top of your typical x and y axes.

CATEGORICAL DATA

TEXT TABLE

Let's start building! We'll begin with something familiar: a text table. For those Excel wizzes out there, these will look like pivot tables. You'll also hear folks refer to them as crosstabs, which is the language Tableau often uses. We'll be looking to answer this question: How many 311 service requests did each department receive in 2018 in Kansas City?

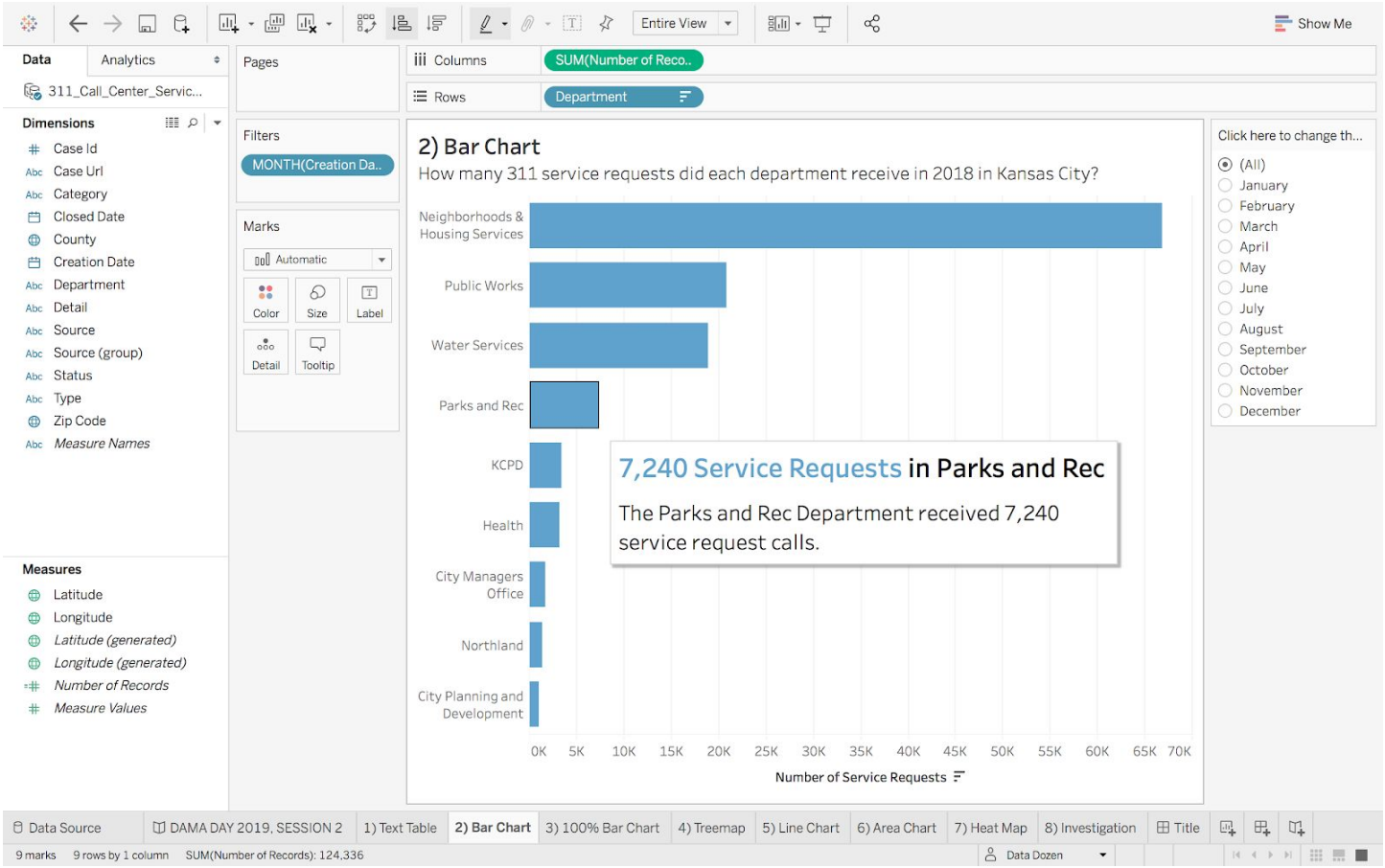


	January	February	March	April	May	June	July	August	Septem..	October	Novemb..	Decemb..	Grand T..
City Managers Office	131	159	133	128	138	129	155	117	123	153	208	99	1,673
City Planning and Development	46	62	98	97	92	87	134	111	104	101	55	72	1,059
Health	168	153	213	235	282	244	278	345	357	388	288	213	3,164
KCPD	254	227	292							321	298	277	3,418
Neighborhoods & Housing Services	6,362	4,335	5,173	5,149	7,203	6,694	7,784	5,434	4,747	4,487	5,536	3,852	66,756
Northland	13	12	47	47	74	115	49	231	296	112	98	243	1,337
Parks and Rec	204	227	357	379	873	1,170	758	1,174	851	708	206	333	7,240
Public Works	1,408	1,528	1,774	1,673	1,759	1,606	1,585	1,660	1,523	1,638	3,385	1,248	20,787
Water Services	2,263	1,008	1,510	1,664	1,543	1,374	1,328	1,582	1,387	2,223	1,369	1,651	18,902
Grand Total	10,849	7,711	9,597	9,630	12,291	11,670	12,364	10,991	9,671	10,131	11,443	7,988	124,336

- Create a Text Table
  - Drag Department to Rows
  - Drag the Number of Records to Text
  - Drag Creation Date to Columns
  - Change the date format from Year to Month by clicking the Creation Date pill's dropdown menu
- Add Subtotals
  - Select Analysis, Totals, and Show Column Grand Totals
  - Select Analysis, Totals, and Show Row Grand Totals
- Formatting
  - Change the view from Standard to Entire View
  - Click the Format, Shading and add shading on the Grand Totals
  - Click Tooltip and create a sentence with your variables, such as: "In <MONTH(Creation Date)> 2018 the <Department> Department received <SUM(Number of Records)> service requests."
  - Double click Sheet 1 and name your sheet something easy to recognize, like Text Table

BAR CHART

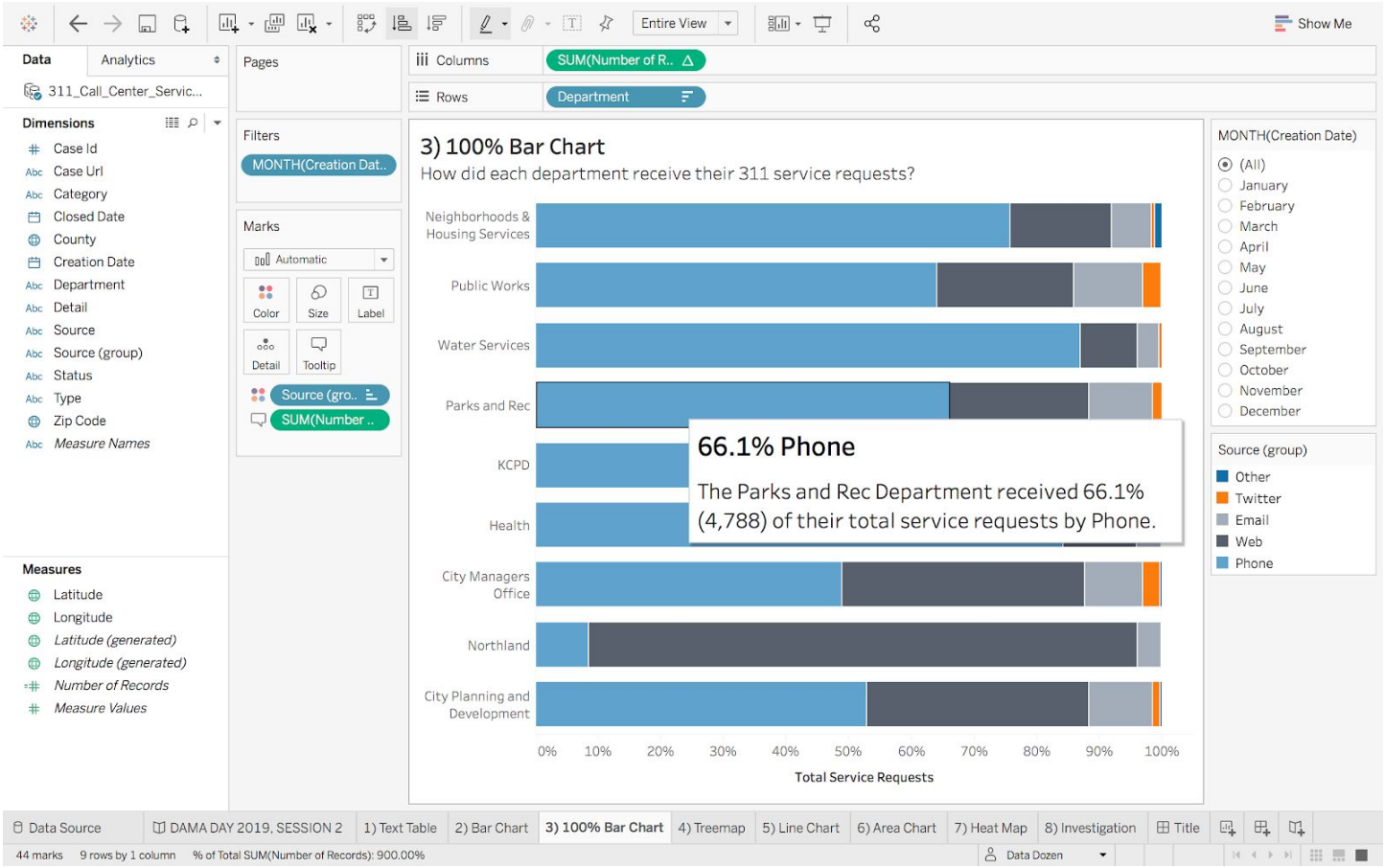
The workhorses in the data viz world, bar charts do a great job comparing the small groups of values. The human eye does a great job of differentiating lengths, so we can glance at a well-sorted bar chart and immediately understand what's going on. When in doubt, always start with a bar chart. If it communicates effectively, chances are you've found the right form. Let's transform the same information that's in our text table into a bar chart. The data becomes immediately accessible.



- Create a Bar Chart
  - Create a new worksheet
  - Drag Department to Rows
  - Drag Number of Records to Columns
  - Click the Sort Icon on the X axis
  - Change the view from Standard to Entire View
- Add a Filter
  - Drag Creation Date to Filter
  - Click Months
  - Select January and then OK
  - Click the dropdown menu on the Creation Date pill on the Marks Card and select Show Filter
  - Using the carrot on the new Filter card, change the filter format to Single Value List
- Formatting
  - Click on Color and pick a color you like
  - Clean up your tooltips
  - Edit the filter title to instructions, like "Click here to change the month." Name your sheet Bar Chart.

100% BAR CHART

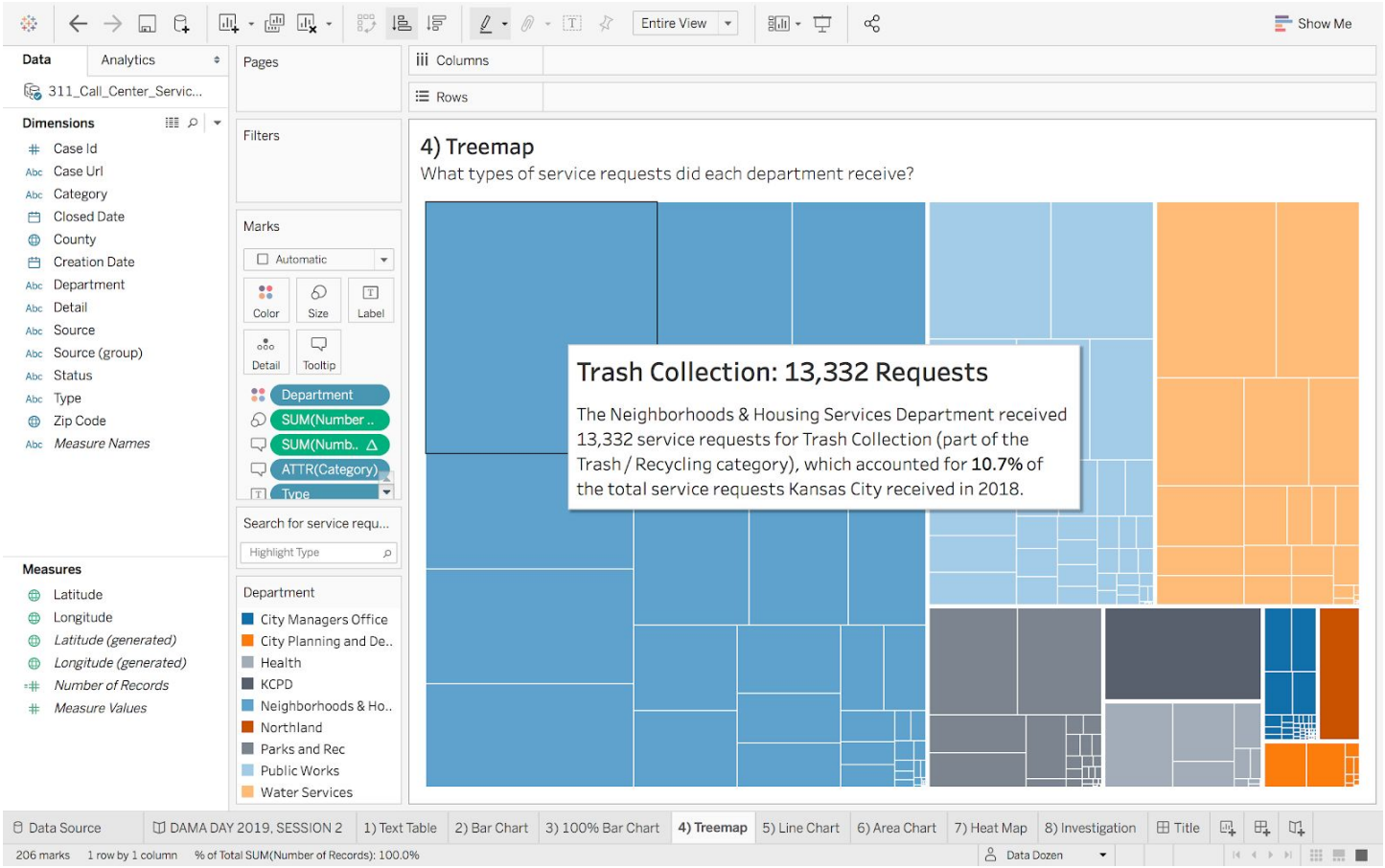
When the question shifts from how big or small a category is to how a given total splits out by percentages, 100% stacked bar charts become helpful. In our example below, it doesn't matter how many service requests each agency received, only the different percentages of how they received them.



- Transform a Bar Chart into a 100% Bar Chart
  - Right click on your Bar Chart sheet and select Duplicate
  - Add Source (Group) to Color
  - Click the dropdown on Sum(Number of Records) on columns
  - Select Quick Table Calculation, and then Percent of Total
  - Notice that your x axis is now in percentages
  - Click the same dropdown menu and change Compute Using from Table (Down) to Table (Across)
- Formatting
  - Sort Source (Group) by clicking the dropdown menu and selecting Sort, by Field, Number of Records
  - Click Color, Edit Colors, and change the palette to Color Blind, click assign palette, and OK
  - Under Color , add a white border between the marks
  - Adjust your tooltips

TREEMAP

When bar charts start to have too many categories to be useful, it's usually time to try a treemap. More precise than its word cloud and bubble chart cousins, the treemap does a great job of showing how diverse a variable can be without losing track of the heavy hitters. Here we're examining what types of service requests each department received?

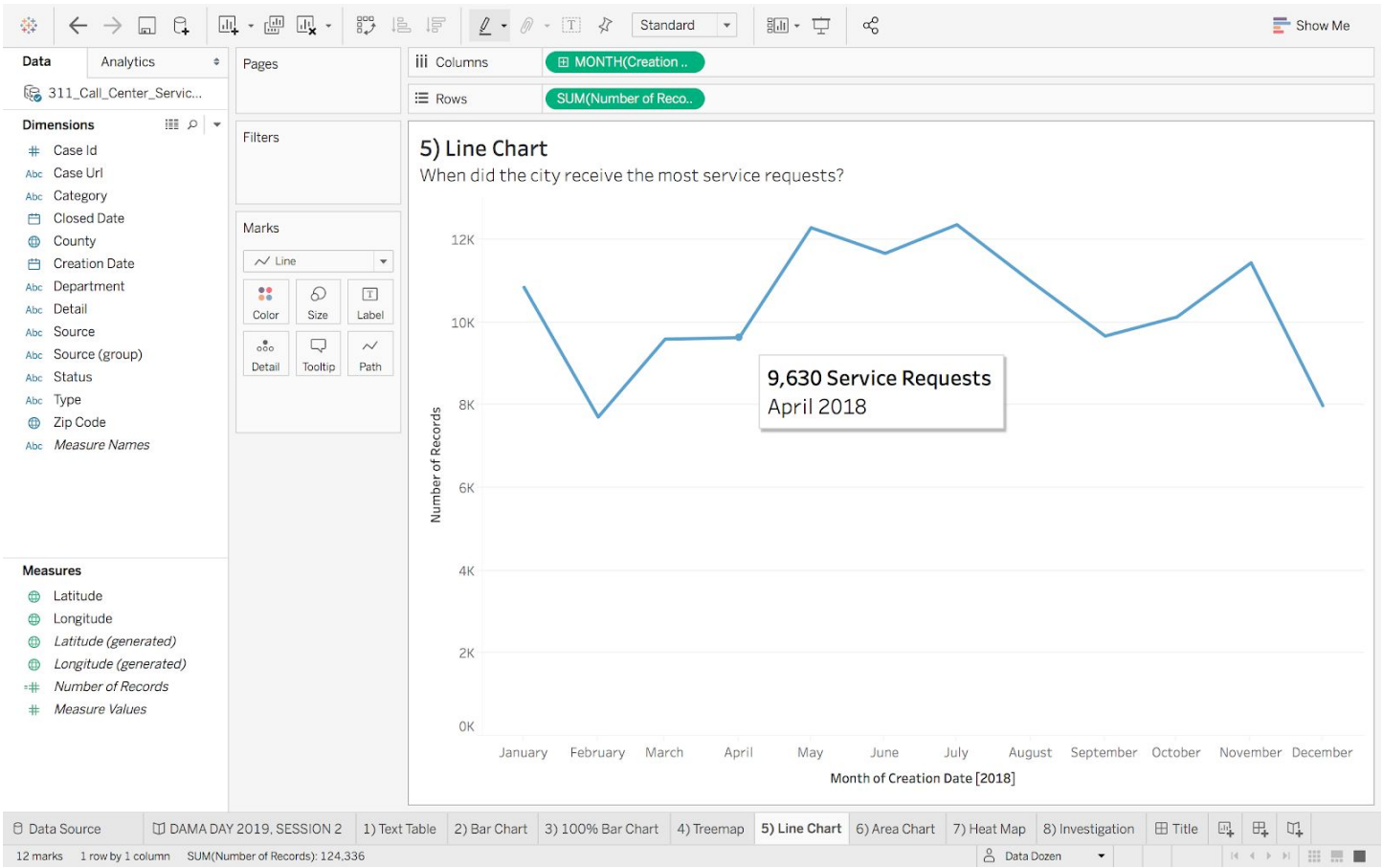


- Where Bar Charts Fail
  - Drag Category to Rows, Number of Records to Columns, and Sort (the bar chart still works)
  - Replace Category with Type and change the Standard view to Entire View (now the bar chart is useless)
- Create a Treemap
  - Create a new worksheet
  - Drag Type to Detail (123 square appear, one for each service request type in the data)
  - Drag Number of Records to Size and Drag Department to Color
- Formatting
  - Change Standard to Entire View
  - Assign the Color Blind Palette
  - Drag Category to Tooltip and clean up your tooltip
- Add Percent of Total
  - Drag another Number of Records pill to Tooltip
  - Click the dropdown menu and add the Percent of Total Quick Table Calculation (double check the math!)
- Add a Highlighter
  - Click on the Type pill on the Marks Card and select Show Highlighter
  - Try it out! For example, start typing "pothole" and you'll see that's Public Works number 1 request

LONGITUDINAL DATA

LINE CHART

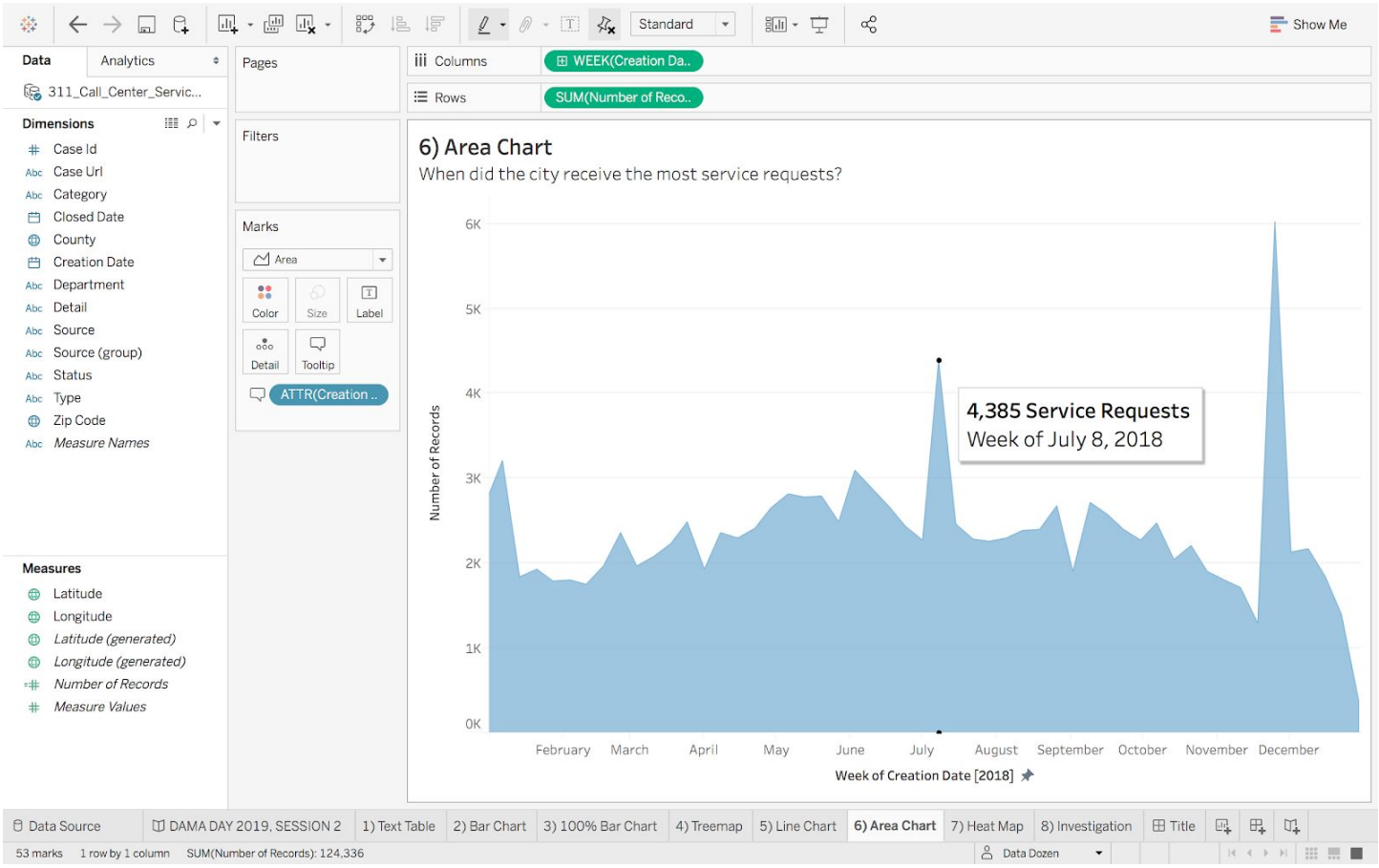
Now let's move on to time. The most classic chart type for longitudinal data, the line chart is a great place to start when it comes to visualizing changes over time. The human eye can detect very subtle shifts in how a line moves up or down.



- Create a Line Chart
  - Drag Creation Date to Columns
  - Click the pill's dropdown menu and change the data type from the discrete Year to the continuous Month (this will be the month in the second set of date types and the pill will turn from blue to green)
  - Drag Number of Records to Rows
  - Adjust your tooltips and name your sheet

AREA CHART

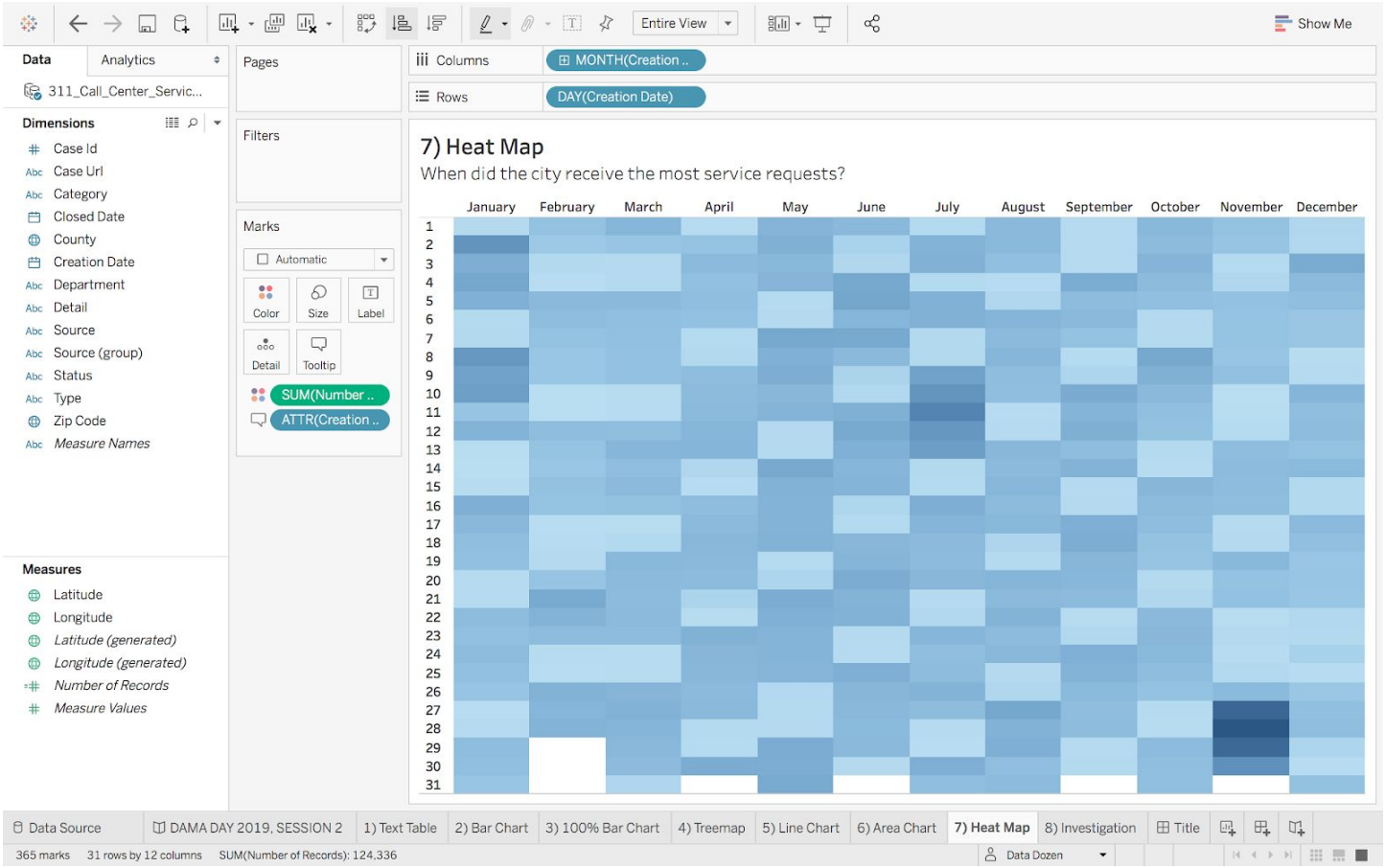
Area charts can offer a bit more weight to the chart and make it even easier for the eye to see subtle shifts. Area charts can be used with a single color as we'll do here, or broken out into multiple categories as well.



- Create an Area Chart
  - Duplicate your line chart and rename the sheet
  - Use the dropdown menu on the marks card to change the mark type from a line to area
- Drill In
  - Click on the small + sign on the green Creation Date pill on the columns shelf
  - You've now broken out your data by week. Outlying weeks stand out. This leads to the question about whether those were particularly hectic weeks or whether they contained outlier days in them.

HEATMAP

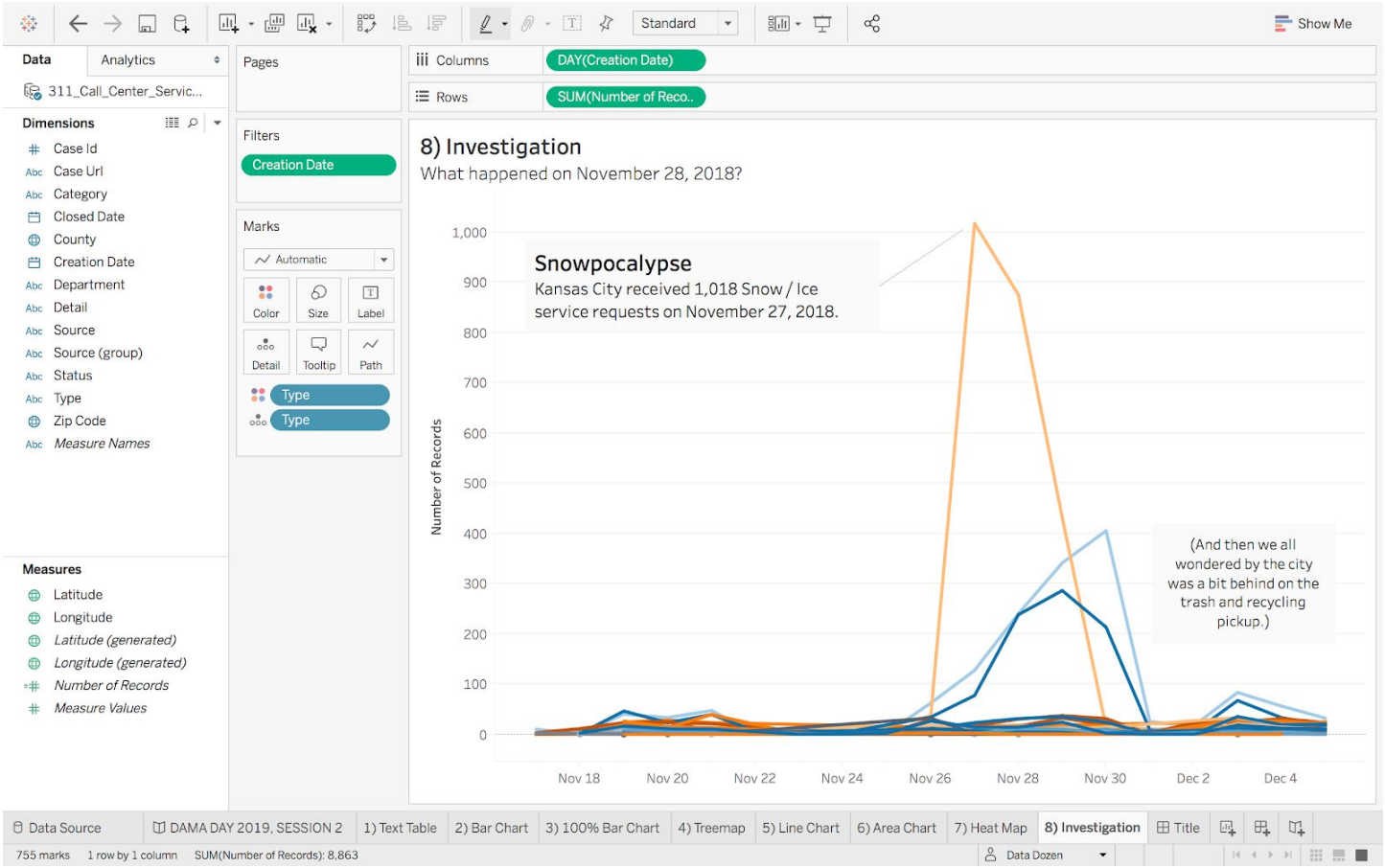
The human eye sees color before it absorbs anything else. A heat map takes advantage of this by filling a typical grid with color instead of plain numbers or text. We'll still offer our end user all that tabular information in the tooltip. Here's we'll create a grid out of the month and day numbers to create one cell for each day in the year. At a glance, we can spot the most intense service request day in 2018: November 28.



- Create a Heat Map
  - Create a new worksheet
  - Drag Creation Date to Columns and change it to Discrete Month
  - Drag Creation Date to Rows and change it to Discrete Day
  - Drag Number of Records to Color
- Patterns
  - Add Creation Date to Tooltip
  - Change the formatting of this Creation Date pill to Standard Long Date in the Pane
  - With the day of the week now in the tooltip, we can see why we get the two-block pattern: we don't complain on weekends (or holidays for that matter)
- Formatting
  - Change Standard to Entire View
  - Change the Color Palette to Blue
  - Hide the Columns and Row Labels
  - Shrink the column width for your day labels by pulling the arrow between the labels and the grid to the left

INVESTIGATION

This heatmap leads to a natural investigation into the curious spike in service requests in late November. Let's build one final visualization to see what types of requests were going on. This final visualization will give as an opportunity to see how annotations can provide our end user an easy foothold into the chart we've created.



- Create a Line Chart
  - Create a new worksheet
  - Drag Creation Date to Columns
  - Change it from a discrete Year to Continuous Day
  - Drag Number of Records to Rows
  - Drag Type to Detail
  - Click the dropdown menu on Creation Date on Columns and show the filter
  - Adjust the Filter to just show late November
- Add Annotations
  - Right click on spike on Tuesday, November 27
  - Select Annotate and then Mark
  - Adjust the annoation's format to read like a story
  - Right click the area near the second to spikes in trash and recycling requests and add another annotation, this time an Area annotation
  - Now your end user will have an immediate anchor in the visualization you've created.