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# Choosing Data Displays

In: Data Visualization & Presentation With Microsoft Office

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## Choosing Data Displays

### Learning Objectives

- Describe the audience factors that drive data visualization decisions
  - Distinguish data reports from presentations
  - Match data to chart types
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### Information and Audience Considerations

Before opening software and starting to create tables and charts, several preliminary issues should be addressed. Answering these questions will guide your data visualization decisions as you proceed with your analysis and reporting.

#### How much information?

More information does not equate to better information. It is your job to determine what the audience needs and provide it. It is never a good idea to deliver everything you have and let the audience sort it out. Extraneous data are distracting and damage message reception, comprehension, and retention. Having a clear picture of your audience will drive your decision about how much data to provide, which in turn will affect your data visualization choices. For example, smaller groups tasked with specific decision making may need a lot of data with considerable detail. Larger groups aiming mainly to stay informed will often require less data presented at a high level.

#### Who is the audience for your data?

The composition of the audience for your report or presentation will determine how you organize and present the data. For example, a face-to-face meeting with a few potential investors for a new venture will require a detailed proposal containing precise values presented in a data table, charts showing the results of market research, and illustrations of potential growth over time. On the other hand, a presentation prepared for a group of hundreds or thousands of diverse individuals would be best accompanied by high-level data shown in simple charts that can be understood at a glance without the need for legends, footnotes, or data definitions.

There are many variations between these extremes. The key is to determine at the outset who will be reading your report or viewing your presentation and choose the best displays for those people in that situation. Information prepared for one setting can be repurposed for another; however, it is important that the data displays be reconfigured to suit the new audience and setting. Charts created for a boardroom presentation

are not likely to be useable in a keynote address without editing.

## What does the audience know?

An understanding of the audience's familiarity with and attitude toward your topic also is useful when designing data visualizations. Choices such as using acronyms in chart titles or including data labels on only the end points of a chart might be acceptable for audiences who have deep knowledge of your data. If the audience is unfamiliar with your topic, or if it is impossible to ascertain how much the audience knows, you should avoid acronyms, label charts more completely, and include definitions of key data elements. Similarly, if you anticipate resistance to your message, it is advantageous to choose data displays that will address skeptics preemptively.

## What will the audience do with the information?

The question of what readers or viewers will do with the information you're preparing is a natural follow-up to the question of who is in the audience. Audiences who are responsible for making strategic decisions may find an executive dashboard to be the most useful report format. Readers charged with making operational decisions, for example, increasing staffing to meet customer demand, will need detailed and current data. When preparing charts or tables for websites, the focus should be on creating engaging data visualizations with strong visual appeal that will hold the viewer's attention.

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## Are You Preparing a Report or Presentation?

One of the most important questions you will need to resolve as you begin to create data displays is whether you are preparing a report, a presentation, or both. Although most of the principles for effective data visualization apply equally to both formats, factors such as chart size, amount of detail included, and degree of explanation required differ significantly based on the presence or absence of the author while the data are being viewed.

### Reports

Reports are stand-alone documents meant to be read by the recipient, usually without the report author present. These must be self-contained, highly engaging, comprehensive documents that will attract and hold the audience's attention from beginning to end. Reports, whether distributed in hard or soft copy, should be formatted for maximum readability and include navigational aids and resources such as data definitions, indices, and FAQs.

### Presentations

In presentations, a speaker delivers a message orally, accompanied by visual displays of information. The role of the visual display is to support the speaker's narration by illustrating key data elements or trends. The presenter employs public speaking principles to hold the audience's attention and is able to explain or add information to the data being presented. There are many types of in-person and virtual presentations, and the amount and type of data included will vary accordingly. The defining feature of all presentations, however, is the presence of a speaker to describe the data being shown.

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## Forms of Data Visualization Covered in This Text

*Data visualization* is a general term that describes the use of visual representations to help people analyze and interpret data. Simple as the definition may seem, the concept means many different things to followers of the field. For some, the term evokes images of interactive dashboards, hierarchical layouts, network diagrams, infographics, tree maps, and word clouds. Data visualizations like these often rely on specialized software for their creation and consumption.

To us, data visualization is a way to summarize and display large amounts of information using familiar charts and tables. For example, using a simple bar or line chart to summarize thousands, or tens of thousands, of data points to tell a story. Familiar charts have the benefit of being immediately recognizable to audiences, an important factor when analysts have only a few minutes or pages in which to present results. We have chosen to focus on a narrow collection of charts that can be created using ubiquitous software. These charts will serve most data visualization goals. Our focus is primarily on static visualizations, not those intended to be manipulated by viewers to display subsets or alternate views of data. Once the basic chart creation principles and skills are learned, practiced, and mastered, they will be transferable to more complex visualizations.

## Charts

A chart is a visual display of quantitative information where the values are displayed within an area bounded by one or more axes. Data values are shown as visual objects, such as bars or lines, positioned in relation to the axes. The axes provide scales used to assign values to the bars or lines. Charts reveal shapes and trends and show relationships among multiple data series.

### Column and bar charts

Column and bar charts (see [Figures 1.1](#) and [1.2](#)) are the most versatile types of charts. They work well for displaying differences in magnitude and making it easy for us to compare those differences. Because the bars have visual weight, they emphasize the individuality of the items charted. This makes bar and column charts well suited for illustrating categorical data.

Figure 1.1 Column chart

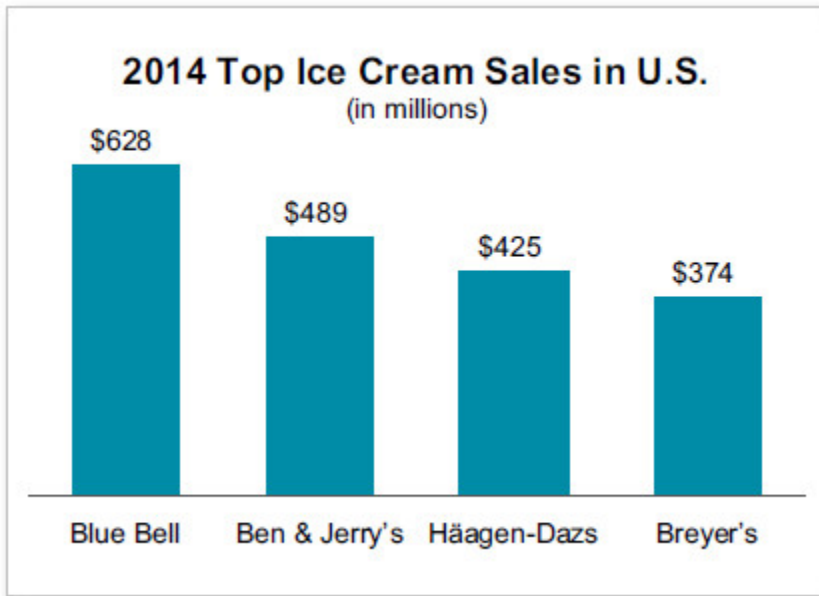
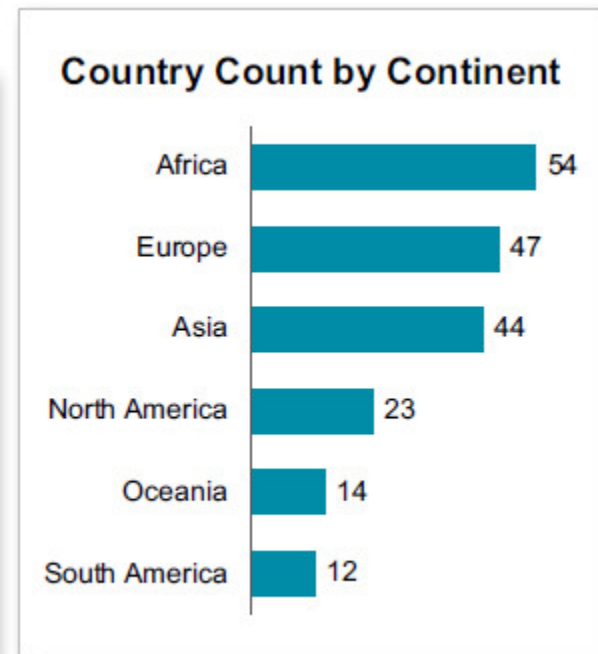


Figure 1.2 Bar chart



Bar and column charts may be clustered (see [Figure 1.3](#)) or stacked (see [Figure 1.4](#)) to show multiple data series or part-to-whole relationships.

Figure 1.3 Clustered column chart

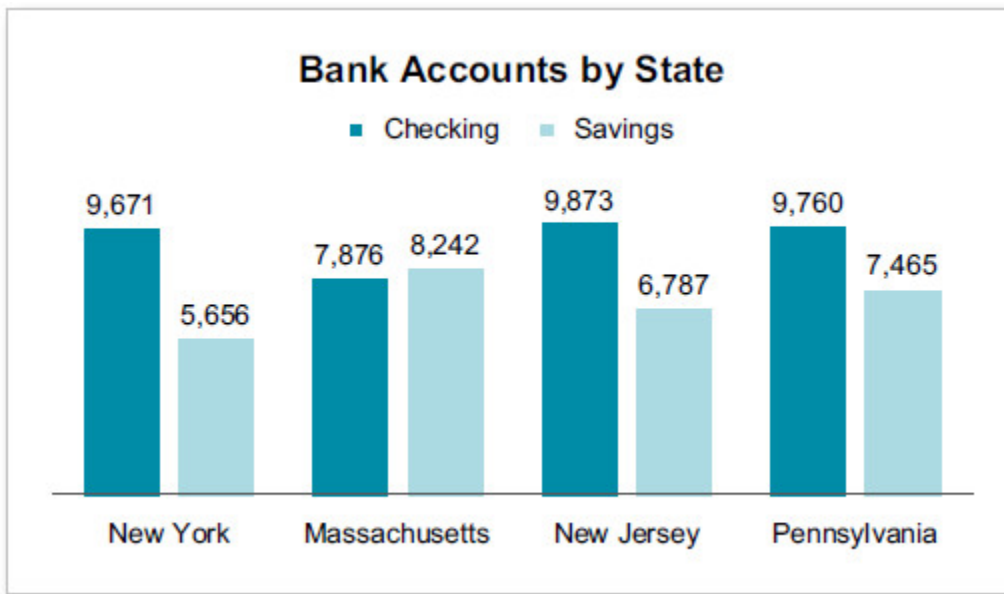
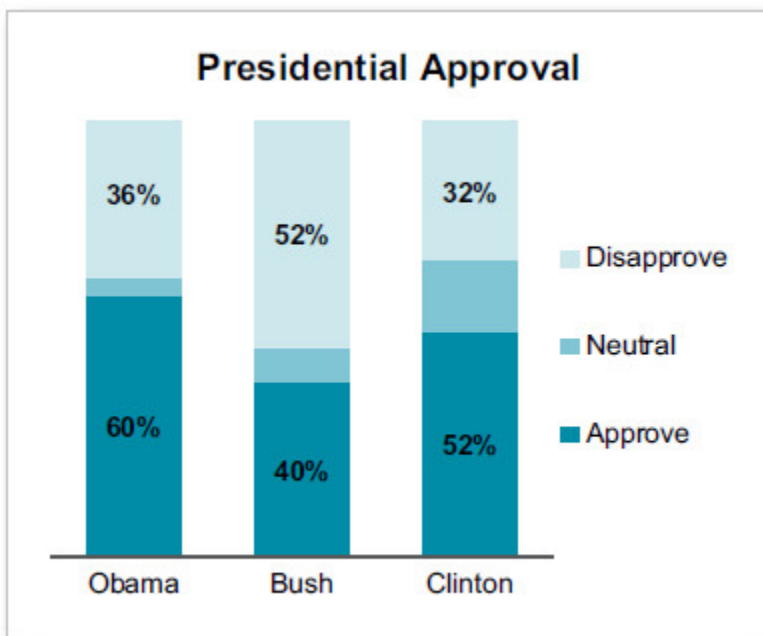
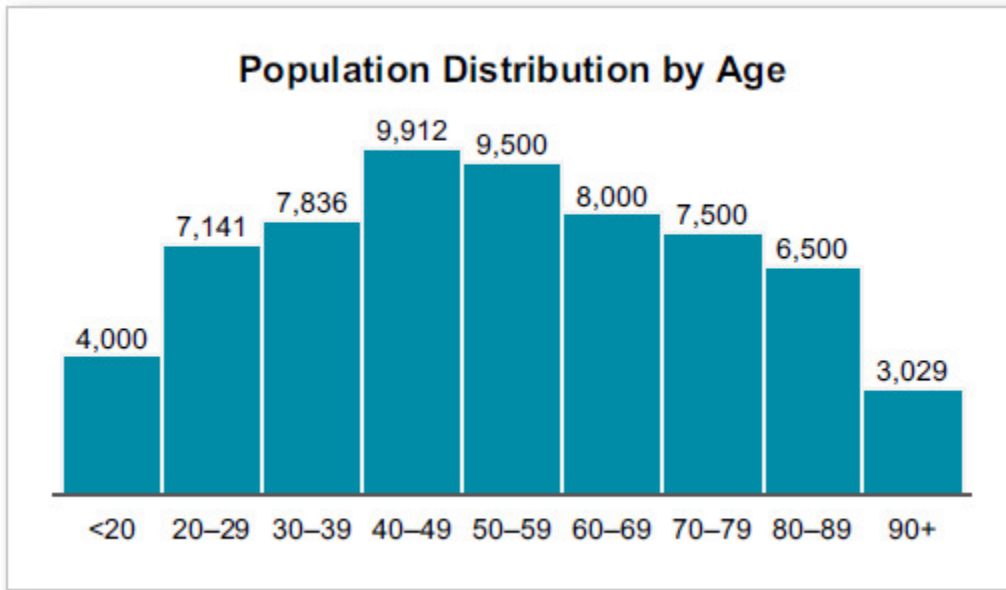


Figure 1.4 Stacked column chart



A variant of the column chart used to present continuous data is the histogram (see [Figure 1.5](#)). The histogram shares many of the features of the column chart, except the histogram columns are not separated and the data values are grouped into ranges.

Figure 1.5 Histogram



Line charts

Line charts present data in a series of points connected by line segments (see Figure 1.6). They are typically used for showing the shape of change from one value to the next, especially over time. Multiple lines (or reference lines) can be used to compare performance among categories or between categories and a target (see Figure 1.7). Information presented in a line chart can usually be shown equally well in a column chart. The decision about which chart to use is determined based on what you wish to emphasize: the values of the categories at different points in time or the trend over time.

Figure 1.6 Line chart

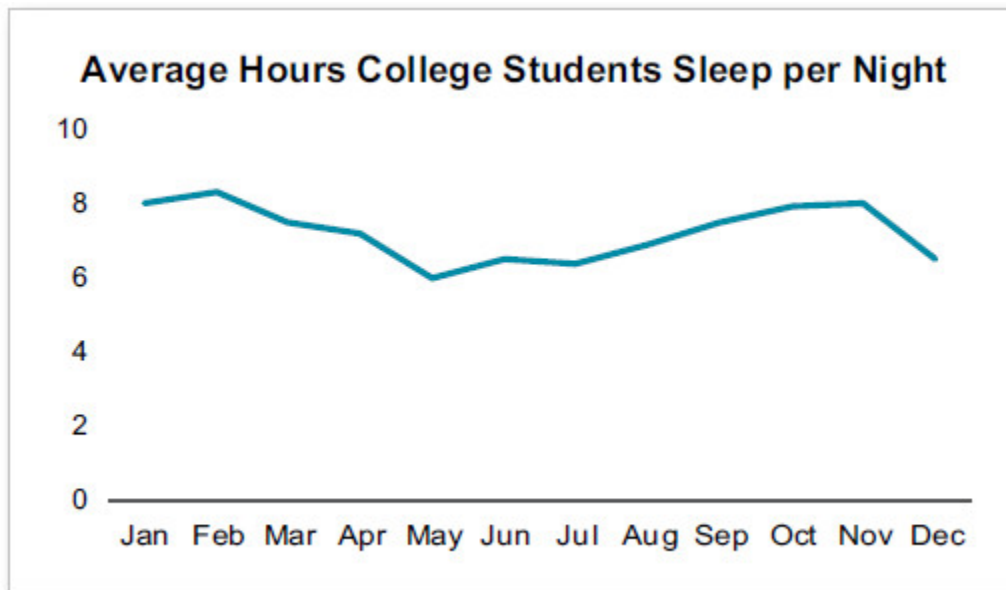
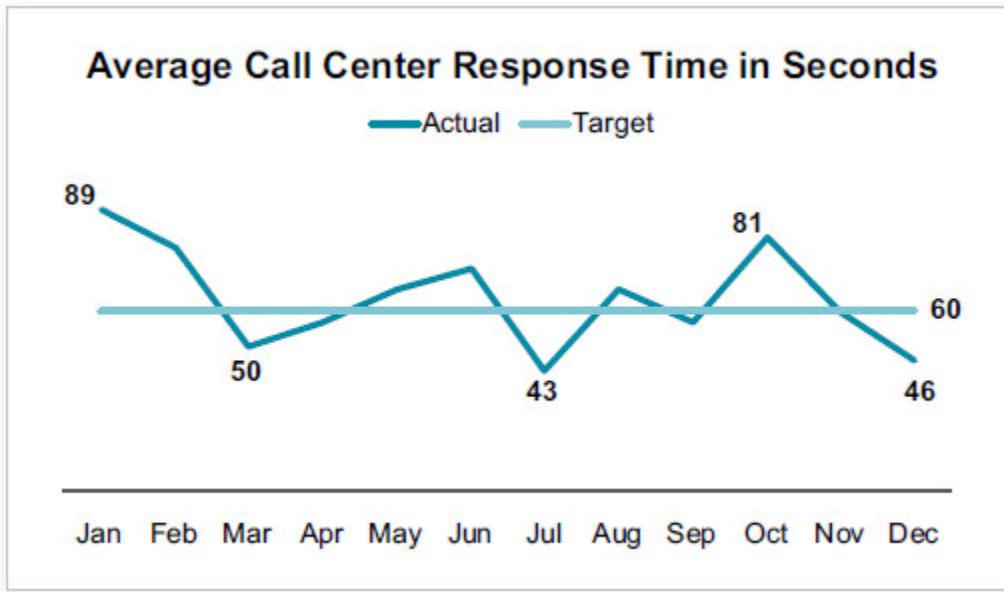


Figure 1.7 Line chart with target



### Area charts

An area chart is a line chart with the area beneath the line filled in with color (see Figure 1.8). Like line charts, they are often used to illustrate change over time. Area charts have greater visual weight than line charts so they are often used to emphasize the magnitude of the data. Area charts can quickly become complicated when multiple data series are added, and stacked area charts have potential for misinterpretation.

Figure 1.8 Area chart



### Pie charts

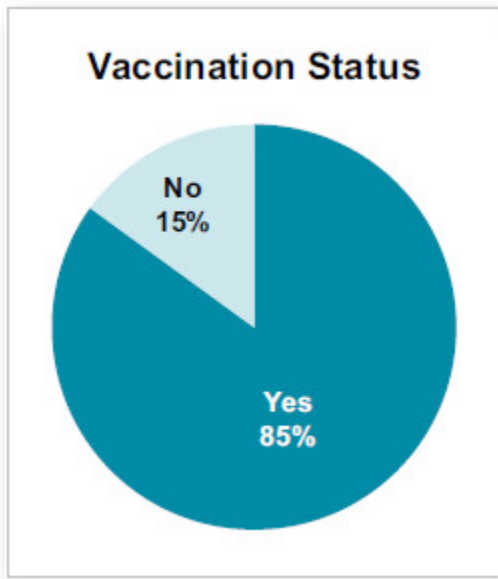


Pie charts are used to show part-to-whole relationships (see [Figure 1.9](#)). They are among the most controversial data displays, and many experts refuse to use them. The primary issue centers on the inability of the human perceptual system to accurately interpret proportions represented by the pie slices. This is compounded by the plethora of ill conceived, poorly designed, and misleading pie charts in circulation. Pie charts, when carefully created, are an acceptable form of data visualization. Because most analysts will encounter pie charts at some point in their careers, it is important to adopt best practices for creating them.

## Tables

A table is a structure for organizing and displaying information in rows and columns (see [Figure 1.10](#)). Values are shown as text in the body of the table. Tables are ideal for looking up specific data points and are useful for showing quantitative values and categorical subdivisions. They are best reserved for reports rather than presentations because even a simple table requires more cognitive effort from the audience than a chart. Use tables when readers need to know precise data values and in situations when you wish to show different metrics in one illustration, for example, frequencies and proportions.

**Figure 1.9 Pie chart**



**Figure 1.10 Table**

Number of Program Enrollees and Their Mean Ages		
Region	Enrollees	Mean Age
North	29,942	39
South	28,842	37
East	14,025	41
West	2,149	40

Total	74,958	38
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## Which Form of Data Visualization to Use

### *Are you comparing quantities at a fixed point in time?*

- Use a bar or column chart.

### *Are you describing a trend over time?*

- If you're focusing on discrete values over time, use a column chart. If you want to call attention to data trends over time, create a line chart. If it's magnitude of change over time that you want to show, consider an area chart.

### *Do you need to know the distribution of a variable?*

- Create a column chart for categorical data; a histogram for continuous data.

### *Do you want to know the proportion of a whole that is represented by x?*

- Choose a pie chart or a stacked bar or column chart. If there are more than five parts of the whole to be represented, opt for a single-series column or bar chart.

### *Do you want to show different types of data in one display?*

- If you want to show different statistics for the same variable, for example, frequency and percentage, choose a table. For something like number of members over time along with revenue over the same time period try a combination chart.

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## Summary

Data visualization decisions should begin by curating the available data based on a thorough understanding of the audience's needs, knowledge, and use of the information. Having determined the context for the data illustrations, the next step is to choose from among the array of familiar charts and tables to display the data. Mastering the creation of the basic charts will equip analysts with knowledge and skills that may be applied to more complex data illustrations.

### *Choosing Data Displays Checklist*

1. Evaluate the available information and determine which subset will be used for the present project.

2. Determine who the audience is, what they need to know, and what they intend to do with the information you provide.
3. Decide if you are creating a report, a presentation, or both.
4. Choose the appropriate combination of charts and tables to best display your data.

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