Make Better Charts

Kristin Briney
BBE Librarian

https://xkcd.com/1798/
It’s not enough to collect data.

You also need to effectively convey it.
Learning Outcomes

1. Participants will be able to choose the right chart for their message and type of data
2. Participants will be able to make good design decisions to highlighting what’s important and eliminating excess information
Learning Outcomes

1. Participants will be able to choose the right chart for their message and type of data
2. Participants will be able to make good design decisions to highlighting what’s important and eliminating excess information

Focusing on the very basics for a good foundation
Choose the Right Chart
What is your message?
Same Data
Different Charts

LIFE EXPECTANCY AT BIRTH, 2000-2015
Each line represents a country.

http://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
LIFE EXPECTANCY AT BIRTH, 2000-2015

Same Data
Different Charts

http://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
Same Data
Different Charts

http://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
Same Data
Different Charts
Same Data
Different Charts

http://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
What is your message?
What is your message?

Hint: make it the title of your chart
Let’s Break it Down by Your Type of Data

A single number
Comparison
Beating a benchmark
Survey results
Parts of a whole
Correlations
Change over time
Qualitative data [not covered]

Adapted from Evergreen, S. D. H. (2017). Effective data visualization: The right chart for the right data.
Research Says The Best Charts Are…

# Choose Your Chart

![Table of chart types with indications of when to use them.]

<table>
<thead>
<tr>
<th>Single number</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
<th>X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Beating a benchmark</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Survey results</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Parts of a whole</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Correlations</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Change over time</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Non-Standard Charts
Introducing…

1. Big number
2. Icon array
3. Slope graph
4. Back-to-back bar chart
5. Dot plot
6. Small multiples
7. Column chart with benchmark line
8. Combo chart
9. Histogram
Big Number

**CASES OF MEASLES IN THE LAST YEAR**

58 cases occurred in just two **Brooklyn, NY** neighborhoods

Population: **250,000**

There were 200 total cases of measles in the **United States**

Population: **317,000,000**
Icon Array
Slope Graph

Sales are higher for nearly every fruit in the West region, with the exception of Strawberries.

- Apples $82
- Peaches $74
- Strawberries $67
- Oranges $61
- Pears $58
- Avocados $55
- Bananas $50
- Grapes $45

Back-to-Back Bar Chart

![Texas vs California Unemployment Chart](http://www.exceluser.com/training/charts/excel-chart-058.htm)
Dot Plot

Kindergarten readiness increased between Fall and Spring. Minimum entry requirement: 65% in all areas.

Small Multiples

http://flowingdata.com/2017/01/24/one-dataset-visualized-25-ways/
In United States, religious minorities more likely to have college degrees than Christian majority

% with higher education, by religion

- Hindus: 96%
- Jews: 75%
- Muslims: 54%
- Buddhists: 53%
- Unaffiliated: 44%
- Christians: 36% (39% U.S. average)

Note: Adults ages 25 years and older as of 2010 (or latest year available).
Source: Pew Research Center analysis.
See Methodology for more details.
“Religion and Education Around the World”

PEW RESEARCH CENTER

Histogram

http://minimaxir.com/2015/02/ggplot-tutorial/
### Activity 1

Americans and Privacy: Concerned, Confused and Feeling Lack of Control Over Their Personal Information

<table>
<thead>
<tr>
<th>% who say they feel ___ control over who can access the following types of their information</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot</td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td><strong>Private conversations online, text messaging</strong></td>
</tr>
<tr>
<td><strong>Purchases made online, in person</strong></td>
</tr>
<tr>
<td><strong>Search terms they use online</strong></td>
</tr>
<tr>
<td><strong>Their physical location</strong></td>
</tr>
<tr>
<td><strong>Their posts, activities on social media</strong></td>
</tr>
<tr>
<td><strong>Websites they visit</strong></td>
</tr>
</tbody>
</table>

Pew Research Center’s “Americans and Privacy: Concerned, Confused and Feeling Lack of Control Over Their Personal Information”
Activity 1

1. What is your message?
2. What type of data do you have?
3. What type of chart will you use?
4. Draw a preliminary sketch

<table>
<thead>
<tr>
<th>Chart Type</th>
<th>Single number</th>
<th>Comparison</th>
<th>Beating a benchmark</th>
<th>Survey results</th>
<th>Parts of a whole</th>
<th>Correlations</th>
<th>Change over time</th>
<th>Do not visualize</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big number</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Icon array</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pie chart</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bar/column chart</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Side-by-side column chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slope graph</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Back-to-back bar chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dot plot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small multiples</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Column chart with benchmark</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combo chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stacked bar/column chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number and icon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Histogram</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Map</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scatterplot</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagram</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Line chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deviating bar chart</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not visualize</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 1

9 out of 10 American say they have little to no control over who can access the search terms they use online.
Activity 1

About half of Americans feel as if they have no control over who can access their online searches

<table>
<thead>
<tr>
<th>Information Type</th>
<th>A lot</th>
<th>A little</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Their physical location</td>
<td>18</td>
<td>54</td>
<td>28</td>
</tr>
<tr>
<td>Their posts, activities on social media*</td>
<td>16</td>
<td>50</td>
<td>35</td>
</tr>
<tr>
<td>Private conversations online, text messaging</td>
<td>13</td>
<td>49</td>
<td>37</td>
</tr>
<tr>
<td>Purchases made online, in person</td>
<td>12</td>
<td>43</td>
<td>45</td>
</tr>
<tr>
<td>Websites they visit**</td>
<td>10</td>
<td>44</td>
<td>41</td>
</tr>
<tr>
<td>Search terms they use online**</td>
<td>9</td>
<td>39</td>
<td>48</td>
</tr>
</tbody>
</table>

* Based on social media users.
** Based on internet users.

Note: Respondents were randomly assigned questions about how much control they feel they have over who can access different types of their information. Those who did not give an answer are not shown.

Source: Survey of U.S. adults conducted June 3-17, 2019.
“Americans and Privacy: Concerned, Confused and Feeling Lack of Control Over Their Personal Information”

Chart Design
Reduce Cognitive Load

• People can only hold about 3 things in our working memory at one time
Reduce Cognitive Load

• People can only hold about 3 things in our working memory at one time

• Readable charts highlight key information, suppress (or delete) other information, and are visually easy to scan
  • Easy to scan doesn’t necessarily mean simple
  • People read charts in a Z pattern starting at the top left
Strategies to Reduce Cognitive Load

1. Identify what is important
2. Remove chart junk
3. Draw the viewer’s eye
4. Be consistent
Example Figure

Figure 1. Data Staff and Service Comparison from 2014 to 2019

What is My Message?

• University library data support increased from 2014 to 2019
Change Chart Type

Figure 1. Data Staff and Service Comparison from 2014 to 2019
Identify What is Important

• Decide which data to highlight
• Give your figure a helpful title
Remove Chart Junk

• Remove extraneous lines and numbers
• Label the data directly
Draw the Viewer's Eye

• Use color sparingly to highlight
  • Use grey for less important content
• Avoid:
  • Pairing red and green (colorblind)
  • Pink for women and blue for men
• Check: print in black and white
• Reorder your data, where possible
Draw the Viewer's Eye

• Use color sparingly to highlight
  • Use grey for less important content
• Avoid:
  • Pairing red and green (colorblind)
  • Pink for women and blue for men
• Check: print in black and white
• Reorder your data, where possible
Be Consistent

- Align content left or right
- Limit font types and sizes
- Limit color palette
- Make color assignment consistent across figures
One More Thing

• It’s okay to annotate the data on the graph
Figure 1. Data Staff and Service Comparison from 2014 to 2019

Data Support at AAU Libraries Increased from 2014 to 2019

The gain in total data repositories likely accounts for loss of data in IRs.
Test Your Figures

• Take a break; see how you process the chart when you come back
• Show your figure to a friend and ask them to talk through what they see and understand
Activity 2

Six Year Graduation Rates of Freshman Cohorts
2006-2010

A first-time freshman cohort includes those entering Caltech directly from high school with no prior academic history at an institution of higher learning.

*URM students are classified as “American Indian or Alaska Native,” “Black or African American,” “Native Hawaiian or Other Pacific Islander,” or “Hispanic” consistent with Integrated Postsecondary Education Data System categories.
Activity 2

1. What is your message?
2. What chart type?
3. What information is important?
4. What content should be suppressed?
5. How will you draw the viewer’s eye?
6. What details do you need to make consistent?
Activity 2

1. What is your message?
2. What chart type?
3. What information is important?
4. What content should be suppressed?
5. How will you draw the viewer’s eye?
6. What details do you need to make consistent?
Further Reading

• Evergreen, S. (2016). Effective data visualization: The right chart for the right data. SAGE.


Attribution

- Content is available under a CC BY attribution license
- Please attribute to Kristin Briney, Caltech Library

Questions? Let me know at briney@caltech.edu