How to Avoid Some Common Graphical Mistakes

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Summary of Session

- Avoid misusing color.
- Always explain all graphical elements.
- Never deceive your audience.
- Don't use inappropriate designs.
- Improve tables.
- Learn a useful graphical method.

Avoid misusing color

- Color should have meaning.
- Consider those with color vision deficiencies.
- Colors used should be distinguishable.
- Avoid gradient backgrounds.
- Use an appropriate color scheme.

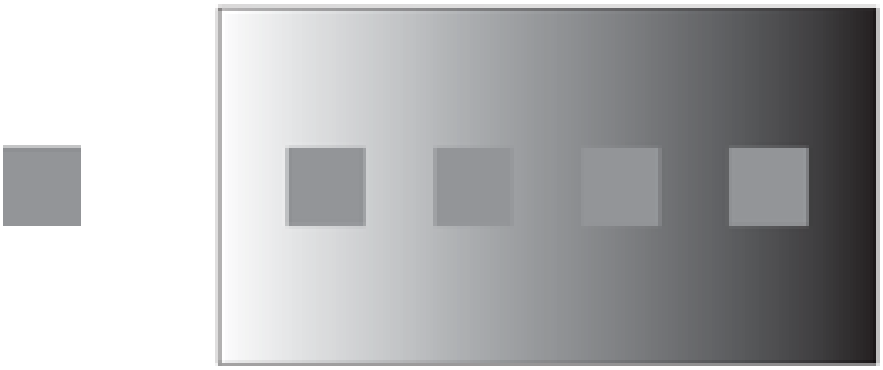


Figure 1. Avoid gradient backgrounds.

- www.vischeck.com is useful for simulating how those with color vision deficiencies see your figures.
- www.colorbrewer2.org suggests color schemes and gives their properties (e.g., being photocopy safe.)
- Poor color choices can cause misleading figures.

Always explain all graphical elements

- Error bars should be clearly explained.
- Shading and other formatting should be explained.

Never deceive your audience

- Beware of bar graphs that don't start at zero.
- Scales on double-Y axes can be chosen to deceive.
- Draw your figure to scale.
- Don't cherry-pick what you show.

Don't use inappropriate designs

- Think about your data and the message you want to convey. Don't limit your thinking to the items on your software's menu.
- Use the title to reinforce your message.
- Make it easy for your readers. Don't require them to make calculations.
- Readers don't know if the data is encoded in the diameter or the area of bubble charts.

Improve Tables

- Round your data.
- Do not overuse rules and grids.
- Don't clutter the table with dollar signs and percent signs.
- Numbers should be right adjusted.

Left	Center	Right
38,537	38,537	38,537
918	918	918
5,506	5,506	5,506
82,838	82,838	82,838
16,270	16,270	16,270
7,077	7,077	7,077
15,686	15,686	15,686

Figure 2. Number Alignment. It is easier to compare, add, and subtract if numbers are right adjusted.

Learn a Useful Graphical Method

- Diverging stacked bar charts are useful for showing the results of Likert and other rating scales.
- There are problems with many of the common ways of plotting Likert and other rating scales.
- Likert scales include strongly disagree, disagree, no opinion, agree and strongly agree.
- Other rating scales include other bipolar adjectives such as not important to very important.

- Since the distance between *strongly agree* and *agree* is not necessarily the same as the distance between *agree* and *no opinion*, it is controversial whether these categories can be given quantitative values.
- Even if it makes sense to assign the values 5 to 1 to the Likert responses, a mean of three is not very useful since it can represent all threes or half fives and half ones.
- It is difficult to judge the segments of a divided bar chart that are not at either end.
- It is difficult to compare multiple pie charts.
- Ribbon charts are especially difficult to read.
- Many readers have trouble interpreting radar plots.
- Diverging stacked bar charts are a preferred way to present the results of rating scales.

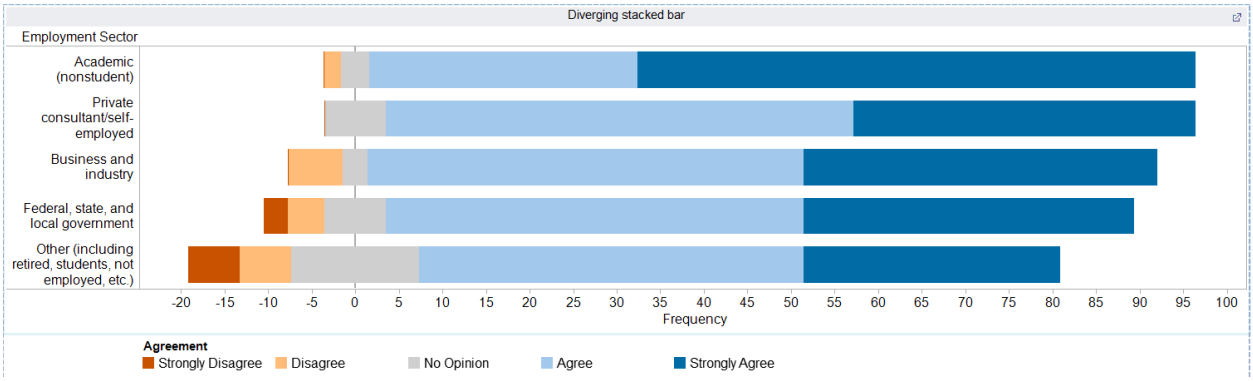
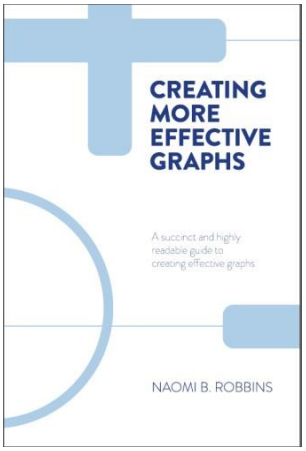


Figure 3. An example of a diverging stacked bar chart.

- Diverging stacked bar charts are centered at zero with a reference line at zero.
- The reference line is behind the bars so that the "no opinions" are not split.
- There is a symmetric intensity of colors in each direction.
- The colors used are accessible to those with color vision deficiencies.
- The bars are sorted by the total of the right-hand side.
- Diverging stacked bar charts are also useful in a number of other situations.
- To draw diverging stacked bar charts in R, use the likert function in the HH package.
- The easiest way to draw diverging stacked bar charts in Excel is to use Peltier Tech Utilities.[1] The time you will save justifies the fee.

- The options you use in everyday graphics software determine whether you communicate clearly or confuse your audience. Choose them carefully, striving for clarity and conciseness.

[1] affiliate



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About the Presenter

Naomi B. Robbins is a consultant and seminar leader who specializes in the graphical display of data. She offers keynotes, short courses and workshops to train employees of corporations and organizations on the effective presentation of data. She also reviews documents and presentations for clients, suggesting improvements or alternative presentations as appropriate. She is the author of *Creating More Effective Graphs*, published by Chart House (2013, originally published by Wiley (2005)). Dr. Robbins has been the keynote speaker at international conventions and has spoken on graphs to universities, professional societies, corporations, and non-profits. She received her Ph.D. in mathematical statistics from Columbia University, M.A. from Cornell University, and A.B. from Bryn Mawr College. She had a long career at Bell Laboratories before forming NBR, her consulting practice. Naomi is a Past-chair of the Statistical Graphics Section of the American Statistical Association and was a founding member of the New Jersey Chapter which she served as President, Vice President, Secretary, Treasurer and Chair of the Advisory Committee. She is the organizer of the Data Visualization New York Meetup.