How to present your data more effectively with graphics

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Your research is finally done and you're compiling the results for a presentation at a major conference. You carefully create overheads with tables showing all of your results. All of the relevant information is in the tables, right? The information is there, but it may be difficult for your audience to comprehend. Here are some reasons why you should consider using graphics instead of, or in addition to tables, summary statistics, or words.

- Effective graphics attract others to your work. People will be drawn to your presentation because graphics appear friendlier than tables or numbers, and much friendlier than equations or formulae.
- Effective graphics can convey more information than is possible by any other means.
- Graphics reveal data. Research has shown that people comprehend and retain up to five times more information from a verbal presentation if it is accompanied by visuals. The human brain is remarkably good at interpreting visuals.
- Effective graphics make your presentation more persuasive. Research has shown that documents containing visuals are up to twice as persuasive as those without.

What does it take to create an effective graph?
Here are some simple suggestions for making your graphics more effective. In this discussion we are focusing on pie charts, bar charts, and line charts because these are the most frequently used graph types. The following five tips are based upon studies of human perception, and also upon well-established principles of design.

1. Use appropriate graph types
   The most suitable graph type to use depends upon the type of data to be displayed and the purpose of the graph. Line plots are useful for showing trends and multiple series of data on the same graph. Bar charts can be useful for comparing relative sizes. However, they tend to use a large amount of ink to display relatively little information; this data can often be more effectively displayed using a line plot. Pie charts are good in that they indicate that the data must add up to 100%. However, they can make it difficult for people to distinguish relative sizes, especially if two slices have a difference that is less than 10%.

   When choosing a graph type, keep in mind that viewers are able to judge length, position along a common scale, and position along identical non-aligned scales better than they can judge area, volume, color, saturation, and density.

2. Avoid clutter that adds no information
   The data used in the following graphs are from van Erp-Baart's article "Nationwide Survey on Nutritional Habits in Elite Athletes," published in the International Journal of Sports Medicine.

   Consider the graph shown in Figure 1. This graph's axes ticks are poorly scaled; the ticks intrude on the plot area; and the legend conceals part of the graph. Now look at the same graph with a few minor changes (Figure 2). The axes are marked at even increments, the ticks are positioned outside the plot area, and the legend has been moved.

3. Use sufficient annotation on a graph
   In Figure 3 the graph is substantially improved by removing the legend and labeling the plot lines directly. It's better to place labels directly on the graph rather than force people to go back and forth to a legend. Vertical reference lines have also been added for further clarification. Arrows are used to help differentiate the two plot lines that cross over each other.

4. Pay attention to aesthetics
   Also note that in Figure 3 the lines used for the axes, ticks, and the plot lines have been thickened considerably. And since the plots are labeled directly, solid line types can be used for all plots. Finally, the titles are spelled out instead of abbreviated, and contain upper and lowercase characters. All of these small changes add up to a graph that is truly publication-quality, and that is attractive and easy to understand.
4 ways to make text easier to read

- always use black text on a white background
- avoid using all caps
- avoid abbreviations
- avoid putting text on top of something else; it becomes difficult to read

5 questions to ask yourself

- Are there places in which words or tables could be replaced or enhanced with graphs?
- Do the graph types used help emphasize the key points to be communicated?
- Could anything be removed from a graph without sacrificing information?
- Is the graph self-explanatory?
- Does the graph look professional and well-designed?

References