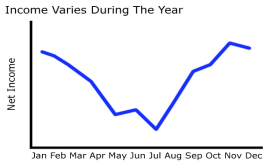
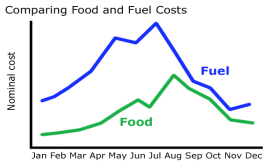
Charts & Graphs: Choosing the Right Kind of Chart or Graph

Choose the right graph or chart style for the task you want your audience to accomplish

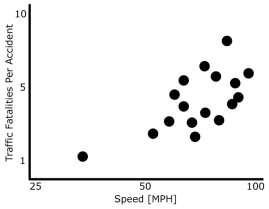
See how something **changes over time**, such as income ….



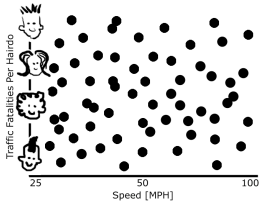
Show **how one change is related to another**, such as fuel prices and food costs…



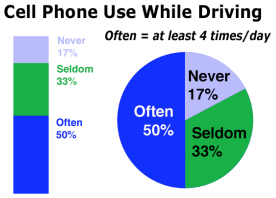
Show **cause and effect** …



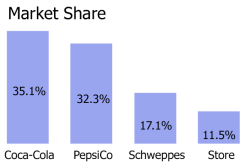
… or show that there's **no causal relationship** at all …



Compare the parts of a whole, such as … how *many* are heavy users, use occasionally, or never use at all?

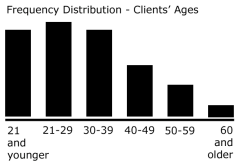


Rank items in a particular order … which is the *highest*, or … how does our market share *compare*?



See frequency distribution: **how items in a group are clustered or spread out**, such as:

The age distribution of our clients;



Error rates in shipping concentrated around certain times of year…

The main thing you've got to ask yourself is: what am I asking my audience to do with this data?

There are 3 basic types of chart or graph

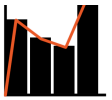
Believe it or not, there are really **only 3 basic types of chart or graph**. All the rest are just variations of these:

The **pie chart**,  , the **bar chart**  , and

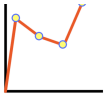
the **line chart**. 

Bar charts may be either horizontal  or vertical  – these vertical bar charts are sometimes referred to as *column* charts.

A **line chart can be created by connecting the tops of the bar chart.**



A dot chart is really just an **incomplete line chart**.



Rather than think about the ways we can bring variety to our presentation, let's look at what each type of chart is best at representing.

The line chart is very familiar, so we'll tackle that one first.

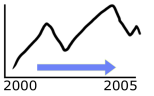
Line Charts

A dot, or scatter-plot, chart is really just an incomplete line chart. We either have some dots and we connect the lines, … or, really, we're asking our audience to do it.

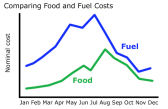
The only significant difference between a scatter-plot graph and a dot graph is that the dots are so scattered, *a single line wouldn't make a fair representation* …. So, for those, we can, and should, leave out the lines.

In other cases, shouldn't we just go ahead and draw the lines?

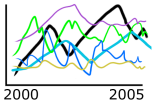
Line charts are best for showing pattern in the dots and changes over time. The line chart naturally makes us look from left to right, just as we do when reading.



A line chart can be used for showing how one change is related to another.



If you need to show more than 3 relations, don't pile up more lines.



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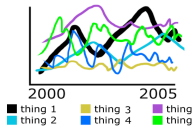
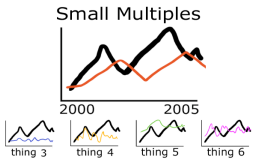
Instead of giving your audience one mass of 'tangled wires', or a complex code …



… give them separate charts. We can make **small multiples** of the chart, and graph our various changes against one, important line that we re-use, from chart to chart.



So maybe you're asking yourself: why are **small multiples** so great? They take up more space *and* it takes me longer to make 'em!

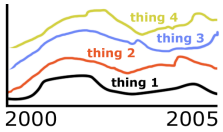
They're better because they make your points more clearly. Your **reader does not have to untangle all those lines**; they save your reader the effort of **moving back and forth from the legend to the actual graphic**; once she **understands how to read the first graph, she can quickly absorb the rest of them**, so you may not even need a large graph.

In some cases, you get a chance to *repeat* your message. The repetition reinforces your message.

Maybe you ask, 'what if I want my audience to compare **more than 3 variables** as they change over time?

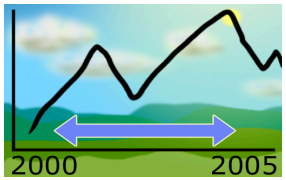
Since the goal is to make comparisons, **giving them their own graphs will generally be more clear**.

If you *must* include 3 or more lines, keep the whole chart visually simple. If *no* lines cross, you can do it like this…



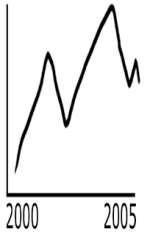
… but if they *do* cross, use **small multiples** instead.

Line graphs with crisscrossed lines, with different kinds of dotted and dashed lines, or with color codes are not effective ways to communicate your message. Avoid using those.

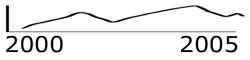


In line charts that plot a change over time, time should always move from left to right. Don't put time on the vertical axis. In fact, **your graphs should generally be horizontal, not vertical**, in their overall shape. Your **audience reads left to right**, and they are used to looking at horizons and horizontal charts.

More importantly, **set your own axes** – don't let some software designer do it for you. Whether you intend it or not, your message can change. You want the picture to **accurately show the data** – whether the news is good or bad. Otherwise your audience will become suspicious: 'Hmm, why are they trying to trick me by making the lines look steeper and more dramatic?'



Or you'll lead your audience to poor decisions with misleading data. See how **a change in axes changes the message of the chart**?

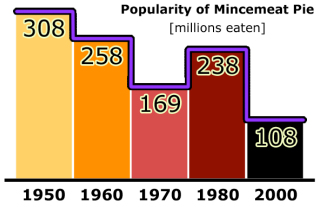


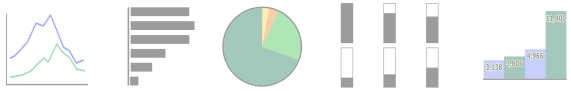
Which one is right? Only you can decide based on objectively examining the data and determining the right message.

Bar Charts

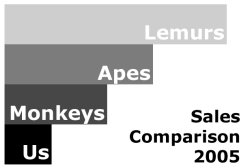
These same rules are true for bar charts. We'll use the term bar charts to refer to both horizontal and vertical versions – again, the latter are sometimes called *column charts*.

In fact, many bar charts might be thought of as blocky line charts if, for example, they show changes over time.



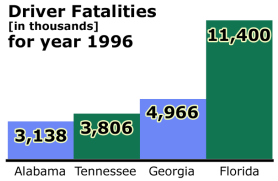


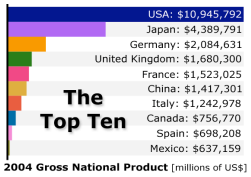
Rather than showing change over time, **bar charts are best for categorical data that is, items that don't belong in any particular order**, such as when you want to show your audience, for example,



How *our* sales compare with *their* sales...

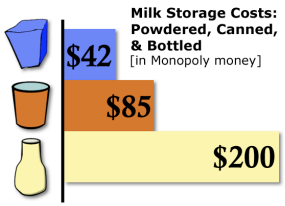
How does our state's traffic accident count compare with other states?





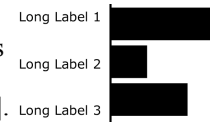
Which nation had the highest Gross National Product last year?

What's the total cost of ownership of this product vs. other products?



As we saw, bar charts can be vertical or horizontal. A couple of cases where you should use one instead of the other would be:

- if the chart is really showing a time series [in which case, use a vertical bar chart]
- if you're *not* talking about changes over time, and your labels don't fit under the columns [in which case, use a horizontal chart].

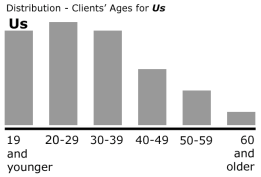


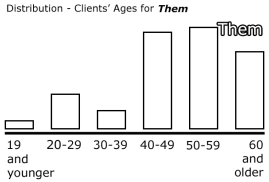
Charts & Graphs: Choosing the Right Kind of Chart or Graph

Sometimes it just doesn't matter whether you use vertical or horizontal bars, but it's important to remain consistent. **Don't mix up charts just for the sake of variety**. You're not here to entertain. You want your audience to be able to read your graphs **clearly and easily**.

Besides comparison of items, **bar charts can also be used for comparing frequency distributions**.

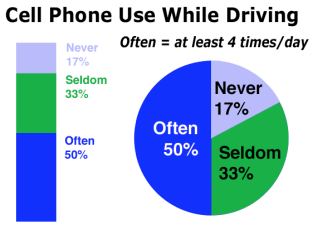
The key word here is '*comparing*'… if you want to *compare* two or more frequency distributions, you can **use bar or column charts that share a common baseline**.





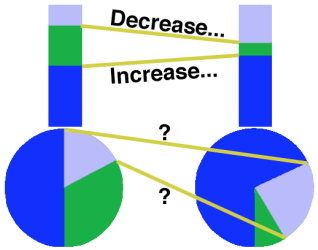
Remain consistent and simple. By this we mean eliminating distracting elements such as three-dimensional charts and irrelevant decoration. Unfortunately these are defaults in many software programs. We'll return to this later.

Bars Instead of Pies



Bar charts can also be used instead of pie charts. This works really well when you are asking your audience to *compare* two or more different values.

It's easier for us to compare the various parts when they are in adjacent bar charts, rather than adjacent pie charts. We can even connect lines between the bars, to help mark the differences … … that's something we can't really do with pies.

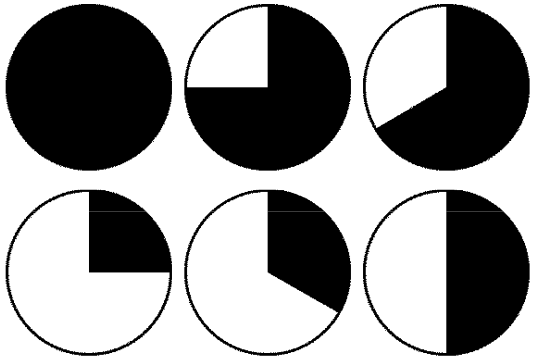


Problems with Pies

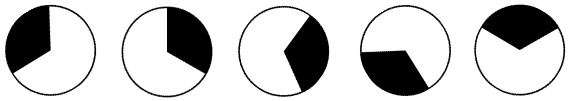
Speaking of pies – pie charts may be one of the most popular. But they are quite often bad choices! Here's why:

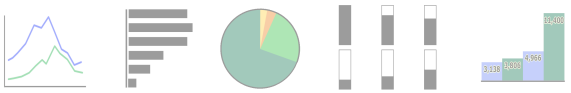
-- humans can't read and compare the *area* of an object like we can with a length.

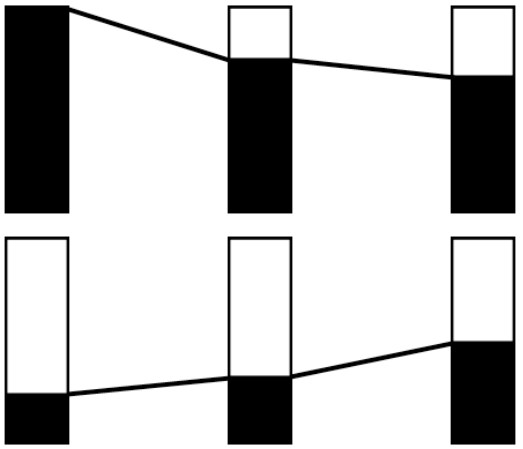
In fact, humans are very good at estimating fractions of lines… … but **research shows we are not so good at estimating slices of pies**. We can reliably only recognize halves and quarters. Even thirds can give us a hard time.



—circles have no beginning or end.







—you can't draw connecting lines between pies.

Pie graphs are really only good at one thing: **showing the parts of a single whole**. If you want to compare lots of wholes, with all their parts …

… you could try **small multiples**, but let's face it, it's easier to compare bar charts than pies. We can **compare the heights of shaded bars far more easily**, left to right, than we can the sizes *and* shapes of a bunch of little pie slices.

If you really want some pie, save it for when you only want to **compare the pieces within a single whole**, and when **there are only a *few* categories**.

If you're not talking about percentages of a whole or fractions of something, then stay away from pies.

Part of a series on Charts & Graphs by
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