

Comparison

A method of illustrating relationships and patterns in system behaviors by representing two or more system variables in a controlled way.

People understand the way the world works by identifying relationships and patterns in or between systems. One of the most powerful methods of identifying and understanding these relationships is to represent information in controlled ways so that comparisons can be made. Key techniques for making valid comparisons are *apples to apples*, single contexts, and benchmarks.¹

¹ See, for example, *Visual Explanations*, Graphics Press, 1998; and *Envisioning Information*, Graphics Press, 1990 both by Edward R. Tufte.

Apples to Apples

Comparison data should be presented using common measures and common units. For example, when comparing crime rates of different countries, it is necessary to account for differences in variables such as population, types of laws, and level of law enforcement. Otherwise, conclusions based on the comparison will be unreliable. Common methods of ensuring apples-to-apples comparisons include clearly disclosing details of how variables were measured, making corrections to the data as necessary to eliminate confounding variables, and representing the variables using the same graphical and numerical standards.

Single Context

Comparison data should be presented in a single context, so that subtle differences and patterns in the data are detectable. For example, the ability to detect patterns across multiple graphs is lower if the graphs are located on separate pages versus the same page. Common methods of representing information in single contexts include the use of a small number of displays that combine many variables (versus many separate displays), and multiple small views of system states (known as *small multiples*) in a single display (versus multiple displays).

Benchmarks

Claims about evidence or phenomena should be accompanied by benchmark variables so that clear and substantive comparisons can be made. For example, claims about the seriousness of the size of the U.S. debt are meaningful only when accompanied by benchmark information about U.S. gross national product (GNP); a debt can appear serious when depicted as a quantity, but irrelevant when presented as a percentage of GNP. Common types of benchmark data include past performance data, competitor data, or data from well-accepted industry standards.

Use comparisons to convincingly illustrate patterns and relationships. Ensure that compared variables are apples to apples by measuring and representing variables in common ways, correcting for confounds in the data as necessary. Use multivariate displays and small multiples to present comparisons in single contexts when possible. Use benchmarks to anchor comparisons and provide a point of reference from which to evaluate the data.

See also Garbage In–Garbage Out, Layering, and Signal-to-Noise Ratio.

This is a modified version of Florence Nightingale's famous *Coxcomb graphs*. The graphs are composed of twelve wedges, each representing a month. Additionally, each wedge has three layers representing three different causes of death. A quick review of the graphs reveals that the real threat to British troops was not the Russians, but cholera, dysentery, and typhus. The graphs also convincingly illustrate the impact of improved hygienic practices at military camps and hospitals, which were aggressively implemented beginning in March 1855. The graphs make apples-to-apples comparisons, representing the same variable (death rates) the same way (area of the wedge).

The graphs are multivariate, integrating a number of key variables so that patterns and relationships in the data can be studied within one context. Deaths resulting from war wounds serve as a compelling benchmark to illustrate the significance of disease, as does the earlier graph for the later graph. The graphs have been corrected based on original data published in Nightingale's *Notes on Matters Affecting the Health, Efficiency and Hospital Administration of the British Army, 1858*.

Diagram of the Causes of Mortality
in the Army in the East

