

2.3: The Value of Visual Summaries

Visual summaries such as tables and graphs can reduce how overwhelming it is to look at all the raw data. Let's use the variable salary for example. Take a moment to look at the data in the column for the variable Annual Salary in Data Set 2.1. You might have to look at the data several times to start to get a sense of how high, low, common, or rare the various salaries were. Though it is possible to get a sense of the variable and how scores are distributed from Data Set 2.1, it is harder than it needs to be. For comparison, take a look at Salary Reordered Data Set 2.1 below (see Table 2). You will likely find that it is easier to get a sense of the data when they are reordered for the focal variable; reordering the scores from highest to lowest reduces the effort it takes to understand the data. The amount of mental effort we exert to understand something is known as *cognitive load*. If you find it faster and easier to get a sense of the data when they are in order rather than in disorder, it is because the cognitive load has been reduced. Notice that when salary was reordered so that salaries were presented in order from highest at the top to lowest at the bottom, the data for the other variables were rearranged as well. Recall that each row represents a case. Therefore, when a value for one variable gets moved, the whole row moves with it. Compare the data for the case whose ID number is 1. They were the top row in Raw Data Set 2.1 but are the second row in Salary Ordered Data Set 2.1; despite this movement, however, all their data stayed the same. The data for this case still indicate the person is a UX researcher with 4 years of experience who makes \$184,600 annually.

Table 2 Salary Reordered Data Set 2.1

ID Number	Major	Job	Years of Experience	Annual Salary	Morale
3	Statistics	Sr. Research Fellow	7	190,000	8
1	Statistics	UX Researcher	4	184,600	7
13	Statistics	Data Scientist	7	181,000	8
5	Statistics	Biostatistician	5	167,000	4
4	Statistics	Research Analyst	4	138,000	6
14	Statistics	UX Researcher	6	123,700	10
6	Statistics	Psychometrician	6	120,000	3
7	Statistics	Data Scientist	5	110,240	6
9	Statistics	Biostatistician	3	102,000	6
16	Statistics	UX Researcher	1	88,950	5
12	Statistics	Research Analyst	2	74,500	9
2	Statistics	Science Journalist	6	74,490	5
11	Statistics	Data Scientist	4	65,500	5
15	Statistics	Research Analyst	5	65,000	4
8	Statistics	Research Assistant	5	57,750	7
18	Statistics	Research Analyst	2	52,680	2
10	Statistics	Research Assistant	3	48,200	3
17	Statistics	Research Assistant	1	34,000	7

Reordering the data is especially helpful when trying to understand quantitative data because it allows the statistician to easily see the highest and lowest values. For example, when the data are reordered for annual salary, it is easy to quickly discern that the lowest salary was \$34,000 and the highest was \$190,000. That's quite a large range. We could do the same by reordering data based on years of experience to quickly and easily see that the least experience in the data set was 1 year and the highest was 7 years (see Table 3).

Table 3 Experience Reordered Data Set 2.1

ID Number	Major	Job	Years of Experience	Annual Salary	Morale
3	Statistics	Sr. Research Fellow	7	190,000	7
13	Statistics	Data Scientist	7	181,000	8
14	Statistics	UX Researcher	6	123,700	10
6	Statistics	Psychometrician	6	120,000	3
2	Statistics	Science Journalist	6	74,490	5
5	Statistics	Biostatistician	5	167,000	4
7	Statistics	Data Scientist	5	110,240	6
15	Statistics	Research Analyst	5	65,000	4
8	Statistics	Research Assistant	5	57,750	7
1	Statistics	UX Researcher	4	184,600	8
4	Statistics	Research Analyst	4	138,000	6
11	Statistics	Data Scientist	4	65,500	5
9	Statistics	Biostatistician	3	102,000	6
10	Statistics	Research Assistant	3	48,200	3
12	Statistics	Research Analyst	2	74,500	9
18	Statistics	Research Analyst	2	52,680	2
16	Statistics	UX Researcher	1	88,950	5
17	Statistics	Research Assistant	1	34,000	7

Statistics can be complicated and sometimes feel difficult. However, we can use visual displays to ease the mental effort it takes to understand the data even further. Therefore, statisticians follow some basic strategies and rules for organizing, summarizing, and presenting data that are meant to reduce cognitive load, thereby making things easier to understand. So far we have seen the efficiency gained simply putting quantitative values in descending order. When statisticians are interested in summarizing how frequently various data occurred, however, reordering is not sufficient. Therefore, specific tables have been designed and used to make it easy to deduce the frequency with which various raw scores occurred.

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