

2.7: Bar Graphs

Univariate Bar Graphs. Frequency distributions, cumulative frequency distributions, histograms, and frequency polygons are all appropriate for continuous, quantitative data measured on interval or ratio scales but not for qualitative data nor discontinuous, quantitative data. When statisticians want to report the frequencies of different categories for qualitative data (such as college major) or discontinuous, quantitative data (such as number of children), they can use a bar graph. Though bar graphs look very similar to histograms, they can be easily distinguished by the fact that spaces are left between adjacent bars in bar graphs. This space between the bars is meant to visually represent the distinction between categories. Bar graphs are sometimes also created for discontinuous, quantitative data measured and those measured on an ordinal scale. For discontinuous, quantitative data, the gaps between the bars serve as a visual reminder that the ordered categories either are discontinuous. For ordinal data, the gaps serve as a visual reminder that the intervals between the data are not known to be the same size or distance and, thus, that the visual midpoints between them are not necessarily quantitatively equivalent differences.

Similar to histograms, bar graphs represent the diversity of data on the x-axis and the frequency with which the various observations occurred on the y-axis. Unlike histograms, however, the x axis of a bar graph shows categories of data (such as job titles or gender identities) which generally do not have a prescribed order. There are a few ways to present the categories on the x-axis but a fairly common option is to put the categories in alphabetical order when the data consist of letters, words, or phrases. Bars are then constructed centered over their anchors on the x-axis. Evenly sized gaps are left between bars to emphasize the distinction of categories. These gaps should be wide enough to be apparent but narrower than the bars representing the data. The height of the bars represents frequency, however, the y-axis is often labeled with the word *count* instead of *frequency*, though both are generally considered acceptable.

Bar graphs can be used to quickly deduce which qualitative responses occurred and which of those were more or less common than one another. Let's take a look at an example of a bar graph and how to interpret it. Job Title in Data Set 2.1 is qualitative and, thus, the counts of the various job titles can be summarized on a bar graph but not on a histogram; Figure 5 shows a bar graph for those data. There are 8 bars which means that there were 8 distinct job titles observed in the data set. Note the fact that the bars are all the same width. Adjacent bars do not abut or touch to represent the distinction between categories. Note also that the gaps separating the bars are all the same width and are narrower than the bars. This allows the bars to get the visual emphasis over the gaps. In reading the graph we glean that the most common of the 8 job titles was Research Analyst which appeared in the data set four times. We can also see that Data Scientist, Research Assistant, and UX Researcher were equally common as each appeared in the data set three times. Biostatistician appeared in the data twice and the remaining three job titles each appeared in the data once. If we sum the heights of the bars we get 18 which was the total sample size.

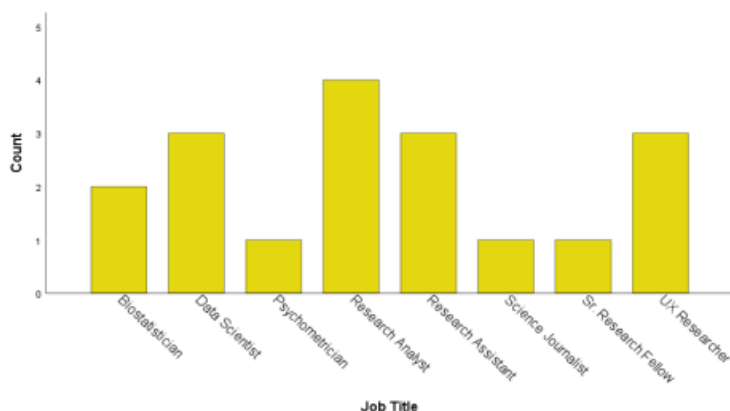


Figure 5 Counts of Job Titles ($n = 18$)

Reading Review 2.2

1. Under what conditions would an interval column be used in place of a score column in a frequency distribution?
2. What is indicated in each row of the cumulative column in a cumulative frequency distribution?
3. Why are adjacent bars shown abutting or touching in histograms?
4. What is represented by bar heights in histograms?

5. For which forms of data are bar graphs the appropriate choice over histograms? 6. What is represented by bar heights in bar graphs?

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