# Data Visualization

## INTRODUCTION

What is data visualization? In scientific research, data visualization is the graphic depiction of information driven by clear objectives to be useful. When visualizing data, you begin by asking questions like, “what would researchers want to see from this data?” and “which computational methods and visual representations would best visualize the trends that researchers would need to see?” When used strategically, visualizations are powerful tools for exploring data.

When viewing data in a visualized form, the goal is to have the reader make graphical comparisons in strategic ways to reveal new meaning through a dataset. The subject matter will determine what kinds of comparisons are relevant to consider. These comparisons should be easy to see depending on context. Sometimes, in order to make these significant comparisons from a dataset, several charts with different purposes may be useful to readers.

Once you determine the necessary charting for visualizing your dataset, consider how best to show important patterns. Some developmental and relational patterns can only be seen in certain types of charts, so you will need to experiment by using different analytical approaches that reveal them.

“Anscombe’s quartet” teaches us that graphic representations contribute to understanding the meaning behind data as much as numerical summaries do, but this is only when visualizations are designed with clear objectives. Experts point out that poor charts are worse than no chart at all. Without careful consideration of objectives, you run the risk of confusing a reader instead of enhancing understanding. Solve this problem by considering visualization as a reinforcement of content and function. This is the visual equivalent of “parallel construction” for expressing coordinate ideas. Thinking about visualization this way may also reveal shapes and colors that intuitively capture categorical hierarchies and other patterns within datasets (Fig. 3).

In this chapter, you will gain insights for designing charts and interpreting data for helpful visualization. Topics include goals, theories, and historical perspectives as well as guiding principles of design and examples.