FOCUS ON VOCABULARY AND LANGUAGE

. . . statistics are *tools* that help us see and interpret *what the unaided eye might miss*. In descriptive, correlational, and experimental research, statistical techniques are useful ways *(tools)* to reveal what might otherwise go unobserved or unnoticed *(what the unaided eye might miss)*. As Myers points out, *to be an educated person today is to be able to apply simple statistical principles to everyday reasoning*.

Off-the-top-of-the-head estimates often misread reality and then mislead the public. Without knowing actual data and numbers *(statistics)*, people may guess at figures (they make *off-the-top-of-the-head estimates*). These guesses do not represent the true nature of things (they *misread reality*) and consequently can deceive *(mislead)* the public. Figures generated in this manner are often easy to articulate, such as 10 percent or 50 percent *(big, round numbers)*. When repeated *(echoed)* by others, they may eventually be believed to be true by most people *(they become public misinformation)*. Rather than naively accepting easy-to-remember, but inaccurate, figures *(big, round, undocumented numbers)*, be *skeptical* and apply straightforward statistical principles and *critical thinking* skills.

Describing Data

Measures of Central Tendency

Because the bottom *half* of British income earners received only a *quarter* of *the national income cake*, most British people, like most people everywhere, made less than the mean. Incomes are not *normally distributed* (that is, they do not follow a bell-shaped curve, or **normal curve**). So, a better *measure of central tendency* than the **mean** (arithmetic average) is either the **median** (the score in the middle) or the **mode** (the most frequently occurring score). In Myers' example, half the people account for 25 percent of all the money earned in the country *(the national income cake)*; therefore, in this uneven *(skewed)* distribution, most people earn below-average wages.

Measures of Variation

It [standard deviation] better *gauges* whether scores are packed together or *dispersed*, because it uses information from each score. The most commonly used statistic for measuring *(gauging)* how much scores differ from one another (their *variation*) is the **standard deviation**. Using the formula for *standard deviation* (see Table A.1), each score is compared to the *mean*; the result is an index of how the scores are spread out *(dispersed)*. A relatively small standard deviation indicates that most of the scores are close to the average; a relatively large standard deviation indicates that they are much more *variable*.

Correlation: A Measure of Relationships

Statistics can help us see what the *naked eye* sometimes misses. When looking at an array of data consisting of different measures for many factors (for example, height and temperament), it is very difficult to detect what, if any, relationships exist. Statistical tools, such as the **correlation coefficient** and the **scatterplot**, can help us see clearly what the unaided eye *(the naked eye)* might not see. As Myers notes, *to see what is right in front of us, we sometimes need statistical illumination*. In properly summarized statistical data, we can easily see a trend that would not be obvious when the same information comes in bit by bit *(dribbles in, case by case)*.

Significant Differences

Data are *"noisy."* Differences between groups may simply be due to random *(chance)* variations *(fluctuations)* in those particular samples. When data have a great deal of *variability*, they are said to be *"noisy,"* which may limit our ability to generalize from them to the larger population. To determine if differences are *reliable*, we should be sure that (a) samples are random and representative, (b) scores in the sample are similar to each other (have low *variability*), and (c) a large number of participants or observations are included. If these principles are followed, we can confidently make inferences about the differences between groups.

Close-Up: Cross-Sectional and Longitudinal Studies

Others have since pointed out that longitudinal studies *have their own pitfalls*. Researchers using **cross-sectional studies**, which compare different age groups at the same time, have concluded that mental ability declines with age. In contrast, **longitudinal studies**, which examine the same group of participants at different times in their life span, have found that, until late in life, intelligence remained stable. These longitudinal studies were assumed to be a better reflection of the stability of intelligence over the life span, but critics pointed out that they too had methodological problems *(they have their own pitfalls)*. When interpreting research results, it is important to pay close attention to the methodology used.