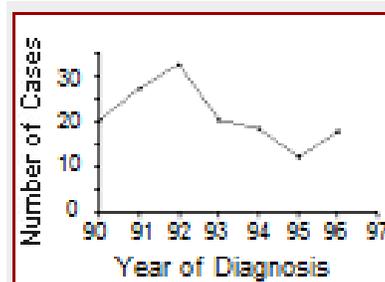
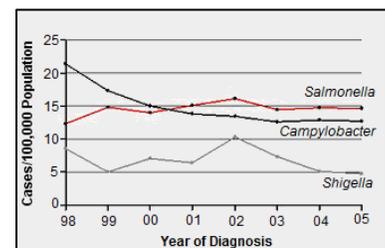


# Drawing Line Graphs and Bar Charts

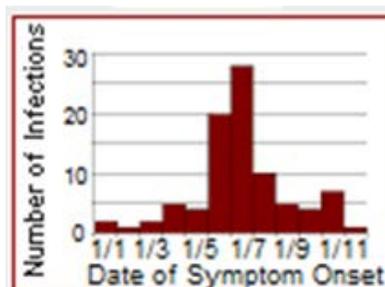
A **line graph** is a visual display of the relation between two continuous variables such as time and number of cases. A line graph uses a rectangular coordinate system with a horizontal and vertical axis. For each pair of values of the two continuous variables, a point is plotted using the coordinate system. The points are connected by a line. *The best use of a line graph is to display trends in events over time such as numbers of cases or rates of a disease over time.*



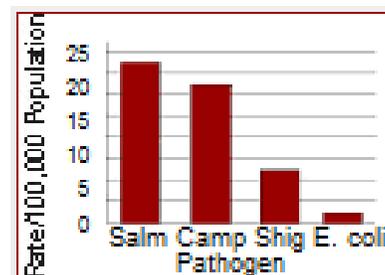
A **multiple-line graph** is a special type of line graph in which more than one series of data is shown on the same coordinate system. The different data series share the same values along the horizontal axis, but can differ on the vertical axis. *The best use of a multiple-line graph is to compare trends in different diseases over time or the same disease in different populations over time.*



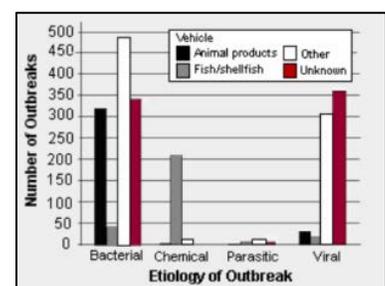
A **histogram** is a visual display of a continuous variable such as time or date of illness onset. Rectangles of varying height are used to represent the frequency of different values of the continuous variable. The heights of the rectangles are proportional to the number of observations of those values. There are no spaces between the rectangles. *The best use of a histogram is to display the number of events over time, for example, the number of cases during an outbreak, as in an epidemic curve.*



A **bar chart** is a visual display of a variable that can take on only a finite number of values (such as sex or race/ethnicity) or a continuous variable (such as age) that is presented as discrete categories (such as age groups). Each value or category of the variable is represented by a bar. The length of the bar is proportional to the number of observations for that value or category. The bars are separated by a space. *The best use of a bar chart is to compare size or frequency of different values or categories of a variable.*



A **grouped bar chart** is a special type of bar chart used to illustrate data from the cross-tabulation of two variables which results in multiple subcategories. The subcategories of the variables are individually represented by bars on the same chart and are clustered together into meaningful groups. *The best use of a grouped bar chart is to compare size or frequency of subcategories within multiple categories.*



## Tips for Better Figures

Figures illustrate trends, aberrations, similarities, and differences in data at a glance. They are an ideal way to present data to others. Viewers remember key points from data presented in figures much better than they do through tables.

In drawing any type of figure, several overarching principles should be followed. Figures should be easy to interpret. They should be simple and limited in the amount of information being conveyed. Figures should always be able to stand alone, meaning the viewer can interpret the information without further explanation. Adornment of figures, such as use of different fonts, multiple colors, and three-dimensional effects, should be limited and not distract the eye of the viewer or interfere with the reception of the intended message. Figures should be created to convey a message, but should not be manipulated to misrepresent the truth or add nonexistent drama, such as by using a scale inappropriate to the data or the juxtaposition of two unrelated series of data.

Tips to achieve these principles are listed below.

- Every figure should have a title that describes its content, such as subject, person, place, and time.
- The source of the data should be clearly stated.
- The horizontal and vertical axes should be distinct from other lines on the figure and clearly labeled with units of measurement and variable names.
- If more than one series of data is presented, each should be labeled and clearly distinguishable.
- No more than 2-4 series of data or 2-4 subcategories of a variable should be presented in one figure.
- Footnotes should be used to explain codes, abbreviations, and symbols.
- Information that can give meaning to the figure's message, such as the timing of implementation of control measures, should be noted. Unnecessary information should not be included.
- The amount of text included on the figure should be limited and readable.
- Adornment should be limited to features that help convey the figure's message.

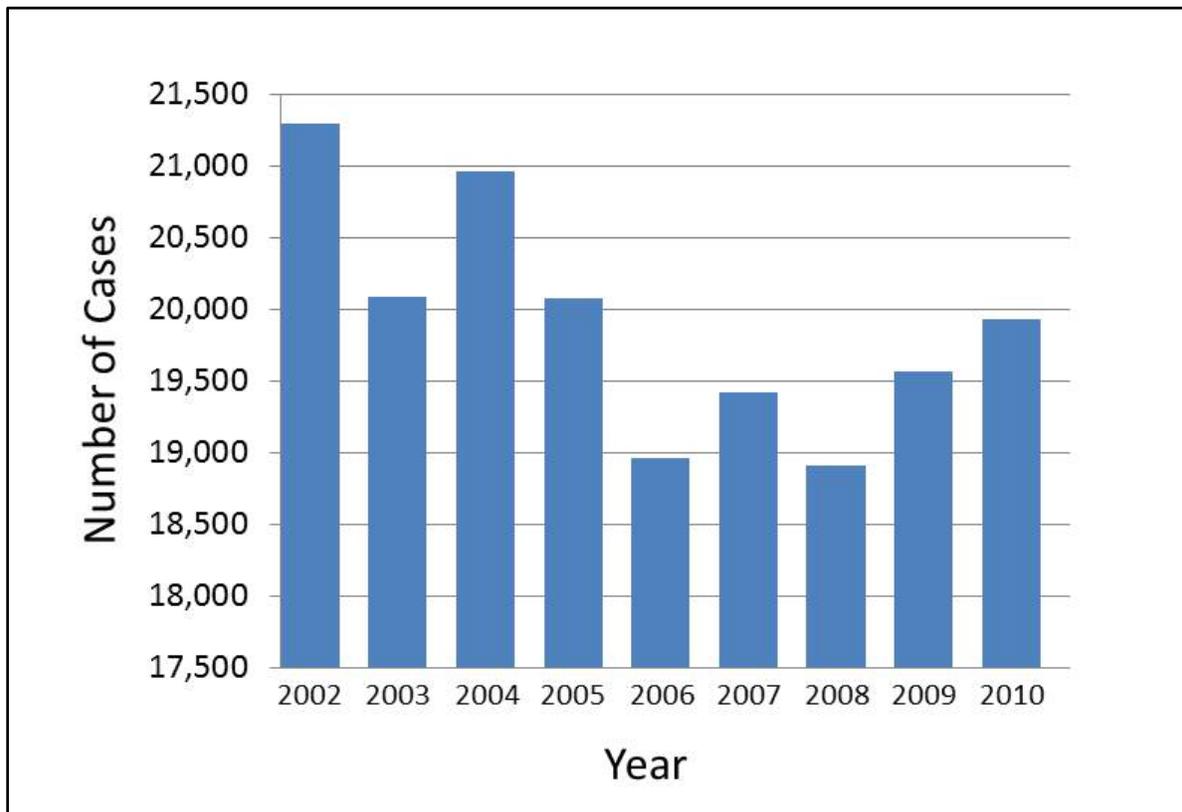
## Give it a try with the following exercise.

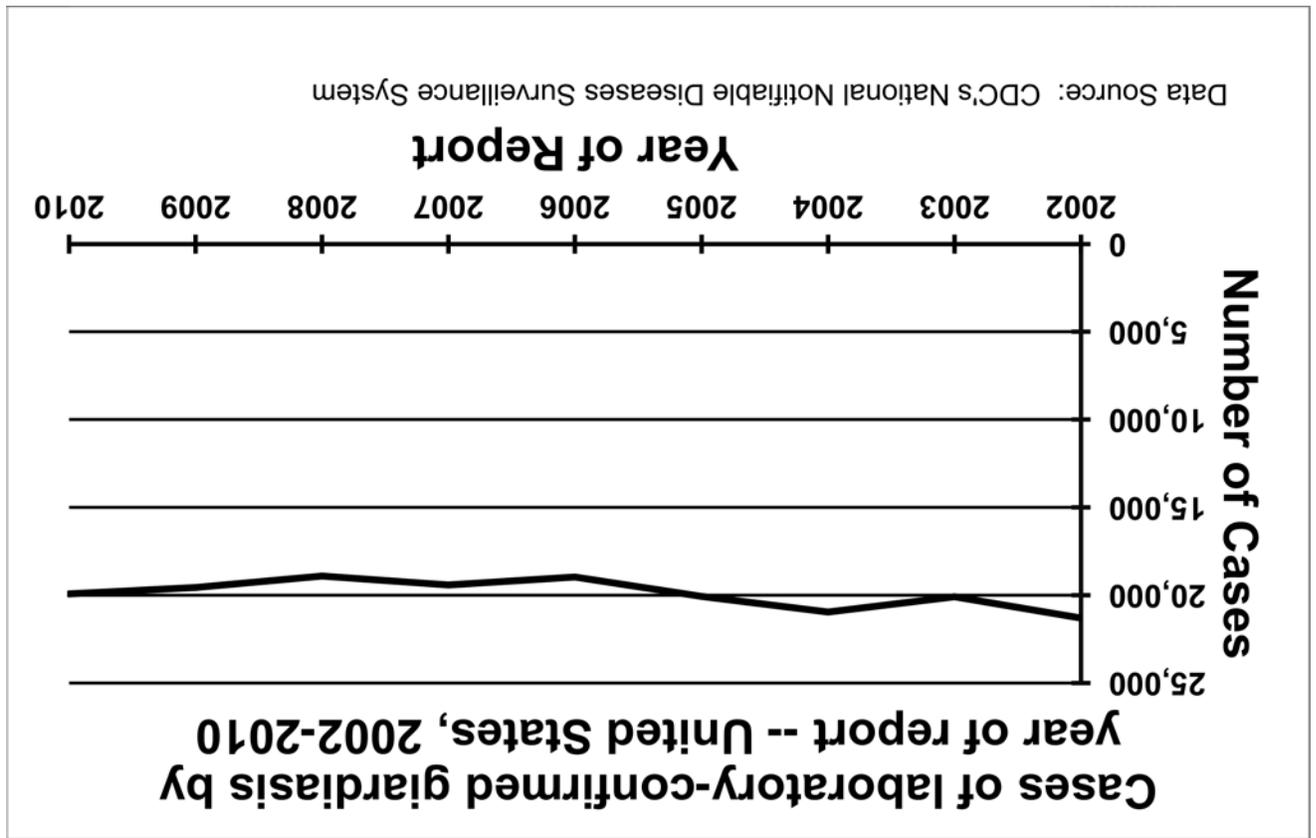
### EXERCISE

Giardiasis is a gastrointestinal illness caused by the protozoal parasite, *Giardia intestinalis*. Giardiasis became a nationally notifiable disease in 2002.

This figure represents laboratory-confirmed giardiasis reported to the Centers for Disease Control and Prevention (CDC) during 2002 to 2010. Investigators are interested in examining trends in cases over time.

Critique this figure. What changes would make it better?





The following figure incorporates the above recommendations.

- The figure should have a title that describes its content, such as subject, place, and time.
- The axes lines should be more prominent than other lines on the graph.
- The label on the horizontal axis should indicate that the cases are presented by year of report.
- The number of labels included on the horizontal and vertical axes should be limited to simplify the figure.
- The source of the data should be indicated in the title or a footnote.

In addition

Because the figure displays the relation between two continuous variables (time and number of cases), it is best presented as a line graph or histogram, not a bar chart. In addition, the y-axis (number of cases) should begin at zero, not 17,500. Starting the y-axis at 17,500 suggests that there is a bigger variation in case counts from year to year than actually exists.

## Exercise Answer:

Note: Use Shift+Ctrl+ Plus to rotate view