Module 4: Presenting Public Health Data

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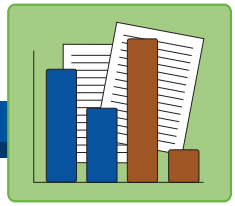
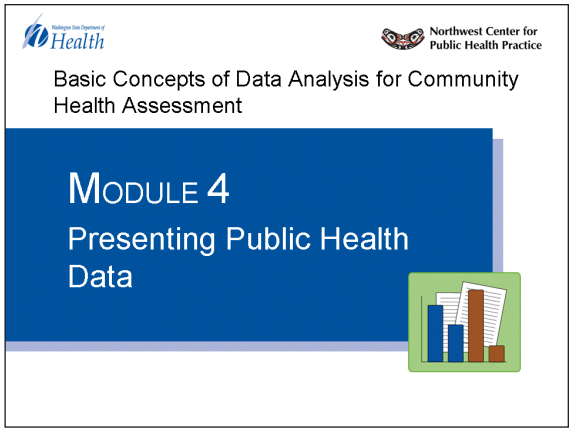
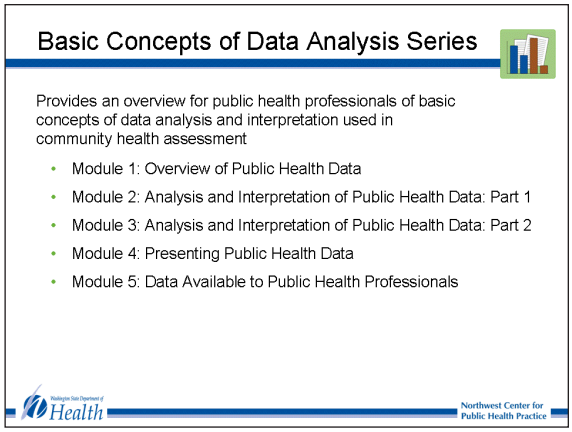


Presenting Public Health Data



Welcome to Presenting Public Health Data, the fourth module in the series on Basic Concepts of Data Analysis for Community Health Assessment in Washington State. I'm Jane Ballard. I helped create this course, along with a team of other community health assessment experts at both local and state health departments in Washington and Oregon. I have a doctorate in epidemiology and manage the Health Statistics and Assessment Program at Snohomish Health District. I have worked at Snohomish Health District since 2000.

Basic Concepts of Data Analysis Series



This series provides an overview for public health professionals of the basic concepts of data analysis and interpretation used in community health assessment. The training is intended to help professionals who work in public health practice at state and local agencies hone their assessment skills.

Module 1 provides an overview of public health data sources and uses. Module 2 introduces the analysis and interpretation of public health data. Module 3 continues the discussion of the analysis and interpretation of the public health data. Module 4 provides information on how to present public health data, and module 5 describes data available to public health professionals in Washington State. This series was developed by Washington State Department of Health in partnership with the Northwest Center for Public Health Practice. Many of the examples use Washington State or county level data, but the concepts they illustrate are relevant to public health professionals in any location.

Learning Objectives

After you've summarized your data, you'll need to present your findings in a way that is easy to understand and clearly emphasizes what you consider to be the most

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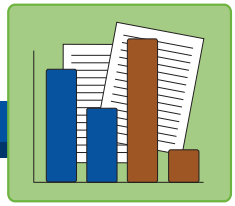
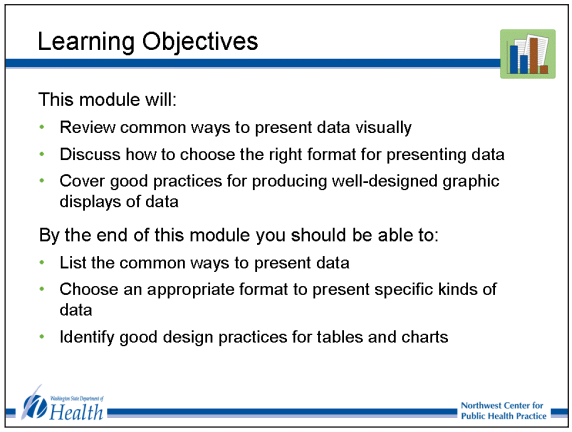


important results. In this module we'll review some of the most common ways to present data visually. We'll discuss how to choose the right format for presenting your data, and we'll also cover some basic good practices for producing well-designed graphic displays of data.

By the end of this module, you should be able to:

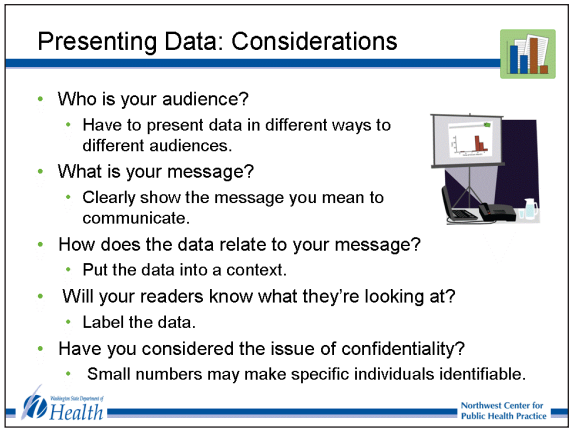
- List the common ways to present data
- Recognize appropriate formats to present specific kinds of data, and
- Identify good design practices for creating tables and charts.



Presenting Data: Considerations

When choosing a format for displaying your data, you want to consider several questions.

Who is your audience? In other words, who will you be presenting the data to, and who will be using your data results? If you're presenting a report to your local board of health or county commissioners, you may have to present your data in a very different way than if you're presenting to local citizens, in public forums, or to peers in assessment.



What is your message? Your results should clearly show your audience the message you mean to communicate. Your tables, charts, and graphs should be easy to read and understand.

How do the data relate to your message? Be sure to put the data into a context. When additional information is needed to accurately interpret the data displayed in your graphic presentation, make sure that it accompanies the graphics.

Will readers know what they're looking at? Accurately label and annotate your visuals so all the data are easy to identify.

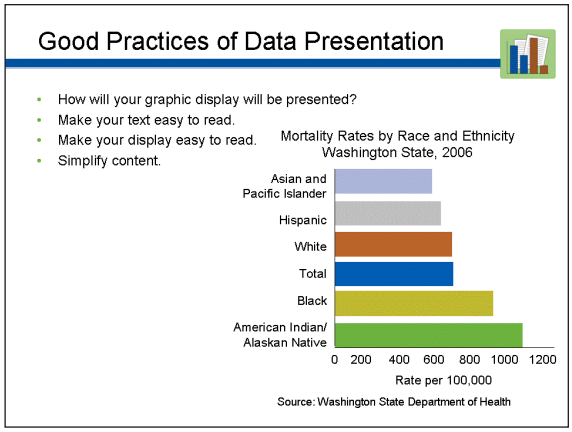
Have you considered the issue of confidentiality? Reporting data based on small numbers is a special challenge. You must observe protocols to protect confidentiality and also make it clear when the reader should not infer too much about differences. You may even need to eliminate some data from your presentation if it is based on

small numbers and opens up the possibility that specific individuals might be identifiable. Remember that you may need to explain this to your audience. For example, if you work in a county with a very small Asian population and you have only one case of an Asian male, age 25, with active Tuberculosis disease, it would be easy to identify this individual in the community even without any "personal identifying information."

Let's pause so you can check your understanding of these points.

Practice: Basic Concepts

Good Practices of Data Presentation



The most common formats used in public health presentations of data are tables, charts, and maps. Regardless of the format, though, some basic design principals apply to all of them.

Keep in mind how your graphic display will be presented. Will it be on a PowerPoint slide, in a black and white hand out, or a report printed in color? I'll talk about color issues in the next slide. But for now, remember that someone will probably print your presentation, and they'll probably print it on a black and white printer. Make sure that it is still legible and attractive when printed in grayscale.

Make your text easy to read. Use only one typeface, such as Arial. For emphasis, use different type sizes rather than different fonts. And speaking of type size, be sure that you've made the type big enough to be easily read.

Make your display easy to read. Don't use perspective or 3-D effects. They make it very hard to accurately interpret differences between the chart elements. Also, be sure that the colors or patterns for each value are different enough to be able to distinguish between them. Be careful, however, when using patterns. Multiple patterns can make it harder for people to read your charts. And, of course, don't use the same color or pattern for different values.

Simplify your content. Delete irrelevant data. If your chart period covers a year by weeks, for example, combine the data into monthly increments or quarters. Be careful here, of course, that your key point is still captured. You don't want to delete so much data that your presentation is misleading.

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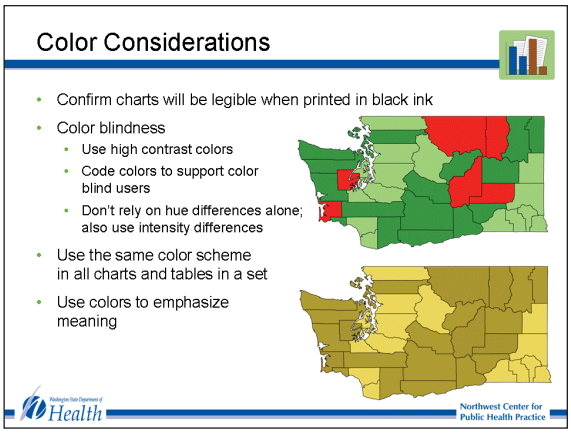
Finally, for a clean, compelling graphic display, eliminate chart junk, such as unnecessary grid lines, tick marks, and images.

Color Considerations



As I said, the first point to keep in mind is how the graphical data will be displayed. On a PowerPoint slide or in a color document, you can design with color, but if you're creating a chart to be printed in black ink, on an office printer or copy machine for example, you should probably work only with blacks and grays. Make sure you have enough contrast between colors, or shades of gray, to adequately distinguish the individual components. If you are using PowerPoint you can preview your slides in grayscale to check the contrast between colors. If you design your graph with color, keep in mind any possible confusion for people with color-blindness. Use high contrast colors, and avoid using reds and greens in the same chart. For an idea of the possible problems these color combinations can cause, let's look at how a red-green color-blind person would see this map.

If you're going to use red and green colors, code the colors for color-blind users. Do this by titling the elements or including a legend. And don't rely on hue differences alone, also use differences in intensity.

Another point about chart colors: If a set of charts and tables will be used together, for example in a PowerPoint presentation, use the same colors in all of the charts and tables. It's handy to create a palette of colors to refer to.

Colored text on a colored background can create problems. Don't use blue text on a red background, for example, or pale green text on a white background. When possible use colors or patterns that emphasize data with a similar meaning, for example use red for critical or problem data, and use the most striking color or pattern for the most important data.

Let's pause so you can check your understanding about what we've just covered.

Practice: Graphic Design

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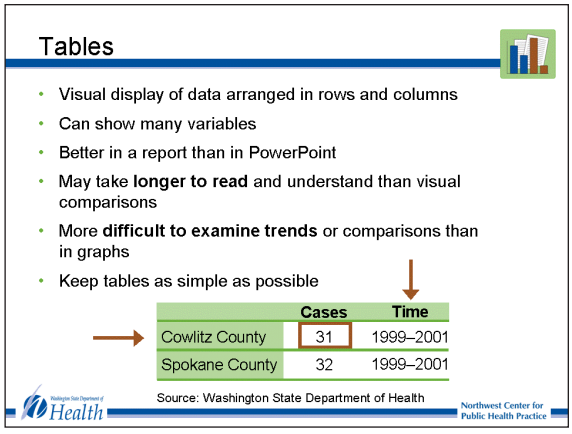
Tables



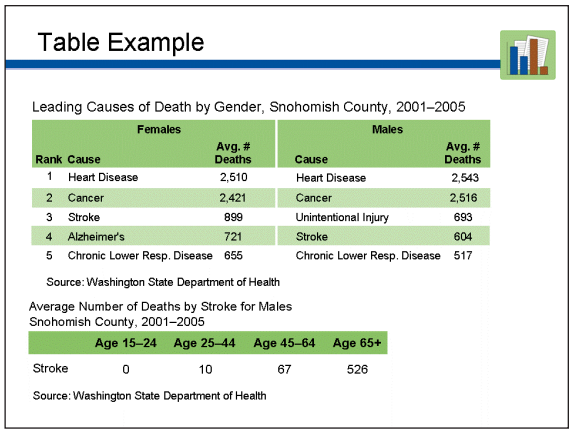
Tables are a very common form of graphic display of data. Let's look at the structure of a table.

Tables are visual displays of data arranged in rows and columns. The individual data points are in cells. At the top of the table is the header, containing the titles of the columns. On the left side of the table are titles for the rows. Sometimes at the bottom of the table, you'll find notes and the source for the table or data.

The advantage of a table is that you can show many variables at the same time. Any type of quantitative data can be displayed this way. Tables are generally better to use in a report than in a PowerPoint presentation. If tables are included in a presentation, they need to be very simple with only a few rows and columns. All too often they include so much data they become very small, making them too complex to describe, and impossible to read. How many times have you heard the speaker say "I know you can't read this, but…"

In general, complex tables take longer to read and interpret than graphic displays. And it is more difficult to pick out trends and comparisons between groups. For all of these reasons, tables should be kept as simple as possible.

Table Example



In this table showing leading causes of death in Snohomish County, we've included statistics for all ages and four different age groups each also broken down by gender. Although the table provides a lot of information, it's too complex to read easily or interpret. When presenting data to a local health board or the general public, this table might be overwhelming. Instead, focus on the most important information that gets your point across. If you wanted to discuss the major causes of death in the community as a whole, you might list just the all-age data for the top 5 to 10 diseases. Or, if you wanted to specifically discuss strokes in men of different ages, your table should look like this.

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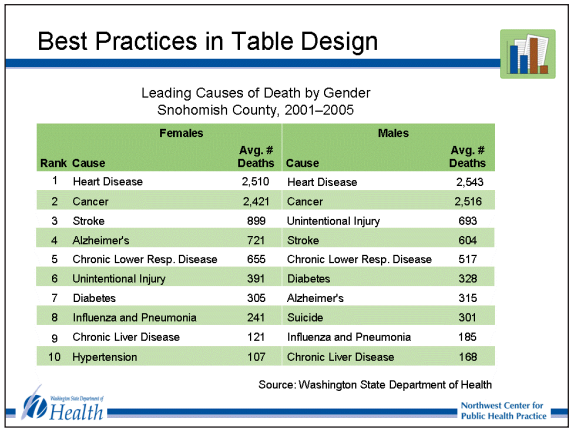
Best Practices in Table Design



Following some simple design points will help you make useful, readable tables.

Order the table items in ascending or descending order, and cluster like items together. Delete irrelevant items

Pay attention to the spacing of the rows and columns. Consider using alternating bands of color, rather than grid lines, to indicate rows and columns.

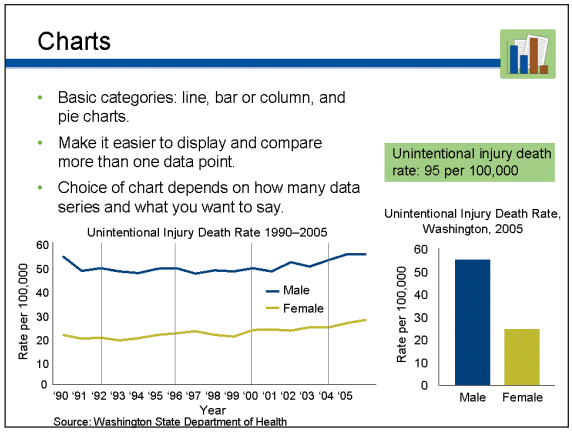
Place units of measure, source notes, and supplementary statements in footnotes rather than in the title.

You can see how much easier this table is to read now. This is clearly a case of less is more. By focusing on the important variables and limiting the data presented, it's actually possible to provide more information for your audience. Your audience, now, can easily see the differences in the top leading causes of death by gender in Snohomish County from 2001 to 2005.

Take a moment to check your understanding of what we've just covered.

Practice: Tables

Charts



Data can also be presented graphically, or in other words, in charts. You probably use charts in your work.

Charts fall into a few basic categories. In this module we'll discuss line, bar or column, and pie charts.

Charts make it easier to display and compare more than one data point. If you merely want to say that the unintentional injury death rate in your county is 95 per 100,000, a chart isn't necessary. But say you want to compare the unintentional injury death rates by gender. Now you have two data categories, and the difference between them can be seen much more easily as a graph. You may also compare a series of data points for more than one year. For example, we might want to look

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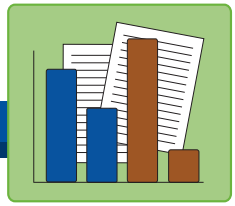
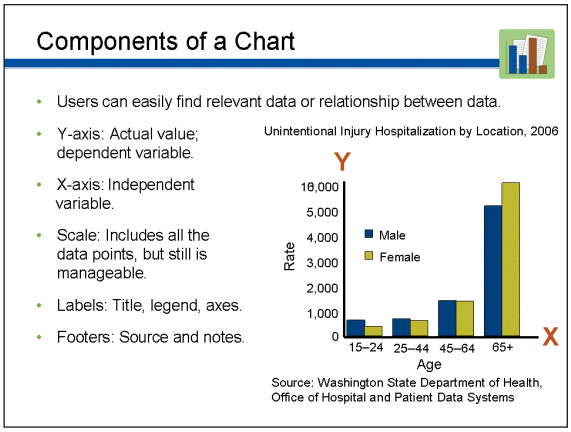


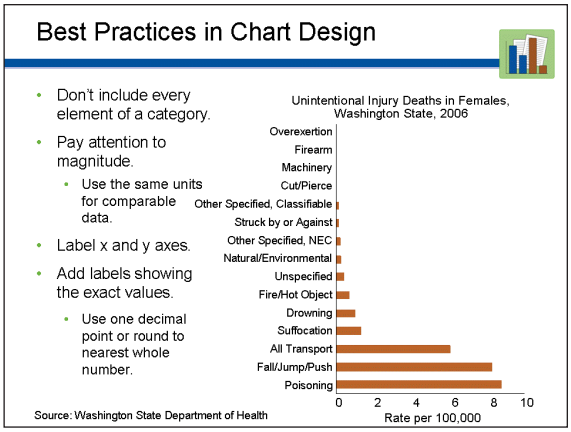
at unintentional injury death rates among men and women for 16 years. As you increase the number of data points, you increase the complexity of the information. What kind of chart you use will depend on the type of data and how many data series you have and what you are trying to say.

Components of a Chart



Good charts enable users to easily and quickly find relevant or critical data or recognize important relations between data. Let's look at the basic components of charts. Charts are two-dimensional. We call those two dimensions the x-axis and the y-axis. The y, or vertical, axis is the actual value of each data point such as the unintentional injury death rate. The convention is to display the dependent variable on the y-axis. The x, or horizontal, axis is the category to which your data point belongs, such as age. By convention, the x-axis displays the independent variable. The scale you use on the y-axis is determined by the size of the values. For example, if all of the data points on your chart are less than 6,000 per 100,000, the upper limit of the scale shouldn't be set at 10,000. This would obscure any differences that exist between your data points. You'd probably set it at 6,000 so you include all the data points, but still have a manageable scale. In general, start the scale at 0 in the lower left corner, although it's sometimes better to start the value higher then zero, if the data would otherwise be obscured. A title, legend, and axis labels are necessary so the reader knows what they're looking at. The source for the data, and any notes can be included in a footer.

Best Practices in Chart Design



I'll go into more detail later about specific best practices for each kind of chart, but some global points apply to all the kinds of charts.

Limit the number of data points on a graph. Keep the graph simple.

Include only information that is needed for your reader to correctly interpret the data.

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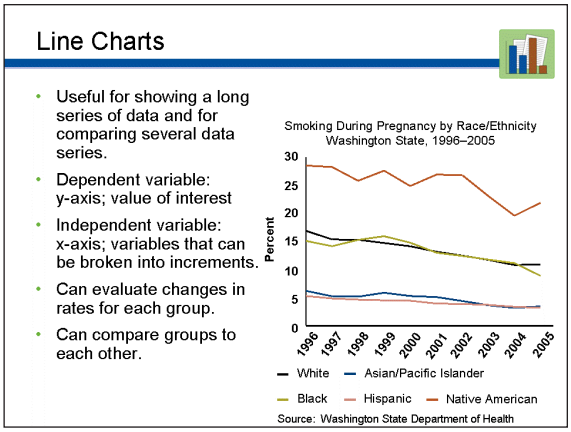
Pay attention to magnitude. Make sure you're using the same units for comparable data.

Clearly label the x- and the y-axis.

Where appropriate, add labels showing the values to avoid misinterpretations. Including confidence intervals provides valuable information as to whether the observed differences are statistically meaningful. Usually in a graph it is sufficient to use only one decimal point. More decimals just clutter up the graph. When presenting in PowerPoint, you might want to round up to the nearest whole number to keep the information more readable and easier to describe.

Line Charts

Line charts are useful tools for showing a time series of data (such as disease trends over time) and for comparing several series. You can use them to show changes over time or correlation between two continuous variables.



The dependent variable, the y or vertical axis, will be your value of interest (such as rate) and the independent variable, the x or horizontal axis, will usually be years, money, ages, or other continuous variables that can be broken into increments.

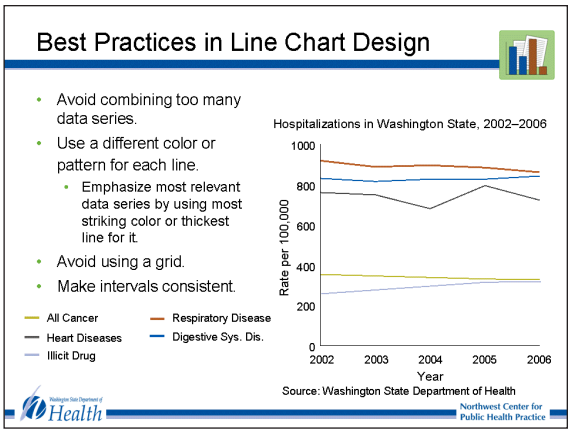
This line chart shows trends in smoking during pregnancy among different racial and ethnic groups in Washington State over time. This chart could benefit from some additional information in the labeling.

The chart allows us to evaluate the changes in rates or the trends for each group separately and also to compare the trends of the groups to each other.

Best Practices in Line Chart Design

When you're creating line charts, keep these principles in mind.

Avoid combining too many data series in one line chart. If there are several lines in one chart, use different colors or line styles to distinguish between them. Thinner data lines usually look better in a printed report, but may need to be thicker when using them in a PowerPoint presentation.



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Try to emphasize the most important line, if applicable, by using the most striking color or the thickest line width for it.

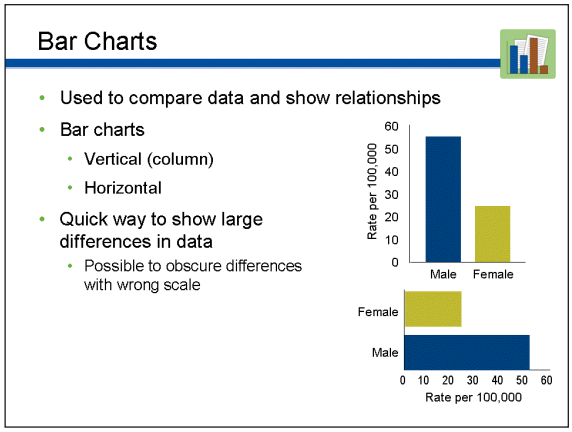
Avoid using a grid. It just clutters up the chart.

Finally, the intervals on the x-axis should be a consistent width.

Take a moment to check your understanding of what we've just covered.

Practice: Line Charts

Bar Charts



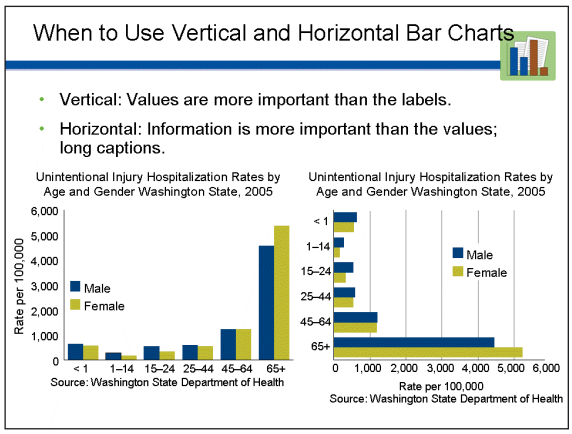
Bar charts are used to compare categorical data and show relationships among groups, individuals, or items.

Bar charts may be either vertical, which are sometimes called column charts, or horizontal. In a moment, we will discuss when to use each orientation.

Just as with line charts, the left side, or y-axis, of a vertical chart represents the dependent variable, or value. The bars represent categories of the variable. Bar charts are a quick way to show large differences in data. Keep in mind, though, that it's possible to obscure differences by choosing the wrong scale. When attempting to compare several bar charts, choose a similar scale for each.

A horizontal bar chart just flips the x- and the y-axes of a vertical bar chart. So the dependent variable, or value, is now on the x-axis instead of the y-axis.

When to Use Vertical and Horizontal Bar Charts



Whether to use a vertical or horizontal orientation can depend on personal preference, but it might be useful to look at your data both vertically and horizontally to decide which presentation format is clearest for the data you are presenting. However, a consideration when choosing between a horizontal or vertical orientation depends on what you're

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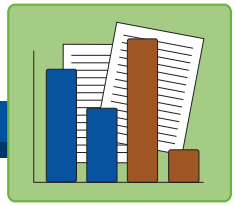
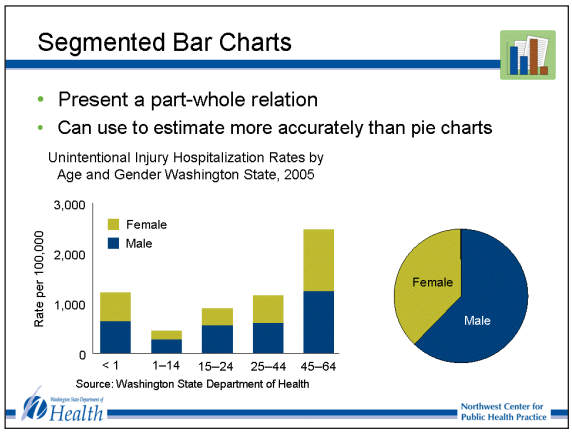


trying to communicate. Generally, you'd use a vertical chart if the values are more important than the labels. And you'd use a horizontal chart if the label information is more important than the values themselves, since the labels will be on the left and, therefore, will be more likely be read first.

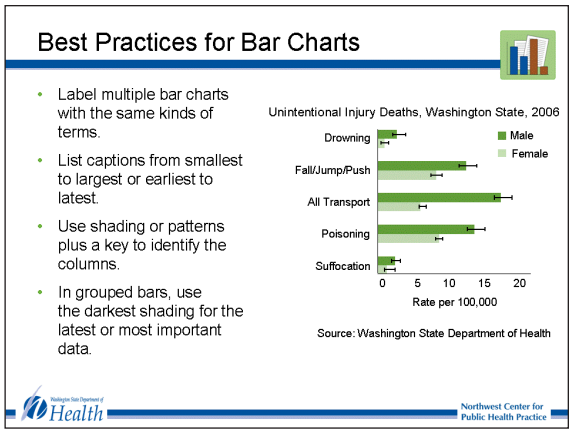
Segmented Bar Charts



A variation on a vertical or horizontal bar chart is a stacked, or segmented, bar chart. You'd use it to present part-whole relationships. In other words, you might want to present sub-groups of a variable. For example, when looking at unintentional injuries, you might want to compare the rates of males and females. Rather than using multiple bars to display the data, you can combine the data into one bar.

Segmented bar charts are easier to interpret than pie charts, (which we'll look at in a moment) because people can generally estimate heights or lengths more accurately than the areas in a pie chart. Generally, we put the segment that we want to emphasize, or that shows the variation, on the bottom of a vertical bar—or the one closest to the y-axis on a horizontal bar. Before deciding to use segmented charts consider the data and the audience. These types of bar charts can be more complex and are harder to understand.

Best Practices for Bar Charts



When you're creating bar charts, remember to label multiple bar charts with the same kinds of terms.

Listing captions from smallest to largest or earliest to latest, makes for a more effective presentation.

If you include values as part of the labels, limit them to one decimal or round up to a whole number.

Use short labels for the vertical bar charts. And don't make the text vertical. You can rotate the entire line of the text, but for long titles consider converting a vertical chart to a horizontal bar chart. For horizontal bar charts, align the labels to the right.

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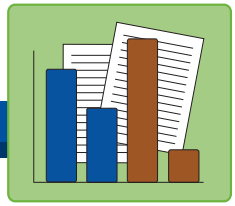
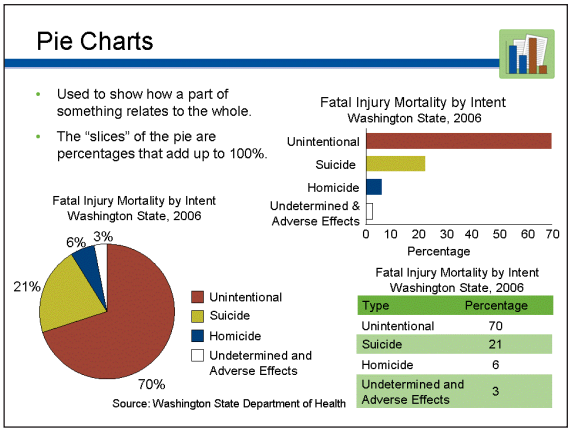


Use shading plus a legend or key to identify the bars. In grouped bars, use the darkest shading for the most recent or most important data.

Take a moment to check your understanding of what we've just covered.

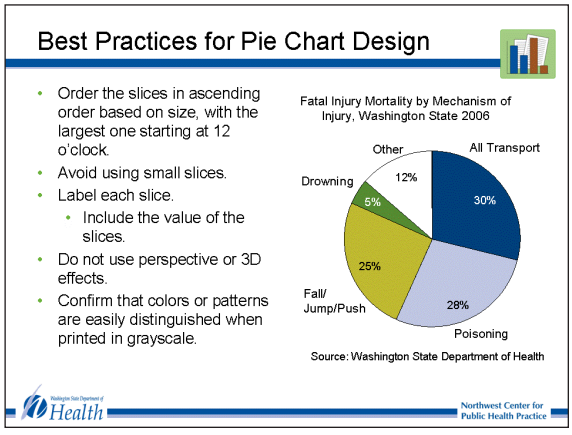
Practice: Bar Charts

Pie Charts



Pie charts are frequently used to show how a part of something relates to the whole. Pie charts are useful for showing the component parts of a single group or variable. The basic design is a circle, or in other words a pie, and the components, or slices of the pie, are usually percentages of the different categories of the variable. The "slices" of the pie always add up to 100%.This pie chart represents the major fatal injury types for 2006. Although these data could certainly be presented in a table or a bar graph, note how easy it is to make comparisons between major fatal injuries using a pie chart. When a single variable is being presented (such as fatal injury type), and the information you want to convey is how parts relate to the whole (for example, what percentage of the deaths are due to suicide), consider using a pie chart to display your data.

Best Practices for Pie Chart Design



When drawing a pie chart order the slices in ascending or descending order based on size, with the largest one starting at 12 o'clock, and the other slices following clockwise.

Avoid using small circle segments, no smaller than 5%. You can sometimes combine smaller segments into one larger segment labeled "Other." Even if the "Other" category is large, place it at the end of the sequence of slices

Label each segment. You can place labels inside segments if the segments are large enough and the

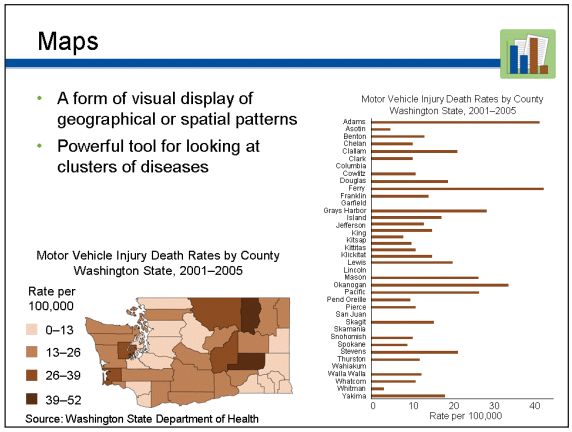
labels short. If the segments are small or the labels long, place the labels near the segments. It's usually helpful to include the value of the segments as a percent.

And finally, be sure your chart is legible. Do not use perspective or 3-D effects. They make it very hard to accurately interpret a pie chart. And confirm that the colors or patterns are easily distinguished when printed in grayscale. If you use a legend or key, confirm that a reader will be able to identify the patterns or colors.

Take a moment to check your understanding of what we've just covered.

Practice: Pie Charts

Maps



Maps are also a form of visual display of data, in this case geographic, or spatial, data. Of course, you could display the same data on a table or bar chart, but maps are a much easier way of taking in spatial or geographic patterns. And, you may have too many geographic units to easily display on a chart.

Mapping in public health is still in its infancy for many assessment uses. This is changing and many public health offices are exploring the use of such data for a variety of purposes. Mapping is a particularly powerful tool for looking at clusters of diseases.

Look at this map. If the same data were displayed on a bar or column chart, there would be 39 separate data points, which would make for a very crowded chart. However, a bar chart does provide information on the exact rate and confidence intervals. The map allows us to quickly pick out the variation in rates by looking at its shading.

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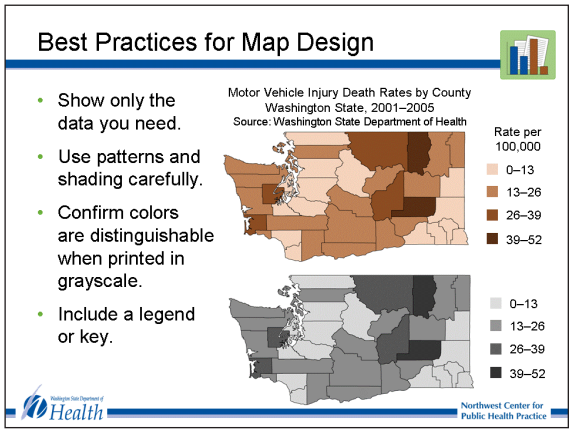
Best Practices for Map Design

When creating maps, remember to show only the data you need. Use patterns and shading carefully. Don't use the same color or pattern for more than one category on the map. And confirm that the colors are distinguishable when printed in grayscale. Finally, be sure to include a legend or key.

Take a moment to check your understanding of what we've just covered.



Practice: Maps

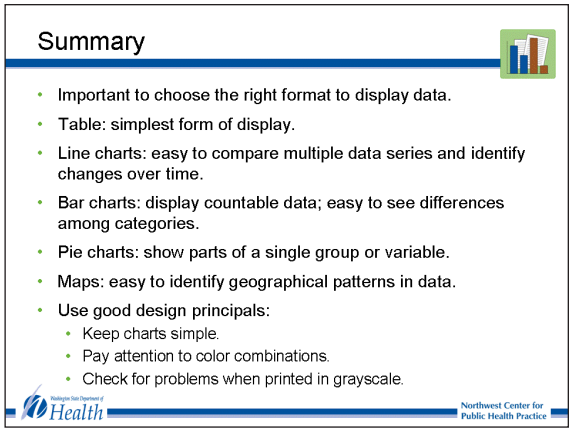
Summary

In summary, we've looked at a number of ways to display data.

It's important to choose the right format to present specific kinds of data. The simplest form of data display is the table.

But many times data can be displayed and interpreted much more easily in a chart or map. Line charts make it easy to compare multiple data series and identify changes over time.

Bar charts are used to display countable or categorical data, such as race or gender, and make it easy to see differences among the categories.



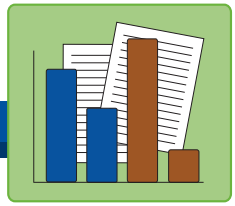
Pie charts are useful for showing the component parts of a single group or variable.

Maps are an excellent way to display geographic information, and make it easier to identify geographical patterns in data.

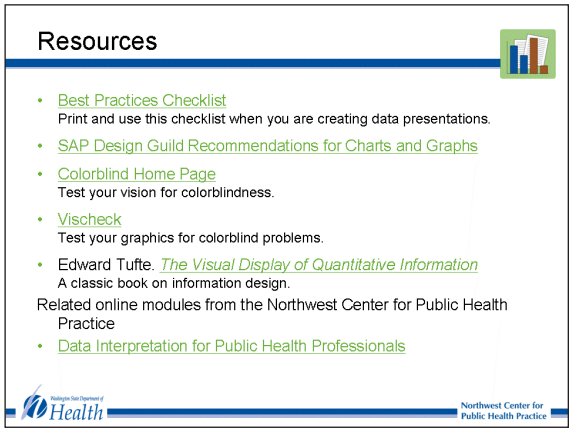
When designing graphs, remember to simplify as much as possible. Get rid of chart junk such as tick marks, grid lines, and 3-D styles. Especially keep in mind color combinations that are problems for color-blind people and the possible confusing results when printing or copying colors and shading in grayscale.

In the Attachments tab, above, you can find a convenient Good Design Checklist to print and use when you create graphs and charts.

Transcript



Resources



If you would like to learn more about the concepts in this module, you might want to explore some of the resources listed here.

Best Practices Checklist Print and use this checklist when you are creating data presentations. www.nwcphp.org/docs/bcda_mod4/best_practices_checklist.pdf

SAP Design Guild Recommendations for Charts and Graphics
www.sapdesignguild.org/resources/diagram_guidelines

Color-blind test colorvisiontesting.com

Vischeck. Check your images to see what they would look like to a person who is color-blind. www.vischeck.com

Edward Tufte. The Visual Display of Quantitative Information. A classic book on information design. www.edwardtufte.com/tufte/books_vdqi

Mapping tools

SaTScan www.satscan.org

ArcGIS www.esri.com/software/arcgis

Related online modules from the Northwest Center for Public Health Practice

Data Interpretation for Public Health Professionals www.nwcphp.org/data

Now, if you're ready, please go on to the final test.