Speaking about numbers is a common means of communicating quantitative information, whether a lecture in a classroom setting, a short speech to the general public, or a professional conference presentation. Many of the principles described throughout this book apply to speaking about numbers. However, there are a few important modifications that will improve your speeches about quantitative concepts or help you translate written documents into spoken form.

The first section of this chapter includes a quick overview of time and pacing, use of visual materials, and speaker's notes, with an emphasis on aspects of public speaking that pertain specifically to conveying quantitative information. The second section describes how to create slides for a speech, including text, tabular, and graphical slides and their applications. The third section explains how to write speaker's notes to accompany your slides, including my infamous "Vanna White" technique for succinctly but systematically describing a table or chart. The last section provides guidance on rehearsing your speech to make sure it is clear and fits within the allotted time. See also Fink (1995) for guidance on preparing slides, Montgomery (2003) for suggestions on speaking about scientific topics, and Miller (forthcoming) for additional issues related to speaking about multivariate analyses.

**CONSIDERATIONS FOR PUBLIC SPEAKING**

Three factors together determine how you will design and deliver a speech: your topic, your audience, and the time available to you. Leave out any of those elements as you plan and your talk will not be as successful. For example, the appropriate depth, pace, types of materials, and language for describing relationships between exercise and obesity are very different for a 5-minute presentation to your
child's fifth-grade class than for a 10-minute talk to the school board or a half-hour presentation to a panel of nutrition experts.

First identify the few key points you want your listeners to understand and remember, taking into account both your topic and audience. Then consider time and pacing before you design the visual materials and speaker's notes.

**Time and Pacing**

Most speeches have been allocated a specific amount of time, whether 5 minutes, 15 minutes, or an hour or longer. There are trade-offs between the length of time, the amount of material, and the pace at which you must speak. Reduce the range and depth of coverage rather than speeding up your delivery, especially for an audience that is not accustomed to quantitative information. Better to cut detail than to rush an explanation of your central points or fail to leave time for questions and discussion.

In contrast to when they read a written document, members of your listening audience all receive the material at the same rate — the pace at which you show the slides and explain them. During a speech, individuals cannot take extra time to examine a chart or table, or go back to reread an earlier point. Set the tempo to meet the needs of your typical listener rather than aiming to please either the least or most sophisticated members of your audience. Even for scientific audiences, avoid moving at too rapid a clip. If you present many different statistics in a short talk, the findings blur together and the purpose of each gets lost. Decide which results relate to your main objectives, then introduce and explain them accordingly.

**Visual Accompaniment**

For speeches of more than a few minutes, visual materials focus your audience's attention and provide a structure to your speech. Slides also help listeners recall facts or concepts to which you refer. In the absence of visual reminders, spoken numbers are easily forgotten, so if specific values are important, put them on a slide. This point is doubly true for comparisons, patterns, or calculations: even if you elect not to create slides for every facet of your talk, do provide charts and tables for your audience to follow as you describe key patterns or findings so they don't have to try to envision them as you speak.

A complete set of slides guides you through your material in a logical order and reminds you where you were if you stopped to answer questions from the audience. Some speakers like to create slides for
each component of their talk, mixing text slides for introductory, background, and concluding material with charts and tables of results. However, some speakers prefer a less formal approach, with slides only of essential tables and charts. Even if you use a comprehensive set of slides in some situations, you may want only selected slides in others. For example, although I usually create slides for the whole talk for short professional presentations, I rarely use that approach when teaching. I've found that putting every aspect of a lecture on slides discourages student participation, so I generally create slides only of tables, charts, or other diagrams that I plan to discuss. Working from a written outline or notes, I then introduce each topic, interweaving questions that require students to supply details from readings, describe patterns in the charts or tables, practice calculations, or provide illustrative anecdotes for the points under discussion.

To decide among these different approaches, consider the available time and your own experience, style, and desired extent of interaction with your audience.

**Speaker's Notes**

Effective slides reduce full sentences into short phrases and reduce complex tables and charts into simpler versions. Accompanying speaker's notes include full sentences and paragraphs to introduce, flesh out, and summarize the information on each slide, and to provide the wording of transitions between slides. For a "generalization, example, exception" (GEE) description of a chart or table, speaker's notes are a place to store clear, concise, well-organized descriptions that you have pretested on similar audiences. Notes can prompt you about which aspects of tables or graphs to emphasize. Perhaps most important, speaker's notes are a reminder *not* to simply read the material on your slide out loud — a truly deadening way to give a presentation. More detailed guidelines on writing speaker's notes are given below.

## SLIDES TO ACCOMPANY A SPEECH

Slides focus and direct your audience and display the facts and patterns mentioned in the speech. With the advent of computerized presentation software such as PowerPoint, it is easy to produce text, tabular and graphical slides, and accompanying speaker's notes. Such software automatically formats the material with large type, bullets, and other features that enhance readability and organization. Once
the slides have been created, it is simple to reorganize text within and across slides, adding or removing material to create longer or shorter versions of talks, or making other revisions. Depending upon available audiovisual equipment, these materials can be projected from a computer directly onto an auditorium screen, printed onto overhead transparencies or slides, or printed as paper handouts.

Recently, a backlash has emerged against the use of PowerPoint and other presentation software, stating that these programs have lead to inferior content and organization of slides, overreliance on fancy graphics, and substitution of rote reading of slides for other, more engaging means of presentation (Schwartz 2003). Used poorly, any tool — whether a hammer, paintbrush, or presentation software — can be used to produce substandard work. With appropriate training and good technique, however, these tools can help create exemplary results. Below are guidelines on how to create effective slides for a speech, whether or not you elect to use presentation software.

**Organizing Your Talk**

For a speech to an academic or professional audience, organize your talk with sections that parallel the sections of a scientific paper: an overview and introduction, review of the key literature, description of your data and methods, results, and conclusions. Below are illustrative slides for the sections of a scientific talk about racial/ethnic and socioeconomic differences in low birth weight based on the material in chapters 10 and 11. For a talk to a lay audience, devote less time to previous literature or data and methods, focusing instead on the purpose, results, and conclusions of your study.

**Introduction and Overview**

In the introduction, familiarize your audience with your topic: what are the main issues you will be investigating and why are they interesting and important? Incorporate some background statistics about the consequences of the issue under study (figure 12.1) or provide some figures on the frequency with which it occurs (figure 12.2).

For speeches of 20 minutes or more, consider starting with an overview slide which outlines the topics you will touch upon (figure 12.3).

**Literature review.** Unless you have half an hour or more for your speech, devote much less attention to reviewing the published literature on your topic than you would in a written description of the same study. Often you can incorporate a few important citations in
Consequences of Low Birth Weight

- Low birth weight (LBW) = 2,500 grams (or 5.5 pounds)

- LBW infants more likely to
  - die before their first birthday;
    - 24 times as likely as normal-weight infants to die in infancy.
  - have other health problems in
    - infancy,
    - childhood,
    - adulthood;
  - have developmental problems.

Figure 12.1. Introductory slide: Bulleted text on consequences of issue under study.

Incidence of LBW in the United States

- Levels (2000)
  - 7.6% of all U.S. births
  - 2x as high among blacks (13.0%) as whites (6.5%)

- Trends
  - Reducing % LBW a priority for Healthy People U.S. objectives
  - Stable for 20 years
    - Slight increase due to more multiple births
    - Racial difference also stable

Source: Martin et al. 2002

Figure 12.2. Introductory slide: Chart and text on incidence of issue under study
your introduction. If a comparison of individual articles is important, consider summarizing their key conclusions on your topic in tabular form (e.g., figure 12.4).

Data and Methods
Introduce your data, starting with the W’s (who, what, when, where, and how many), type of study design, response rates for your data sources (figure 12.5), and key variables (figure 12.6).

Break this material up onto several slides to make room for all those topics without creating a cluttered slide. Define your variables on one or more slides in the data and methods section. If you define them as you present the results, viewers tend to focus on the numeric findings rather than listening to how the variables were measured and defined.

Consider including a schematic diagram to illustrate how your variables are hypothesized to relate to one another (figure 12.7)—showing mediating or confounding relations, for example.

See below for guidelines about slides to present your results and conclusions.
### Previous Studies of Race & Birth Weight

<table>
<thead>
<tr>
<th>Article</th>
<th>Type of study &amp; data source</th>
<th>RR(^f) of LBW: black/white</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smith &amp; Jones (1999)</td>
<td>Sample survey; birth certificates</td>
<td>2.2*</td>
<td>Nationally representative; controlled education</td>
</tr>
<tr>
<td>Williams (2000)</td>
<td>Retrospective survey; maternal questionnaires</td>
<td>3.8*</td>
<td>Study in state X; no controls for SES</td>
</tr>
<tr>
<td>Travis et al. (1990)</td>
<td>Prospective study; medical records</td>
<td>1.5</td>
<td>Enrolled women in prenatal care clinics in NYC; low SES only</td>
</tr>
</tbody>
</table>

\(^f\) RR: Relative risk.
* denotes p < .05.

*Figure 12.4. Slide with tabular presentation of literature review*

---

### NHANES III Data

  - Nationally representative sample of United States
    - Oversample of Mexican Americans
  - Cross-sectional
  - Population-based
- N = 9,813

*Figure 12.5. Slide describing data source using text and a pie chart*
Variables

- Birth weight
  - Reported by mother at time of survey
  - Asked in pounds or grams
  - Also asked whether “low birth weight”
    - “Low” not defined on questionnaire
- Maternal smoking
  - Did she smoke cigarettes while pregnant?

- Socioeconomic status
  - Mother’s education (years)
    - % < high school education
  - Mother’s age at child’s birth (years)
    - % teen mother
  - Family income/poverty
    - Family income in $ compared against poverty line for family of same size and age composition
    - % poor

Figure 12.6. Slide describing major variables in the analysis

Relations among Race, SES, and LBW

Race

?  \rightarrow

Socioeconomic status (SES)

LBW

Figure 12.7. Slide with schematic diagram of hypothesized relationship among major variables in the analysis
General Guidelines for Slides

"KISS"

"Keep it simple, stupid," to reiterate one of the principles from chapter 2. Design each slide to concentrate on one or two major points, with title and content to match. Doing so divides your material into small, readily digestible chunks that are easier to organize into a logical, straightforward sequence. Simple, uncluttered slides have another advantage: each can be covered in a minute or two — a much better way to maintain your audience's attention than showing the same crowded slide for several minutes while you slog through each of its contents.

How Many Slides?

Figure on an average of one slide per minute, then err on the low side to avoid rushing and to permit time for questions or discussion. Although a simple text slide can often be covered in 30 seconds, those showing many specific facts or complex patterns may require several minutes apiece. If you are drafting a talk from a written document, start by creating one slide for each major paragraph or topic to be discussed. For short talks, be parsimonious in selecting what material to cover: A five-minute talk obviously cannot accommodate one slide for every paragraph and table in a 20-page document. Determine which parts of the paper are essential for introducing and answering the key points you have identified for your audience and time limit, then design slides accordingly.

Slide Formats

Like written documents, slides can include text, tables, graphs, diagrams, maps, and other types of graphical images. To enhance the visual appeal of your slides and introduce texture into your talk, vary the design of your slides to include a combination of these elements.

Slide Titles

Good titles guide listeners through your talk, introducing the specific purpose of each slide and orienting listeners to the different sections of the talk. To outline a new talk or revise an existing talk for a new audience, write the titles for each of your slides before you fill in the body of the slide. Give each slide a short, specific title to identify the objective or content of that particular slide. General titles such as "Introduction" or "Results" tend to be ignored if they are repeated for several consecutive slides. The title features prominently on each
slide — at the top in large type. Take advantage of that size and position: write informative titles! For instance, although the slides shown in figures 12.1 through 12.3 all comprise parts of the introduction, their titles clearly identify which facet of the introductory material is covered in the respective slides.

Some speakers like to title each slide with a concluding point or rhetorical question related to the slide contents. For example, the title to figure 12.2 could be replaced with “LBW Stable over Past Two Decades” or “Has LBW Declined over Time?” Alternatively, put a title such as “Incidence of LBW” on the slide, then paraphrase it into a concluding point or rhetorical question as you introduce the slide.

Text Slides

Text slides can be used throughout a presentation, as an outline (figure 12.3), in the introduction (figure 12.1), in the data and methods section (figure 12.6), and in the discussion and conclusions (figure 12.8). Text slides also work well to summarize a few key points from previous studies, state hypotheses, list major results, or provide an executive summary.

As you design each text slide, put vital numbers in a prominent

Conclusions

- Much of racial/ethnic difference in LBW due to SES:
  - Infants of color more likely to be low SES.
  - Low SES infants more likely to be LBW.
  - When SES taken into account, LBW differences narrow.
- Mexican American infants do better than expected despite low SES.
  - “Epidemiological paradox”

Figure 12.8. Text slide summarizing major study conclusions
position in large type, and make sure to report and explain them before they are used in any calculations or discussion. A NASA presentation about possible explanations of damage to the shuttle Columbia’s wing during its fatal flight placed critical numeric information in a footnote on the last slide where it was easily overlooked, making it hard to follow the logic of the investigation or understand its conclusions (Schwartz 2003).

Resist the urge to cut and paste sentences from a written document or speaker’s notes into your slides. Instead, simplify your paragraphs and sentences into bulleted text phrases, aiming for no more than six bullets per slide and no more than 6 to 10 words or numbers per bullet (Fink 1995). These guidelines force you to plan simple, focused slides, and enhance readability by permitting large type and ample white space.

**Bullets.** Create a separate bullet for each concept, definition, or fact. For a review of the previous literature, use bullets to organize material from different studies. To revise sentences into bulleted format:

- Include only the essential words from each sentence — nouns, verbs, adjectives, and adverbs.
- Look for commas or the words “and” or “or” to identify clauses or elements of a list, each of which can become its own bullet item.
- Substitute common mathematical symbols such as $<$, $>$, $=$, $\#$, or % for their equivalent phrases.
- Use arrows to convey directionality and causation.
- Eliminate most other words from the slide.
- Cast all bulleted points in the same syntax. If one is a sentence, make all sentences. Make all bullet points either active or passive, and use a consistent tense throughout. It’s much easier to take in and remember points conveyed in a consistent, predictable form.

After you have drafted a bulleted version of a sentence or paragraph, review it to see whether more words can be eliminated without loss of meaning, or if additional words are needed to maintain clarity.

**Indenting.** Use indenting to organize the material on a slide, presenting supporting facts or clusters of related information under one heading. In figure 12.6, socioeconomic status (SES) is one of several conceptual blocks of variables in the analysis. Indented below the bullet “socioeconomic status” is a list of the different SES measures,
Introduction

• "Low birth weight, which is defined as a weight of less than 2,500 grams or 5.5 pounds, is a widely recognized risk factor for infant mortality and a variety of other health and developmental problems through childhood and even into adulthood (Institute of Medicine, 1985).

• In 1999, U.S. infants born weighing less than 2,500 grams (5.5 pounds) were 24 times as likely as normal birth weight infants to die before their first birthday (Mathews, MacDorman, and Menacker, 2002).

Figur 12.9. Example of a poor introductory slide

with one variable per bullet. Indented yet again beneath each of the SES measures is the categorical version used in this study to indicate low SES.

Observe how these principles improve the introductory slide shown in figure 12.9.

Poor: Figure 12.9.

The slide includes the full text sentences from the introductory paragraph of the paper upon which the talk is based. Although each sentence is given its own bullet, the full sentences crowd the slide and encourage viewers to read rather than listen. The title of the slide describes its position in the talk but does not identify the contents or issues addressed.

Better: Figures 12.1 and 12.2.

This version includes the essential information from the "poor" version but is more succinct and better organized. The titles clue listeners into the specific topics and purposes of the slides. Clauses are broken into separate lines, with supporting information indented.

Full-sentences can be used in the accompanying speaker's notes. For an academic audience, mention citations in the bullets or as foot-
Data

- The data were taken from the 1988–1994 National Health and Nutrition Examination Survey (NHANES III), which is a cross-sectional, population-based, nationally representative sample survey of the United States. To allow for an adequate number of Mexican Americans to study separately, that group was oversampled in the NHANES III.

- Our study sample included 9,813 infants, including 3,733 non-Hispanic white infants, 2,968 non-Hispanic black infants, and 3,112 Mexican American infants.

**Figure 12.10. Example of a poor data slide**

notes. For lay audiences, omit citations except for public figures or widely recognized authorities (e.g., the Centers for Disease Control).

Another example, this time from the data and methods:

**Poor:** Figure 12.10

*Again, paragraphs are pasted directly from the paper onto a slide, resulting in an overcrowded slide that is difficult to read.*

**Better:** Figures 12.5 and 12.6.

*The information from figure 12.10 is broken up into manageable pieces. Racial composition of the sample is presented in a pie chart and the W's and other background information on the data source and variables for the analysis are organized using bullets and indenting.*

**Diagrams, Maps, or Graphic Images**

In many cases a picture is worth a thousand words — a particularly valuable saving in a timed speech. Schematic diagrams can help viewers understand hypothesized relationships among variables (e.g., figure 12.7), using different types of arrows to illustrate association and causation. Timelines can portray the sequence of events under study or illustrate the number and timing of data collection points in
a longitudinal study. If your topic has an important geographic component, include one or more maps to present statistics such as population density or pollution levels for each area, or to show where the sites you discuss are located relative to hospitals, rail lines, or other features that pertain to your research question. Photographs of people or places can provide a richness difficult to capture in words.

Charts and Tables

Use slides with tables, charts, or other graphical material in both brief, general speeches and longer, in-depth presentations. Simple tables of numeric results work well for both scientific and general audiences. For a scientific talk, a table that organizes and compares key previous literature on your topic can be very effective (e.g., figure 12.4).

Adapting tables and charts for slides. Rather than using tables or charts that were designed for a written document, adapt them to suit a slide format. If your table or chart includes information on more than a few variables, it is impossible to discuss all the patterns simultaneously, so don't ask your viewers to ignore most of a large table or complex chart while you describe one portion. Instead, create two or more slides with simpler tables or charts, each of which includes only the information needed for one comparison. Although many publishers set limits on the number of charts or tables in a published document, such restrictions don't affect speeches, so take advantage of that flexibility by creating chart and table slides that focus on one or two straightforward relationships apiece.

First, identify the different patterns you plan to discuss from a given table or chart, then design simplified versions that focus on one or two major points (or one GEE) apiece.

Poor: Figure 12.11

The type for the table, which was copied and pasted directly from a typed document, is far too small for a slide. To describe the many patterns on this slide, you would have to ask viewers to wade through a lot of microscopic numbers and labels to find the three numbers that pertain to each comparison. E.g., "The second row of numbers shows the percentage of low birth weight births in each racial/ethnic group . . ." [Description of that pattern.] [Then] "The fourth row of numbers shows the percentage of mothers in each racial/ethnic group who gave birth as teenagers," etc.
Results

Birth weight, socioeconomic characteristics, and smoking behavior by race/ethnicity, United States, 1988–1994

<table>
<thead>
<tr>
<th></th>
<th>Non-Hispanic white (N = 3,733)</th>
<th>Non-Hispanic black (N = 2,968)</th>
<th>Mexican American (N = 3,112)</th>
<th>All racial/ethnic groups (N = 9,813)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Birth weight</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (grams)</td>
<td>3,426.8</td>
<td>3,181.3</td>
<td>3,357.3</td>
<td>3,379.2</td>
</tr>
<tr>
<td>% Low birth weight</td>
<td>5.8</td>
<td>11.3</td>
<td>7.0</td>
<td>6.8</td>
</tr>
<tr>
<td><strong>Socioeconomic characteristics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mother’s age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (years)</td>
<td>26.6</td>
<td>24.2</td>
<td>24.9</td>
<td>26.0</td>
</tr>
<tr>
<td>% Teen mother</td>
<td>9.4</td>
<td>22.9</td>
<td>18.4</td>
<td>12.5</td>
</tr>
<tr>
<td>Mother’s education</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (years)</td>
<td>13.3</td>
<td>11.9</td>
<td>9.1</td>
<td>12.6</td>
</tr>
<tr>
<td>% &lt; High school</td>
<td>14.7</td>
<td>30.1</td>
<td>58.4</td>
<td>21.6</td>
</tr>
<tr>
<td>% High school</td>
<td>54.9</td>
<td>41.7</td>
<td>24.5</td>
<td>35.0</td>
</tr>
<tr>
<td>Income/needs ratio</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>2.60</td>
<td>1.39</td>
<td>1.34</td>
<td>2.28</td>
</tr>
<tr>
<td>% Poor</td>
<td>14.7</td>
<td>48.5</td>
<td>50.7</td>
<td>23.9</td>
</tr>
<tr>
<td><strong>Health behavior</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Mother smoked while pregnant</td>
<td>26.8</td>
<td>22.9</td>
<td>10.1</td>
<td>24.5</td>
</tr>
</tbody>
</table>

*Figure 12.11. Example of a poor results slide using a table directly from the paper.*


**Better:** Figures 12.12, 12.13 and 12.14

The table from the poor version has been transformed into three separate slides, each of which presents data for one aspect of the story. Although this approach results in more slides, it takes no longer to describe because the amount of material is unchanged. It may even save time, because less guidance is needed to find the pertinent numbers for each comparison. The title of each slide names the variables or relationships in question. Speaker’s notes would introduce each slide by identifying the role of the variables before describing the pattern and the findings on the topic at hand.

- Figure 12.12 uses a simple bar chart to show how the outcome — low birth weight — varies by race and ethnicity.
- Figure 12.13 shows how the three socioeconomic variables each relate to race/ethnicity. To facilitate a “generalization, example, exceptions” (GEE) summary, those patterns are presented in one clustered bar chart rather than as three different bar charts each on a separate slide.
Figure 12.12. Results slide: Simple bar chart created from part of a statistical table.

Figure 12.13. Results slide: A clustered bar chart created from part of a statistical table.
Maternal Smoking by Race/Ethnicity

<table>
<thead>
<tr>
<th></th>
<th>Smoked cigarettes (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic white</td>
<td>26.8</td>
</tr>
<tr>
<td>Non-Hispanic black</td>
<td>22.9</td>
</tr>
<tr>
<td>Mexican American</td>
<td>10.1</td>
</tr>
</tbody>
</table>

Figure 12.14. Results slide: A simple table created from part of a larger table.

- To emphasize that smoking is a behavior, not a socioeconomic variable, statistics on racial patterns in maternal smoking are shown on a separate slide (figure 12.14). Although figure 12.14 presents the smoking pattern in tabular form, if I were presenting the material in an actual talk, I would replace the table with a bar chart. Why? Once you have introduced your audience to a certain format — in this case a bar chart — save time and minimize confusion by reusing that format throughout the talk whenever suitable.

Mixed-Format Slides

If your charts or tables are fairly clear-cut (e.g., a 2-by-2 table, or a pie, single-line, or simple bar chart), consider a “chartbook” layout: a table, chart, or other image occupies one side of the slide, with bulleted text annotations on the other side (e.g., figure 12.2 or figure 12.5). Put more complicated tables or charts alone on a slide, then describe the pattern in your speaker’s notes or make an additional slide with a short written summary.
Design Considerations

Substance over Style

Don't give in to the temptation to let the features available in presentation software packages carry your show. Fancy, multicolored background designs, animated text, or sound effects might impress your audience for a moment or two, but if they distract from your story line or substitute for correct, clearly presented material, they will do more harm than good. Whatever time you put into creating a dog-and-pony show is taken away from selecting and organizing the information and writing a clear narrative.

Focus on the substance, not the style, of the slides. First, get the content and organization right, just as you would for a written description of the same material. After you have practiced and revised your talk (see below), consider adding a bit of color or animation only if they enhance your presentation.

Color

That said, judicious use of color can enhance communication appreciably, giving you another tool for conveying information. For instance, color all of the statistically significant findings in tables or text slides red, leaving nonsignificant effects in a neutral shade. Once you have explained that color convention, your viewers will quickly be able to ascertain results of all your statistical tests without further explanation.

Use a consistent color scheme for all charts within a talk. If the Northeast is represented in green in a pie chart illustrating sample composition, for example, use green for the Northeast in all subsequent charts (whether pie, bar, or line charts) that compare patterns across regions.

A caution about creating handouts from color slides: some color combinations and lighter colors do not reproduce well in grayscale — the typical color scheme for photocopied handouts. To make sure the handouts convey the same information as the projected slides, follow the guidelines in chapter 7 about using color in charts, then review them in black and white on-screen or in print before making copies. Or if your budget and equipment permit, make color handouts.

Type Size

Use a legible font in a large type size on all slides — at least 18 point type — and avoid fussy calligraphic fonts. For your slides to
be of value, they must be readable in the back row. If you aren’t sure about the size of the room in which you’ll be speaking, err on the generous side when you select your type size (see Zelazny 2001 for specific guidelines). If material you had planned for a single slide will fit only if you use small type, divide that material across several slides until the contents can be displayed with readable type. Ditto for words used to label charts and tables. Even with large type, slides can be difficult to read from the rear of a large auditorium. For such situations, consider printing handouts of your slides; some presentation software can print several slides per page with space for listeners to take notes.

Symbols and Annotations
As you adapt charts or tables for your slides, omit any features such as symbols, reference lines, or other annotations that you don’t explain or refer to during your speech. Unless you mention them, they distract your viewers and clutter the slide. Conversely, you may want to add symbols to charts and tables as you modify them for use on slides. For example, your audience won’t have time to digest detailed standard errors or test-statistics during your talk, so replace them with symbols for $p < 0.05$ or $p < 0.01$ to save space and reduce the amount of data on the slide.\footnote{Include footnotes or legends to explain the symbols.}

\section*{Writing Speaker’s Notes}
Having created slides that present the essential textual and graphical elements of your talk, write speaker’s notes to fill in the details and transitions among slides. Although you can draw heavily on the content and organization of a full paper or book when formulating these notes, avoid recycling large blocks of text in your speech. Rarely will you have time to read an entire paper in the time available. Even if time permits, reading a document out loud is a poor substitute for a speech.

\textbf{Speaker’s Notes to Suit Your Style}
The notes can be adapted to suit your speaking style and level of experience. If you are a novice, are uncomfortable inventing sentences in front of an audience, or have a tendency to be long-winded, you may do best with a full script. The wording for such notes can be
pirated largely from the corresponding written paper or article, cut-
ting some of the detail (such as citations) and rephrasing into the first
person. For figure 12.5, a script might read:

"We used data from the 1988–1994 National Health and
Nutrition Examination Survey, also known as NHANES III,
which is a cross-sectional, population-based, nationally
representative sample of the United States. To allow for an
adequate number of Mexican Americans to study separately,
that group was oversampled in the NHANES III. We excluded
infants of racial and ethnic groups not shown on this slide
because we did not want to group them with any of these
three groups and there were not enough of them to analyze as
a distinct group. As shown in the pie chart, our study sample
comprised nearly ten thousand infants, approximately equally
distributed among the three racial/ethnic groups studied."

If you are at ease speaking extemporaneously and are able to keep
yourself on schedule, you may need only a list of additional points to
make or items to underscore. For the same slide, such notes might read:

"To allow for an adequate number of Mexican Americans to study
separately, that group was oversampled in the NHANES III."

"As shown in the pie chart, our study sample comprised
approximately equal numbers of the three racial/ethnic
groups studied."

Before reading those notes, restate the information in the title and
bullets into two or three complete sentences. Using selected re-
minders takes more practice than working from notes that comprise
the full speech because you must remember where each typed note
fits within the overall description of each slide. Key your notes to
your slides to coordinate the spoken and visual components of your
speech. Some presentation software programs allow you to type
speaker's notes for each individual slide. If you write your notes
longhand or in a word processor, write the number of the slide, table,
or chart in the margin next to the associated text to remind yourself
when to change slides. Do yourself a favor and print your speaker's
notes in large type so you won't have to squint to read them as you de-
deliver your speech.
Explaining a Chart “Live”

Tables, charts, maps, and other diagrams offer real advantages for presenting numeric patterns. Unfortunately, many speakers devote far too little time to describing such slides. They put up the slide, state “as you can see, . . .” and then describe the pattern in a few seconds before moving on to the next slide. As the slide disappears, many listeners are still trying to locate the numbers or pattern in question and have not had time to digest the meaning of the statistics. This disease plagues rookie and veteran speakers alike: Beginners may not want to spend very long on a chart out of fear that they will run out of time (or because they just want to get their talks over with). Experts forget that not everyone is conversant with their chart or table layouts or may be too uppity to explain such rudiments.

Although it may appear to save time, failing to orient your listeners to your charts or diagrams reduces the effectiveness of your talk. If you designed the chart and wrote the accompanying talk, you know it well enough to home in quickly on the exact number or table cell or trend line you wish to discuss. Give your audience the same advantage by showing them where to find your numbers and what questions they address before you report and interpret patterns.

*Steps to Explaining a Chart or Table*

Follow these three steps to explain a chart or table in a speech.

*Introduce the topic.* First, state the topic or purpose of the table or chart, just as you do in the introductory sentence of a written paragraph. Rather than reading the title from the slide, paraphrase it into a full sentence or rephrase it as a rhetorical question. For figure 12.13:

“This slide examines racial and ethnic patterns in each of three indicators of low socioeconomic status. In other words, ‘Does socioeconomic status vary by race?’”

*Explain the layout.* Second, explain the layout of the table or chart. Don’t discuss any numbers, patterns, or contrasts yet. Just give your audience a chance to digest what is where. For a table, name what is in the columns and rows. For a chart, identify the concepts and units on the different axes and in the legend, mentioning the color or shading of bars or line styles that correspond to each major group you will discuss. For maps or other diagrams, point out the location of different features and explain the meaning of legend items or other elements such as arrows, symbols, or scales.
Use a "Vanna White"\textsuperscript{2} approach as you explain the layout, literally pointing out the applicable portion of the table or chart as you mention it. Point with a laser pointer, pen, or finger — it doesn't matter. The important thing is to lead your viewers' eyes across the key features of the slide before reporting or interpreting the information found there. At first this may seem silly or awkward, but most audiences follow and retain the subsequent description much more easily than if you omit the guided tour.

Below, I use bracketed comments to describe the Vanna White motions that accompany the surrounding script; they are there to guide you, not to be spoken as part of the presentation. For figure 12.13:

"Across the bottom [wave horizontally at the x axis], there is one cluster for each of the three socioeconomic characteristics — teen motherhood, incomplete high school, and poverty [point quickly at each label in turn]. Each racial/ethnic group [point to the legend] is displayed with a different color bar, and the height of a bar [gesture vertically along the y axis] shows the percentage of that racial or ethnic group with the associated characteristic."

In the next step, you will give a specific example and introduce the bar colors for each subgroup. For lay audiences, "x axis" and "y axis" may be fuzzily recalled jargon. Instead, use phrases like "across the bottom" or "on the vertical axis," respectively.

If you are explaining a chart with more than three or four nominal variables or categories, mention the organizing principle you have used rather than simply naming each of the categories. As always, coordinate the narrative with the layout of the chart.

"In figure 7.6, the different AIDS transmission topics are shown on the horizontal axis [point] grouped into "likely" modes on the left [wave at that group of clusters] and "unlikely" modes on the right [gesture]. Within those groupings, the topics are arranged in descending order of average score [wave along the tops of the bars within one group of clusters]."

Describe the patterns. Finally, having introduced your audience to the purpose and layout of the table or chart, proceed to describe the patterns it embodies. Use the GEE approach, starting with a general descriptive sentence followed by specific numeric examples and exceptions (where pertinent). Again, gesture to show comparisons and point to identify specific values, naming the associated colors or
shading schemes for each group the first time you mention it, as shown in the following description of figure 12.13.

"Regardless of which dimension of socioeconomic status we examine, non-Hispanic black infants, illustrated with the black bar, and Mexican American infants — the dark gray bar [point at legend] — are far more likely than their non-Hispanic white counterparts, in light gray [point at legend element], to be born into low SES families. The black and dark gray bars are higher than the light gray bar in each of the three clusters. For example [gesture at the right-most cluster], infants of color are more than three times as likely to be poor as their white counterparts [point to the respective bars as you mention them]."

As you describe your charts, tables, or other graphics, point to and explain any features such as reference lines or regions, symbols, colors, or other annotations. For example,

"As you can see, recessions, which encompass the years in the gray-shaded bands in figure 7.13 [gesture at the range of shaded dates], coincided with a notable increase in poverty [wave along the line showing the trend in poverty]."

"In table YYY, relationships that were statistically significant at \( p < 0.05 \) are shown in orange and are marked with asterisks [point to the footnote on the slide that defines the asterisk]. For example, the difference in average math scores between boys and girls was statistically significant [point to pertinent cells], but most other comparisons in the table were not."

Until you are confident that you can recall your Vanna White description, include it in your speaker’s notes, either in full sentences or as circles and arrows on a hardcopy of the chart, numbered to help you recall the order in which you plan to explain each feature.

**PRACTICE, PRACTICE, PRACTICE**

After you have drafted your slides and accompanying notes, practice your presentation, first alone and then with a test audience. If someone else wrote the speech and made the slides, all the more reason to review and practice. Rehearsal is particularly important for slides involving tables or charts, which are usually more complex than simple text slides. Likewise for slides explaining methods, es-
especially if you have not worked previously with those methods or explained them to a similar audience.

Time how long the entire talk takes, anticipating that you will become somewhat faster with practice (and adrenaline). If you will be using a Vanna White approach, rehearse speaking and gesturing at the associated chart until you are comfortable coordinating those two actions. Evaluate the order in which you’ve covered the material, making sure you define terms, acronyms, and symbols before you use them and that your results are in a logical order with good transitions to convey where they fit in the overall story.

If you exceeded the allotted time by more than a minute or two, identify which sections were too long and assess what can be condensed or eliminated. Some sections will require more time than others, so you may have to omit detail or simplify explanations in other parts of your talk, taking into account what your audience knows (and needs to know). If you finished well under time, think about where additional material or explanation would be most useful. If you were under time but rushed your delivery, slow down.

Revise the coverage, level of detail, and order of material to reflect what you learned from your dry run. If you make substantial revisions, practice on your own again before you enlist a test audience. To assist yourself in pacing your talk, insert reminders in your speaker’s notes to indicate where you should be at certain time points so you can speed up or slow down as necessary during your talk.

**Dress Rehearsal**

Once you have a draft of slides and notes that you are comfortable with, rehearse your talk in front of a colleague or friend who represents your audience well in terms of familiarity with your topic, data, and methods of analysis. If you differ substantially from your prospective listeners on those dimensions, it is difficult to “put yourself in their shoes” to identify potential points of confusion. A fresh set of eyes and ears will be more likely to notice such issues than someone who is jaded from working closely with the material while writing the paper or drafting the slides and talk.

*Elements to Listen For*

Before you begin your dress rehearsal, ask your guinea pig audience to make notes on the following aspects of your talk:

- Were the objectives of your talk plainly identified?
• Were the purpose and interpretation of your numeric examples evident?
• Were your definitions of terms and concepts easy to grasp? Did you define terms before you used them?
• Did you use jargon that could be replaced by terms more familiar to this audience?
• Were your descriptions of tables or charts clear and not too rushed? Was it easy to see where your numeric examples came from in those tables or charts? To follow the patterns you described?
• If you were over time, what material could be omitted or explained more briefly? If under time, where would more information or time be most beneficial?
• Was the amount of time for each section about right? If not, which sections need more or less emphasis?

Go over your reviewer's comments with them, then revise your talk and slides accordingly. Practice yet again if you make appreciable changes.

CHECKLIST FOR SPEAKING ABOUT NUMBERS

Before you plan your speech, consider your topic, audience, and amount of time, pacing the talk for the average listener and allowing time for questions and discussion.

• Slide format and content: adapt material from your paper, following the same sequence of major topics.
  For a scientific audience, include an introduction, literature review, data and methods, results, discussion, and conclusions.
  For lay audiences, omit the literature review and condense the data and methods.
  Write a simple, specific title for each slide.
  Replace full sentences with bullets.
  Simplify tables and charts to focus on one major question per slide.
  Create no more than one slide per minute, fewer if slides involve tables or charts.

• Speaker's notes: decide whether you need a full script or selected notes. In either case, follow these steps:
  Write an introductory sentence.
Note aspects of the slide you want to emphasize.
Include analogies or examples you use to flesh out the material.
Write a Vanna White description of charts or tables.
- Paraphrase the purpose of the slide.
- Explain the layout of the table (contents of rows and columns) or chart (axes, legend), with notes about which elements to point to for each sentence.
- Describe the pattern, listing which illustrative numbers you will point to as you speak.
Write a summary sentence.
Insert a transition to the next slide.

- Other design considerations:
  Use at least 18 point type for titles and text; smaller for footnotes.
  Consider using color to emphasize selected points or terms, or to indicate statistical significance.
- Rehearsing your talk. First alone, then with a critic familiar with your intended audience, evaluate the following:
  Order and relative emphasis of topics
  Definitions of terms
  Level of detail
  Introductions and explanations of charts and tables
  Coordination of spoken and visual materials
  Time to complete the talk