

# 12

## Speaking about Numbers

### SOLUTIONS

1. Slides for material in box 11.1.

### Annotated example of good writing

- Article from front section of *New York Times*
  - “First Tower to Fall Was Hit at Higher Speed, Study Finds”
    - E. Lipton and J. Glanz (2/23/02)
- Tailoring to the audience and objectives
  - An educated lay audience
  - Two-page article

Figure 12A.

## Airplane speed

- “The FBI said the government’s analysis put the speeds at 586 m.p.h for the United flight and 494 m.p.h. for the American one.”  
—*Basic principle: Report numbers.*
- “In both cases, the planes were flying much faster than they should have been at that altitude; the aviation agency’s limit below 10,000 feet is 287 m.p.h.”  
—*Basic principle: Compare against a standard to help interpret number.*

Figure 12B.

## Energy and impact of planes

- “The energy of motion carried by any object, called the kinetic energy, varies as the square of its velocity, so even modest differences in speed can translate into large variations in what the building had to absorb.”  
—*Basic principle: Define concepts using simple wording.*
- “That means that while the United jet was traveling only about a quarter faster than the American jet, it would have released about 50 percent more energy on impact.”  
—*Tool: Relative difference and % difference calculations*

Figure 12C.

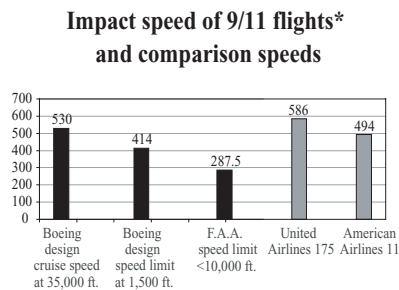
## Just how much energy is that?

- “Even at a speed of only about 500 m.p.h., a partly loaded Boeing 767 weighing 132 tons would have created about three billion joules of energy at impact, the equivalent of three-quarters of a ton of T.N.T.”

—*Basic principle: Interpret numbers and relate them to familiar quantities.*

Figure 12D.

## How did speeds compare to design limits?



- Uses a bar chart to illustrate speed of planes relative to important benchmarks.  
—*Basic principle: Choose the right tools.*
- Describe patterns in chart by pointing out that planes' speeds exceeded design limits.  
—*Basic principle: Compare against meaningful cutoffs.*

Figure 12E.

## Why do design limits matter?

- “Such speeds threatened the structural integrity of the planes even before they struck the buildings, because the lower the plane goes, the thicker the air becomes, so the slower the plane must travel to avoid excessive stress.”

—*Basic principle: Explain complex concepts in simple terms.*

- In this case, explain principles of physics.

Figure 12F.

## Authors’ use of tools and principles

- Explained complex ideas without (much) jargon.
  - Energy on impact
  - Effect of altitude on stress
- Compared against
  - Useful benchmarks
    - FAA speed limit
    - Design speed limit
  - Familiar examples
    - TNT
- Used appropriate tools.
  - Chart to show relative speed
  - Prose
    - Reports a few numbers.
    - Explains patterns.
    - Defines terms.
  - Types of quantitative comparisons
    - Absolute difference
    - Relative difference
    - Percentage difference

Figure 12G.

3. Slides for a scientific audience.

## CESD scale

- Center for Epidemiological Studies Depression (CESD) Scale
  - Developed by National Institute of Mental Health (NIMH)
- 20 items on frequency of symptoms in past week
  - Each scaled from 0 (“rarely or none of the time”) to 3 (“almost or all of the time”).
- Very good internal consistency
  - $\alpha = 0.85$  for the general population
  - $\alpha = 0.90$  for a psychiatric population

Source: Radloff 1977.

**Figure 12H.**

## Factors within the CESD scale

- Four separate factors
  - Depressive affect
  - Somatic symptoms
  - Positive affect
  - Interpersonal relations

**Figure 12I.**

5. “Vanna White” notes to tables and charts.
- a. “Table 6.1 shows the distribution of households by type of household, race, and ethnic origin in the United States in 1997. Households are divided into family and nonfamily households, shown in the

middle and right-hand sections of the table. The racial distribution of all households is in the leftmost column of numbers. All numbers are reported in units of thousands, meaning that there are 102 million households when all races and household types are combined. Distributions of household types are also broken out separately by race and Hispanic origin—shown in the rows.” [Then point out the modal household type and how it compares to other household types of interest, overall, and by race.]

- b. “The distribution of federal outlays by major function in the United States in 2000 is shown in figure 7.2b.” [Define the slices and point out their respective colors in the pie or legend as you describe the relative shares of the outlay categories, as in the answer to question 1, chapter 11.]
- c. “Figure 7.5a shows how the relative chances of emergency room use among asthmatic children varied by family income and race in the United States in 1991. Income groups (poor, near poor, and non-poor) are arranged from left to right along the horizontal axis [wave along the axis]. There is a different color bar for each racial group—black for black children and gray for non-black children [point at legend or one cluster of bars]. The heights of the bars show the relative chances of emergency room use for asthma, compared to non-poor, non-black children (the reference category) [point at pertinent bar].” [Then describe the patterns by race and by income as in appendix A.]
- d. “The age pattern of death rates in the United States in 1996 is shown in figure 7.15b. Age is grouped into five-year age categories across the x-axis. Death rates are shown on a logarithmic scale on the y-axis, measured in number of deaths per 100,000 persons in the pertinent age group. The logarithmic scale is used to allow a wide range of death rates to be shown on a single graph without obscuring differences at the low end of the range. [For a lay audience, add] That means that the distance between successive marks on the y-axis corresponds to a 10-fold increase in death rates. For example, death rates increase by nearly a multiple of 10 between the age groups 20–24 and 50–59 (from 101.3 deaths per 100,000 persons to 851.3 per 100,000). Death rates increase by another factor of 10 between the age groups 50–59 and 80–84 years.” [Then go on to describe the J-shaped pattern, as in the answer to question 3 from chapter 9.]