15

Speaking about Numbers

SOLUTIONS

1. Slides for a presentation about the physical impact of the planes on the Twin Towers (box 16.2).

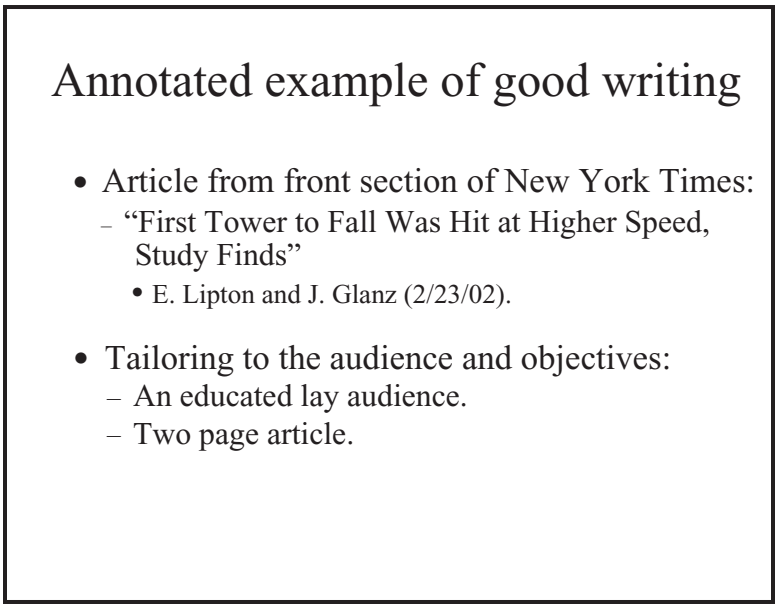


Figure 15A.

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 15B.

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.*

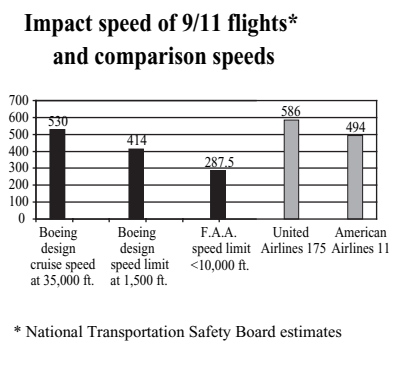
Figure 15C.

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 15D.

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 15E.

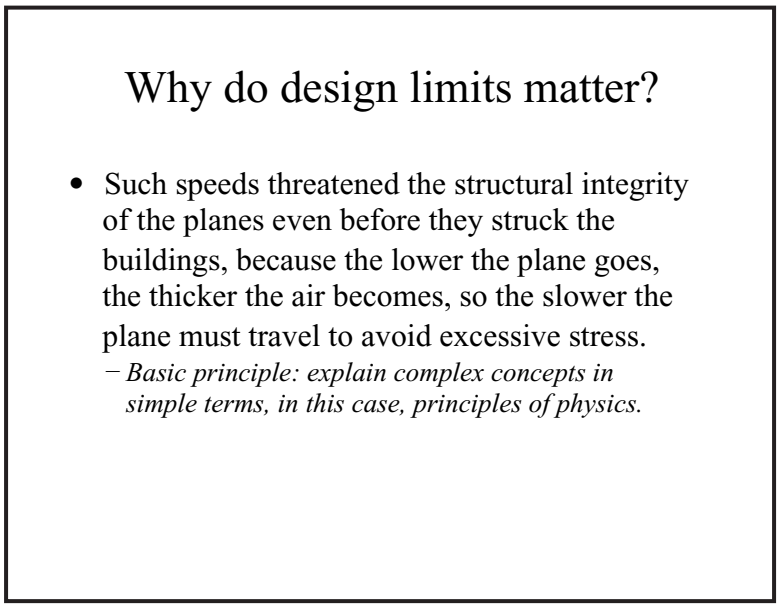


Figure 15F.

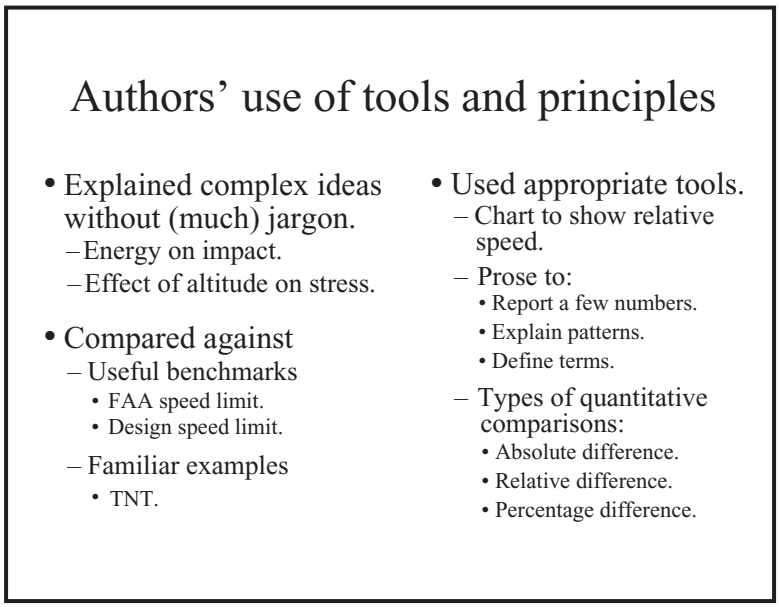


Figure 15G.

3. Slides about data and methods regarding CES-D scale for a scientific audience.

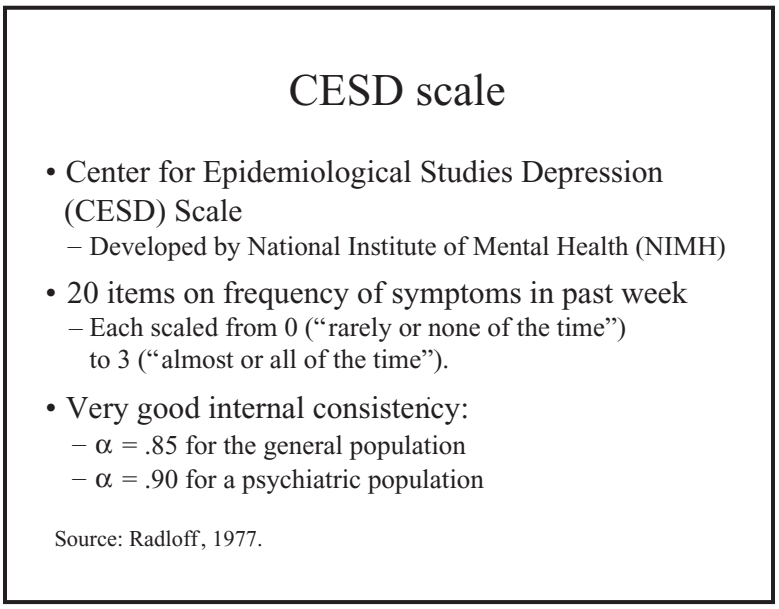


Figure 15H.

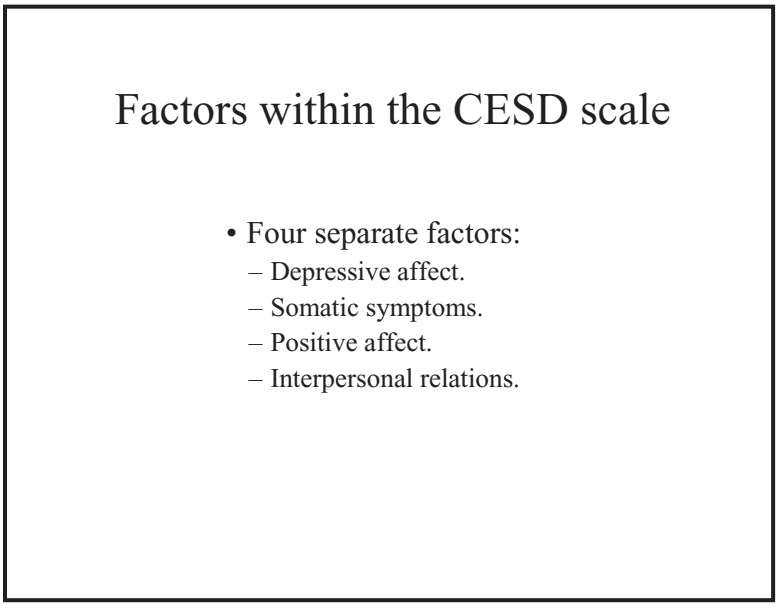


Figure 15I.

5. Vanna White notes, and GEE approach where appropriate
   a. "Figure 6.8 illustrates how the chances of disenrolling from the State Children's Health Insurance Program vary by reason and demographic factors, based on a set of competing risks models controlling for all variables shown in the chart. Demographic factors are arrayed across the *x* axis [wave horizontally]. Each cluster [point to one] shows how that factor is associated with each of the three possible reasons for disenrollment, with other insurance shown in gray, other government program in white, and nonpayment in black [point at respective bars]. The log-odds of disenrollment are shown on the *y* axis [wave vertically]. Bars that drop below the line at $y = 0.0$ represent lower odds than in the reference category, while those above the line represent higher odds." (Describe the pattern as in the description of figure 6.8 in chapter 6, *Writing about Multivariate Analysis,* 131–33.)
   b. "The distribution of federal outlays by major function in the United States in 2000 is shown in figure 6.2b. Human resources (the black wedge [point]) comprised by far the largest single category of federal outlays (61% of the $1.8 trillion spent that year). The second largest category—national defense (dotted)—accounted for only about one quarter as much as human resources (16% of the total). Net interest, physical resources, and other functions together amounted for the remaining 23% of total outlays [point to each wedge as you mention its category]."
   c. "The predicted pattern of birth weight by race/ethnicity and income-to-poverty ratio (or "IPR") is shown in figure 6.12. The results are based on a multivariate model with controls for gender, mother's age, educational attainment, and smoking status. The *x* axis shows the IPR, ranging from 0 to 4 times the poverty line [wave across horizontal axis]. There are separate lines for each of the racial/ethnic groups—the solid line for non-Hispanic whites, the dotted line with triangles for Mexican Americans, and the dashed line with squares for non-Hispanic blacks [point at each in turn, top to bottom on the left-hand side of the *x* axis]. Predicted birth weight in grams is shown on the *y* axis [wave vertically].

      "Non-Hispanic black infants have considerably lower mean birth weight than the other two groups across the income range [gesture left to right across the line for blacks]. Although Mexican Americans weigh more than whites below the poverty line [gesture from IPR = 0 to 1], for groups with incomes above the poverty line, Mexican Americans weigh less than whites [gesture horizontally at Mexican American line from IPR = 1 to 4]."
   d. "Table 7.1 shows poverty rates for the U.S. in 1992 under different poverty definitions, for the overall population and several age and racial groups in the rows [gesture at the row labels]. The leftmost column of numbers [point to 'Current' column label] is the poverty rate under the current poverty definition, while the next two columns to the right [point to 'Proposed measure' column labels] show poverty rates under two alternative definitions. The rightmost two columns [point to 'Percentage point change' column label] show the percentage point change in the poverty rate between each of the two alternative definitions and the current definition." [Note: Explain the alternative poverty definitions on a previous slide, as viewers will focus

on the results when presented with the table. Remove the footnote from the slide of this table and turn it into a text slide to precede the table slide.]

"Under either of the proposed alternative definitions, the poverty rate is several percentage points higher than under the current definition. For example, the overall poverty rate would increase by 3.6 points under alternative definition 1 and 4.5 points under alternative definition 2 [point to pertinent cells in 'Total population' row]. Differences for some subgroups are quite small. For example, the poverty rate for the elderly would be projected to increase by only 1.7 percentage points under alternative 1. For other groups, such as Hispanics, the projected increases are considerably larger: 10.6 points [point to pertinent cell]."

e. "Table 9.2 shows the predicted differences in birth weight by race/ethnicity and mother's educational attainment based on the results of model B in table 9.1. Racial/ethnic groups are arrayed in the columns [name them and point to associated columns in turn], and educational attainment is shown in increasing order in the rows [name them and gesture down the rows]. The number in each cell shows the difference in predicted birth weight (grams) between the pertinent group and non-Hispanic whites with at least some college, which is the reference category from the multivariate model." (Describe the pattern as in statement 2 of box 14.2b, *Writing about Multivariate Analysis,* 339.)

7. Slides to present results of Yonkers Residential Mobility Program evaluation (Fauth et al. 2004).
   a. Slides demonstrating why a multivariate model is needed.

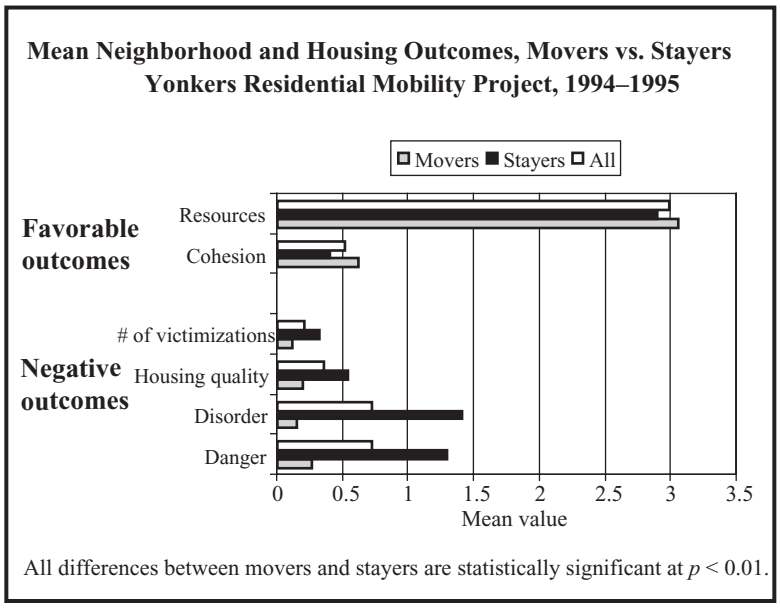
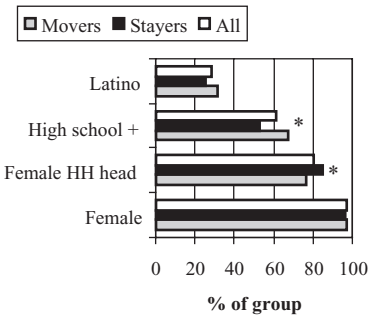


Figure 15J.

Demographic Characteristics of Movers vs. Stayers Yonkers Residential Mobility Project, 1994–1995



- Movers were more likely than stayers to be
  - High school graduates
  - From two-parent households
- Movers were also on average
  - Older
  - In households with fewer children
- No difference in gender or racial composition of movers vs. stayers

* Difference between movers and stayers statistically significant at $p < 0.05$.

Figure 15K.

Summary of Bivariate Findings

- Each of the six neighborhood and housing outcomes differs for movers versus stayers.
- Four of the six demographic characteristics also differ for movers versus stayers.
  - Movers have demographic characteristics associated with more favorable neighborhood and housing outcomes.
- Multivariate models are needed to assess the effects of the residential mobility program net of the effects of confounding demographic factors.
  - One model for each of the six neighborhood or housing outcomes
  - Controls for age, education, household headship, and # kids

Figure 15L.

7b. Slides presenting multivariate model results.

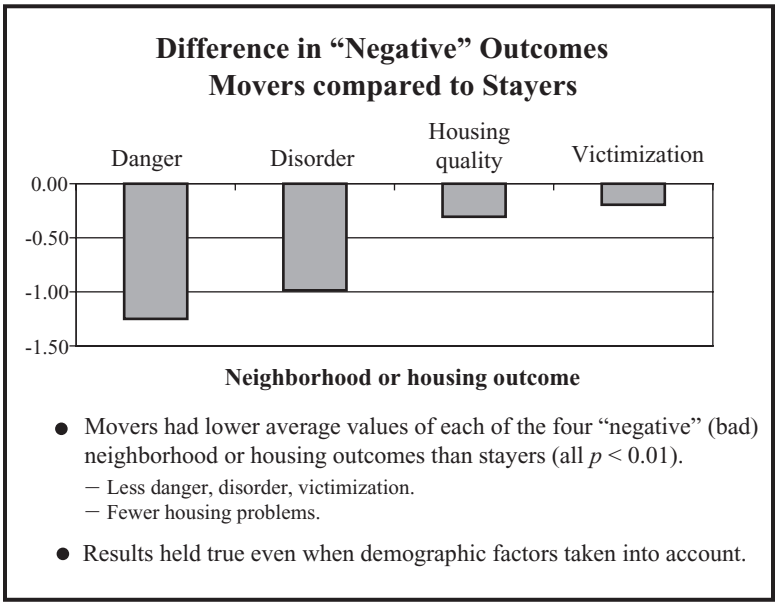


Figure 15M.

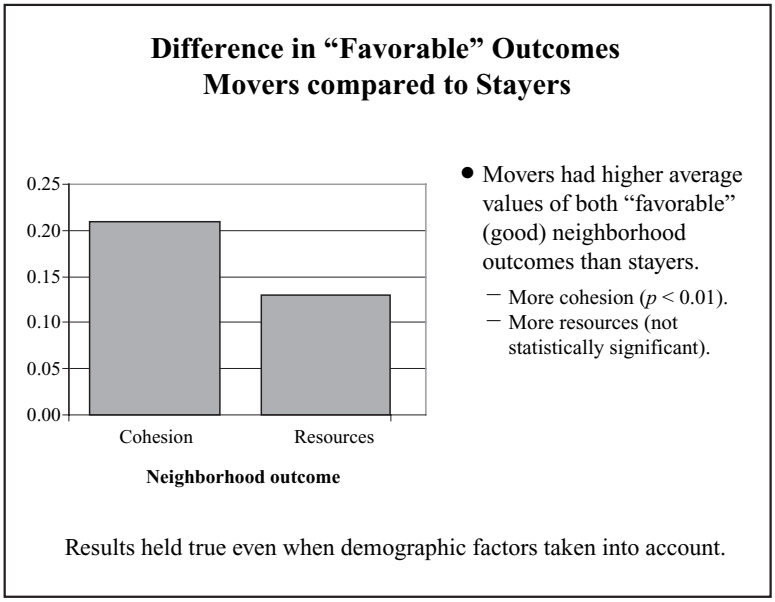


Figure 15N.

c. "Figure 15J shows mean values of six different measures of neighborhood and housing quality for low-income families who moved to low-poverty neighborhoods versus those who stayed in high-poverty neighborhoods. In all six dimensions studied, outcomes were statistically significantly better among movers (the gray bars) than among stayers (the black bars). Favorable outcomes (cohesion and resources) [gesture at top two clusters on the chart] were higher among movers than stayers, whereas negative outcomes (danger, victimizations, disorder, and indicators of poor housing) [gesture at four bottom clusters on the chart] were all lower among movers than stayers.

"However, it is important to consider whether differences in demographic characteristics might explain some of the observed differences in these outcomes. Although participants in the Yonkers Residential Mobility Program were randomly assigned to be movers or stayers, some differences in these characteristics are possible. In figure 15K, we see that four of the six background characteristics are more auspicious among movers than stayers. Movers were more likely to be from two-parent households and to have completed high school [point to respective clusters on chart]. They were also on average older and had fewer children in the household.

"[Transition to slide 15L] These bivariate statistics suggest that multivariate models are needed to assess the impact of residential status on each of the outcomes, net of the potentially confounding effect of the background characteristics. All of the observed differences in background characteristics would be expected to favor better outcomes among movers than stayers regardless of residence. For example, older age, two-parent households, better education, and smaller families are often associated with better resources than younger, female-headed, less-educated, and larger families. Hence multivariate models are needed to control for those characteristics.

"Figure 15M shows results of multivariate models of the four negative measures of neighborhood characteristics and housing quality studied as part of the Yonkers Residential Mobility Program (danger, victimization, disorder, and problems with housing quality) [point to respective bars]. Even when the effects of potential confounders were taken into account, subjects who moved had statistically significant better values of each of these four outcomes than those who remained in their original neighborhoods. Put differently, movers experienced less danger, victimization, disorder, and housing problems than stayers.

"Figure 15N shows the results of multivariate models of the two favorable outcomes (cohesion and resources). Both were higher (better) among movers [gesture along *y* axis], but the difference in resources was not statistically significant. Although some of the background control variables were statistically significantly associated with one or two of the outcomes, none showed a consistent pattern of association."