

## Stat 150 - Day 4 Good and Bad Graphs

### Types of Statistical Graphs

Categorical variable: bar graphs, pie charts

Only use pie charts when talking about parts of the whole

Many statisticians avoid pie charts entirely

At least try to use 5 or fewer slices, order the slices from large to small, begin the largest slice at 12:00

Especially difficult to compare across pie charts

Quantitative variable: dotplot, histogram, line graph (vs. time), boxplot

### Principles of Good Graphs

- Always include labels and legends (units)
- Describe the source of the data
- Let the data speak for themselves
- Avoid fancy 3D graphs and visual effects that hide the message in the data
- Avoid double Y-axes
- Watch for the “lie factor” – the perceived change vs. the actual change (e.g., area vs. length)
- Think carefully about the choice of scales
- Make sure the data are accurate
- Graph the data in context
- Use consistent scaling
- Organize by the most important features of the data

The “Gallery of Data Visualization” at ([www.math.yorku.ca/SCS/Gallery/](http://www.math.yorku.ca/SCS/Gallery/)) provides examples of very good and very bad graphs. It also offers this advice:

- Like good writing, good graphical displays of data communicate ideas with clarity, precision, and efficiency.
- Like poor writing, bad graphical displays distort or obscure the data, make it harder to understand or compare, or otherwise thwart the communicative effect which the graph should convey.

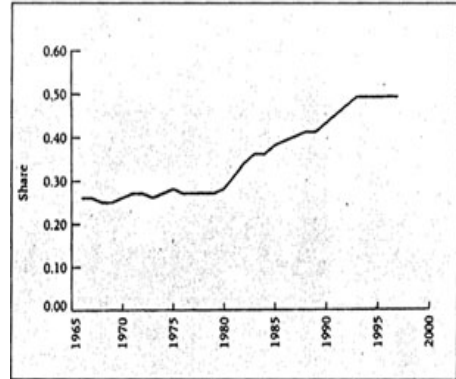
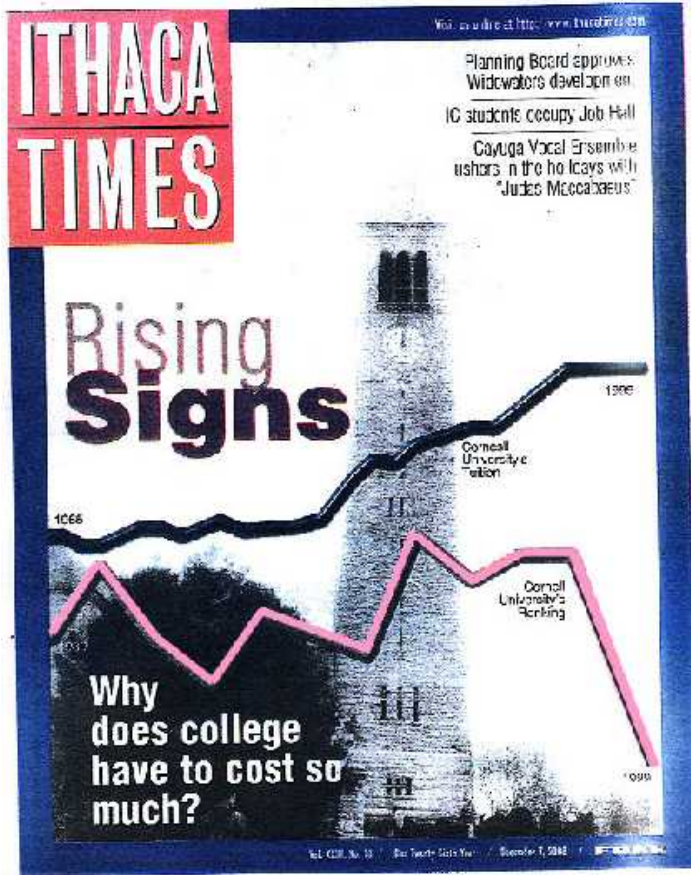
### Critiquing and Improving Graphs

On the next two pages, you will find four graphs that we believe are misleading. The top one has been called “the worst statistical graphic ever drawn.” We will discuss how these two graphs are misleading. Then we will give you a misleading graph, and ask you to work with a partner to:

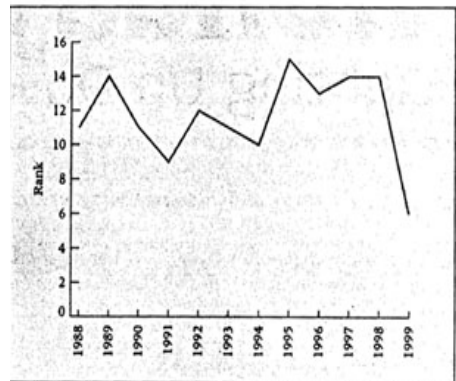
(a) Summarize what stands out to you most immediately in the graph and why the graph is misleading.

(b) Thinking about the context and information available, create a new graph that you believe does a better job of displaying the most important features of the data.

You will be asked to show both the original and your new graph to the class, discuss what you feel was misleading about the first graph, describe how you feel you improved the graphical presentation, and summarize the information revealed by your revised and improved graph.

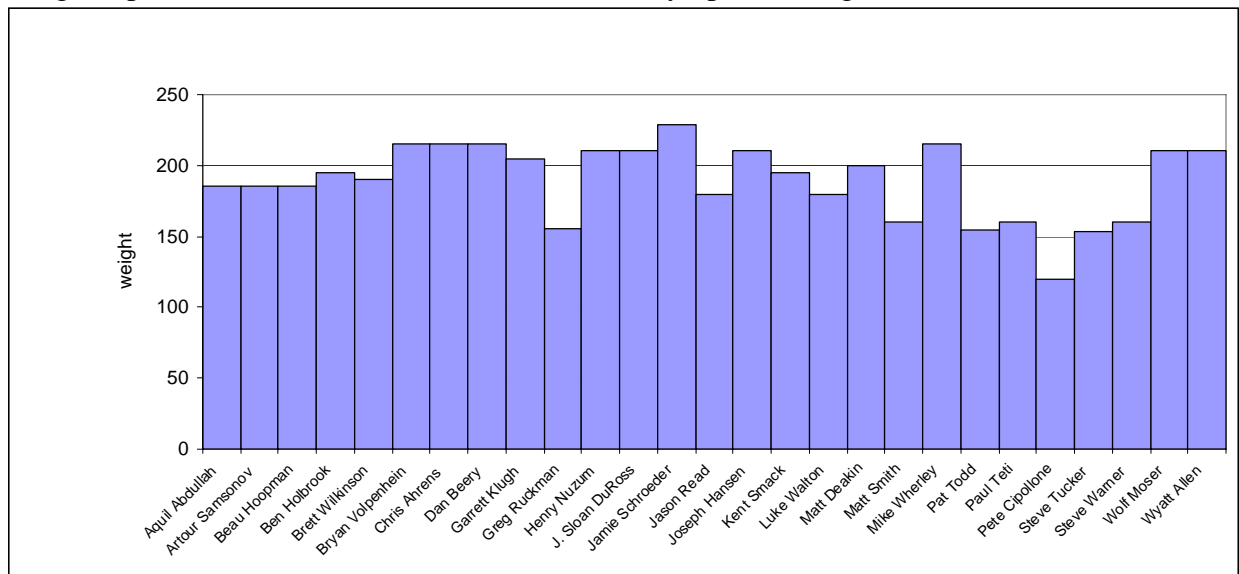


BY THE NUMBERS: OVER 35 YEARS, CORNELL'S TUITION HAS TAKEN AN INCREASINGLY LARGER SHARE OF ITS MEDIAN STUDENT FAMILY INCOME.



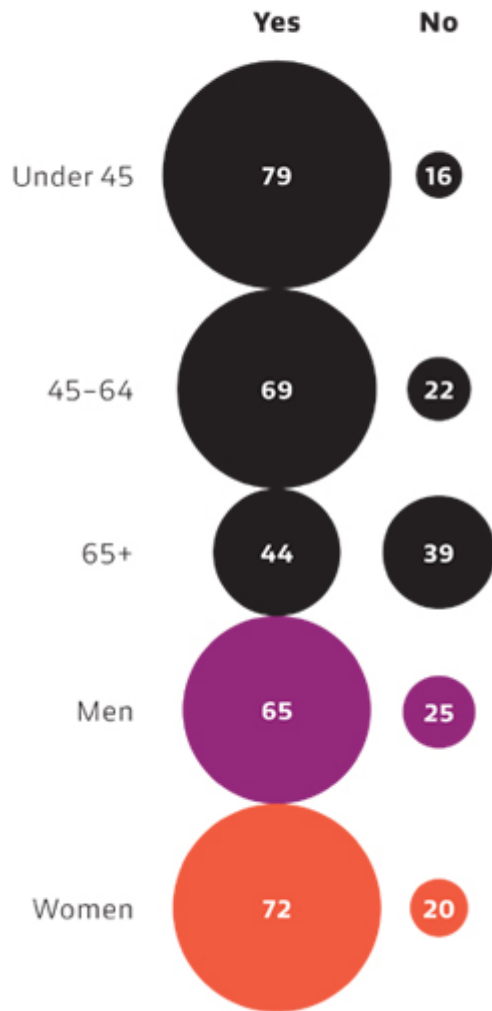
PECKING ORDER: OVER 12 YEARS, CORNELL'S RANKING IN US NEWS & WORLD REPORT HAS RISEN AND FALLEN ERRATICALLY.

Weights (pounds) of rowers on 2004 U.S. Men's Olympic Rowing Team



## MRS. PRESIDENT

Percentage of respondents who say it is likely that a woman will be president in their lifetime.



Source: CBS News, June 2008

## CALLINGS

Proportion of respondents who attribute "very great prestige" to the following professions:



Source: The Harris Poll, July 2008

Chart by **ERIK DE GRAAFF** ArtEZ Academy of Visual Arts, the Netherlands