Displaying Data: Maximizing the Effective Use of Tables and Figures in Research Reports

Shawn M. Flower Ph.D.
Laura Gerhard

Justice Research and Statistics Association
10/20/16

Key Portions of Presentation based on a presentation by Marianne W. Zawitz of the Bureau of Justice Statistics at the JRSA 2006 Conference in Denver Colorado
When you write a report or present, you don’t want this...
or this ...
This IS what you want!
Webinar Objectives

1. Data Display – Why does it Matter?
   – The Good, the Bad, and the Ugly

2. Overall Graphic Guidelines
   – Tables
   – Graphics

3. Tips for Effective Presentation
Data Display: The Good

• Purpose:
  – To Impart Information
    • Time and Space Saving

• You Need To:
  – Engage Participants
  – Make Data Understandable

• The Result?
  – Audience Comprehension
The Bad

- Not Brief
- Not Informative
- Confusing
- Doesn’t Add Anything
The Ugly

- Misleading
- Distortion

Discussion of Infographic based on Marcotte, 2013(1)
Statistical Graphics

• Big Picture; “Paragraphs of data”
• Best when conveys one finding or one concept
• Graphical elegance is often found in simplicity of design and complexity of data.\(^{(3)}\)
Effective Graphics:

- Augment/Supplement (Not Duplicate) Text
- Convey Only Essential Facts
- Omit Visually Distracting Detail
- Are Easy to Read and Understand
Text and Graphics

• Text should refer to each graphic and tell the reader what to look for
• The text should discuss only the highlights of the graphic
• Formats, titles and labels should be consistent across graphics
## How To Choose: A Table, Figure or Text?

<table>
<thead>
<tr>
<th>Table</th>
<th>Figure</th>
<th>Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Numerical values in small space</td>
<td>Trends, patterns, relationships across and between data sets</td>
<td>Limited and Uncomplicated data</td>
</tr>
<tr>
<td>Compare and contrast data values or characteristics among related items</td>
<td>Summarize research results. Use: graphics, data plots, maps, pie charts.</td>
<td>When your table would have 2 or fewer columns</td>
</tr>
<tr>
<td>Presence or absence of specific characteristics</td>
<td>Sequence of events, procedures, geographic features and/or physical characteristics. Use: schematic diagrams, images, photographs, and maps</td>
<td>When the data is peripheral to the study or irrelevant to the main study findings</td>
</tr>
</tbody>
</table>
Table Guidelines

• Tables should …
  • Be Self-Explanatory
  • Be Divided –
    • Large Amounts, Use Categories
  • Be Simple –
    • Avoid non-Data Ink
    • Sufficient Spacing
    • Avoid Excessive Decimals
## Excess Lines/Marks Make Data Hard to See

<table>
<thead>
<tr>
<th>State</th>
<th>Number of agencies</th>
<th>Full-time employees</th>
<th>Full-time sworn officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>All States</td>
<td>18,769</td>
<td>921,978</td>
<td>663,535</td>
</tr>
<tr>
<td>Alabama</td>
<td>432</td>
<td>14,389</td>
<td>9,767</td>
</tr>
<tr>
<td>Alaska</td>
<td>69</td>
<td>1,884</td>
<td>1,254</td>
</tr>
<tr>
<td>Arizona</td>
<td>130</td>
<td>16,828</td>
<td>10,088</td>
</tr>
<tr>
<td>Arkansas</td>
<td>360</td>
<td>7,958</td>
<td>5,819</td>
</tr>
<tr>
<td>California</td>
<td>524</td>
<td>103,967</td>
<td>69,134</td>
</tr>
<tr>
<td>Colorado</td>
<td>247</td>
<td>14,002</td>
<td>9,896</td>
</tr>
<tr>
<td>Connecticut</td>
<td>129</td>
<td>10,319</td>
<td>8,525</td>
</tr>
<tr>
<td>Delaware</td>
<td>45</td>
<td>2,134</td>
<td>1,660</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>3</td>
<td>4,651</td>
<td>3,909</td>
</tr>
<tr>
<td>Florida</td>
<td>385</td>
<td>60,808</td>
<td>37,395</td>
</tr>
</tbody>
</table>
Without Lines, Data are Focus of Table

<table>
<thead>
<tr>
<th>State</th>
<th>Number of agencies</th>
<th>Full-time employees</th>
<th>Full-time sworn officers</th>
</tr>
</thead>
<tbody>
<tr>
<td>All States</td>
<td>18,769</td>
<td>921,978</td>
<td>663,535</td>
</tr>
<tr>
<td>Alabama</td>
<td>432</td>
<td>14,389</td>
<td>9,767</td>
</tr>
<tr>
<td>Alaska</td>
<td>69</td>
<td>1,884</td>
<td>1,254</td>
</tr>
<tr>
<td>Arizona</td>
<td>130</td>
<td>16,828</td>
<td>10,088</td>
</tr>
<tr>
<td>Arkansas</td>
<td>360</td>
<td>7,958</td>
<td>5,819</td>
</tr>
<tr>
<td>California</td>
<td>524</td>
<td>103,967</td>
<td>69,134</td>
</tr>
<tr>
<td>Colorado</td>
<td>247</td>
<td>14,002</td>
<td>9,896</td>
</tr>
<tr>
<td>Connecticut</td>
<td>129</td>
<td>10,319</td>
<td>8,525</td>
</tr>
<tr>
<td>Delaware</td>
<td>45</td>
<td>2,134</td>
<td>1,660</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>3</td>
<td>4,651</td>
<td>3,909</td>
</tr>
<tr>
<td>Florida</td>
<td>385</td>
<td>60,808</td>
<td>37,395</td>
</tr>
</tbody>
</table>
Keep Decimal Places to a Minimum

• They imply false precision (often they are not significant)
• They pad the numbers making them bigger than they really are
• Use only as many decimal places as needed to break a tie
This table has too many decimal places

<table>
<thead>
<tr>
<th></th>
<th>Male perpetrators</th>
<th>Female perpetrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male victim</td>
<td>67.8697%</td>
<td>7.7851%</td>
</tr>
<tr>
<td>Female victim</td>
<td>21.9989%</td>
<td>2.3463%</td>
</tr>
</tbody>
</table>

With fewer decimal places, it is easier to read

<table>
<thead>
<tr>
<th></th>
<th>Male perpetrators</th>
<th>Female perpetrators</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male victim</td>
<td>68 %</td>
<td>8%</td>
</tr>
<tr>
<td>Female victim</td>
<td>22 %</td>
<td>2%</td>
</tr>
</tbody>
</table>

The numbers were different enough that decimal places were not needed.
Table Guidelines (Cont.)

• Tables should also …
  • Have Informative Titles
  • Have Column Heads and Figure labels
  • Contain Non-Repetitive Information
Graphic Guidelines

- Graphics should Be Self-Explanatory
- Do not use abbreviations
- Avoid acronyms
- Write all labels left to right
- Use proper grammar
- Do not use legends unless using maps
- Scaling is Key
Scale Guidelines

• Include all of the data
• Ticks, grids, or labels should be easy to understand like 10s, 100s, 1,000s
• Use as few labels as required to convey the message
Use of Scaling in Graphics

- Side-by-side graphics should have same scale
- The lack of a scale makes it difficult to “eyeball” magnitude of difference
Keep Graphics Simple

- Too much information makes graphics hard to read
- Smoothing techniques can help make trends in “noisy” data easier to see
- Avoid Non-Data Ink
Focus the Ink on The Data
Non-Data Ink

- Grids
- Ticks
- Frames
- 3-D for 2-D data
- Anything that does not convey data
Defendants Released on Bond
August 2015 vs. 2015 Overall

By Facility

Facility 1  Facility 2  Facility 3  Facility 4

Percentage of Defendants Released on Bond

August Snapshot

2015% Distribution
Types of Graphics

• Graphs
• Charts
• Maps
• Drawings
• Photos
Graphics by Type of Variable

• **Continuous Data** – a scale such as over time and age

• **Categorical Data** – classified into discrete categories such as gender or race
Continuous Data

- Line Graphs
- Area Charts
- Scatter Plots
- Maps
Displaying Many Lines on a Line Chart

- Use small multiples
- Use different colors for different lines
- Use different weights or shades in black and white
- Break lines to show one on top
- Reduce the number of lines shown to those of interest
Small Multiples

Weapons arrest rate, 1965-92

16 years old

18 years old

17 years old

19 years old
Weapons arrest rate, 1965-92

Age of offender

- 18 years old
- 17
- 19
- 16
- 20
- 15
- 13-14

Years:
- 1965
- 1970
- 1975
- 1980
- 1985
- 1990

Arrest rate measures:
- 0
- 250
- 500
- 750
- 1000
Area Chart

Homicide rate, 1900-2004

Rate per 100,000 population


0 5 10 15
Map – With Scaled Values

Firearms Offenses per 100,000

- 1 to 50
- 50 to 100
- 100 to 150
- 150 and over
Categorical Data

• Bar Graphs
• Maps
• Diagrams
Criminal history of detained Vs. released felony defendants, 1990

Prior criminal history

- Arrest
- Any conviction
- Felony conviction
- Violent felony conviction

Bar Graph
Map - Categorical Data

Oldest age for juvenile court jurisdiction

- 15 years old
- 16
- 17
Manhattan, New York

100 drug arrests → 98 accepted → 40 dismissed → 3 to trial → 55 guilty plea

2 rejected

Washington, D.C.

100 drug arrests → 84 accepted → 30 dismissed → 5 to trial → 49 guilty plea

16 rejected
Tips for Effective Presentation

• Graphics
  – Photos
  – Icons
• Font Type
• Callouts
• Infographics
Graphic Presentation

- Pictorial Superiority Effect
- Emphasize Content
- Create a Visual Theme
Estimating the Size and Structure of the Underground Commercial Sex Economy in Eight Major US Cities

Meredithe Dank, PhD
Urban Institute

Bilal Khan, PhD
John Jay College

P. Mitchell Downey
Urban Institute

Cybele Kotonias
Urban Institute
Reference Icons

• Symbols used throughout a report that organize information
• Provides reader with a mental organizational structure
• Facilitates quick comprehension
• Can Be Repeated to Reference Details
Example: US & State Reference Icons

[Images of US and state icons]

[Images of US and state icons]

[Images of US and state icons]

[Images of US and state icons]
Example: Family Icons

Families

Men

Teens

Teen Girls

Teen Boys
Font Type

• The shape of individual letters and numbers “that contribute to legibility in different contexts.” (4)

• Two Basic Categories:
  - Serif – “little feet”
  - Sans Serif – Titles, headings, and callouts
Beware of...

Fonts that are too casual or childlike:

*Effective Data Presentation*

Or fonts that interfere with legibility:

*Effective Data Presentation*
Callout

• Short burst of text that draws attention to key point
• Used for emphasis
• Can adjust font and color to distinguish from main content.
Introduction to National Data

Examining recent national trends in crime and justice system responses provides a context for understanding how national, state, and local criminal justice policies are developed and implemented. Judicial and legislative policy, as well as public perceptions, are often shaped as much by national statistics on crimes, sentencing, and corrections as they are by state and local trends. It is therefore important to understand crime and justice trends at the national, as well as state, level.

This next part of the *Crime and Justice Atlas 2000* presents recent statistical trends for the nation in three areas that correspond to the major components of the justice system: law enforcement (“The Nature and Extent of Crime”), the courts (“The Judicial System’s Response to Crime”) and corrections (“Supervision and Punishment of Offenders”). In each of these parts of the Atlas, a series of graphs and tables present selected statistical trends over the past 20 to 25 years, including the most recent year for which data are available. Each data display is accompanied by a series of bullets highlighting important points for consideration in interpreting the trends shown. When taken as a whole, the displays in this section provide an overview of the trends in various components of the justice system, and demonstrate how changes in one justice system component, such as law enforcement, can affect other areas of the system.

The first section of this national component of the Atlas, “The Nature and Extent of Crime,” presents data on crime and arrest trends for both adults and juveniles. The displays show trends and geographical variations in reported crimes by type of offense, changes in arrest rates for both adults and juveniles for both violent and property crimes, changes in the age distributions of arrestees for various crime types, trends in arrests for drug offenses, and changes in self-reported drug use of juveniles and adults in our nation. Taken together, these displays show how the nature of crime and law enforcement activities has changed over the last 25 years. This information is essential for understanding the development and implementation of law enforcement policies and procedures, and their impacts on other components of the justice system.
Finally … The “Infographic”

A visual presentation of information in the form of a chart, graph, or other image accompanied by minimal text, intended to give an easily understood overview, often of a complex subject.
### Stations

<table>
<thead>
<tr>
<th>Station Name</th>
<th>Lines</th>
<th>Amenities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addison Road - Seat Pleasant</td>
<td></td>
<td>Metered Parking, Daily Parking, Reserved Parking, Carsharing, Bike Racks</td>
</tr>
<tr>
<td>Anacostia</td>
<td></td>
<td>Metered Parking, Daily Parking, Reserved Parking, Carsharing, Bikesharing, Bike Racks, Bike Lockers</td>
</tr>
<tr>
<td>Archives - Navy Memorial - Penn Quarter</td>
<td></td>
<td>Bikesharing</td>
</tr>
<tr>
<td>Arlington Cemetery</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ballston - MU</td>
<td></td>
<td>Bikesharing, Bike Racks</td>
</tr>
<tr>
<td>Benning Road</td>
<td></td>
<td>Carsharing, Bikesharing, Bike Racks</td>
</tr>
<tr>
<td>Bethesda</td>
<td></td>
<td>Carsharing, Bikesharing, Bike Racks, Bike Lockers</td>
</tr>
<tr>
<td>Braddock Road</td>
<td></td>
<td>Metered Parking, Carsharing, Bikesharing, Bike Racks, Bike Lockers</td>
</tr>
<tr>
<td>Branch Ave</td>
<td></td>
<td>Metered Parking, Daily Parking, Reserved Parking, Carsharing, Bike Racks, Bike Lockers</td>
</tr>
<tr>
<td>Brookland - CUA</td>
<td></td>
<td>Metered Parking, Carsharing, Bikesharing, Bike Racks, Bike Lockers</td>
</tr>
</tbody>
</table>

*sort by line*
Lifetime Likelihood of Imprisonment

All Men: 1 in 9
White Men: 1 in 17
Black Men: 1 in 3
Latino Men: 1 in 6

All Women: 1 in 56
White Women: 1 in 111
Black Women: 1 in 18
Latina Women: 1 in 45

Summary

• Highlight the data
• Let the data lead you to the best method of presentation
• Strive for clarity in all elements of your presentation/report
• Do the work for your audience so that they can easily understand your point.
Future Topics in the *Statistical Analysis for Criminal Justice Research* Series

- Simple Linear Regression
- Multiple Linear Regression
- Logistic Regression
- Exploratory Data Analysis
References


Resources

- Guidelines for Graphics in Excel

- Cartography Colors --
  http://colorbrewer2.org/
  #type=sequential&scheme=BuGn&n=3

- Creating Confidence Interval Charts
  http://www.ph.ucla.edu/EPI/rapidsurveys/RScourse/chartconfinterval.pdf