Data Visualization Fundamentals
You know more than you think you know...
Today's Plan

• Use strategies to select elements (type, color, design, space) for visualizing data
• Demonstrate an understanding of different types of data visualizations
Think about...

- What do you like/dislike?
- Is it easy to read?
- Look at labels, colors, type of visualization, scales, annotations, etc.
- Where is the information from? Do you trust the source?
Example 1

The Small Business Administration reports:

New Business Survival Rates:

- 30% new businesses survive 10 years
- 51% new businesses survive 5 years
- 70% new businesses survive 2 years
Example 2

HOW BABY BOOMERS DESCRIBE THEMSELVES

- Leaders: 40%
- Willing to Learn: 61%
- Tech-Savvy: 22% (I have a smartphone, don’t discount my technical abilities)
- People-Savvy: 78%
- Creative: 42% (My work experience has made me resourceful)
Example 3

THE MOST ICONIC SOFT DRINK OF EVERY STATE IN AMERICA

THRILLIST
Example 4
What is data visualization?

- visual representation of data
- clear and efficient communication of information using graphics and plots
- an art and a science
How do we understand data visualizations?

• Visualizations help us to see patterns.
• Patterns can be represented in a variety of ways.
How do we understand data visualizations?

• Visualizations construct meaning through both our conscious and pre-conscious ("snap") judgements
  • This is based on our basic knowledge and understanding of the world around us.
How do we understand data visualizations?

• Cultural norms and bias play a part in how we interpret visual cues
• Make sure to keep in mind both your own and your intended audience's biases.
COLORS by Culture

WESTERN Culture
- Orange: Harvest, Warmth, Affordability
- Brown: Practicality, Comfort, Stability
- Yellow: Happiness, Joy, Caution
- Green: Luck, Jealousy, Greed
- Blue: Depression, Trust, Calm
- Purple: Royalty, Spirituality, Wealth
- Red: Love, Danger, Action
- Black: Intimidation, Death, Mourning

FAR EASTERN Culture
- Orange: Happiness, Spirituality, Adaptability
- Brown: Earth, Industrious, Mourning
- Yellow: Masculinity, Sacred, Royalty
- Green: Fertility, Hope, Life
- Blue: Feminine, Healing, Relaxation
- Purple: Wealth, Privilege, Spirituality
- Red: Prosperity, Good Fortune, Vitality
- Black: Health, Prosperity, Stability
Elements of Design: Purpose

- BEFORE designing your data visualization, determine your purpose based on...
  - Message
  - Interactivity
  - Medium
  - Audience
  - Amount of detail
Elements of Design: Message

• **Exploratory vs. Explanatory**
  • Is there a specific message you want to convey?
  • Do you want to show a general overview where the user plays with the visualization?
  • Do you want to show the data and the user figures out the message / leaves interpretation up to the user?
Elements of Design: Interactivity

- Interactive, dynamic, or static
  - Would you like the audience to manipulate or play with the information?
  - Does data change over time or in response to other variables?
Elements of Design: Medium

• Poster, webpage, presentation, peer-reviewed article, or other?
  • How will the audience receive/interact with the information?
Elements of Design: Audience

- **Students, instructors, peers, researchers, or others?**
  - Who are they and what do you want them to take away from your visualization?
  - How will you adapt your visualization if the audience changes?
Elements of Design: Details

• **Overview vs. Details**
  • Do you want a big picture of your data or do you want to drill down into important details?
  • It’s possible to use multiple visualizations to drill down into the details you have identified as important.
Elements of Design: Structure/Form

• Your purpose will help you decide your form.
  • Is location important? → Maps
  • Is your data categorical? → Bar charts
  • Do you want to highlight individual outliers? → Scatterplots
  • Does your data show parts of a whole (100%)? → Bar charts, pie charts only if 4 or fewer categories
  • Is your data time-based? → Line graphs, bar charts

These are suggestions! Look at literature in your field to determine what is typically used.
Unemployment rates by region (in October)
Percentage change compared to previous month

Canarias: +3.42
Aragón: +2.46
Madrid: +2.33
C. Valenciana: +2.08
Melilla: +1.86
Ceuta: +1.81
Murcia: +1.78
Andalucía: +1.78
Comunidad Valenciana: +2.08
La Rioja: +1.02
Cataluña: +1.39
País Vasco: +1.02
Extremadura: +0.84
C. y León: +0.77
Canarias: +0.54
Navarra: +0.39
Asturias: +0.39
Andalucía: +0.39
Galicia: -1.86
Extremadura: -1.86
Baleares: -4.27

Average: +0.82
Elements of Design: Colors

• Logical
• Distinguishable
• Accessible
• Necessary
Elements of Design: Colors

**Logical:** Follow cultural and intuitive norms
Elements of Design: Colors

**Distinguishable:** Gradients and hues should be clear
Elements of Design: Colors

Accessible: Be aware of common color vision deficiencies
The colors of the rainbow as viewed by a person with no color vision deficiencies.

Approximation of the colors of the rainbow as viewed by a person with deuteranopia.

Approximation of the colors of the rainbow as viewed by a person with protanopia.

Approximation of the colors of the rainbow as viewed by a person with tritanopia.
Elements of Design: Colors

**Necessary:** All visual cues should reflect information in your data
Elements of Design: Annotations

• Label axes and keys
• Sources should always be included and easily findable

However, remove any annotations or extra information that do not add to the reader's understanding!
Elements of Design: Annotations

The Golden Rule

All visual cues should reflect information in your data.

Extra visual decoration will hurt your audience's ability to interpret the message of the visualization. This is called "chart junk."
Visualization Creation Activity

1. Work as a group to identify the most interesting/important trends in the data.
2. Decide who you are and who the audience would be for your visualization.
3. Based on your audience and type of data, decide on the...
   - structure/form
   - colors
   - layout
   - level of detail
   - other design elements.
4. Sketch your visualization using the pads and markers provided.
5. Be prepared to explain your group's choices.
In Summary

- Decide on your **purpose**
- Choose a **structure / form** that helps your purpose
- **Colors** should be logical, distinguishable, accessible, and necessary
- Include **labels** and **sources**
- All visual cues should help the reader understand your data!
Training and More Info

- guides.auraria.edu/datavvisualization
- guides.auraria.edu/data
- guides.auraria.edu/datamanagement
Questions?

Ask Us: library.auraria.edu/services/askus
Chat/IM: AskAuraria and on Auraria Library’s Website
Text: 303-848-8444
Email: library.eref@auraria.edu
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Survey

tinyurl.com/aurariasavvyresearcher