Effective Data Visualization in Evaluation

Debrishi Bose, Dakota Cintron, & Amit Savkar
What’s the Point?
What’s the Point of this Presentation?

- Definitions, MWS
- Data Visualization (DV) in Evaluation and the CDC Framework for Evaluation
- Research on DV in Evaluation
- Tools for DV in Evaluation
- Final Thoughts
- Questions??
A Definition: Effective

ef·fec·tive əˈfektiv/

1. adequate to accomplish a purpose; producing the intended or expected result

2. actually in operation or in force; functioning

3. producing a deep or vivid impression; striking
A Definition: Data

da·ta ˈdādə/

1. a plural of datum

2. (used with a plural verb) individual facts, statistics, or items of information

3. (used with a singular verb) a body of facts; information

http://www.dictionary.com
A Definition: Visualization

vis·u·al·i·za·tionˌviZH(o)ələˈzāSH(ə)n,

1. the act or an instance of visualizing

2. a technique involving focusing on positive mental images in order to achieve a particular goal

http://www.dictionary.com
Merit, Worth, & Significance

- Data visualization in evaluation not necessarily concerned with merit, worth, or significance
- Rather, data visualization in evaluation can buttress merit, worth, or significance claims
CDC Framework (Koplan, Milstein, & Wetterhall, 1999)
Exercise

- Visualization within the CDC framework
- Demonstrate first 3 steps
- Last 3 steps on website
Engage Stakeholders: WTP?

- The point: involve stakeholders in the evaluation

- How does data visualization help accomplish this goal?
  
  - Engaging visualization of data can highlight the issue, problem effectively/impactful

  - Statistics aren’t always as important as a good cat story!
Visualize a problem or motivating issue (e.g. Flint Water Crisis)

Sanburn (2016)
Lead levels by location

https://github.com/seantma/Flint_Shiny
**DETROIT WATER**

Flint's former and current water supplier:

2.3 parts per billion

**EPA: CAUSE FOR CONCERN**

Levels this high are considered concerning by the EPA, especially for children:

5 parts per billion

**FLINT RIVER WATER**

Readings from 271 Flint homes tested last summer:

27 parts per billion

**FLINT RIVER WATER**

Highest level recorded by Virginia Tech study in Flint's 8th Ward:

158 parts per billion

Highest level recorded by a wider Virginia Tech study. The EPA considers water reading 5,000 ppb to be "toxic waste."

13,000 parts per billion

Graphic by Milt Klingensmith | MLive.com
Describe the Program: WTP?

- The point: clearly describe the program (e.g. inputs, outputs, and outcomes)
- Create logic models!
- How does data visualization help accomplish this goal?
- What about visualizing:
  - expected effects,
  - inputs & resources, and
  - context & outputs
- Total Populations - 682,108 (100%)
- Population below the Poverty Level - 53,932 (8.2%)
- The median age for Will County is 36.2.
- Sex
  - Male: 338,598
  - Female: 343,510

Population by Race

- White
- Black or African American
- American Indian and Alaska Native
- Asian
- Native Hawaiian and Other Pacific Islander
- Some other race

Note: ZIP code in ZCTA are not exact geographic match to ZIP Code. ZCTAs may be comprised of one or more ZIP Codes.
Focus the Evaluation Design: WTP?

- The point: define evaluation purpose, users, uses, questions, methods
- A focused evaluation can help address concerns and be efficient with resources
- Requires *compromise* and *agreements* among stakeholders
- Visualization is helpful in focusing the evaluation design, or reaching compromise, through:
  - Methods such as dot voting
  - Depicting of qualitative input about evaluation design among numerous stakeholders
Concept Mapping (Trochim, 1989)

Figure 19. Final concept map for the Planned Parenthood Project.
Visualization for Decision Making

How can we make the classroom a safe space?

- take_turns
- helpful
- shared
- respect
- responsible
- responsible
- discussion
- shared
- statements
- constructive_criticism
- contribute

Instant Audience Feedback

- Try voting on a multiple choice poll
- Text a free text poll
- Watch the demo video
- How does Poll Everywhere work?

What's your favorite animal?
- Lion
- Turtle
- Grandpa

Try submitting your CHOICE to 37667.
RoE in Data Visualization

*Human factors in Visualization Research (Tory et al., 2004)*

- Visualization is extremely helpful for data analysis and decision making
- Depends on people’s *perception* and *interaction* with the visualization tool
- Directly affects understanding of data or usefulness of the tool.
- Associated mainly with Perception Based Design
RoE in Data Visualization

*Spatial-Perceptual Design Space (Rodrigues Jr. et al, 2007)*

- Developed a model to identify processes through which Visualizations become effective or more expressive

- Visual Expression process has three components-- Observation of visual stimuli, visual perceptions and reasoning

*Spatialization* - how they’re positioned in space, *Shape, Color*
Perceptual Space

Spatial/Perceptual Design Space

Complete Spatial/Perceptual Design Space
RoE in Data Visualization

Visualizing Qualitative Data in Evaluation Research (Henderson et al., 2013)

- Qualitative techniques can be useful in most stages of Evaluation- early planning and design, data analysis or reporting
- Works well with various approaches- summative, developmental, utilization focussed, participatory and Mixed-methods
- Examples: Word/tag clouds, word tree, Themes
Tools for DV in Evaluation

- Tools for DV in Evaluation
  - R, Rstudio, statistics software
  - Rmarkdown, Slidly
  - http://www.graphicaldescriptives.org/#
- Polling Application
  - Poll Everywhere
  - Tricider
Qualitative Tools

- ★Word Clouds- Displays frequency of each word
  - Wordle
  - TagCrowd
- ★Themes- displays broader ideas/theories about the general pattern of data
- Package- CAQDAS
- ★Most free online available softwares (like Many Eyes) **do not allow data privacy or security** which is a BIG ISSUE for Stakeholders and Evaluators!!
Quantitative Tools

- ★Tableau
- ★Google Fusion Tables
- ★Google Chart Tools
- ★Power Pivot
Final Thoughts

- What’s the point?!?!

- Resources
  - AEA Topical Interest Group for Data Visualization & Reporting
    - [Homepage](#)
  - AEA365 Blog on Data Visualization and Reporting
    - 192 entries, as of 3/28/17
    - [Homepage](#)
  - Website with Resources on Data Visualization for Evaluators
Questions?
References


