Data is Personal

Attitudes and Perceptions of Data Visualization in Rural Pennsylvania

Background

Encounters with data can be manipulated by several factors

- Experience or education
- Biases
- Attention
- Focus on people in rural settings is motivated by
  - The population’s absence in the visualization literature
  - Gaps in education, income
  - Literacy may impact perceptions of data visualizations

Which visualizations do people understand?

- Visual Literacy
  - capability of a person “to read, comprehend, and interpret” graphs
- What can cause problems?
  - New graphic representation without training
  - Lack of familiarity

Procedure

- 10 different data visualizations that broadly involve the impact of drugs in the United States
- Charts were chosen to represent a diverse set of features, including form, visual appeal, and source
- Each chart was presented to participants in color on individual sheets of paper.

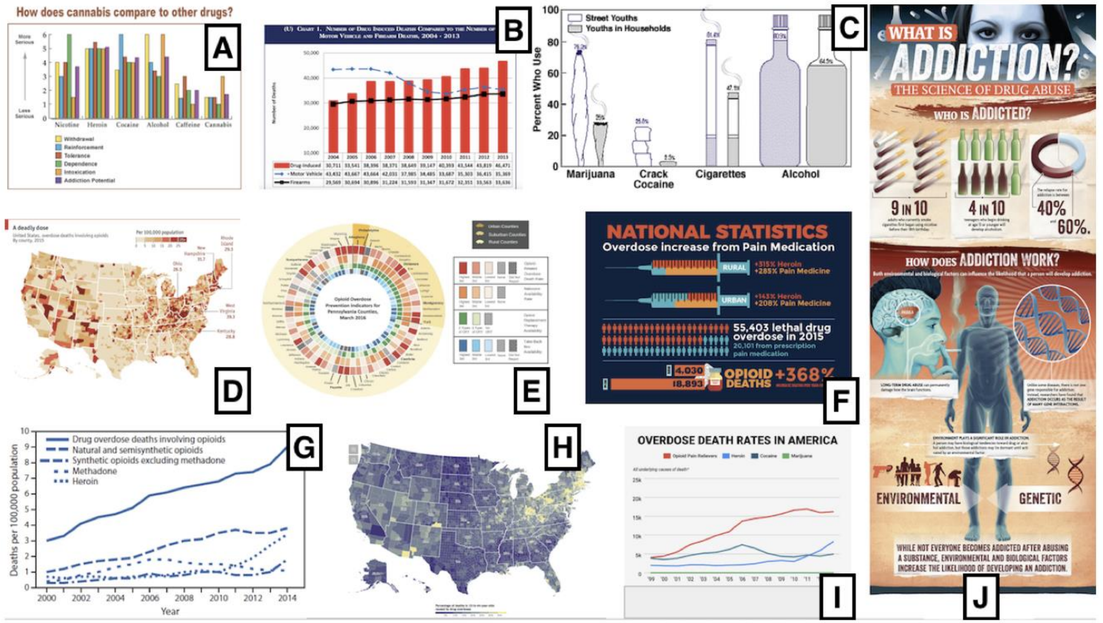


Figure 4: The graphs shown to participants. Each graph was presented on an independent sheet of paper

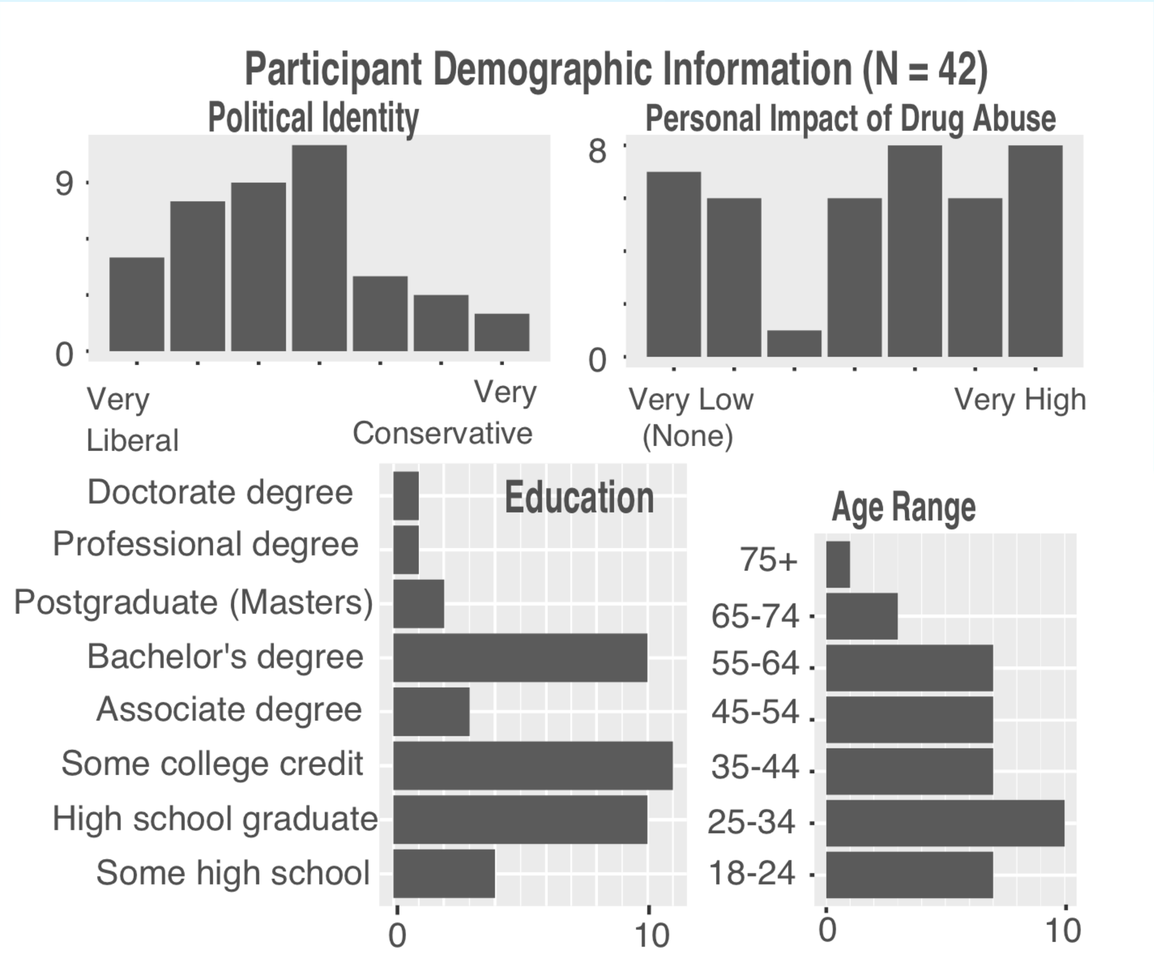
#	Topic	Type	Found on (Source)	Perceptions (Code Frequency)
A	Severity of cannabis vs. other drugs	Bar	National Institute on Drug Abuse (NIDA)	*Relatable*(4), *Informative*(2)
B	Comparison of drug, vehicle, and firearm deaths over time	Bar / Line	BreitBart	*Confusing*(2), *Informative*(2)
C	Drug use in 'street' youths vs. youths in households	Isotype	National Institute on Drug Abuse (NIDA)	*Simple*(3), *Not trusted*(3), *Clear*(2), *Relatable*(2)
D	Overdose deaths involving opioids by county	Map	The Economist	*Clear*(4), *Attractive*(3), *Confusing*(3), *Cluttered*(3), *Simple*(3), *Relatable*(3)
E	Opioid overdose prevention indicators for PA counties	Heat map	Drexel University	*Cluttered*(8), *Confusing*(8), *Clear*(4), *Colorful*(4), *Informative*(4)
F	Overdose increase from pain medication	Infographic	AgriMed (Medical Cannabis)	*Attractive*(5), *Confusing*(5), *Simple*(4)
G	Drug overdoses over time	Line	National Vital Statistics System (NVSS) - CDC	*Confusing*(6), *Simple*(3), *Cluttered*(2), *Intriguing*(2)
H	Overdose deaths by country (15-to-44-year olds)	Map	The New York Times	*Clear*(4), *Colorful*(3), *Relatable*(3), *Simple*(3)
I	Overdose death rates over time	Line	Business Insider	*Colorful*(16), *Attractive*(6), *Clear*(6), *Simple*(5)
J	The science of drug abuse	Infographic	Alternatives in Treatment (Rehab Center)	*Informative*(4), *Attractive*(3), *Relatable*(3)

Table 1: Graphs were chosen for representing diverse styles and sources. Codes are derived from interviews. When interpreting frequencies, recall that many participants chose to only comment on a select group of graphs

Procedure

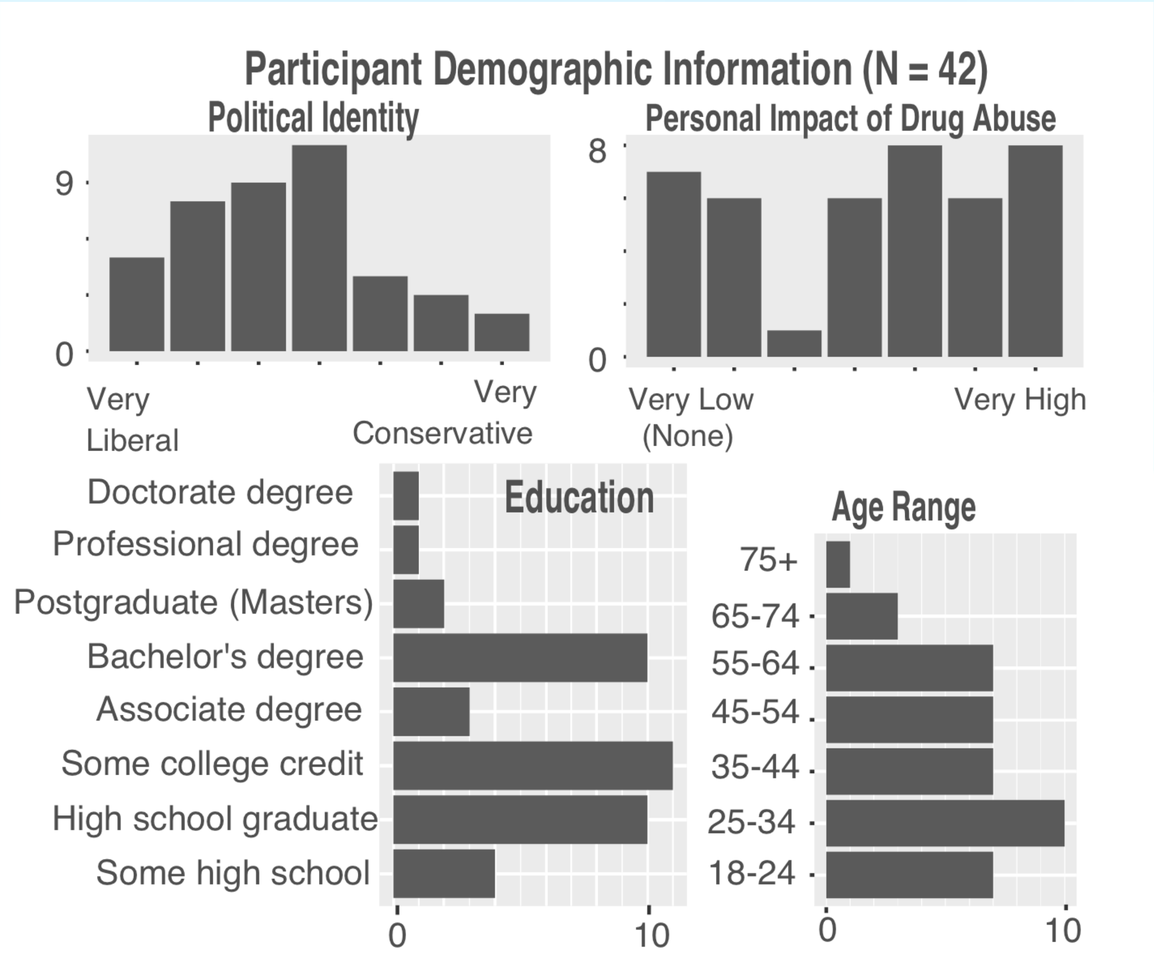
Participants

- Staff members at a local university. Participants largely identified as working in food services as cashier, line server, prep kitchen, or management.
- Employees at a local construction site. Participants largely identified as working in demolition or labor.
- Visitors of a local farmers market. Participants were diverse in their backgrounds and occupations.



Procedure

- Age
- School district,
- Political affiliation (“very liberal”(1) to “very conservative”(7))
- Familiarity with graphs and charts
- Educational background
- The extent to which they had been personally impacted by drugs and/or addiction



Procedure

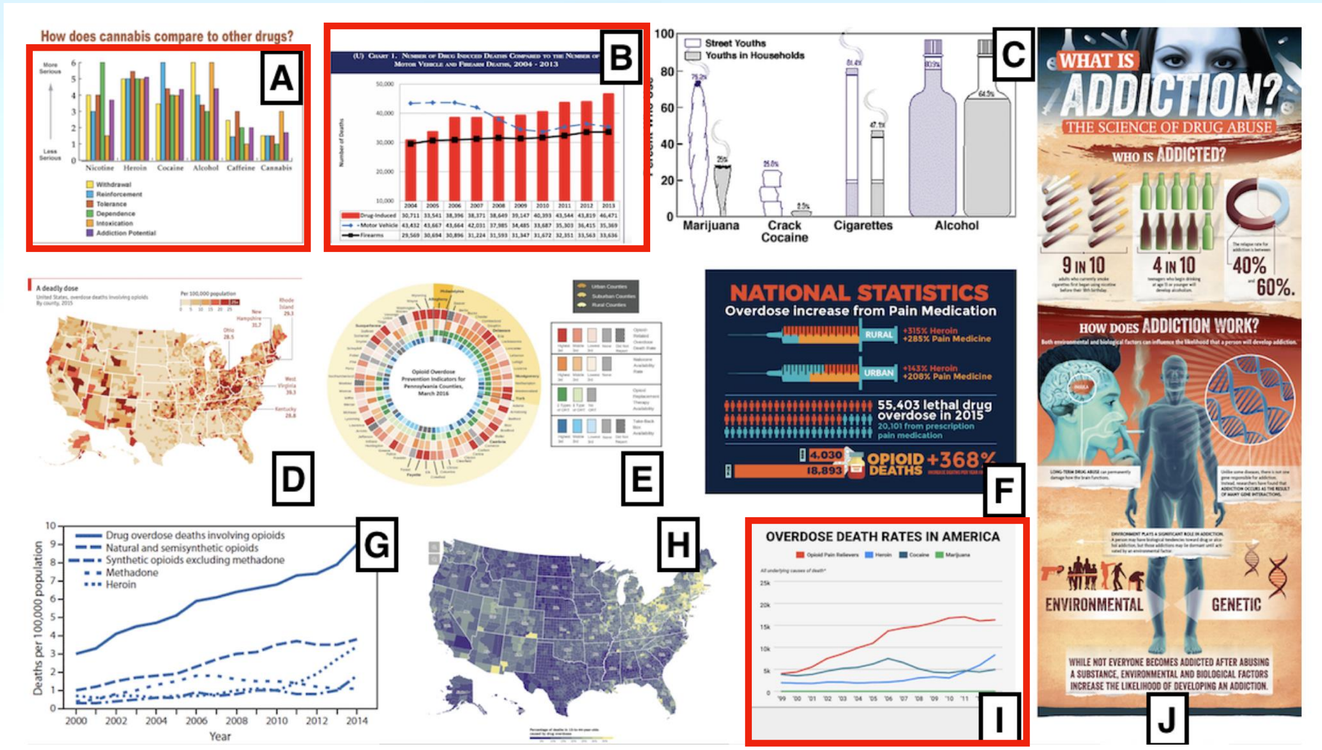
1. Introduction and consent.
2. Graphs presentation and ranking.
    1. “Based on how useful they are to you, arrange the graphs from most useful to least useful”
    2. ‘useful’ was successful in encouraging the participants to express opinions
3. Sources are revealed
4. Demographics questions (collected after the interview)

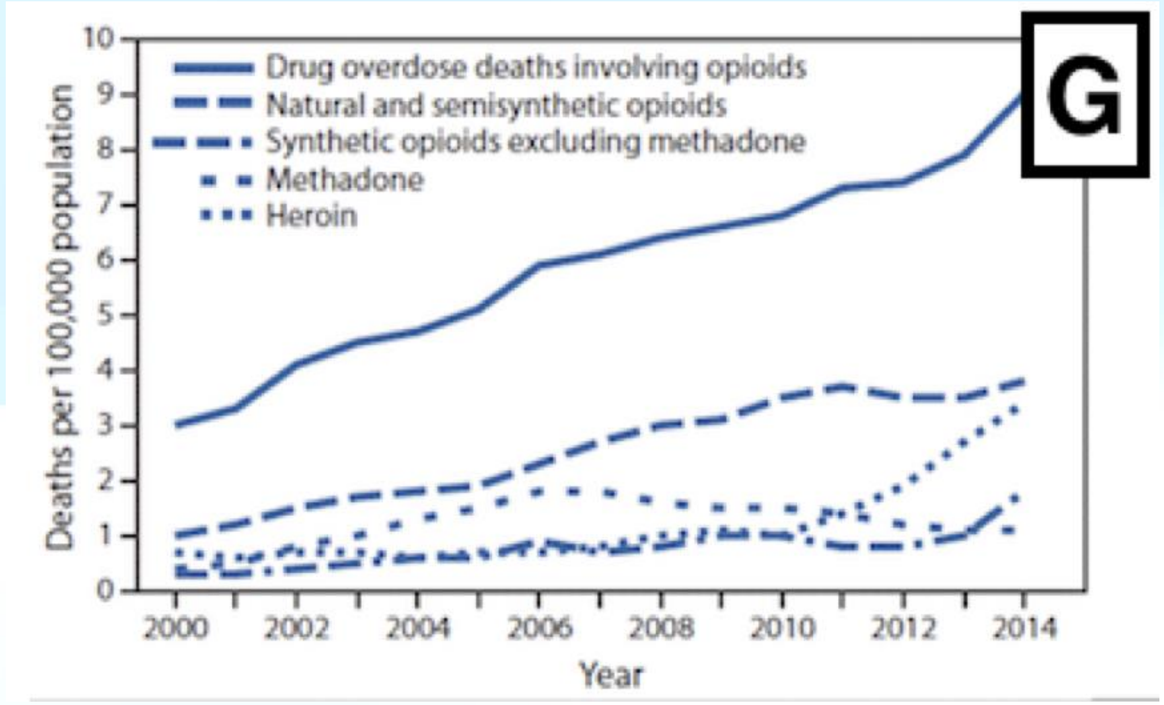
Analysis

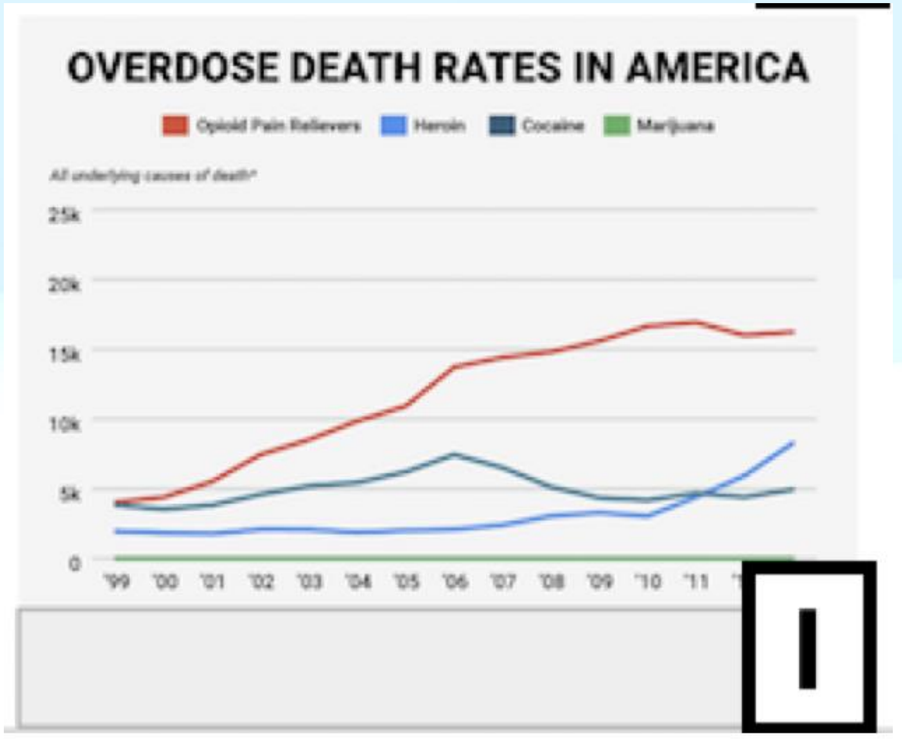
- The most common codes associated with graphs across our interviews are as follows: Colorful (29) , Confusing (29), Clear (26), Simple (26), Relatable (21), Attractive (20), Informative (19), Cluttered (17)

- gravitated towards straightforward visual encodings

- Simple bar graphs (Graphs A, B) and line graphs (Graph I) emerged as among our more highly ranked charts

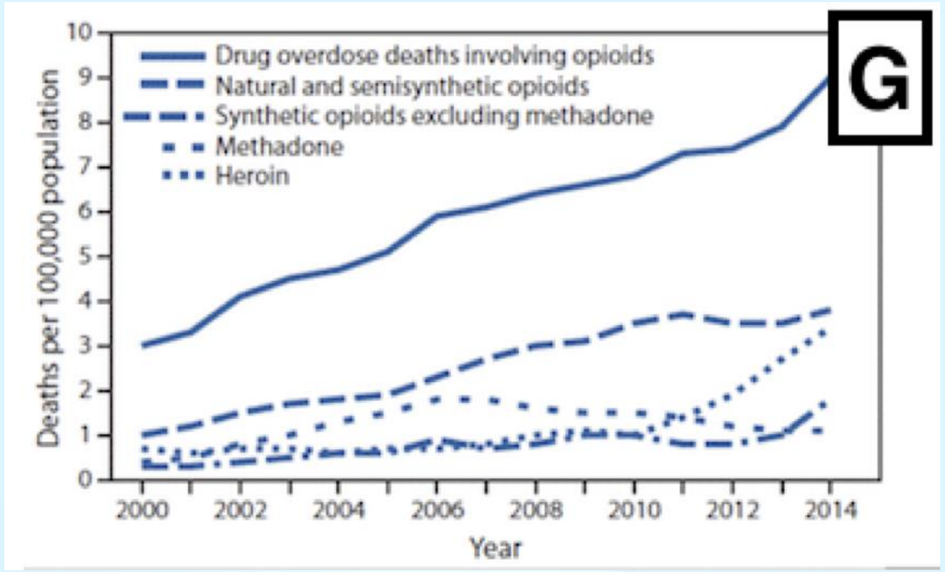


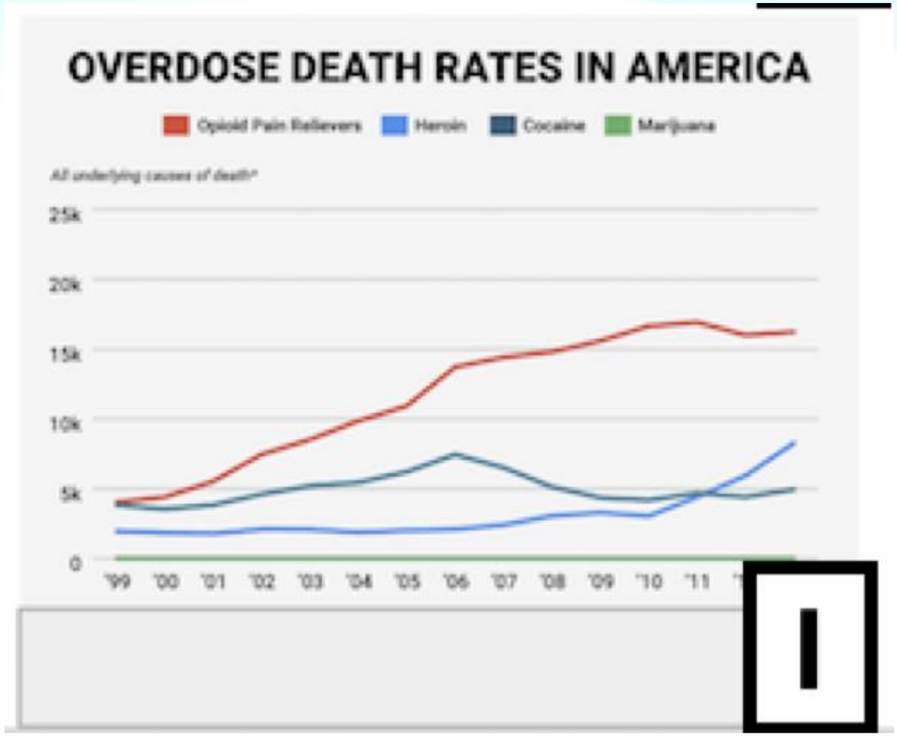

G
Drug overdose deaths involving opioids
Natural and semisynthetic opioids
Synthetic opioids excluding methadone
Methadone
Heroin
Deaths per 100,000 population
0
1
2
3
4
5
6
7
8
9
10
2000
2002
2004
2006
2008
2010
2012
2014
Year


OVERDOSE DEATH RATES IN AMERICA
Opioid Pain Relievers
Heroin
Cocaine
Marijuana
All underlying causes of death*
25k
20k
15k
10k
5k
0
'99
'00
'01
'02
'03
'04
'05
'06
'07
'08
'09
'10
'11
I

Graph G and I

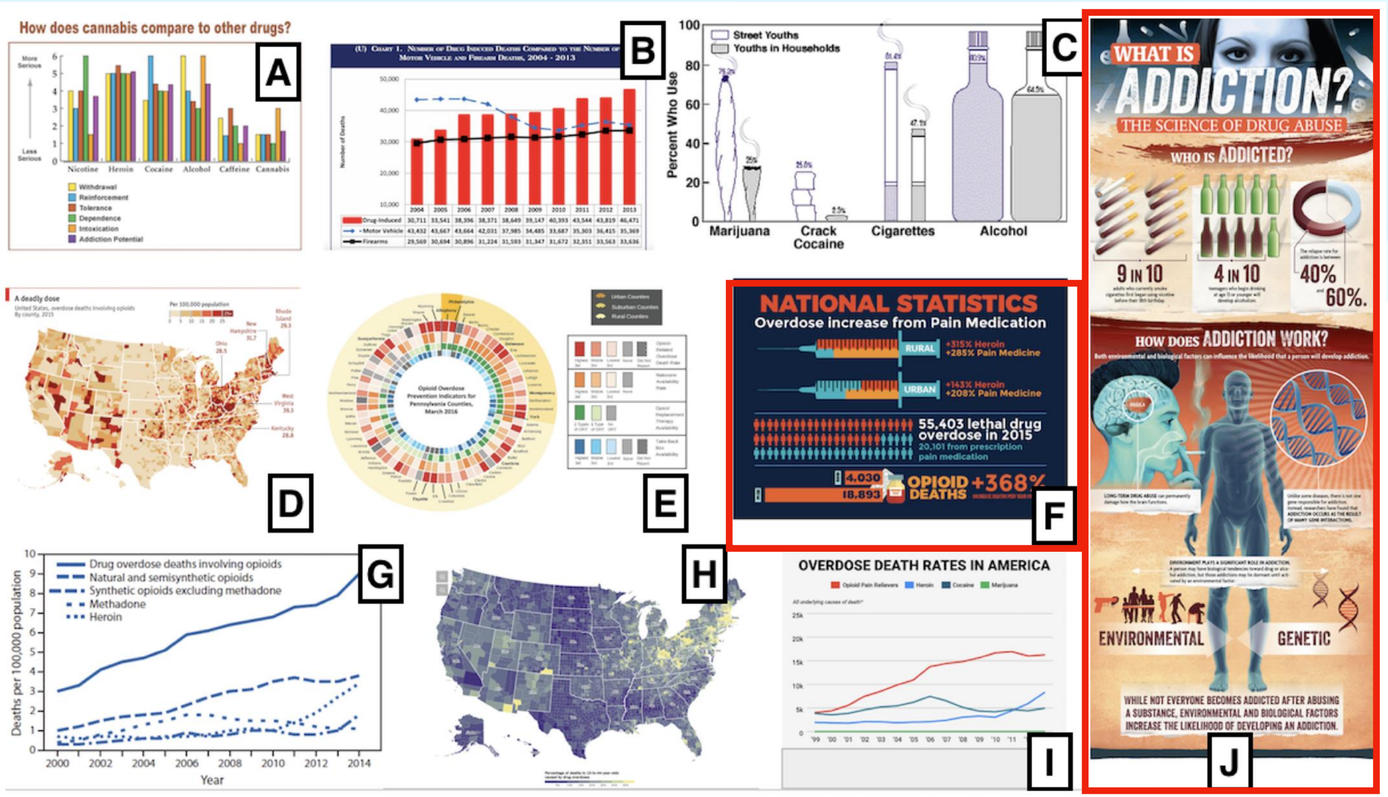
- critiques of clarity and aesthetics often blurred together for our participants
- 16 participants identified color as a distinguishing factor
- often ambiguous as to whether color referenced general appeal or an improved visual encoding





Infographics

- Graph J received the most polarizing rankings of any chart
- Participants who had positive feelings about infographics (Graphs F and J) found them to be clear (5), simple (5), and attractive (8)
- infographics were often rated lower by older people



Unchanged ranking

- Source is irrelevant (9): expressed that the source does not impact the data and/or presentation.
- Ranked on other criteria (5): expressed that their initial ranking was based on other criteria (visuals, interest) and that criteria had not changed.
- No reason(4) :could not (or was not willing to) articulate any reason for maintaining their rankings
- All sources are trusted (3): perceived that all sources were equally trustworthy.

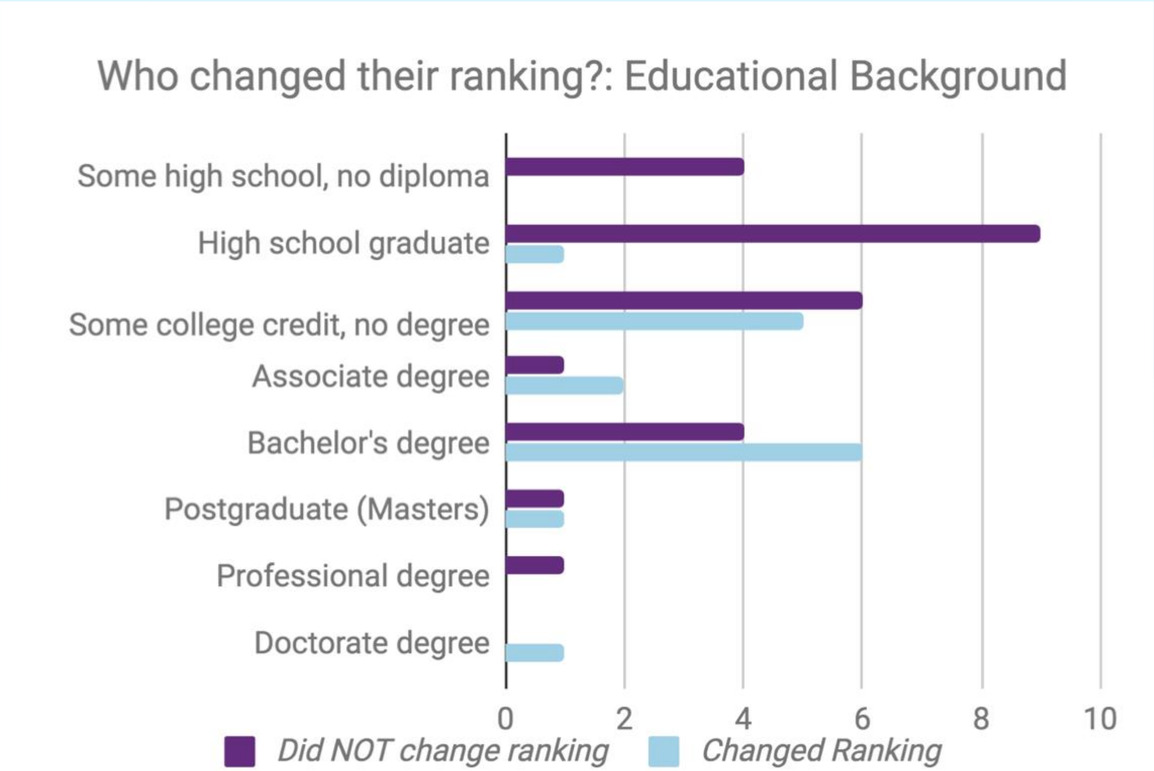


Figure 5: More educated participants were more likely to change their rankings after seeing the graph's source