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A Framework for Data Visualization: Foundations and Threshold Concepts

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Who we are



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4 Frames

Data and its visualization can be manipulated to achieve a desired result

Data visualization is information, and information has monetary value

Content is culture- and community-based

Data visualization tells a story

Data and its visualization can be manipulated to achieve a desired result.

Data is an information object unto itself. It can be manipulated to achieve a positive result, such as conveying important information, or a negative result, such as promoting disinformation.

- Users are creators and critics
- Data can take on both representational and generative properties
- Meaning can be affected by the transmitter, noise source, or receiver
- There are Layers of meaning to any data visualization.
- Visual cues such as font, color, and organization can affect understanding and perceived validity.
- The form of the data's input affects what can be done with the data at the creation stage.
- Bias can affect how data is interpreted.
- Data must be viewed in context.

Example:

[Southwest Border Apprehensions](#)

Example: Manipulation



Data visualization is information, and information has monetary value

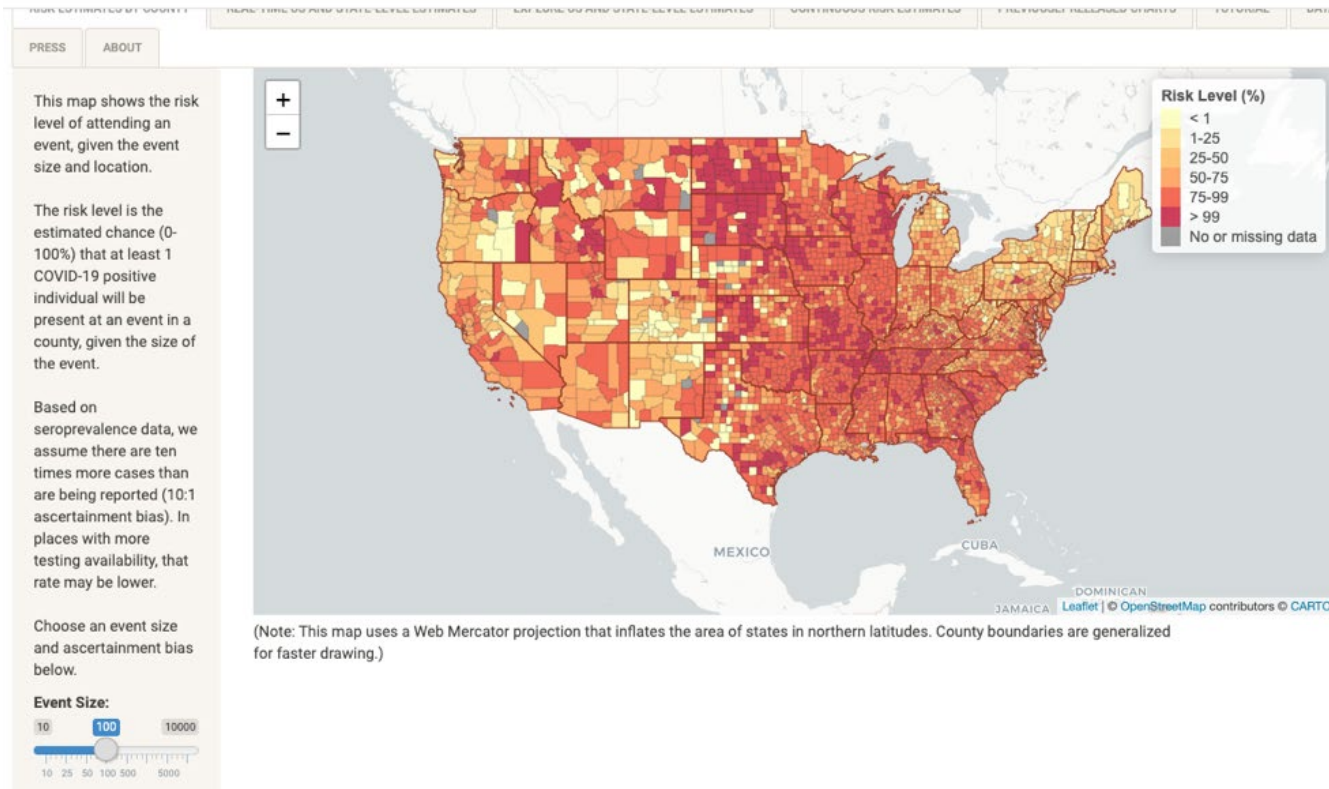
Frederick Douglass's idea that freedom comes from reading must be extended to other forms of communication. Information is now currency so it has a monetary value.

- Data is a currency of power
- The gaps between "haves" and have-nots" are broadened by a lack of data literacy and understanding how visualization effects their ability to interpret that d
- Financial success is determined by access to and an understanding of information.
- The way information is visualized, and the information, itself, may be presented to monetarily reward one social group over another.
- Information in the form of data is the foundation for automated decision making.
- A data visualization can be made to fit any model with enough manipulation.

Example:

[COVID-19 Event Risk Assessment Planning Tool](#)

Example: Monetary Value



This map shows the risk level of attending an event, given the event size and location.

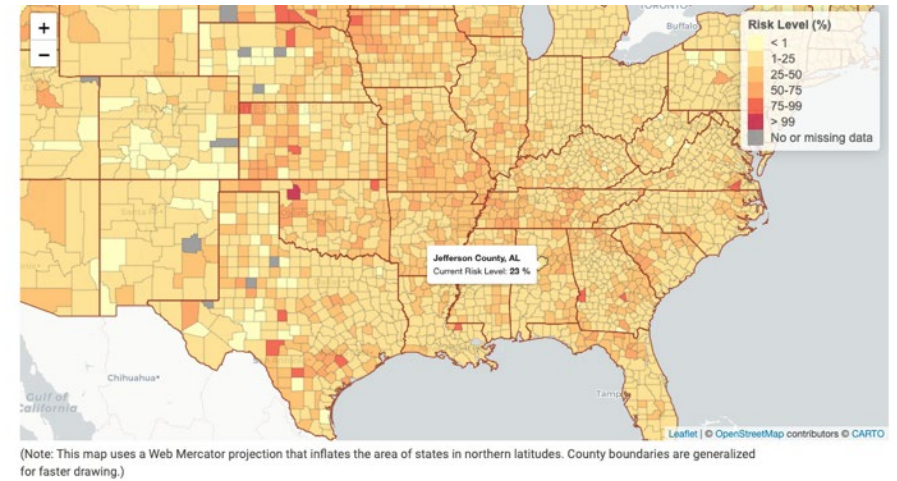
The risk level is the estimated chance (0-100%) that at least 1 COVID-19 positive individual will be present at an event in a county, given the size of the event.

Based on seroprevalence data, we assume there are ten times more cases than are being reported (10:1 ascertainment bias). In places with more testing availability, that rate may be lower.

Choose an event size and ascertainment bias below.

Event Size:

10 100 10000



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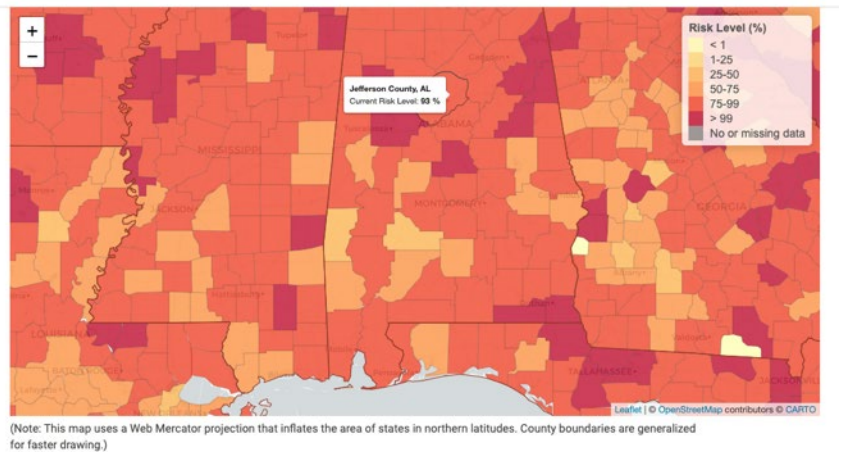
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Content is culture- and community-based

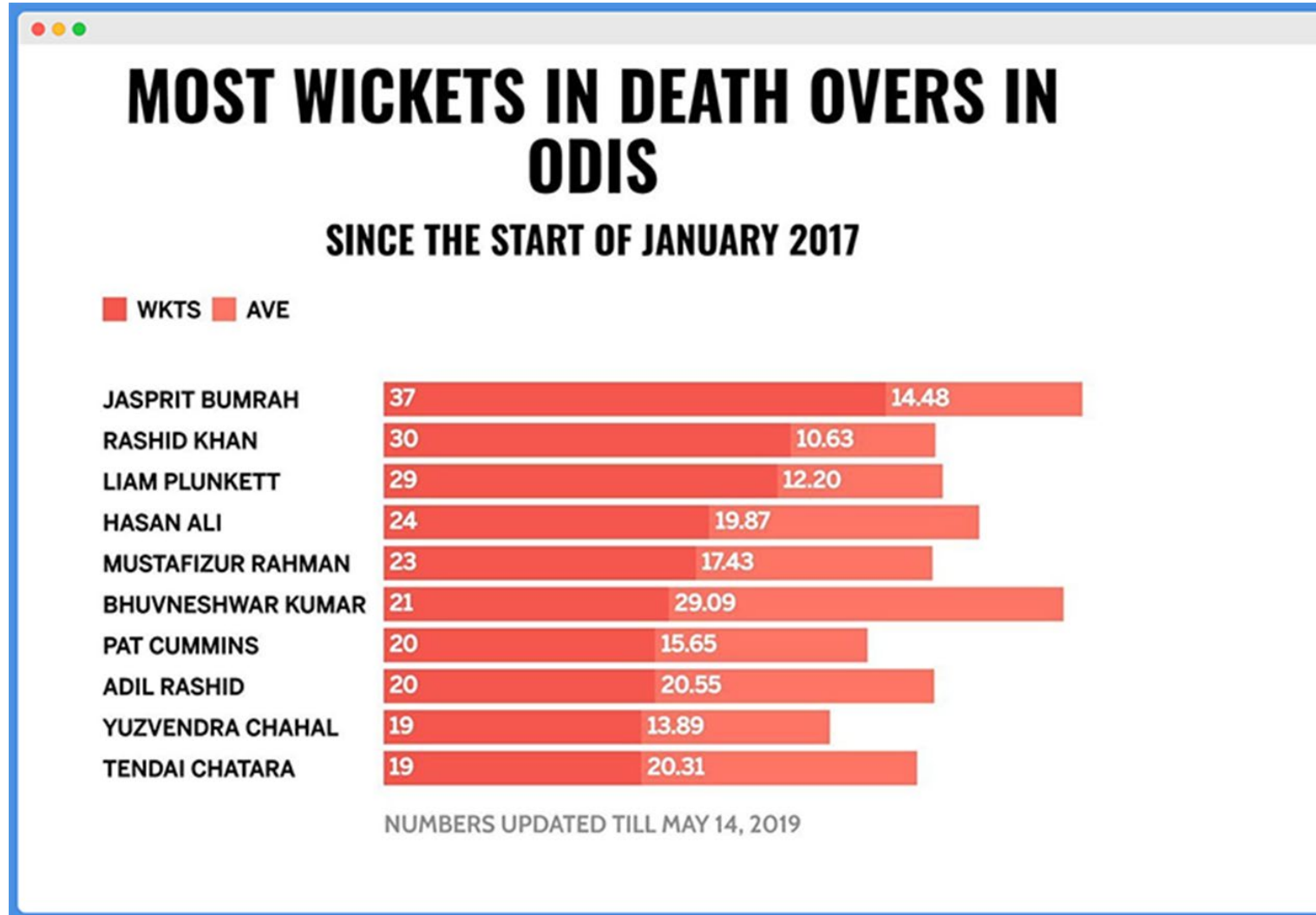
Data visualization is a form of communication, and members of a culture or community must have access to the language of delivery when in the role of the receiver in communication models.

- Social semiotics can affect how data is interpreted by receivers in their social and cultural group.
- Data visualization can facilitate social interaction or alienate a group.
- Prior knowledge can be necessary to visualization interpretation.
- Visual cues can affect attitudes toward the data representation and interpretation
- Social information is explicitly or implicitly revealed in the way the visualization is presented.
- The meaning of content may drift when the content is experienced outside of the original creator's frame.

Example:

[Most Wickets in Death Overs](#)

Example: Culture & Community



Data visualization tells a story

Humans relate to the world through story, as exemplified in many commercials, YouTube videos, and Tweets. Data visualization is a rhetorical argument with visualization and form and data as content.

- “Data storytelling” defines communicating through visualizations
- People hear statistics but they feel stories
- Visualization can reinforce previous knowledge or be used as a rhetorical device.
- Visualization is a form of multimodal rhetoric, combining visual, data, and information tools to produce a message.

Example: [How are the candidates spending on criminal justice ads on Facebook in 2020?](#)

Example: Story

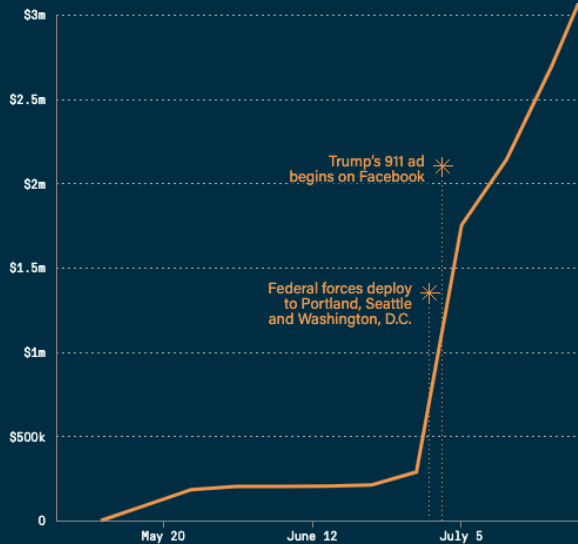
How are the candidates spending on criminal justice ads on Facebook in 2020?

TRUMP'S ESTIMATED COST

\$2,695,003

BIDEN'S ESTIMATED COST

\$0



Meanwhile, after six weeks of historic police brutality protests, Biden continued to spend his Facebook ad money on the coronavirus, essential workers and national unity.

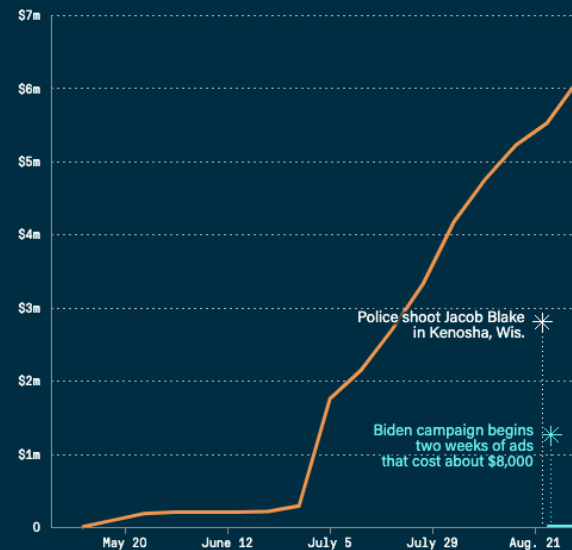
How are the candidates spending on criminal justice ads on Facebook in 2020?

TRUMP'S ESTIMATED COST

\$6,104,788

BIDEN'S ESTIMATED COST

\$8,116



In late August, Biden ran his first ad addressing criminal justice—a response to the police shooting of Jacob Blake in Kenosha, Wisconsin. His Facebook spending on criminal justice in the last two weeks of August amounted to less than 1 percent of what Trump spent in the same period.

Implications

- A creator or user interacting with a data visualization has several roles: user, designer, creator, presenter, communicator, and evaluator.
- Visualization development is an evolving skill and practice that applies across disciplines and professions; potential application of data visualization and related skills is infinite.
- The role of the library is to facilitate the development of proficiencies in abstract thinking and knowledge synthesis by developing an understanding of design as manipulation and interpretation of data.

Project Status

- Additional literature review to address advances in data visualization and its relationship to scholarly communication.
- Examining how the proposed framework interacts with the ACRL Framework on Information Literacy.
- Ongoing examination of library-related data and visual literacy initiatives.