

MISLEADING DATA VISUALIZATIONS ACTIVITY

An Exploration of Distorted and Manipulated Data

ACTIVITY SUMMARY

Students will compare and contrast two data visualizations that each contain the same data, but differ in their presentation. Students will work both individually and within small groups to identify the visualization that has been manipulated and to describe how the manipulation affects the overall message that the creator is hoping to communicate. This activity could be useful at the beginning of the school year because it teaches students strategies for evaluating and analyzing data visualizations. Students can then use these tools and skills throughout the year to evaluate the data visualizations in their own textbook or ones found in the world around them. This activity is best suited for middle school students but can be adapted for other grades.

MATERIALS NEEDED

- ☐ Copies of the 4 misleading data visualizations
- ☐ Copies of the 4 accurate data visualizations
- ☐ Projector
- ☐ Pencil
- ☐ Analyzing Data Visualizations Worksheet
- ☐ Paper for Exit Ticket
- ☐ Anchor Chart Paper

CONCEPT(S) ADDRESSED

- Authority
- Credibility
- Intention

OBJECTIVES

By the end of this activity, students will be able to:

- Identify common ways that data visualizations can mislead learners.
- Analyze a data visualization's origin, content, purpose, and reliability.

RELATED STANDARDS

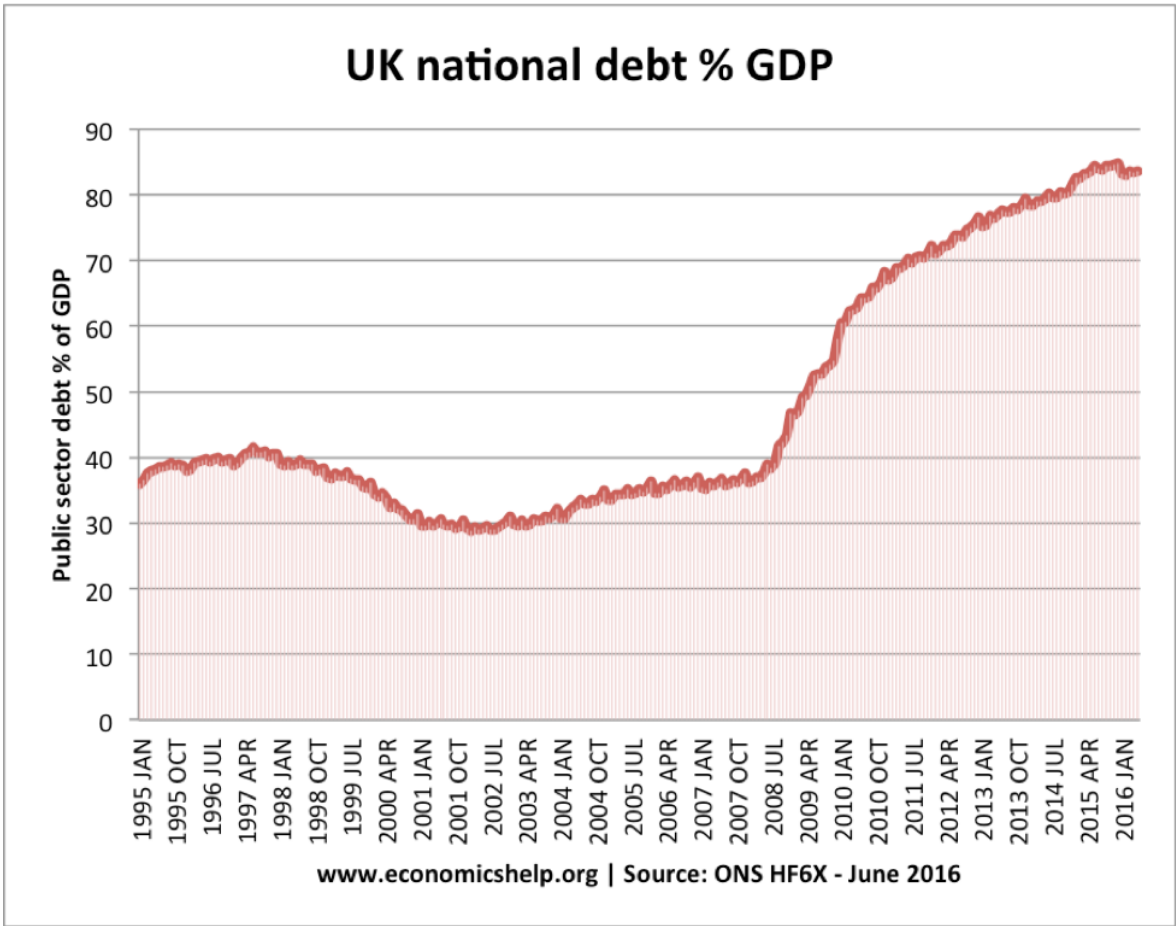
- ☐ P.2.2 Evaluate data presented in social science tables, graphs, graphics, maps, and texts.
- ☐ CCSS.ELA-LITERACY.RI.6.6 Determine an author's point of view or purpose in a text and explain how it is conveyed in the text.

ASSUMED BACKGROUND KNOWLEDGE/POTENTIAL CHALLENGES

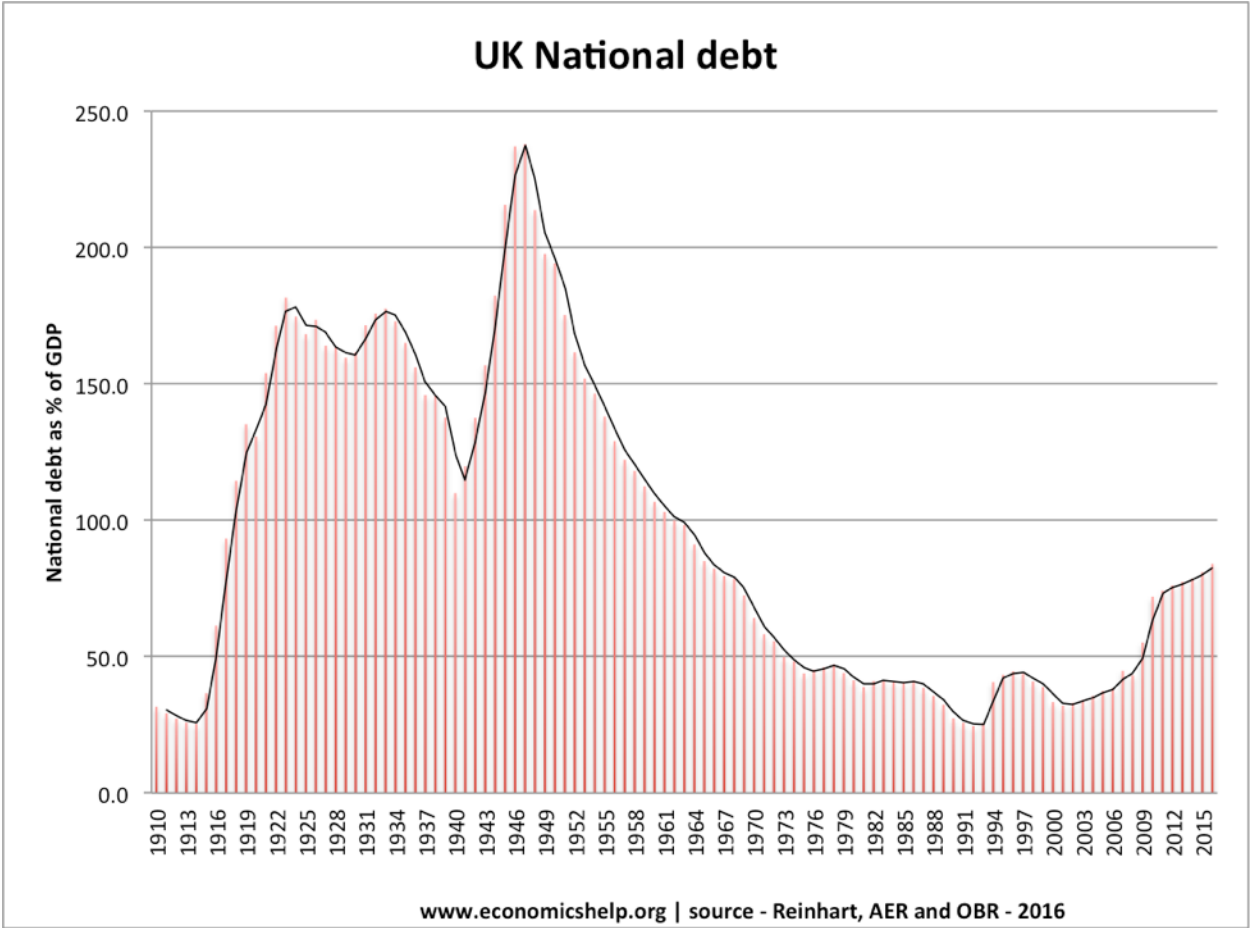
It is assumed that the student is familiar with reading and extracting information from data visualizations like timelines, graphs, charts, and maps. The student should also have some experience interpreting data from a visualization and should have some prior practice with skills like detecting patterns, trends, and oddities. Students may see the topics of the data visualizations as potential challenges during the activity, but students do not need to have extensive background knowledge on the different topics represented in the data visualizations to complete the activity.

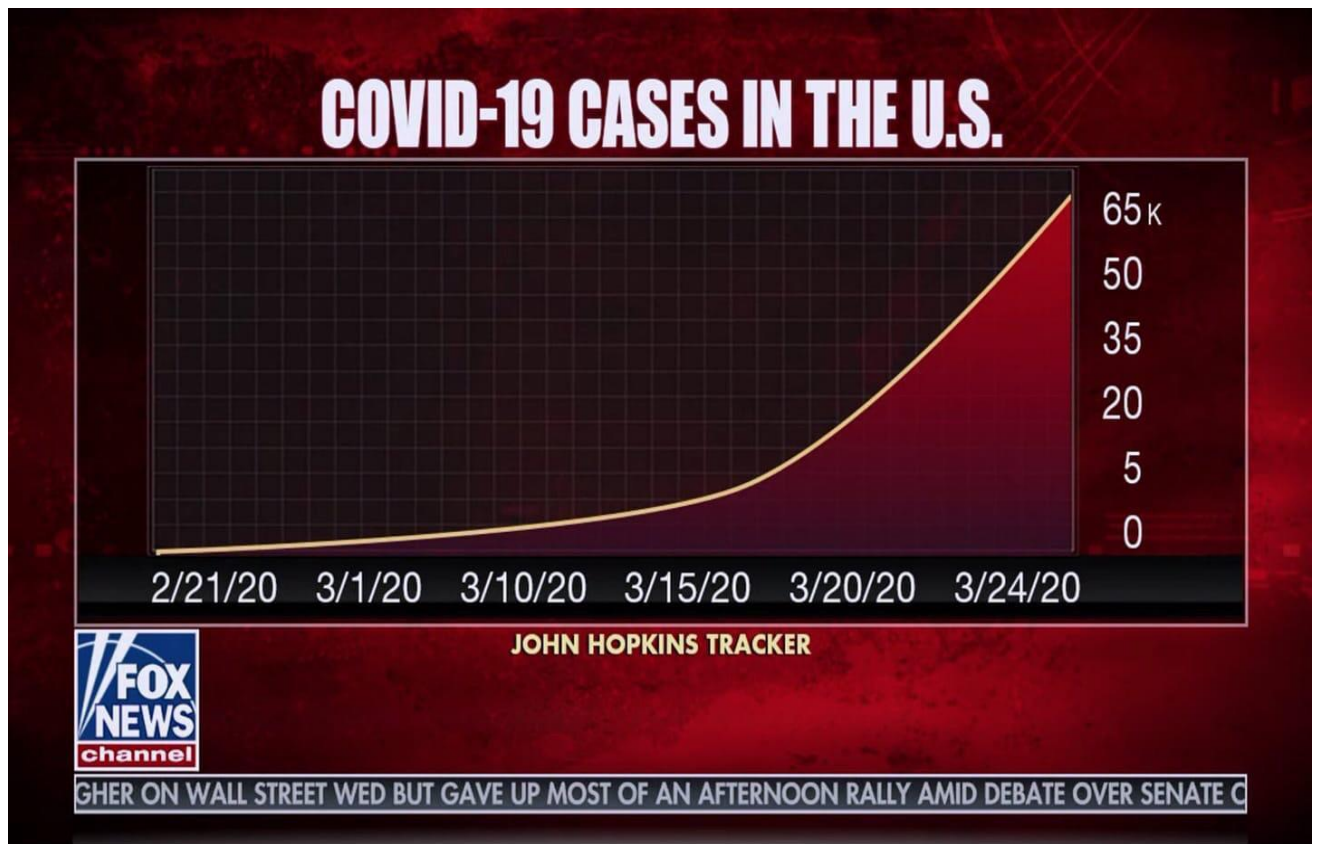
INSTRUCTIONAL SEQUENCE

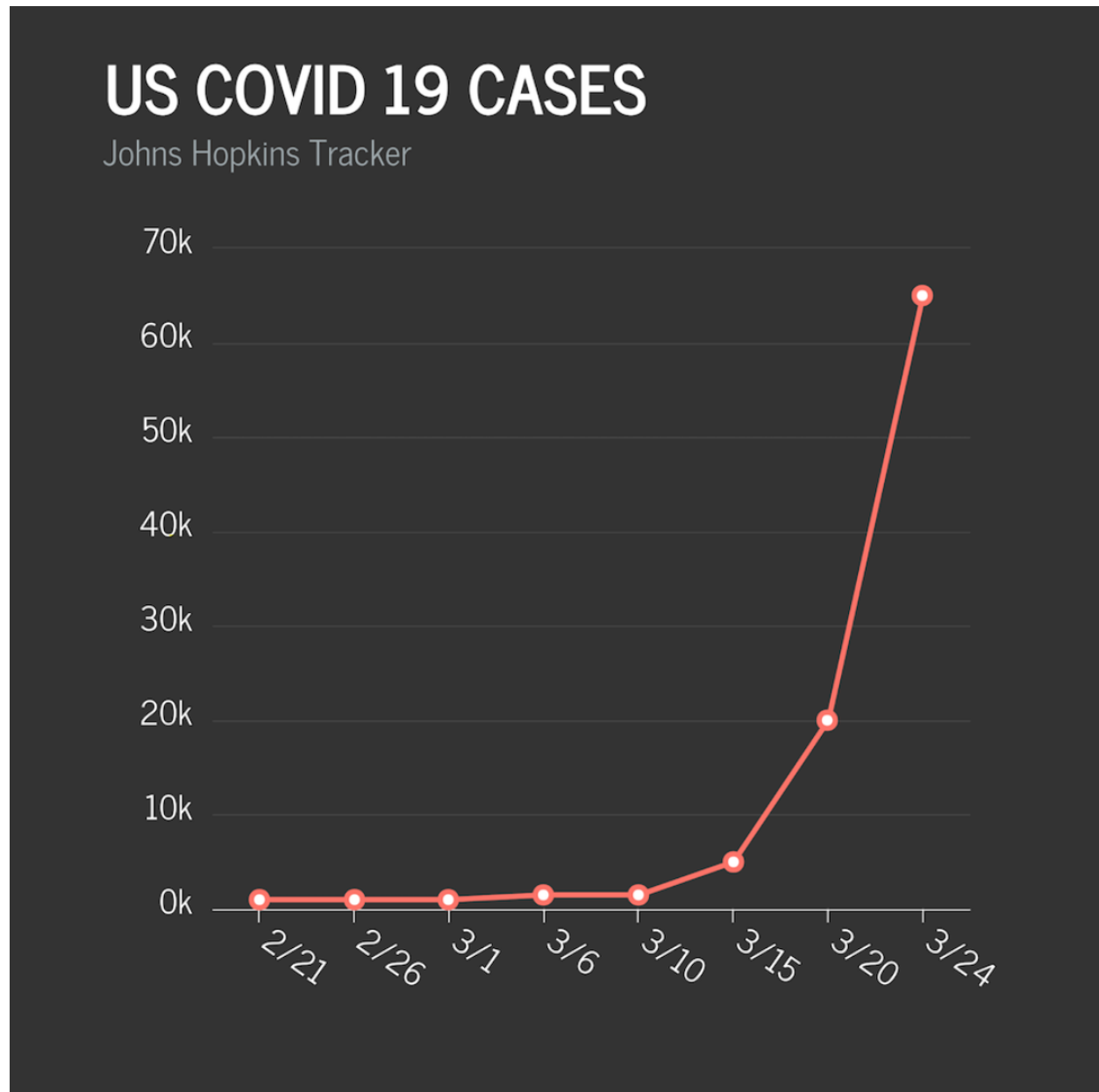
1. Break students into groups of four. Assign each student within the group a number 1-4. This number will then determine which data visualization the student will be responsible for analyzing, as each group member will be assigned a different one. Once numbered, pass out the copies of the corresponding (misleading) data visualizations and the worksheets.
2. Students will jigsaw in their group of four. Each student will spend time reading/analyzing their data visualization independently. While analyzing, they will be asked to fill out a worksheet to organize and guide their thinking. Questions on the worksheet include: Where did this data come from? Do you notice anything inaccurate about the data visualization? What information is the visualization communicating? What is its purpose? Do you think that this is a reliable data visualization? Why or why not?
3. After students complete the independent portion of the jigsaw activity, they will each take turns being the leader of their small group. Each student will take a few minutes to present their data visualization to their group members, summing up their analysis and answers to the worksheet questions. Students who are not presenting will sit and listen quietly.
4. Re-group students based on their assigned number (Group all the 1's together, all the 2's together...). In these groups, all the students should have analyzed the same data visualization. Ask students to take a few minutes to share with their new group members some of their thoughts and findings.
5. Students remain in these groups. Pass out the second (accurate) data visualization for each corresponding number/group. Ask students to take a few moments to check out the new visualization and record their thinking on the back side of the worksheet. Some questions the students must answer on their worksheet are: What do you notice about this data visualization? How is it similar or different to the first data visualization they received? How does this change the meaning of the data? Now, which do you think is more reliable and why?
6. Students receive a few minutes to talk with their group mates about what conclusions they drew and any lingering questions they may have.
7. Switch from small group to whole group instruction. Call on students to identify some ideas that came up during the activity/ideas that their group discussed. Keep conversation focused on how the data visualizations were manipulated and how that affected the message that was being conveyed. Teachers should list these ideas on an anchor chart. Ideas may include: manipulation of the x or y-axis, not including the whole data set, using the wrong type of visualization to communicate their ideas, etc. (See attached answer sheet for more ideas)
8. As an exit ticket, the teacher will project another example of a data visualization on the board. Students will use a half sheet of paper and write down their thoughts on how the data visualization may be misleading. The student should also mention how this distortion changes what message is being communicated to the audience. Teachers should collect the exit ticket and worksheet from the students before they leave.



Group #1 Data Visualization 2



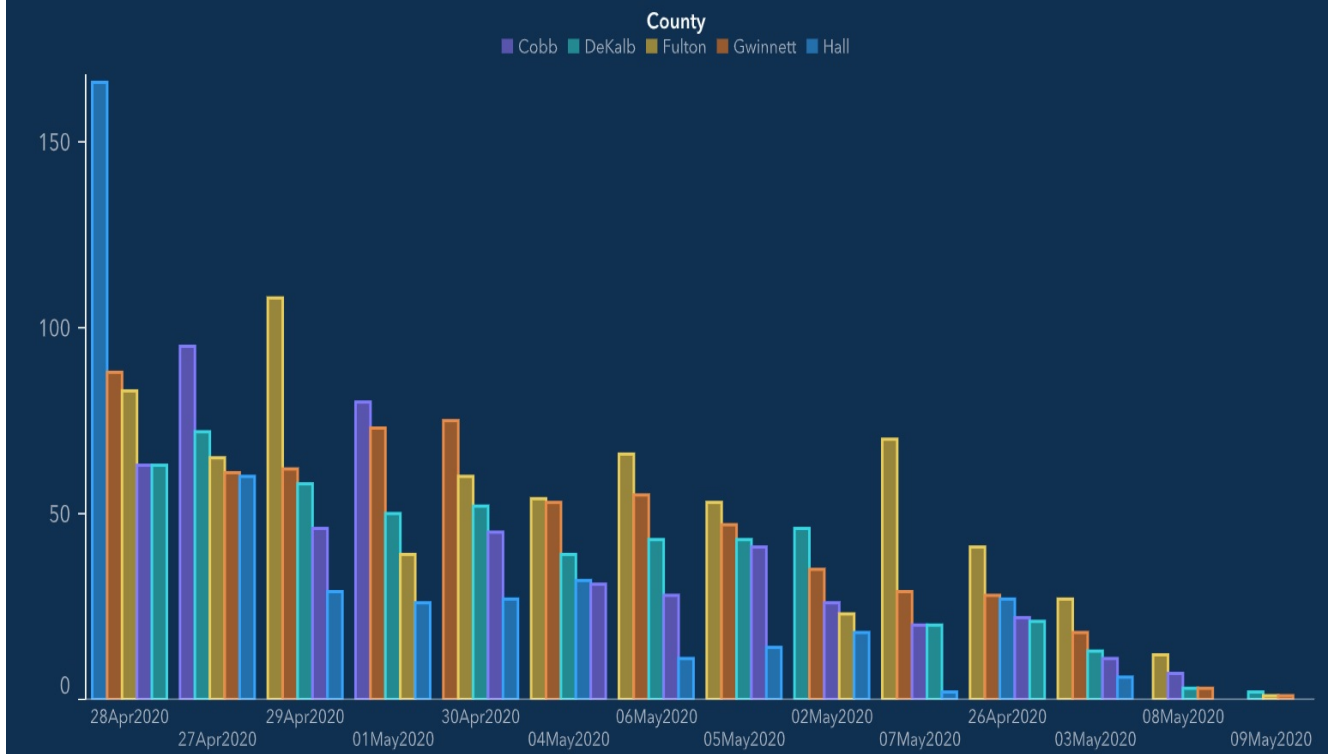




Group #3 Data Visualization 1

Top 5 Counties with the Greatest Number of Confirmed COVID-19 Cases

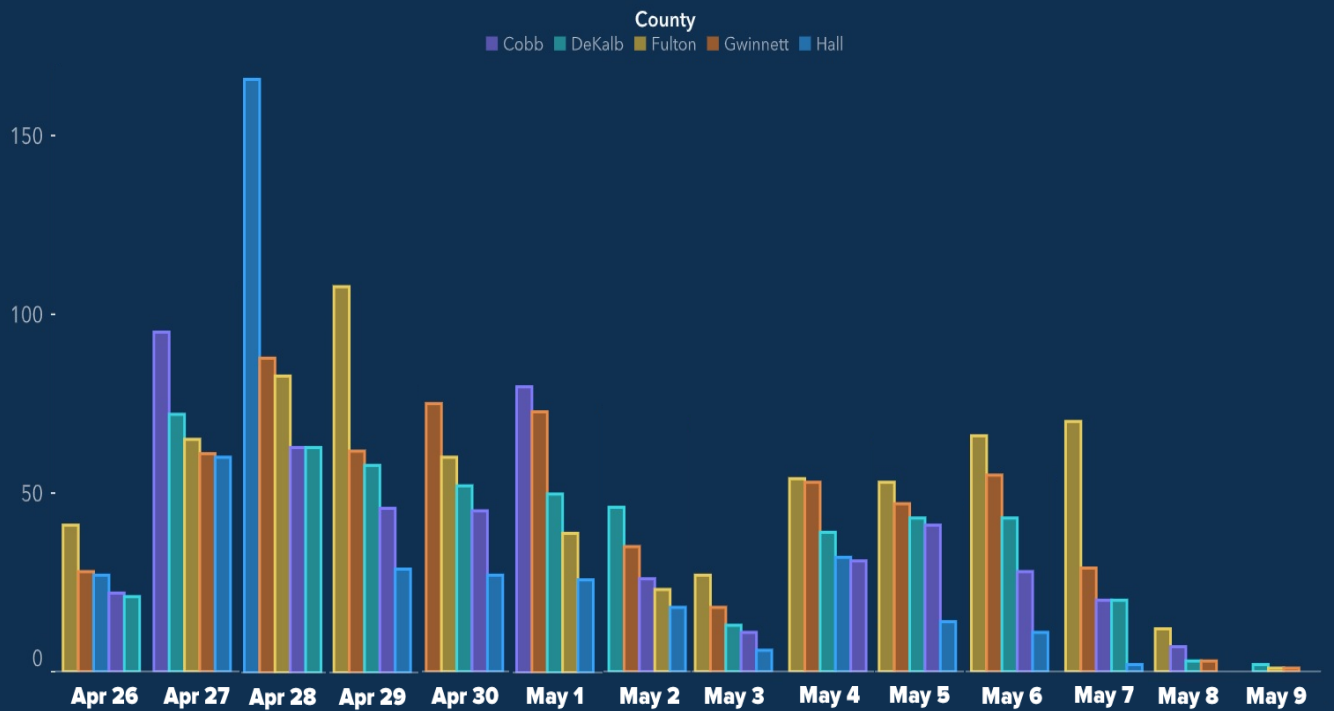
The chart below represents the most impacted counties over the past 15 days and the number of cases over time. The table below also represents the number of deaths and hospitalizations in each of those impacted counties.



Group #3 Data Visualization 2

Top 5 Counties with the Greatest Number of Confirmed COVID-19 Cases

The chart below represents the most impacted counties over the past 15 days and the number of cases over time. The table below also represents the number of deaths and hospitalizations in each of those impacted counties.

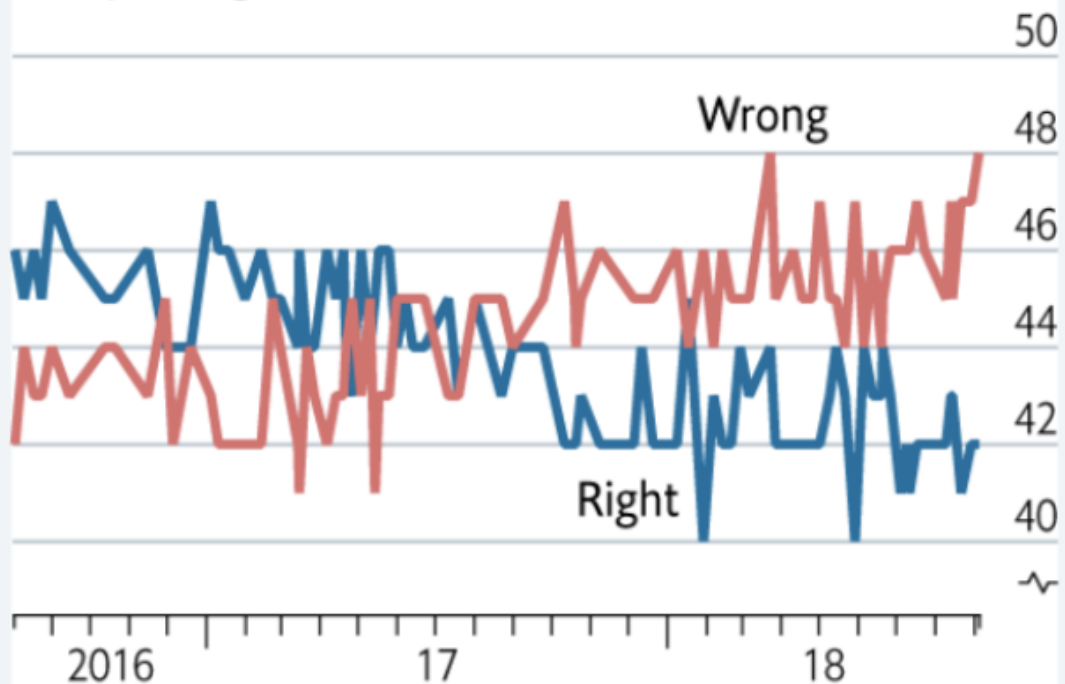


Original

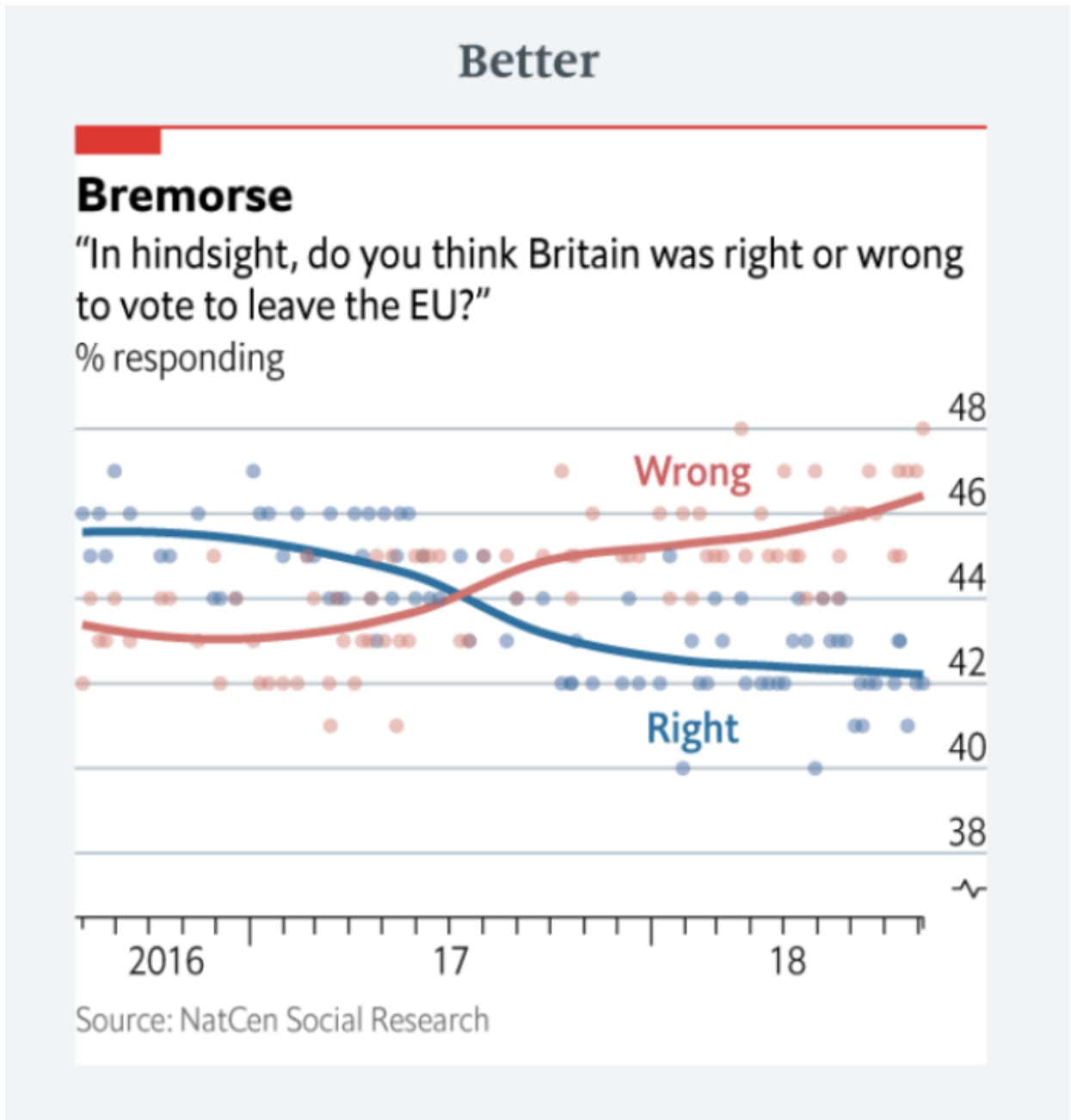
Bremorse

"In hindsight, do you think Britain was right or wrong to vote to leave the EU?"

% responding



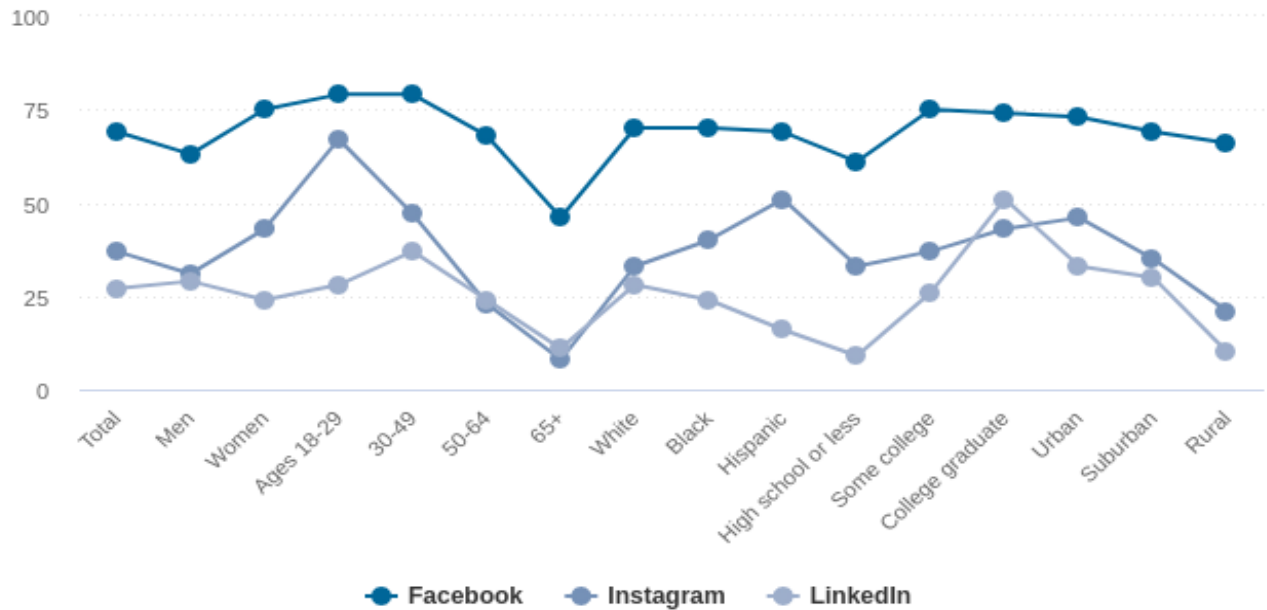
Source: NatCen Social Research



Who uses Facebook, Instagram and LinkedIn

% of U.S. adults who use each social media platform

% of U.S. adults who use ...



Source: Survey conducted Jan. 8 to Feb. 7, 2019.

NAME: _____

DATE: _____

HOUR: _____

DATA VISUALIZATION #1 THOUGHTS & OBSERVATIONS

1. Where did this data come from? Who created the data visualization? How do you feel about its origin?
2. Do you notice anything inaccurate about the data visualization? Is there anything you would change about the visualization?
3. What information is the visualization communicating? What is the “so what” of the visualization?
4. What is its purpose? Why do you think the visualization was created? Was it created with good or bad intentions?
5. Do you think that this is a reliable data visualization? Why or why not?

DATA VISUALIZATION #2 THOUGHTS & OBSERVATIONS

1. What do you notice about this data visualization? How is it similar or different to the first data visualization you received?
2. Does this change the meaning or “so what” of the visualization? If so, how?
3. Now, which do you think is more reliable and why?

ANSWER SHEET TO GUIDE DISCUSSION

Data Visualizations can mislead learners by:

- ☐ Hiding or leaving out data that provides context for the learner
 - ☐ Example: Group 1 Data Viz 1

- ☐ Distorting how the data is presented
 - ☐ This may occur when:
 - ☐ The baseline is left out
 - ☐ The x or y axis has been manipulated (Example: Group 2 &3 Data Viz 1)
 - ☐ The creator uses the incorrect visualization to present the data (Group 4 Data Viz 1 & Exit Ticket)
 - ☐ The visualizations goes against conventions

- ☐ Describing the data inaccurately
 - ☐ This may occur in:
 - ☐ The title
 - ☐ The annotations
 - ☐ The data viz

- ☐ Presenting the wrong data or too much data at once