CREATING ACCESSIBLE DATA VISUALIZATIONS

Presented by

Science Gallery Atlanta

for the Georgia Tech Arts Festival

2023 IS THE YEAR OF OPEN SCIENCE

"The principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity."

- (open.science.gov)

"The principle and practice of making research products and processes **available to all**, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and **equity**."

- (open.science.gov)

DIGITAL ACCESSIBILITY

"Digital accessibility is the inclusive practice of ensuring that everyone has equal access to information, functionality, and experience on digital platforms. That means no barriers prevent interaction with, or access to, digital products by people with any type of disabilities or traits commonly linked to disabilities."

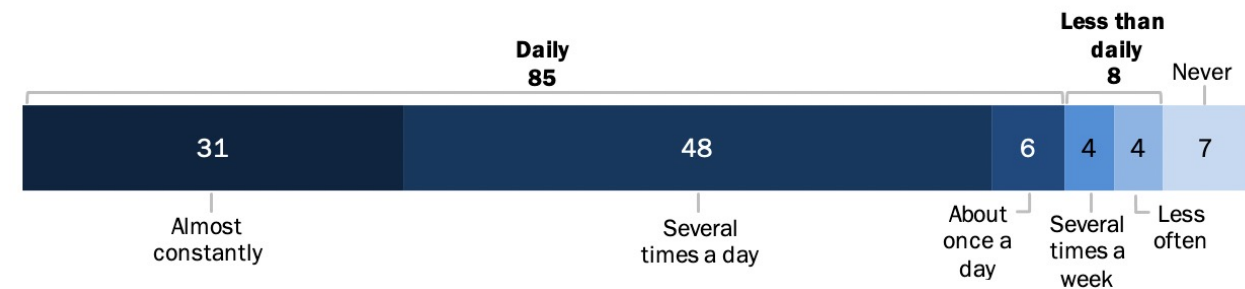- (Teixeira, UX Collective, 2021)

THE INTERNET HAS BECOME ESSENTIAL

- ~ 86% of companies do interviews over video calls (Gartner Research, 2023)

- ~ 37% of adults used telemedicine in 2021 (NCHS, 2022)

Not to Mention…

- Its use for work

- Its use for entertainment

- Its use for social connection

- Its use for education**

More than eight-in-ten U.S. adults go online at least daily

% of U.S. adults who say they go online …

Daily 85			Less than daily 8		Never
31	48	6	4	4	7
Almost constantly	Several times a day	About once a day	Several times a week	Less often	

Note: Respondents who did not give an answer are not shown.
Source: Survey of U.S. adults conducted Jan. 25-Feb. 8, 2021.

PEW RESEARCH CENTER

THE DATA

Americans with a disability are less likely than those without one to have traditional computer, smartphone

% of U.S. adults who say they have the following

● Any disability   ● No disability

		No disability - any disability DIFF
Desktop or laptop computer	62 ● ● 81	**+19**
Smartphone	72 ● ● 88	**+16**
Tablet computer	47 ●● 54	+7
Home broadband	72 ●● 78	+6
All of the above	26 ● ● 44	**+18**

0   20   40   60   80   100

Note: Statistically significant differences in **bold**. The difference values shown are based on subtracting the rounded values in the chart. Respondents who did not give an answer are not shown.
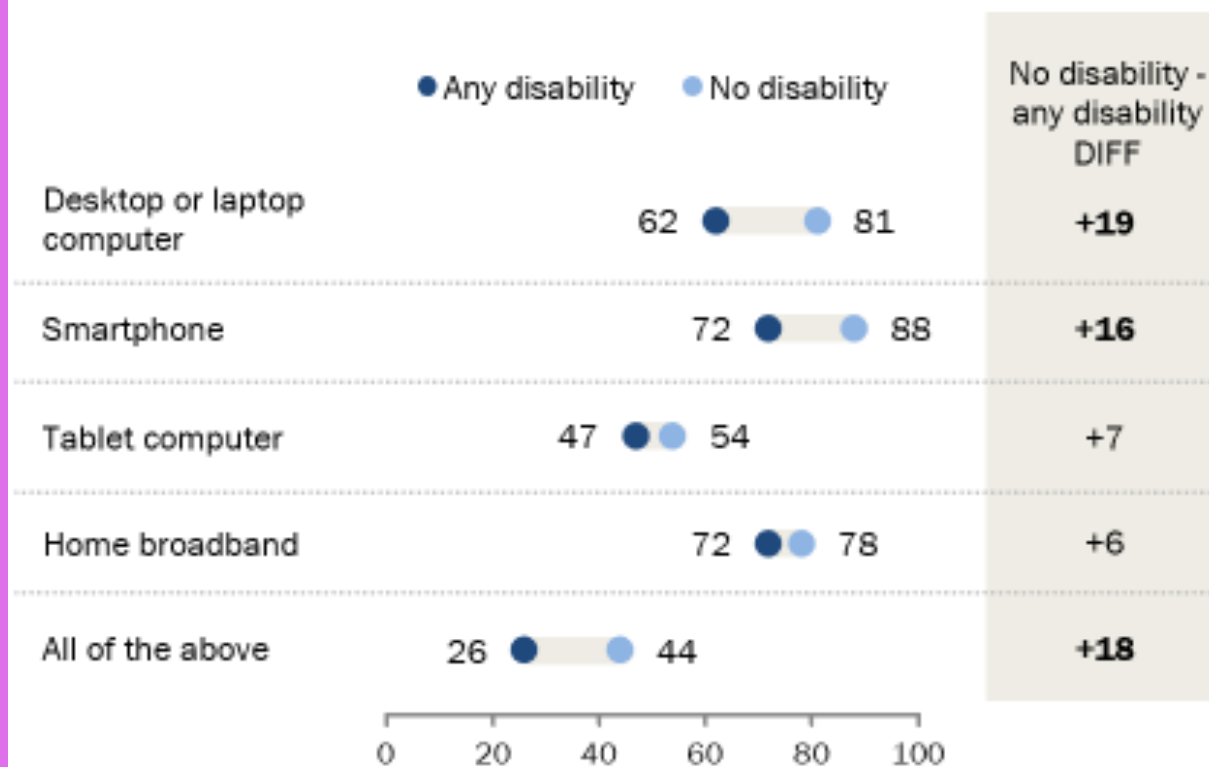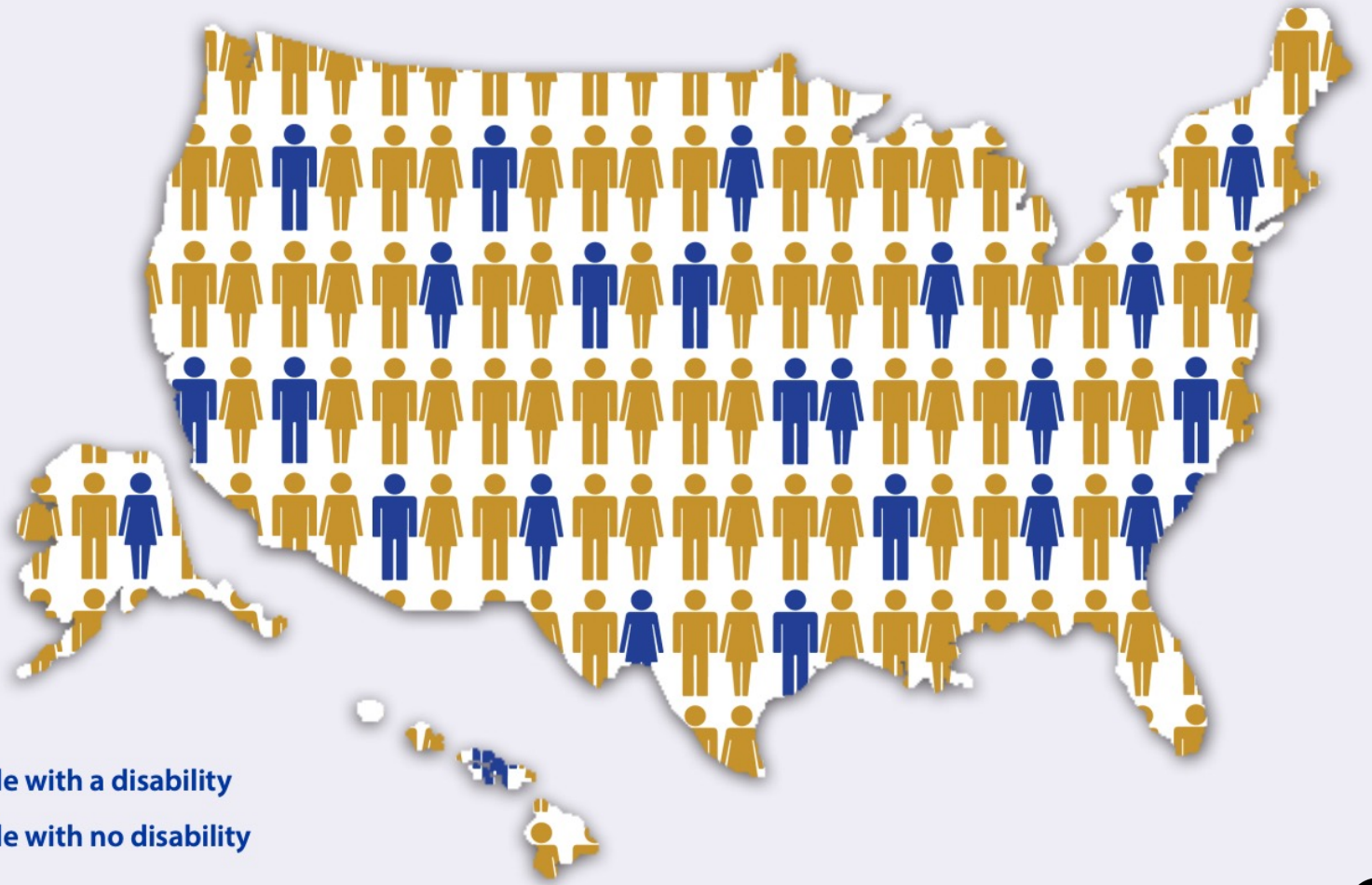Source: Survey of U.S. adults conducted Jan. 25-Feb. 8, 2021.

PEW RESEARCH CENTER

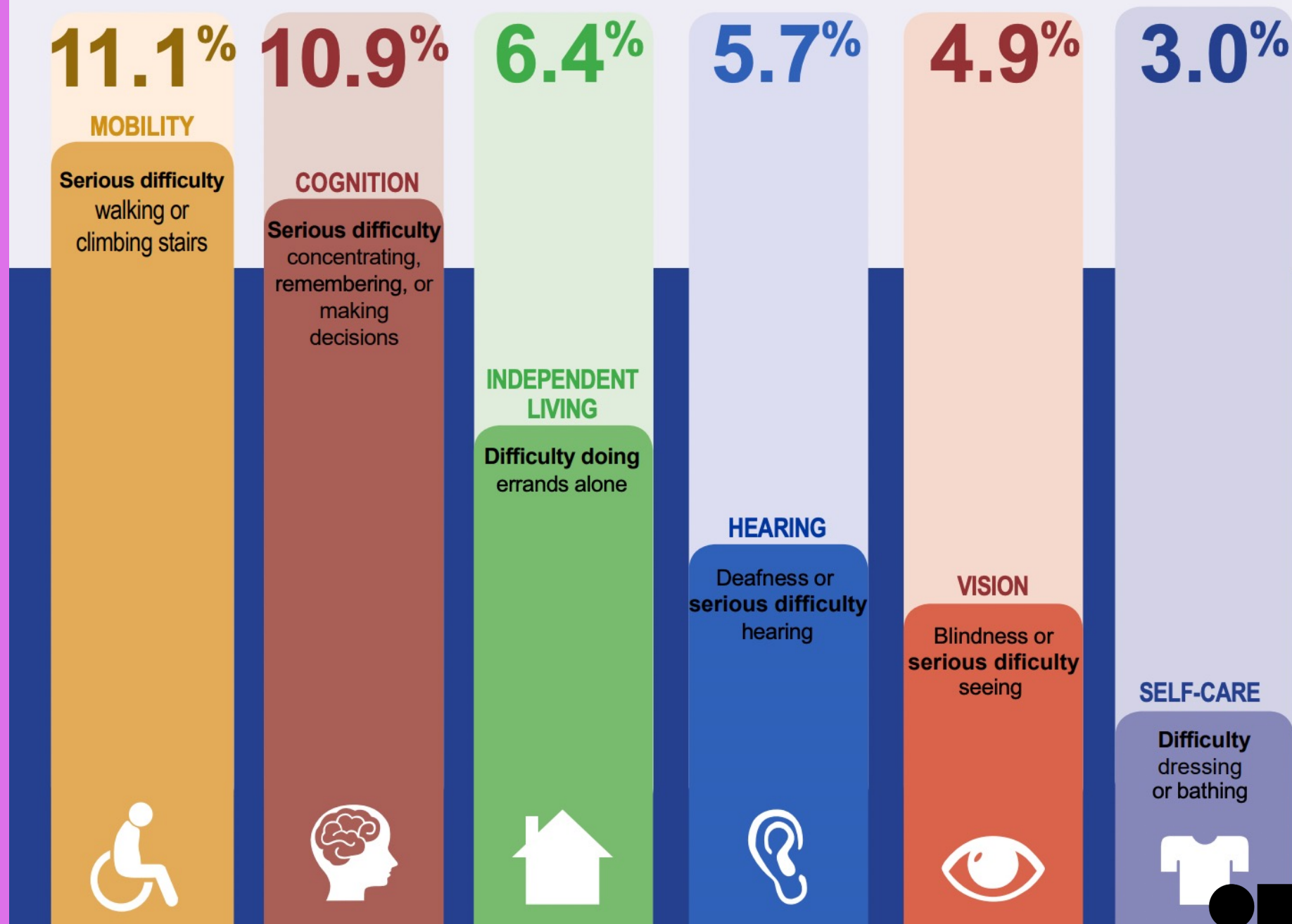Up to **1 in 4** (26%) adults in the United States have some type of disability

People with a disability

People with no disability

THE DATA

THE DATA

CDC. Disability & Health Data System. May 2022

11.1%
MOBILITY
Serious difficulty walking or climbing stairs

10.9%
COGNITION
Serious difficulty concentrating, remembering, or making decisions

6.4%
INDEPENDENT LIVING
Difficulty doing errands alone

5.7%
HEARING
Deafness or **serious difficulty** hearing

4.9%
VISION
Blindness or **serious dificulty** seeing

3.0%
SELF-CARE
Difficulty dressing or bathing

SOME EXAMPLES OF DIGITAL BARRIERS

For people with Auditory Disabilities

- Audio content without captions, transcripts, or volume controls

For people with Cognitive Disabilities

- Complex page layout, navigation, and overstimulating content that can't be suppressed.

For people with Physical Disabilities

- Pages without full keyboard support

For people with Visual Disabilities

- Images without text alternatives
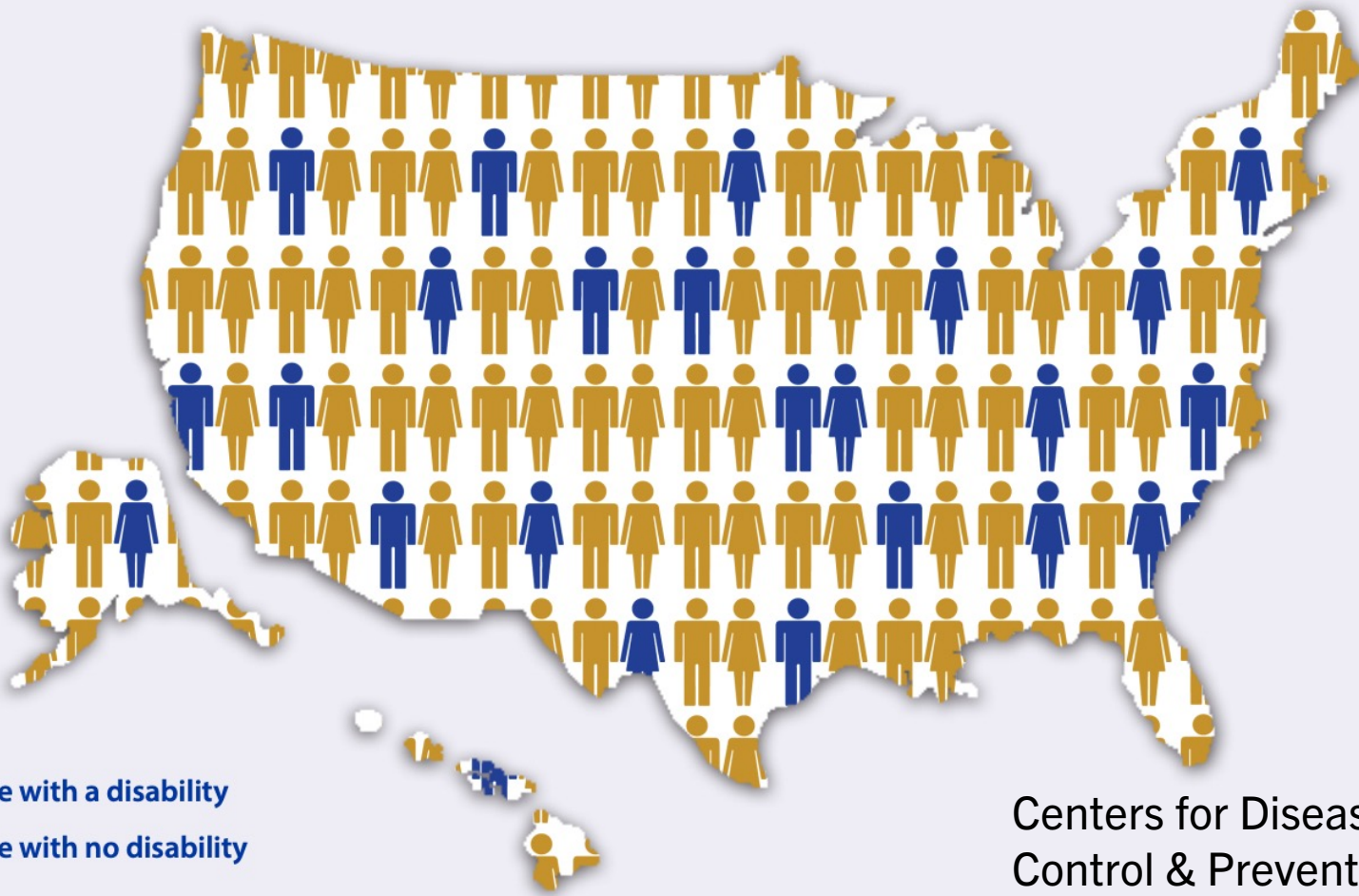
HOW CAN WE MAKE INFORMATION MORE ACCESSIBLE?

DATA VISUALIZATIONS!

WHAT MAKES A 'GOOD' DATA VISUALIZATION?

Up to **1 in 4** (26%) adults in the United States have some type of disability

People with a disability
People with no disability

Centers for Disease Control & Prevention. May 2022

Up to **1 in 4** (26%) **adults in the United States have some type of disability**

People with a disability
People with no disability

Centers for Disease Control & Prevention. May 2022

Alt-Text Auto Generated:

"A picture containing table"
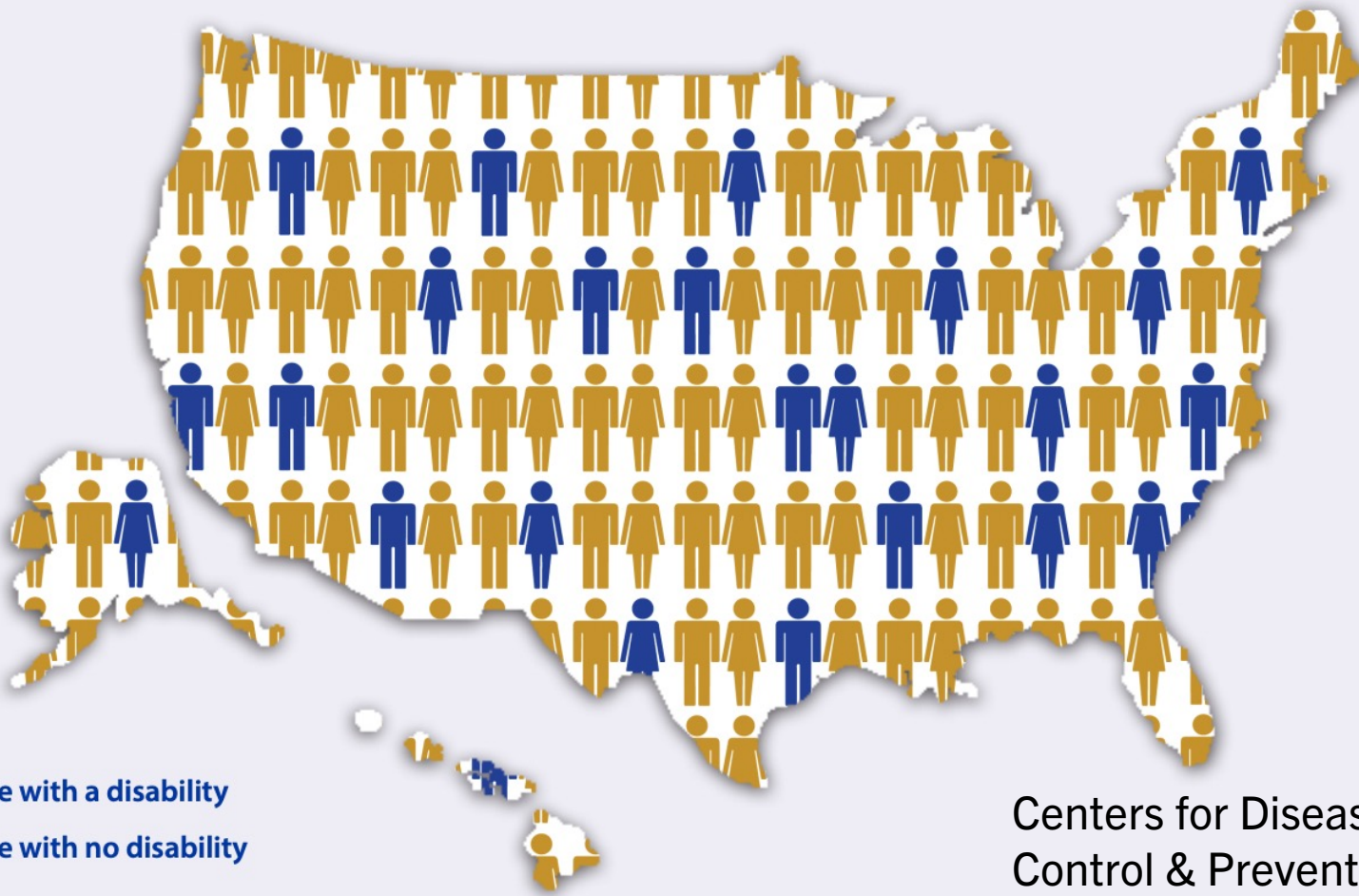
Up to **1 in 4** **adults in the United States have some type of disability**
(26%)
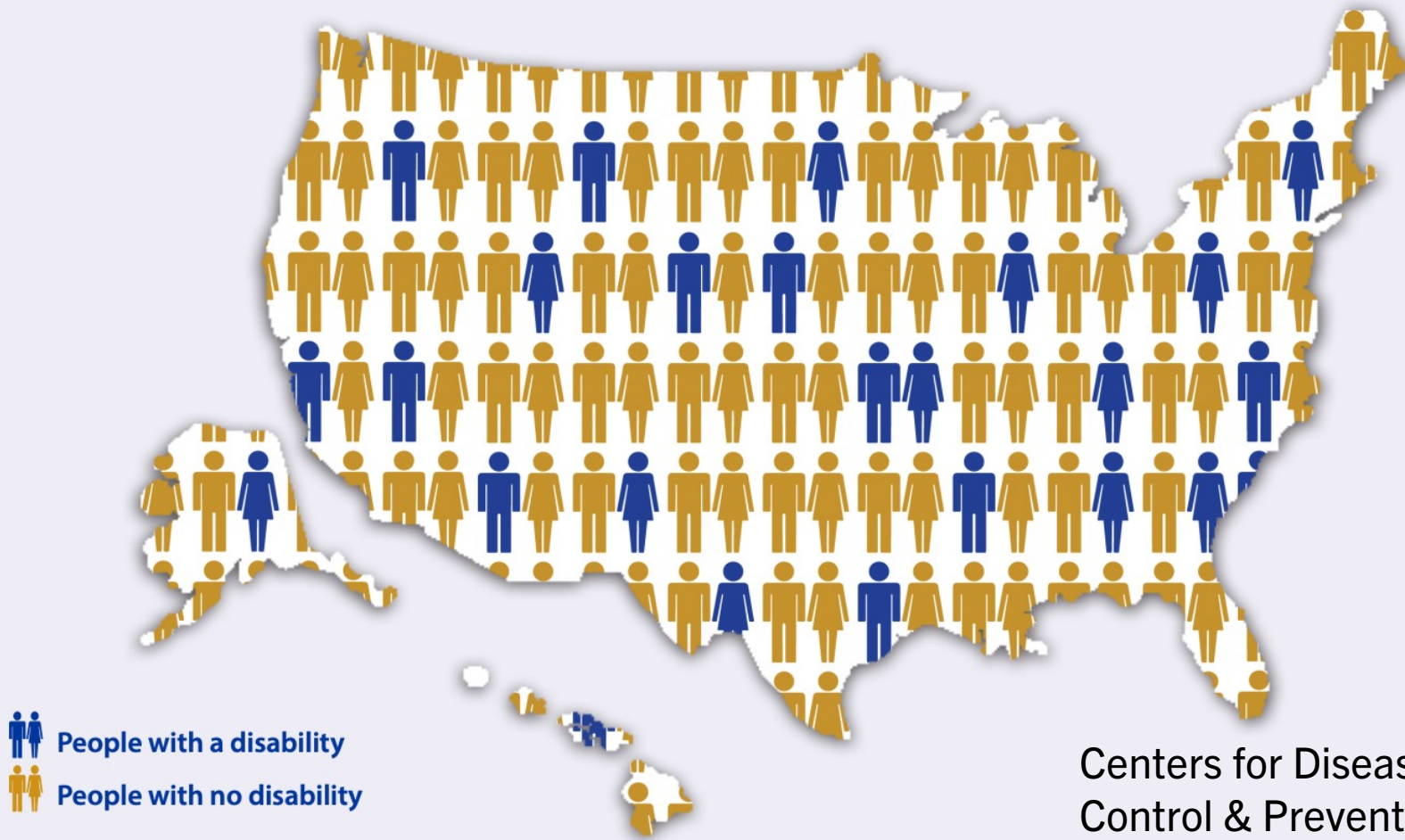
People with a disability
People with no disability

Centers for Disease Control & Prevention. May 2022

Alt-Text Auto Generated:

"A picture containing table"

Example of Good Alt-Text:

A figurative representation of the percent of the American population with a disability. Outline of the map of the United States, filled in with icons of people. Icons depicting the population of people with a disability are blue while icons depicting people with no disability are orange. One-forth of the icons are blue. Graphic Title: "Up to 1 in 4 (26%) adults in the United States have some type of disability."

ALT - TEXT

*"It is read by screen readers in place of images allowing the **content** and **function** of the image to be accessible to those with visual or certain cognitive disabilities.*

It is displayed in place of the image in browsers if the image file is not loaded or when the user has chosen not to view images." (WebAIM)

Writing Alt — Text for Data Visualizations:

"[**Chart type**] **of** [**type of data**] **where** [**reason for including chart**]"

*Good practice to include a link to the data source

EXAMPLE OF ALT – TEXT

(Cesal, 2020)

Gun murders per 100,000 people

America's private arsenal is six times as lethal as Canada's, and 30 times worse than Australia's.

Country	Rate
UNITED STATES	3.0
ITALY	0.7
CANADA	0.5
SWEDEN	0.3
GERMANY	0.2
SWITZERLAND	0.2
AUSTRALIA	0.1
ENGLAND, WALES	0.1
FRANCE	0.1
SPAIN	0.1
JAPAN	0
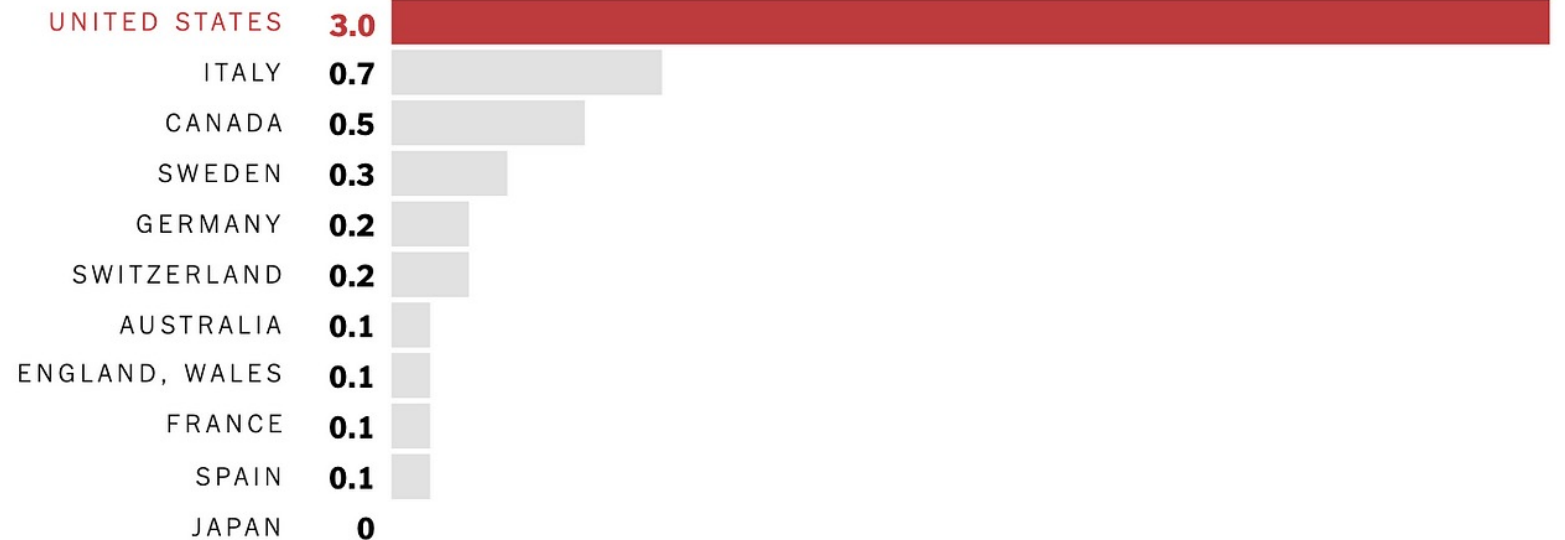
The New York Times | Sources: United Nations Office on Drugs and Crime (gun murders); Small Arms Survey (guns per 100 people) | Murder data for U.S., Canada, Sweden, Switzerland, Australia and Spain from 2015 and latest available for other countries; 2007 data for guns per 100 people.

alt= "Bar chart of gun murders per 100,000 people where America's murder rate is 6 times worse than Canada, and 30 times Australia"

WHAT MAKES A 'BAD' DATA VISUALIZATION?

11.1%
MOBILITY
Serious difficulty walking or climbing stairs

10.9%
COGNITION
Serious difficulty concentrating, remembering, or making decisions

6.4%
INDEPENDENT LIVING
Difficulty doing errands alone

5.7%
HEARING
Deafness or **serious difficulty** hearing

4.9%
VISION
Blindness or **serious dificulty** seeing

3.0%
SELF-CARE
Difficulty dressing or bathing

Centers for Disease Control & Prevention. May 2022

11.1% MOBILITY — Serious difficulty walking or climbing stairs

10.9% COGNITION — Serious difficulty concentrating, remembering, or making decisions

6.4% INDEPENDENT LIVING — Difficulty doing errands alone

5.7% HEARING — Deafness or serious difficulty hearing

4.9% VISION — Blindness or serious dificulty seeing

3.0% SELF-CARE — Difficulty dressing

Centers for Disease Control & Prevention. May 2022

11.1%
MOBILITY
Serious difficulty walking or climbing stairs

10.9%
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Serious difficulty concentrating, remembering, or making decisions

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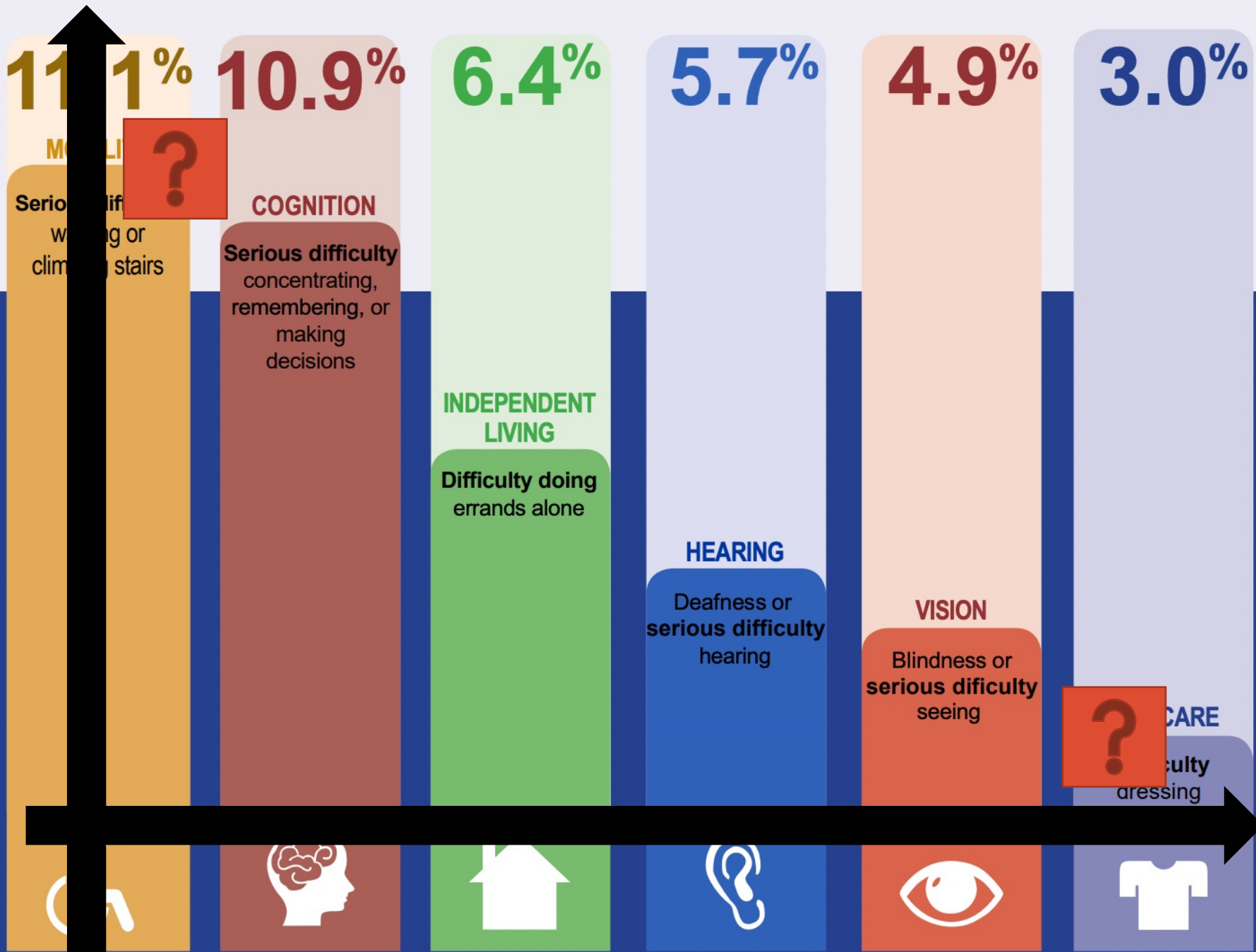VISION
Blindness or **serious dificulty** seeing

3.0%
SELF-CARE
Difficulty dressing or bathing

COLOR,
CONTRAST
Typography

Centers for Disease Control & Prevention. May 2022

COLOR CONTRAST

contrast **ratio**

Background:
white **21** black
Relative Luminance: **1**

Text color:
Relative Luminance: **0**

contrast **ratio**

Background:
blue **1.09** purple
Relative Luminance: **0.0722**

Text color:
Relative Luminance: **0.0614770704324385**

To Pass WCAG 2.0 level AA:

- 4.5:1 for normal text
- 3:1 for large text.

To Pass WCAG Level AAA:

- 7:1 for normal text
- 4.5:1 for large text.

Large text is defined as:

- 14 pt **bold**
- 18 point or larger.

LET'S DISSECT SOME OTHER DATA VISUALIZATIONS
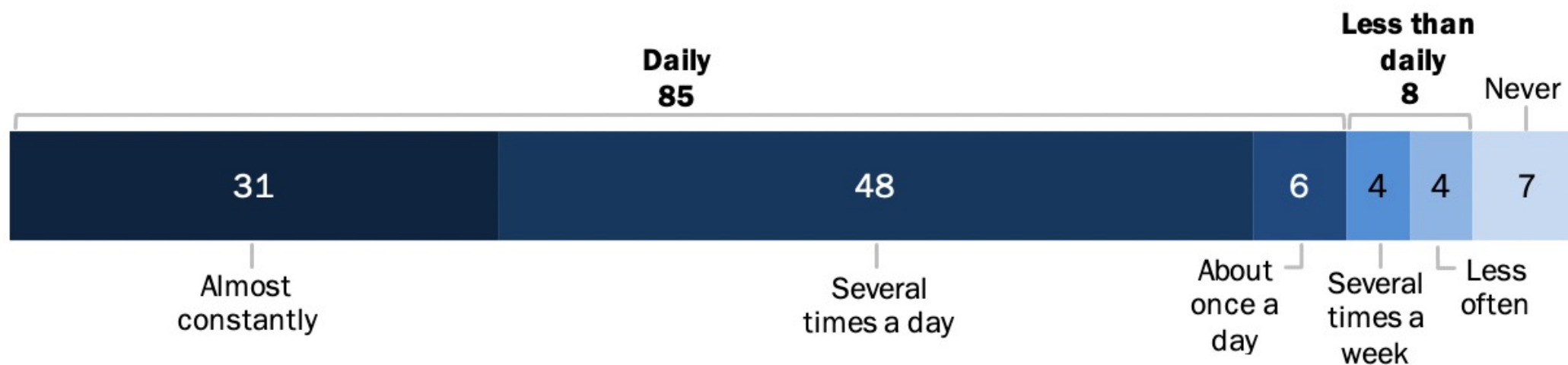
More than eight-in-ten U.S. adults go online at least daily

% of U.S. adults who say they go online ...

**Daily
85**

**Less than
daily
8**

Never

| 31 | 48 | 6 | 4 | 4 | 7 |

Almost
constantly

Several
times a day

About
once a
day

Several
times a
week

Less
often

Note: Respondents who did not give an answer are not shown.
Source: Survey of U.S. adults conducted Jan. 25-Feb. 8, 2021.

PEW RESEARCH CENTER

Regardless of age, disabled Americans are adopting tech at lower rates

% of U.S. adults who say they have ...

	Ages 65+			Ages 18-64		
	Any disability	No disability	Diff	Any disability	No disability	Diff
Desktop/laptop computer	50	66	-16	67	84	-17
Smartphone	32	45	-13	70	87	-17
Home broadband	36	57	-21	66	80	-14
Tablet	21	36	-15	44	57	-13

Overall U.S. Unemployment by state since 2008

Unemployment rate - Seasonally Adjusted [?]

Unemployment - Seasonally Adjusted [?]

3.5 M

3 M

2.5 M

2 M

1.5 M

1 M

0,000

0

0,000

0% 2.5% 5% 7.5% 10% 12.5% 15% 17.5% 20% 22.5% 25% 27.5% 30% 32.

Unemployment rate - Seasonally Adjusted [?]

▶ Dec 1989

Data from U.S. Bureau of Labor Statistics - Powered by Google Explore data
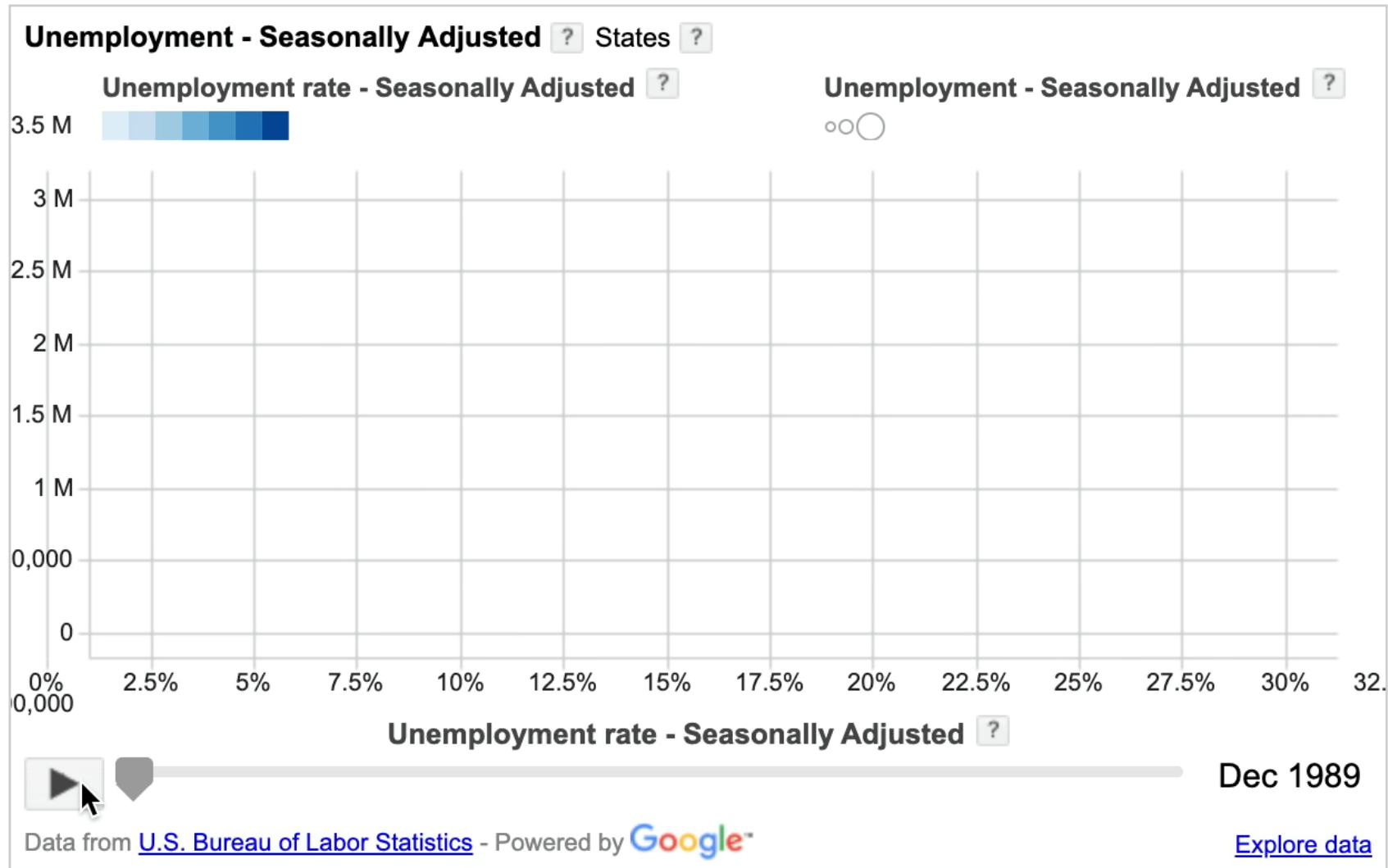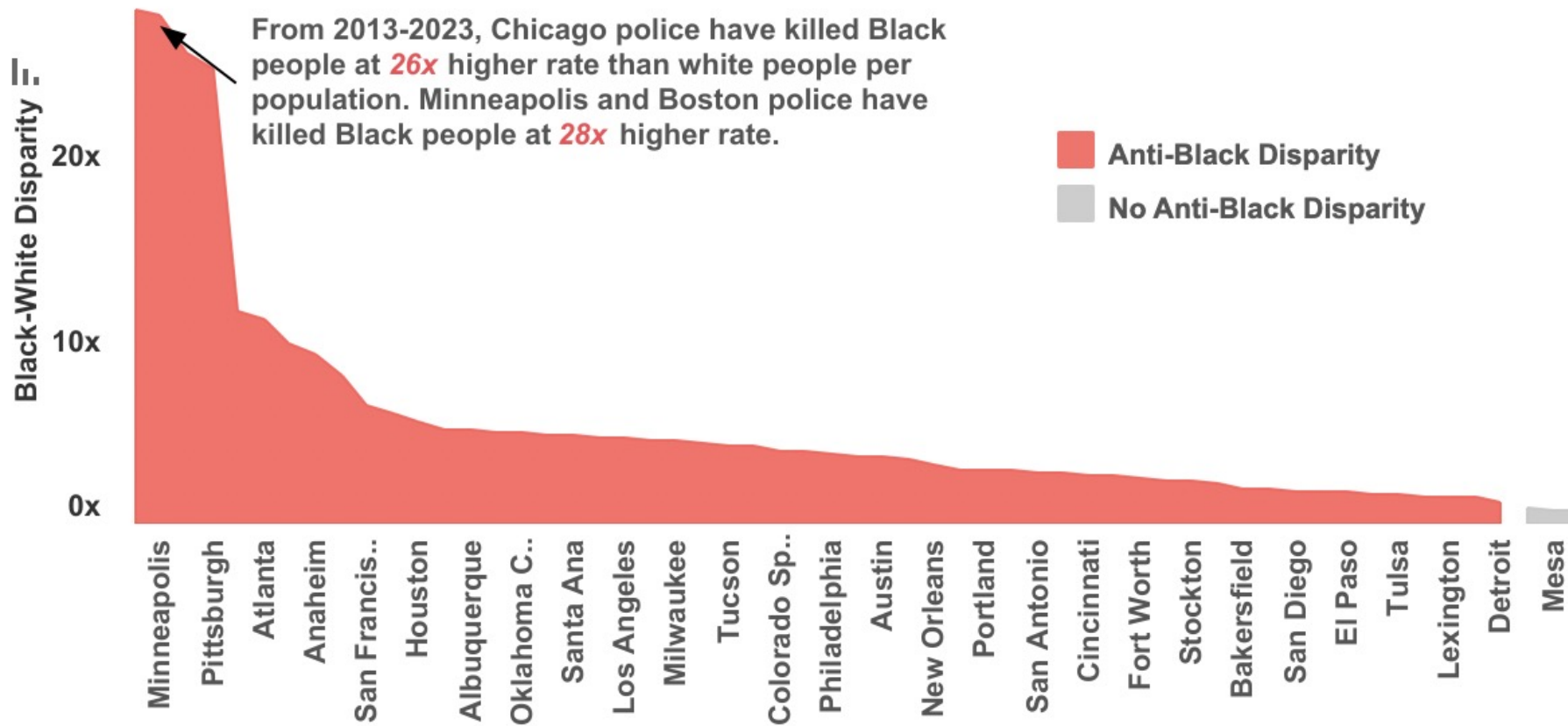
(mappingpoliceviolence.us)

Police have killed 276 people in 2023.

01/06/2022
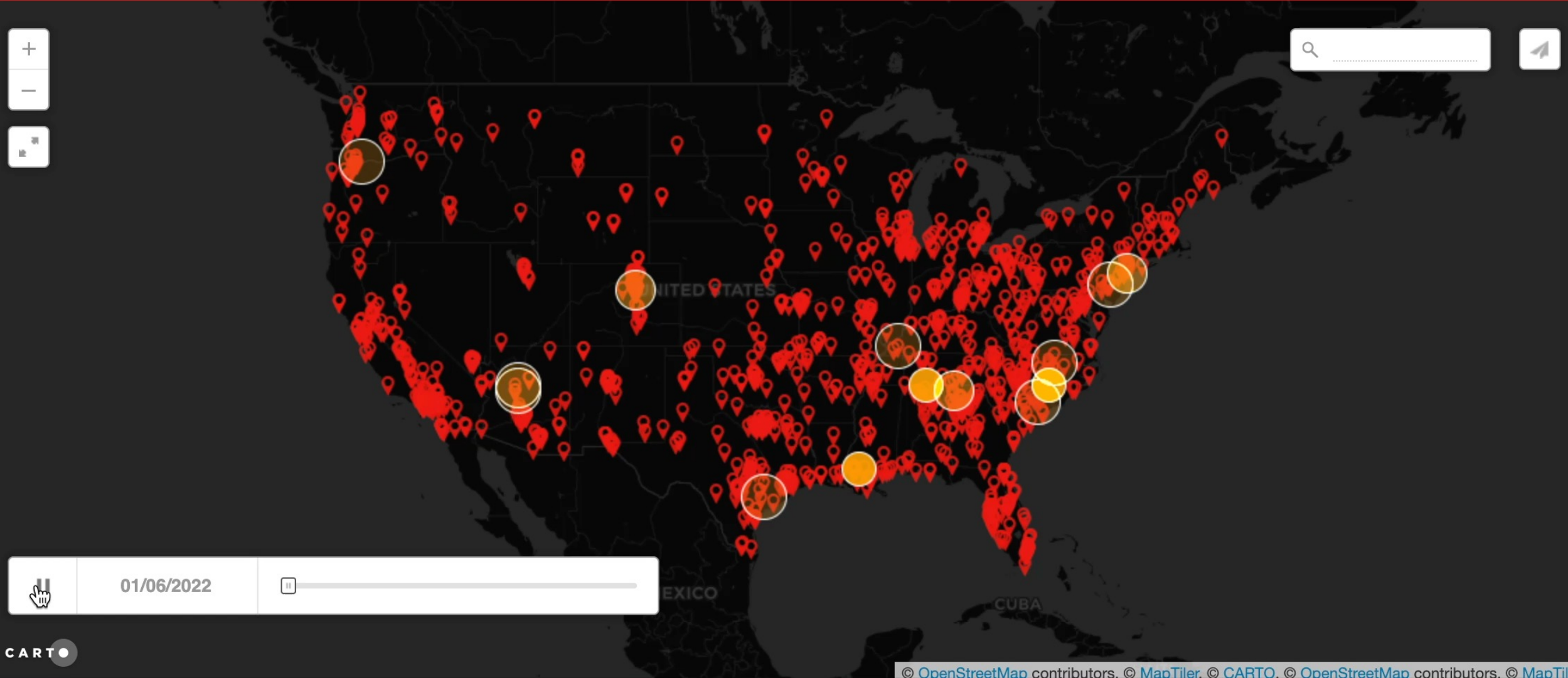
95% of America's major city police departments kill Black people at **higher rates** than white people.

Black-White Disparity in Cities over 300,000 Residents, 2013-2023.

From 2013-2023, Chicago police have killed Black people at *26x* higher rate than white people per population. Minneapolis and Boston police have killed Black people at *28x* higher rate.

Black-White Disparity

20x

10x

0x

■ Anti-Black Disparity
□ No Anti-Black Disparity

Minneapolis, Pittsburgh, Atlanta, Anaheim, San Francis.., Houston, Albuquerque, Oklahoma C.., Santa Ana, Los Angeles, Milwaukee, Tucson, Colorado Sp.., Philadelphia, Austin, New Orleans, Portland, San Antonio, Cincinnati, Fort Worth, Stockton, Bakersfield, San Diego, El Paso, Tulsa, Lexington, Detroit, Mesa

(mappingpoliceviolence.us)

There is no accountability

98.1% of killings by police from 2013-2022 have not resulted in officers being charged with a crime.

■ No Criminal Charges   ■ Officer(s) Charged   ■ Officer(s) Convicted

(mappingpoliceviolence.us)

In February 2021, the City of Berkeley enacted a new policy meant to restrict police from enforcing some traffic violations, including equipment violations like expired tags or tinted windows. While stops for equipment violations have declined since then, overall police traffic enforcement has not reduced substantially – indicating the need for more expansive restrictions on police traffic enforcement.
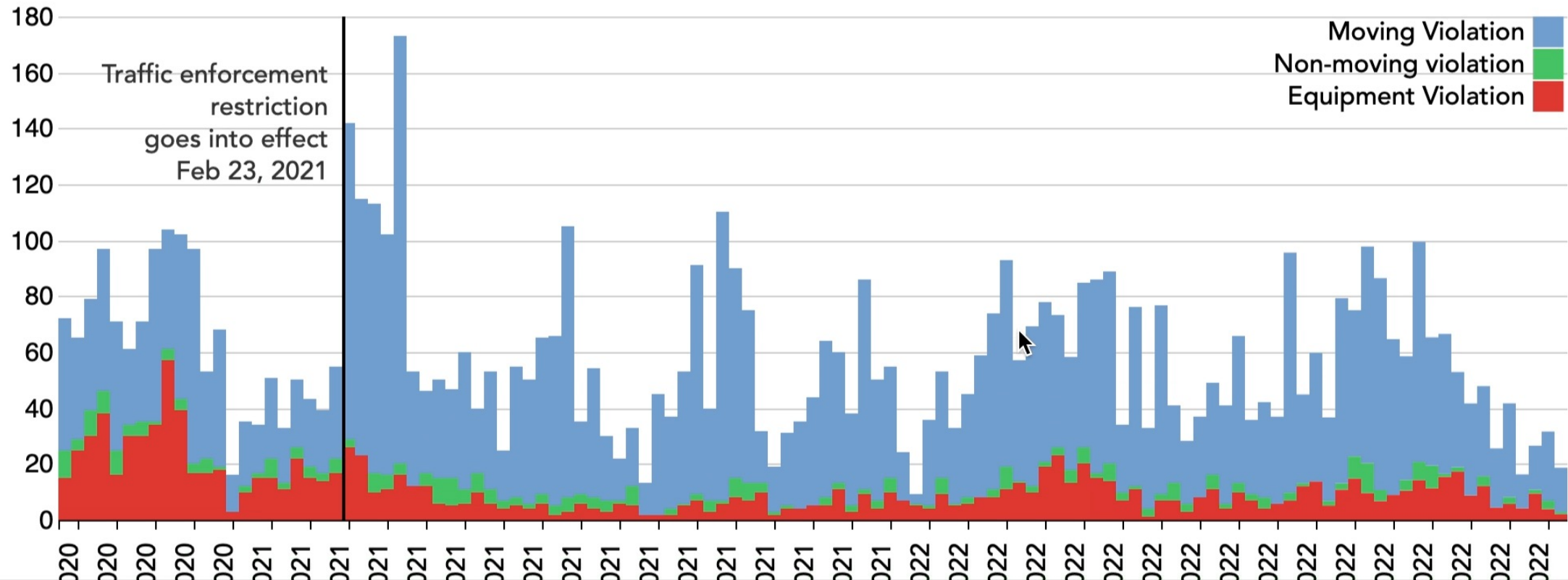
WHAT ARE WE LOOKING FOR WITH THE STRIVE FOR OPEN SCIENCE COMPETITION?

Up to **1 in 4** (26%) adults in the United States have some type of disability

People with a disability

People with no disability
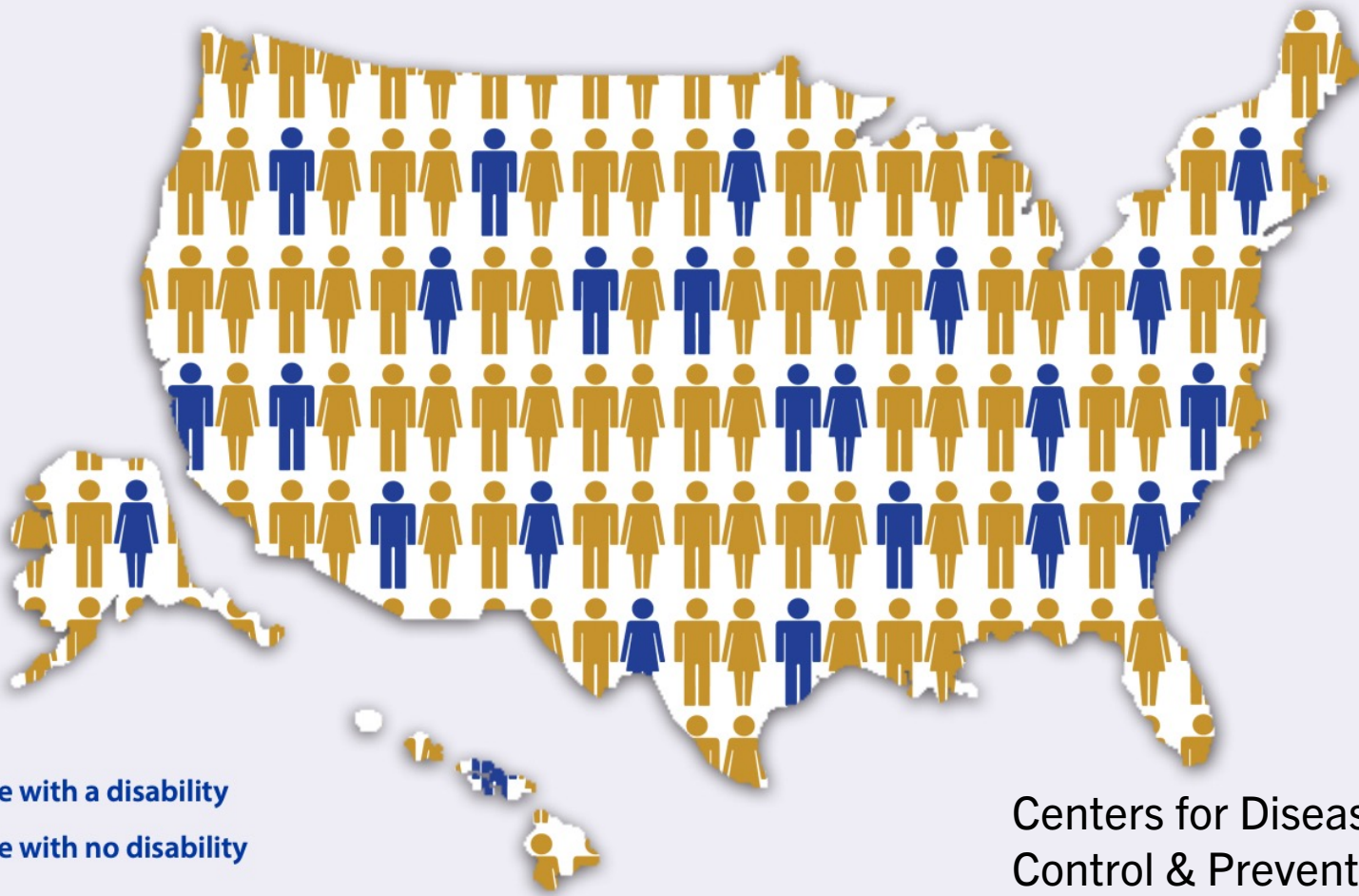
Centers for Disease Control & Prevention. May 2022

THINGS TO CONSIDER WHEN MAKING YOUR DATA VISUALIZATIONS

- Accessibility of Information (Based on W3C Standards)
  - Multisensory delivery of information (i.e. captions for audio & alt-text for images)
  - Takeaway Title (provide context of the data's important points to assist with reading)
  - Check type & color contrast
- Tell a Story & Convey the Emotional Weight Behind the Data (be creative!)
- Ensure the Data Displayed has Meaning
  - Guide the user to the key point
- Let the Data Shine
  - streamline the graphic's elements that don't add to the communication of information

COMPETITION

LOGISTICS

THE DATASET

COVID-19 Case Surveillance Data with Geography

This case surveillance public use dataset has 19 elements for all COVID-19 cases shared with CDC and includes demographics, geography (county and state of residence), any exposure history, disease severity indicators and outcomes, and presence of any underlying medical conditions and risk behaviors.

STEPS

1. Register to be apart of the competition

2. **Use the provided dataset** to create an original data visualization that emphasizes accessibility, creativity, emotional impact, and information content.

3. **Submit your data visualization** before the competition closes on Monday, April 17th.

PRIZES

Chosen finalists, selected by an expert panel of judges, will present their visualizations as a part of the Tech Arts Festival set design. At the block party the community will vote on which submission takes first-place, with the winner getting the opportunity to present their work at a Science Gallery Atlanta public program (program details to be created in conjunction with the winner)!

RESOURCES

- **Getting Started with Tableau**

- **Designing Charts - Principles Every Designer Should Know**

- **Example Data Visualization** 1

- **Example Data Visualization** 2

- **Web Content Accessibility Checklist** (TOOL)

- **Testing for Accessible Data Visualization** (TOOL)

- **Accessible Data Visualization Resources**

- **Resources to Learn More About Digital Accessibility**

- **Web Content Accessibility Guideline (WCAG) Overview**

- **W3C: Web Accessibility Initiative**

ANY QUESTIONS?

Interested in learning more about Science Gallery Atlanta?

Stop by our gallery to see the current exhibition JUSTICE. Open Wed. — Sun. at Pullman Yards

Follow us on social media to stay updated on our upcoming programs