

Chapter 2, Episode 2: Perceivable barriers

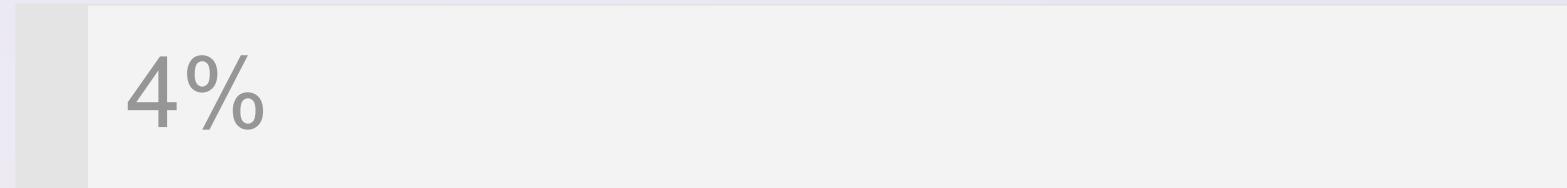
Perceivable

Can someone perceive this in multiple ways? Is each way easy?

Design with high contrast

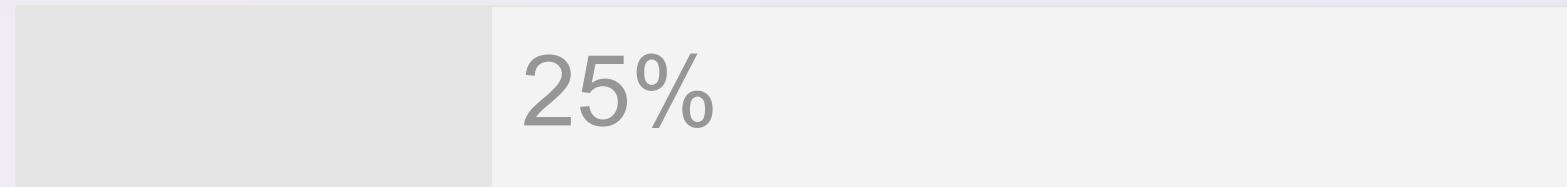
Colorblindness Disproportionately Overrepresented in A11y Resources

Colorblindness: % of People



4%

Low Vision: % of People



25%

Colorblindness: # of Resources



51

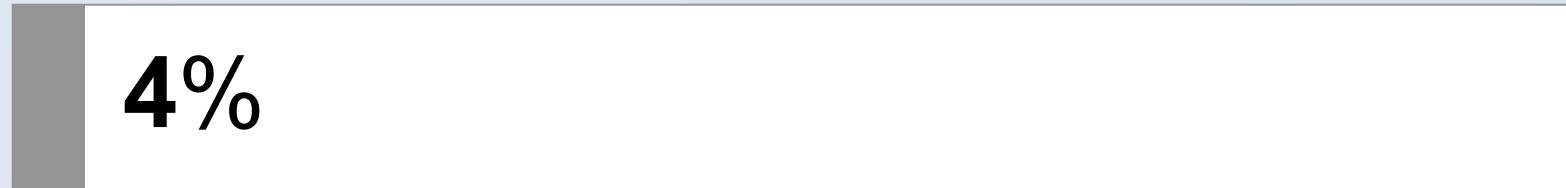
Low Vision: # of Resources



5

Colorblindness Disproportionately Overrepresented in A11y Resources

Colorblindness: % of People



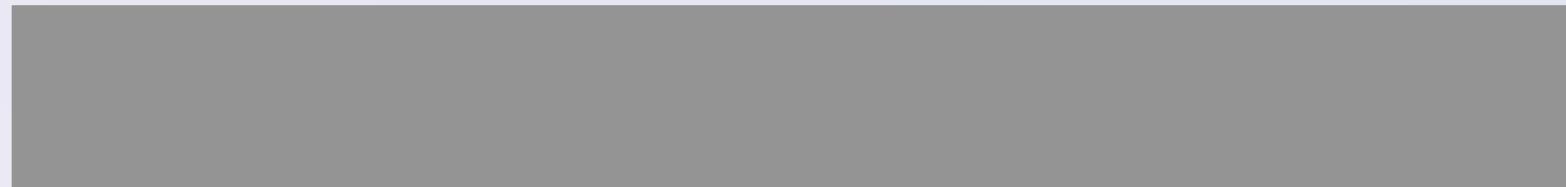
4%

Low Vision: % of People



25%

Colorblindness: # of Resources



51

Low Vision: # of Resources



5

Use High Contrast Text

Text needs at least 4.5:1 contrast against its background.

Large text (bold and 16pt or larger) can be 3:1 or higher.

Contrast Checker

[Home](#) > [Resources](#) > Contrast Checker

Foreground Color
#969696 

Lightness 

Background Color
#FFFFFF 

Lightness 

Contrast Ratio
2.95:1

[permalink](#)

Normal Text

WCAG AA: **Fail**

WCAG AAA: **Fail**

The five boxing wizards jump quickly.

Large Text

WCAG AA: **Fail**

WCAG AAA: **Fail**

The five boxing wizards jump quickly.

Use High Contrast Geometries

Chart elements need at least 3:1 contrast against their background.

Contrast Checker

[Home](#) > [Resources](#) > Contrast Checker

Foreground Color
#E4E4E4

Lightness 

Background Color
#F3F3F3

Lightness 

Contrast Ratio
1.14:1

[permalink](#)

Graphical Objects and User Interface Components

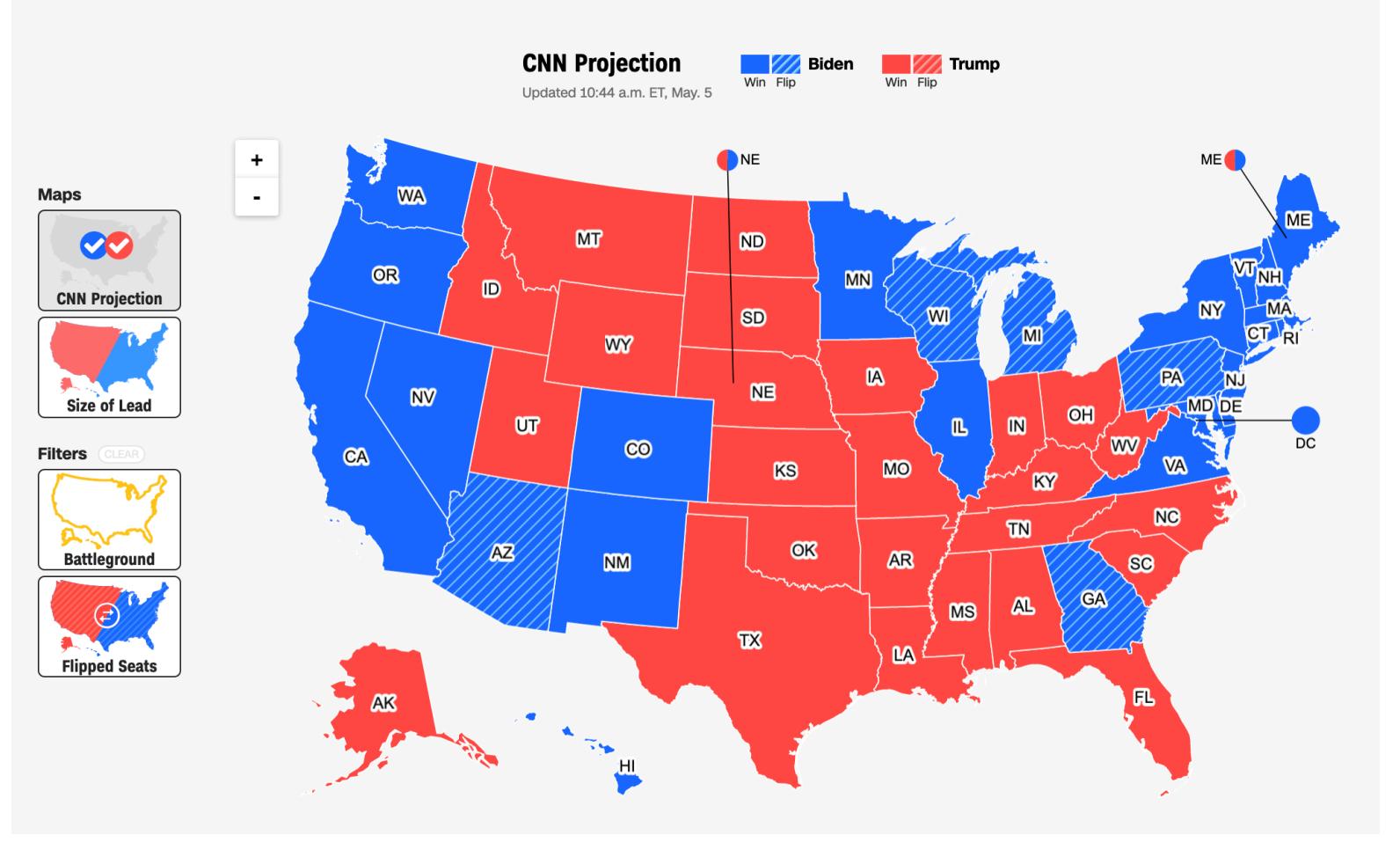
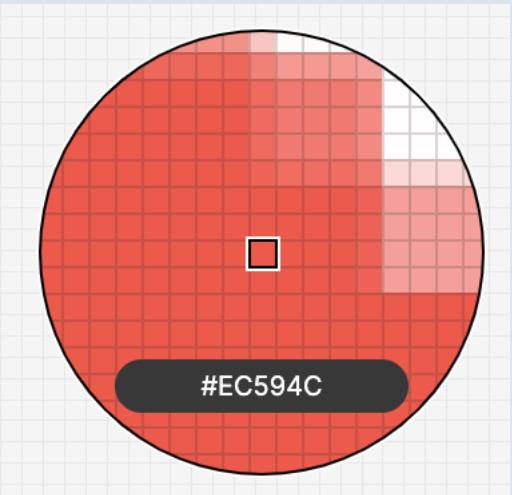
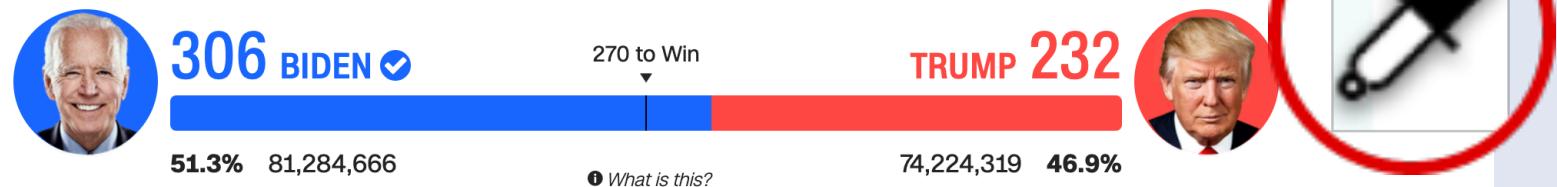
WCAG AA: **Fail**



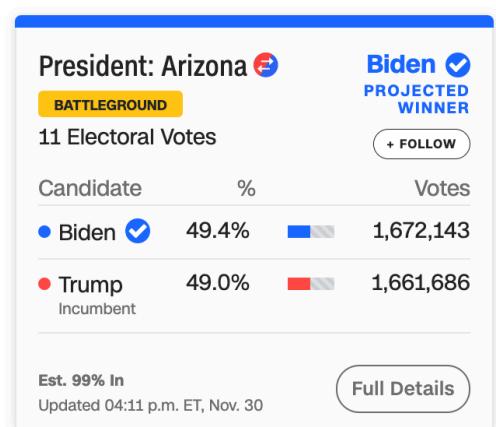
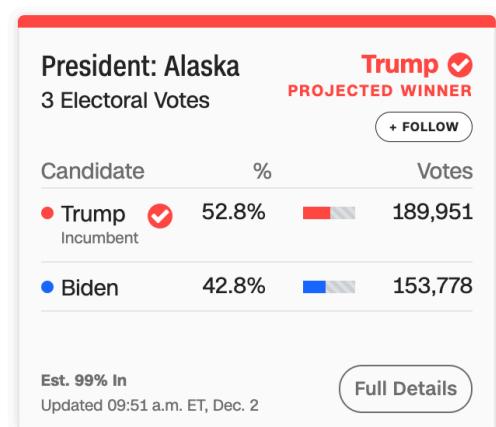
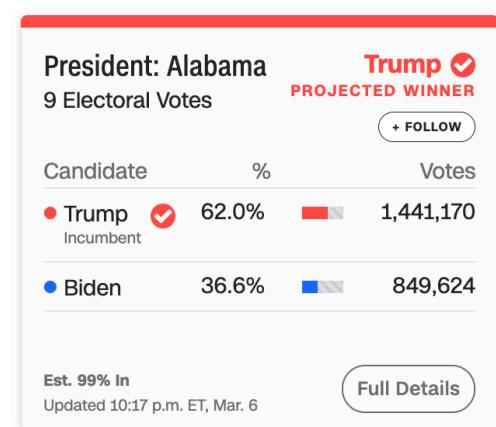
PRESIDENTIAL RESULTS

Joe Biden wins election to be the 46th US President

Pennsylvania's 20 electoral votes put native son Joe Biden above the 270 needed to become the 46th President of the United States. Born in Scranton, the former vice president and longtime Delaware senator defeated Donald Trump, the first President to lose a reelection bid since George H.W. Bush in 1992.



STATE RESULTS

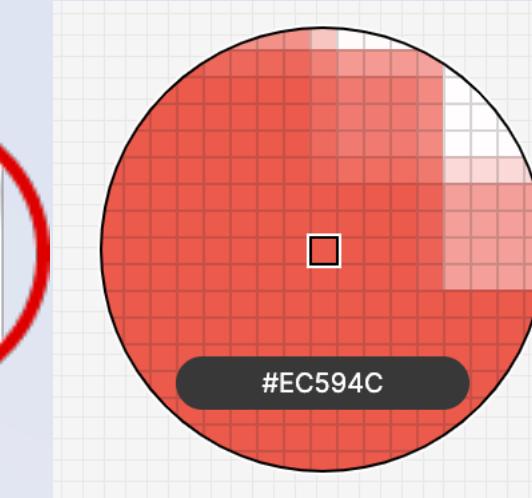
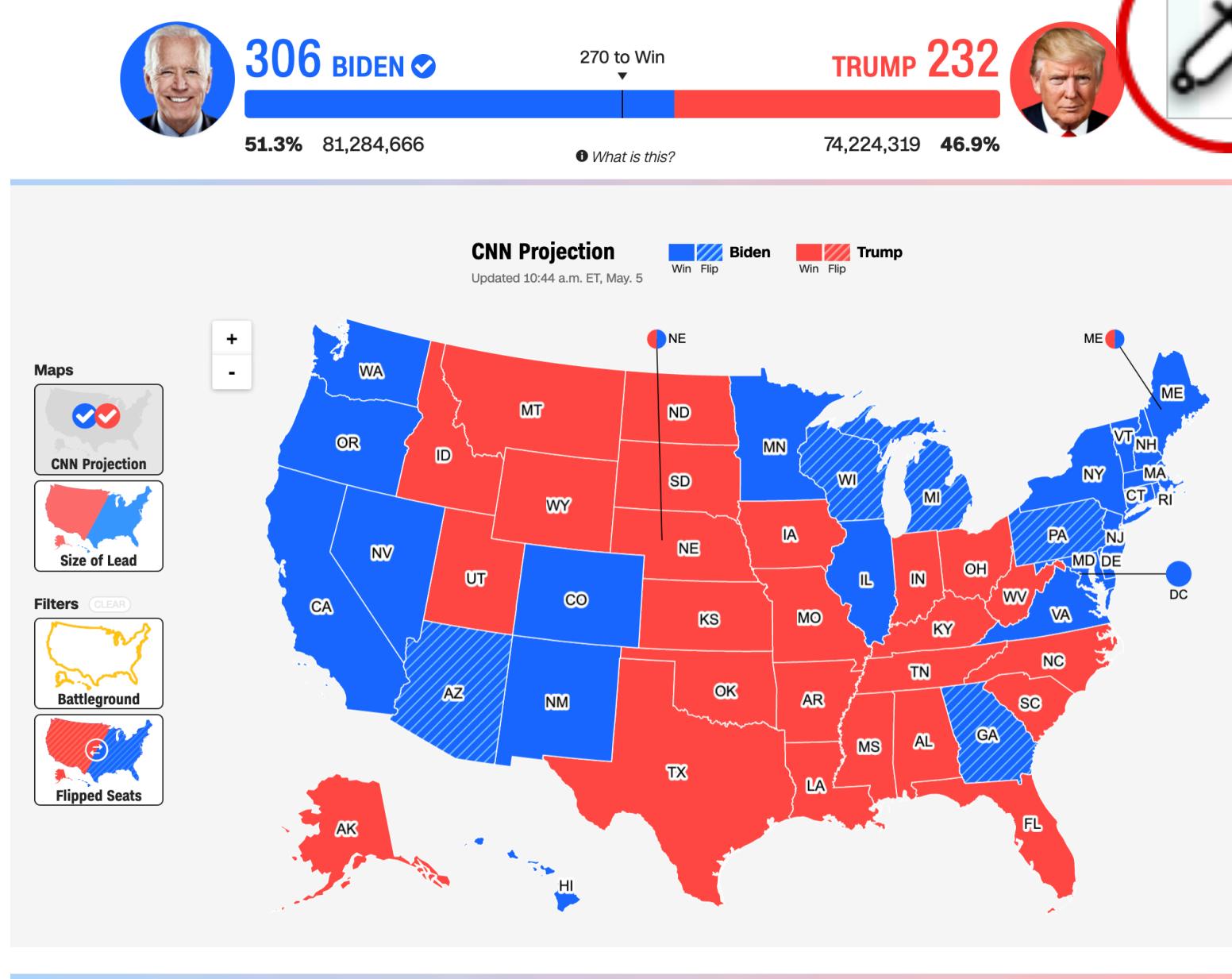


Show More States

PRESIDENTIAL RESULTS

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Contrast Checker

[Home](#) > [Resources](#) > Contrast Checker

Foreground Color

#EC594C

Lightness



Background Color

#FFFFFF

Lightness



Contrast Ratio

3.44:1

[permalink](#)

Normal Text

WCAG AA: **Fail**

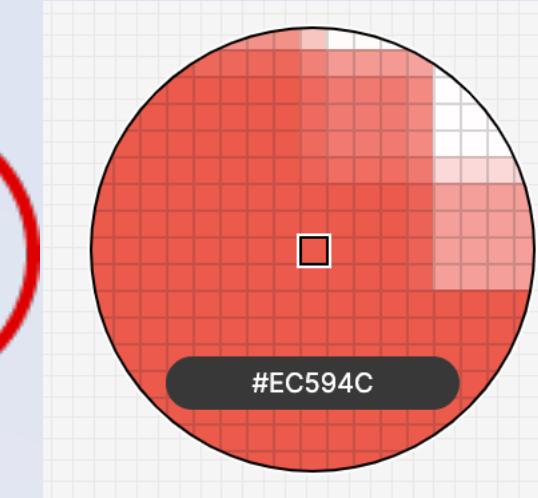
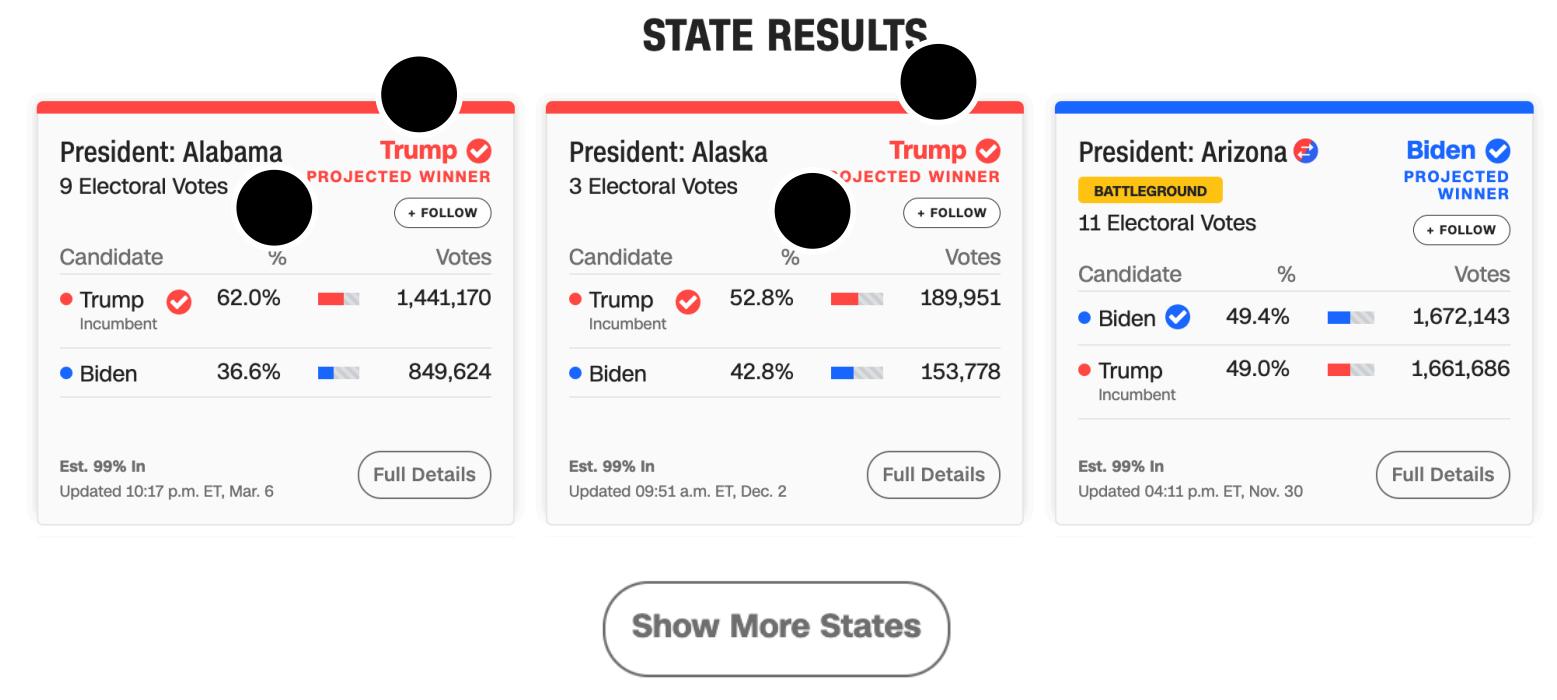
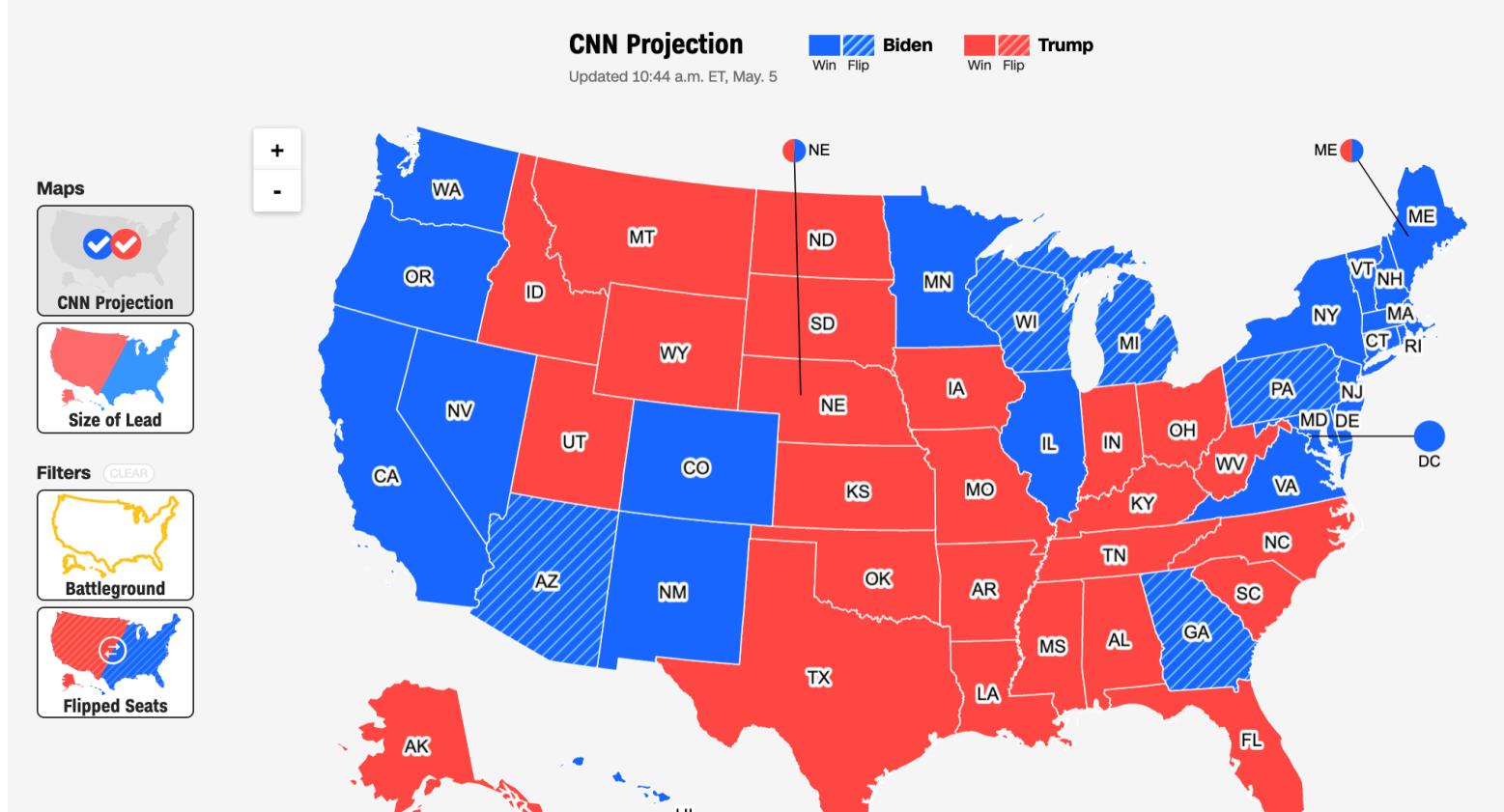
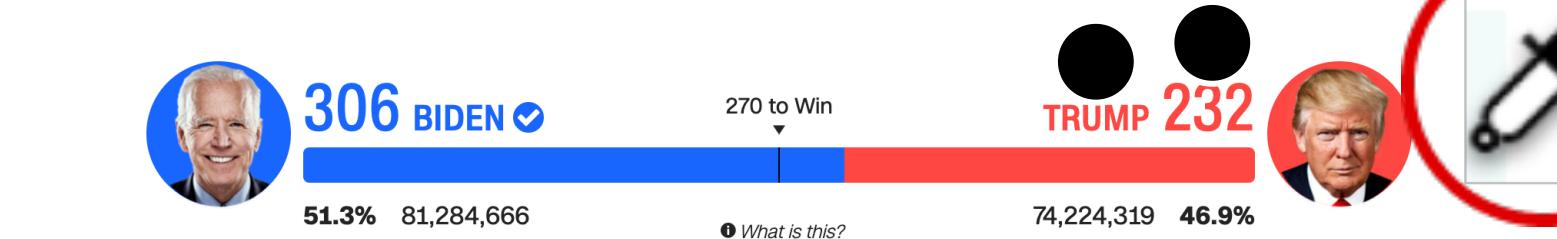
WCAG AAA: **Fail**

The five boxing wizards jump quickly.

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Contrast Checker

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#FFFFFF

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Contrast Ratio

3.44:1

[permalink](#)

Normal Text

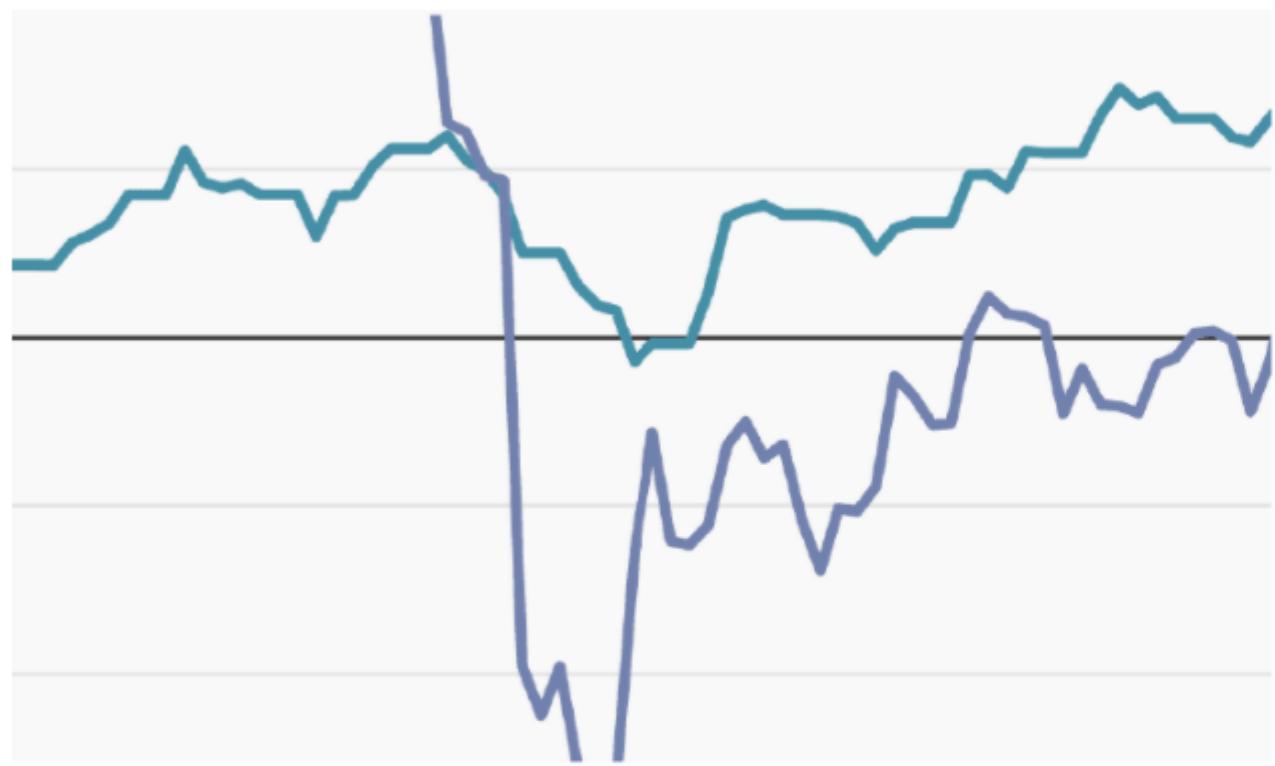
WCAG AA: **Fail**

WCAG AAA: **Fail**

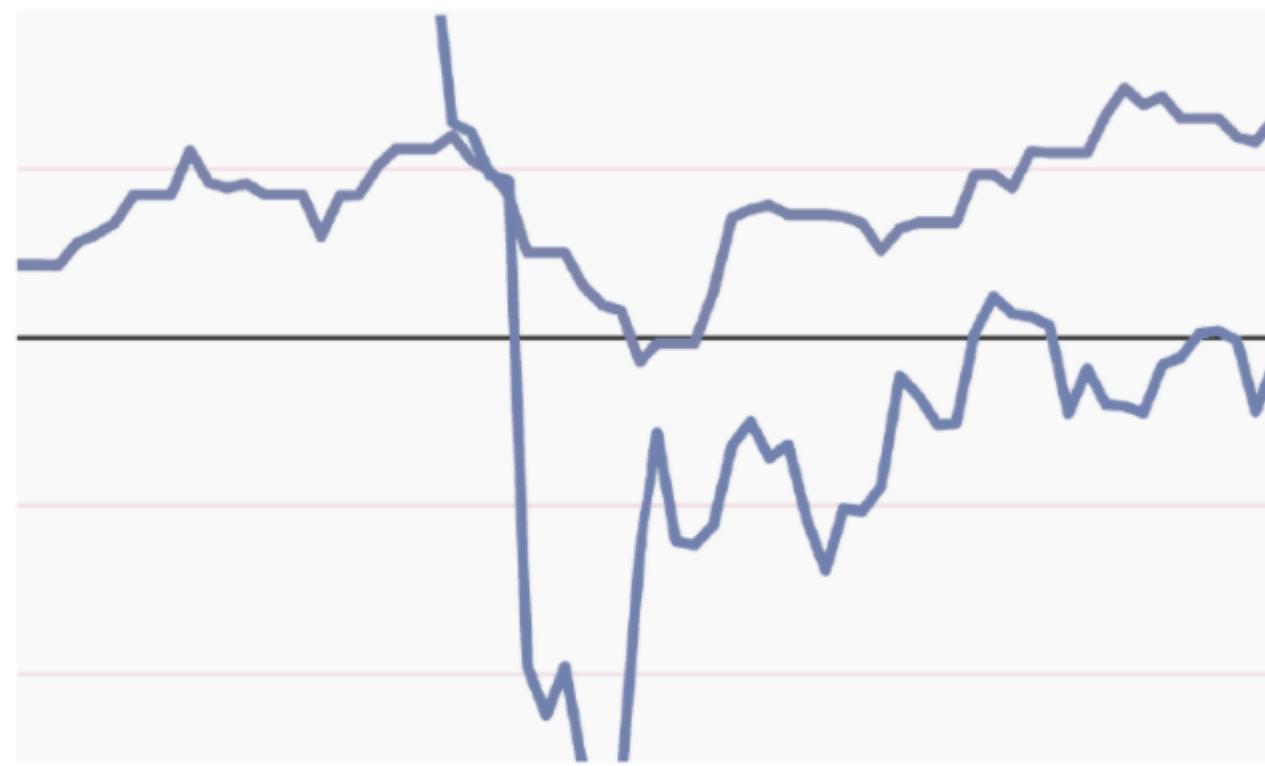
The five boxing wizards jump quickly.

Don't rely on color alone!

(Muth) <https://blog.datawrapper.de/colorblindness-part2/>

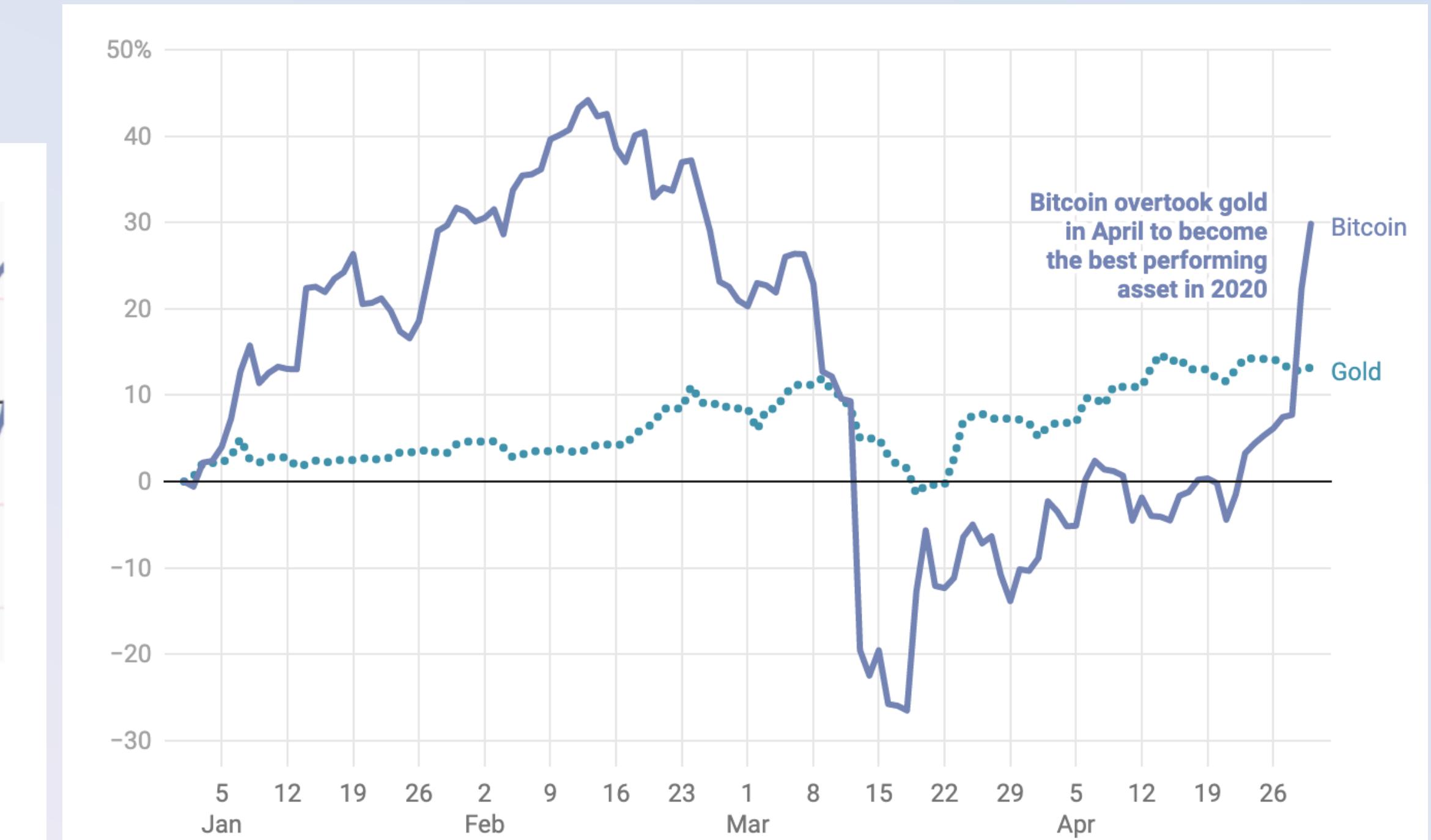
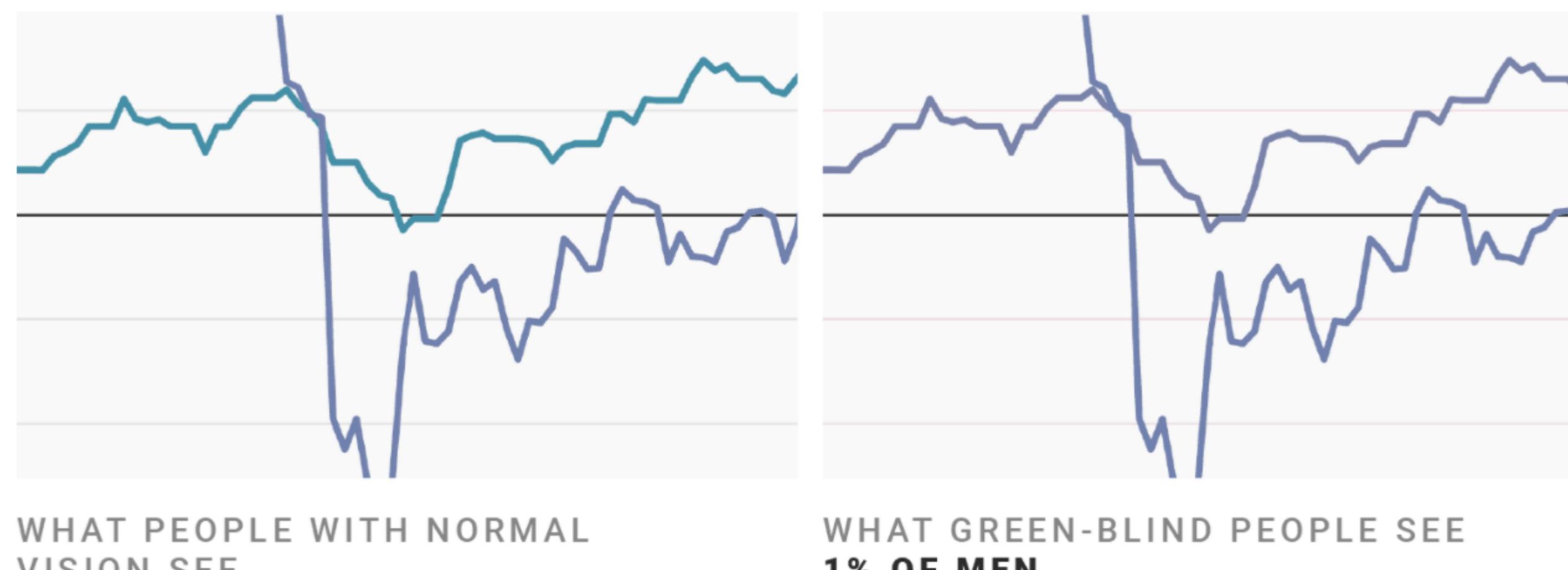


WHAT PEOPLE WITH NORMAL
VISION SEE



WHAT GREEN-BLIND PEOPLE SEE
1% OF MEN

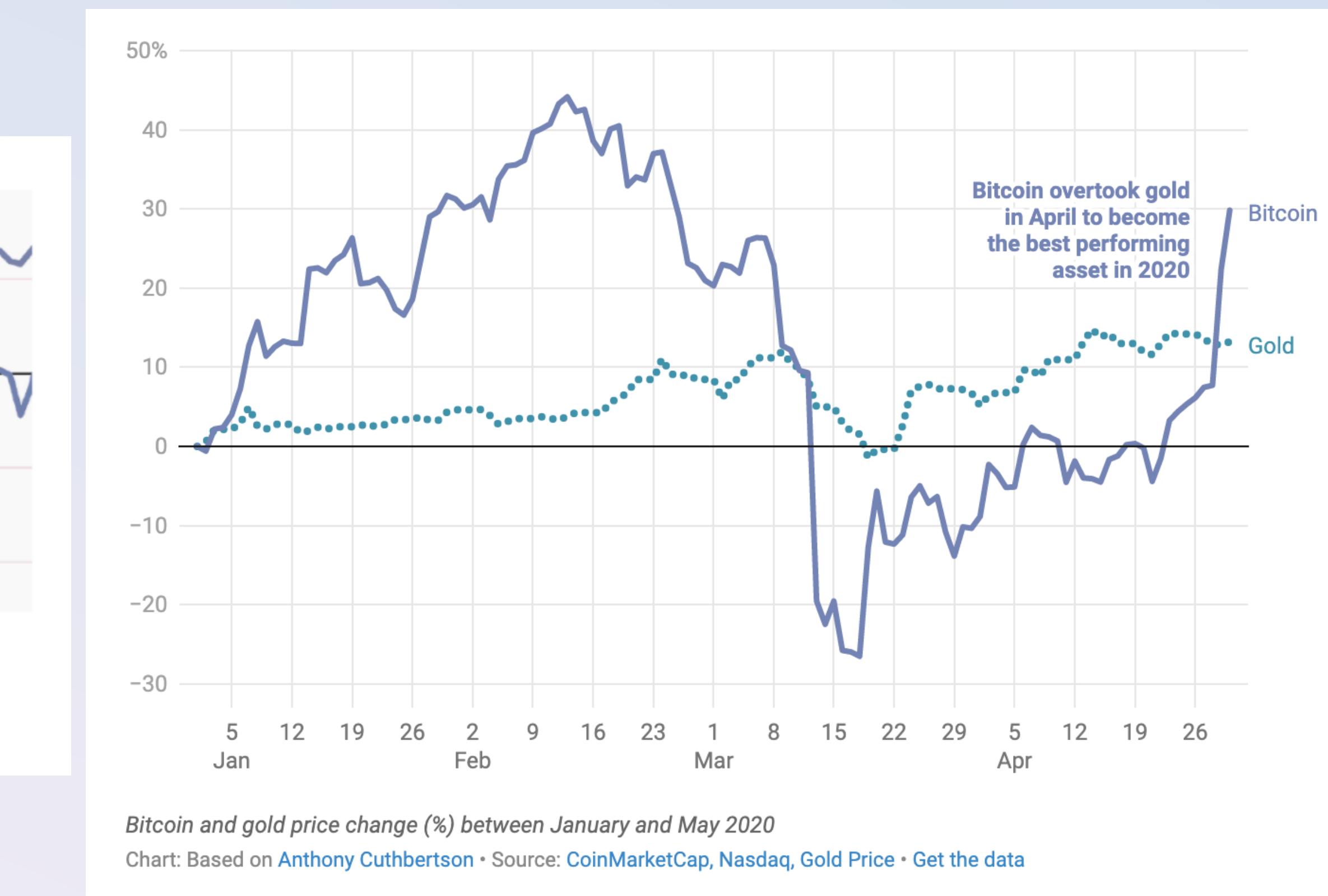
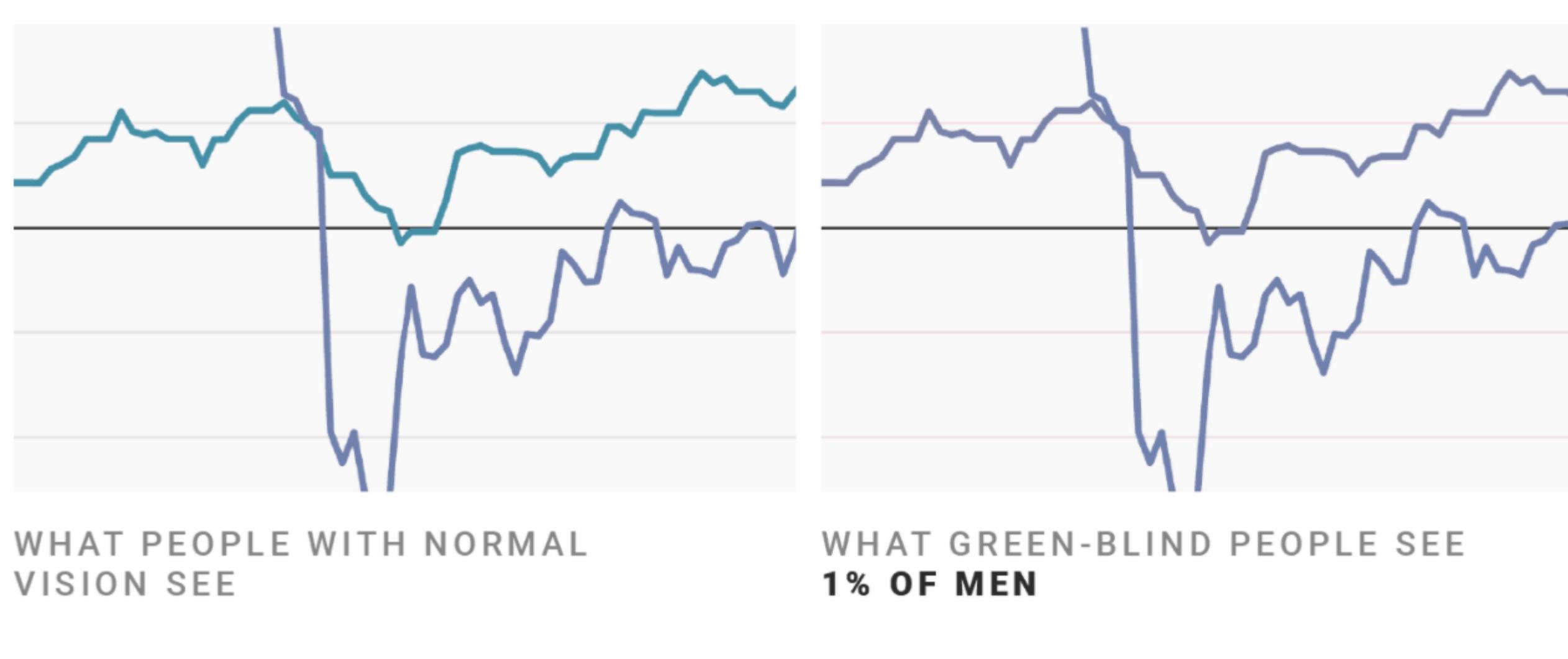
“Redundant encoding” is one strategy



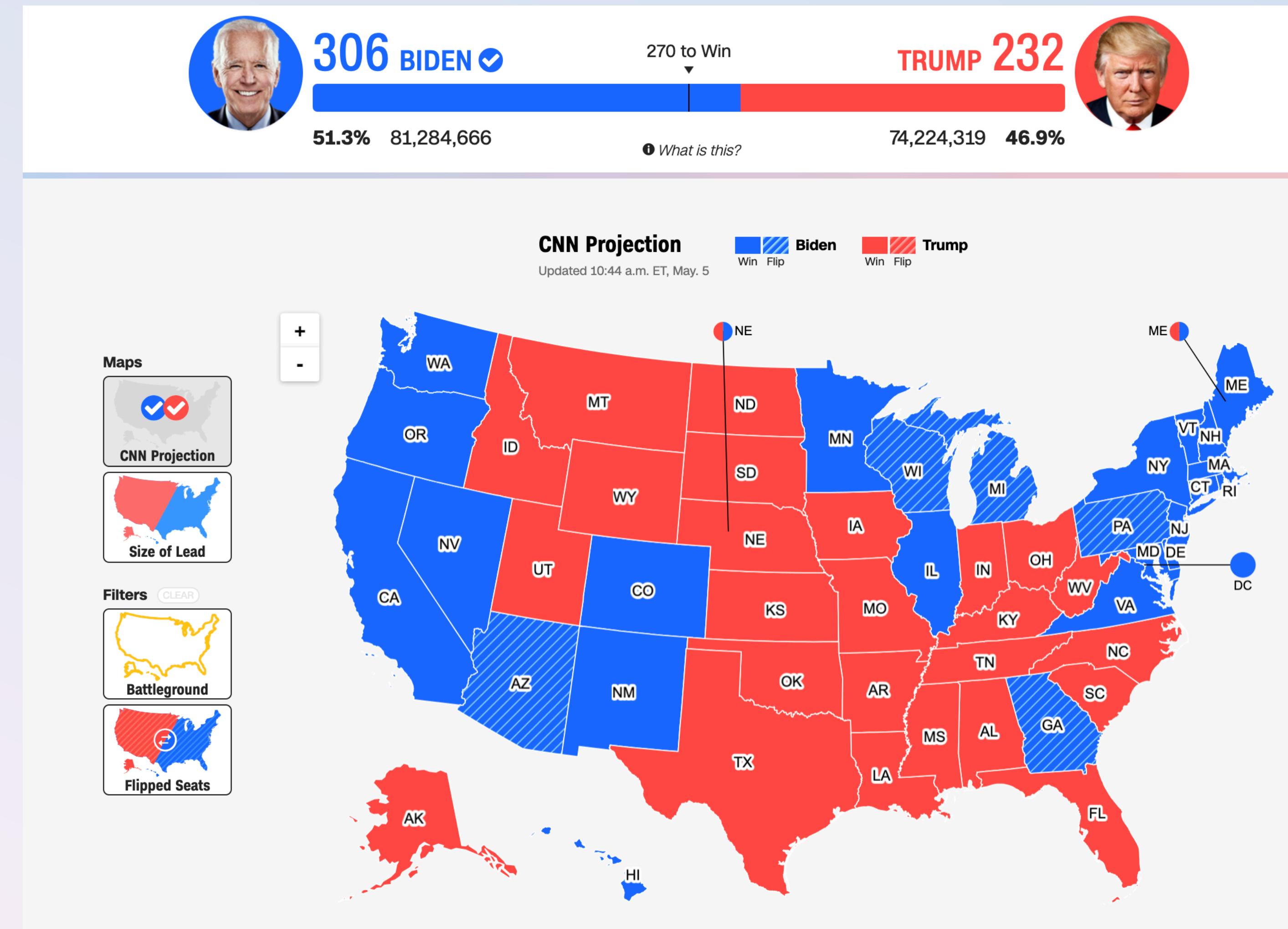
Bitcoin and gold price change (%) between January and May 2020

Chart: Based on [Anthony Cuthbertson](#) • Source: [CoinMarketCap](#), [Nasdaq](#), [Gold Price](#) • [Get the data](#)

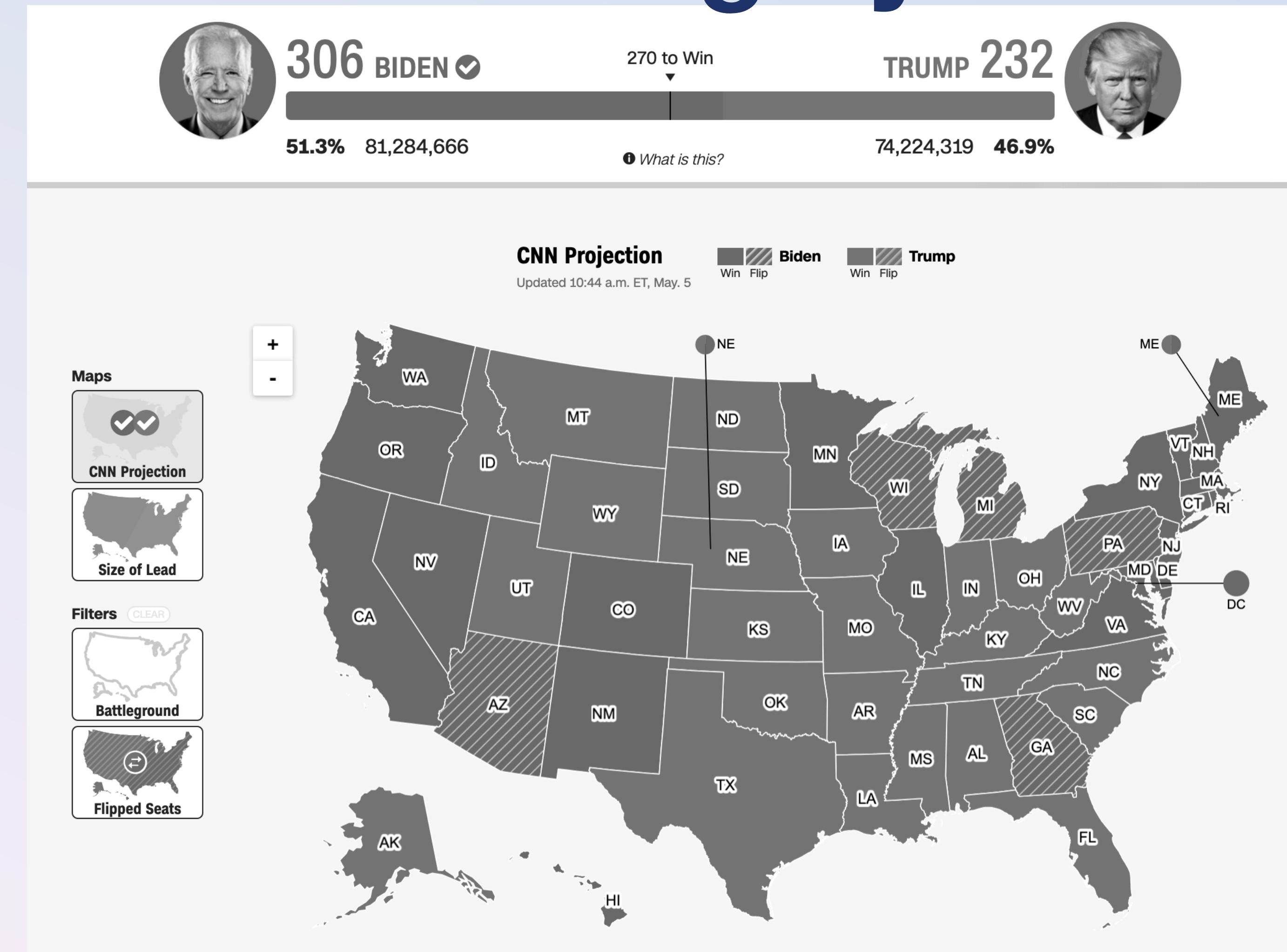
A note: “Color-vision deficiency” and “colorblindness” refer to the same thing, both terms are fine to use.



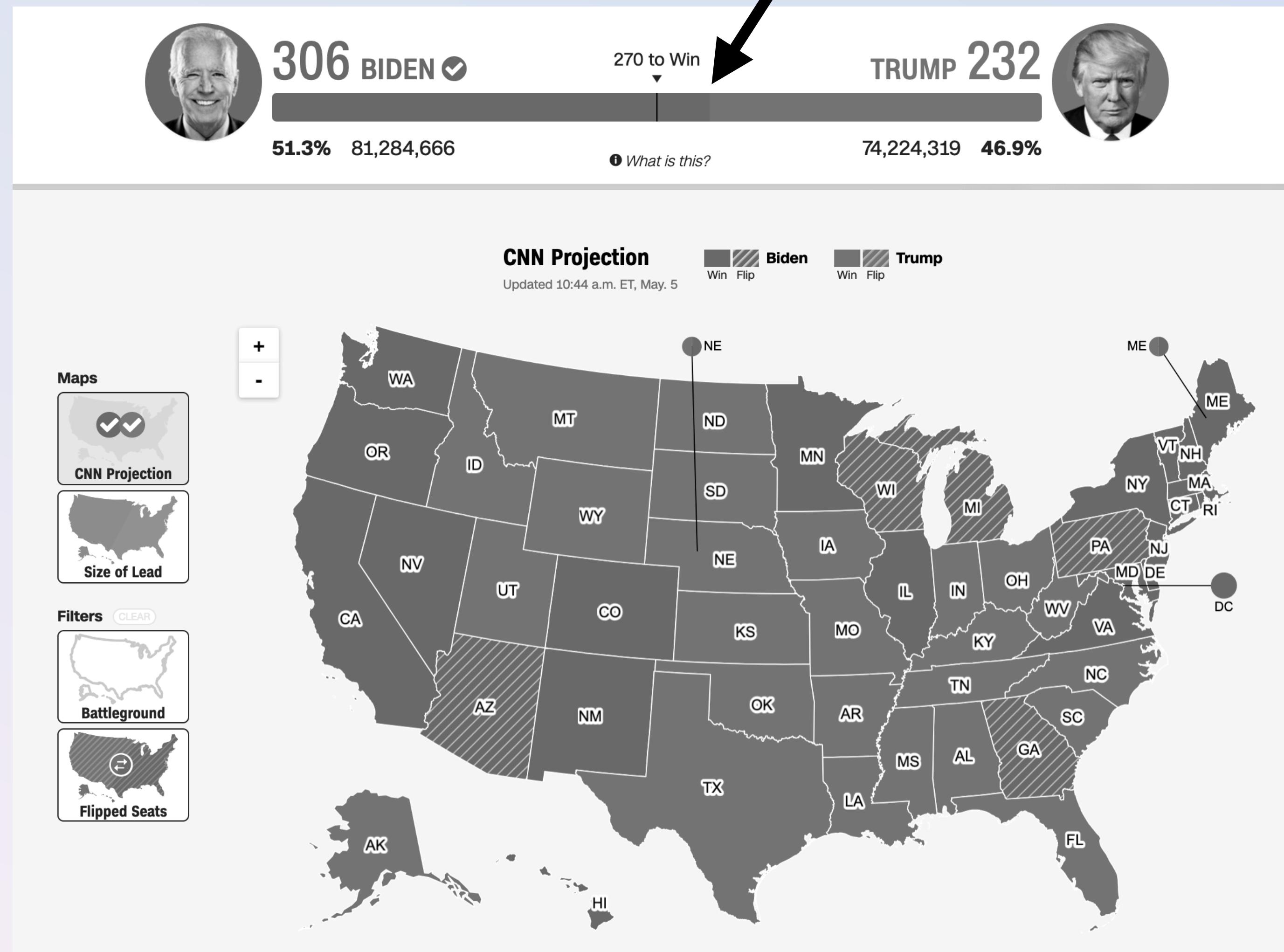
But sometimes you *can't* redundantly encode!



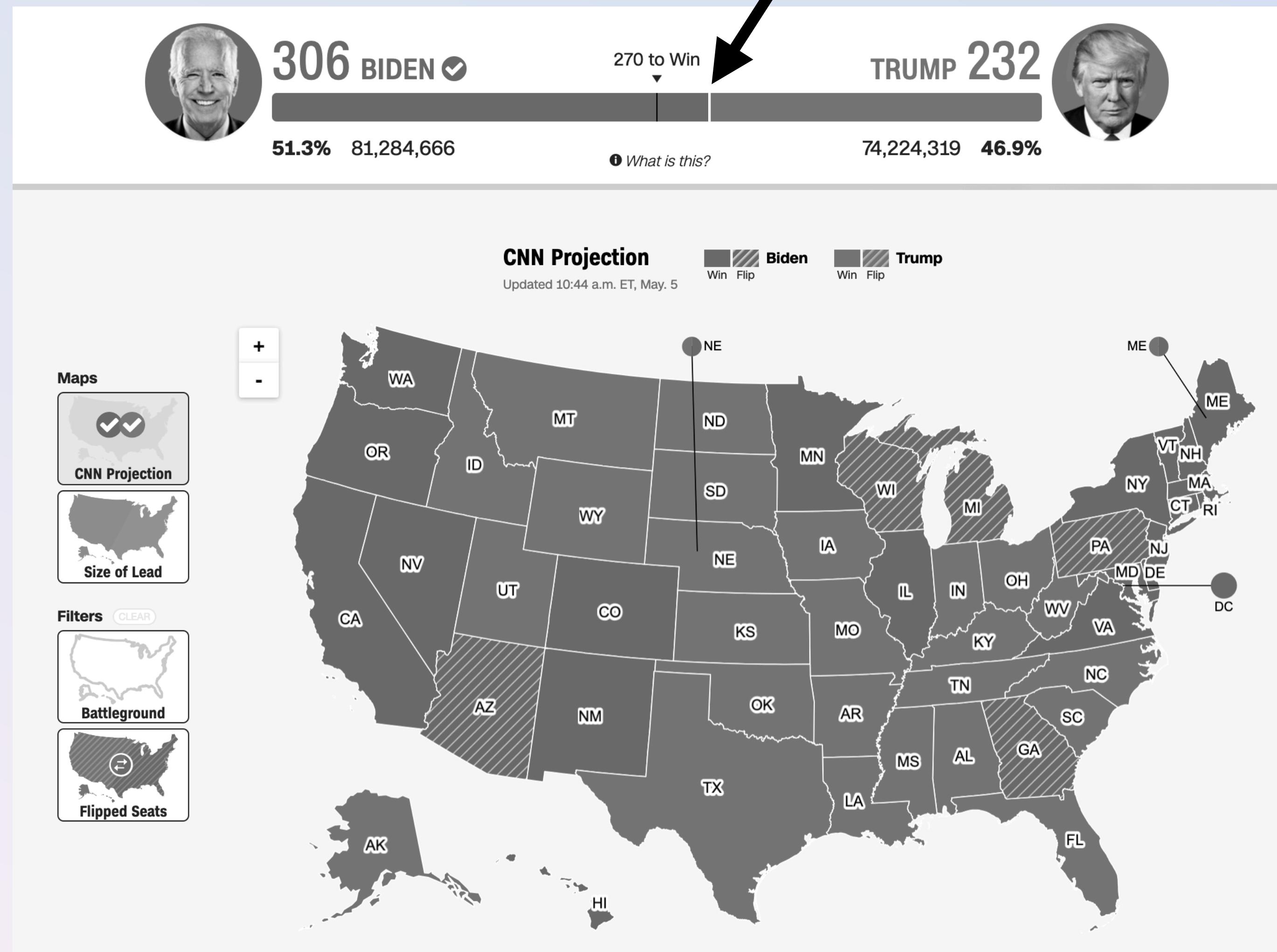
This map is trouble in greyscale



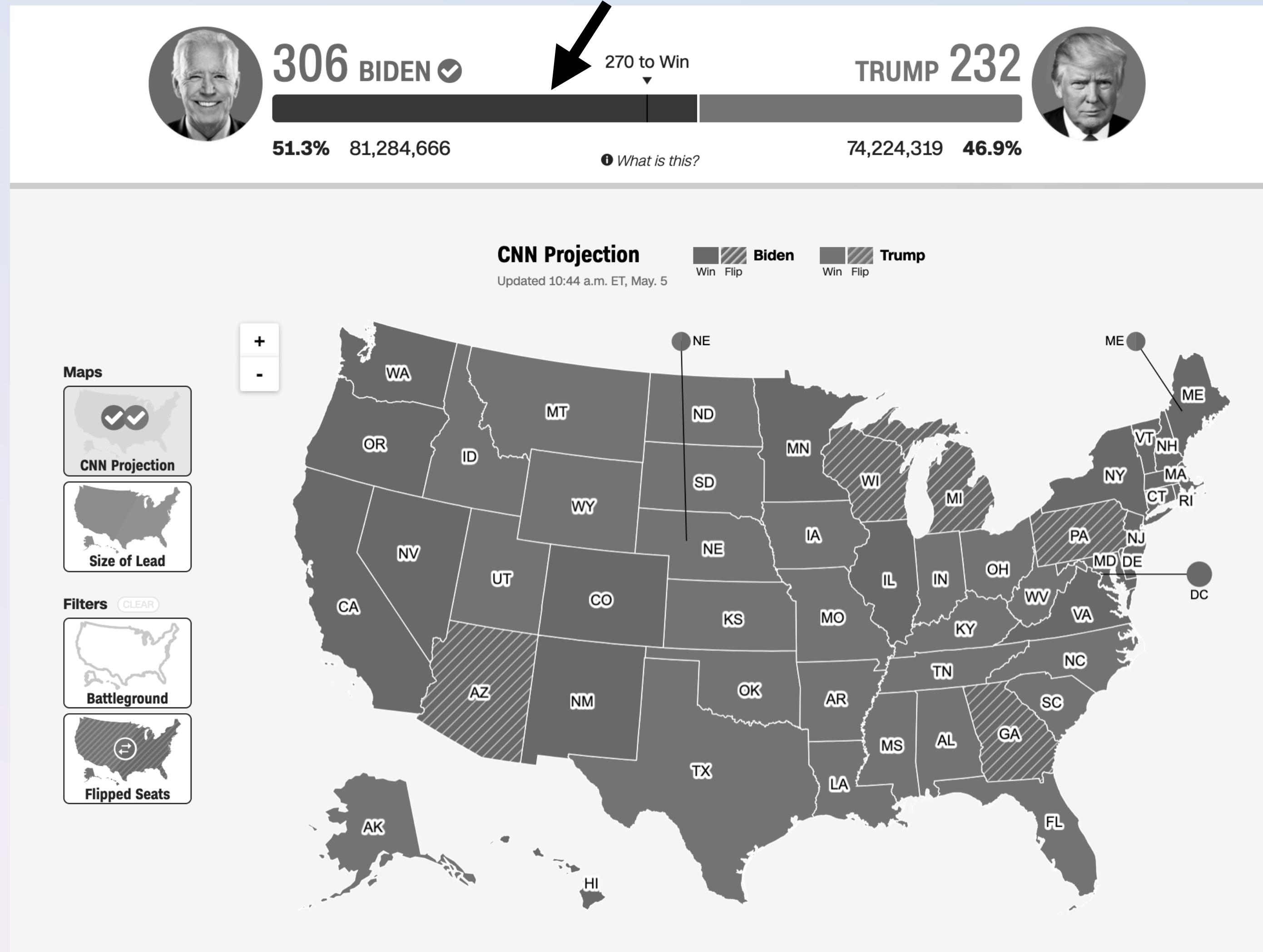
The division here matters!



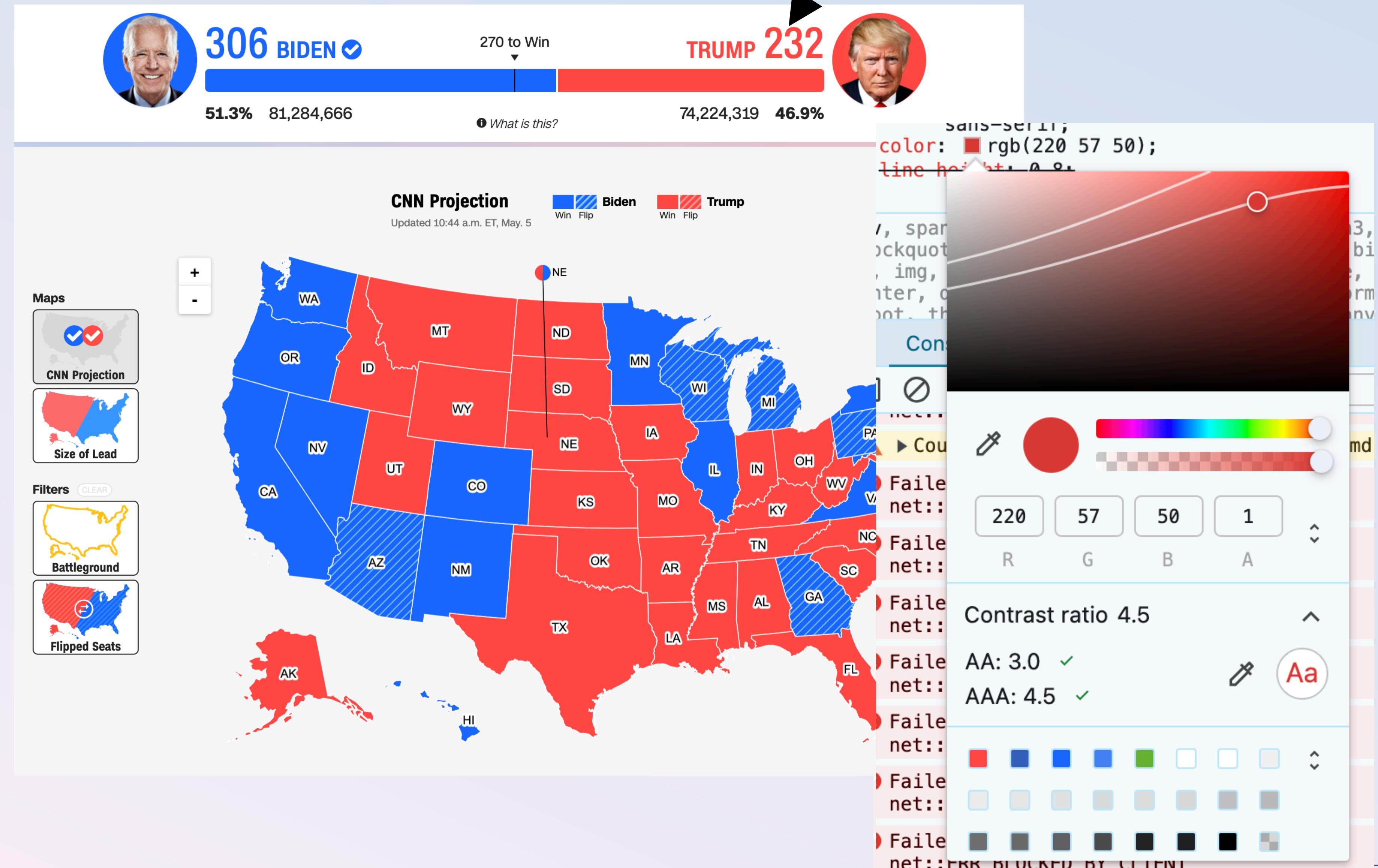
Maybe a small white divider, like the states?



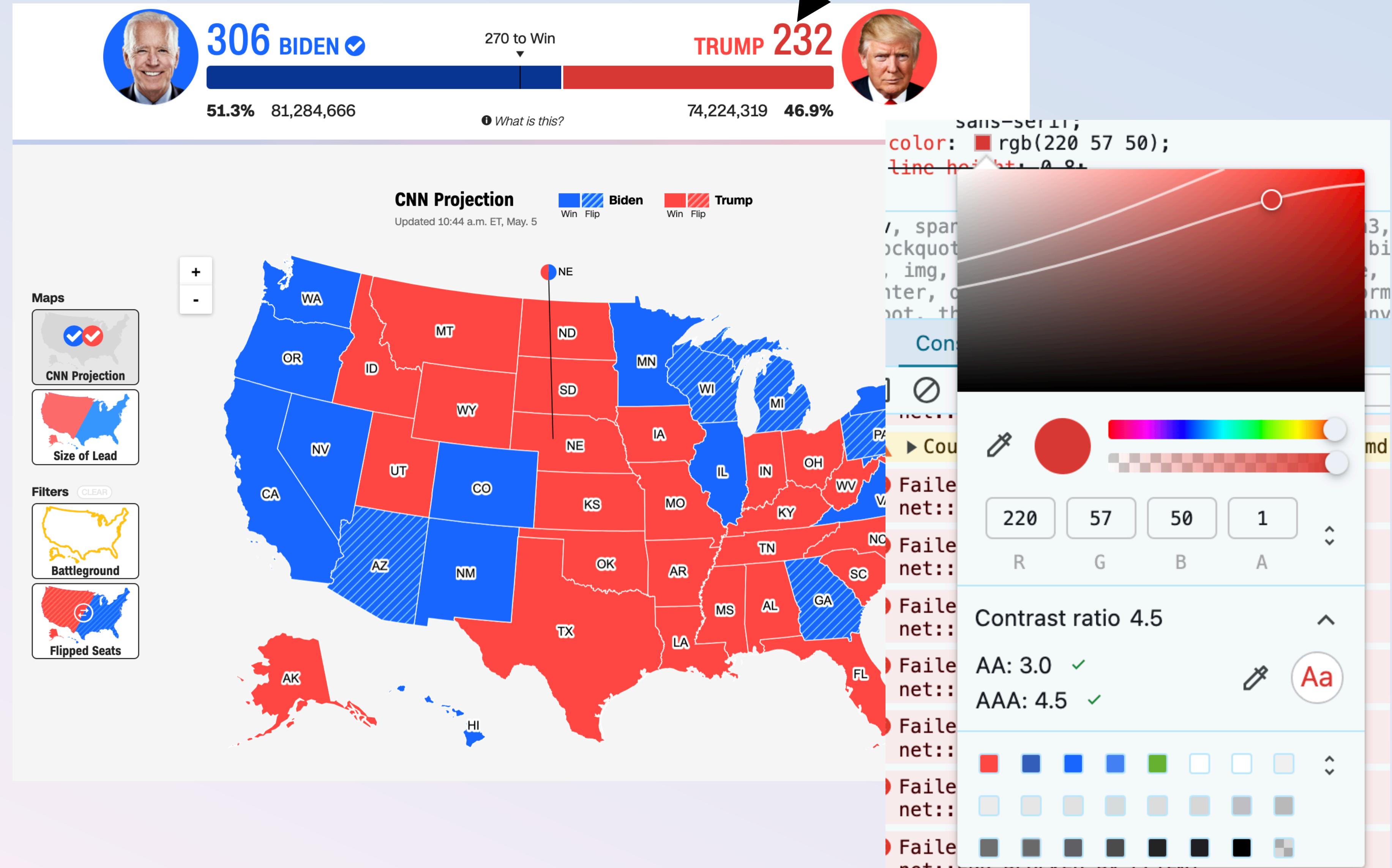
Perhaps test a darker blue too?



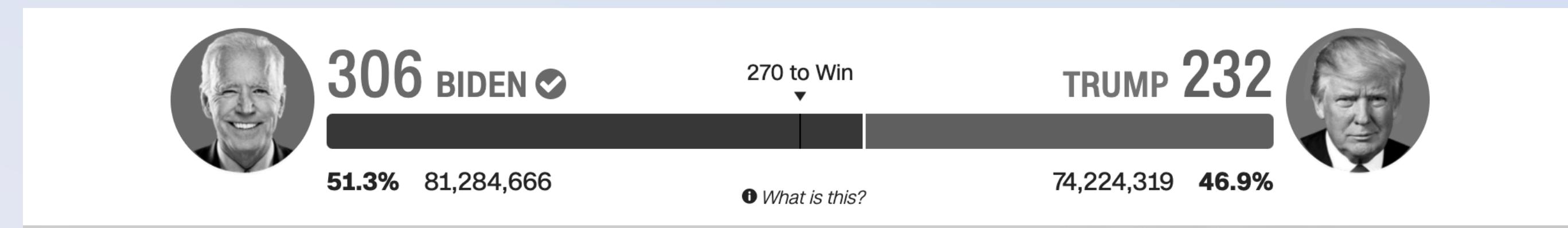
What if we fix the contrast failures at the same time?



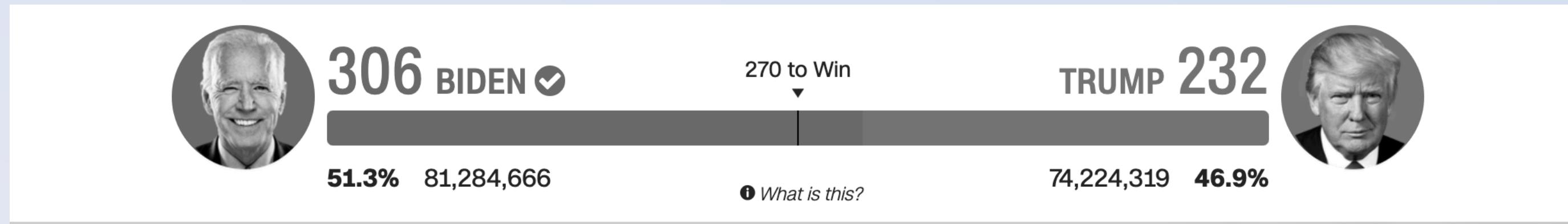
This text now passes!

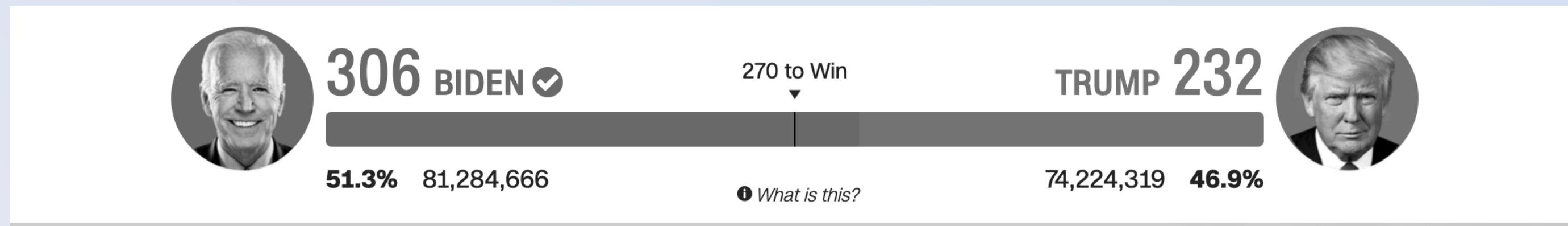


Let's check that greyscale again...

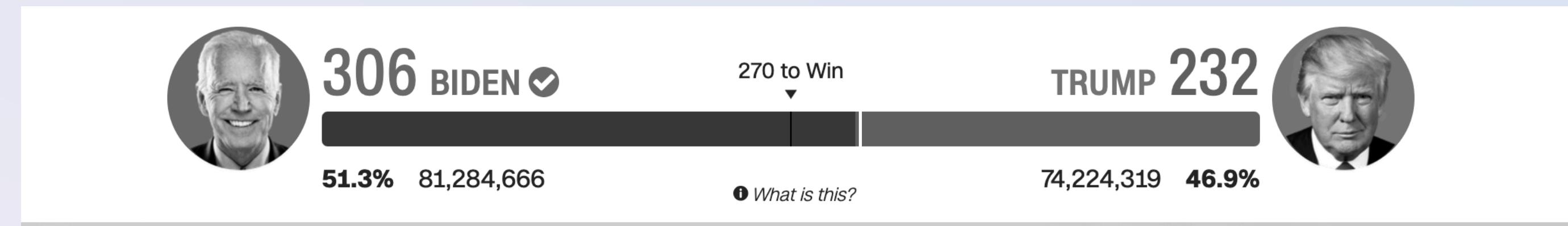


Before

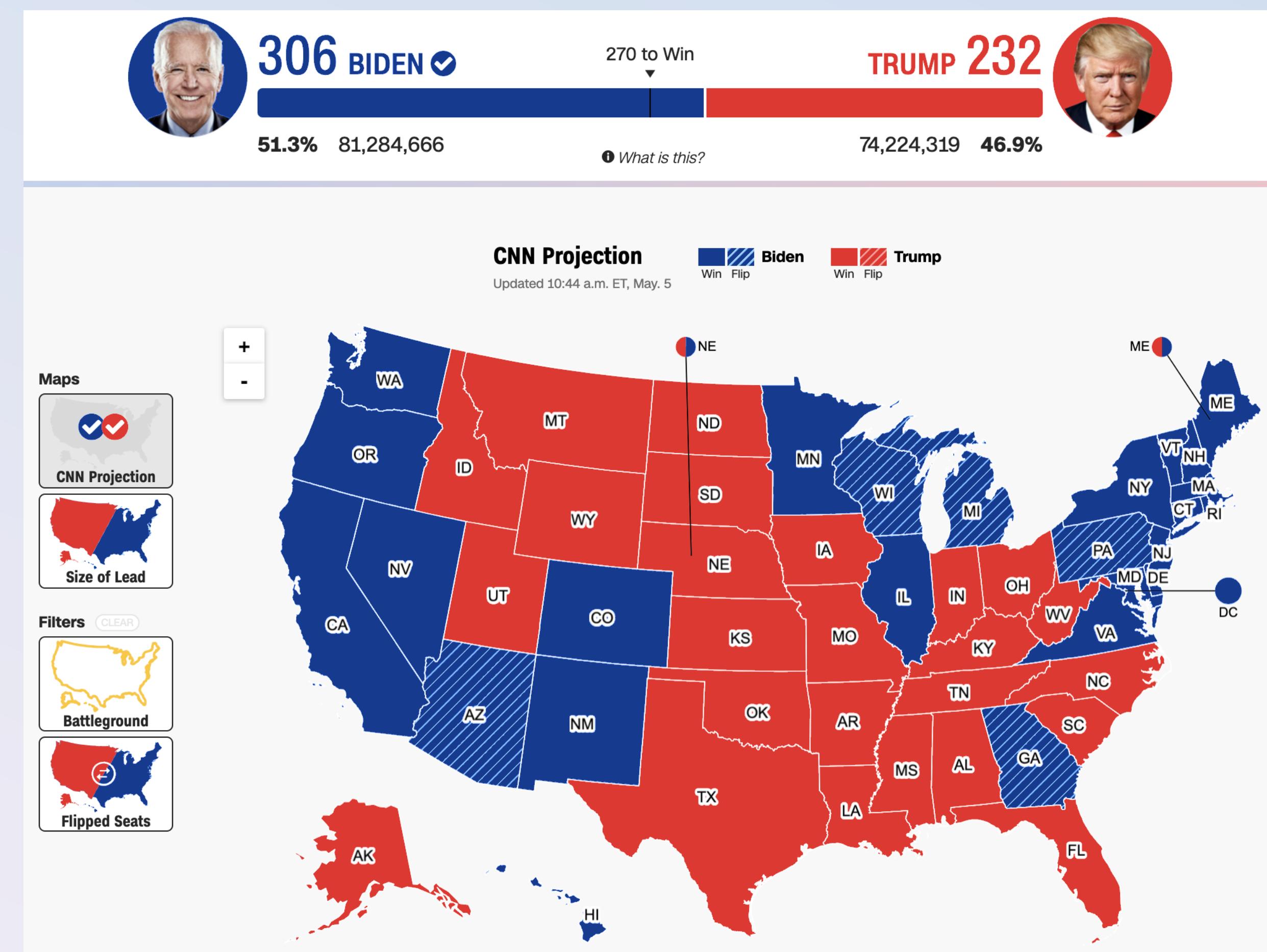
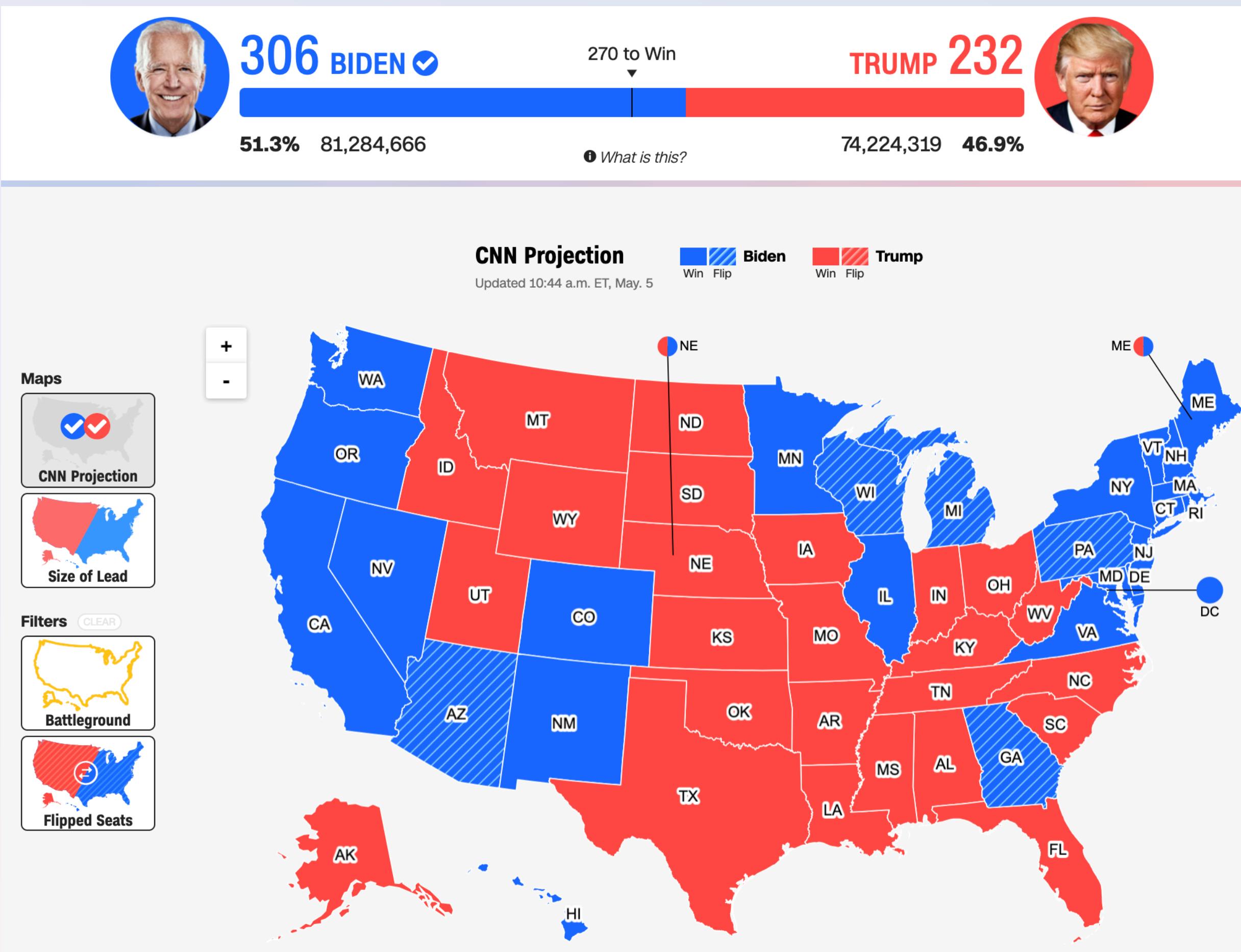




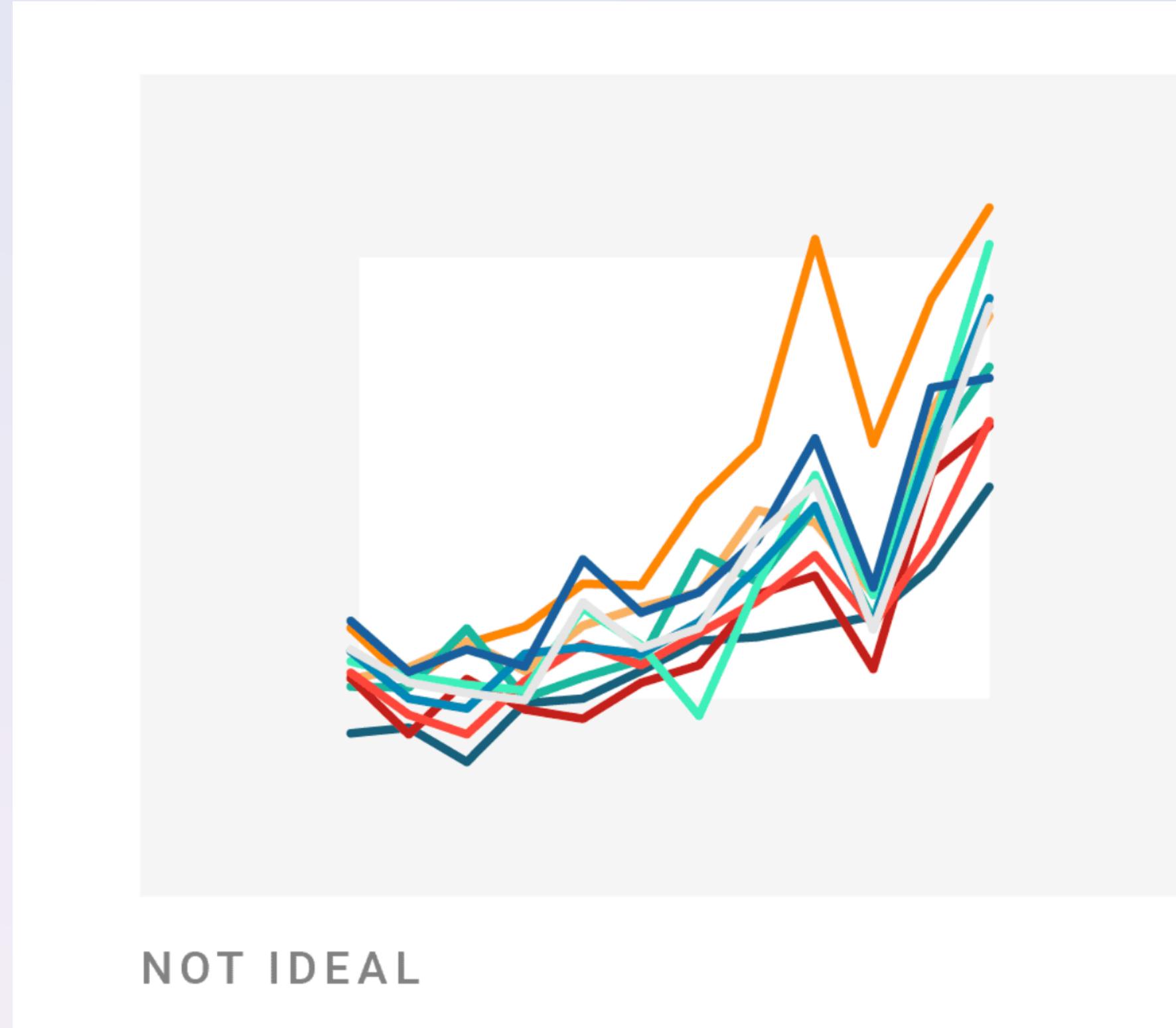
And after!



Sufficient contrast can help folks differentiate

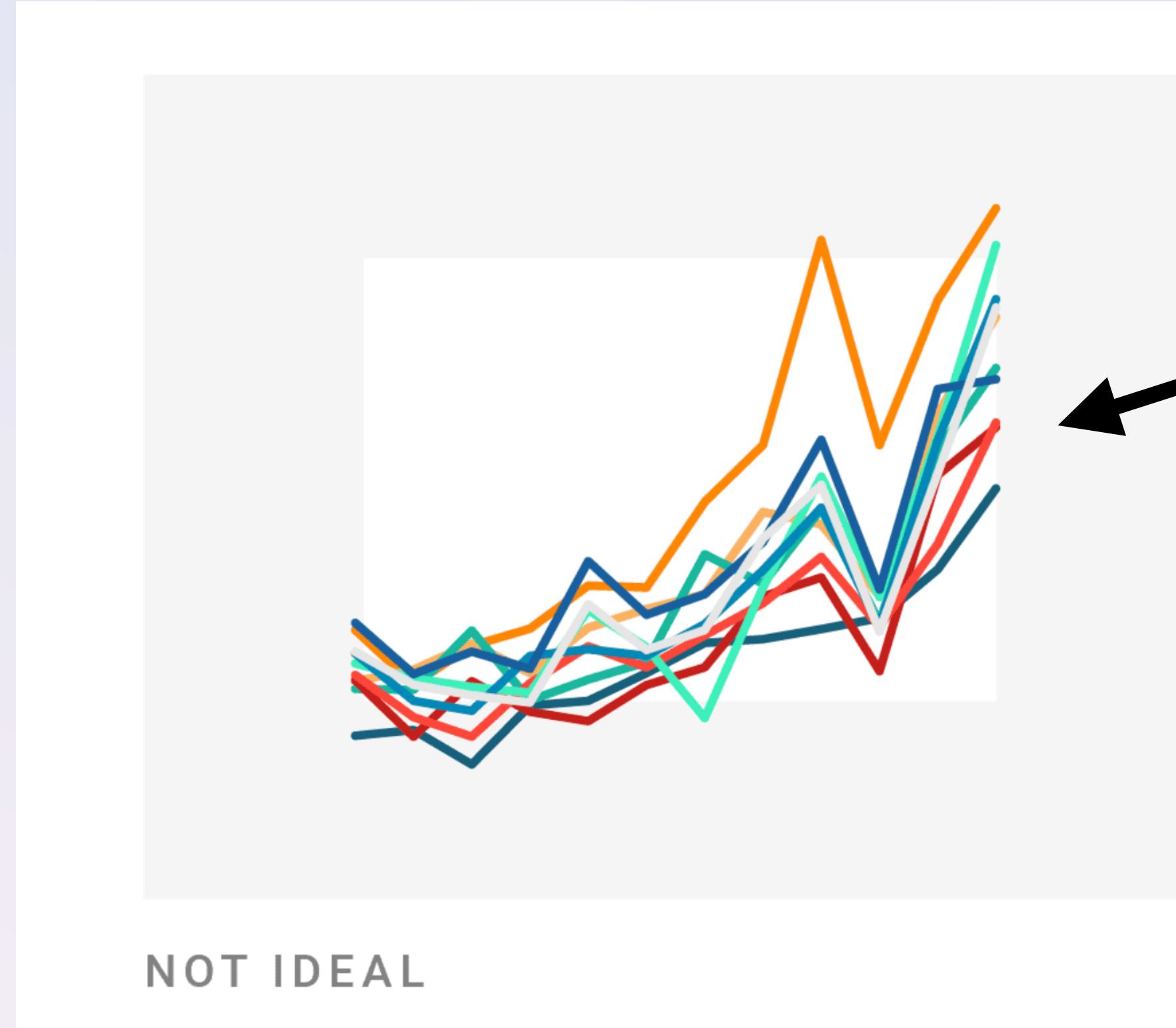


But what about more than 2 colors?



Source: [Datawrapper](#)

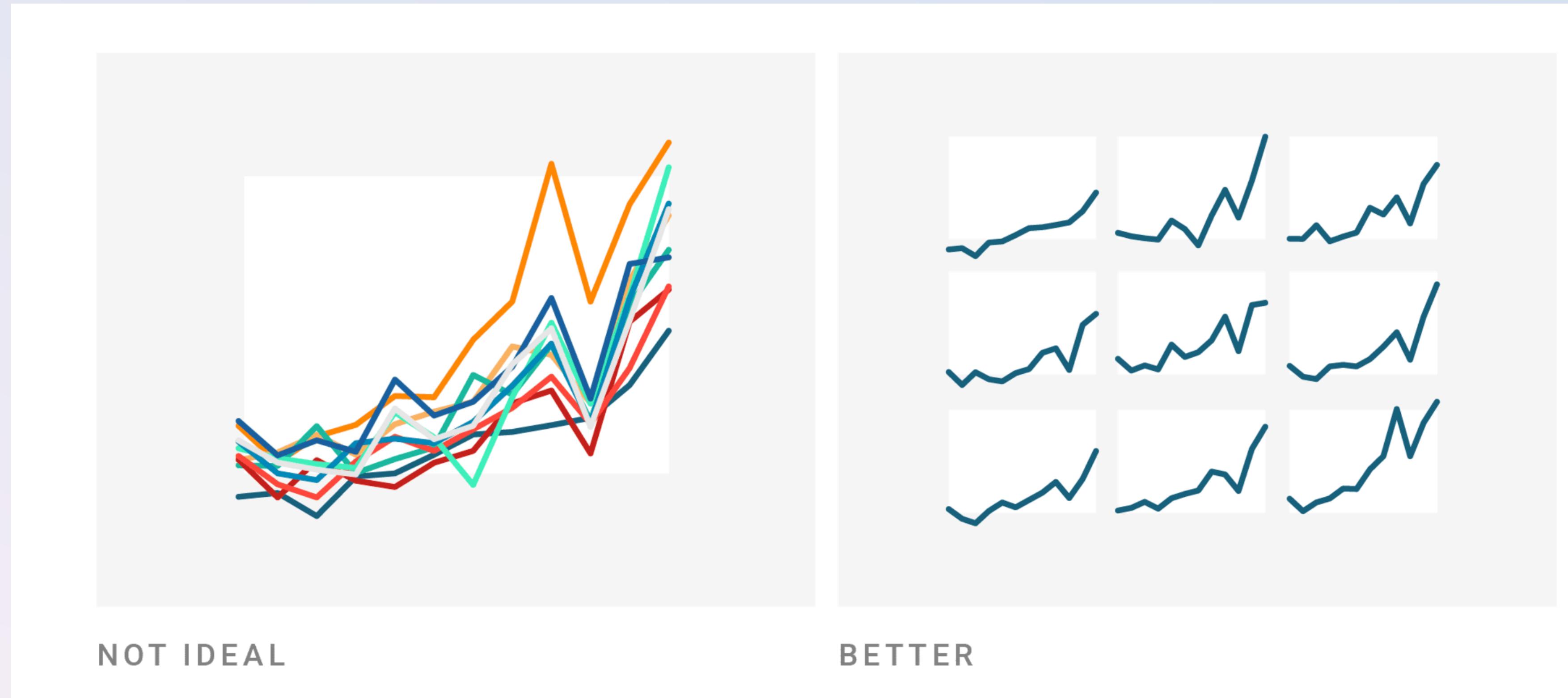
But what about more than 2 colors?



Finding “pair” contrast gets
really hard after 3+ colors...

Source: [Datawrapper](#)

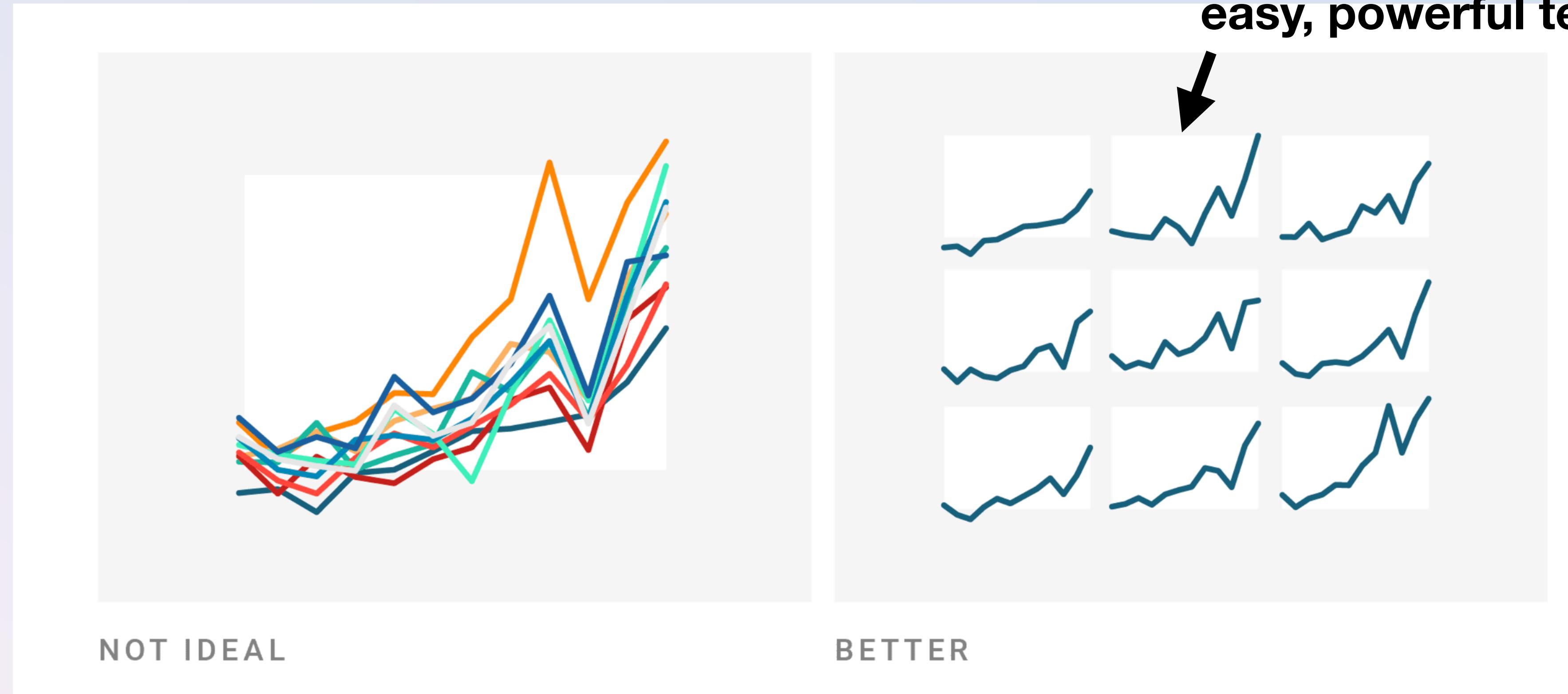
Reduce your colors and redesign!



Source: [Datawrapper](#)

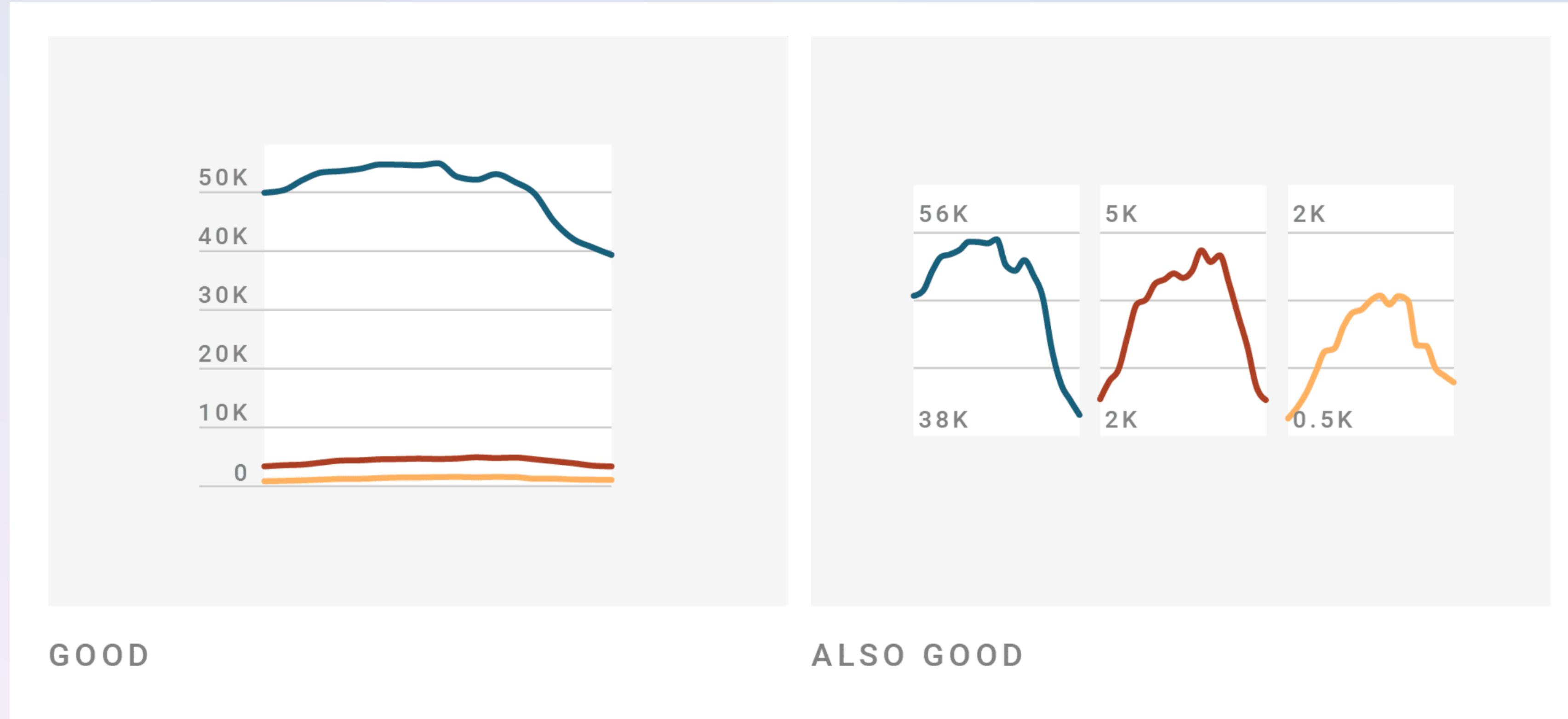
Reduce your colors and redesign!

Using “small multiples” is an easy, powerful technique

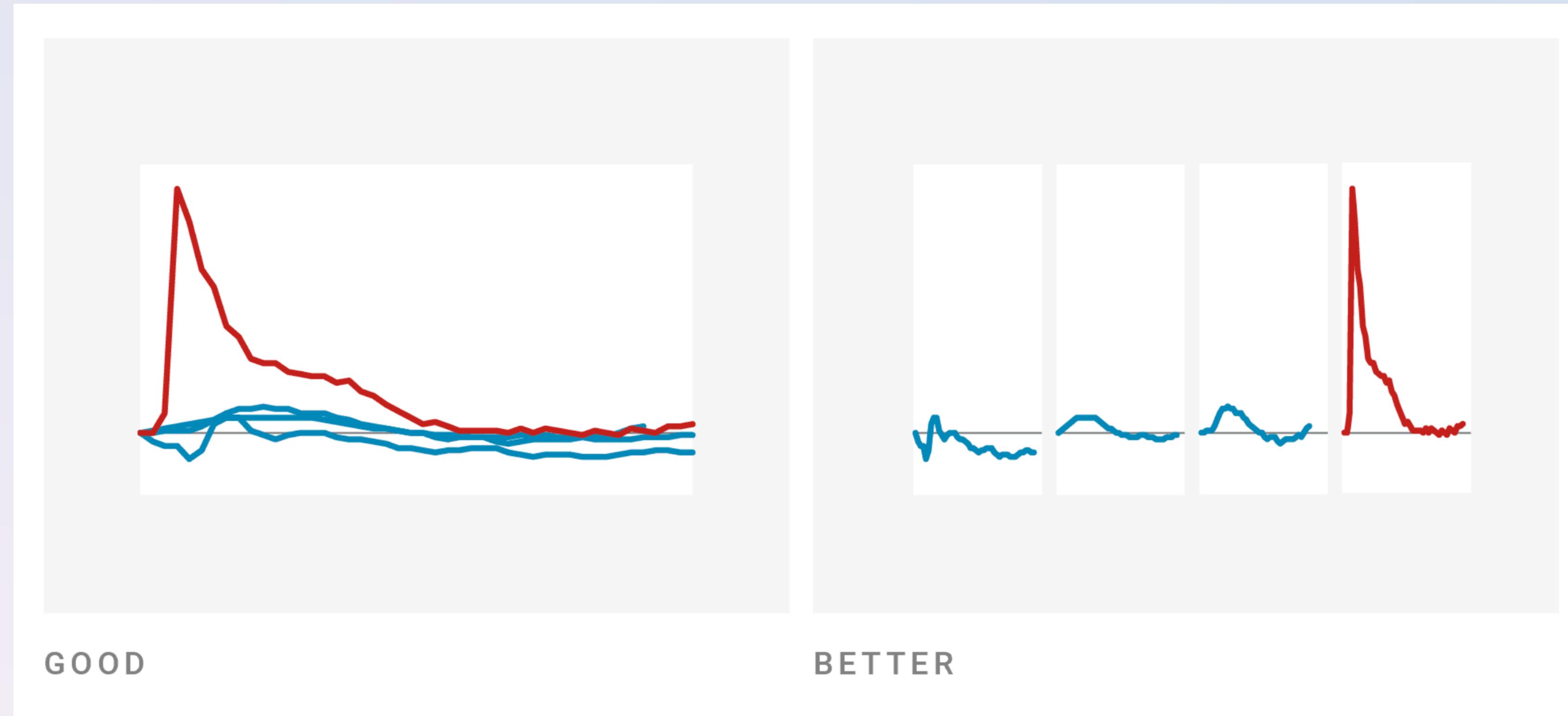


Source: [Datawrapper](#)

Or simply separate your colors, if they matter

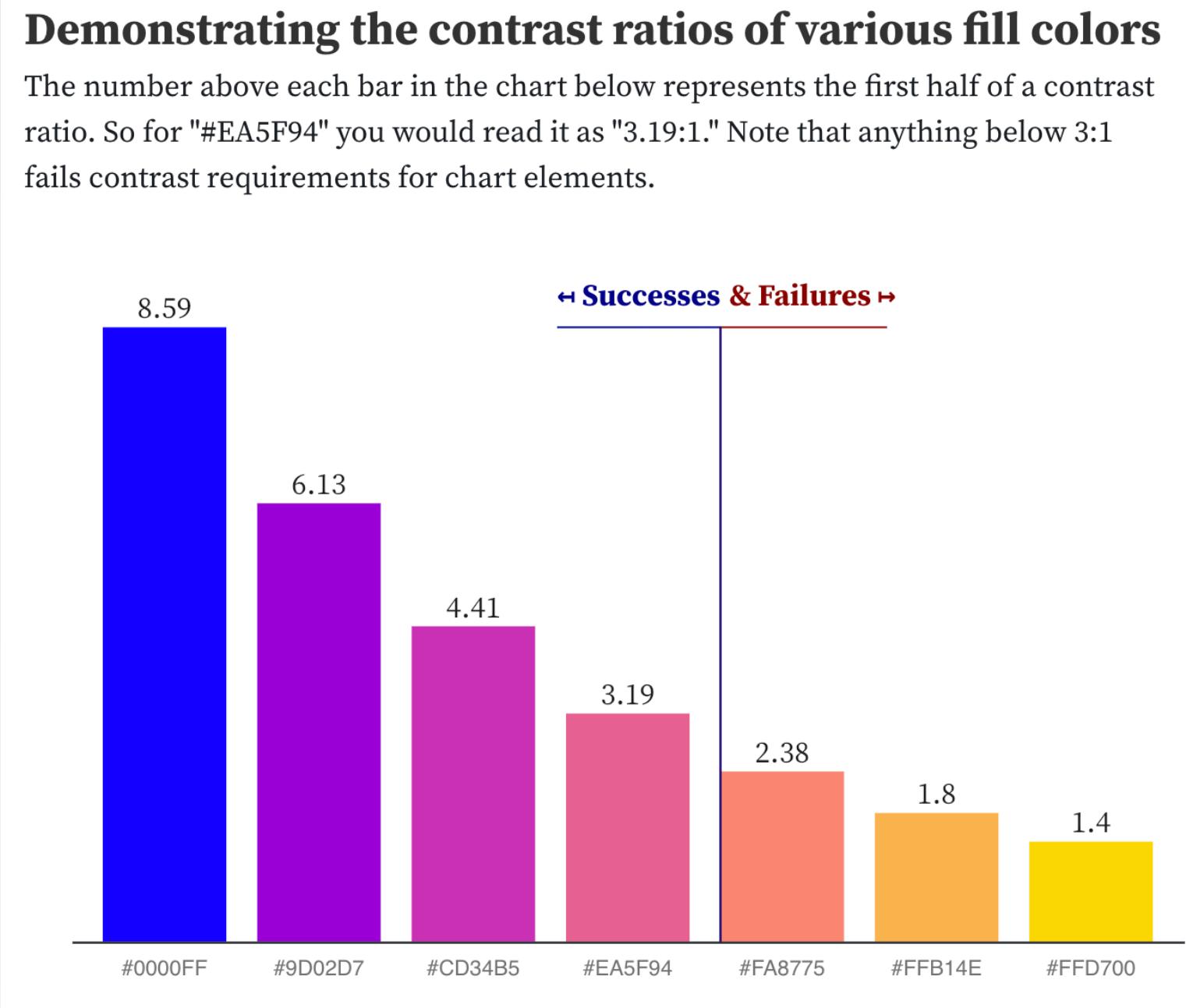


My favorite color strategy is to pick just one for *emphasis*

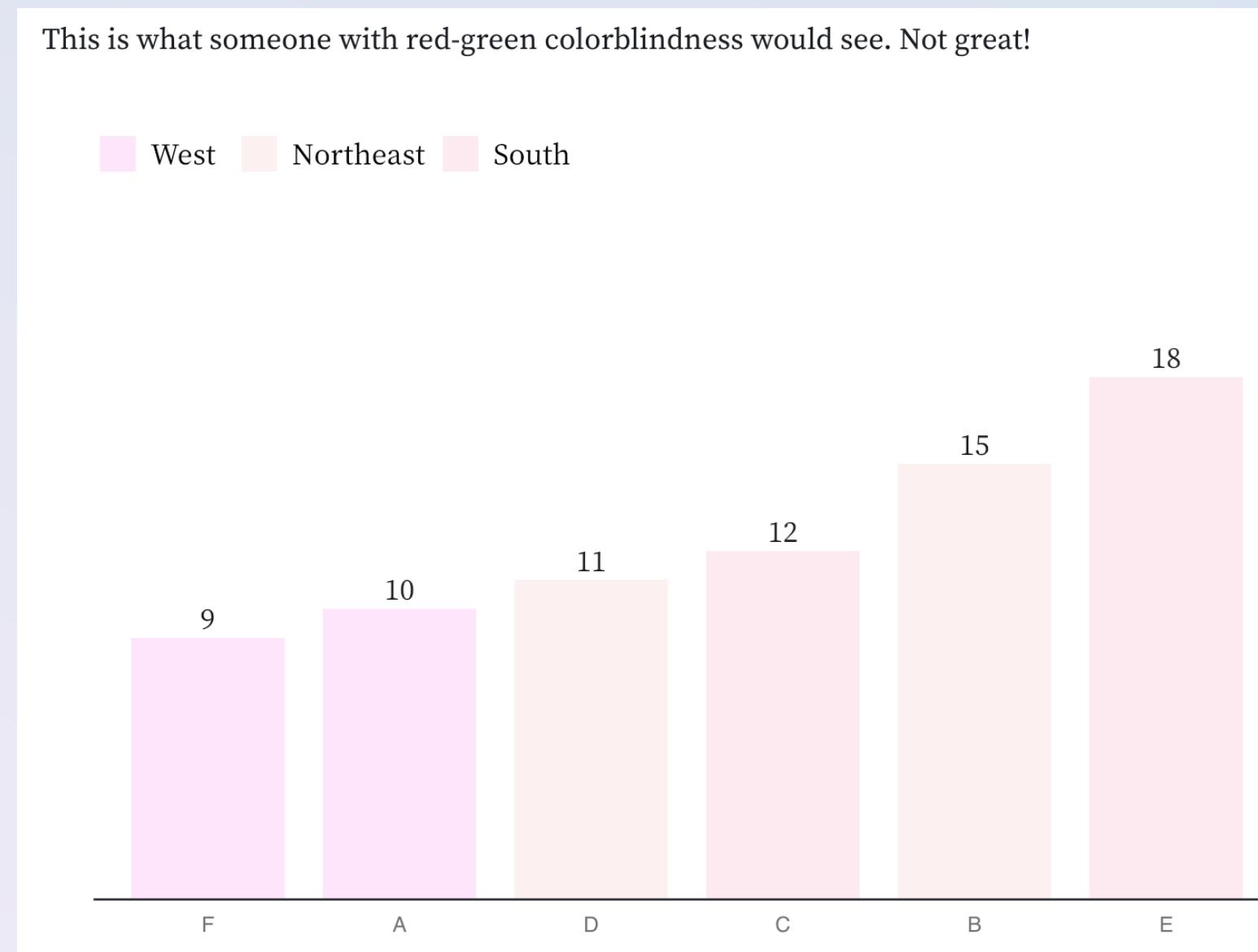


Source: [Datawrapper](#)

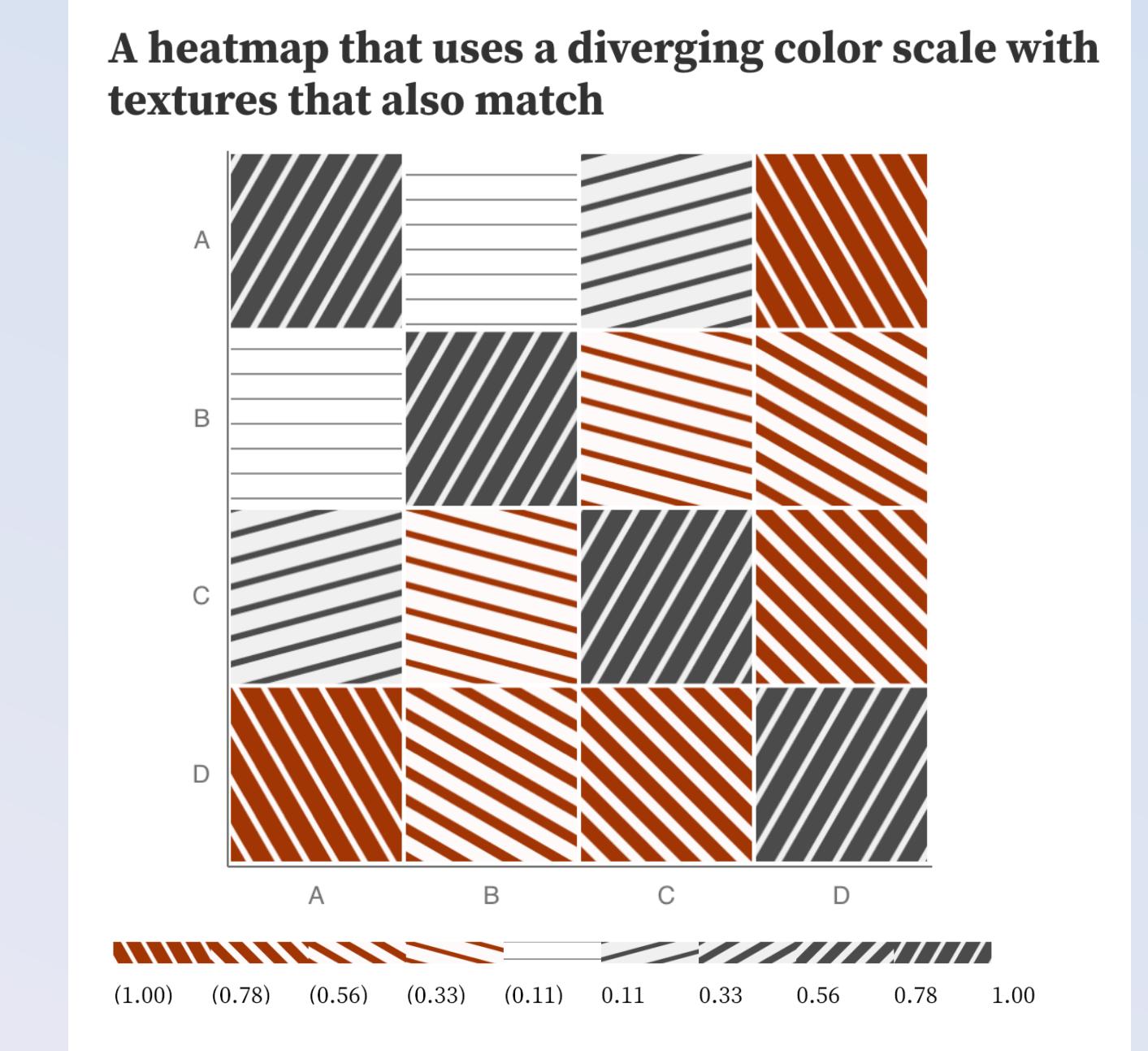
I have multiple guides on color on Observable



[Introduction to Contrast](#)



[Introduction to “No use of color alone”](#)



[Experimenting with textures](#)

Add alt text

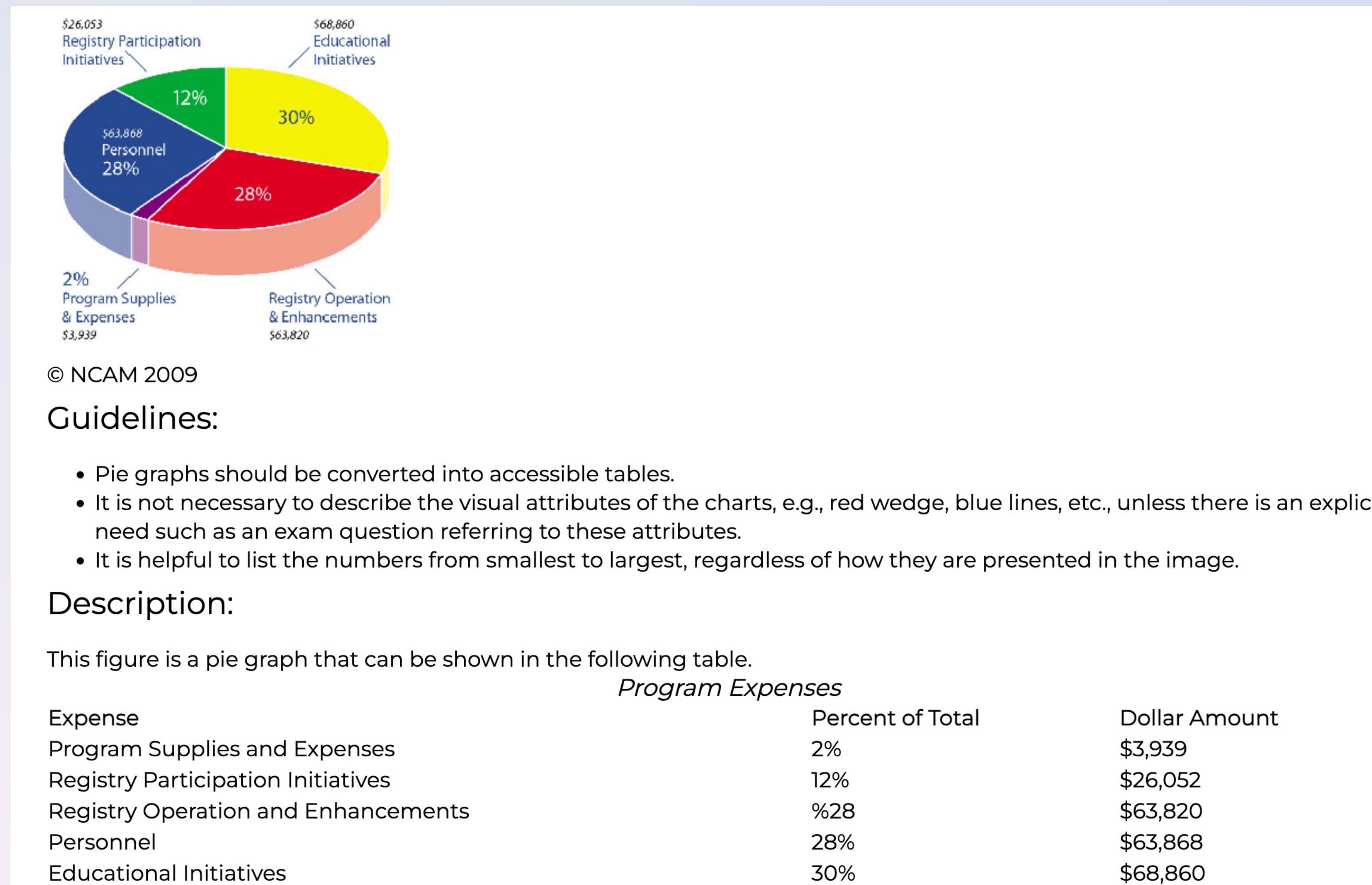
There is great research on alt text, but the most important thing to know is that you should add it to every image you post online (including twitter), in a document, or presentation.

alt= “**Chart type** of **type of data**
where **reason for including chart**”

Include a **link to data source**
somewhere in the text

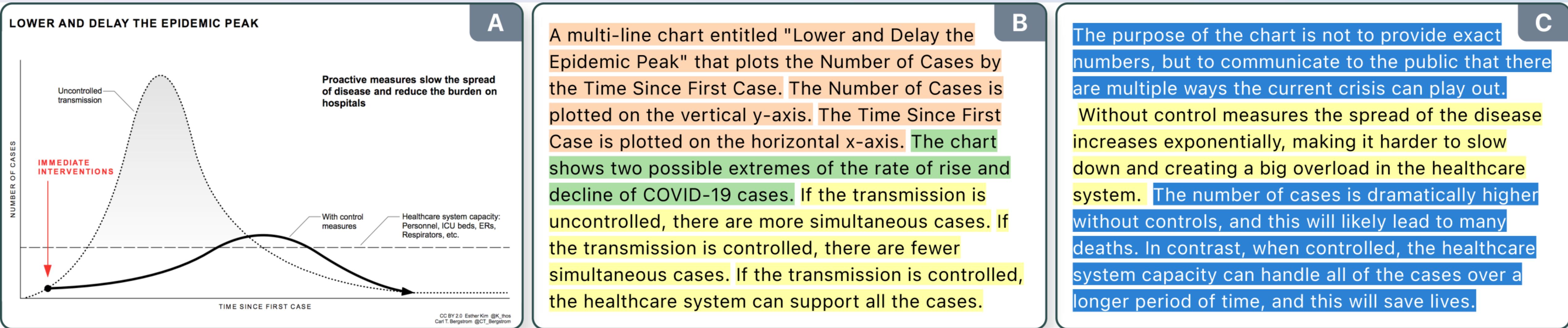
Guidance: <https://medium.com/nightingale/writing-alt-text-for-data-visualization-2a218ef43f81>

NCAM: Descriptions, short and long



Source: [NCAM's Diagram Center Guidelines](#)

Describing charts, in parts



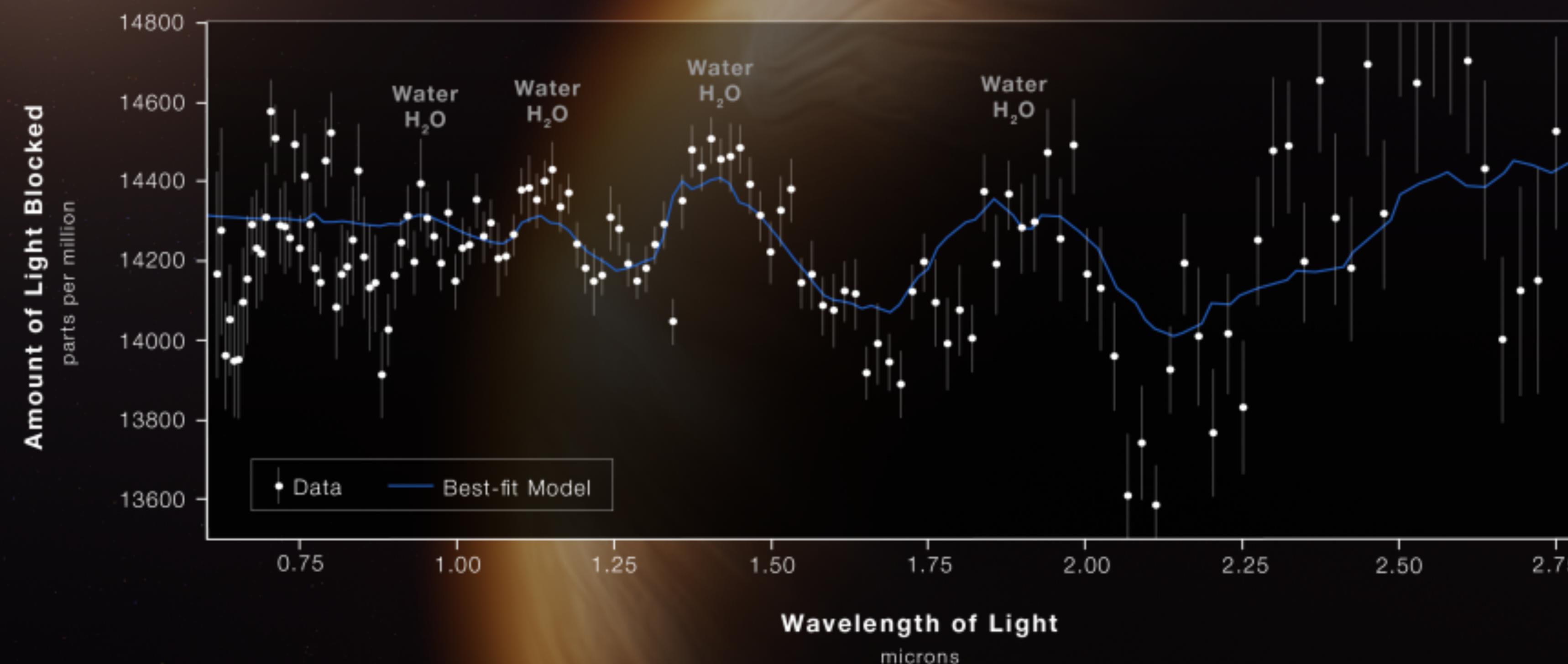
Source: “Accessible Visualization via Natural Language Descriptions,” by Lundgard and Satyanarayan



Source: [NASA's James Webb Space Telescope](#)

HOT GAS GIANT EXOPLANET WASP-96 b ATMOSPHERE COMPOSITION

NIRISS | Single-Object Slitless Spectroscopy



Source: [NASA](#)

Exoplanet WASP-96 b (NIRISS Transmission Spectrum)

Extended Description

Graphic titled "Hot Gas Giant Exoplanet WASP-96 b Atmosphere Composition, NIRISS Single-Object Slitless Spectroscopy."

The graphic shows a transmission spectrum in the form of a graph of the Amount of Light Blocked by the planet's atmosphere in parts per million on the vertical *y*-axis versus Wavelength of Light in microns on the horizontal *x*-axis.

Graph

Axes

The *y*-axis ranges from 13,500 parts per million (less light blocked) at the bottom to 14,800 parts per million (more light blocked) at the top, with labeled tick marks every 200 parts per million, starting at 13,600.

The *x*-axis ranges from 0.6 microns on the left to 2.8 microns on the right, with labeled tick marks every 0.25 microns, starting at 0.75 microns.

Key

The graph includes a key showing that the solid white circles centered on gray vertical lines represent data points, and a blue solid line represents a best-fit model.

Data and Model

The graph consists of 141 data points, each with a gray error bar. The points range in value from 13,589 to 14,883 parts per million. The data points are not connected. They follow a jagged trend from left to right, with a number of broad peaks and valleys. The lengths of the error bars vary from a minimum of plus or minus 43 to a maximum of plus or minus 314. The error bars are smallest between about 1 and 1.3 microns, generally increasing in length toward the left from 1 to 0.6 microns, and toward the right from about 1.3 to 2.8 microns.

A solid blue line with several prominent peaks and valleys represents the best-fit model. The model begins at the far left with a very slight downward slope toward the right with a small peak around 0.95 microns, and another peak at about 1.15 microns. The line then becomes more sinuous, forming a taller, broader peak centered at about 1.4 microns and a slightly shorter broad peak at 1.9 microns. Starting around 2.15 microns, the line trends back upward with a wavy slope of about 30 degrees.

The blue best-fit model line generally follows the trend of the data. It intersects some data points, but does not match the data perfectly. The match between the model and data is clearest between about 0.9 and 1.65 microns.

Source: [NASA](#)

Perceivable Evaluation Toolkit:

1. [Contrast Checker](#)
2. Color design (see [my series on Observable](#))
 1. [CVD Checker](#)
 2. [Redundant encoding design ideas](#)
 3. [Small multiples design ideas](#)
3. Add descriptions:
 1. [Alt text, Semantic levels, and Alt documents](#)