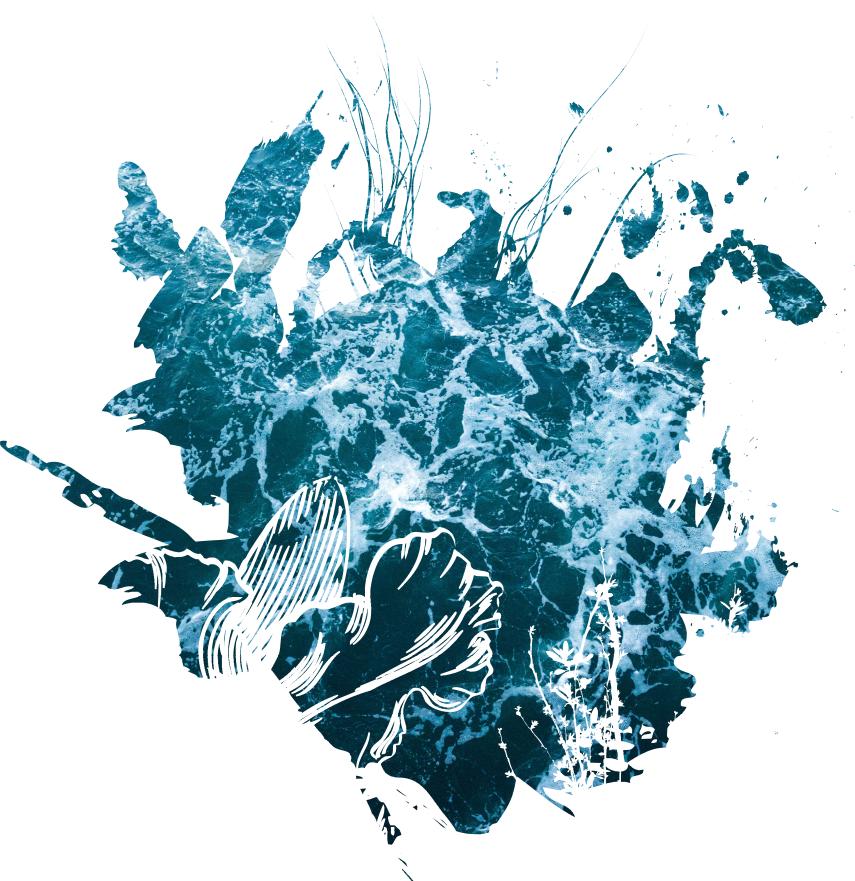

Color Theory in Visualizations

By: Jennifer Smiley





Topics

- » *How we associate color with emotions.*
- » *Dealing with color blindness*
- » *Color Theory in Visualizations*
 - *COVID-19 Visualizations*



1.
*How we associate
color with emotions.*

Implementation

» Google Form to find what people think about different colors and how does that compare to known research

» Colors focusing on:

- Red
- Green
- Yellow
- Orange
- Light Blue
- Dark Blue
- Purple
- Pink
- Black
- White



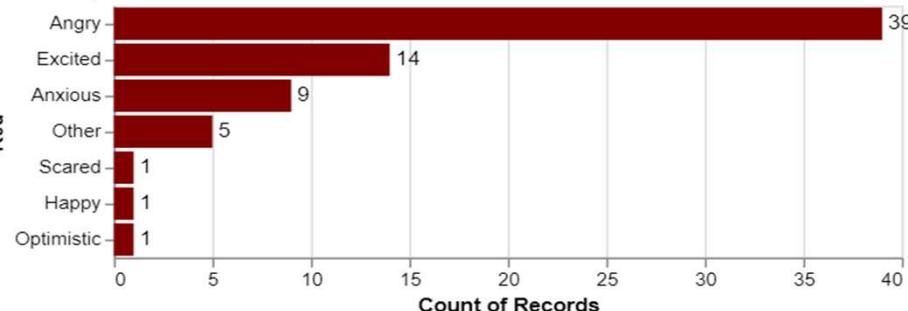
Ethos in Color: Red and Green

Red

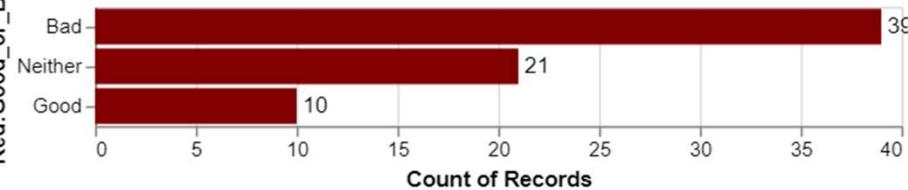


- » Positive emotions: Love, Lust, Passion, also known for giving energy to the wearer.
- » Negative Emotions: Anger, Danger, Stress, and Fear

Red



Red:Good_or_Bad

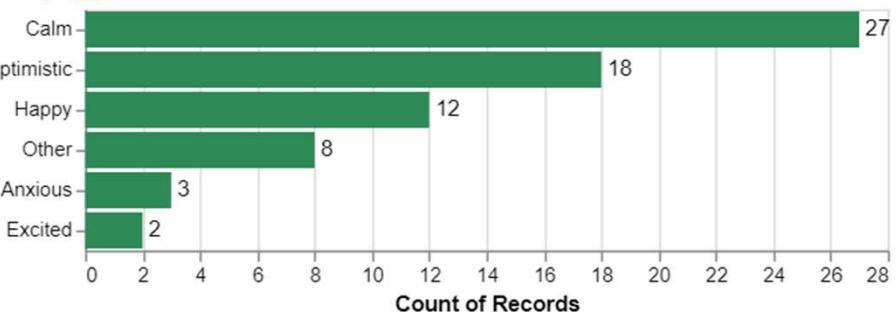


Green

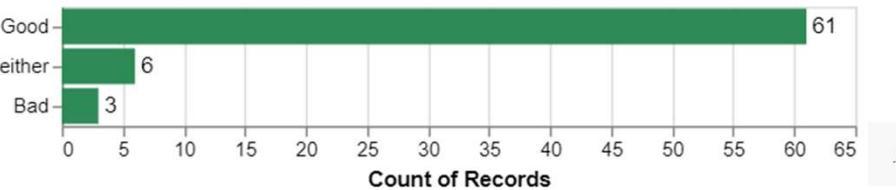


- » Main Aura: Relaxing
- » Associated with: Purity, Health, Growth, Productivity, Connection, Nature, Spirituality, and Soul-searching.

Green



Green:Good_or_Bad

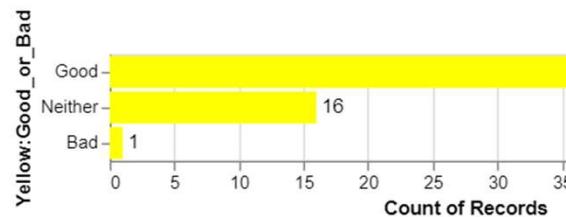
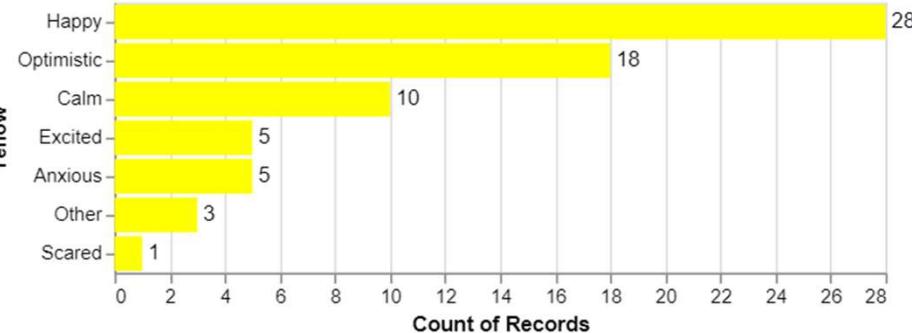


Ethos in Color: Yellow and Orange

Yellow



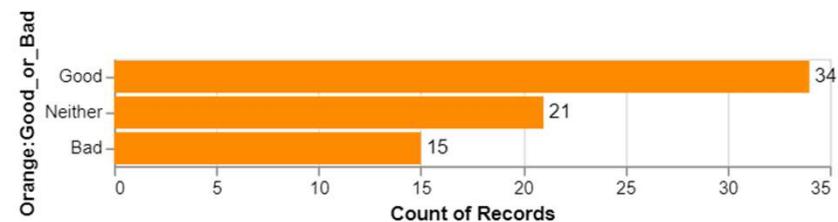
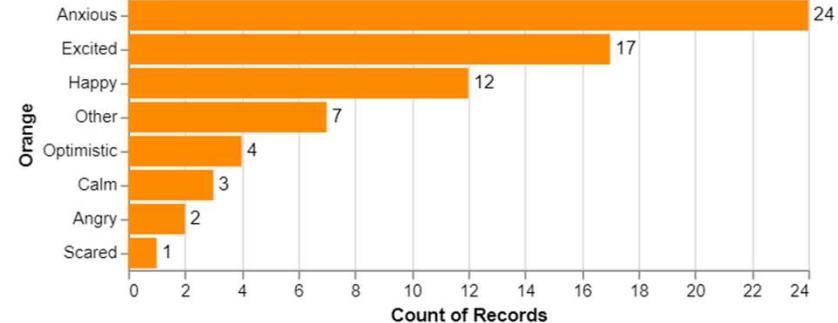
- » Positive Emotions: Happiness, Optimism, Hope, Enthusiasm, Cheerfulness.
- » Negative Emotion: Caution, Anxiety
- » Activates left side of brain to help with deep thinking



Orange



- » Helps with positivity due to the mix of red and yellow
- » Associated with extroverts
- » Positive Emotions: Excitement, Enthusiasm, Optimism
- » Negative Emotions: Aggression, Pride, Arrogance

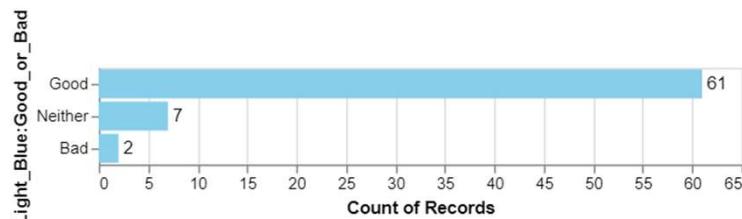
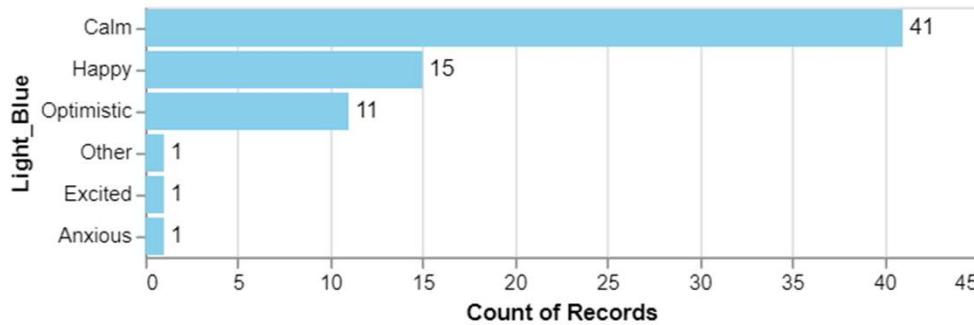


Ethos in Color: Light and Dark Blue

Light Blue



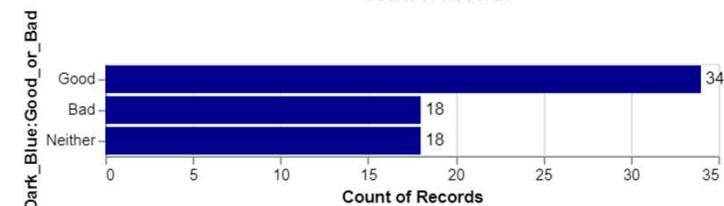
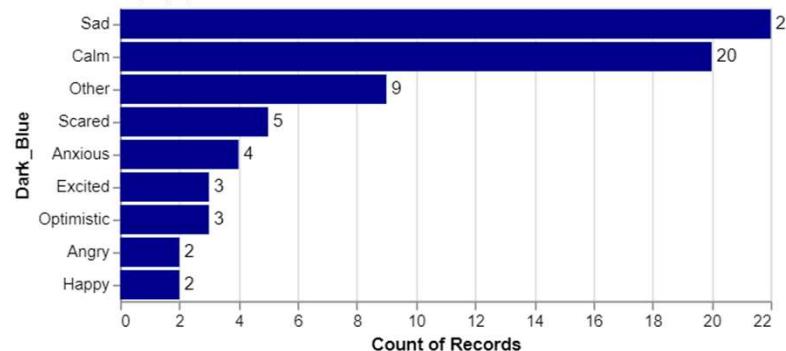
- » Associated with intellect, aids in concentration
- » Emotions: Calmness and Serenity



Dark Blue



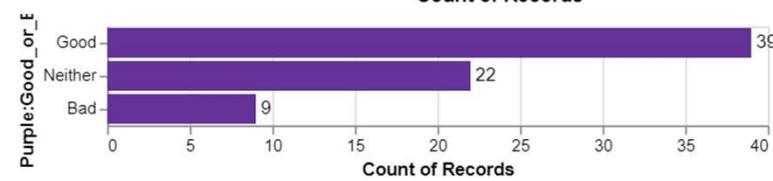
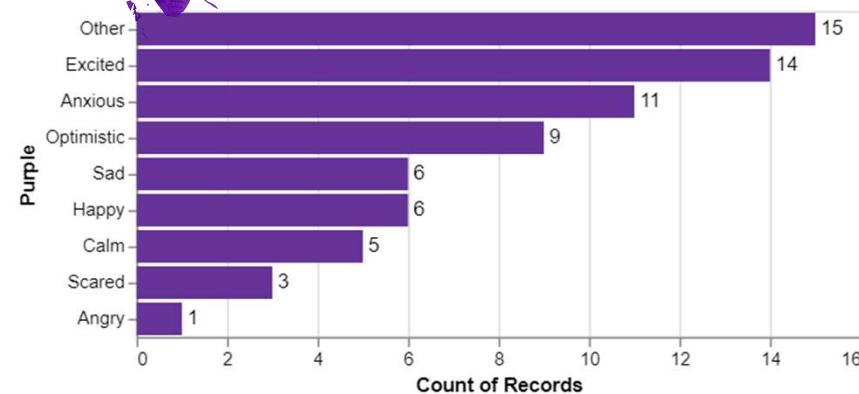
- » Aids in mental clarity
- » Emotions: Grief and Sadness
- » Linked to confidence without aggression



Ethos in Color: Purple and Pink

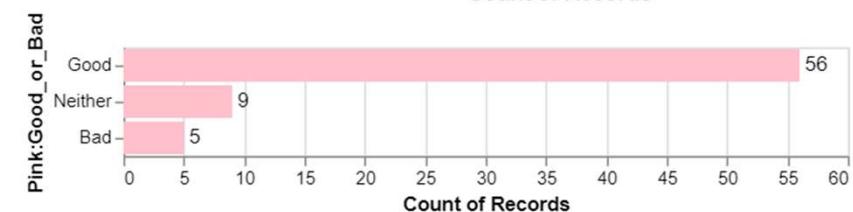
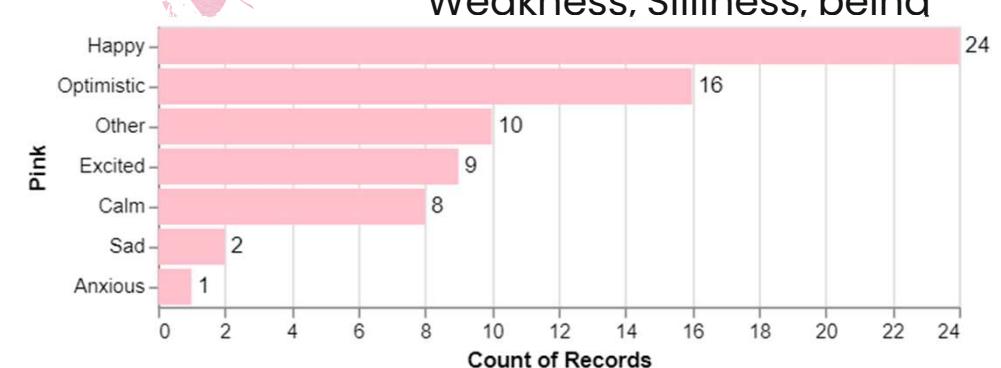
Purple

- » Associated with luxury, power, royalty/nobility, mystery, and magic
- » Creates feelings of wisdom
- » Positive Emotions: Dignity, Curiosity, Passion, Fulfilment, Calm
- » Negative Emotions: Sadness, Frustration



Pink

- » Often seen as a feminine color, the Japanese see it as a masculine
- » Positive Emotions: Love, Tenderness, Intimacy, Calm, Innocence, Optimism
- » Negative Emotions: Weakness, Silliness, being

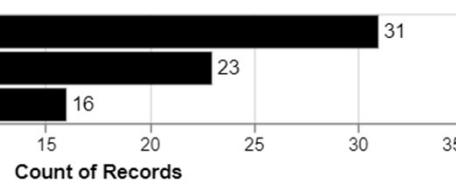
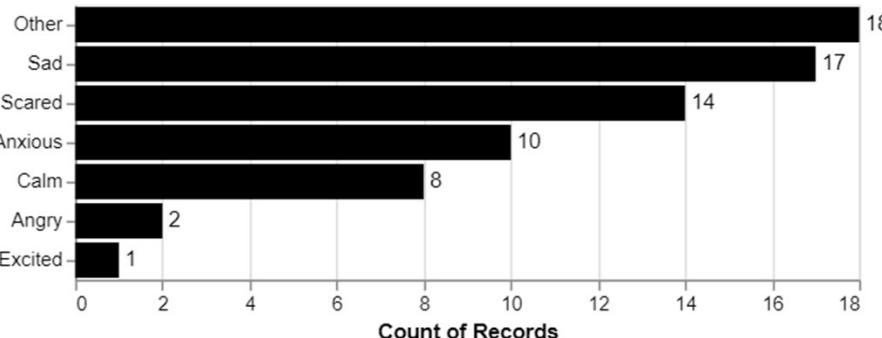


Ethos in Color: Black and White

Black



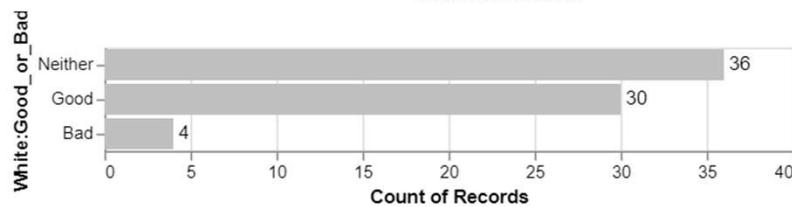
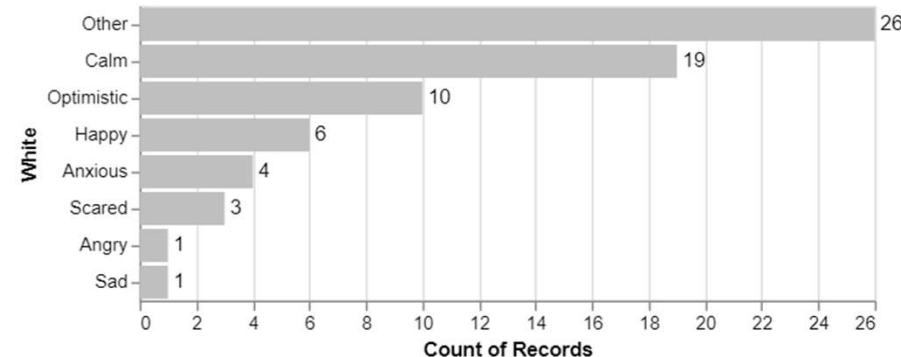
- » Evokes a sense of power, mystery, calmness and sophistication
- » Negative Emotions: depression, disappointment, pessimistic, secretive
- » Positive Emotions: Protection, Comfort, Seductive, Strength



White



- » Associated with Purity, Innocence, and Integrity
- » Represents new beginnings
- » Positive Emotions: Neutral, Hope, Optimism, Clarity, Refreshing
- » Negative Emotions: Indecision, Coldness, Unfriendliness



Ethos in Color

» Auras:

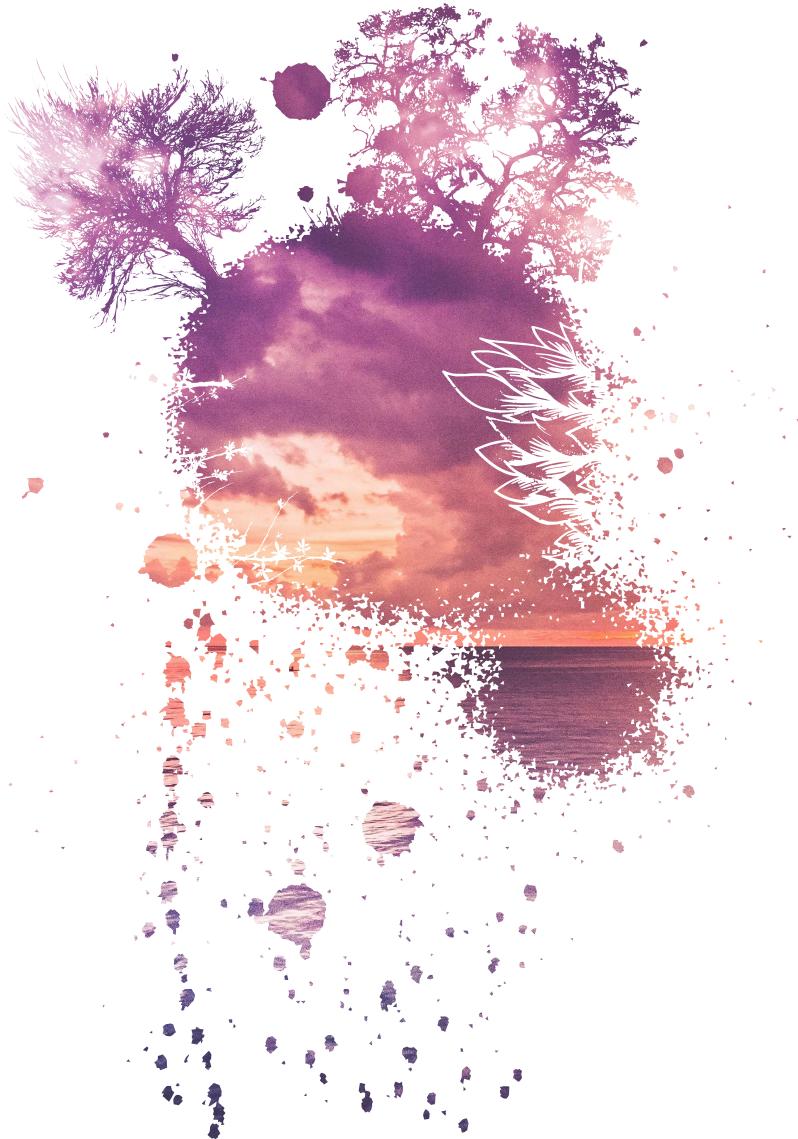
- Concentration
- Studying
- Energy
- Confidence

» Darker colors:

- Serious
- Wise
- Sad

» Lighter colors:

- Happy
- Optimistic
- Hopeful

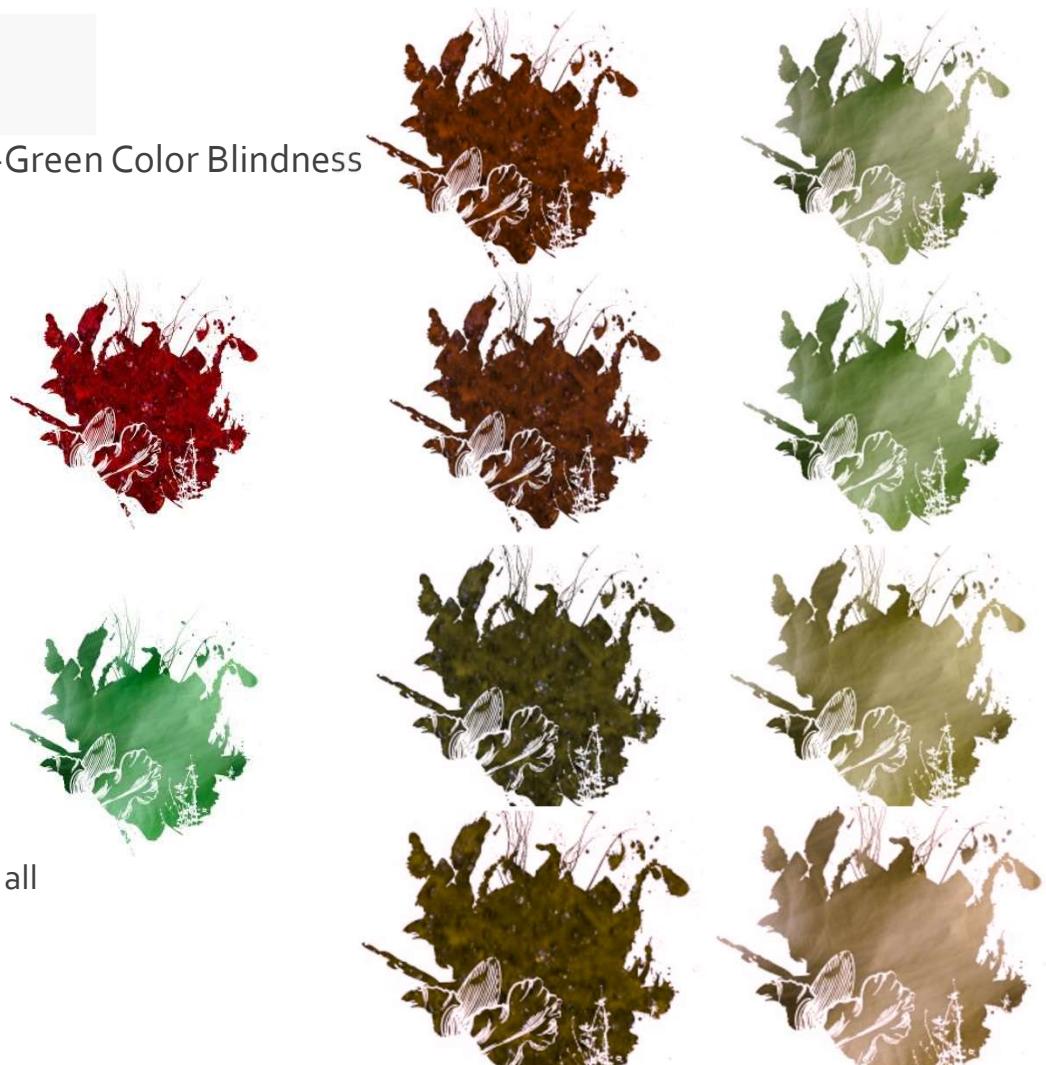


2. *Dealing with color blindness*



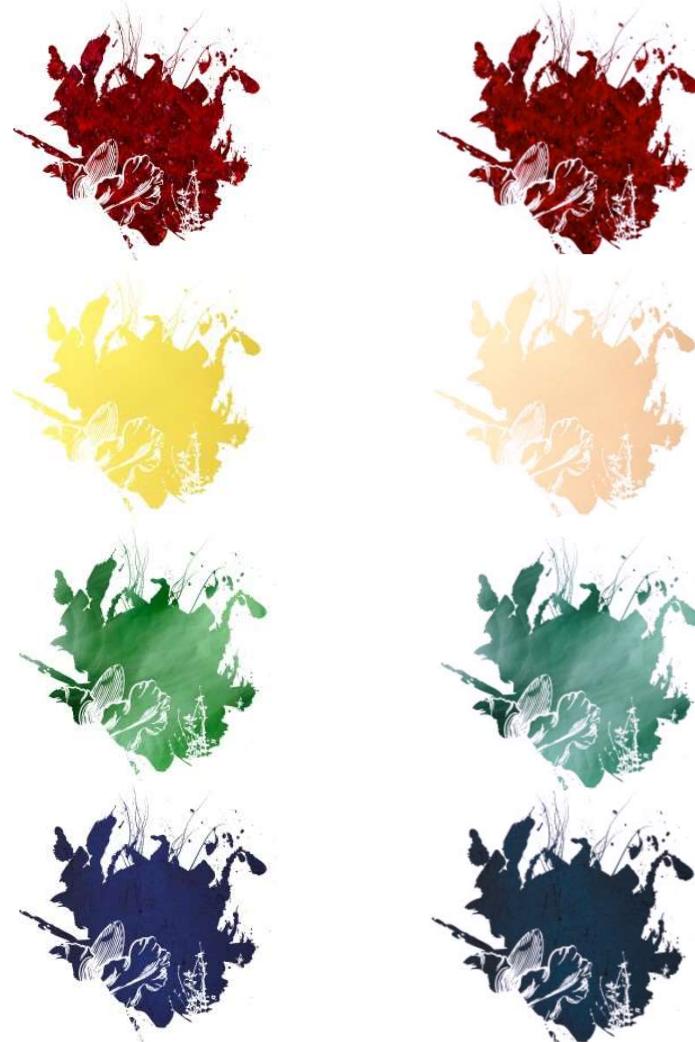
Red-Green Color Blindness

- » ~ 8% of males and 0.4% of females suffer from Red-Green Color Blindness
- » 1/12 men and 1/1000 females
- » Most are X-chromosome linked
- » Deutanomaly
 - Most common type of red-green color blindness.
 - Green looks more red
 - Mild color deficiency
 - Found in 5% of males
- » Protanomaly
 - Red looks more green and less bright
 - Mild color deficiency
 - Found in 1% of males
- » Protanopia (Red-Blind)
 - Unable to tell the difference between red and green at all
 - Found in 1% of males
- » Deutanopia (Green-Blind)
 - Same as Protanopia
 - Found in ~ 1% of males



Blue-Yellow Color Blindness

- » Less Common 0.01% of men and women are likely to have it
- » Difficult to tell the difference between Blue and Green
- » And between Yellow and red
- » Two types Tritanomaly and Tritanopia
- » Tritanomaly
 - Hard to tell the difference between:
 - Blue and green
 - Yellow and red



Blue-Yellow Color Blindness

- » Less Common 1% of males and females
- » Tritanopia
 - Unable to tell the difference between:
 - Blue and green
 - Purple and red
 - And yellow and pink
 - Makes colors less bright



Complete Color Blindness

- » Uncommon 0.003% of people
- » Not linked to sex
- » Can not see colors at all
- » Monochromacy
 - Could have trouble seeing clearly
 - Might be sensitive to light



Blue Cone Monochromacy

- » Rare genetic disease (1:100,000)
- » Almost exclusively affects males
- » Hereditary
- » Impaired vision, intolerance to light, poor ability to distinguish colors
- » Monochromacy
 - Could have trouble seeing clearly
 - Might be sensitive to light

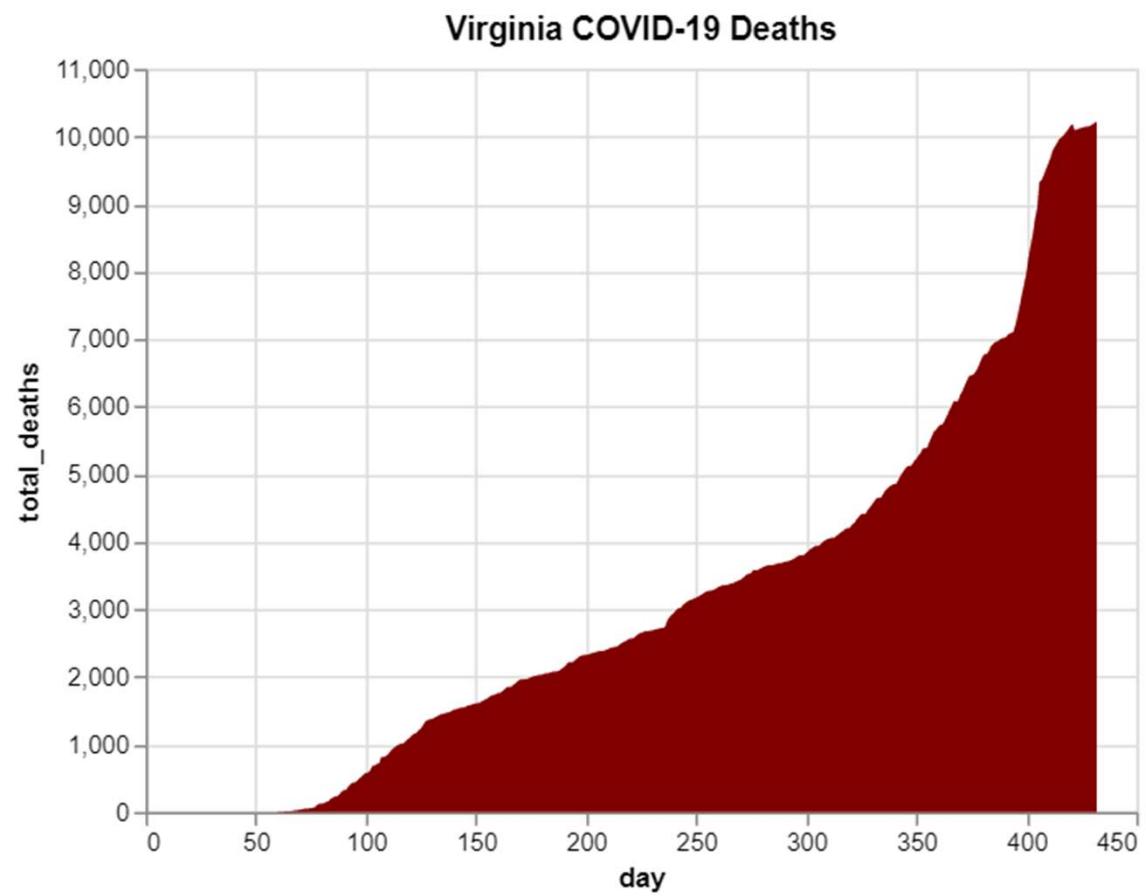




3.
*Color Theory in
Visualizations*

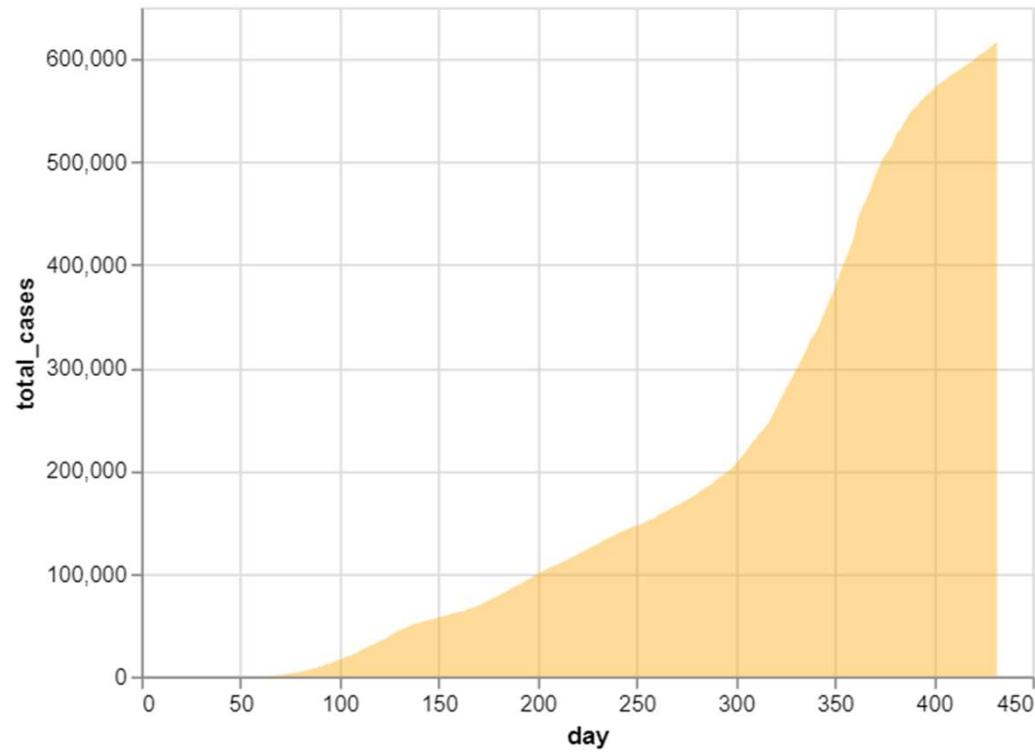
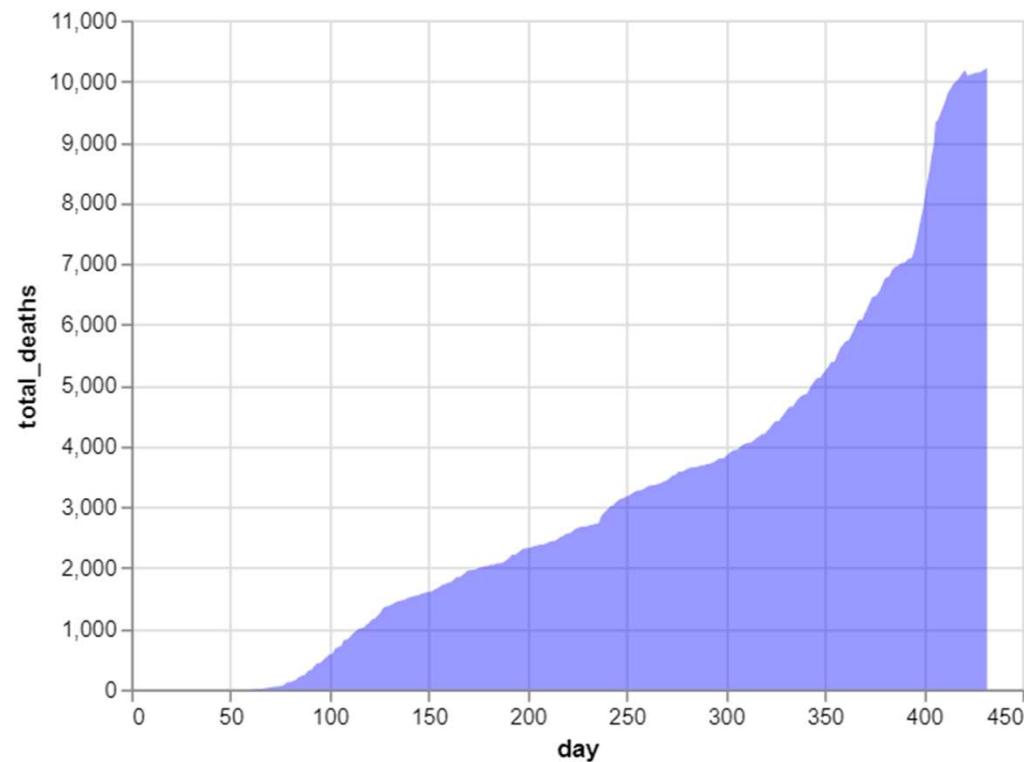
Red

- » Serious
- » Deadly



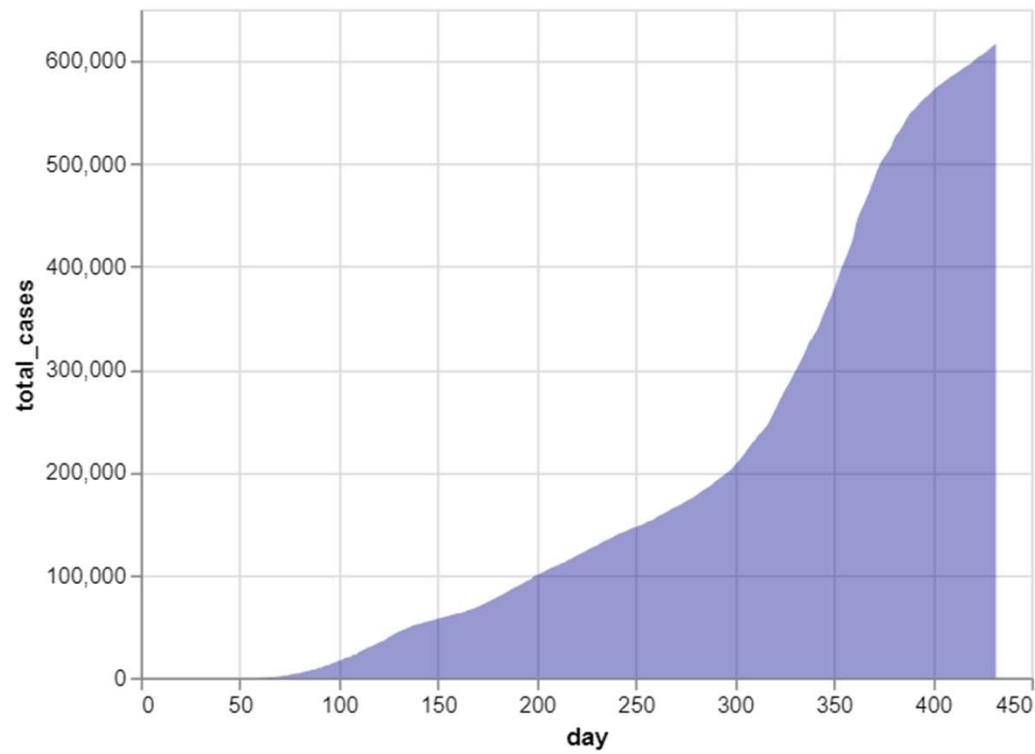
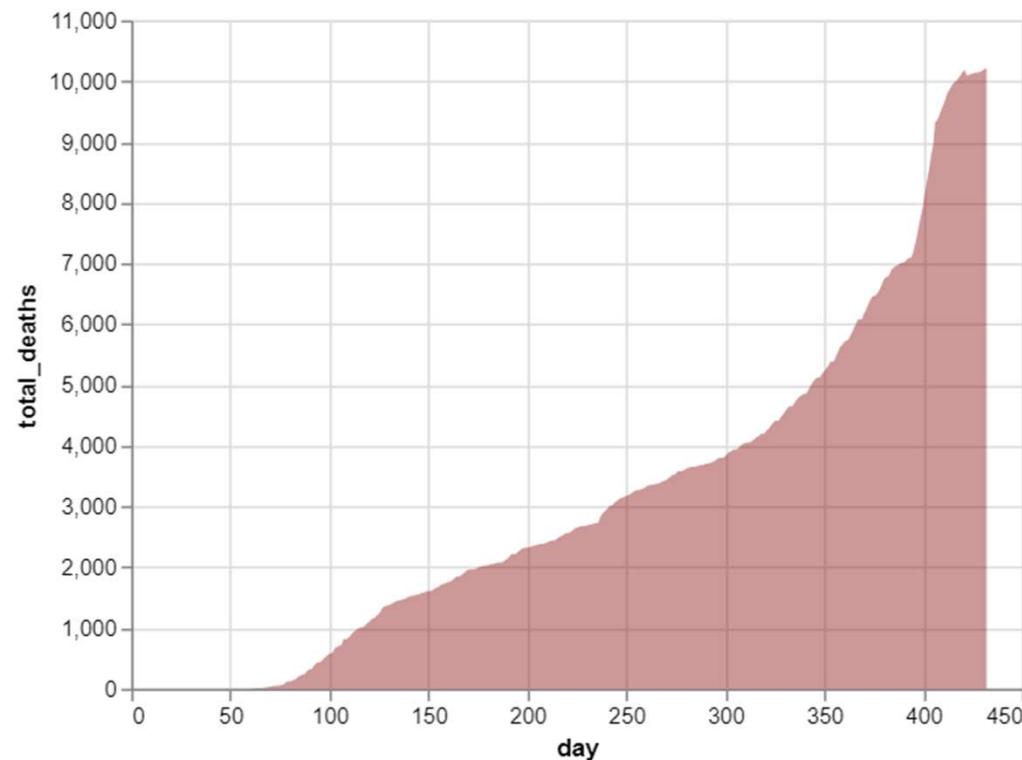
The Effect of Color

» Virginia Data



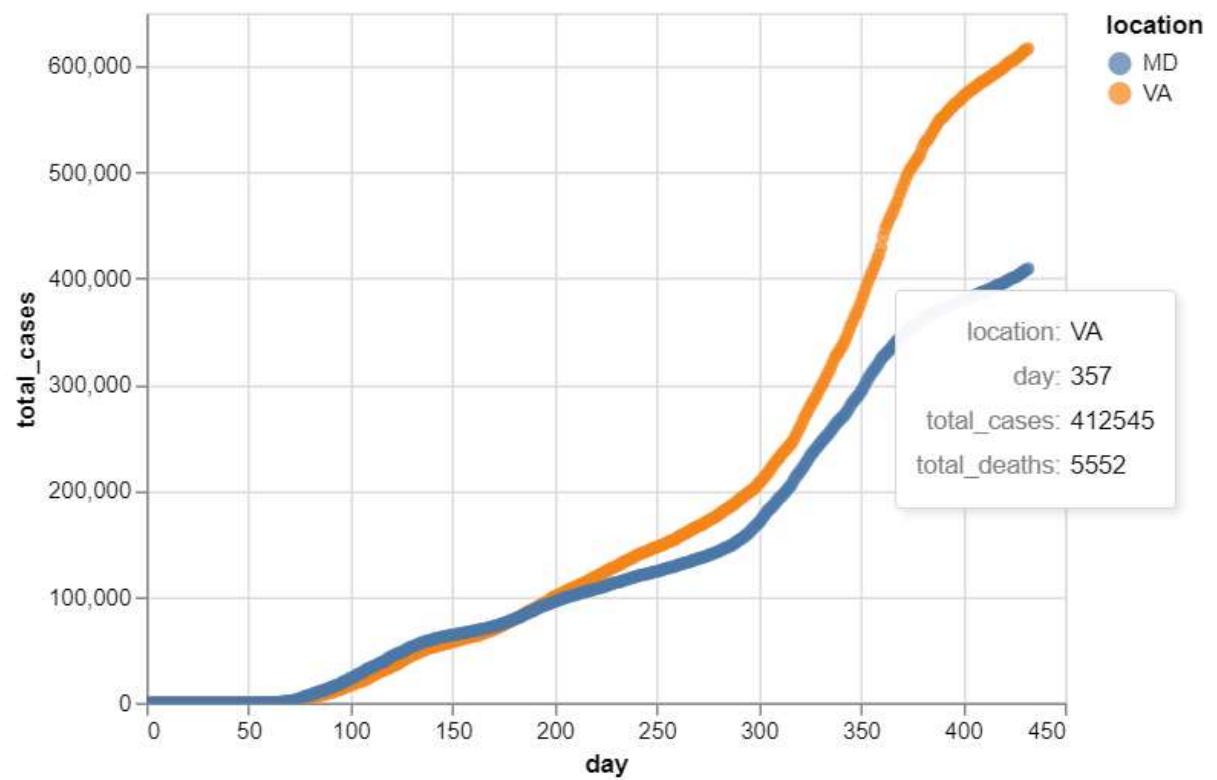
The Effect of Color

» Virginia Data

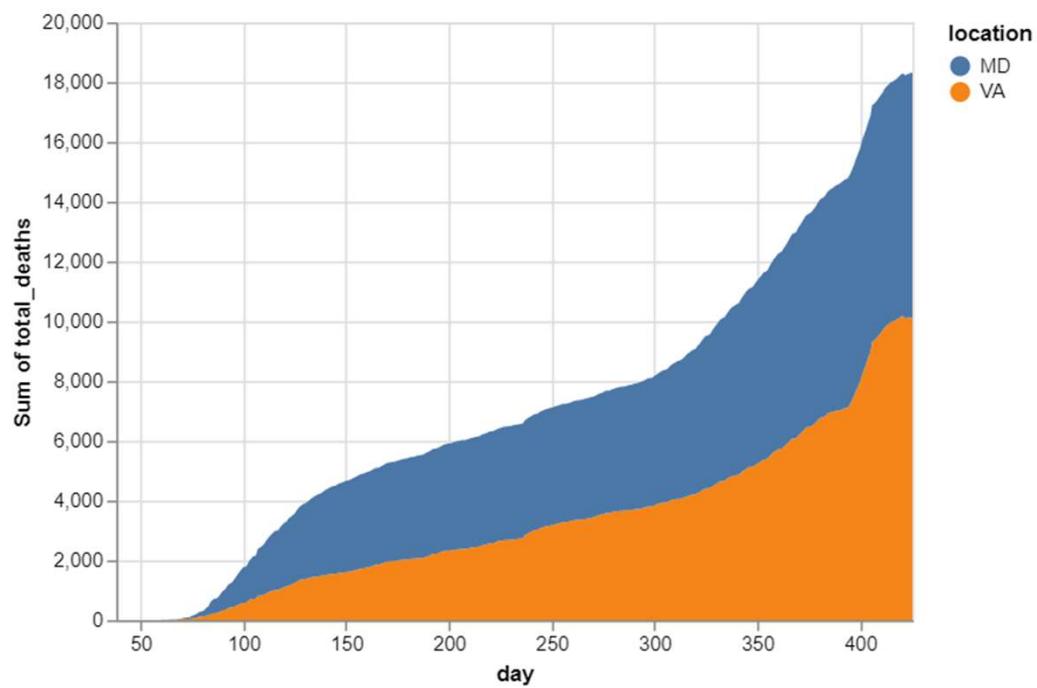
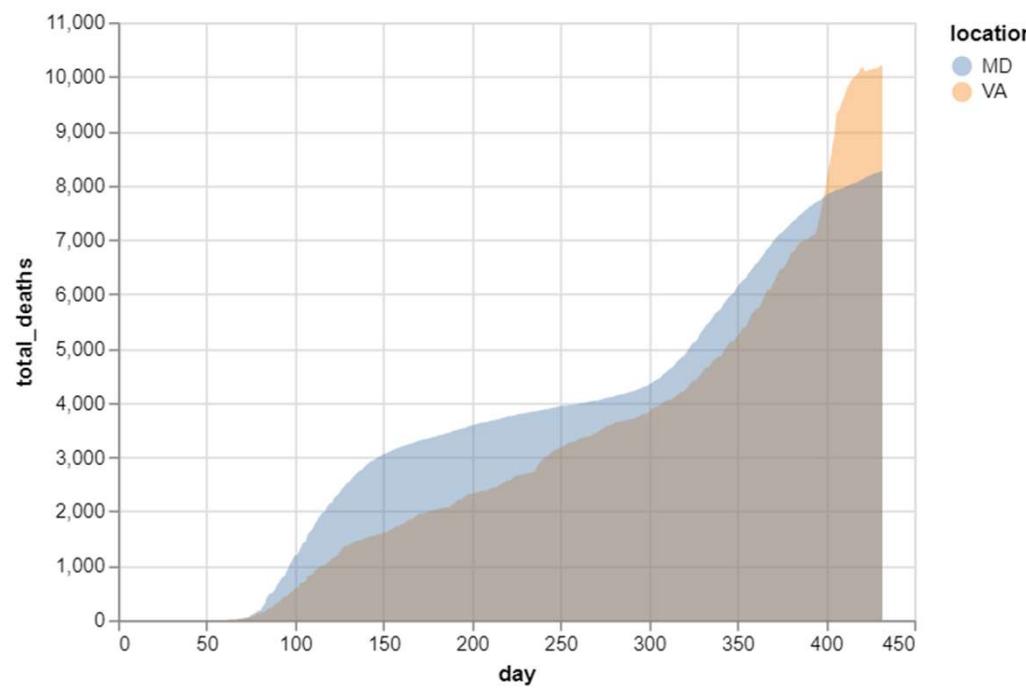


Visualizations

- » Shows the information for that day for each data point.
 - Jan. 12th, 2021



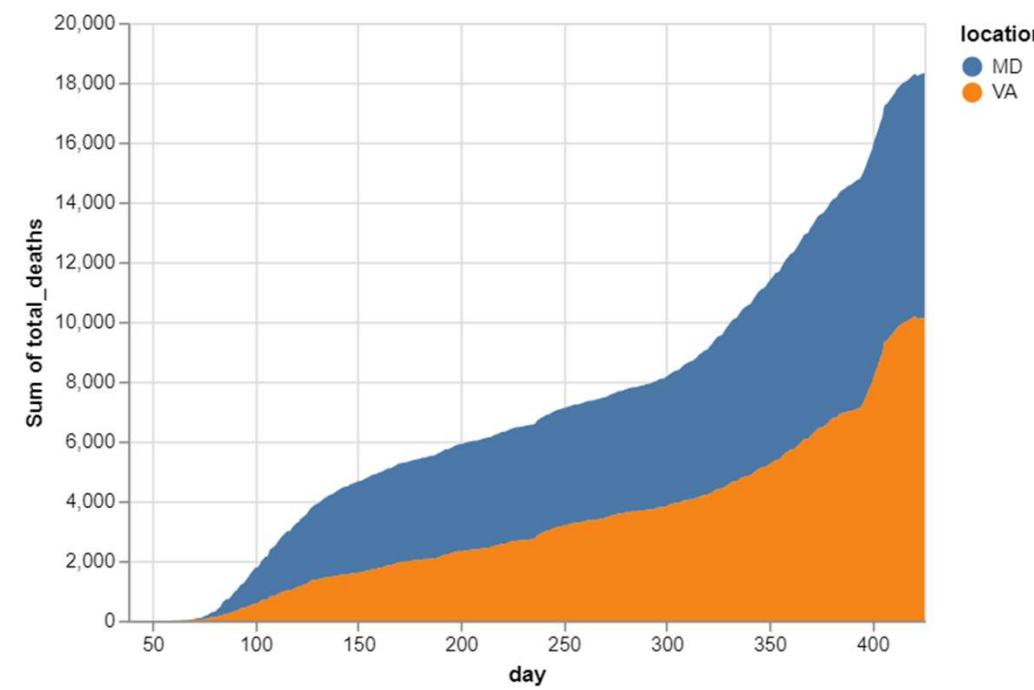
Good vs. Misleading Visualizations



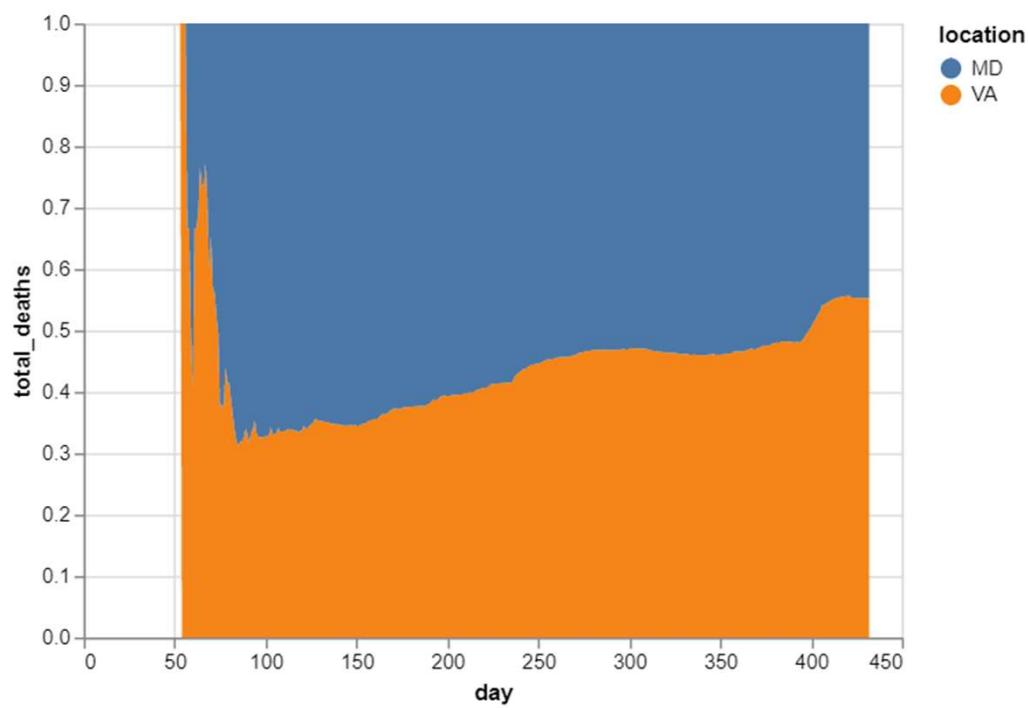
A Better Version

»

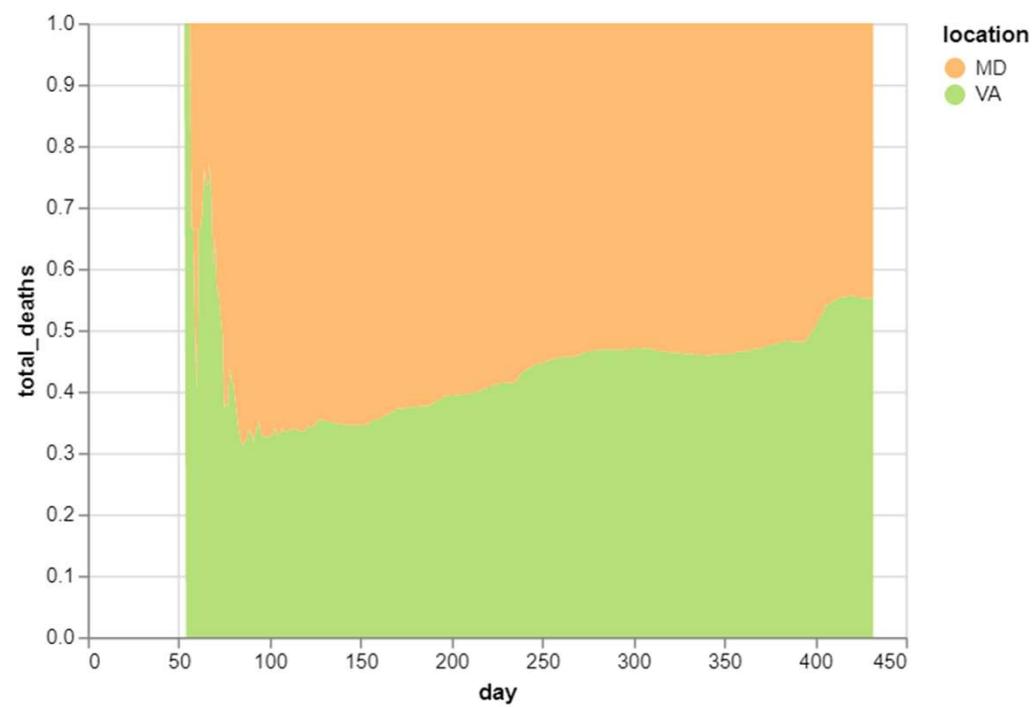
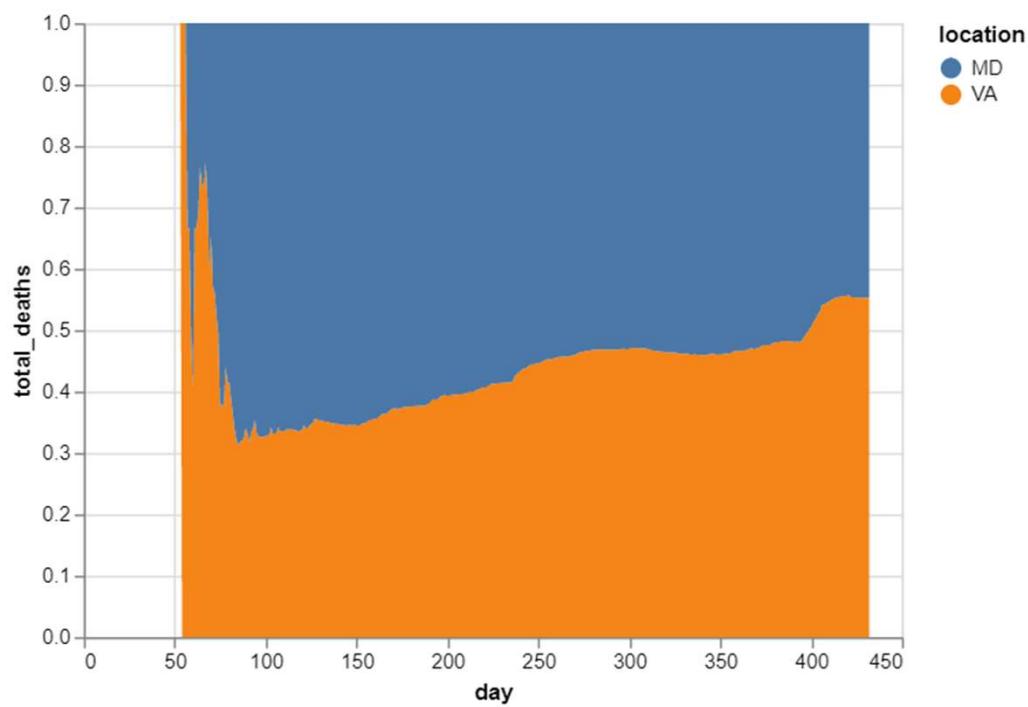
Stacked Area Plot



Normalized Stacked Area Plot

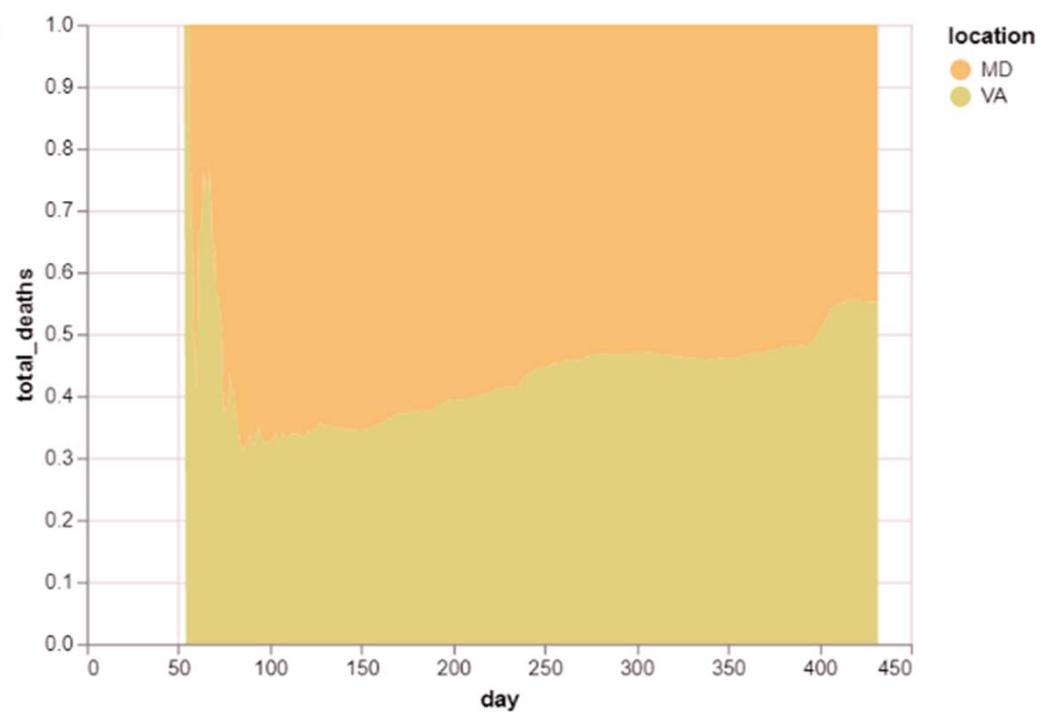
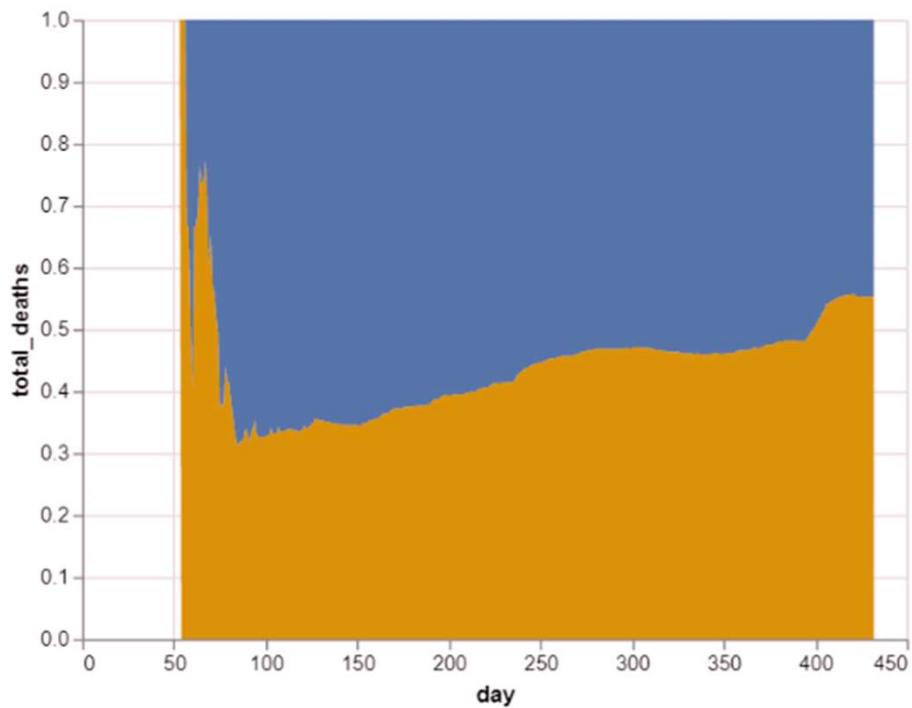


Good vs. Bad Visualization



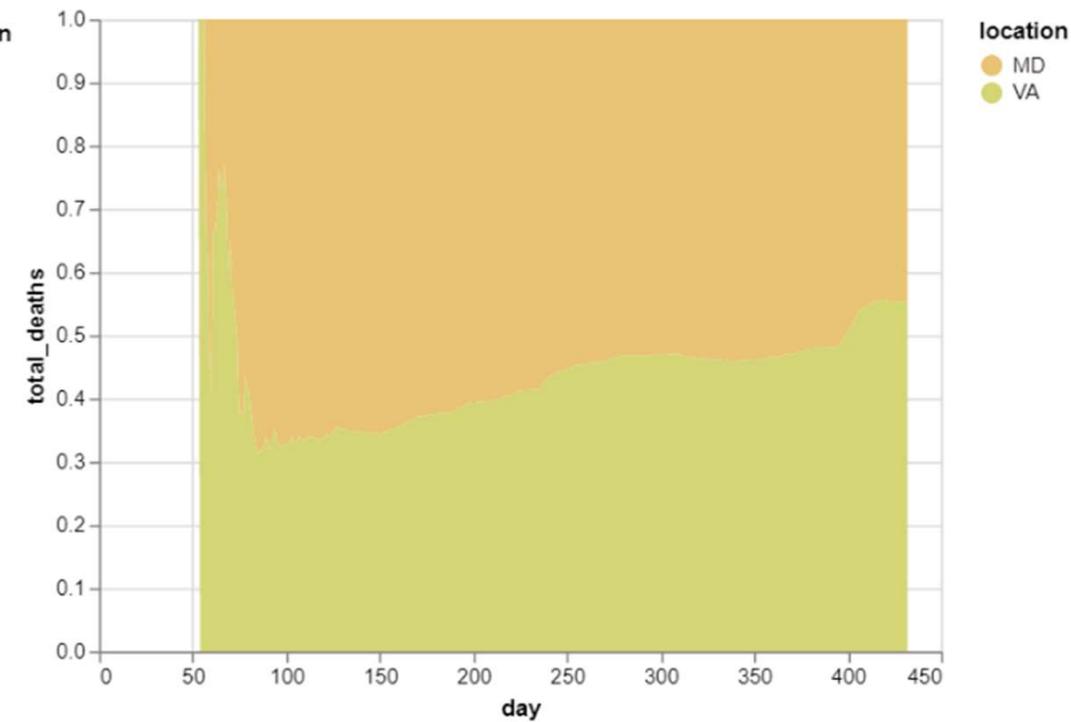
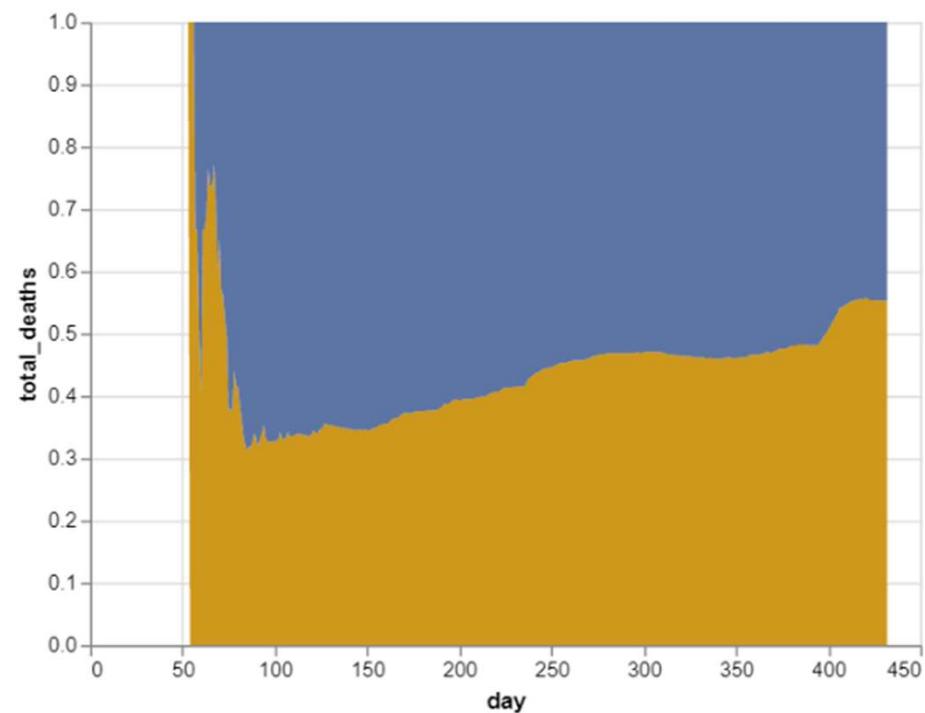
Red-Green Color Blindness Test

» Deuteranomaly (Green-Week)



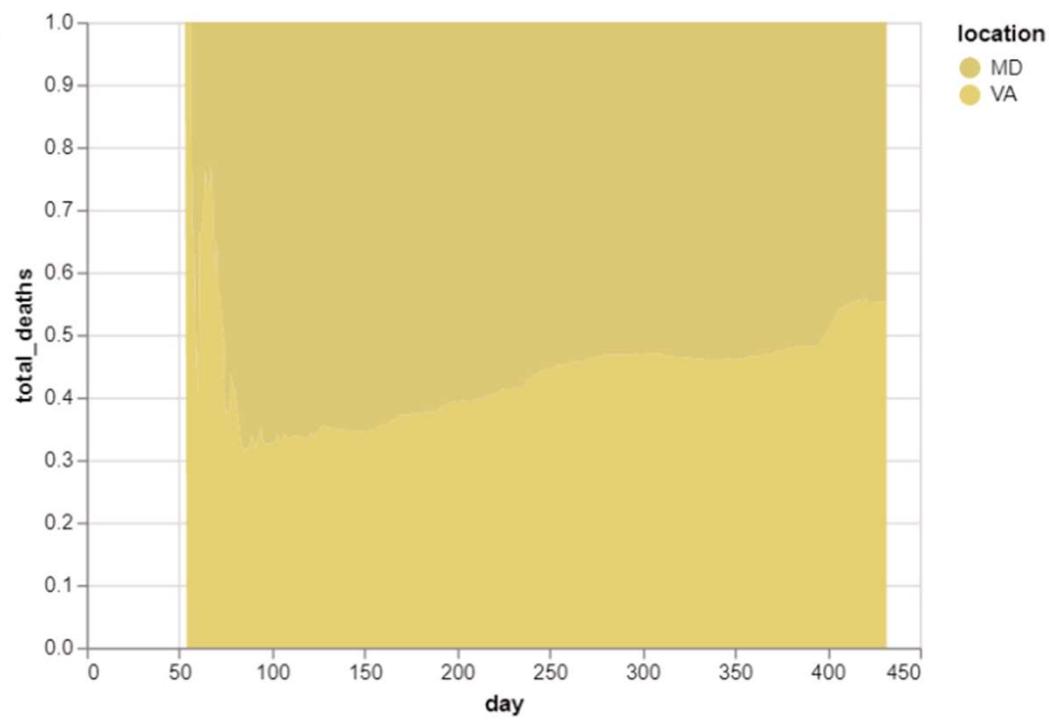
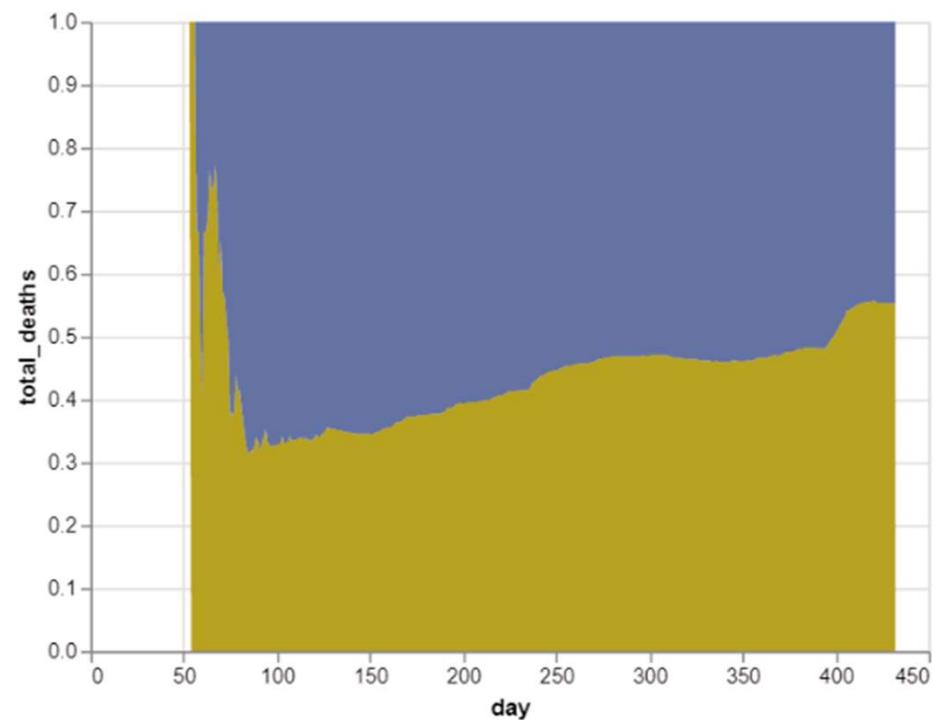
Red-Green Color Blindness Test

» Protanomaly (Red-Week)



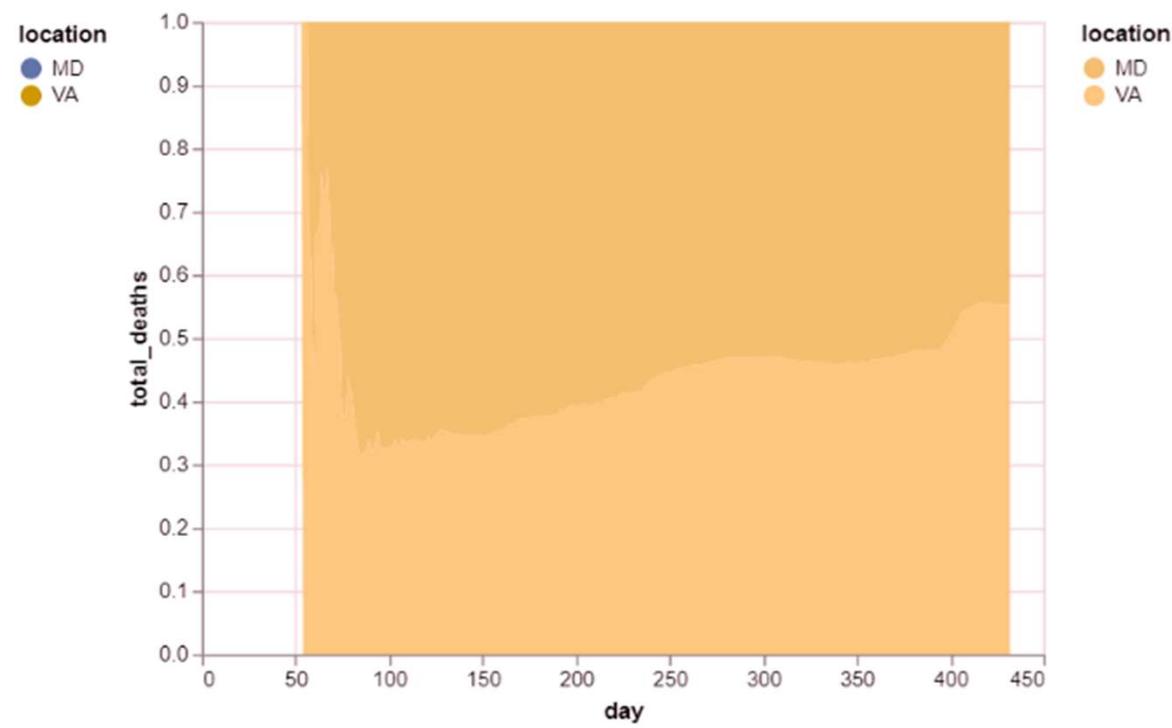
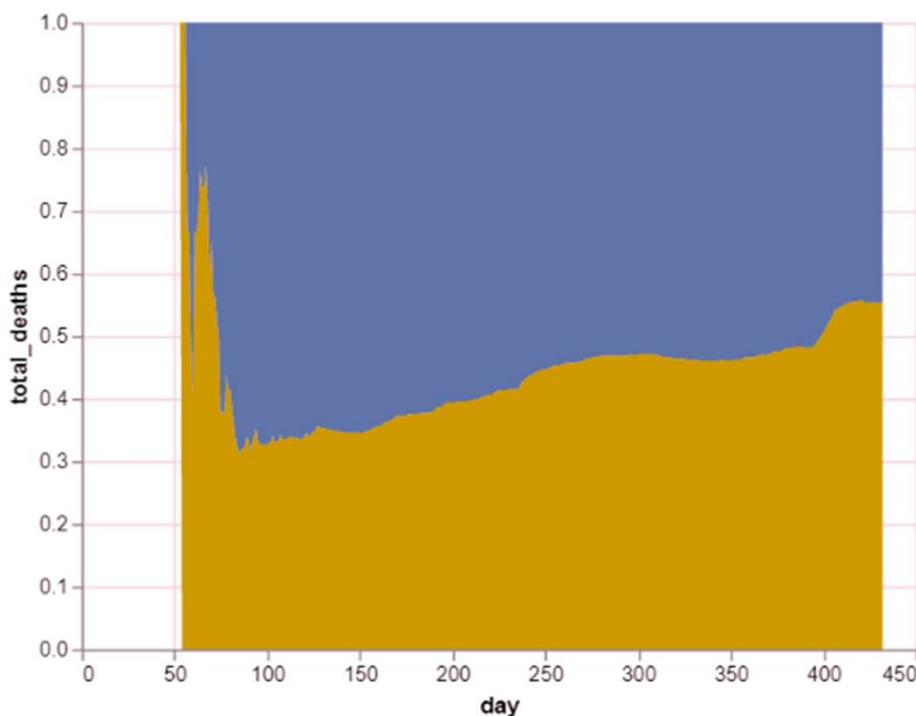
Red-Green Color Blindness Test

» Protanopia (Red-Blind)



Red-Green Color Blindness Test

» Deuteranopia (Green-Blind)



4. *Conclusion*



Conclusion

- » Research into color theory and see how it can change the meaning behind a visualization.
- » Colors do have emotional appeals
- » Darker colors are more serious than lighter colors
- » Red-Green deficiencies are the ones you are most likely to come across.



References

- » <https://www.colorpsychology.org/>
- » <https://www.color-blindness.com/coblis-color-blindness-simulator/>
- » <https://www.blueconemonochromacy.org/blueconemonochromacy/>