

# **INFORMATION DESIGN: DATA VISUALIZATION BEST PRACTICES**

**WHO AM I AND WHAT DO I DO?**

# Introduction

## Rebecca Bergh (she/her)

- Senior Staff Analyst at Boeing
- Instructional Assistant in the UW Continuum College

@rebeccalgourley 

**WHAT'S MY GOAL HERE TODAY?**

# PRESENTATION ROADMAP

- Before and afters
- 5 'rules' for data visualization design
- My data viz story
- How to get started
- Free tools
- Accessibility

# **HOW DATA CAN MAKE AN IMPACT ON STORYTELLING**

State	Infection Fatality Rate	Cumulative Incidence	Undercount Factor
Alabama	0.90% (0.70-1.15)	24.0% (18.8-30.6)	2.4 (1.8-3.0)
Alaska	0.35% (0.28-0.43)	11.8% (10.1-14.2)	1.5 (1.3-1.8)
Arizona	0.93% (0.75-1.14)	24.5% (20.1-30.3)	2.2 (1.8-2.7)
Arkansas	0.78% (0.64-0.95)	23.2% (19.2-28.4)	2.2 (1.8-2.7)
California	0.88% (0.70-1.09)	16.9% (13.6-20.9)	1.9 (1.6-2.4)
Colorado	0.60% (0.49-0.71)	17.2% (14.6-20.9)	2.3 (2.0-2.8)
Connecticut	1.37% (1.10-1.70)	15.9% (12.9-19.9)	2.0 (1.6-2.5)
Delaware	0.92% (0.74-1.13)	17.0% (14.0-21.0)	1.9 (1.6-2.3)
Florida	0.78% (0.64-0.94)	19.5% (16.3-23.8)	2.2 (1.9-2.8)
Georgia	0.67% (0.54-0.82)	25.9% (21.4-32.0)	2.7 (2.2-3.4)
Hawaii	0.70% (0.54-0.91)	4.6% (3.6-5.8)	2.3 (1.8-2.9)
Idaho	0.28% (0.23-0.33)	37.8% (32.1-45.9)	4.0 (3.4-4.8)
Illinois	0.96% (0.78-1.16)	19.3% (16.1-23.7)	2.0 (1.7-2.5)
Indiana	0.84% (0.70-1.00)	22.9% (19.2-27.6)	2.3 (1.9-2.8)
Iowa	0.76% (0.61-0.97)	23.6% (18.7-29.5)	2.6 (2.1-3.3)
Kansas	0.59% (0.47-0.75)	28.6% (22.6-36.1)	2.8 (2.2-3.5)
Kentucky	0.53% (0.43-0.63)	21.4% (18.0-25.8)	2.3 (2.0-2.8)
Louisiana	1.01% (0.82-1.22)	21.1% (17.5-26.1)	2.3 (1.9-2.8)
Maine	0.73% (0.60-0.87)	7.3% (6.2-8.8)	2.1 (1.8-2.6)
Maryland	0.94% (0.77-1.15)	13.9% (11.5-17.1)	2.2 (1.8-2.7)
Massachusetts	1.71% (1.36-2.13)	14.4% (11.6-18.0)	1.7 (1.4-2.1)
Michigan	1.00% (0.77-1.29)	17.1% (13.3-22.1)	2.6 (2.0-3.4)
Minnesota	0.64% (0.52-0.76)	18.4% (15.4-22.4)	2.1 (1.8-2.6)
Mississippi	0.74% (0.61-0.89)	31.6% (26.6-38.6)	3.2 (2.7-3.9)
Missouri	0.69% (0.55-0.87)	19.6% (15.8-24.7)	2.5 (2.0-3.2)
Montana	0.62% (0.50-0.75)	21.0% (17.5-25.5)	2.3 (1.9-2.8)
Nebraska	0.53% (0.43-0.64)	21.1% (17.7-25.7)	2.0 (1.7-2.5)
Nevada	0.73% (0.59-0.87)	22.5% (18.8-27.5)	2.4 (2.0-2.9)
New Hampshire	0.66% (0.54-0.79)	13.4% (11.3-16.2)	2.4 (2.0-2.9)
New Jersey	1.22% (0.97-1.53)	22.2% (17.7-28.0)	2.4 (1.9-3.1)
New Mexico	1.01% (0.83-1.21)	18.6% (15.6-22.7)	2.1 (1.8-2.5)
New York	1.12% (0.87-1.42)	18.6% (14.7-23.9)	2.1 (1.7-2.8)
North Carolina	0.58% (0.48-0.68)	19.4% (16.5-23.4)	2.4 (2.0-2.8)
North Dakota	0.86% (0.71-1.03)	22.4% (19.0-27.1)	1.7 (1.4-2.0)
Ohio	0.83% (0.68-1.03)	19.5% (15.9-23.7)	2.3 (1.9-2.9)
Oklahoma	0.47% (0.38-0.56)	25.1% (21.1-30.6)	2.3 (1.9-2.8)
Oregon	0.69% (0.55-0.85)	8.2% (6.7-10.0)	2.2 (1.8-2.8)
Pennsylvania	1.00% (0.82-1.19)	19.4% (16.4-23.7)	2.6 (2.2-3.2)
Rhode Island	1.41% (1.14-1.72)	17.4% (14.3-21.4)	1.4 (1.2-1.8)
South Carolina	0.76% (0.63-0.91)	23.0% (19.4-28.0)	2.3 (1.9-2.8)
South Dakota	0.68% (0.56-0.82)	31.2% (26.1-37.9)	2.5 (2.1-3.0)
Tennessee	0.79% (0.64-0.97)	21.8% (17.7-26.9)	1.9 (1.6-2.4)
Texas	0.70% (0.57-0.85)	22.7% (18.8-27.8)	2.5 (2.1-3.0)
Utah	0.22% (0.18-0.26)	28.0% (23.8-33.7)	2.5 (2.1-3.0)
Vermont	0.72% (0.57-0.92)	4.6% (3.8-5.6)	1.8 (1.5-2.2)
Virginia	1.53% (1.09-2.36)	8.3% (5.5-11.7)	1.2 (0.8-1.7)
Washington	0.51% (0.41-0.64)	12.9% (10.3-16.1)	2.9 (2.3-3.6)
West Virginia	0.86% (0.71-1.01)	15.4% (13.2-18.5)	2.0 (1.8-2.5)
Wisconsin	0.57% (0.46-0.69)	21.5% (17.9-26.6)	2.0 (1.7-2.5)
Wyoming	0.58% (0.46-0.71)	21.0% (17.3-25.9)	2.2 (1.8-2.7)
Washington, D.C.	1.19% (0.94-1.49)	12.2% (9.8-15.3)	2.1 (1.7-2.7)

# Infection fatality rate

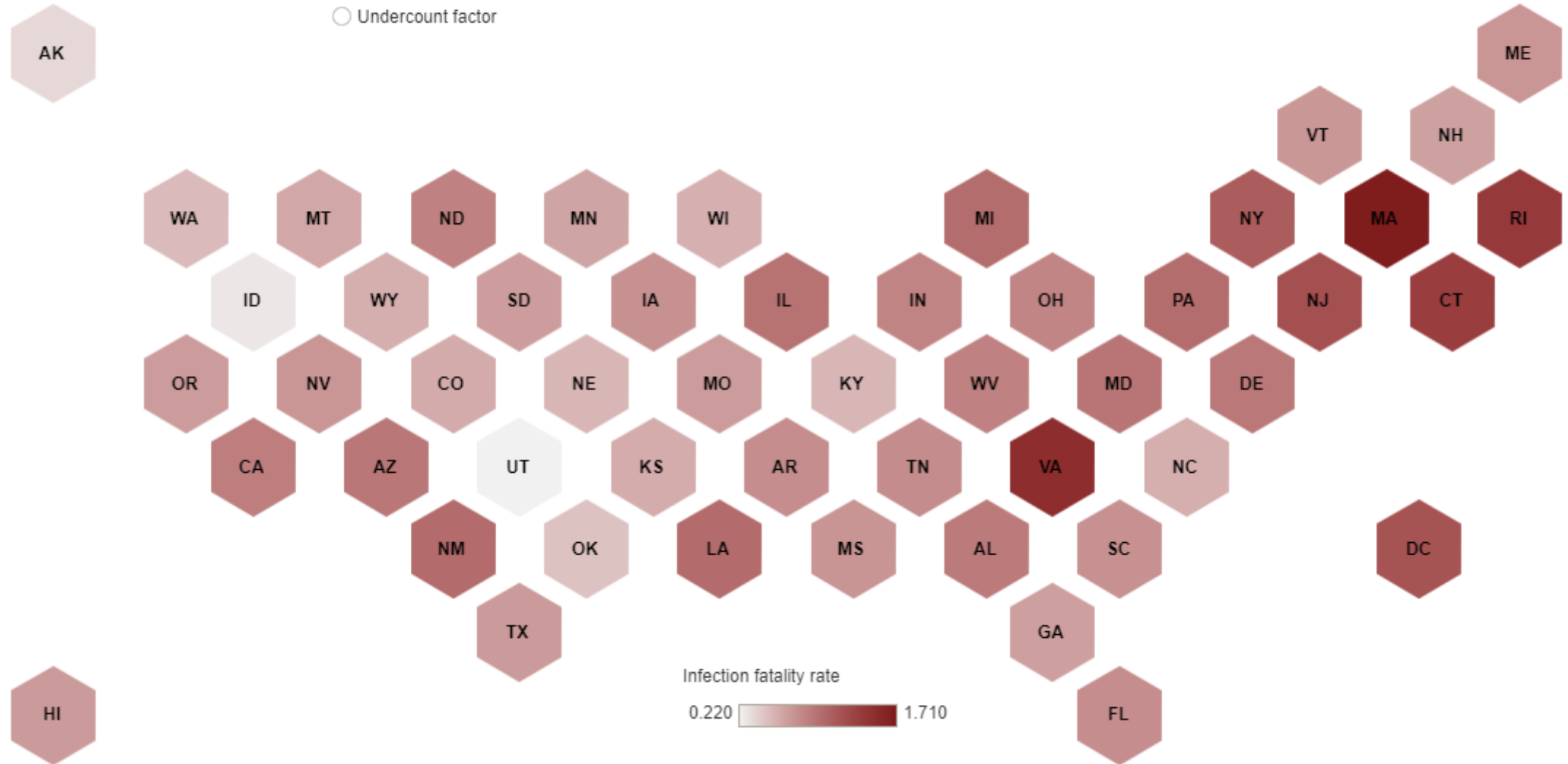
Select a measure to fill the map

- Infection fatality rate
- Cumulative incidence
- Undercount factor

IFR: Proportion of infected individuals who succumb to COVID-19

Cumulative incidence: proportion of the population who have been infected as of March 7, 2021

Undercount factor: Total number of infections divided by total number of reported cases as of March 7, 2021



Infection fatality rate

0.220  1.710



Group	DayinCycle_m a	Duration_mea n	Duration_med ian	Duration sem	Onset mean	Onset median	Onset sem
Rural limited light	0	487.6107	490.7143	6.216443	147.9393	144.3571	5.620017
Rural limited light	1	492.6321	494.8214	5.526152	143.1214	143.0357	5.911505
Rural limited light	2	491.9095	490.1071	5.98482	144.6369	145	5.881448
Rural limited light	3	493.2613	494.8571	5.425634	142.9619	145	6.363351
Rural limited light	4	482.4714	483.75	7.033718	147.6268	140	6.46298
Rural limited light	5	487.1536	489.4286	6.433719	143.3625	136.5357	6.413114
Rural limited light	6	497.1542	502.3929	6.438085	134.7726	128.4643	6.204632
Rural limited light	7	499.8911	507.7857	7.511736	130.8357	123.5357	6.52986
Rural limited light	8	498.2387	509.5714	8.441629	133.4726	125.25	6.40143
Rural limited light	9	496.1208	506.2857	9.415579	133.8524	124.8929	6.584896
Rural limited light	10	493.5583	496.5714	8.944772	136.6774	131.1071	5.688358
Rural limited light	11	502.7982	503.2143	9.895693	128.2911	131.25	6.388764
Rural limited light	12	501.7089	503.2143	8.70312	128.7625	129.4286	6.409602
Rural limited light	13	500.394	501.3929	8.280832	131.6881	132.1786	6.257504
Rural limited light	14	506.7	509.75	8.476082	128.8321	130.75	6.810787
Rural limited light	15	503.0917	498.3571	7.611194	128.856	134.6071	7.435988
Rural limited light	16	501.0339	501.875	7.848023	128.4714	138.3929	7.512363
Rural limited light	17	501.4268	503.8214	7.37299	123.625	130.2143	7.206018
Rural limited light	18	498.7732	492.5357	8.30663	122.7429	126.25	6.634013
Rural limited light	19	498.2018	488.6429	8.903228	120.7143	128.4286	5.961357
Rural limited light	20	497.1446	497.3393	7.369486	122.8	128.1786	6.405048
Rural limited light	21	489.7482	493.1429	6.90089	126.9536	128.1786	5.985884
Rural limited light	22	485.4179	489.1429	5.75989	134.2607	139.4643	5.484627
Rural limited light	23	486.8446	489.7857	5.110014	139.2214	142.1071	6.144732
Rural limited light	24	485.5446	485.8214	5.692828	145.2393	144.0714	5.395291
Rural limited light	25	486.4089	483.3214	5.508875	147.7964	148.4643	5.624027
Rural limited light	26	486.8482	489.1071	5.906097	150.4571	150.8929	5.192801
Rural limited light	27	490.3268	491.3929	6.801881	150.7929	153.4643	5.702707
Rural limited light	28	489.4911	486.0714	6.839911	153.5071	153.5714	5.665191
Rural limited light	29	489.1821	488.75	5.983159	150.1786	151.4286	6.110637
Rural no light	0	501.1149	510.0714	8.06324	132.4565	125.7143	8.917629
Rural no light	1	500.5932	507.9286	7.841553	131.5652	120.7143	8.992683
Rural no light	2	500.7795	504.6429	7.898514	127.7422	117.0714	8.754408
Rural no light	3	502.7516	504.2857	7.929216	129.3106	119.7143	8.083236
Rural no light	4	508.0373	514	7.317479	123.7143	115.5714	7.183407

# Lunar cycle and sleep

Radial cycle



Community type

Rural

## Research

New research shows that on nights before a full moon, people **sleep less** and **go to bed later** on average. The pattern's ubiquity, which was observed in urban and rural settings, may indicate that our natural circadian rhythms are somehow synchronized with the phases of the lunar cycle.

Hover over the sleep density circle (radial cycle) to see the data. The linear cycle charts provide a contextual pattern view starting at the new moon (day 15 of the lunar cycle).

Linear cycle

Sleep duration



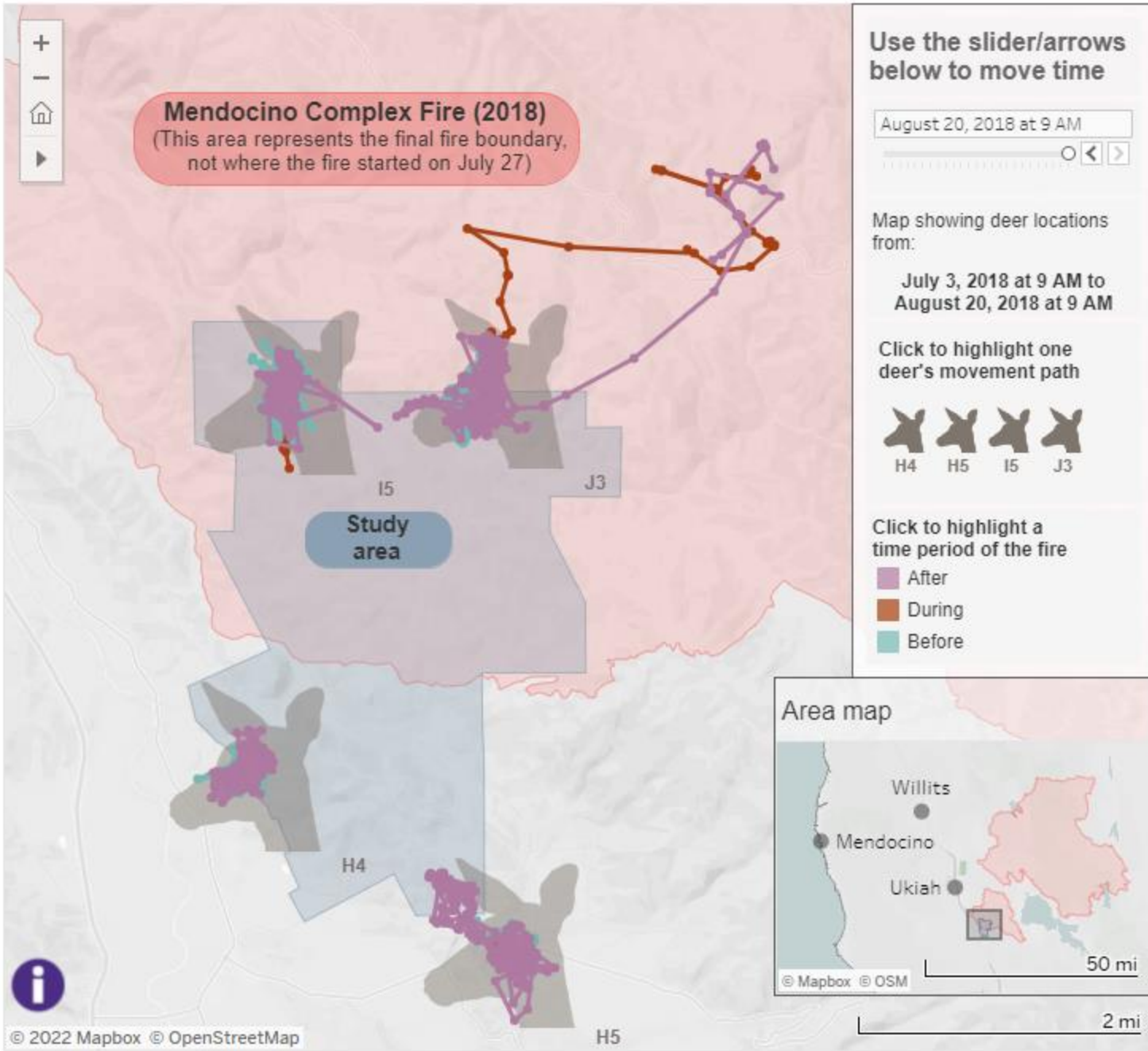
Sleep start



Full moon

AnimalID	Latitude...	Longitude...	Time	TimeStamp	Time Period
J3	39.0353	-123.069	7/4/2018		7/4/2018 23:00Pre
J3	39.03523	-123.069	7/4/2018		7/4/2018 22:00Pre
J3	39.03498	-123.069	7/4/2018		7/4/2018 21:00Pre
J3	39.03501	-123.07	7/4/2018		7/4/2018 20:00Pre
J3	39.0352	-123.07	7/4/2018		7/4/2018 19:00Pre
J3	39.03527	-123.069	7/4/2018		7/4/2018 18:00Pre
J3	39.03518	-123.069	7/4/2018		7/4/2018 17:00Pre
J3	39.03522	-123.069	7/4/2018		7/4/2018 16:00Pre
J3	39.03549	-123.069	7/4/2018		7/4/2018 15:00Pre
J3	39.0355	-123.069	7/4/2018		7/4/2018 14:00Pre
J3	39.03567	-123.069	7/4/2018		7/4/2018 13:00Pre
J3	39.03575	-123.068	7/4/2018		7/4/2018 12:00Pre
J3	39.03552	-123.069	7/4/2018		7/4/2018 11:00Pre
J3	39.03562	-123.069	7/4/2018		7/4/2018 10:00Pre
J3	39.03487	-123.07	7/4/2018		7/4/2018 9:00Pre
J3	39.03493	-123.07	7/4/2018		7/4/2018 8:00Pre
J3	39.0376	-123.066	7/5/2018		7/5/2018 23:00Pre
J3	39.03748	-123.066	7/5/2018		7/5/2018 22:00Pre
J3	39.03761	-123.066	7/5/2018		7/5/2018 21:00Pre
J3	39.0375	-123.066	7/5/2018		7/5/2018 20:00Pre
J3	39.03491	-123.065	7/5/2018		7/5/2018 19:00Pre
J3	39.03446	-123.066	7/5/2018		7/5/2018 18:00Pre
J3	39.03448	-123.066	7/5/2018		7/5/2018 17:00Pre
J3	39.03422	-123.066	7/5/2018		7/5/2018 16:00Pre
J3	39.03423	-123.066	7/5/2018		7/5/2018 15:00Pre
J3	39.0342	-123.066	7/5/2018		7/5/2018 14:00Pre
J3	39.03418	-123.065	7/5/2018		7/5/2018 13:00Pre
J3	39.03509	-123.065	7/5/2018		7/5/2018 12:00Pre
J3	39.03467	-123.066	7/5/2018		7/5/2018 11:00Pre
J3	39.03522	-123.069	7/5/2018		7/5/2018 10:00Pre
J3	39.03542	-123.069	7/5/2018		7/5/2018 9:00Pre
J3	39.03552	-123.069	7/5/2018		7/5/2018 8:00Pre
J3	39.03535	-123.068	7/5/2018		7/5/2018 7:00Pre
J3	39.03535	-123.068	7/5/2018		7/5/2018 6:00Pre
J3	39.0352	-123.068	7/5/2018		7/5/2018 5:00Pre
J3	39.03555	-123.069	7/5/2018		7/5/2018 4:00Pre
J3	39.03552	-123.069	7/5/2018		7/5/2018 3:00Pre
J3	39.03551	-123.069	7/5/2018		7/5/2018 2:00Pre
J3	39.03552	-123.068	7/5/2018		7/5/2018 1:00Pre
J3	39.03537	-123.069	7/5/2018		7/5/2018 0:01Pre
J3	39.03766	-123.065	7/6/2018		7/6/2018 23:00Pre
J3	39.03762	-123.066	7/6/2018		7/6/2018 22:00Pre
J3	39.03781	-123.066	7/6/2018		7/6/2018 21:00Pre
J3	39.03763	-123.066	7/6/2018		7/6/2018 20:00Pre
J3	39.03778	-123.066	7/6/2018		7/6/2018 19:00Pre

# Tracking deer before, during and after a wildfire



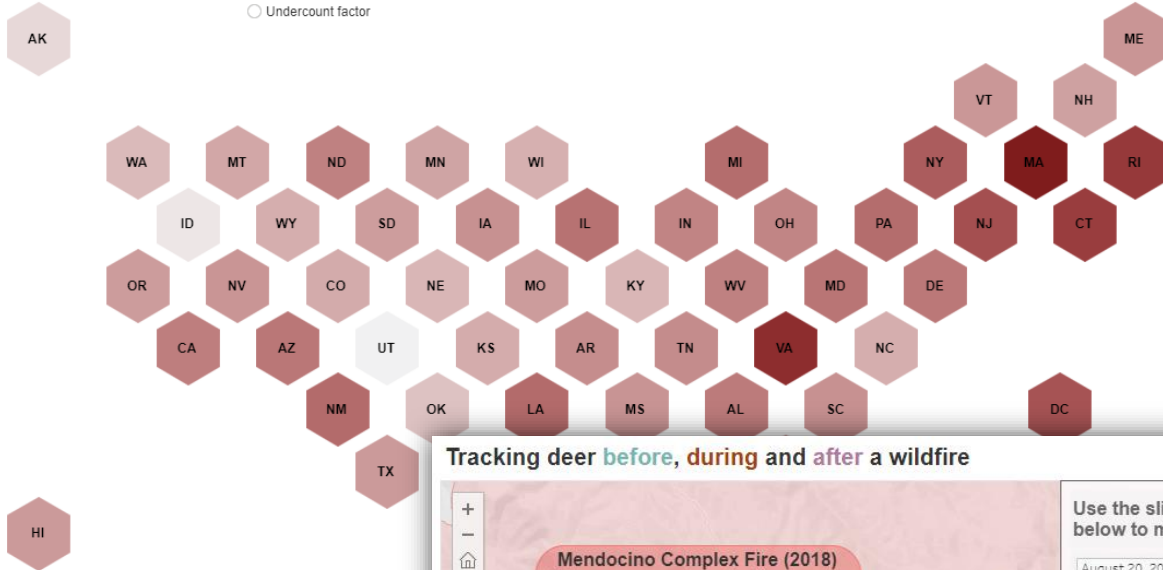
**ARE YOU SEEING A PATTERN?**

## Infection fatality rate

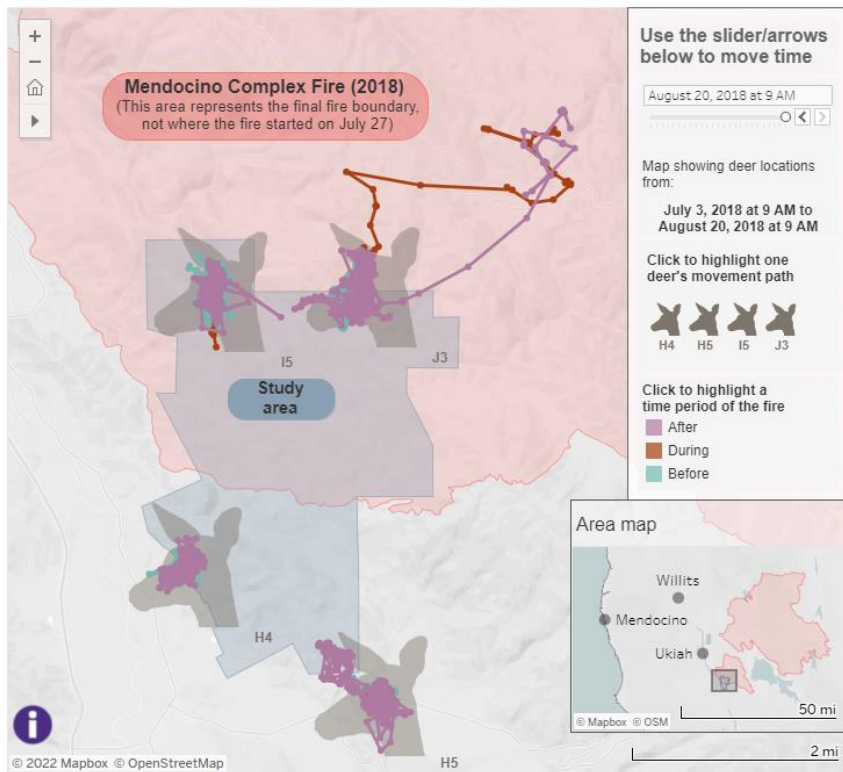
Select a measure to fill the map

- Infection fatality rate
- Cumulative incidence
- Undercount factor

IFR: Proportion of infected individuals who succumb to COVID-19  
Cumulative incidence: proportion of the population who have been infected as of March 7, 2021  
Undercount factor: Total number of infections divided by total number of reported cases as of March 7, 2021



## Tracking deer before, during and after a wildfire



## Lunar cycle and sleep

### Radial cycle

### Community type

Rural



### Research

New research shows that on nights before a full moon, people **sleep less** and **go to bed later** on average. The pattern's ubiquity, which was observed in urban and rural settings, may indicate that our natural circadian rhythms are somehow synchronized with the phases of the lunar cycle.

Hover over the sleep density circle (radial cycle) to see the data. The linear cycle charts provide a contextual pattern view starting at the new moon (day 15 of the lunar cycle).

### Linear cycle

### Sleep duration

### Sleep start

Full moon

# 5 'RULES' OF DATA VIZ DESIGN

1

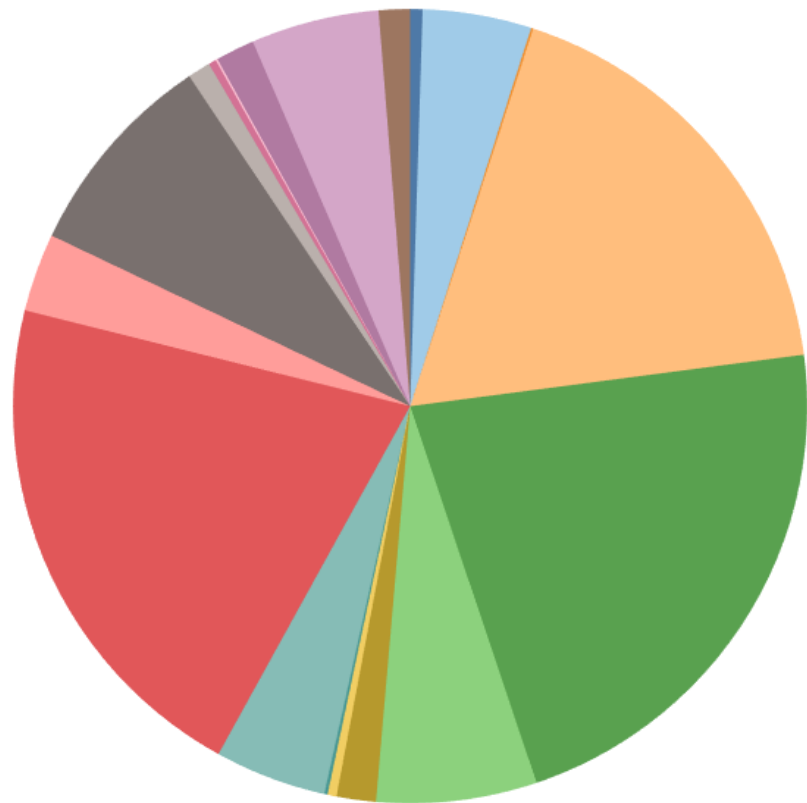
**ALWAYS THINK ABOUT WHAT  
YOUR AUDIENCE NEEDS TO LEARN  
BY VIEWING AND/OR INTERACTING  
WITH YOUR VIZ**

**BONUS: HOW CAN I MAKE IT EASY AND FAST FOR THEM TO DO SO?**

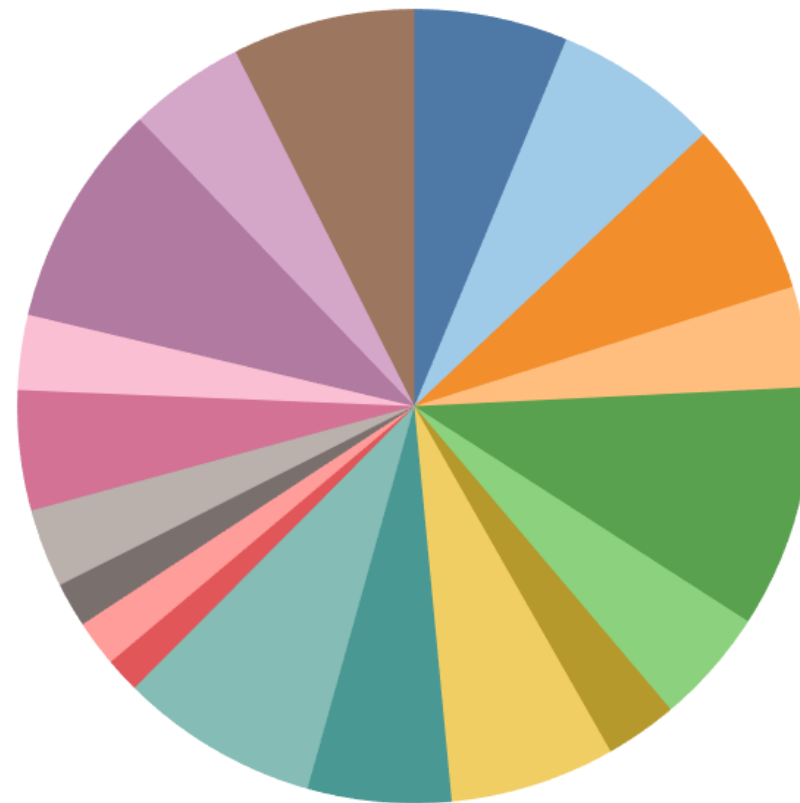


# Example: Chart type

Number of requests



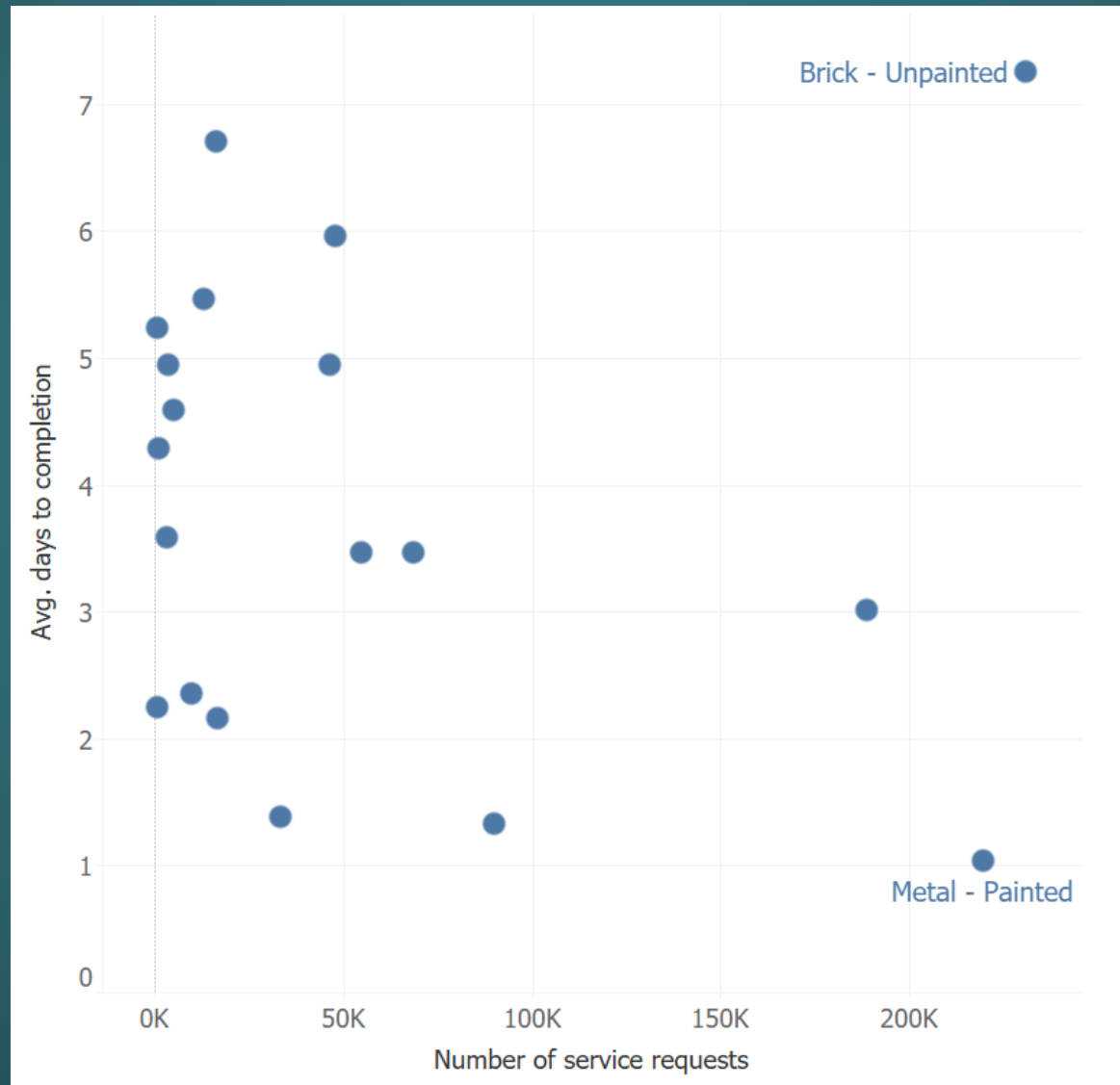
Avg. Time to completion



What Type of Surface is the Graffiti on?

- Null
- Aluminum Siding
- Asphalt
- Brick - Painted
- Brick - Unpainted
- Cement (Sidewalk, Alley, Wall, Curb)
- Glass
- Limestone
- Marble/Granite
- Metal
- Metal - Painted
- Metal - Unpainted
- Other / Unknown Surface
- Other/Unknown Surface
- Stucco
- Tree
- Vinyl Siding
- Wood - Painted
- Wood - Unpainted

# Example: Chart type



Most effective

Position on common scale

Length (1D size)

Tilt/angle

Area (2D size)

Depth (3D position)

Color luminance

Color saturation

Curvature

Volume (3D size)

Least effective

2

**START WITH A WIREFRAME**

3

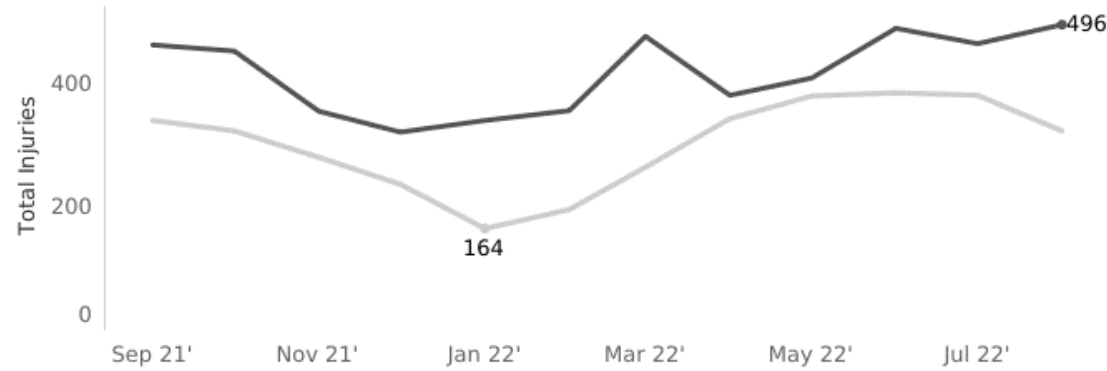
**‘GET IT RIGHT IN BLACK AND WHITE’**

# London Bus Safety | 2022

## Monthly Total Injuries

Use the slider to select the number of months to display and compare to the previous time period

Select Months  
12



## Total Injuries

# 137

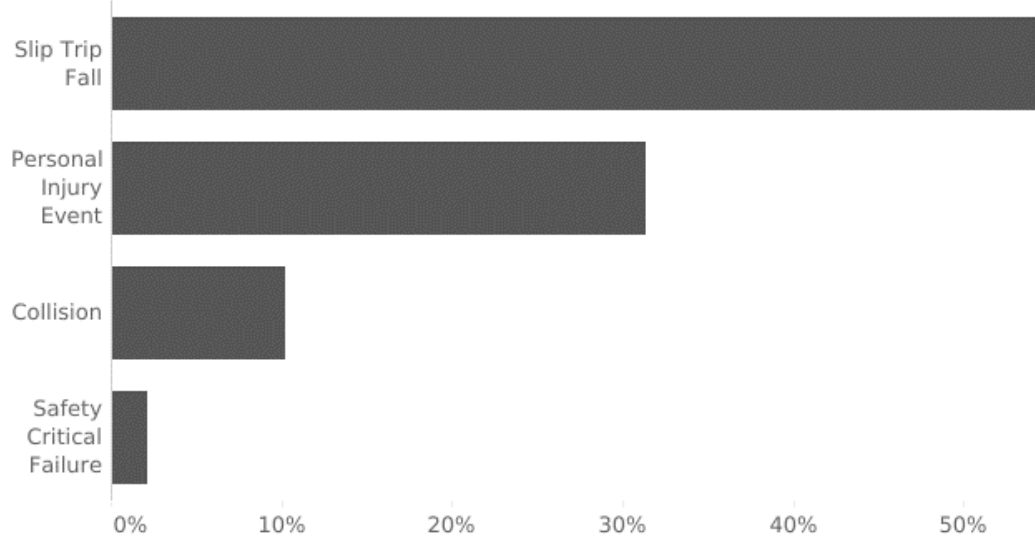
## Top boroughs

Use the slider to filter boroughs by total inju..  
33

Click on a borough to filter charts



## Injury Types



4

**ADD MORE WHITE SPACE**

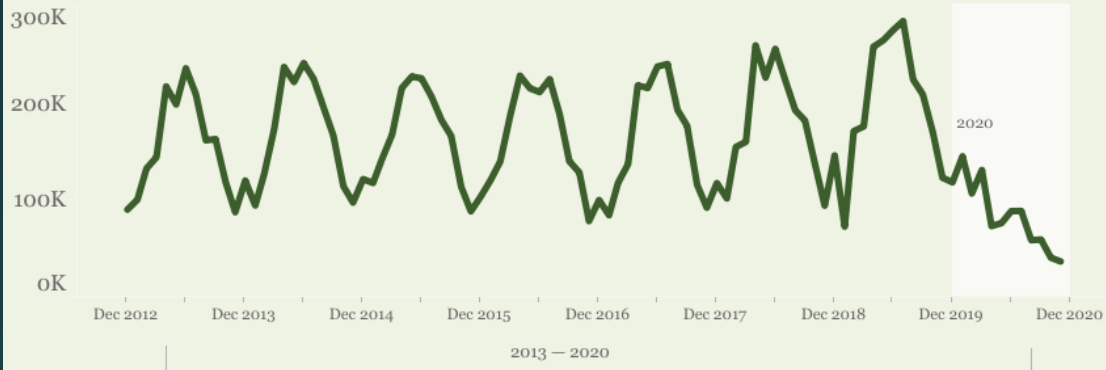
# FREMONT BRIDGE BICYCLE TRAFFIC

On a typical day in the spring months, more than **118 people on average** ride a bike across the Fremont Bridge **every hour**, with peak times at **8 a.m.** and **5 p.m.**



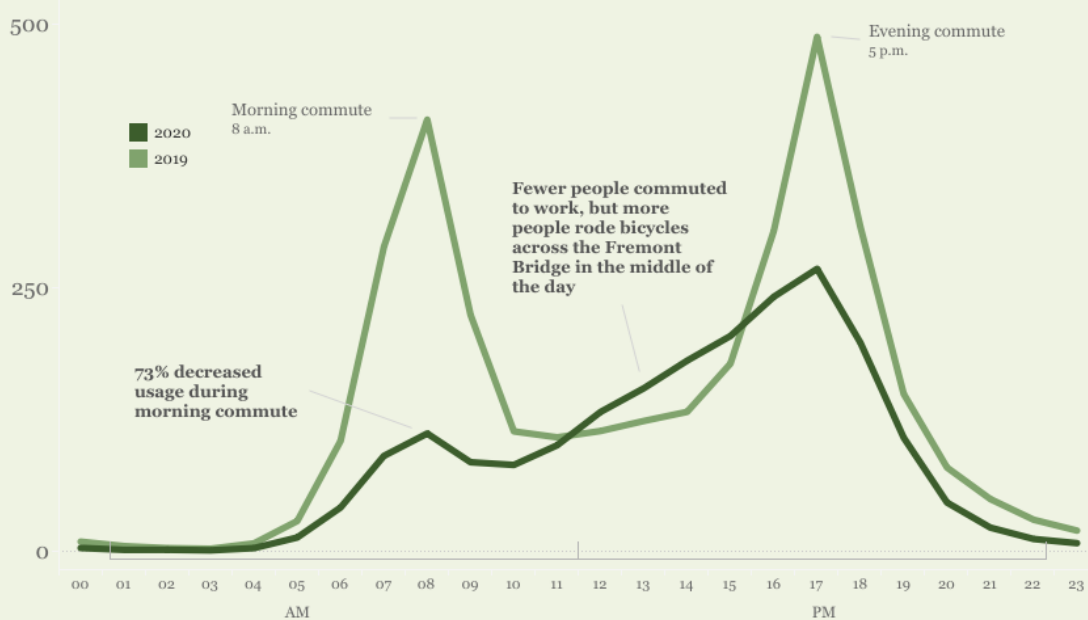
That changed in 2020.

Overall, the number of bikes riding across the Fremont Bridge decreased by **57%** from 2019 to 2020.



The overall usage of the bridge by bicyclists may have gone down but the people that did use it broke a 7-year commuter pattern for the **spring months**.

Lines shows hourly average for March, April and May combined.



Data source: <https://data.seattle.gov/Transportation/Fremont-Bridge-Bicycle-Counter/65db-xm6k>

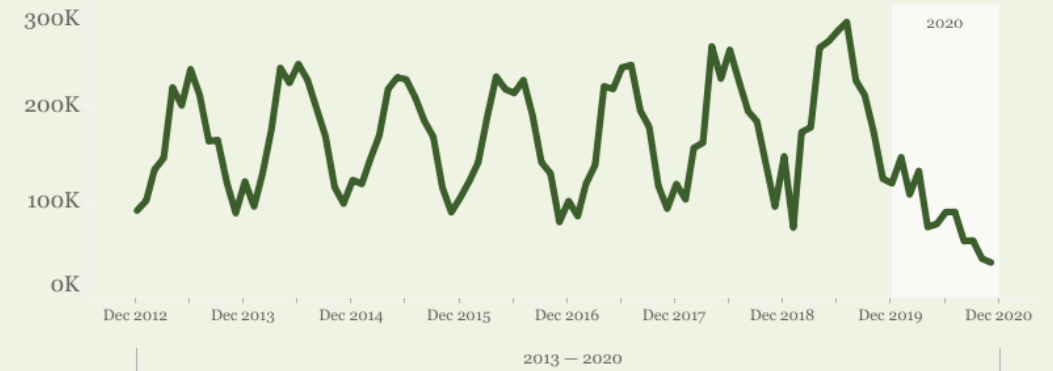
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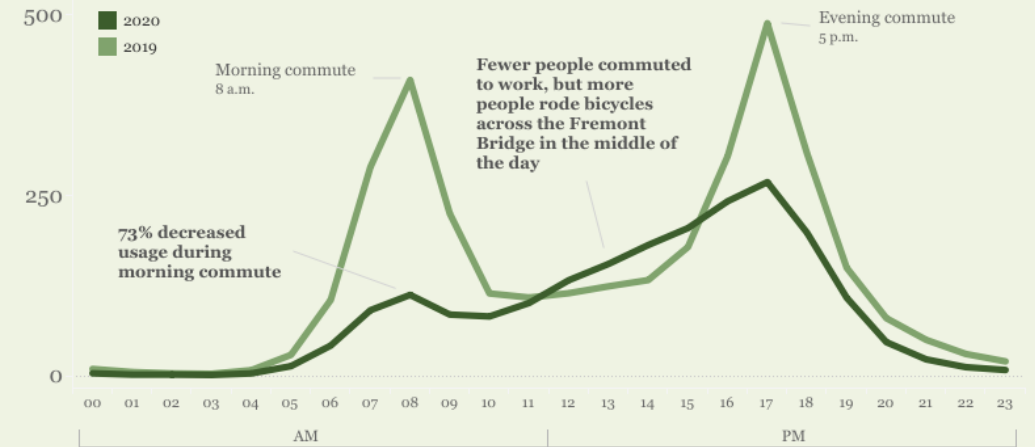
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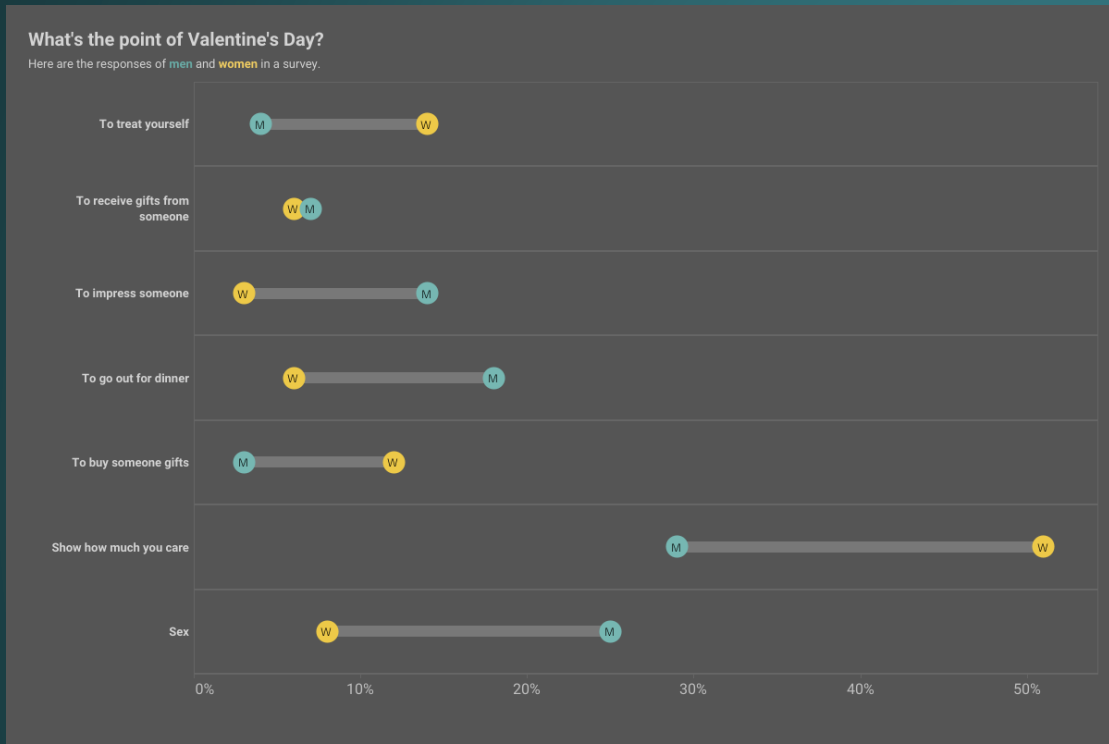


5

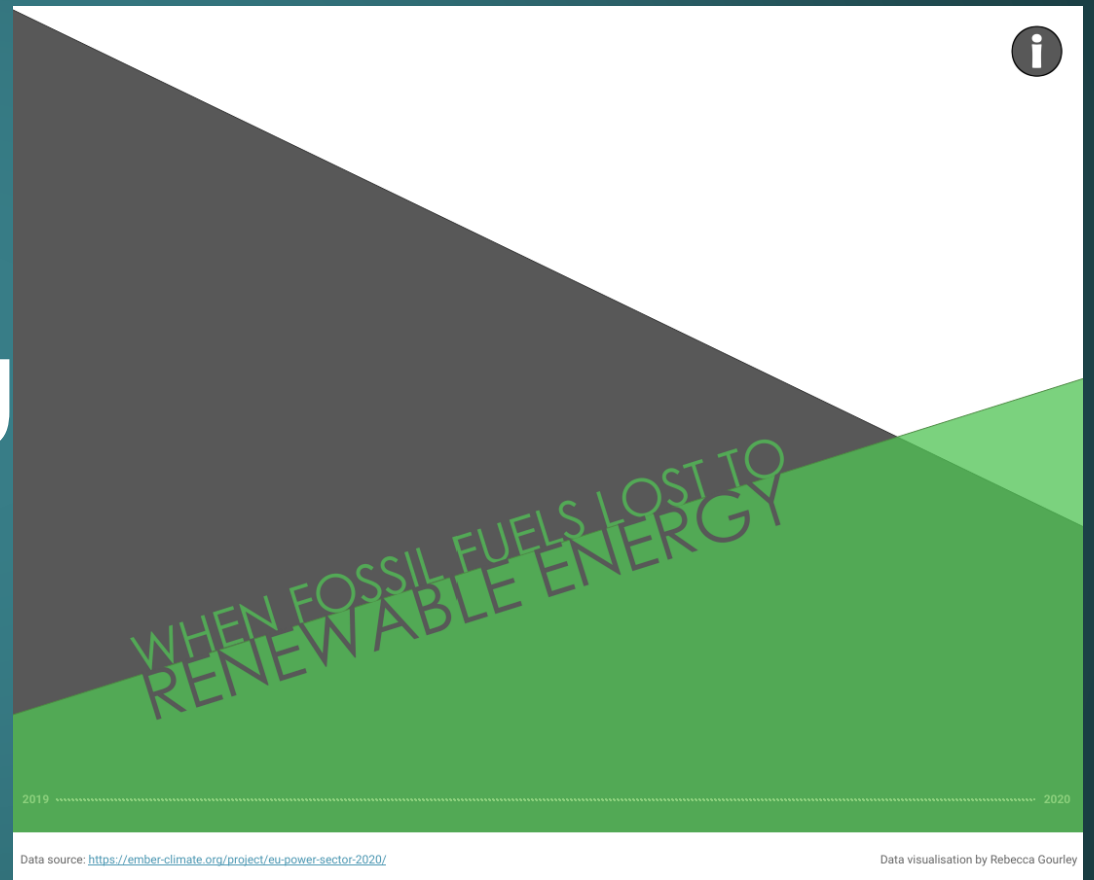
**INSTEAD OF ASKING: 'WHAT SHOULD I **ADD**?'**

**TRY: 'WHAT CAN I **TAKE AWAY**?'**

**BONUS: ASK FOR FEEDBACK **AND** ITERATE**



EU

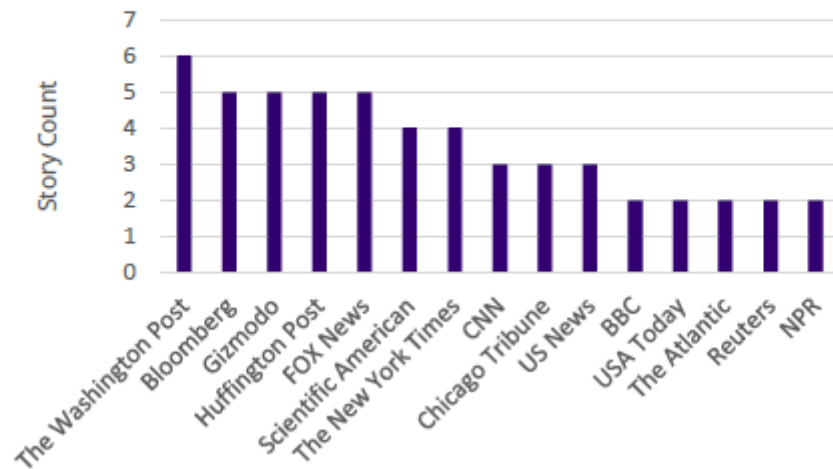


# MY FIRST VISUALIZATION

# MY FIRST VISUALIZATION

- > Year: 2015
- > Time spent: 1.5 hours (at least!)
- > Result:

TOP NATIONAL AND INTERNATIONAL OUTLETS

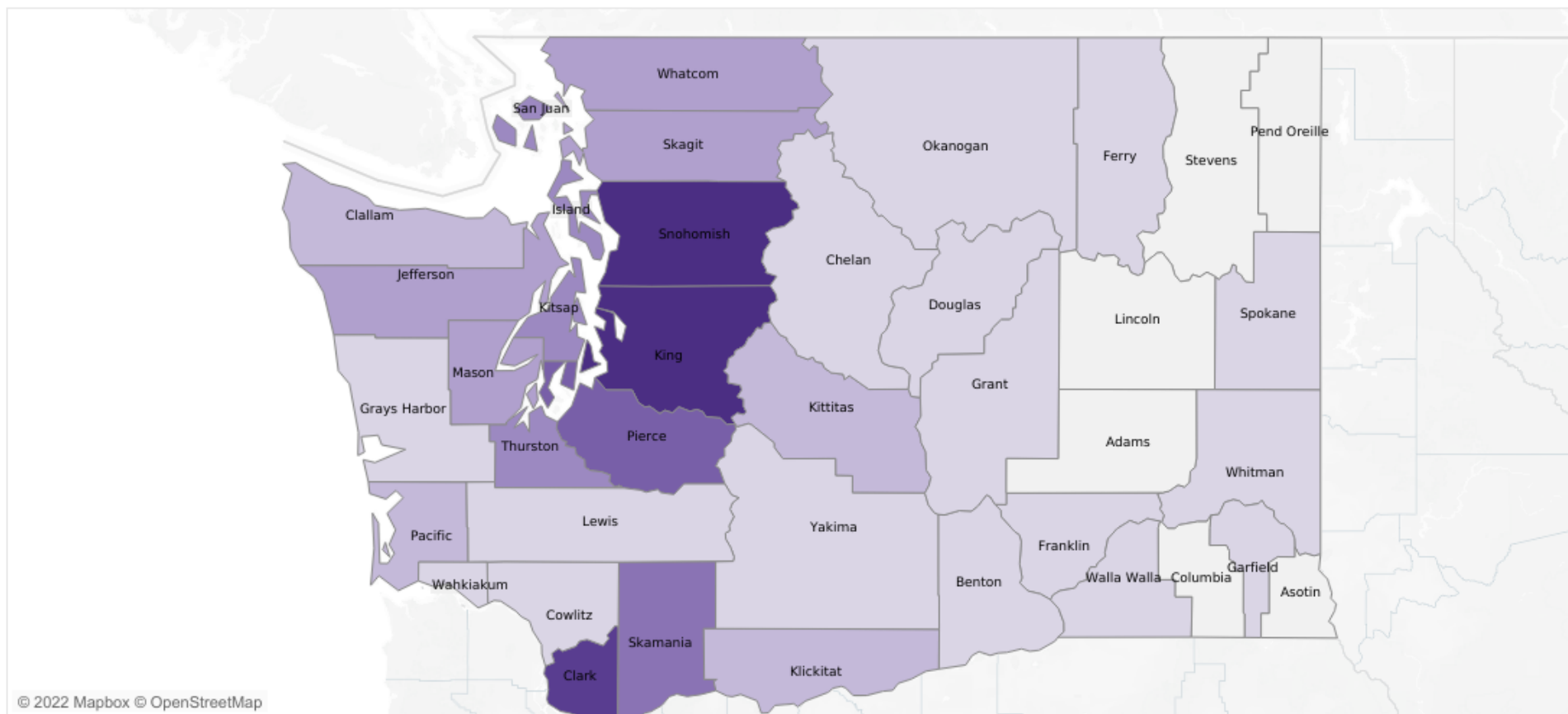


# HOW I GOT HOOKED

# HOW I GOT HOOKED

- > Year: 2017
- > Story: Self-Sufficiency Standard
- > Problem: MASSIVE dataset
  - 24 columns and 33,000+ rows
- > “I feel like this could be a map...”

## Washington Self-Sufficiency Standard by County



### Family of 1 adult: Self-sufficiency wage



The 2017 Self-Sufficiency Standard for the state of Washington identifies the amount of income needed to support families of various sizes without additional help from the government, community or other personal resources.

*\*Note: Data for King, Snohomish, Kitsap, Pierce and Benton counties are an average of multiple sections of those counties.*



# HOW TO GET STARTED

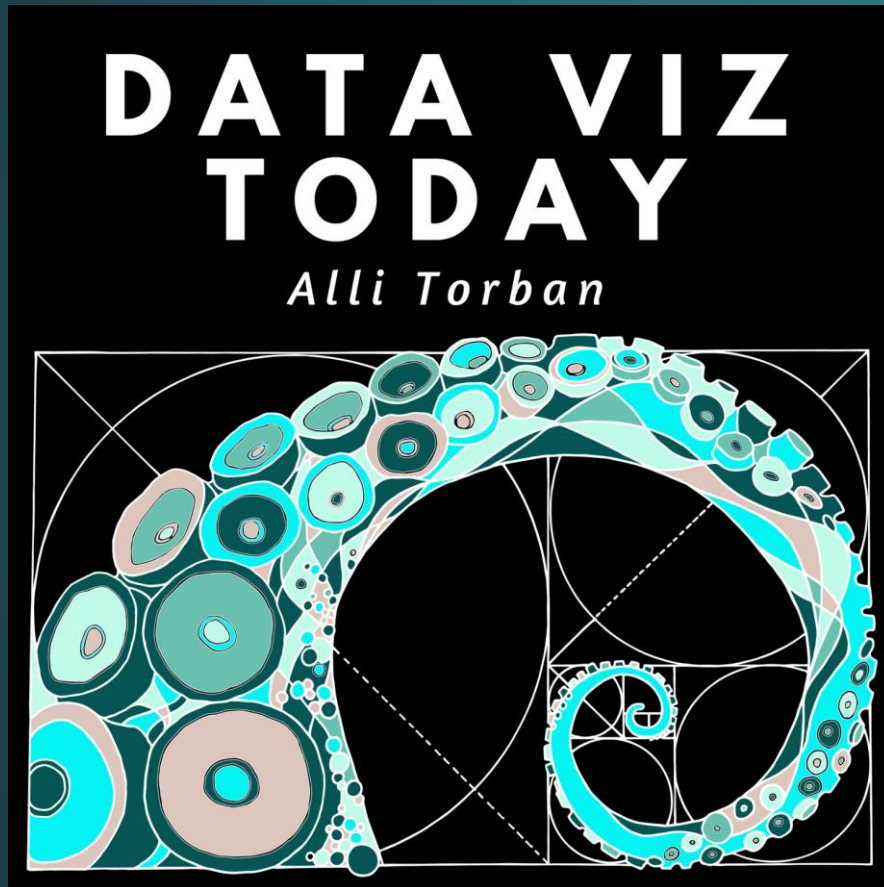
# #DataFam COMMUNITY

## Challenges:

- > Makeover Monday
- > Diversity in Data
- > Workout Wednesday

And so many more!

# Data Viz Today podcast



Alli Torban, host and data viz designer

Since 2018

She asks every guest “What’s your advice to data viz designers just starting out?”

# #DataFam COMMUNITY

## Advice:

*Be observant on your commutes via train and roads. Flip through magazines, look at colors, pattern styles in shopping malls and on the internet. Inspiration is everywhere. So, seek inspiration. Create and share.*

—Pooja Gandhi

# #DataFam COMMUNITY

## Advice:

*Find a challenge to tackle. Figure out tools on the fly as you need them.*

—Lisa Charlotte Rost

# #DataFam COMMUNITY

## Advice:

*Practice, practice, practice and then practice some more. It takes a while to build up muscle memory needed to know what chart types to use and what types of analysis makes the most sense for the data and the audience. If you are relentless in practicing, your work will show the results. And while practicing, accepting feedback is of the utmost importance, you cannot improve your skills in a bubble. So, seek out feedback and accept it.*

**—Adam Crahen**

# #DataFam COMMUNITY

## Advice:

*Always remember the audience that you're designing for and what you want to achieve with your data visualization. Experiment and iterate and judge your designs based on the goals you want to achieve.*

—Jane Pong

# #DataFam COMMUNITY

## Advice:

*First learn to sketch. Second, consult with your audience. That has to be what separates excellent and powerful data visualization from data viz that flops. How do you even know that your visualizations are effective if you don't know how they are perceived? The best measure of effectiveness is how well your audience actually understands the message.*

**—Frank Elavsky**



# FREE TOOLS

## **(A FEW) FREE TOOLS**

- > Tableau Public**
- > Datawrapper**
- > Flourish.studio**
- > ArcGIS storymaps\***
- > Looker (formerly Google Data Studio)**

# ACCESSIBILITY

# THINGS TO KEEP IN MIND FOR ACCESSIBILITY

- > Screenreader access
- > Colorblind-friendly palettes
- > Alt text on images
- > High contrast shading
- > No tiny fonts

# MORE EXAMPLES

- > Simple datawrapper chart
- > Map that gives sense of proximity
- > More complex maps and charts
- > Circular chart to show cyclical data
- > Interactive 'Anatomy of a cherry tree'

Even more examples: [bit.ly/Uwinteractives](https://bit.ly/Uwinteractives)

My Tableau Public profile:

<https://public.tableau.com/app/profile/rebecca.gourley6411/>

Other people to follow on Twitter

**QUESTIONS?**