

# Time

## Session 11

PMAP 8921: Data Visualization with R  
Andrew Young School of Policy Studies  
Summer 2023

# Plan for today

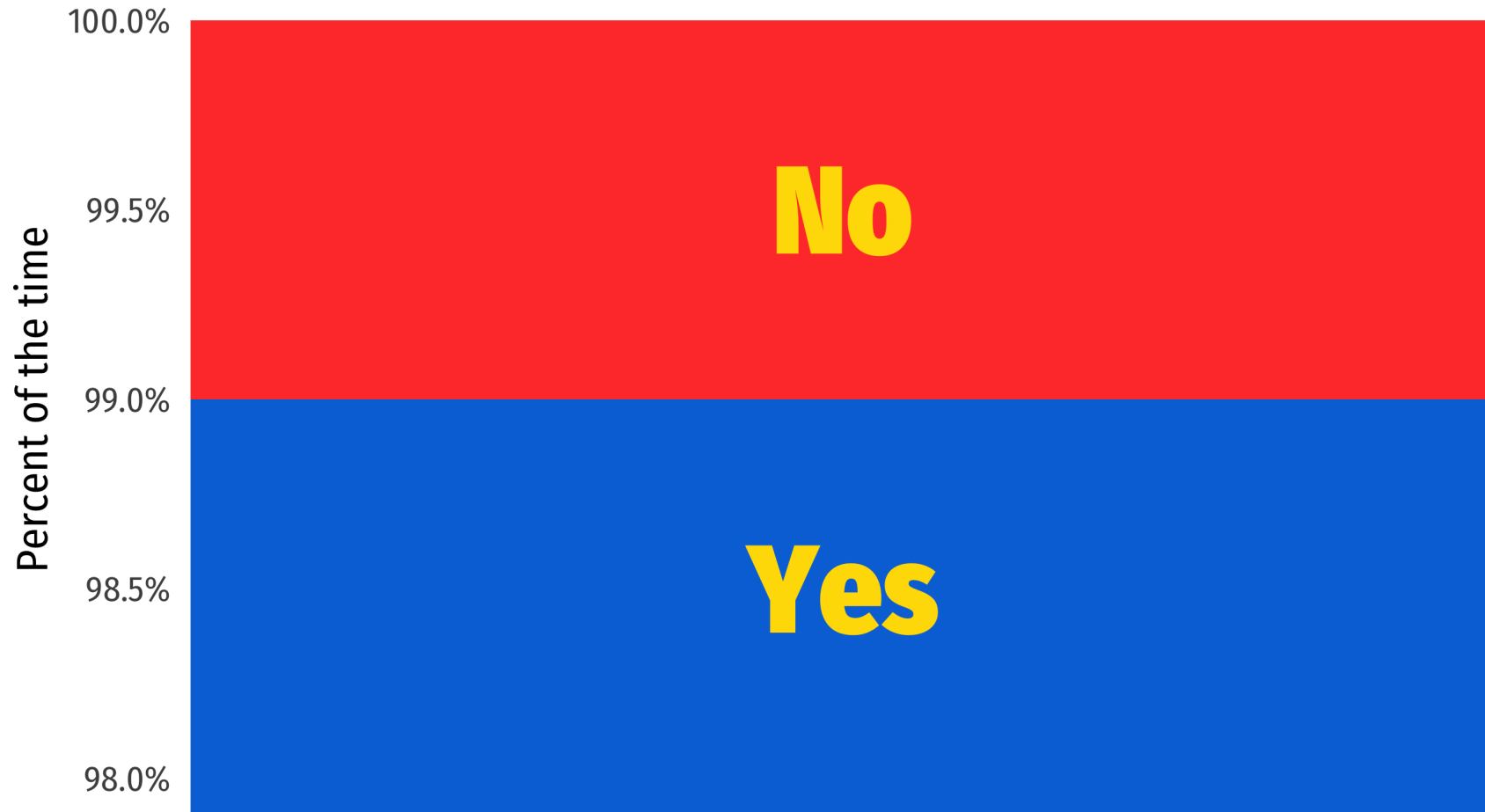
Axis issues

Visualizing time

Starting, ending,  
and decomposing time

# Axis issues

# Is truncating the y-axis misleading?



# Don't be too extreme!

**It is actually more legal to truncate the y-axis than you might think!**

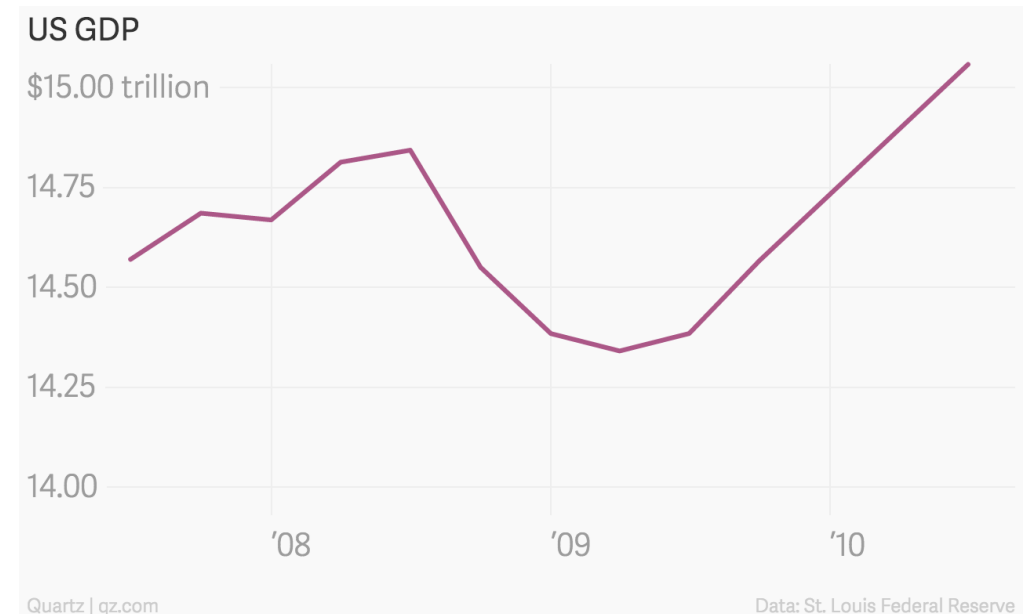
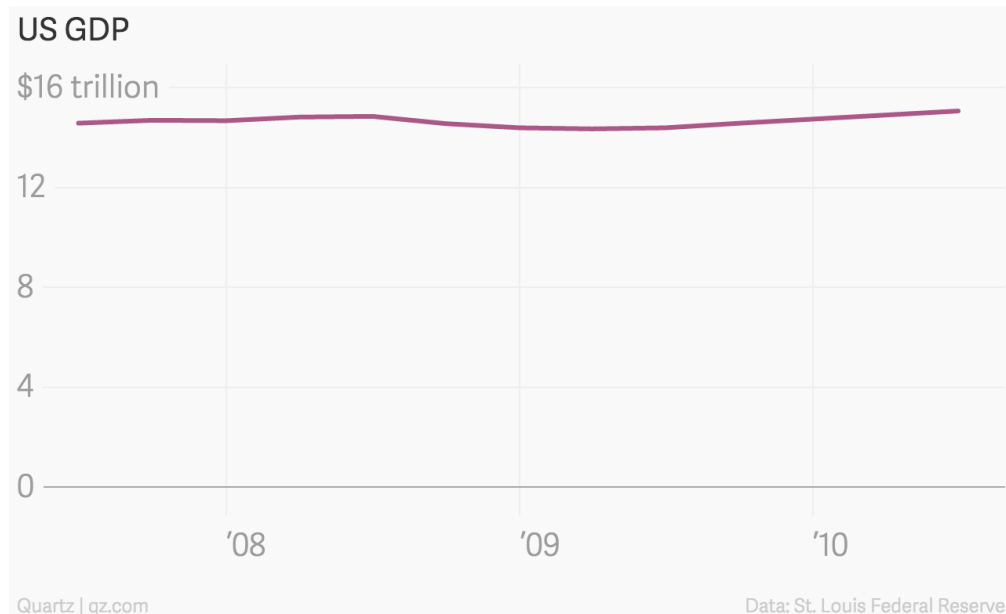
**When small movements matter**

**When the scale itself is distorted**

**When zero values are impossible**

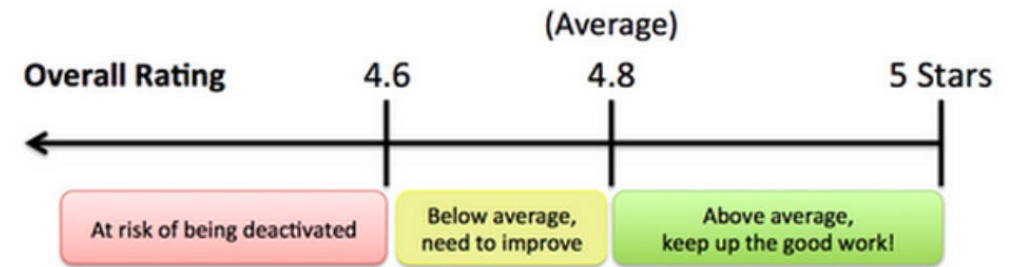
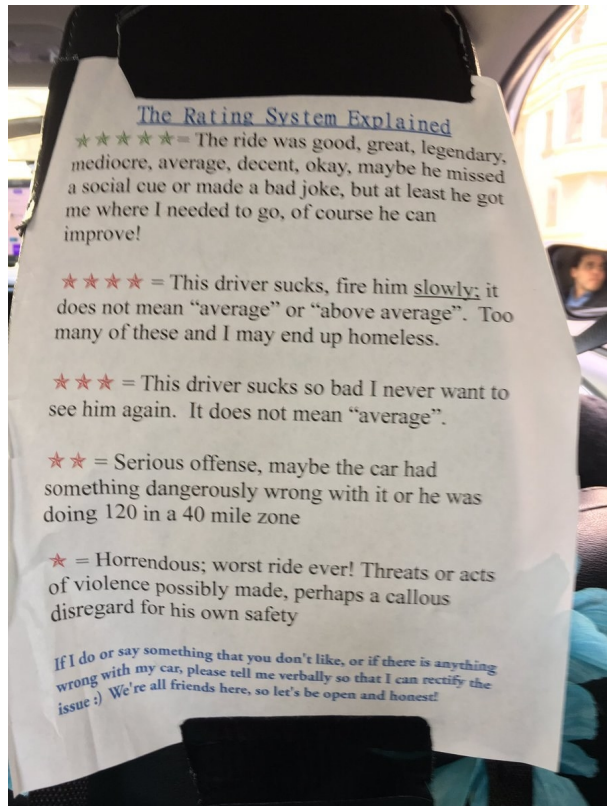
# When is it okay to truncate?

## When small movements matter



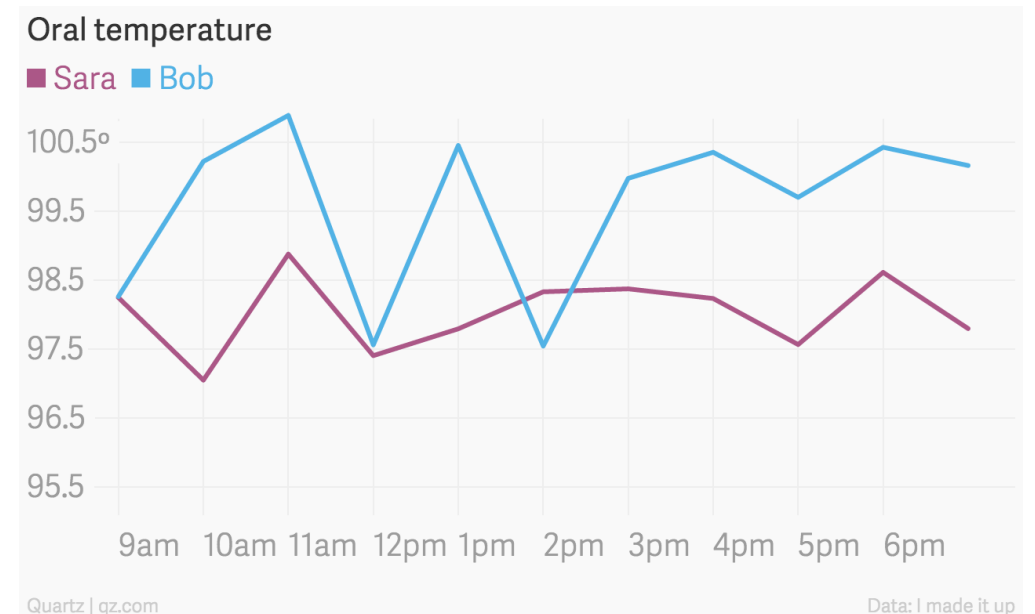
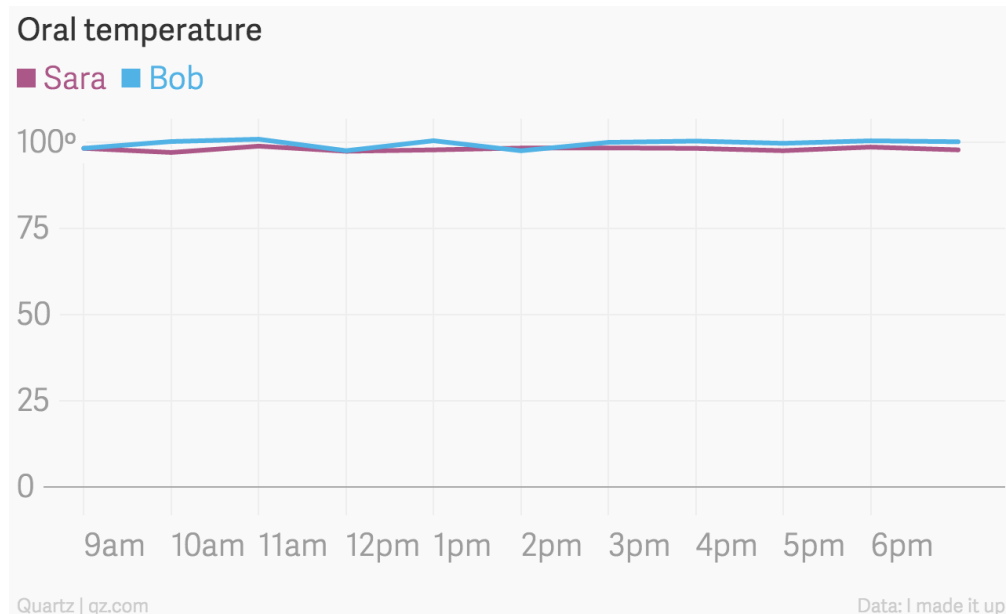
# When is it okay to truncate?

When the scale itself is distorted



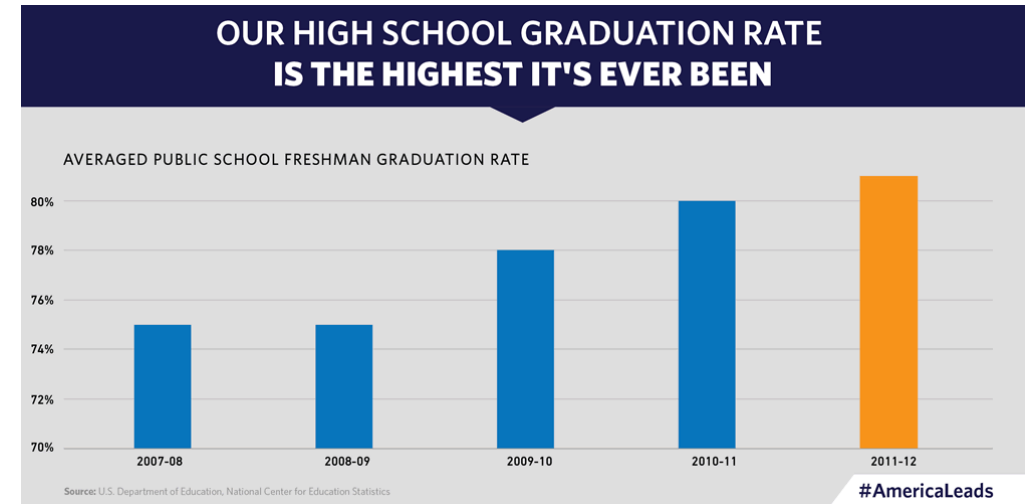
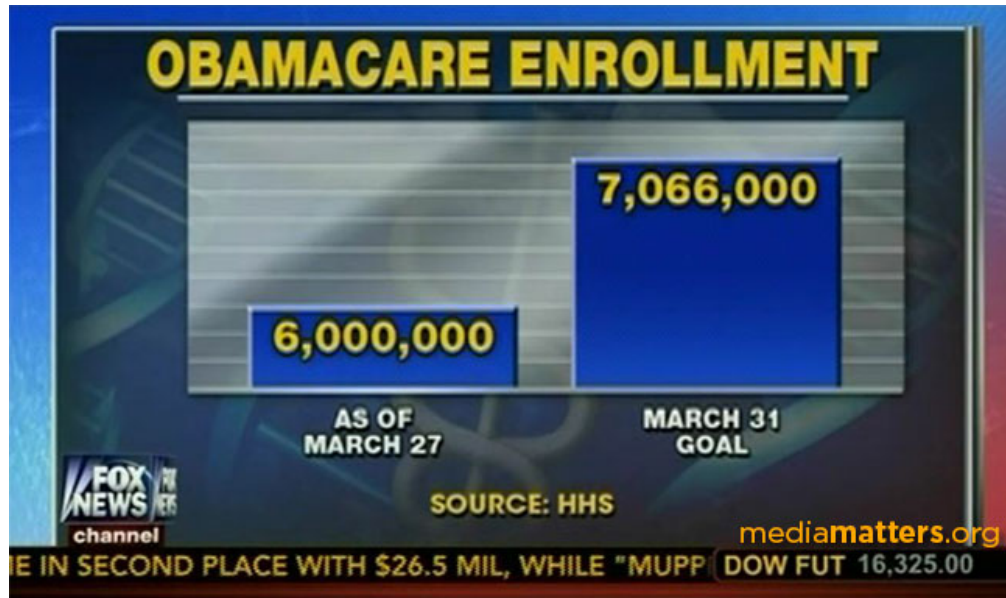
# When is it okay to truncate?

## When zero values are impossible





# Never on bar charts

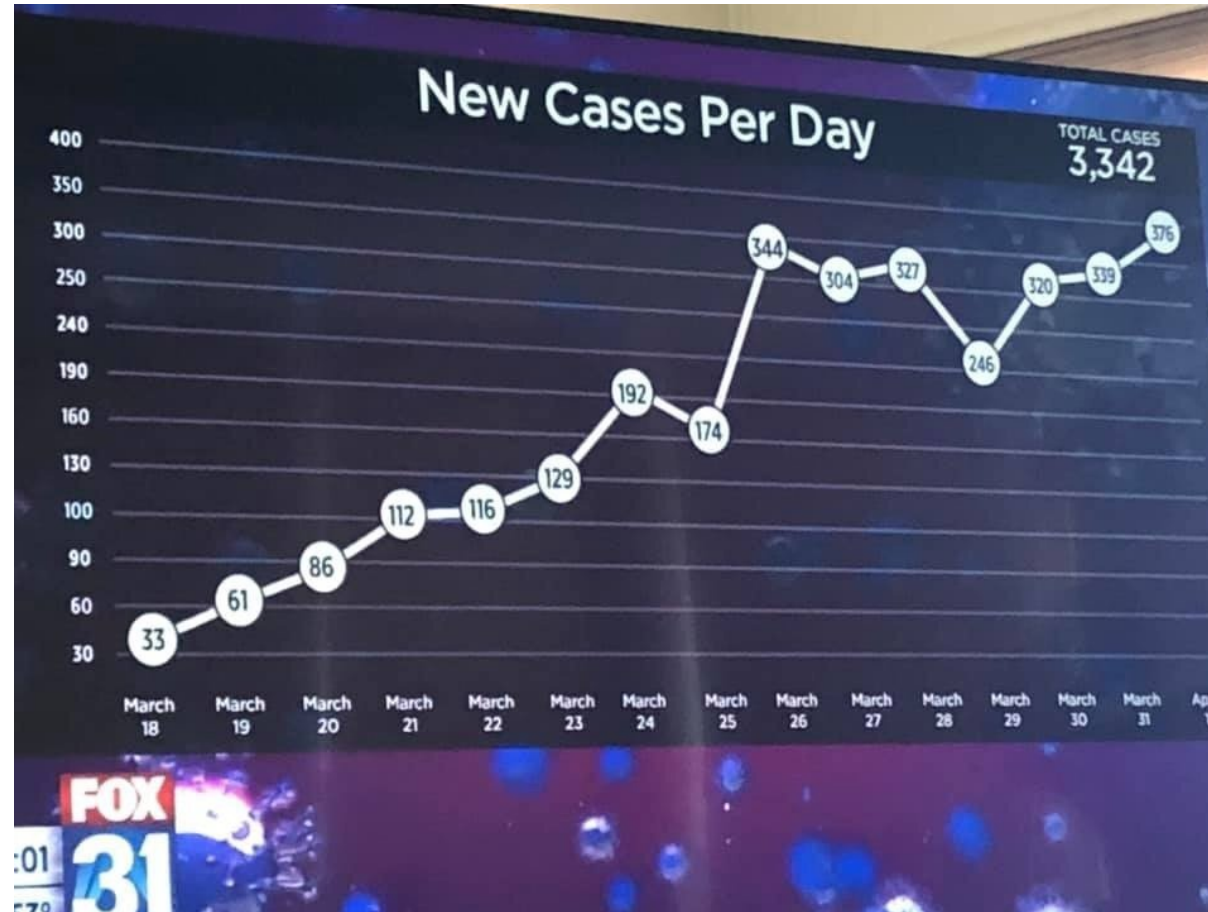


# Zero is okay too!

Just because you don't *have to* start at 0 doesn't mean you should *never* start at 0

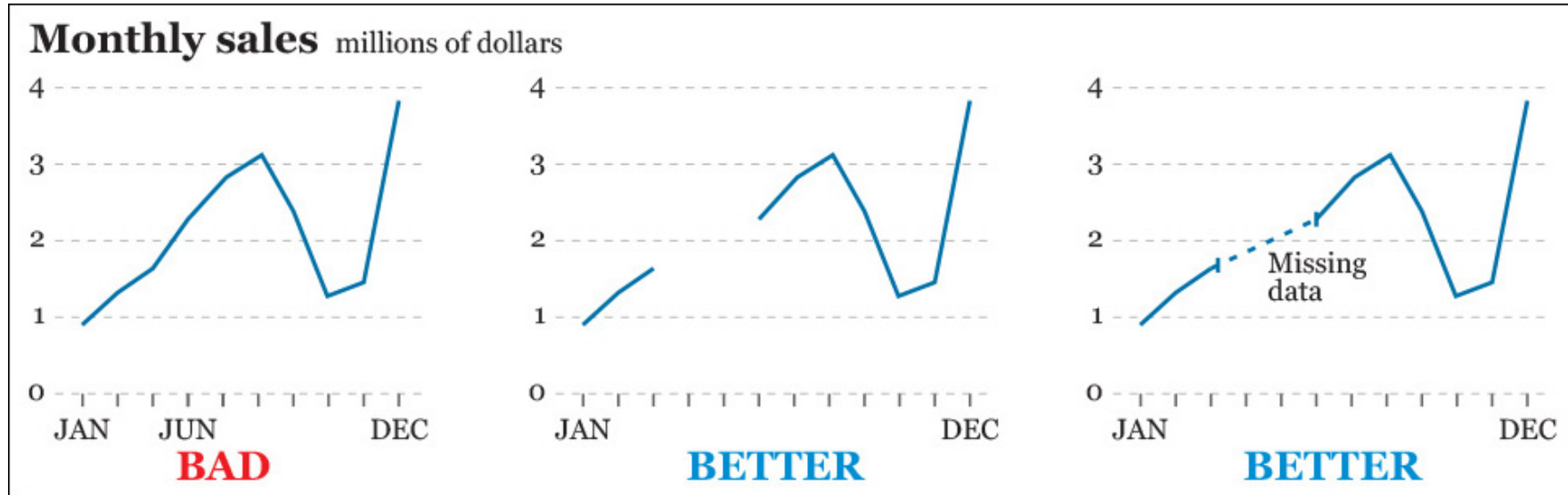
It's often a good idea!

# Keep axis scales consistent

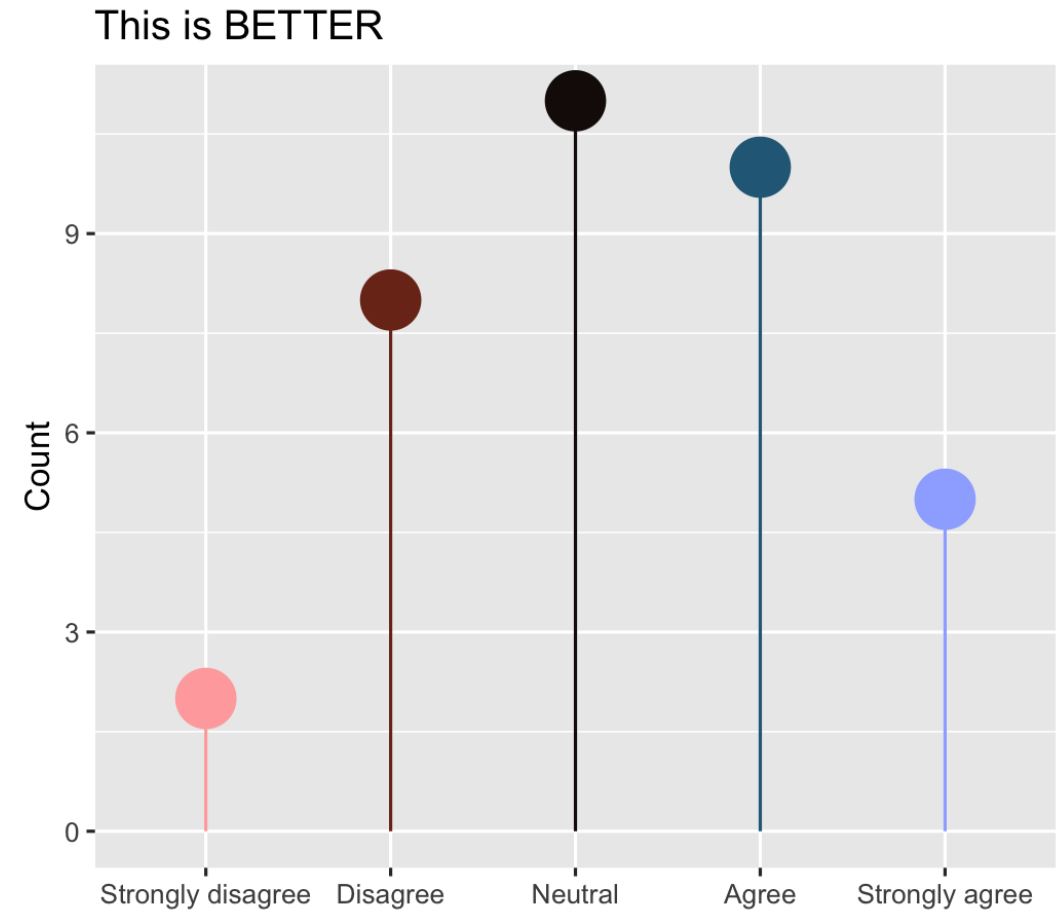
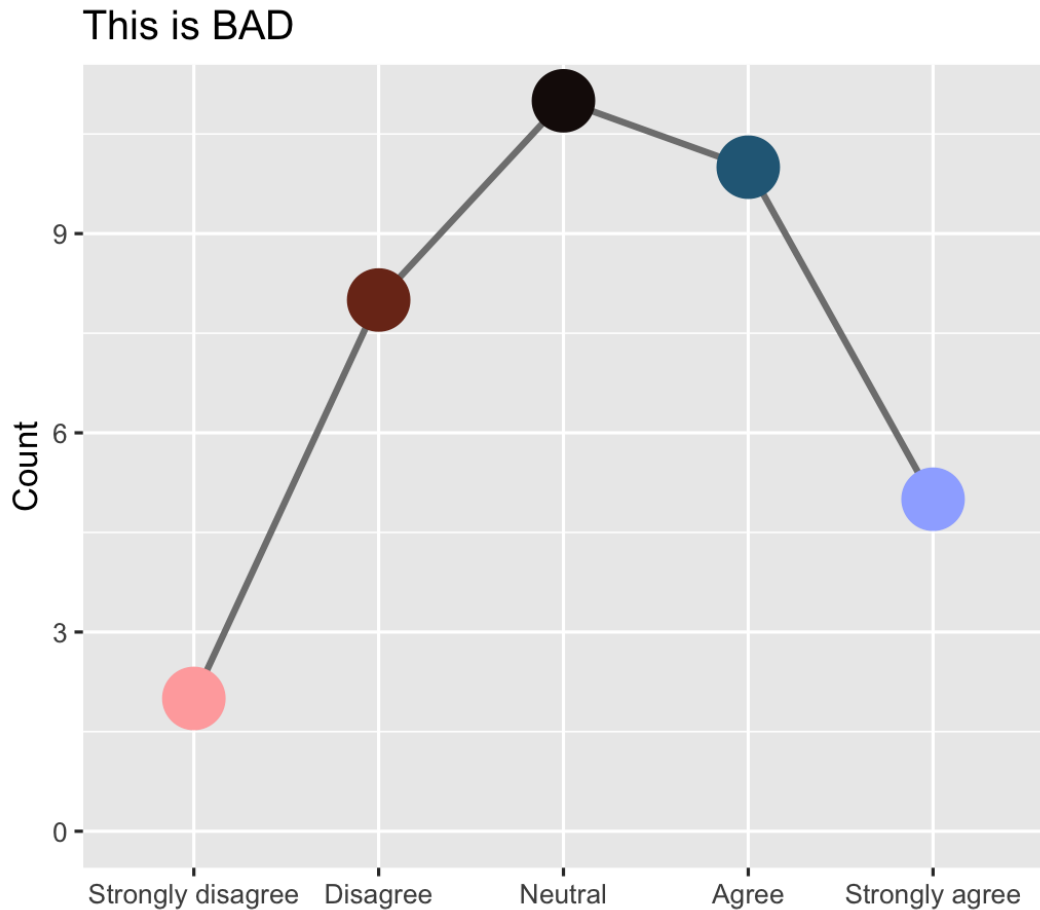


FOX affiliate in Colorado reporting on COVID-19 cases

# Keep axis scales consistent



# Don't impute across categories



# Visualizing time

# Showing changes over time

Time is just a variable that can be mapped to an aesthetic

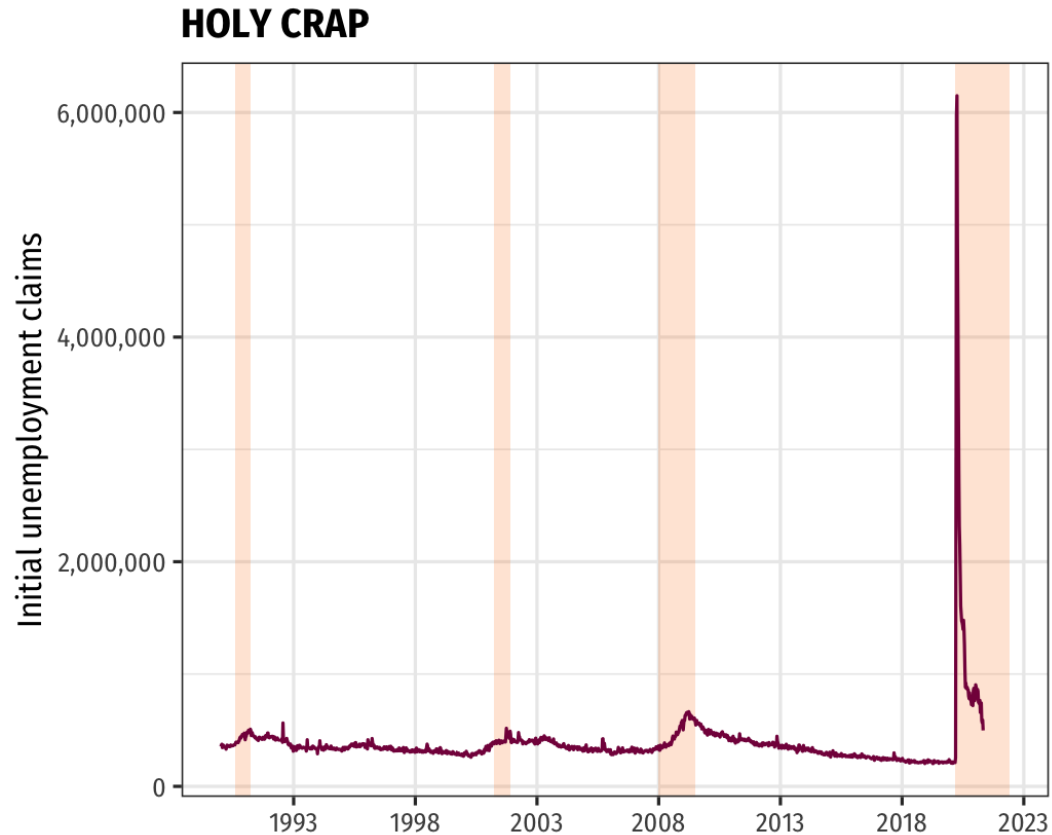
Can be used as `x`, `y`, `color`, `fill`, `facet`, and even animation

Can use all sorts of `geom` S:  
lines, columns, points, heatmaps, densities, maps, etc.

In general, follow reading conventions to show time progression:



# Time on x-axis + geom\_line/col()



Source: Initial weekly unemployment claims (ICSA); FRED  
Recessions highlighted in orange

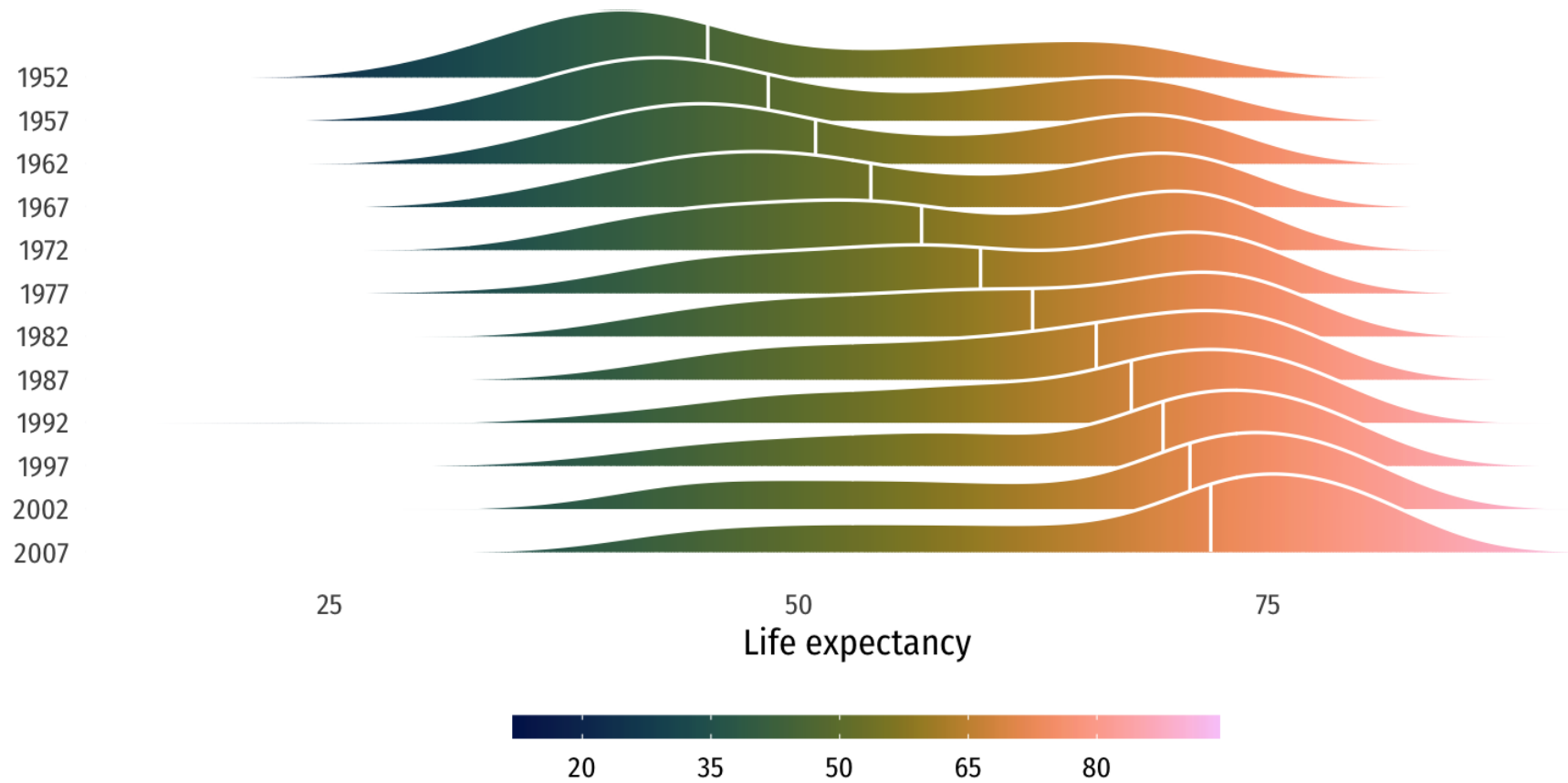


Front page of the New York Times, May 9, 2020





# Time on y-axis + geom\_density()



# Time in animation + geom\_point()



# Time in maps

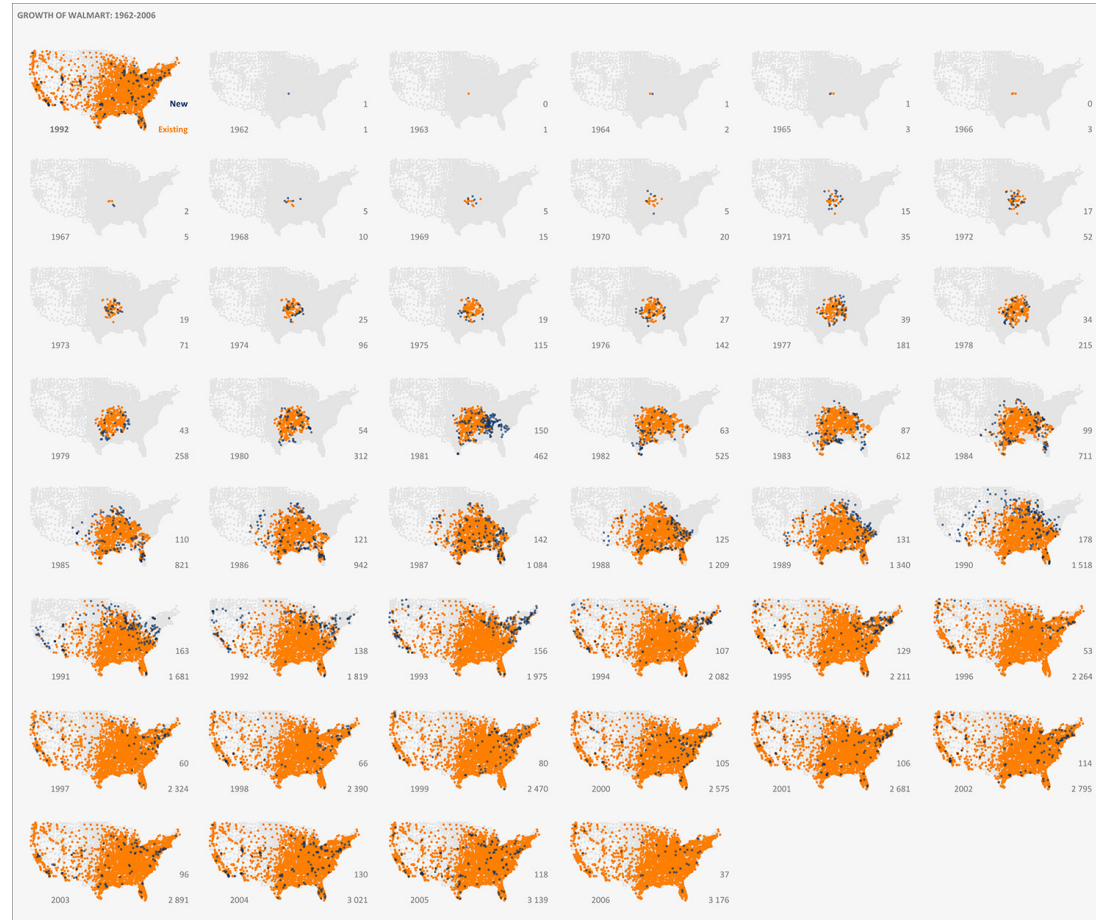
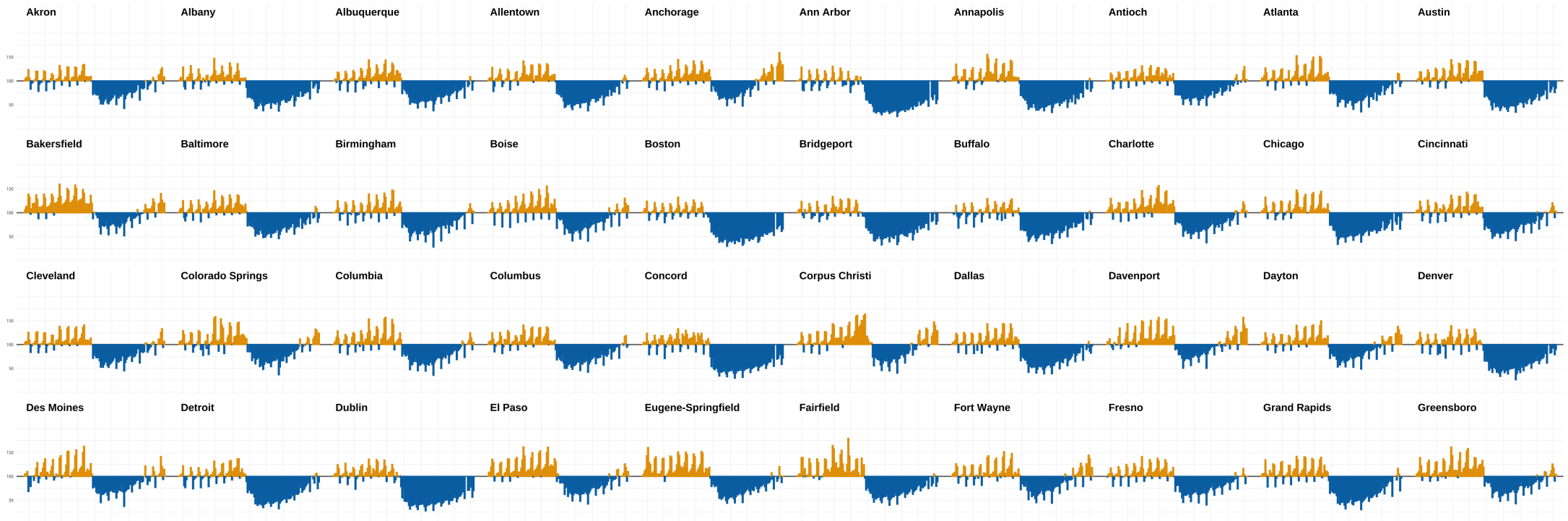


Figure 8.30 in Alberto Cairo's *The Truthful Art: Map of the spread of Walmart* by Jorge Camões

# Time in geom\_col() + small multiples

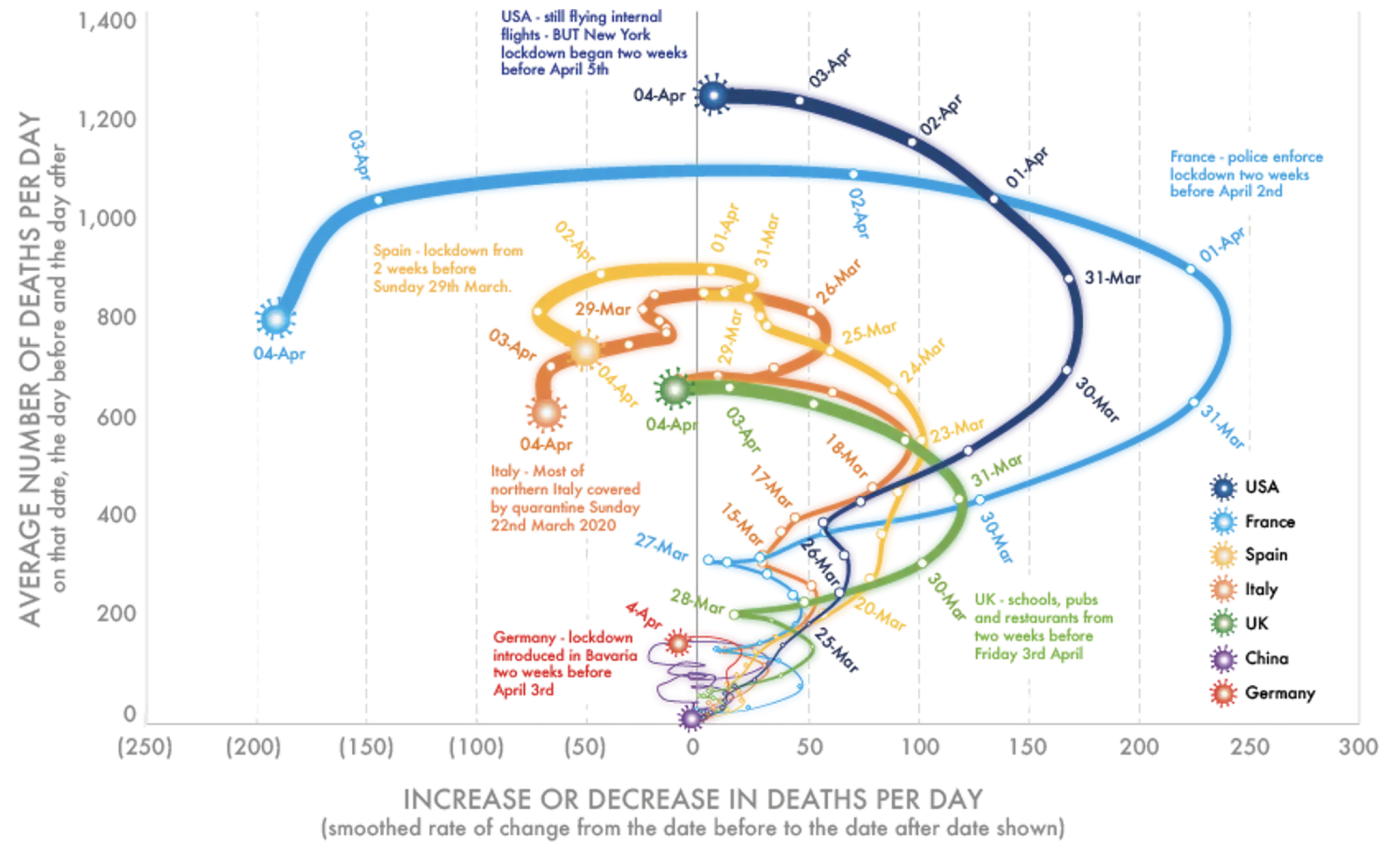
## Driving Trends in One Hundred American Cities, January 13th - May 18th, 2020

Data are indexed to 100 for each city's usage on January 13th.



Kieran Healy, "The Kitchen Counter Observatory"

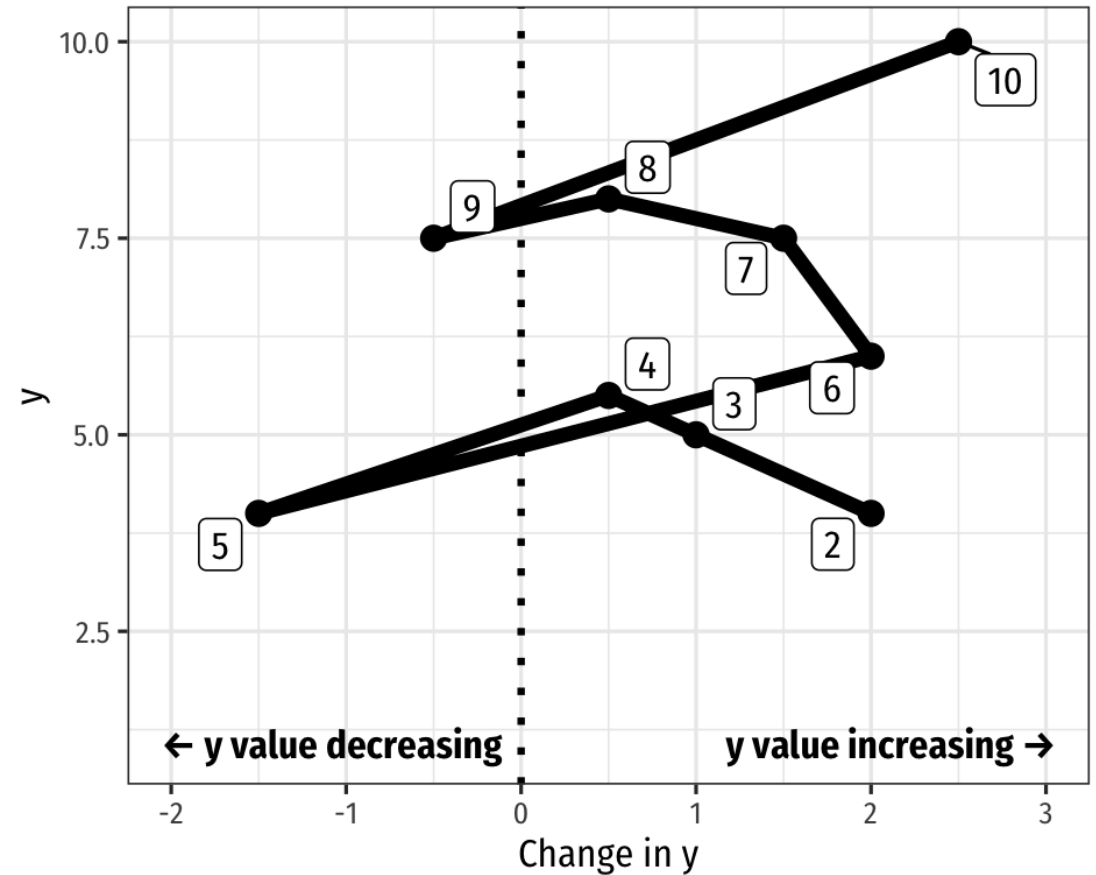
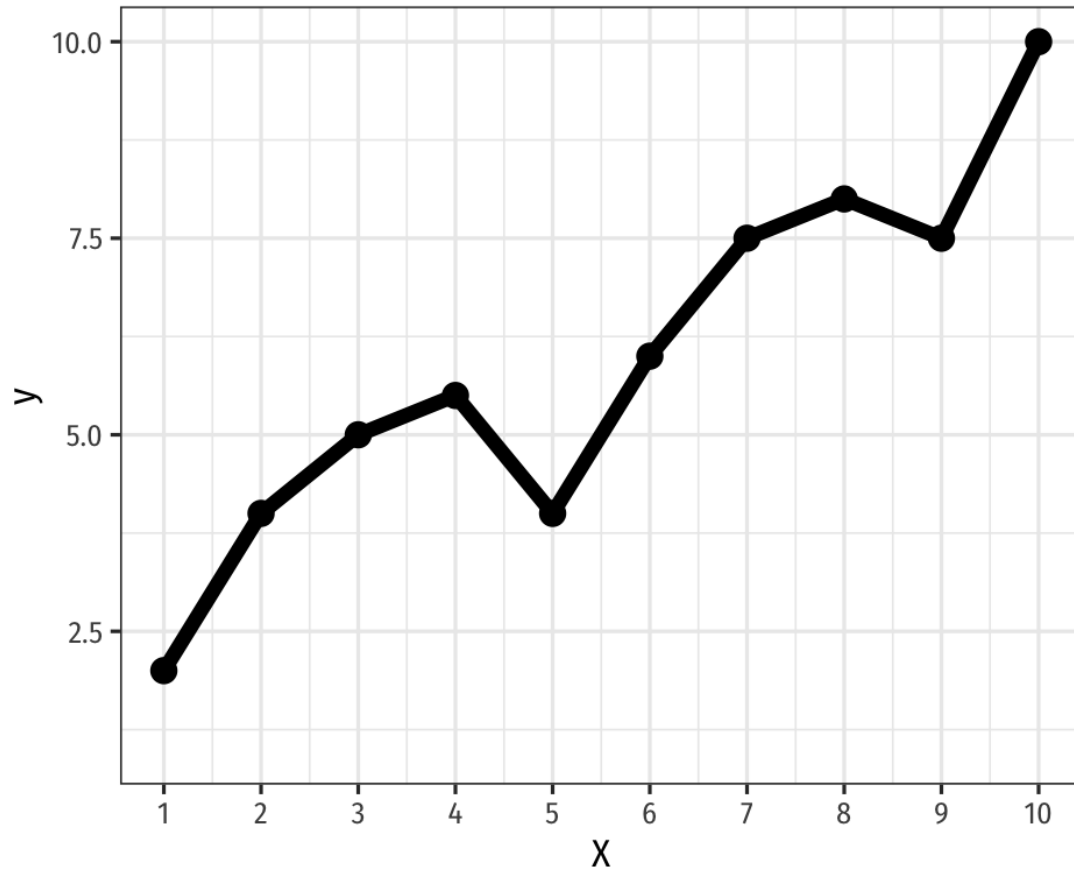
# Don't go wild with time mapping!



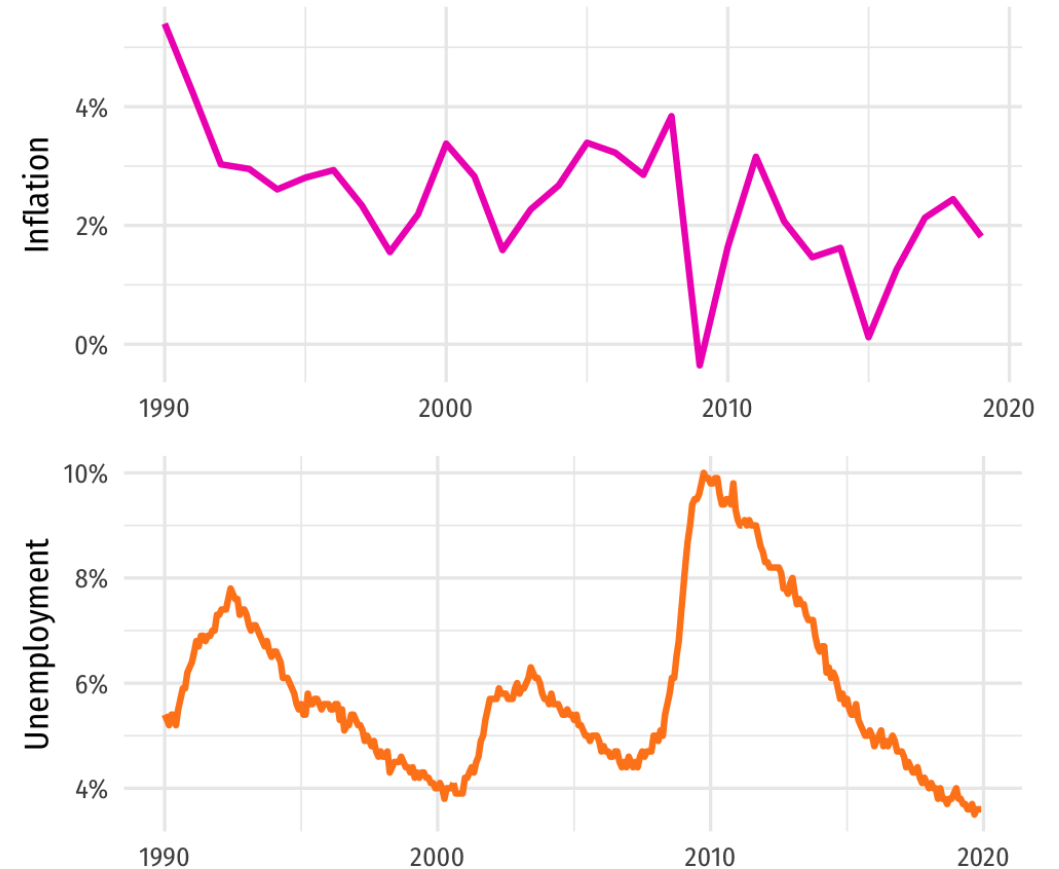
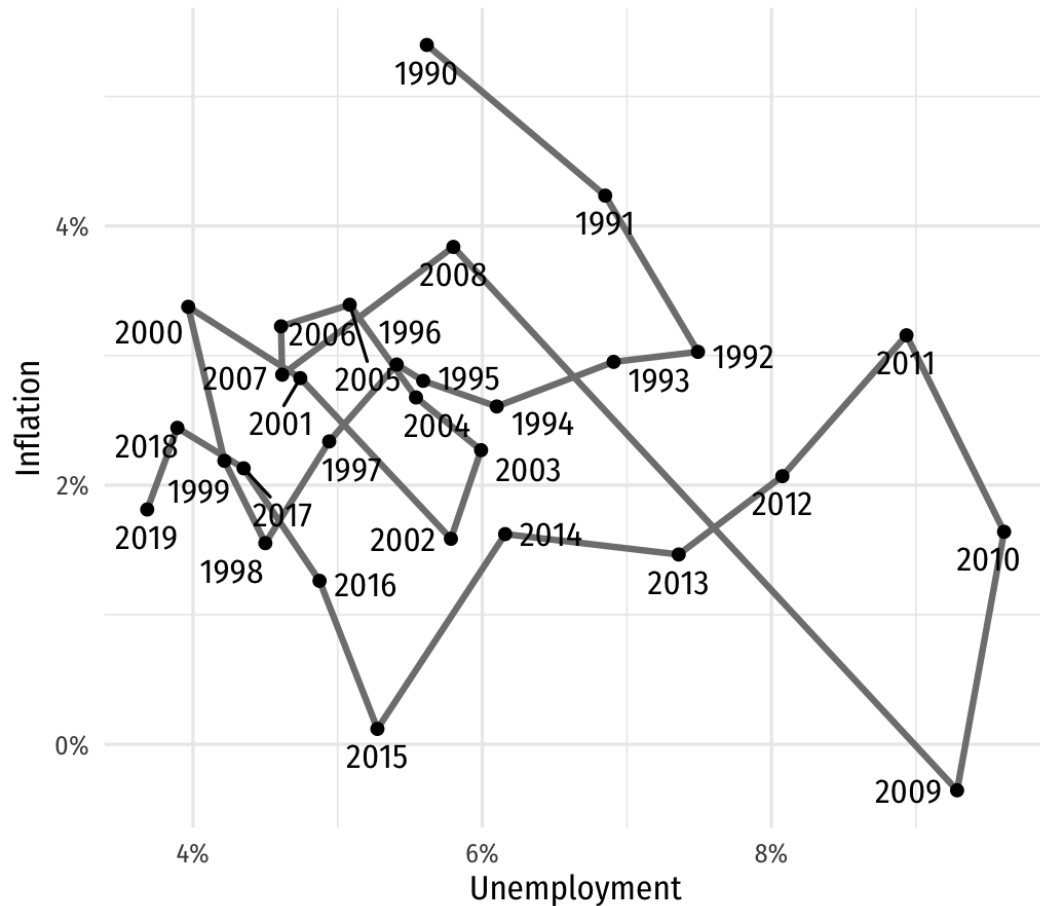
Danny Dorling/Kirsten McClure, Author provided

**Tornado plot:** When a curve crosses the left of the central axis, the number of deaths per day falls

# Interpreting tornado plots



# Better with multiple plots





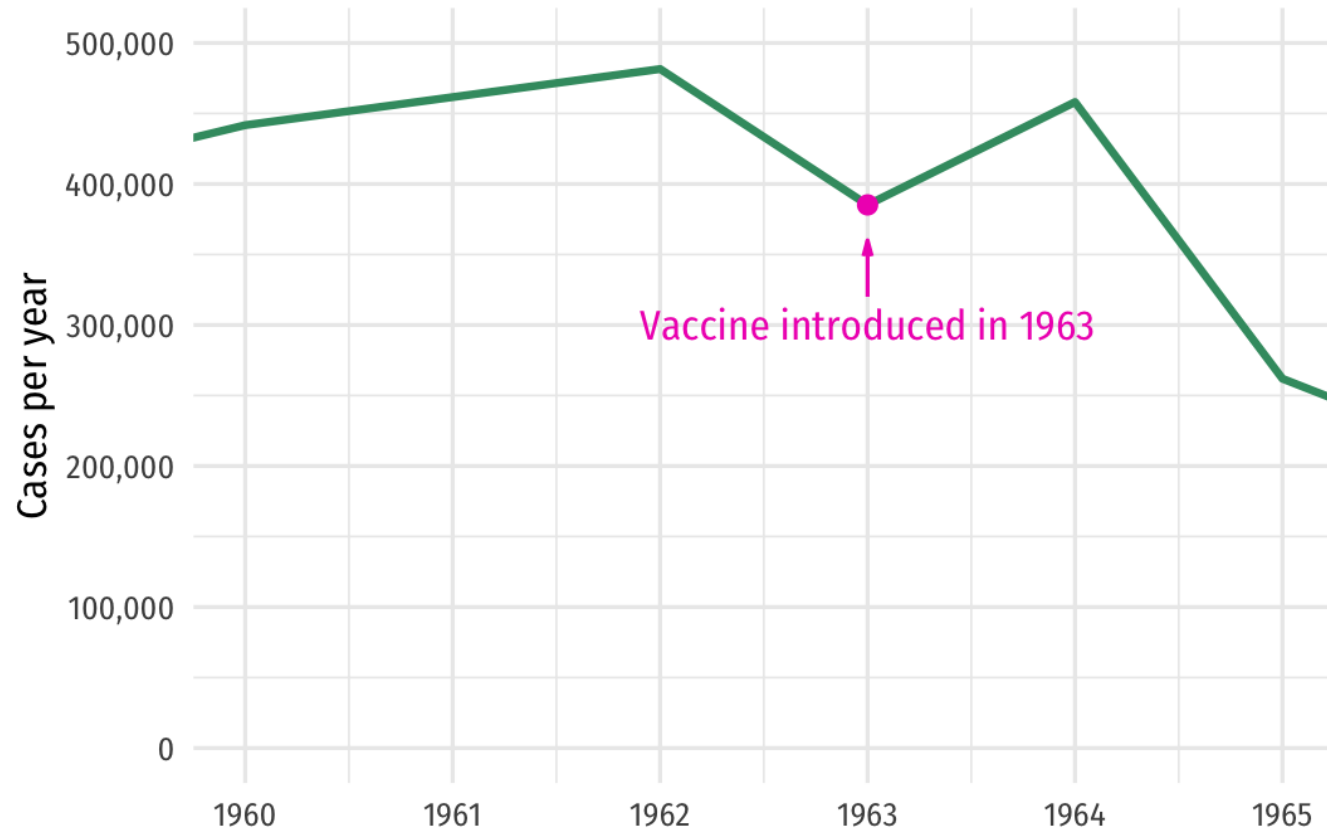
# Starting, ending, and decomposing time



**You always have to choose  
a start and end point**

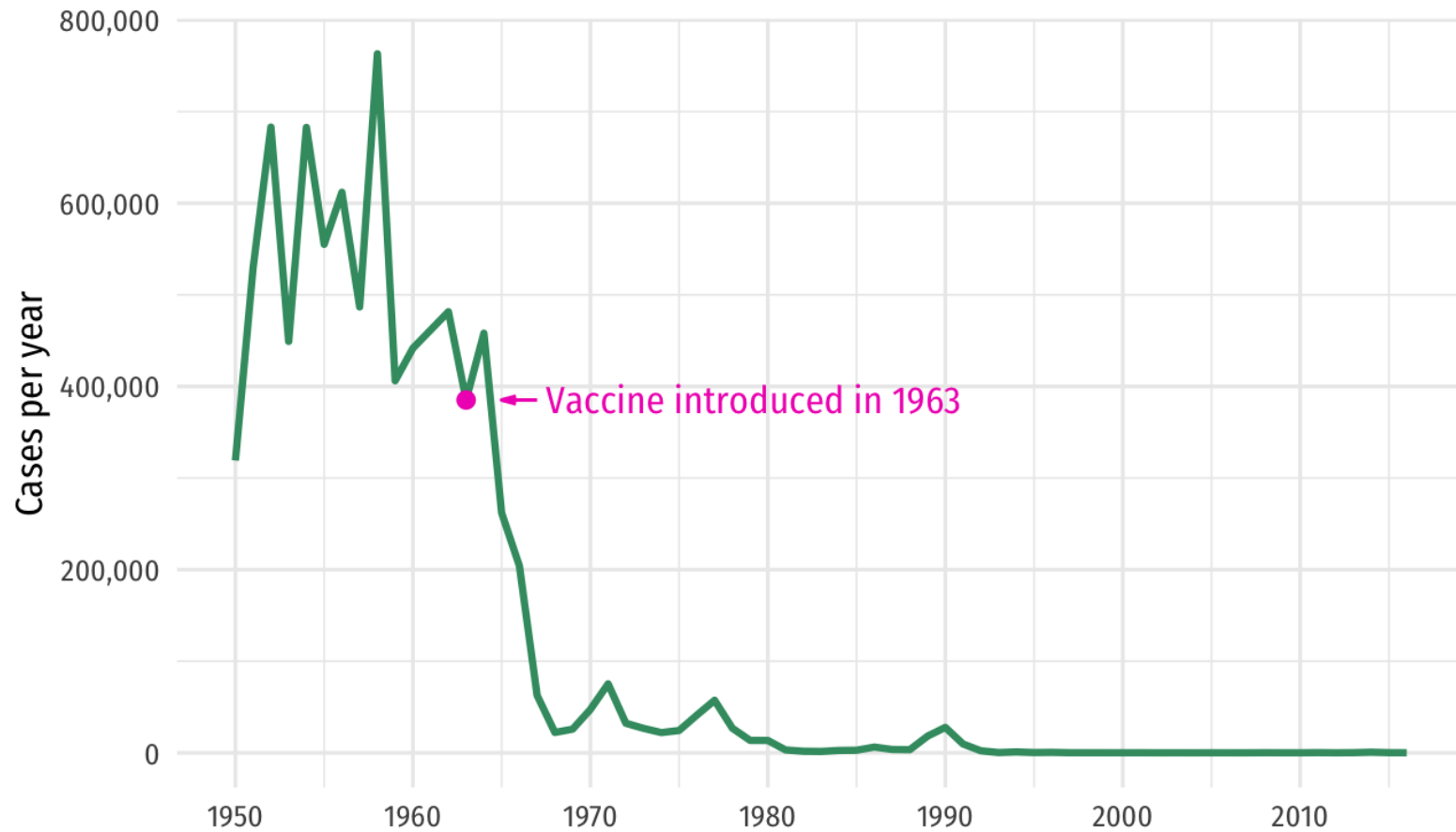
**Start and end at reasonable times that  
help maintain the context of the story**

# Measles vaccine was pretty effective!



Source: CDC, Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition

# Measles vaccine was *incredible!*

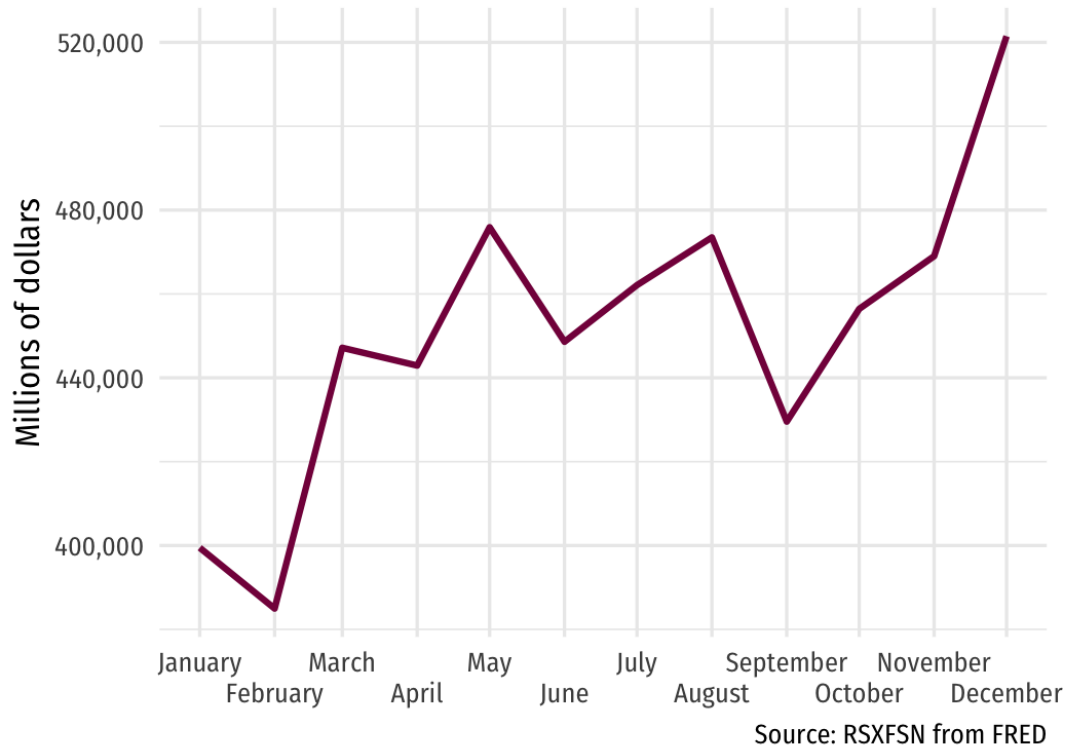


Source: CDC, Epidemiology and Prevention of Vaccine-Preventable Diseases, 13th Edition

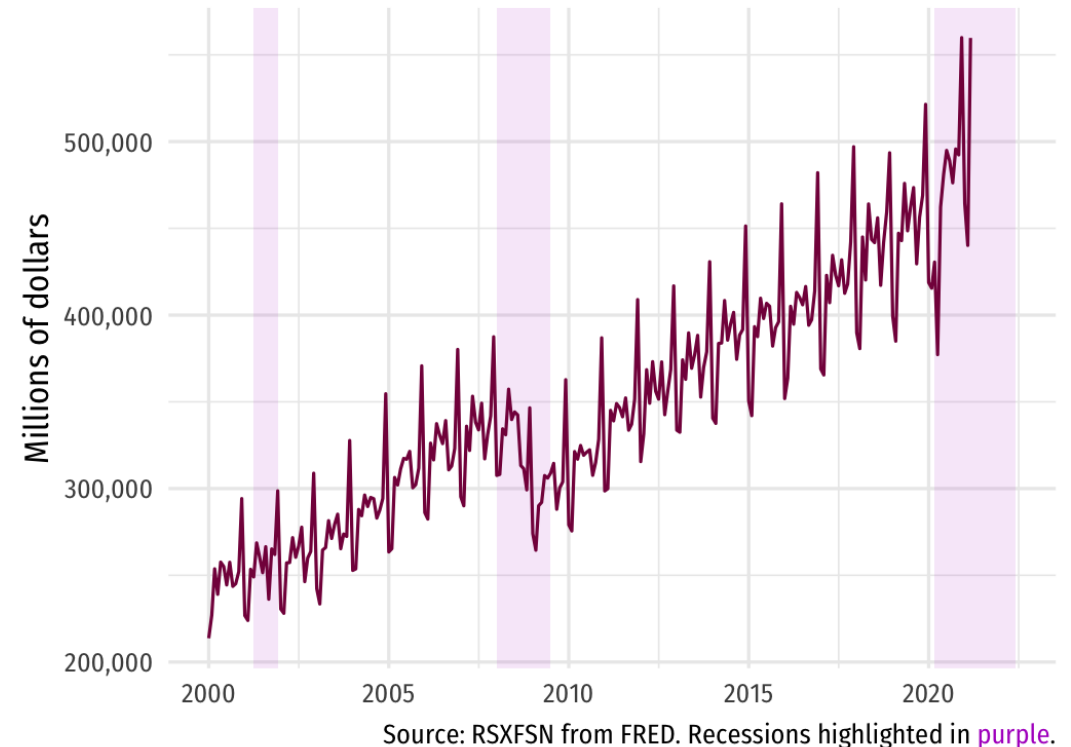
# Seasonality

Don't mistake seasonality for actual trends

### Total 2019 retail sales in the United States

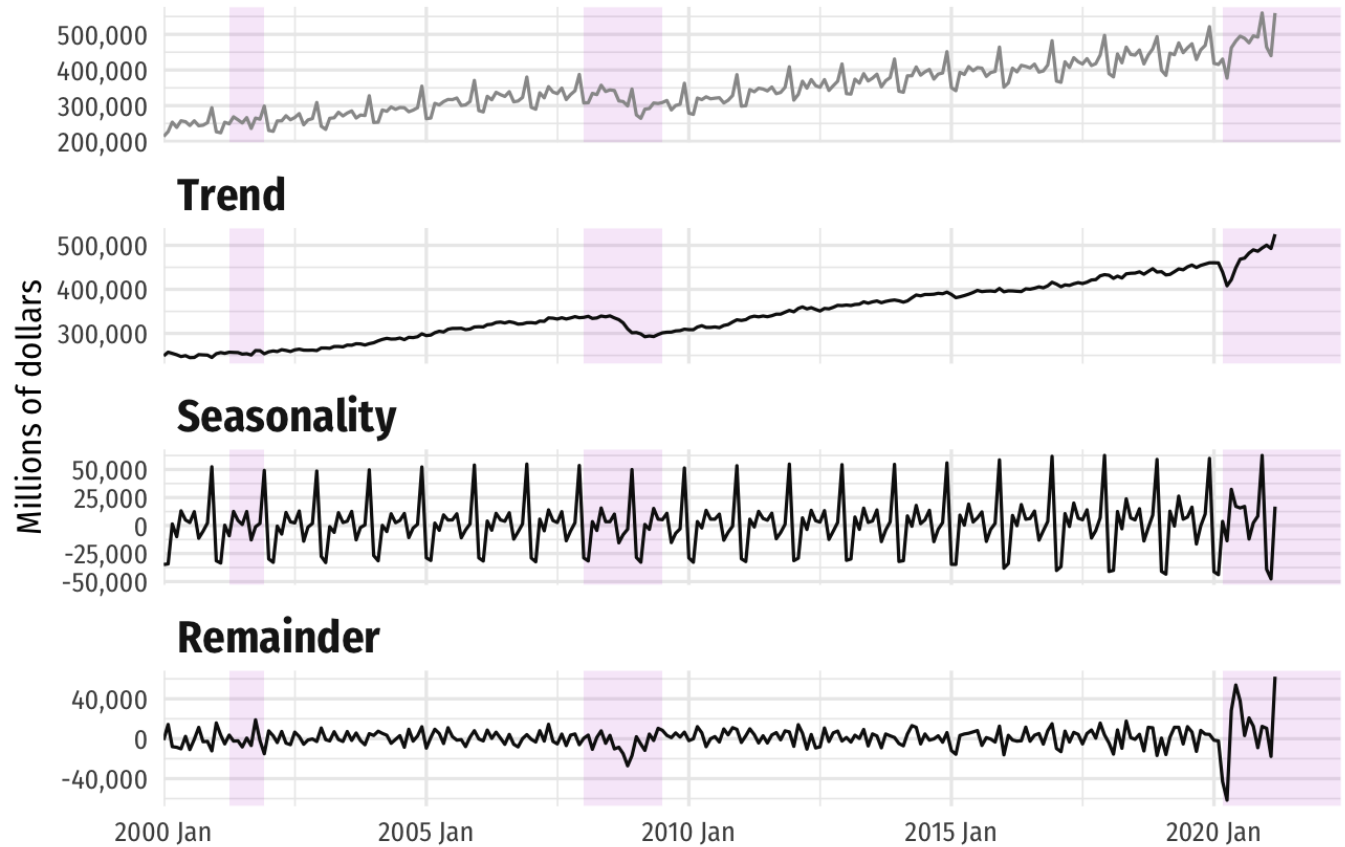


### Total retail sales in the United States, 2000–2019



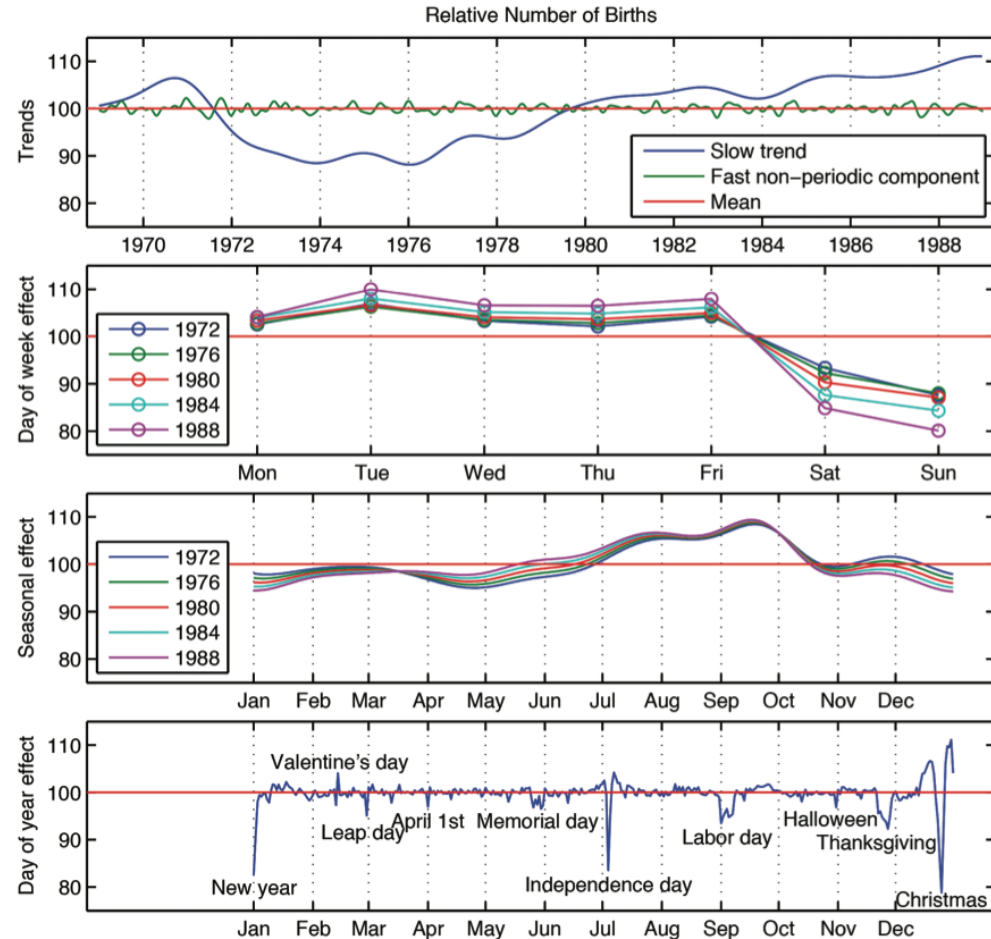
# Decomposition

## Total retail sales in the United States, 2000–2019



Source: RSXFSN from FRED. Recessions highlighted in purple.

# Birthday decomposition



Cover of Andrew Gelman, et al., *Bayesian Data Analysis*