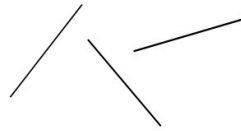


# **Data visualization: basic principles**

**Length**



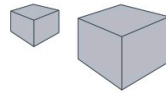
**Slope**



**Color hue**



**Volume**



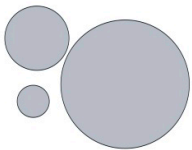
**Angle**



**Length (aligned)**



**Area**



**Color intensity**



**Visualization:  
encoding data  
by visual cues**

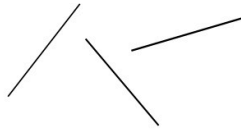
**Length (aligned)**



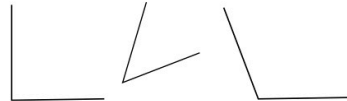
**Length**



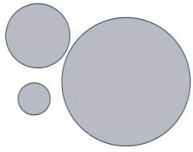
**Slope**



**Angle**



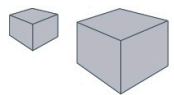
**Area**



**Color intensity**



**Volume**



**Color hue**



**Accurate**

**Generic**

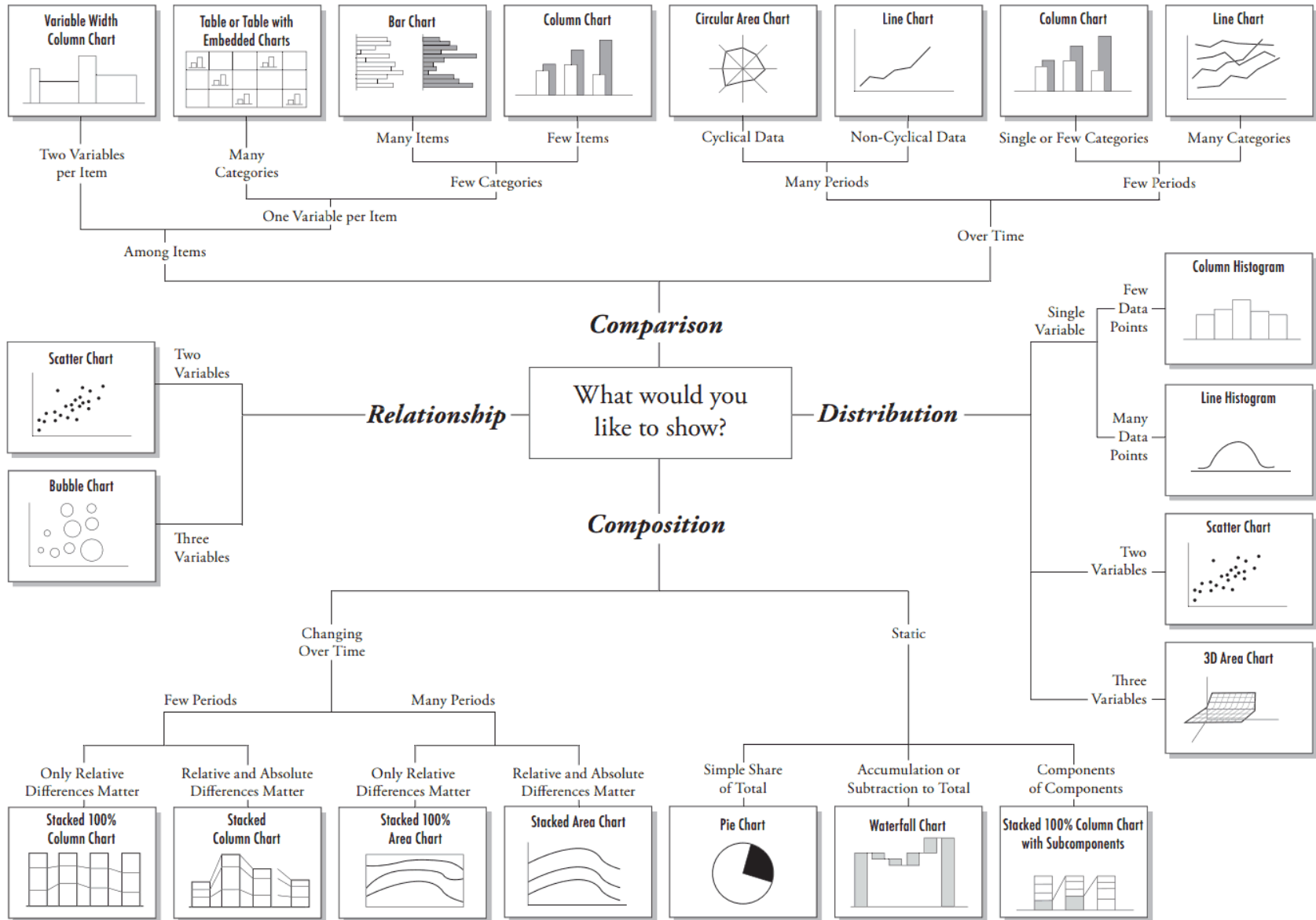
**Our brains do not  
treat those cues  
equally!**

# Design for the human brain!



**What type of chart should I use?**

# Chart Suggestions—A Thought-Starter



Distribution

Relationship

Comparison

**What do you want to show?**

Connection

Composition  
(parts of the whole)

Location

**Distribution**

Relationship

Comparison



**What do you want to show?**

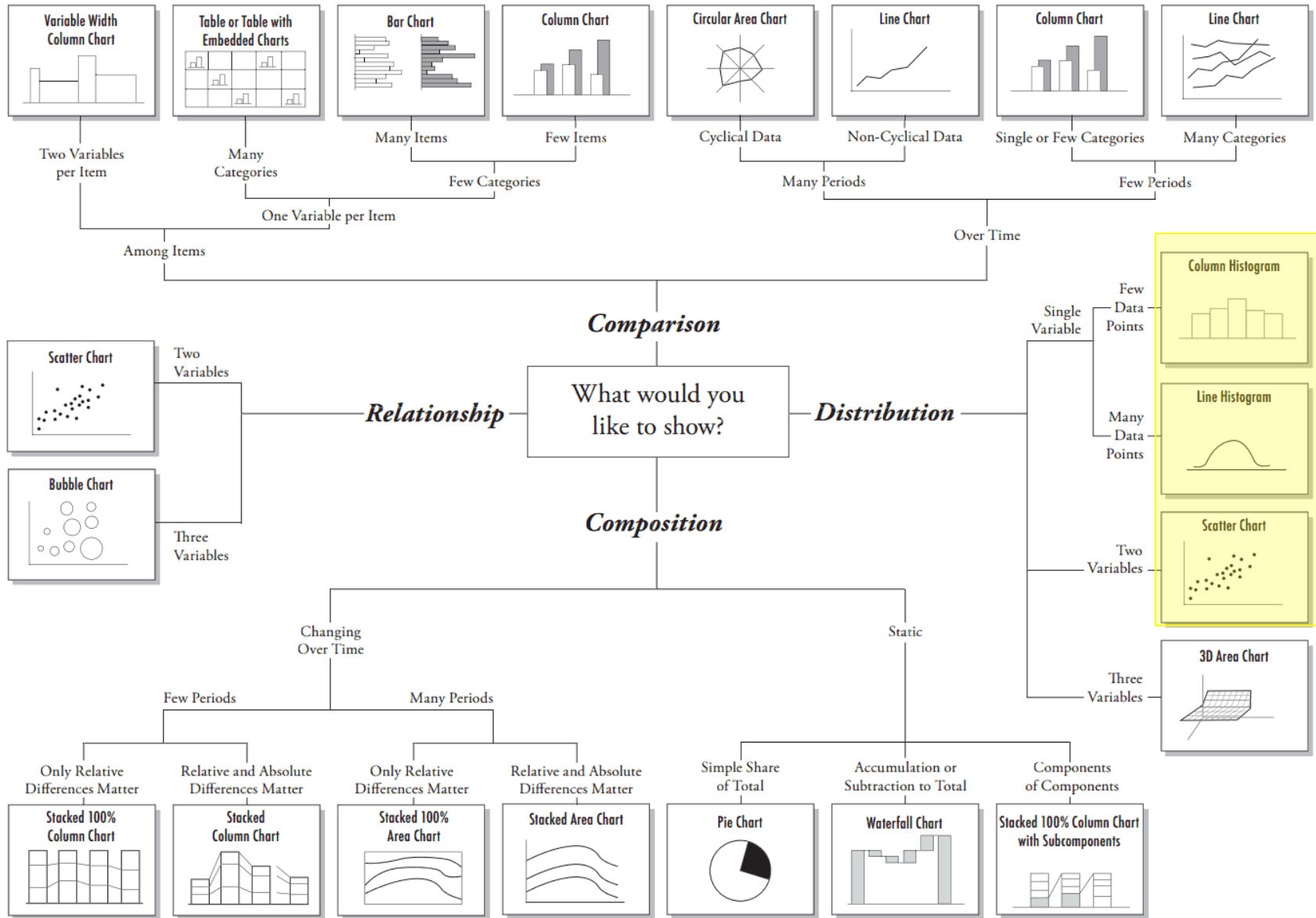
Connection

Composition  
(parts of the whole)

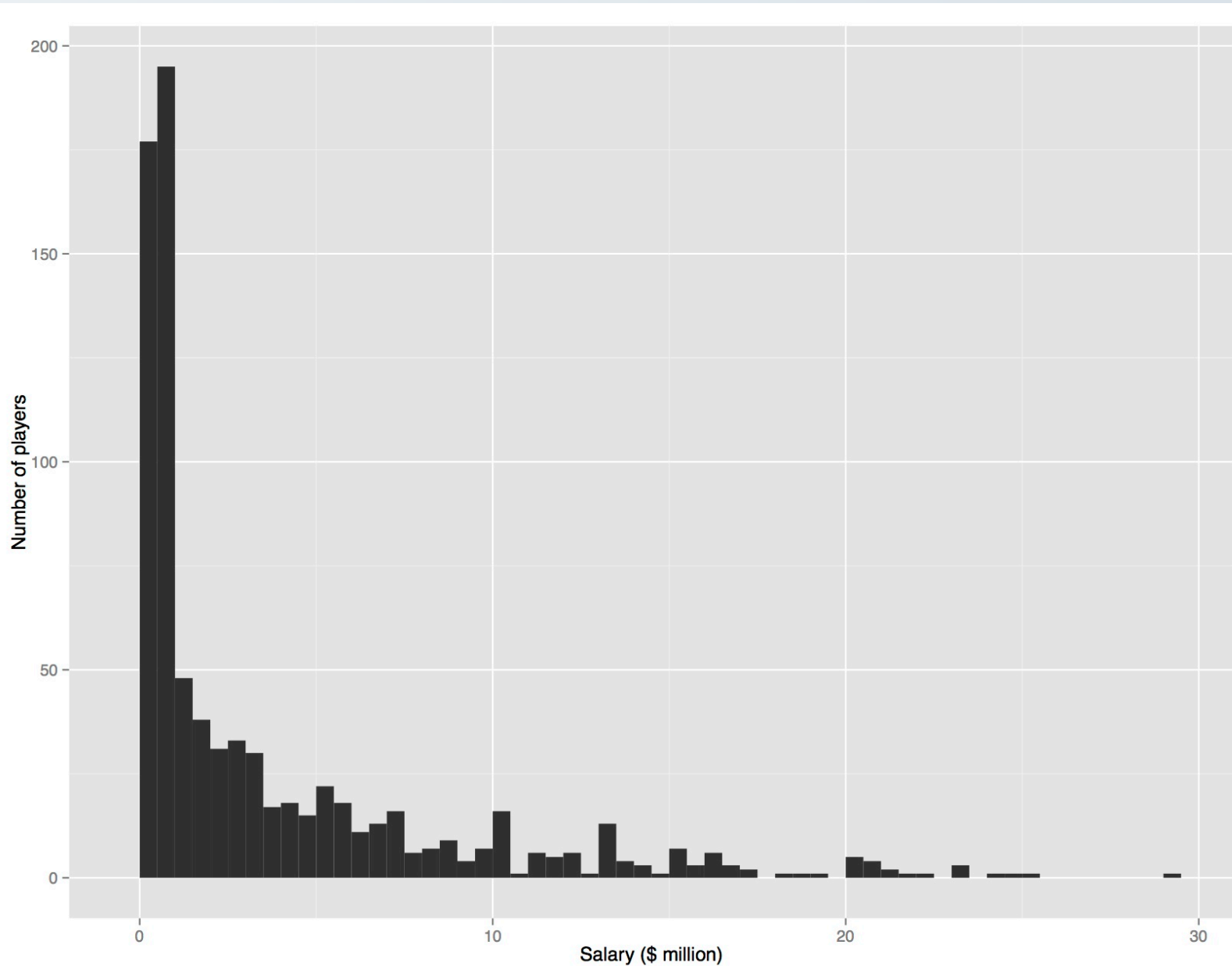
Location



# Chart Suggestions—A Thought-Starter



# Consider the distribution



Distribution

**Relationship**

Comparison



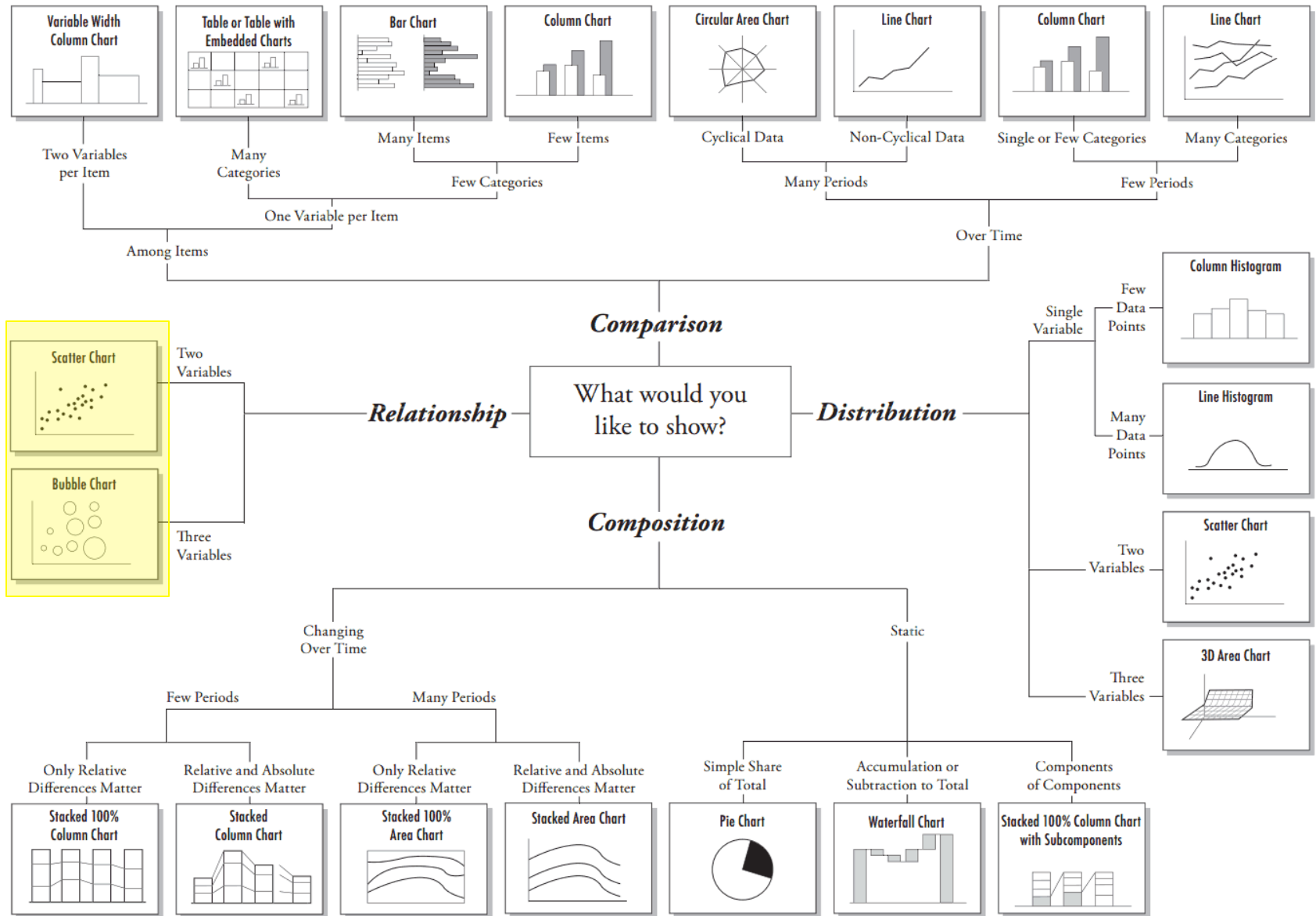
**What do you want to show?**

Connection

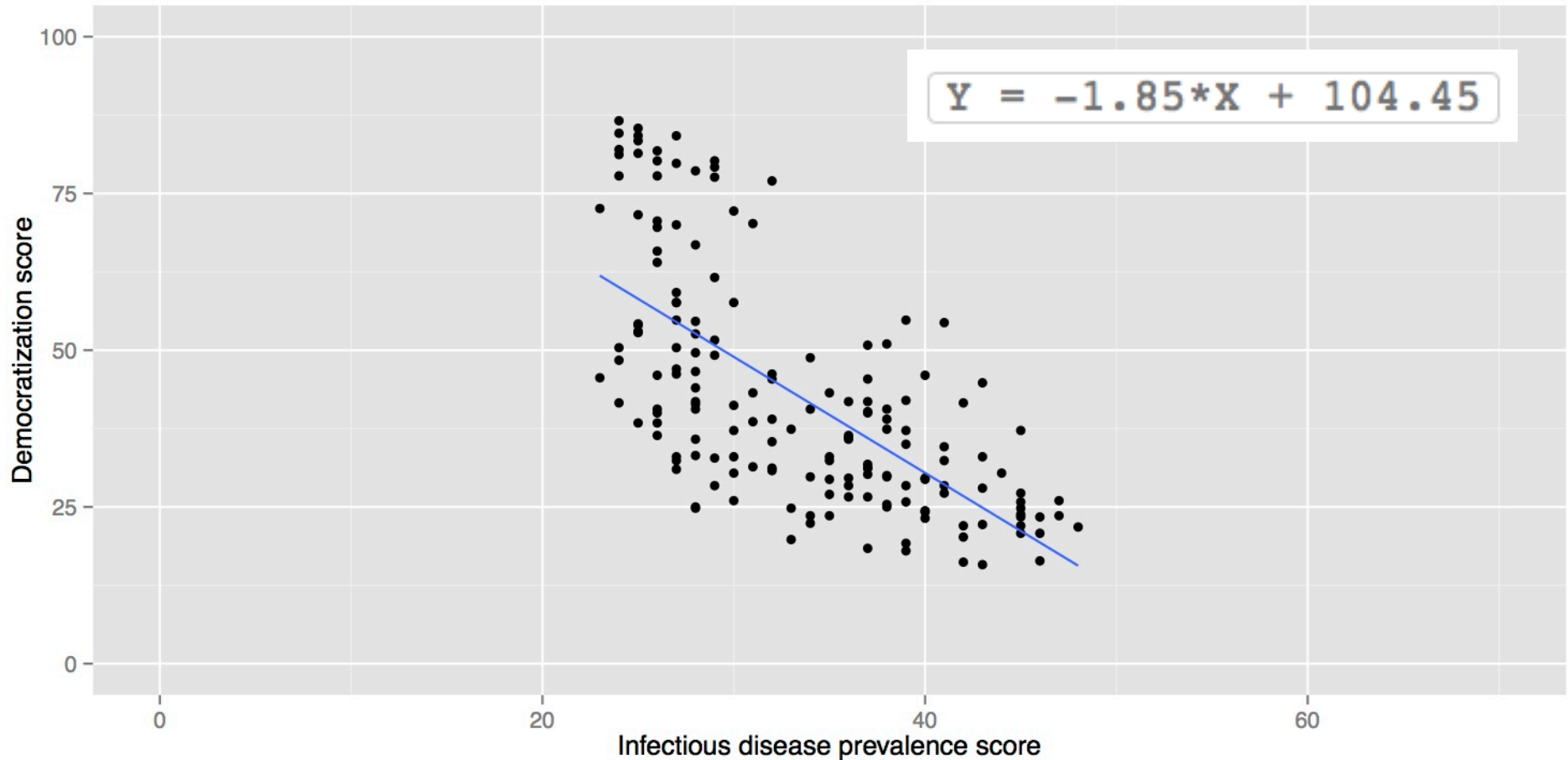
Composition  
(parts of the whole)

Location

# Chart Suggestions—A Thought-Starter



# Relationships between variables: scatter plots and trend lines



Distribution

Relationship

**Comparison**



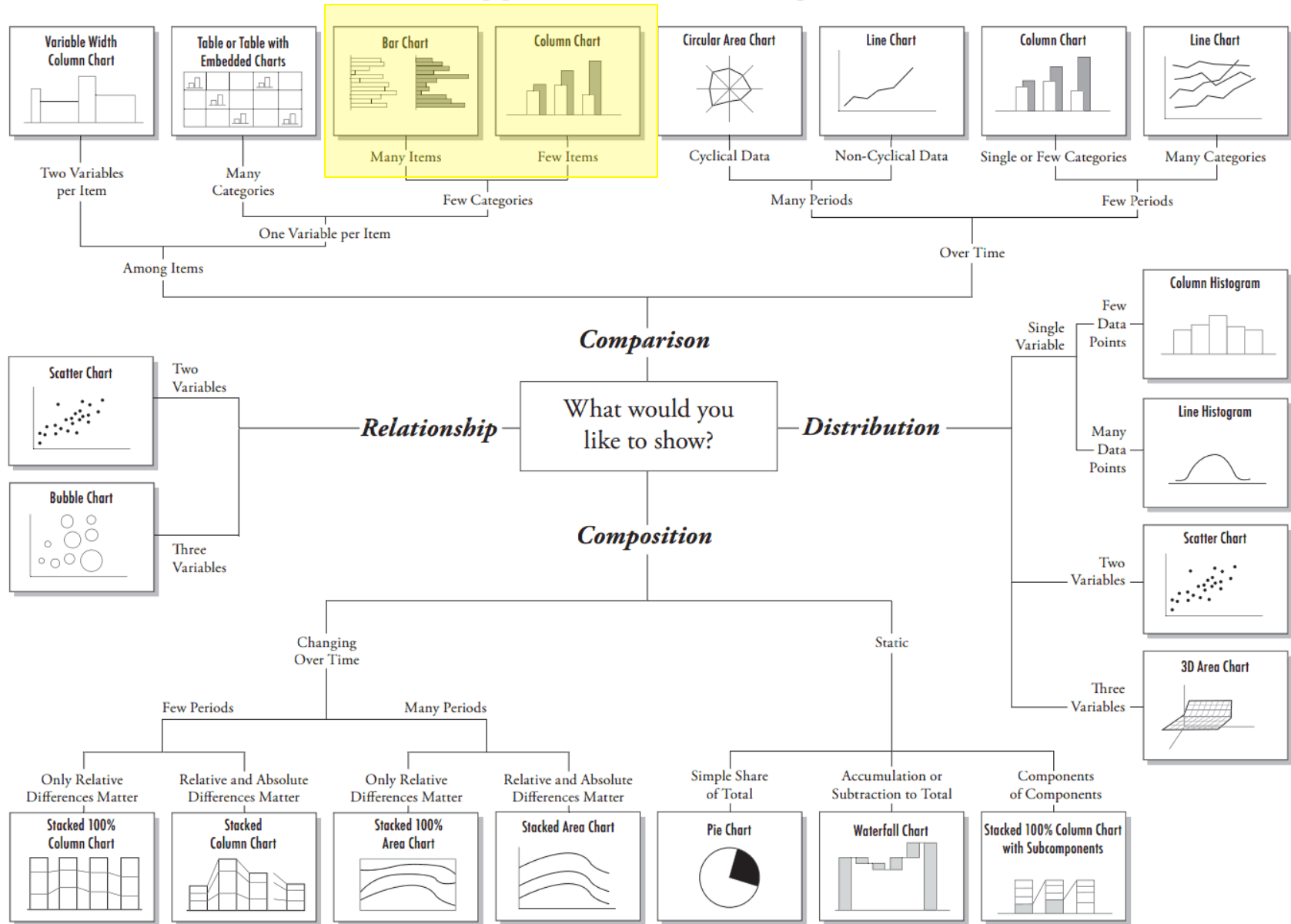
**What do you want to show?**

Connection

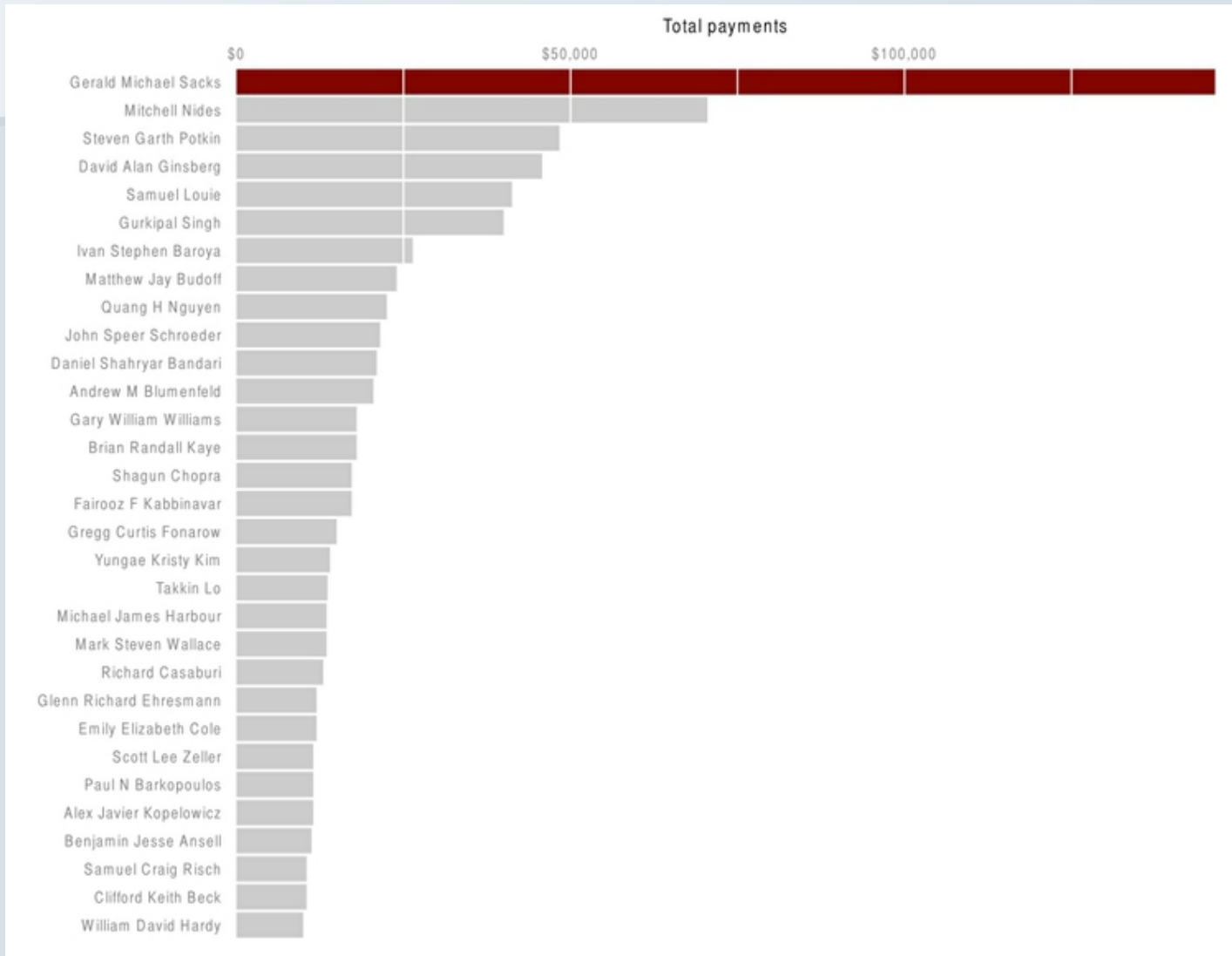
Composition  
(parts of the whole)

Location

# Chart Suggestions—A Thought-Starter

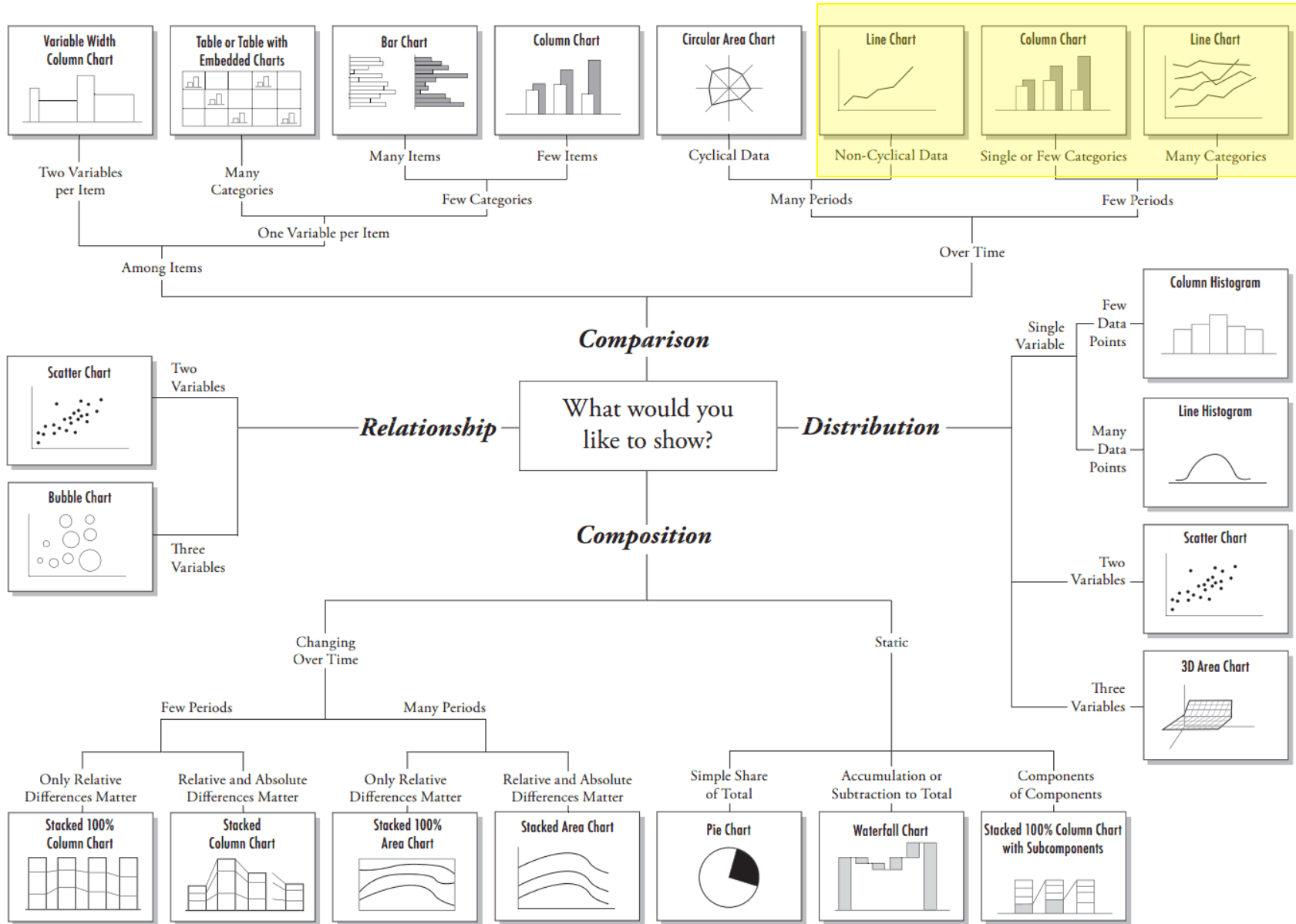


# Simple comparisons: bars and columns



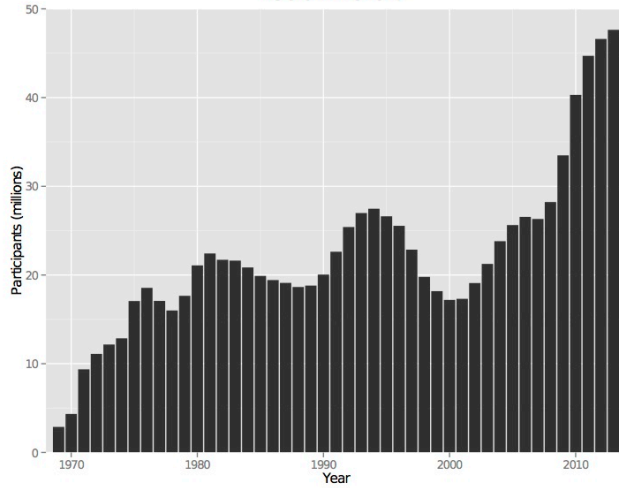


# Chart Suggestions—A Thought-Starter

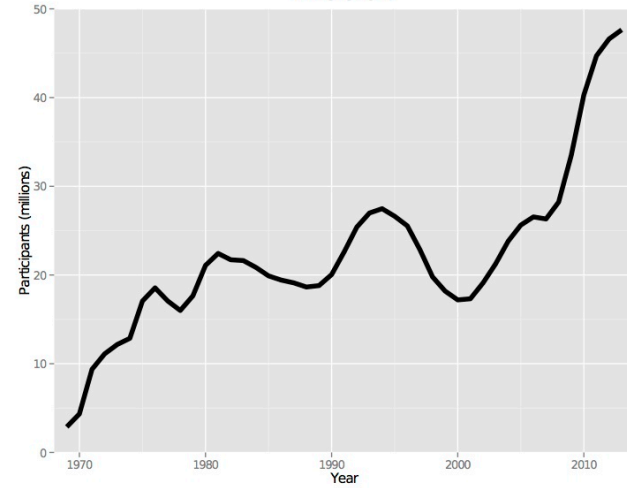


# Comparisons: change over time

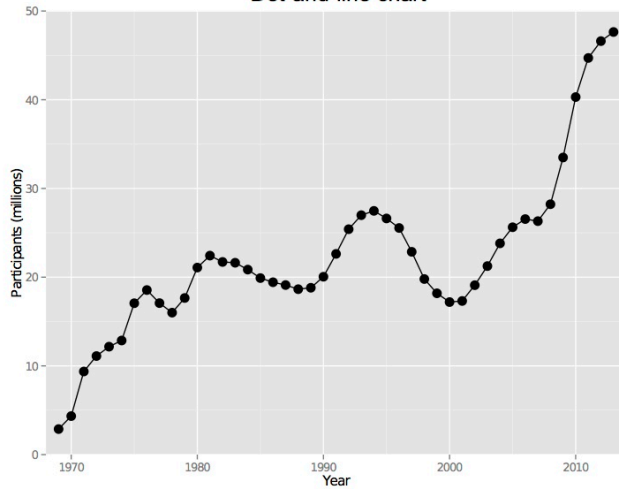
Column chart



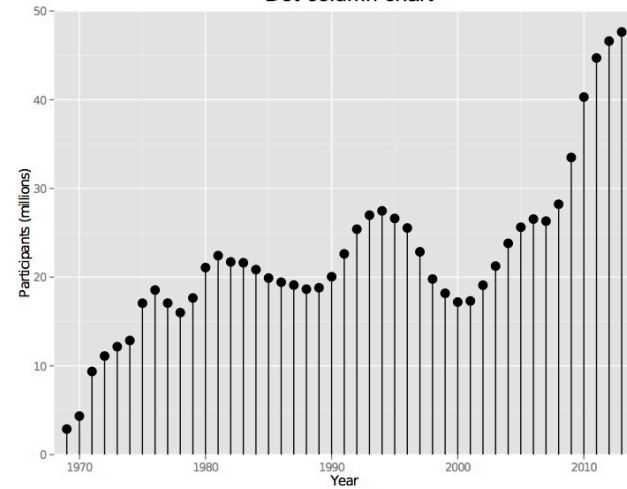
Line chart



Dot-and-line chart



Dot-column chart



Distribution

Relationship

Comparison

**What do you want to show?**

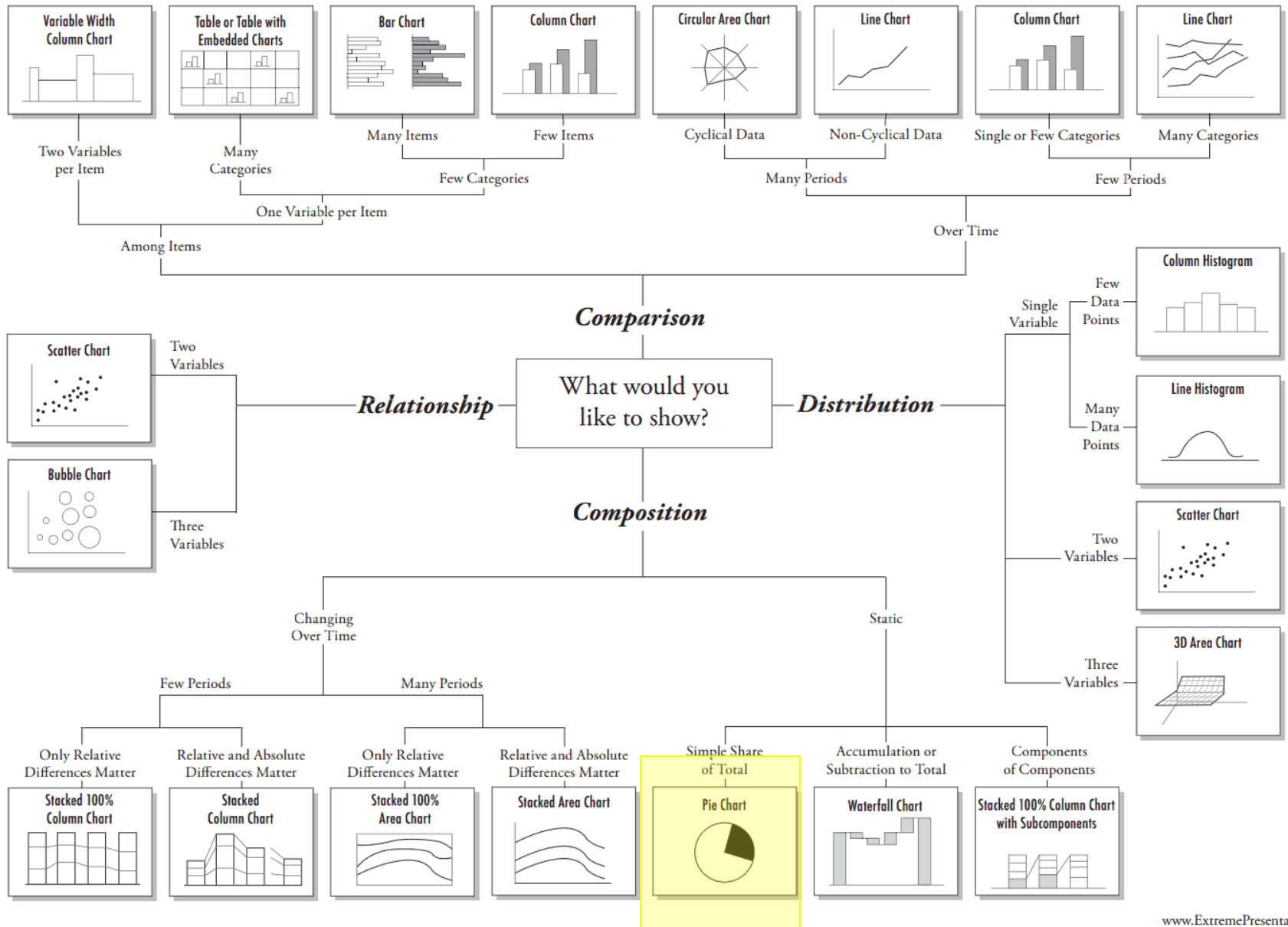


Connection

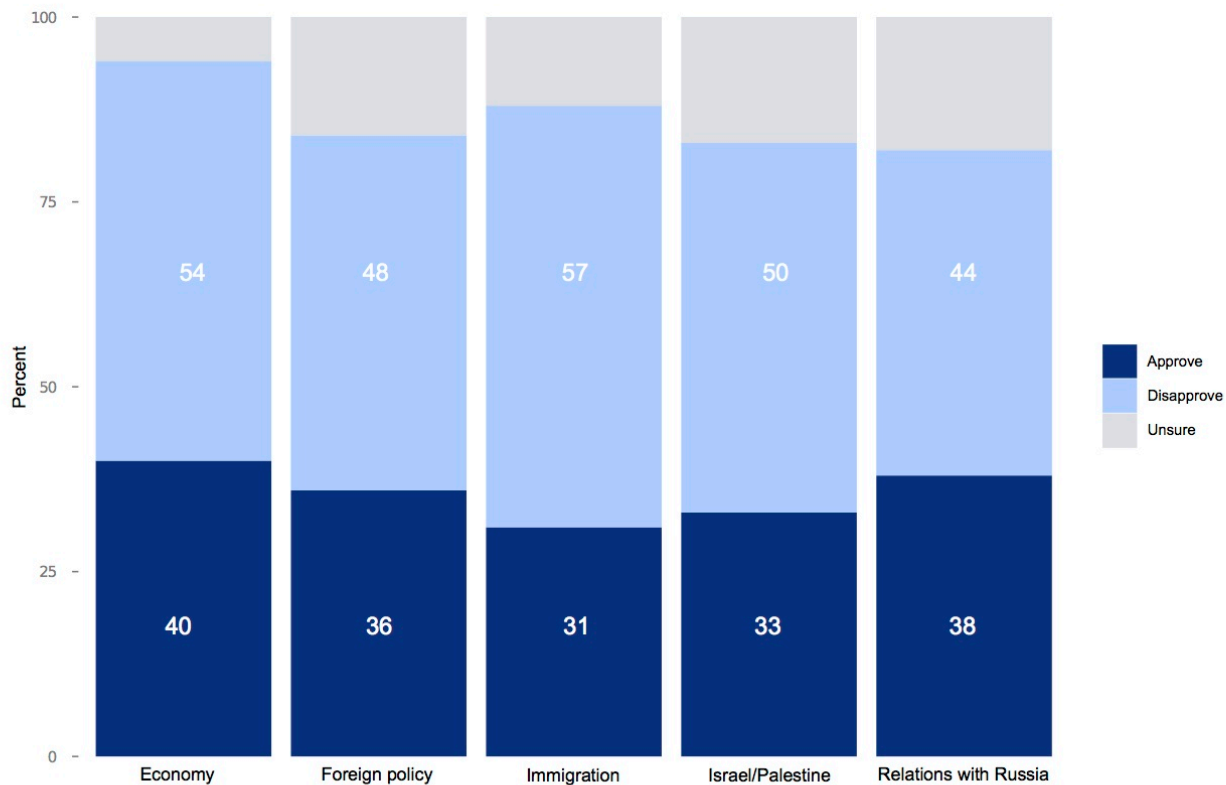
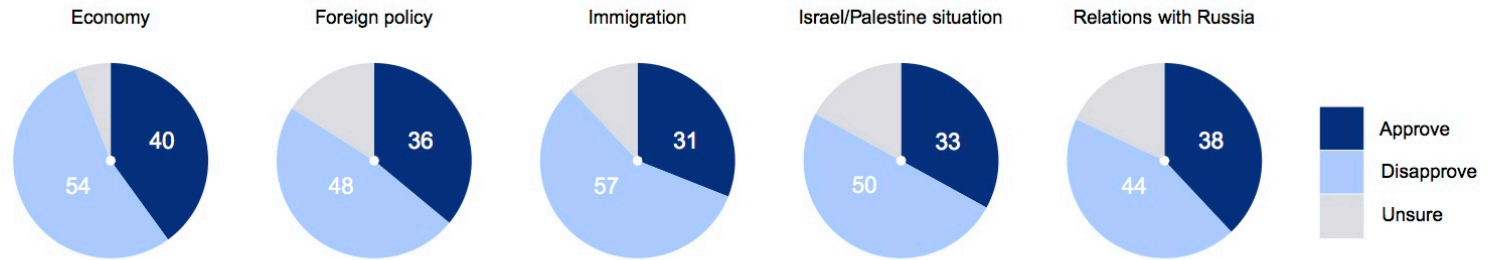
**Composition**  
**(parts of the whole)**

Location

# Chart Suggestions—A Thought-Starter

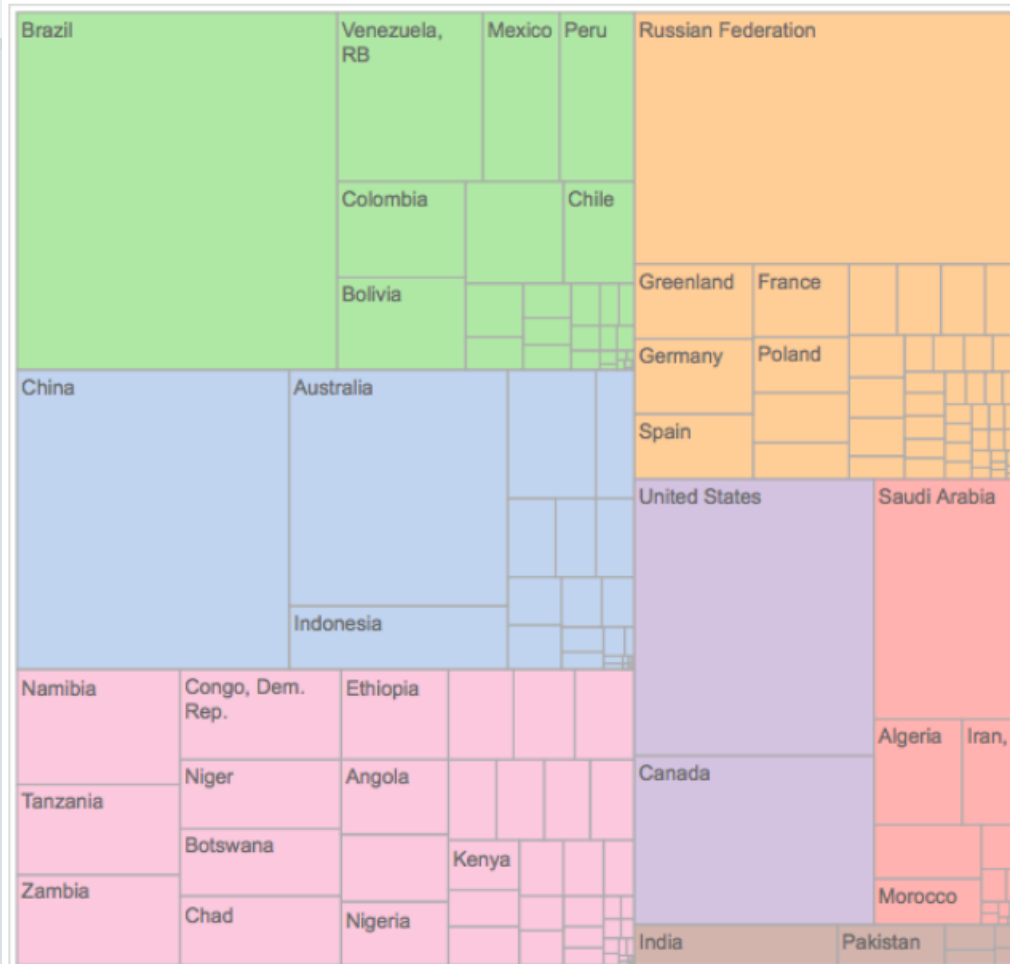


# Composition: parts of the whole



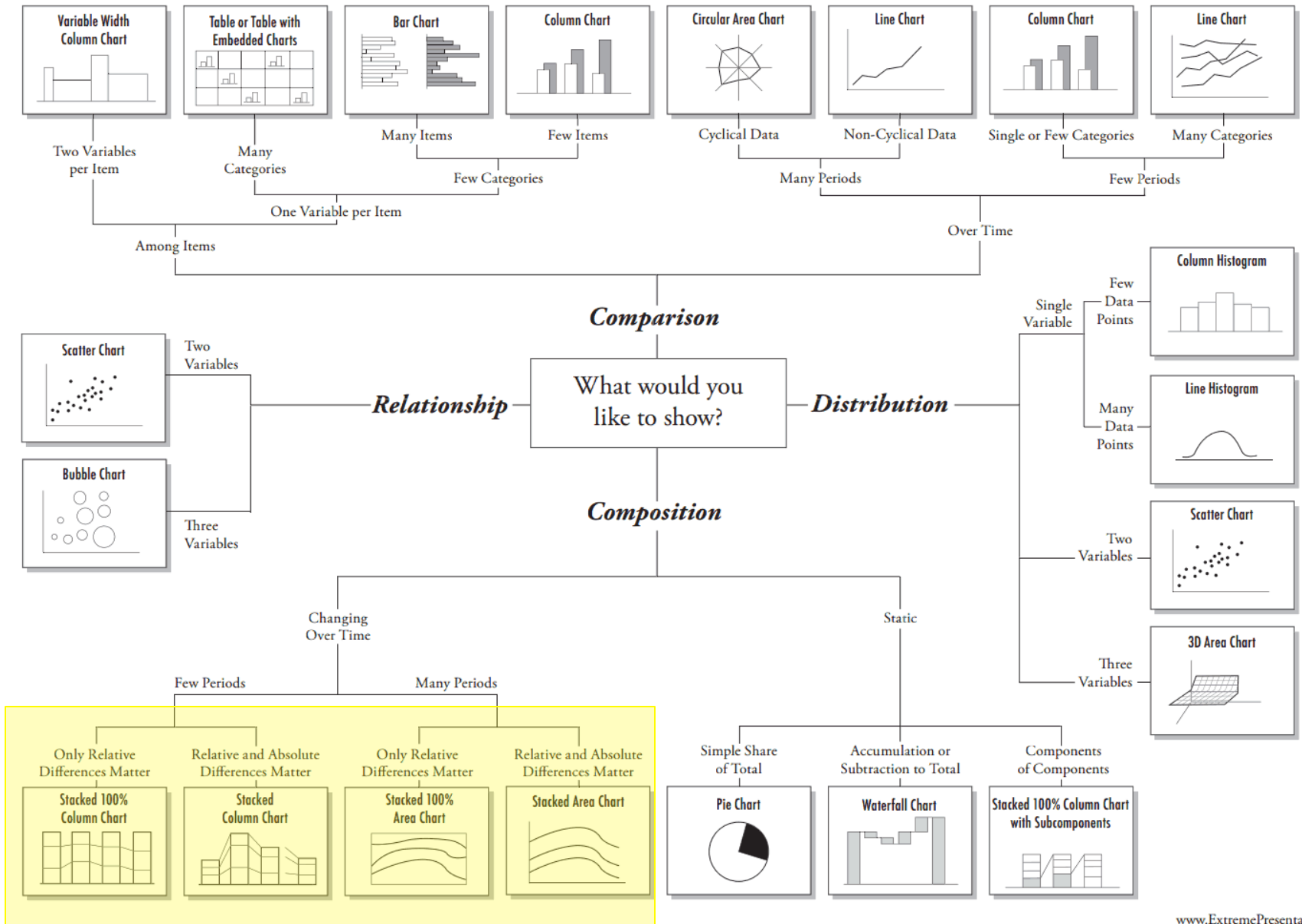
# Composition: parts of the whole

## Protected land in 2012



Source: World Bank Indicators

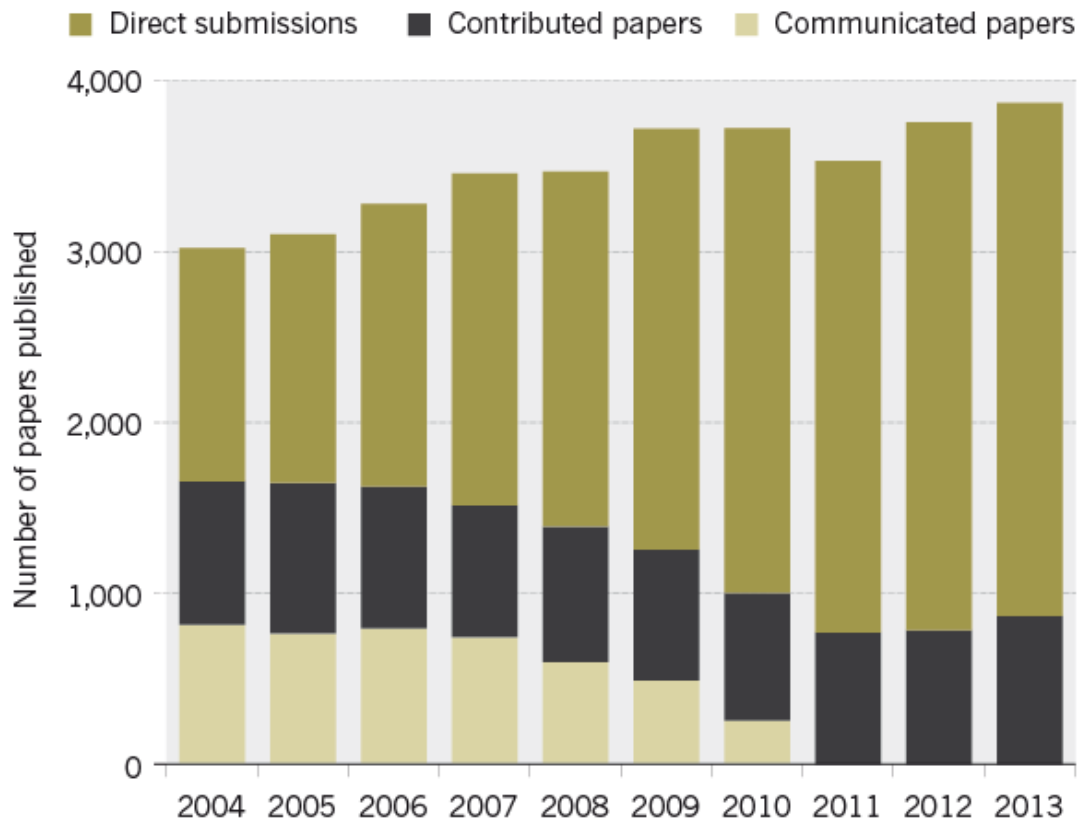
# Chart Suggestions—A Thought-Starter



# Composition: change over time

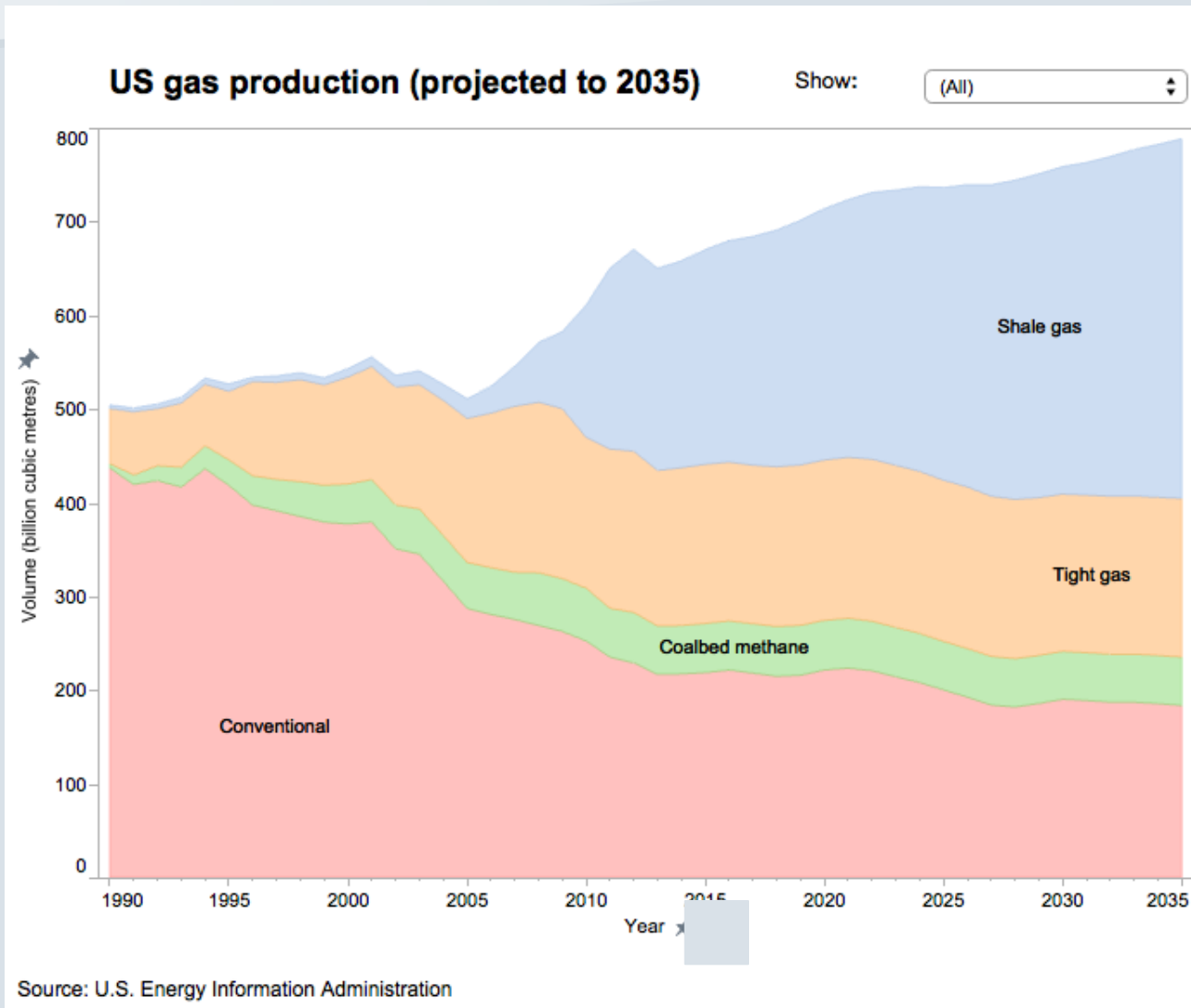
## *A changing journal*

The number of direct submissions to *Proceedings of the National Academy of Sciences* has been increasing steadily over the past decade. Communicated papers were phased out in 2010, but the contributed track has remained constant.





# Composition: change over time



Distribution

Relationship

Comparison

**What do you want to show?**



**Connection**

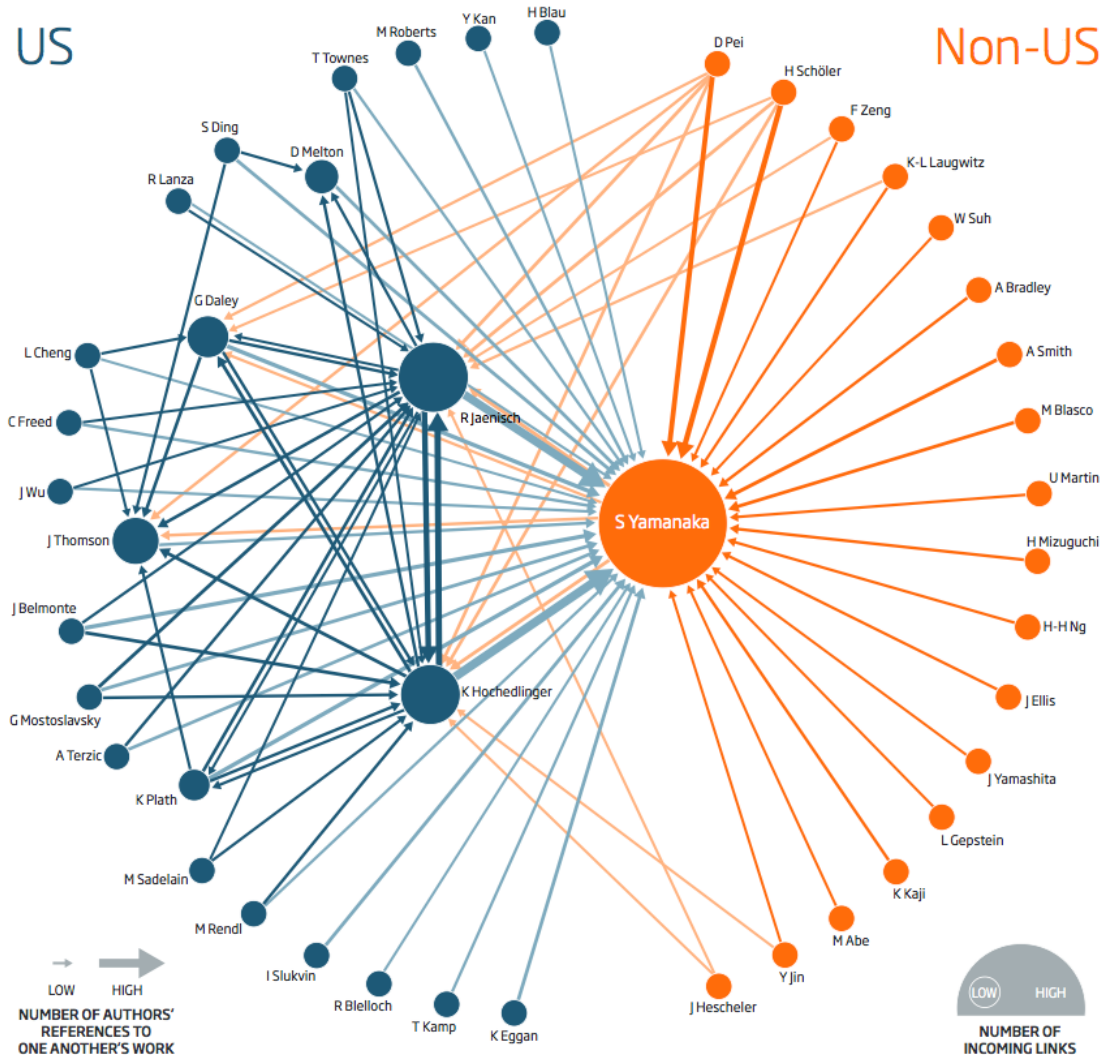
Composition  
(parts of the whole)

Location

# THE STEM CELL WARS

When a Nobel prize is up for grabs, do scientists across the globe compete on a level playing field? **Peter Aldhous** investigates

The most influential players in cellular reprogramming are revealed by recording how many times the scientists have referred to each other's work. Each link shows where one researcher cited another four or more times in papers in leading journals (for analysis, see "The strongest link", below right)



## Connection: network graphs

Distribution

Relationship

Comparison

**What do you want to show?**

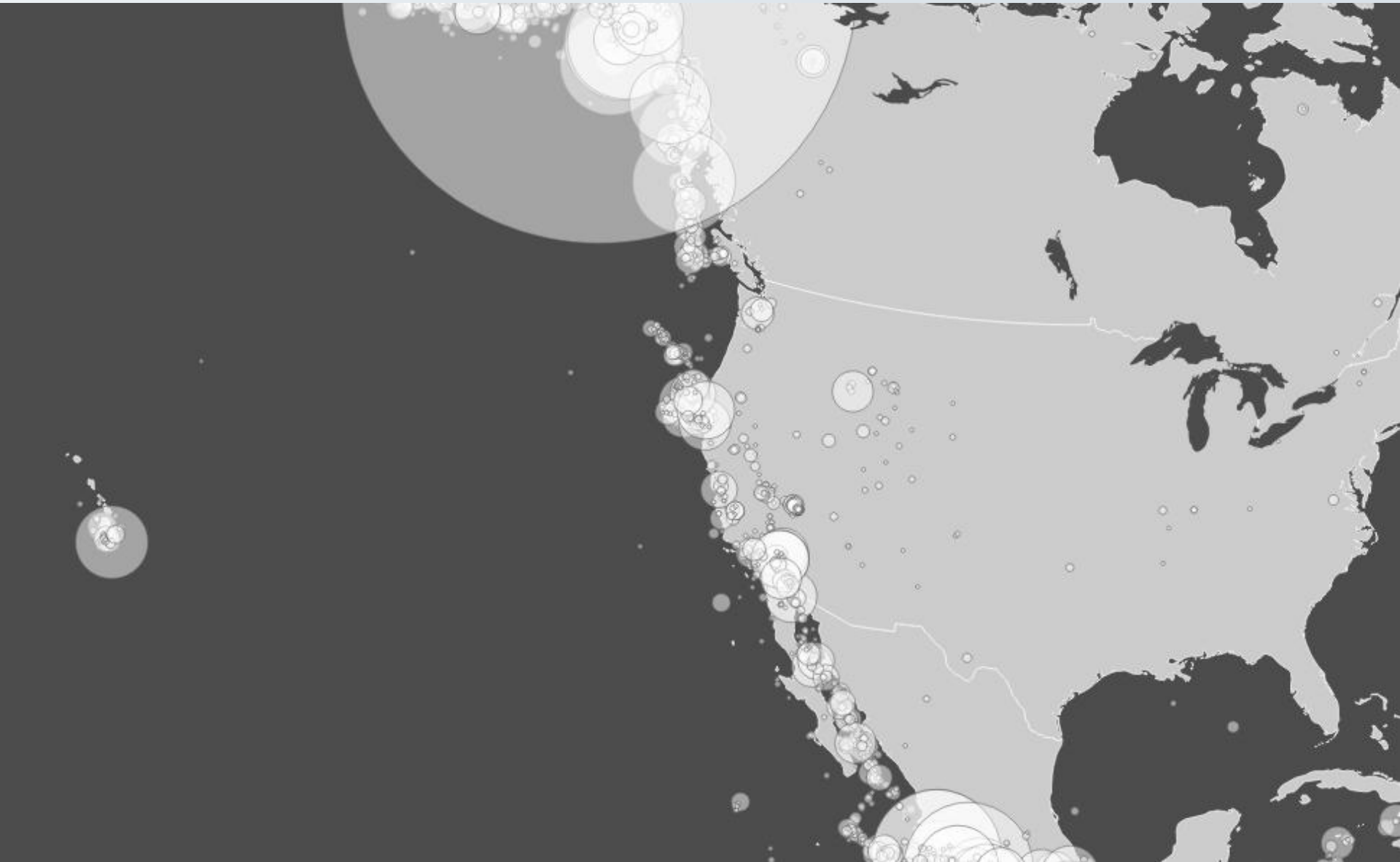


Connection

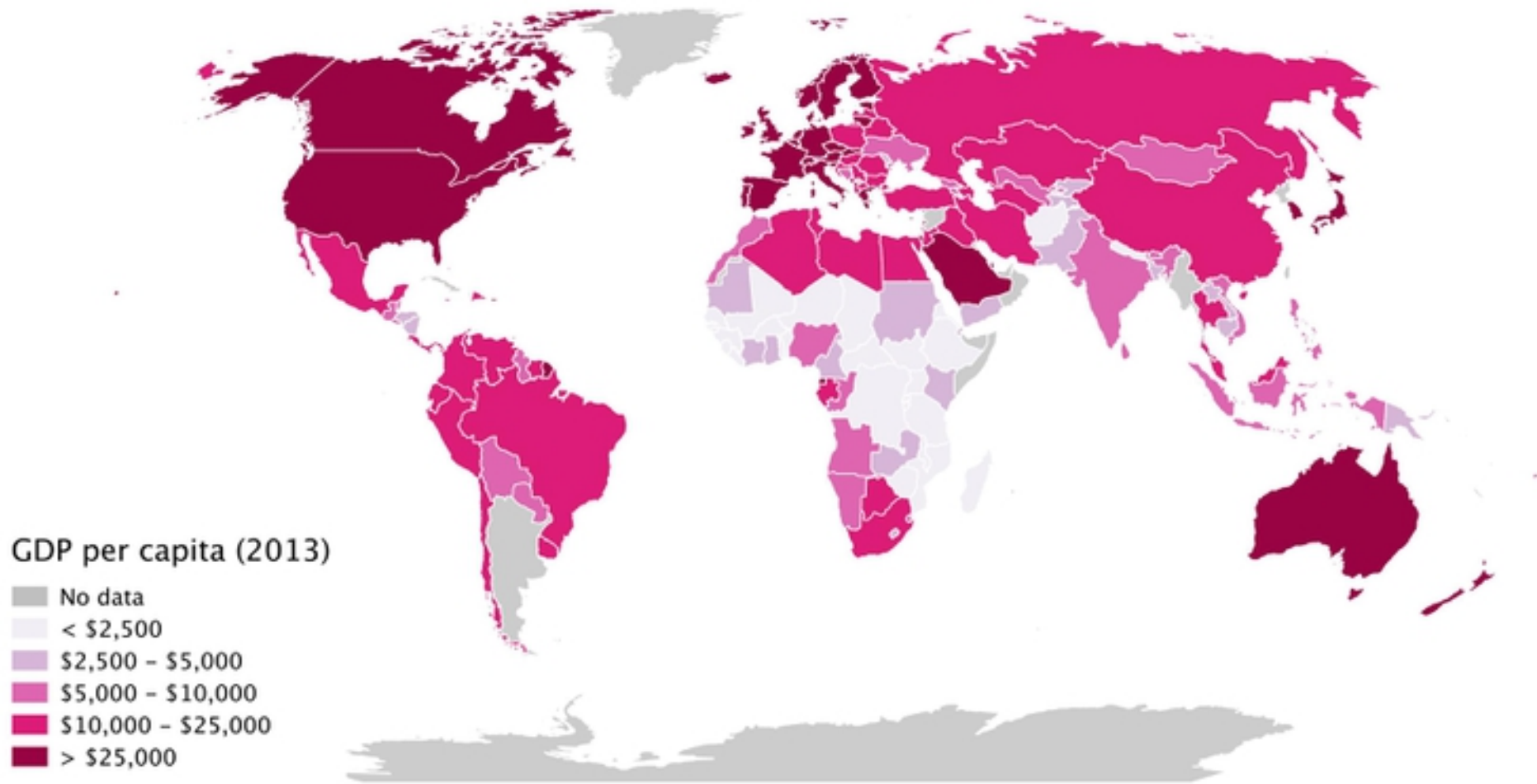
Composition  
(parts of the whole)

**Location**

# Location plus data: scaled circles



# Location plus data: choropleth maps



**Remember the perceptual hierarchy of visual cues!**

Accurate

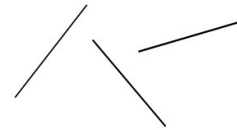
Length (aligned)



Length



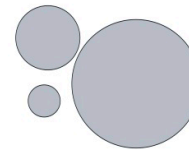
Slope



Angle



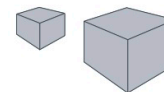
Area



Color intensity



Volume



Generic

Color hue



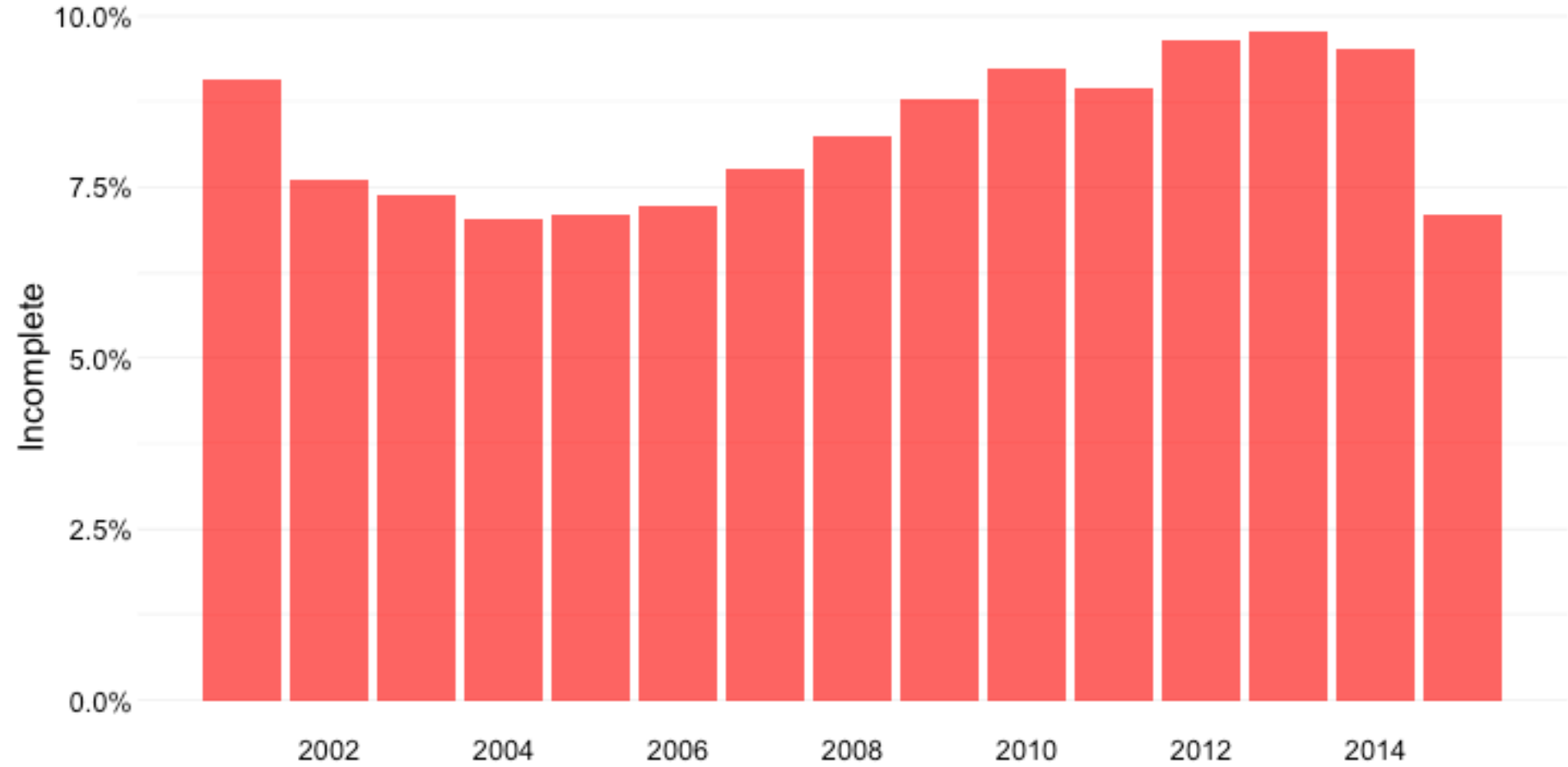
**So ask yourself: Is a map the best way to tell the story?**



# **Case study: Immunization in California kindergartens**

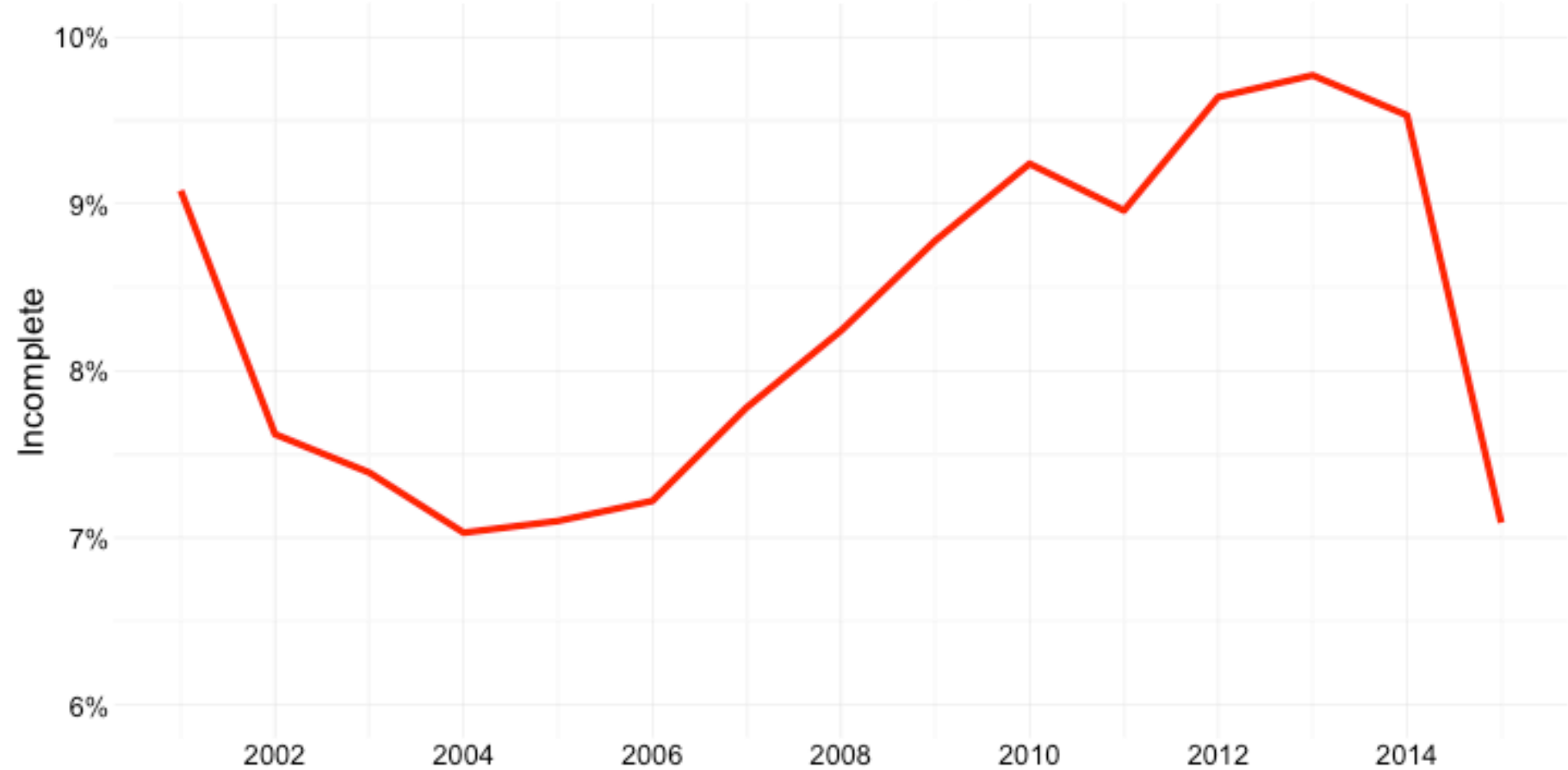
# Length on aligned scale

Immunization in California kindergartens, entire state



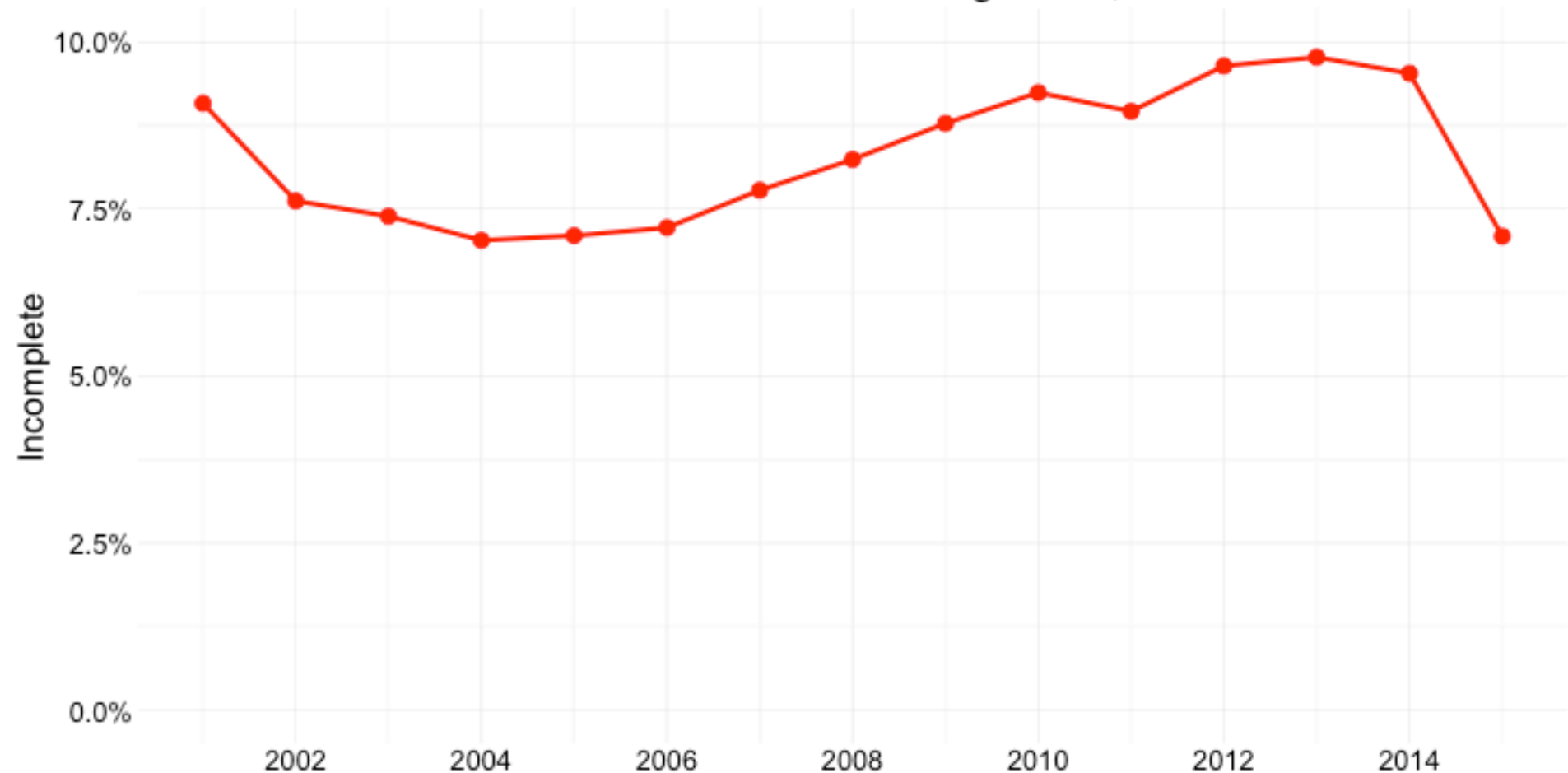
# Slope, note the y axis scale

Immunization in California kindergartens, entire state



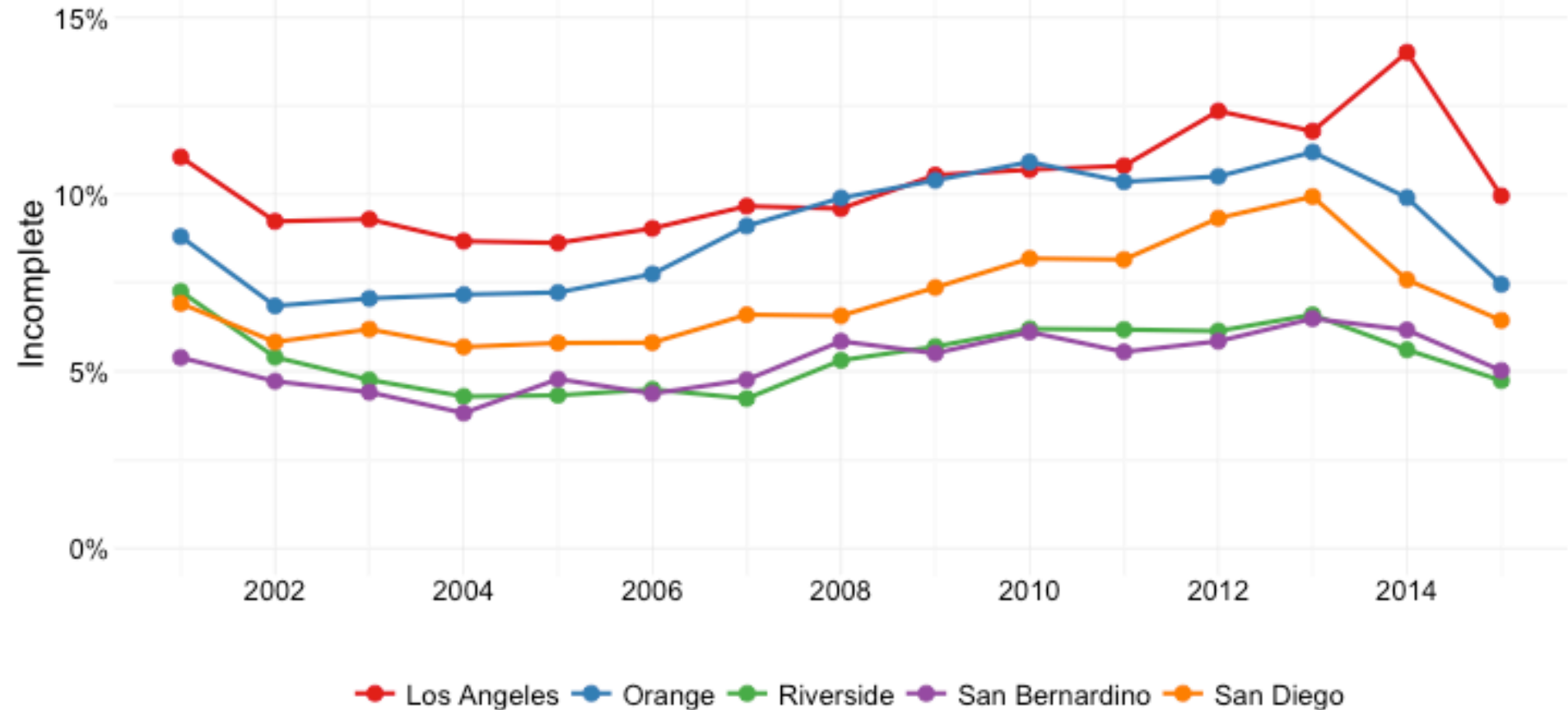
# Position on aligned scale + slope

Immunization in California kindergartens, entire state



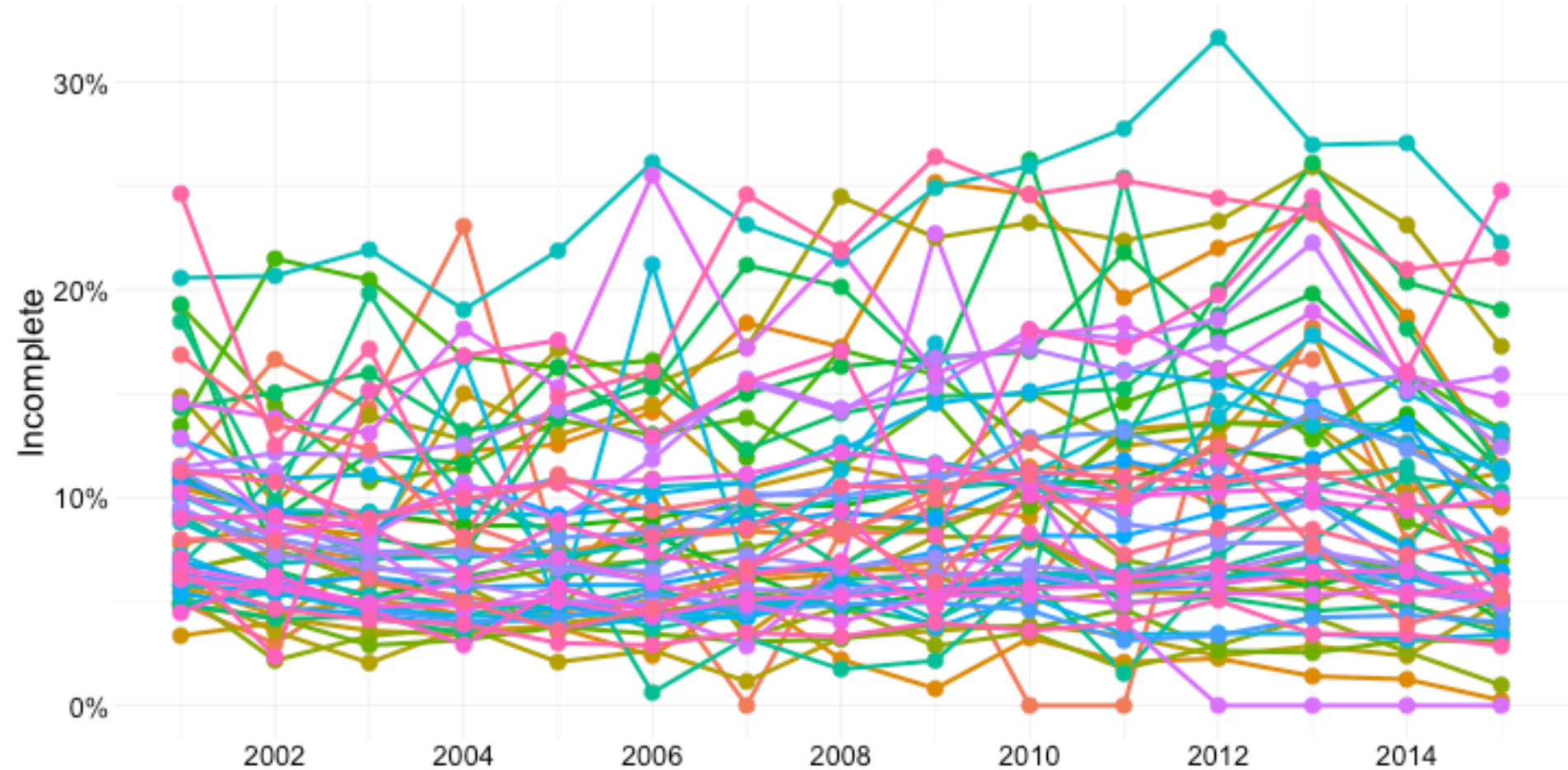
# Several counties

Immunization in California kindergartens  
(five largest counties)

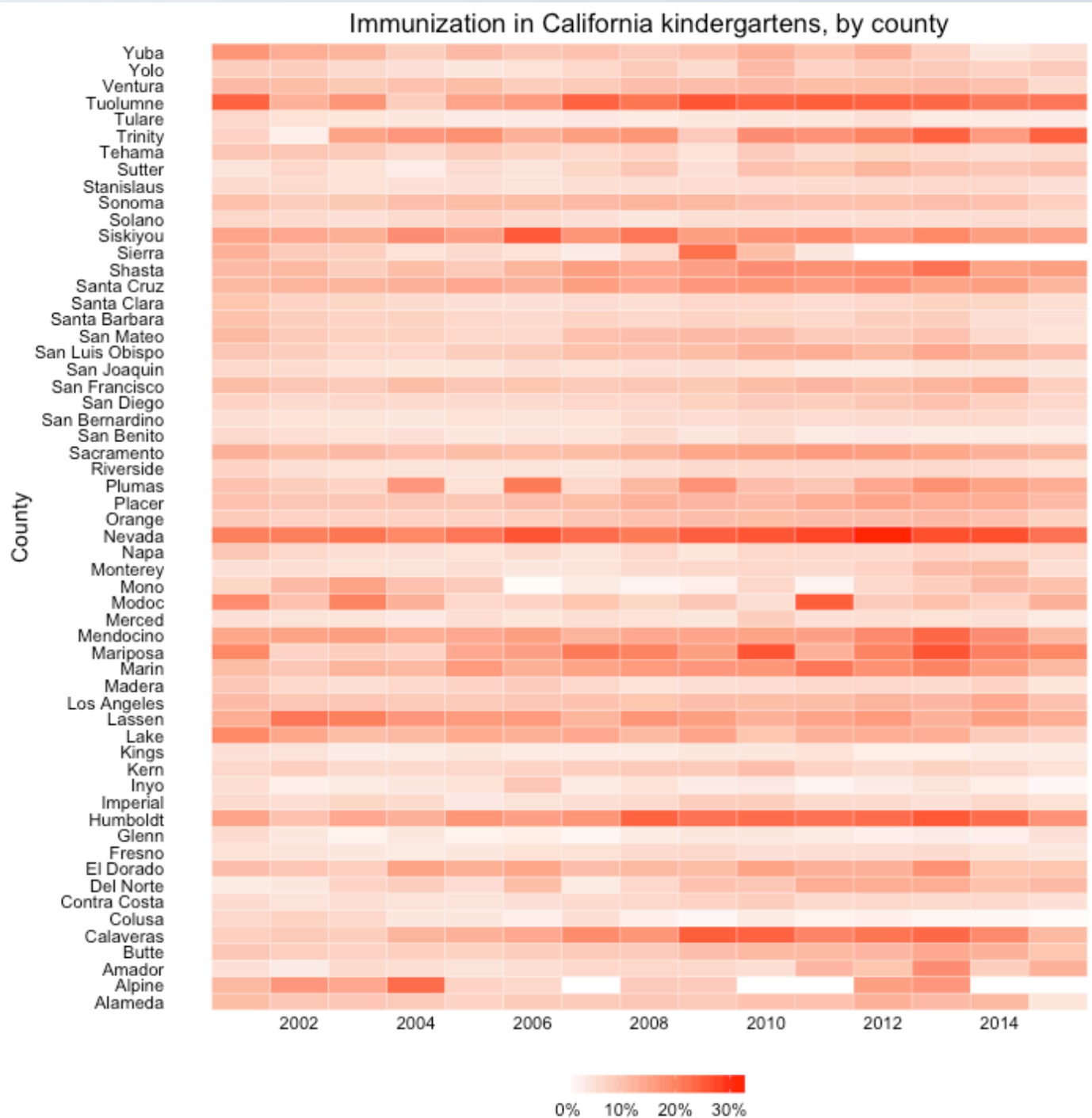


# All the counties: Too many lines, too few colors

Immunization in California kindergartens, by county

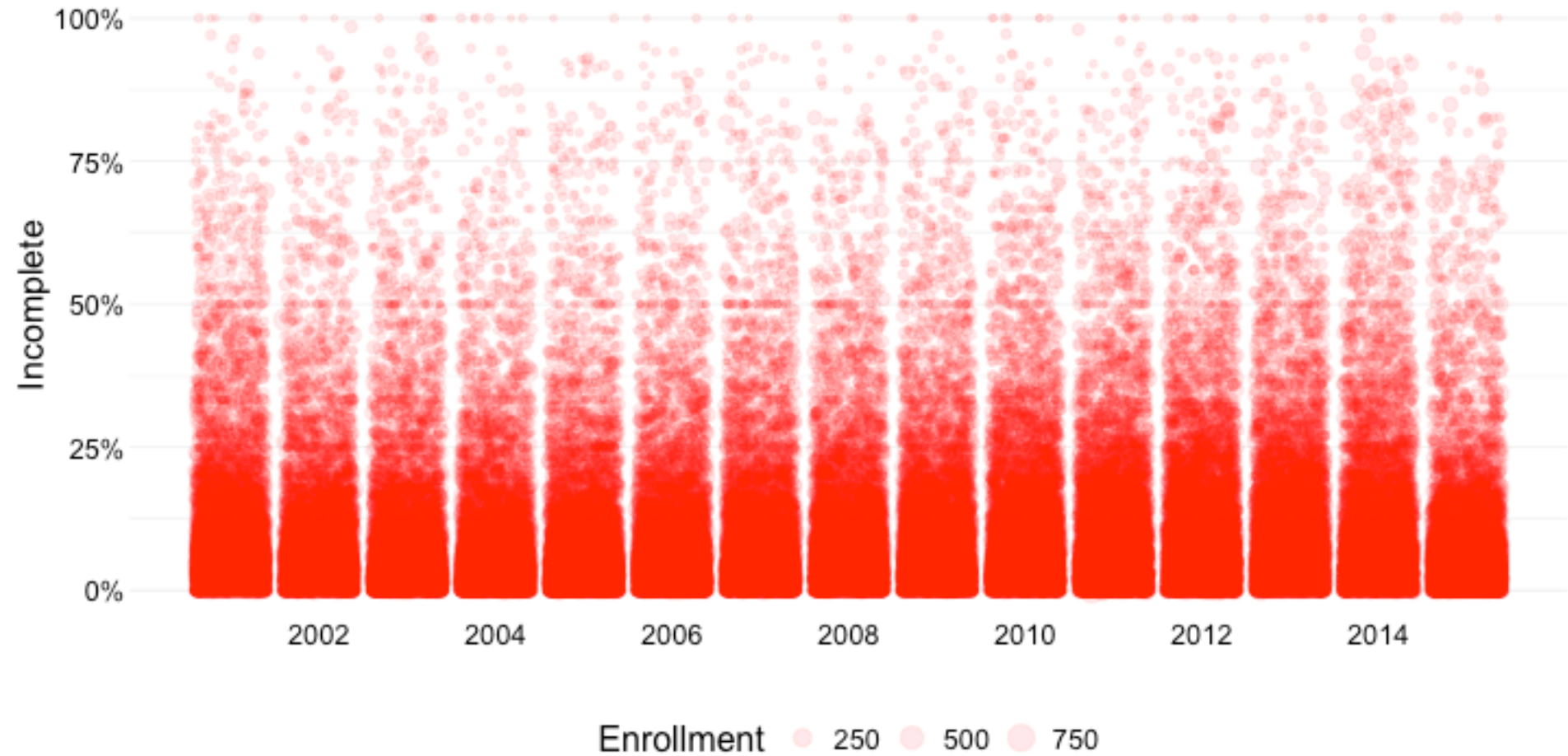


# A solution: color intensity



# All the schools: Position on aligned scale + area

Immunization in California kindergartens





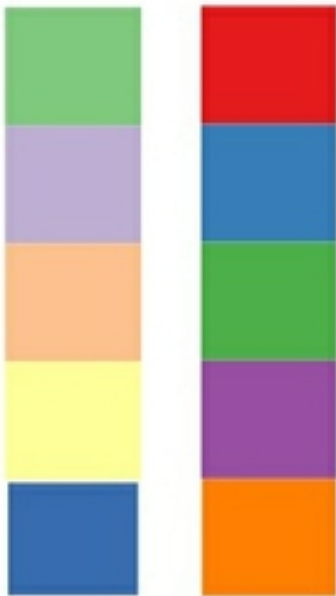
# Using color effectively

# The color wheel



# Using color: fit to your data

Qualitative



Sequential



Diverging



# ColorBrewer is your friend

number of data classes on your map  
3 [learn more >](#)

the nature of your data  
sequential [learn more >](#)

pick a color scheme: BuGn

pick a color system  
229, 245, 249  RGB  CMYK  HEX  
153, 216, 201  
44, 162, 95

adjust map context  
 roads  cities  
 borders

select a background  
 solid color  terrain  
color transparency

[EXPORT YOUR COLORS >>](#)

SCORE CARD

how to use | updates | credits

**COLORBREWER 2.0**  
color advice for cartography

© Cynthia Brewer, Mark Harrower and The Pennsylvania State University

[Support](#)

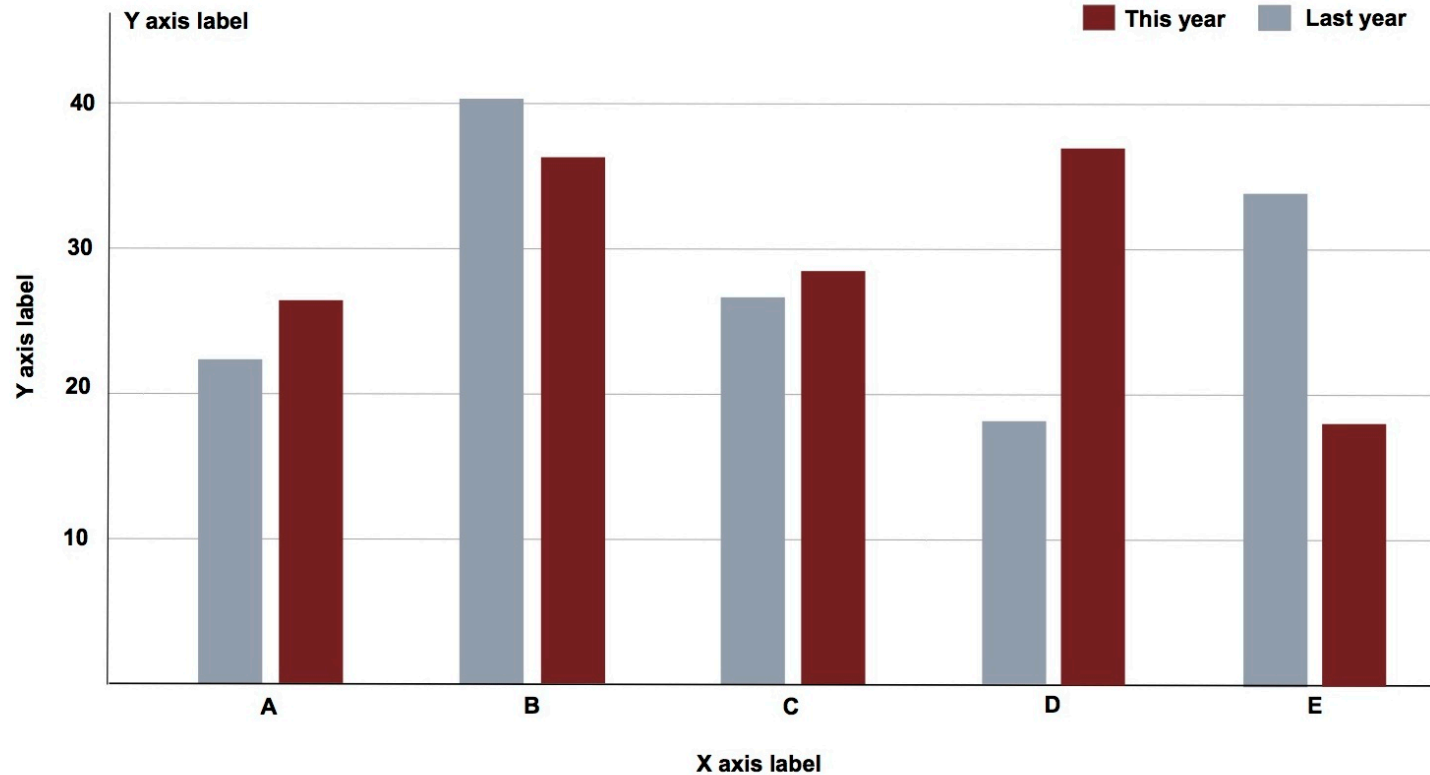
[Back to ColorBrewer 1.0](#)

axm

# Chart furniture

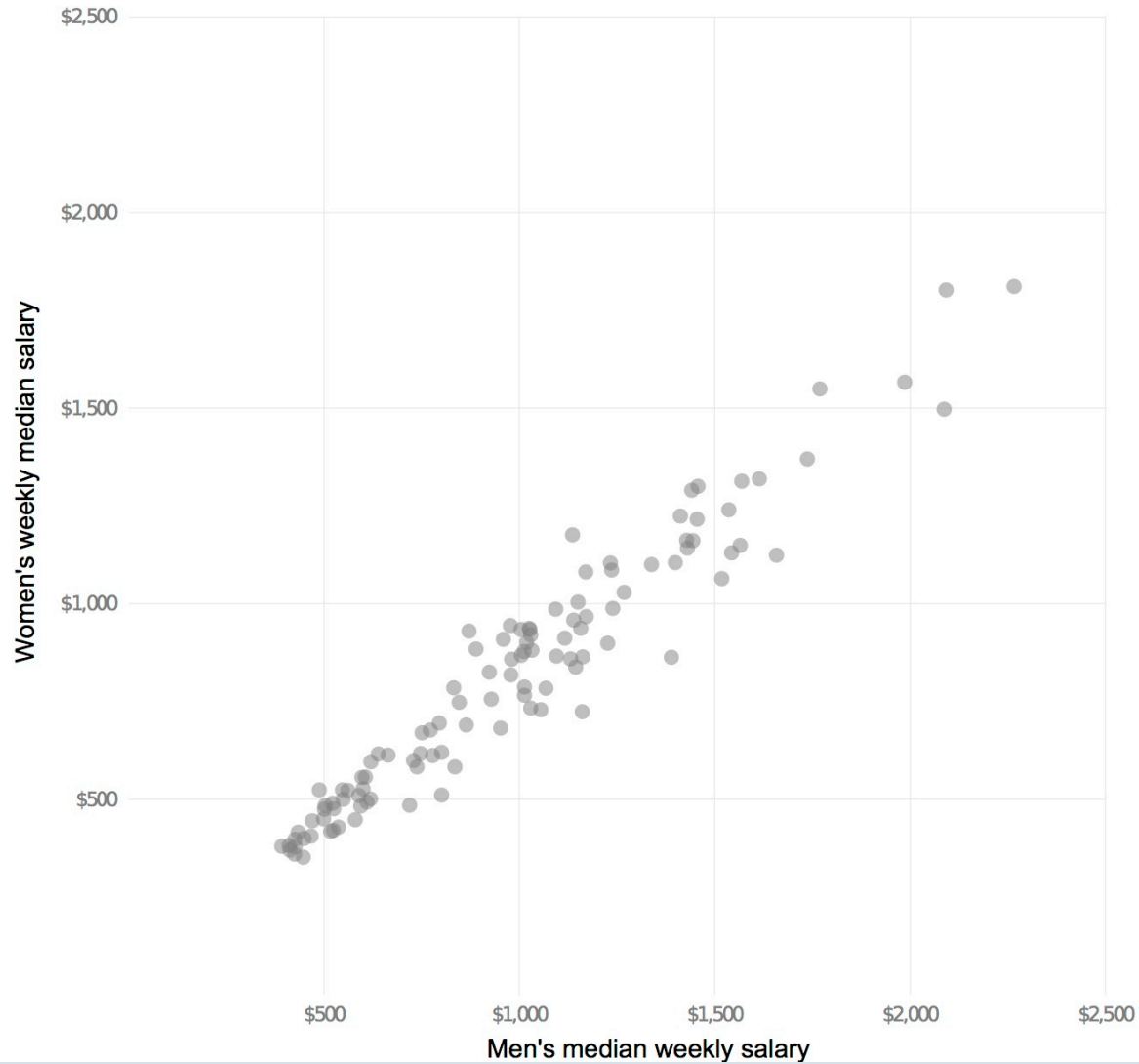
## A title for the chart

And a subtitle, telling us some more about what it shows.

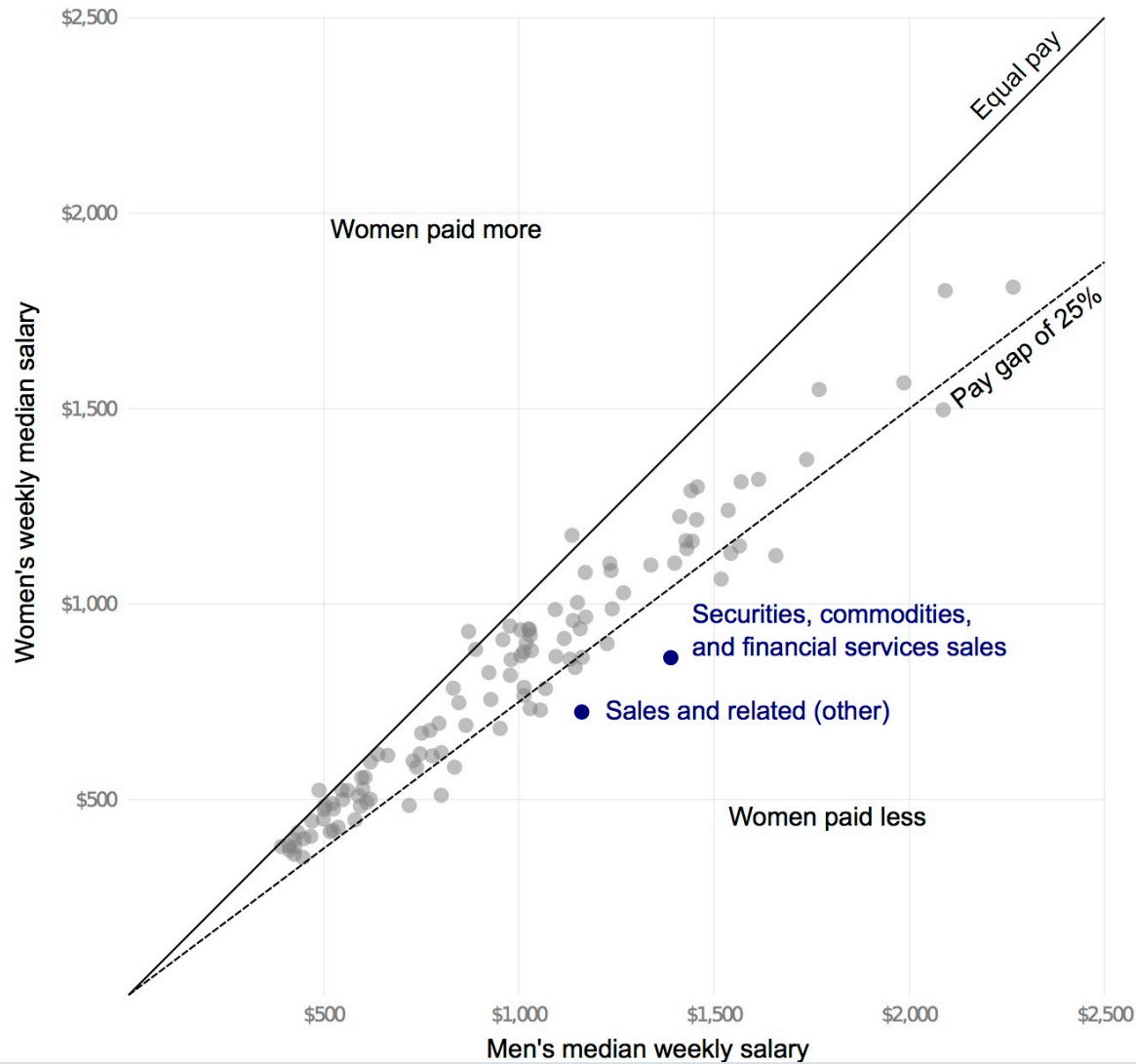


*Source information*

# Highlight the story: labels and annotation



# Highlight the story: labels and annotation



**When in doubt:**

**keep it clean, clear and simple!**

**(But aim for clarity over simplicity)**



# Experiment! Sketch!

That may be how you find the story

Show people. If they're confused, try another approach

# Recommended reading

