

Paul Rosen

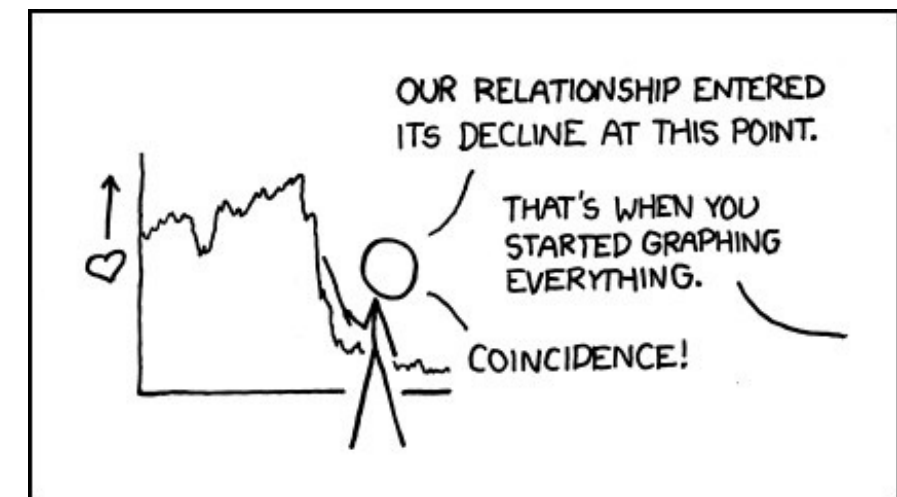
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# Visualization for Data Science

## DS-4630 / CS-5630 / CS-6630

### How to Critique a Vis

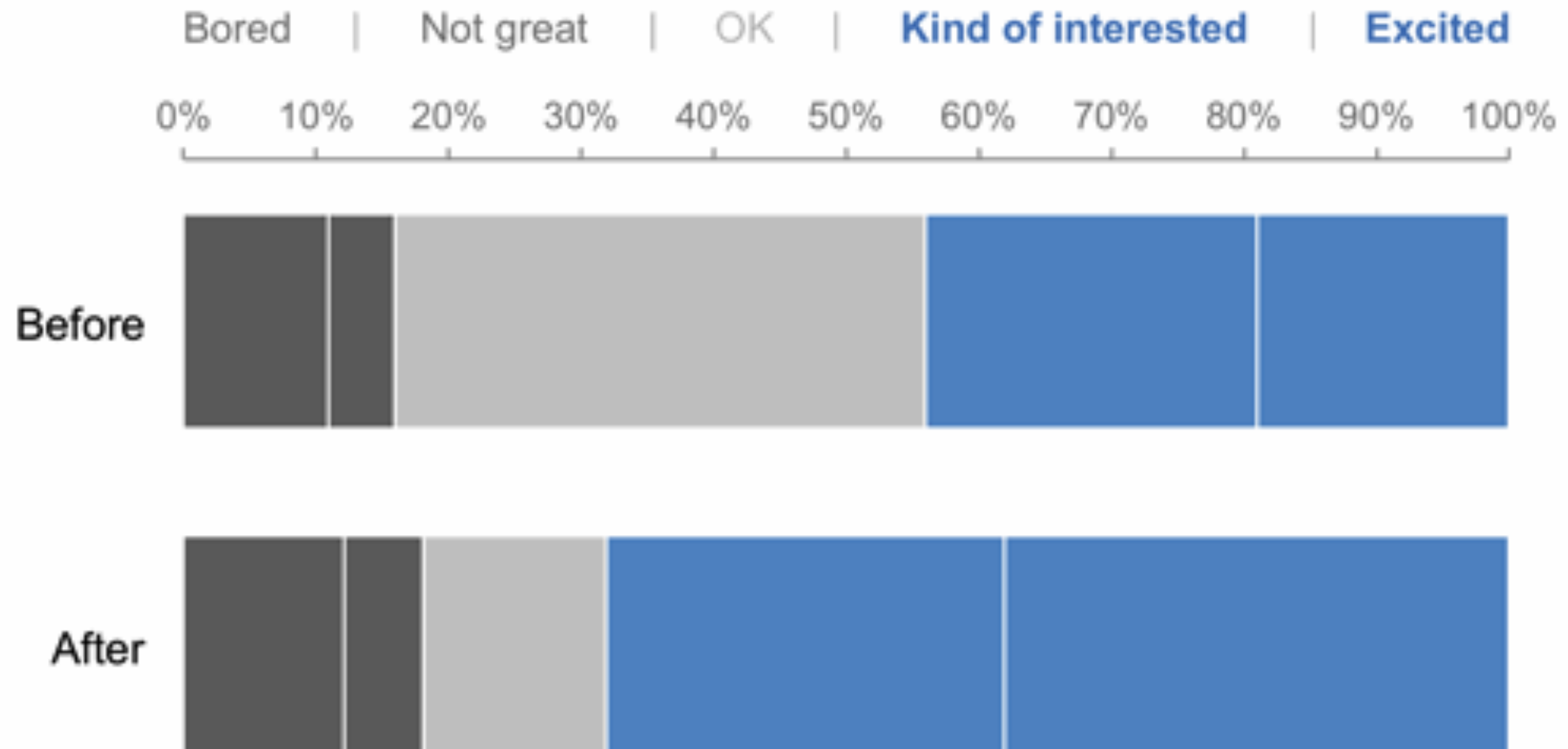


[xkcd]

# 1. Identify Data, Tasks / Intentions

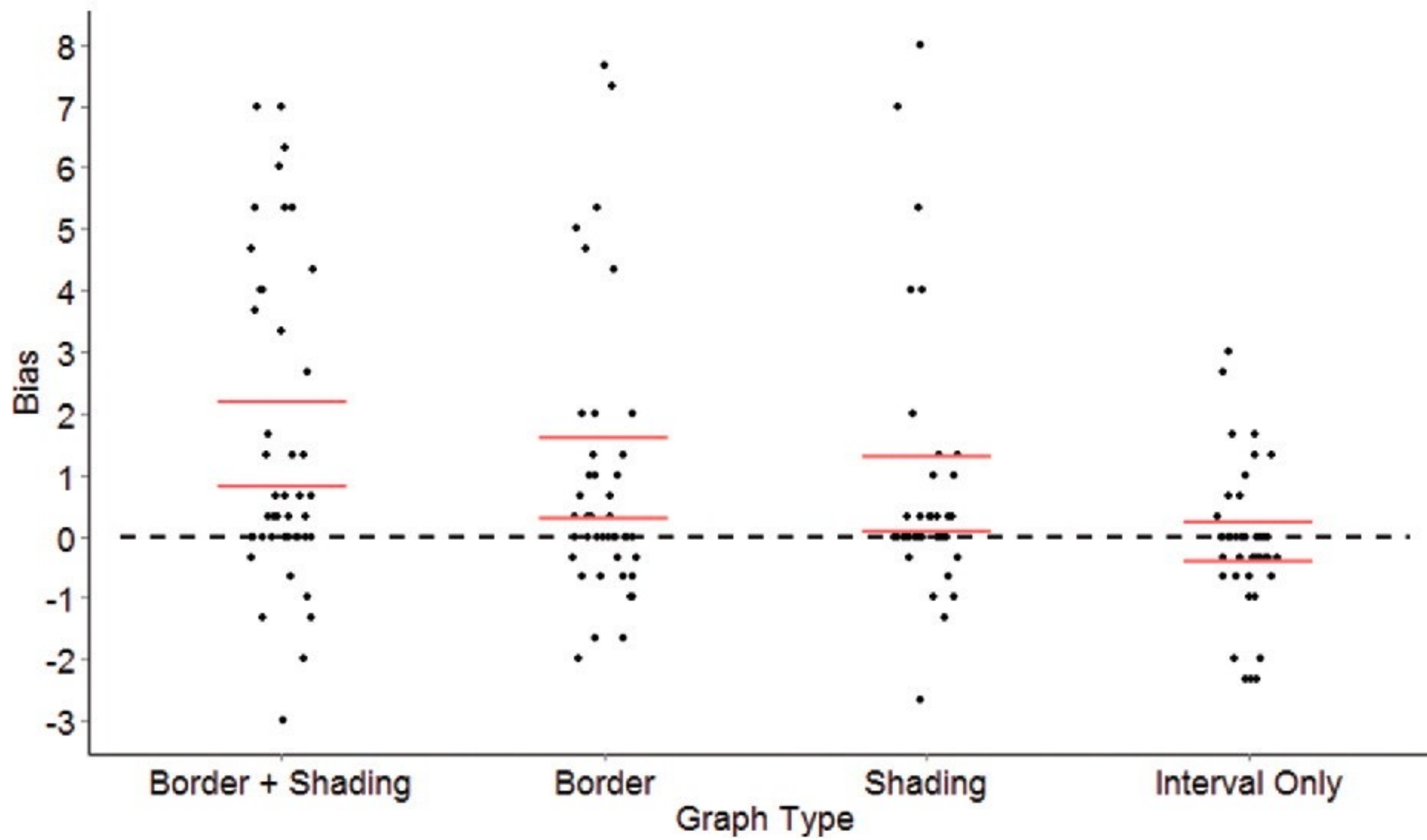
- E.g., quantitative, time-series -> change over time qualitative labels (often supplementary) quantitative, two conditions -> compare
- ....

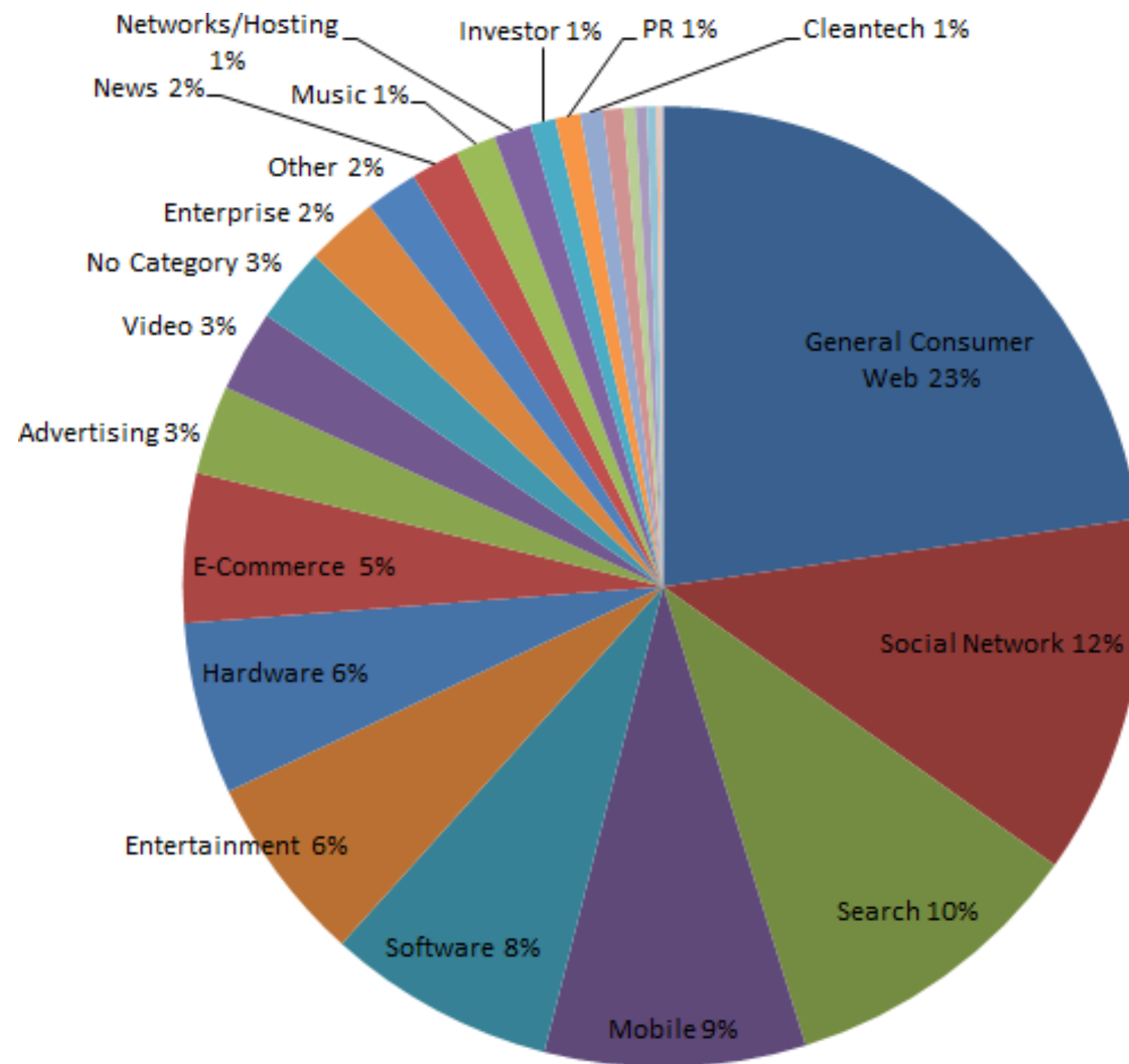
# How do you feel about science?



## 2. Identify Marks, Channels

- Mark: encodes “existence” of item
- point, line, shape, ...
- Channels: encodes “magnitude of dimension associated with an item”
- position, size, saturation, color, ...





Share of coverage on TechCrunch

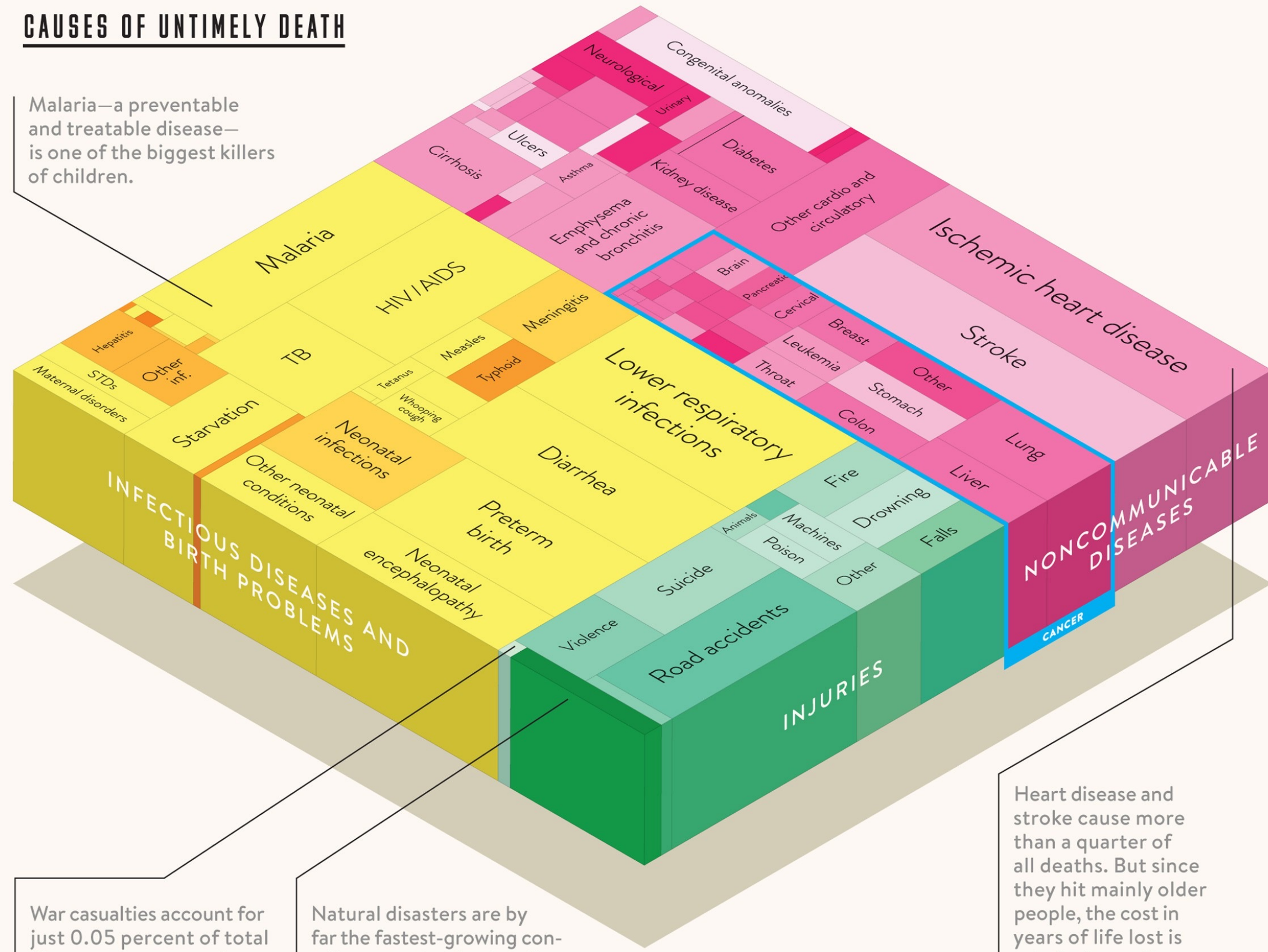
Cole Nussbaumer

[www.storytellingwithdata.com/2011/07/death-to-pie-charts.html](http://www.storytellingwithdata.com/2011/07/death-to-pie-charts.html)



# CAUSES OF UNTIMELY DEATH

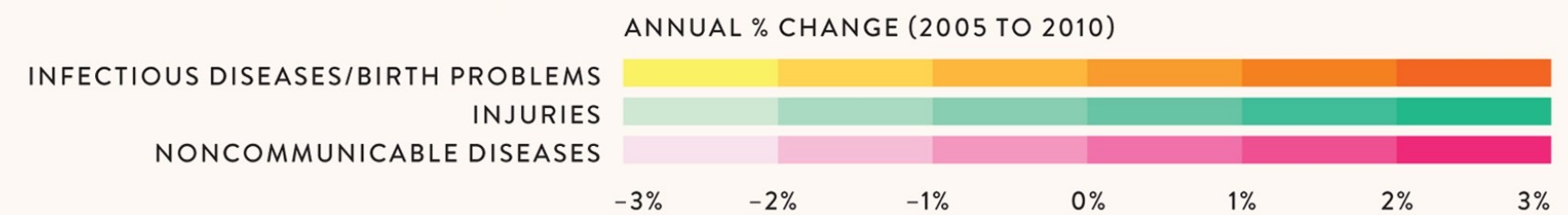
Malaria—a preventable and treatable disease—is one of the biggest killers of children.



War casualties account for just 0.05 percent of total life-years lost annually.

Natural disasters are by far the fastest-growing contributor to the death toll.

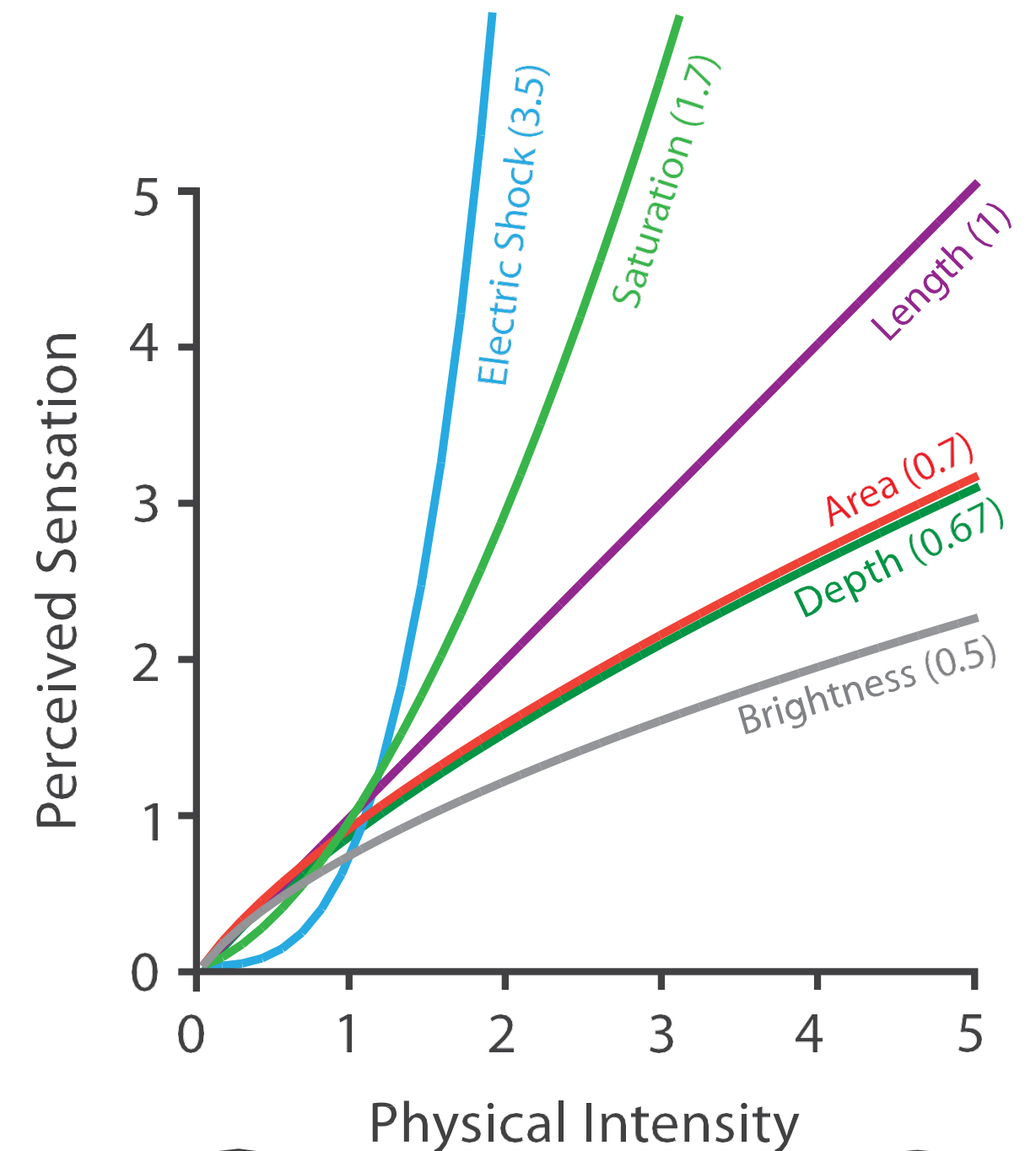
Heart disease and stroke cause more than a quarter of all deaths. But since they hit mainly older people, the cost in years of life lost is relatively small.



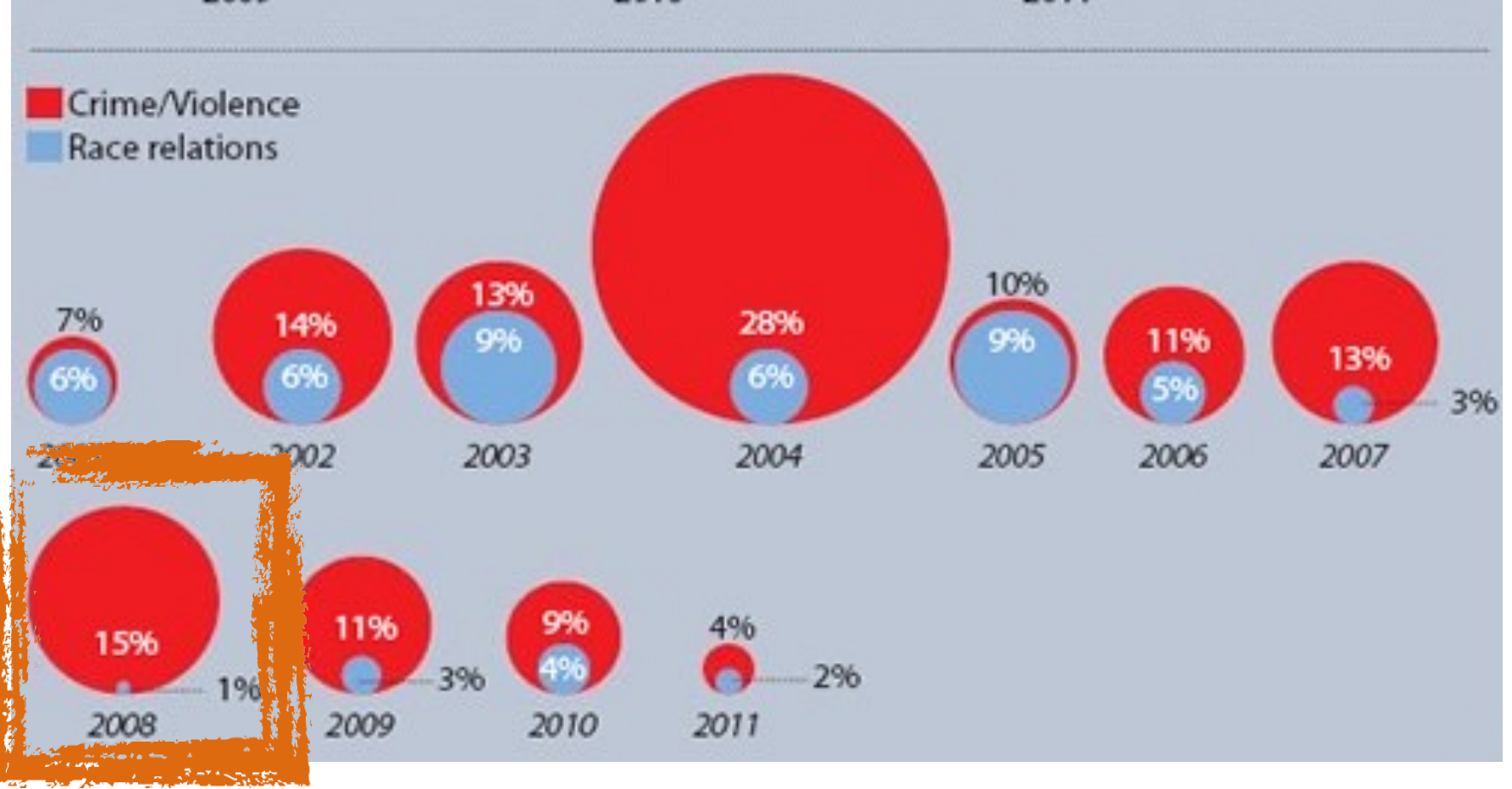
# 3. Is Effectiveness Principle Followed?

Steven's Psychophysical Power Law:  $S = I^N$

- Use the Best Visual Channel Available for the Most Important Aspect of your Data
- Are all visual channels appropriate?

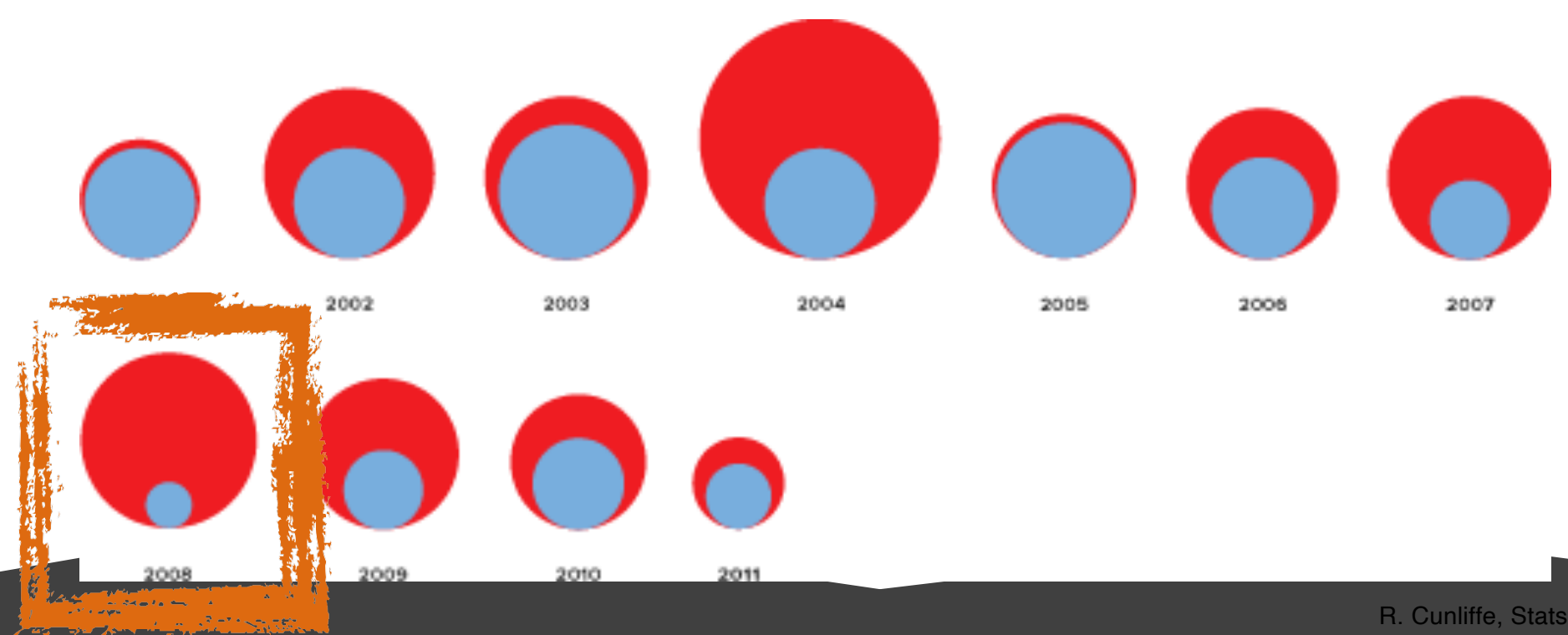


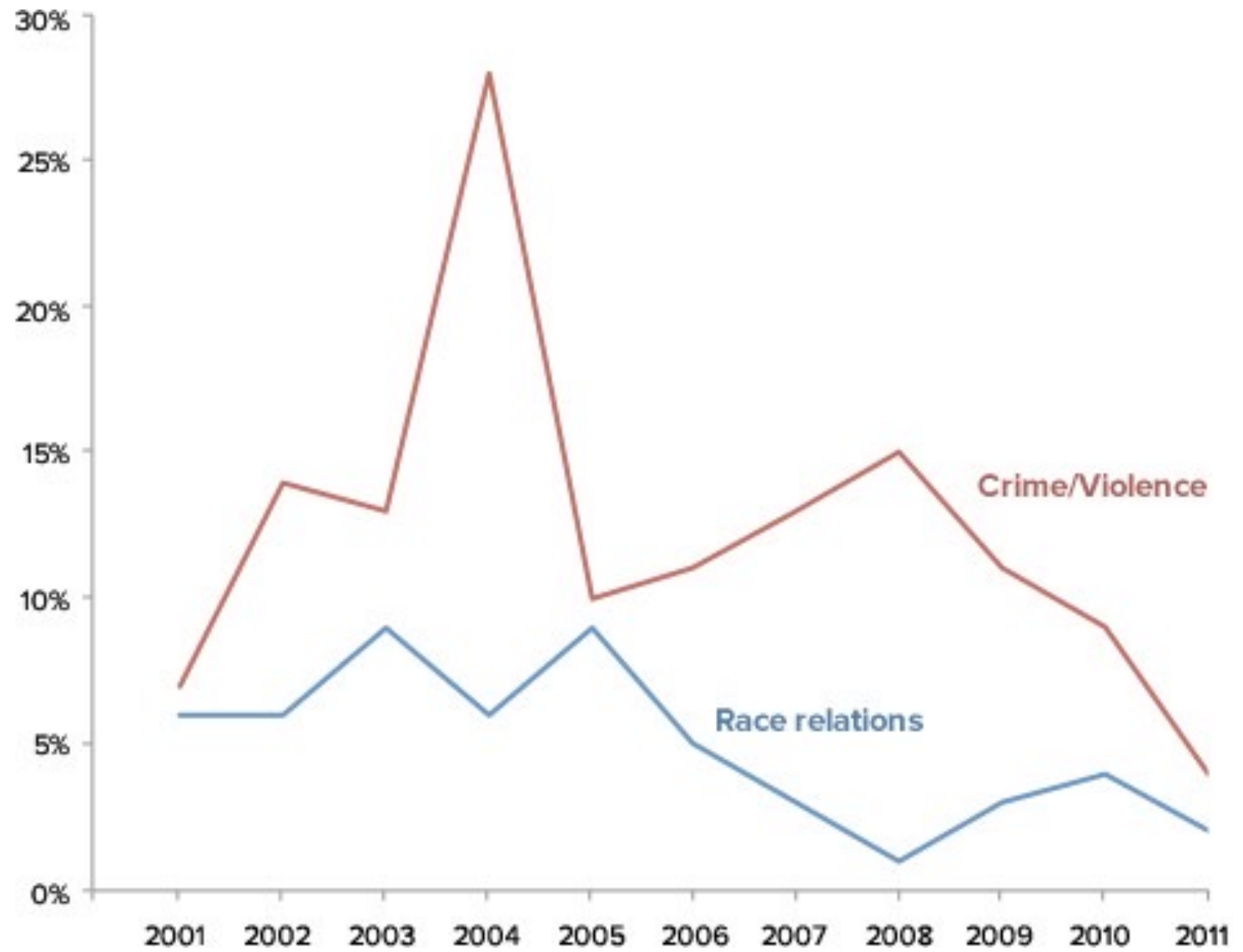




Quantity encoded by diameter, not area!

Fixing that:



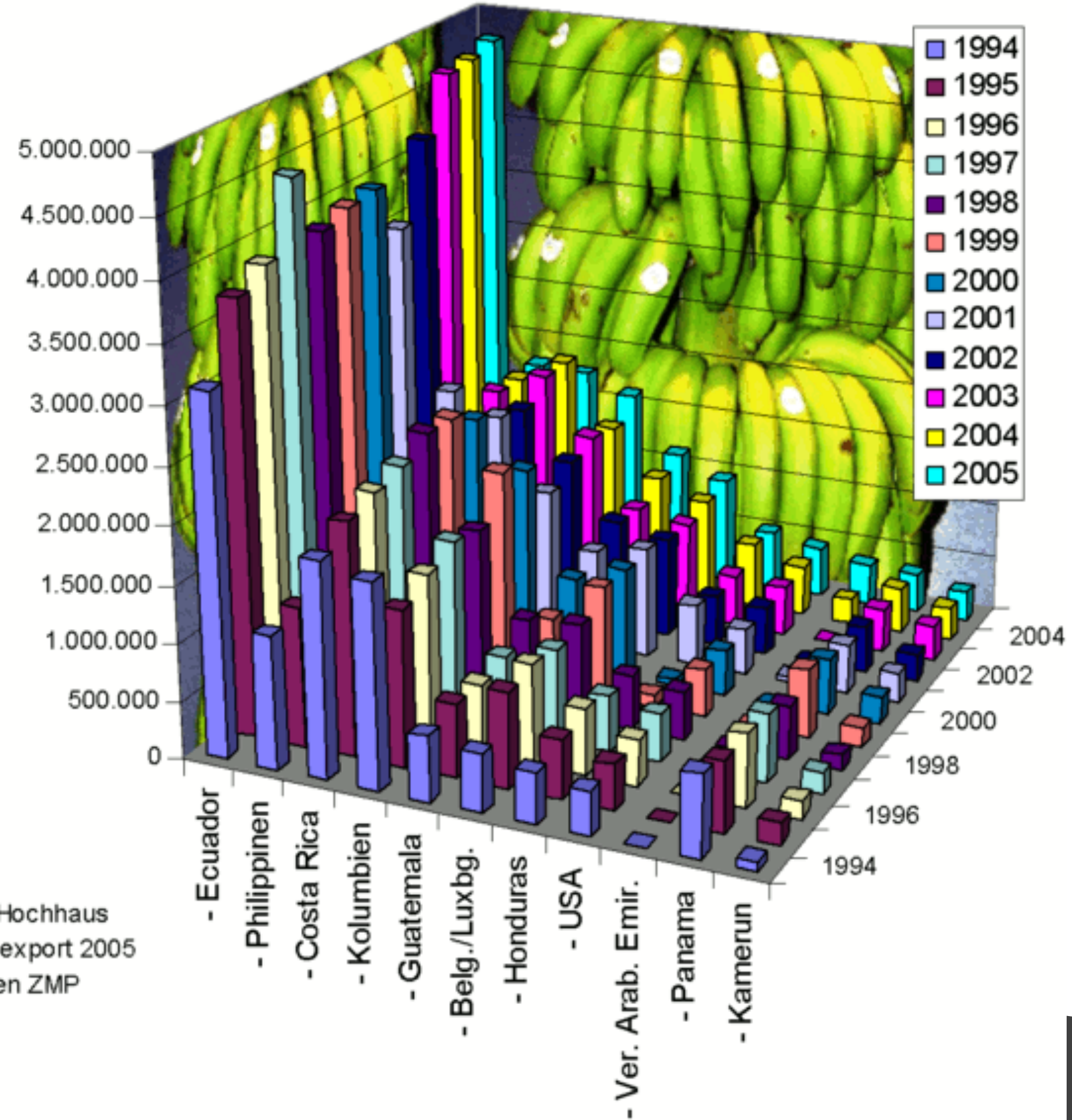


R. Cunliffe, Stats Chat

## 4. Is the Expressiveness Principle Followed?

- The visualization should show all of the data, and only the data
- If there are violations, are they justified (useful chart junk)?

### Export von Bananen in Tonnen von 1994-2005



Dr. Hochhaus  
Banexport 2005  
Daten ZMP

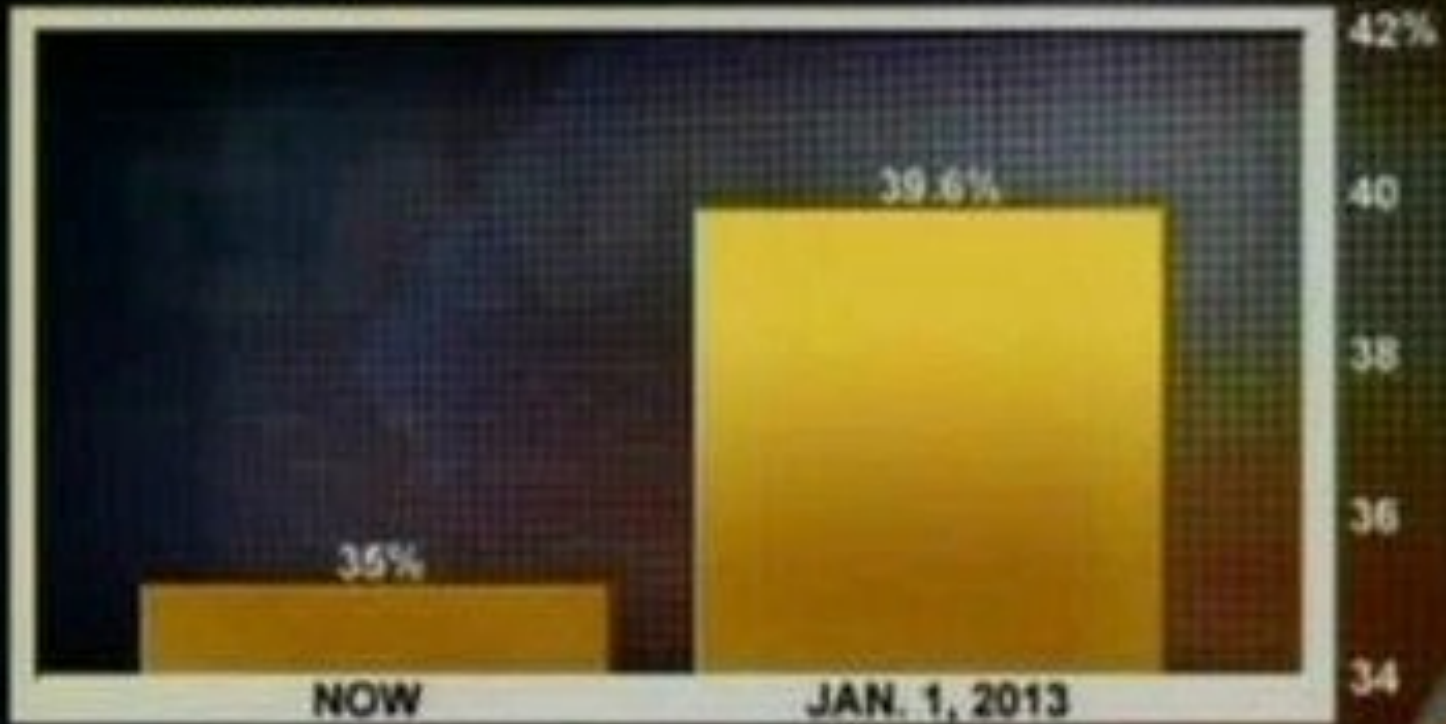
# 5. Scales

- Are the scales appropriate?



# IF BUSH TAX CUTS EXPIRE

TOP TAX RATE



8:01 p ET

**FOX**  
BUSINESS

TOP STORIES

TECHNOLOGY

CONSUMER

WITH THE JUSTICE DEPARTMENT AND ACQUIRES FULL T

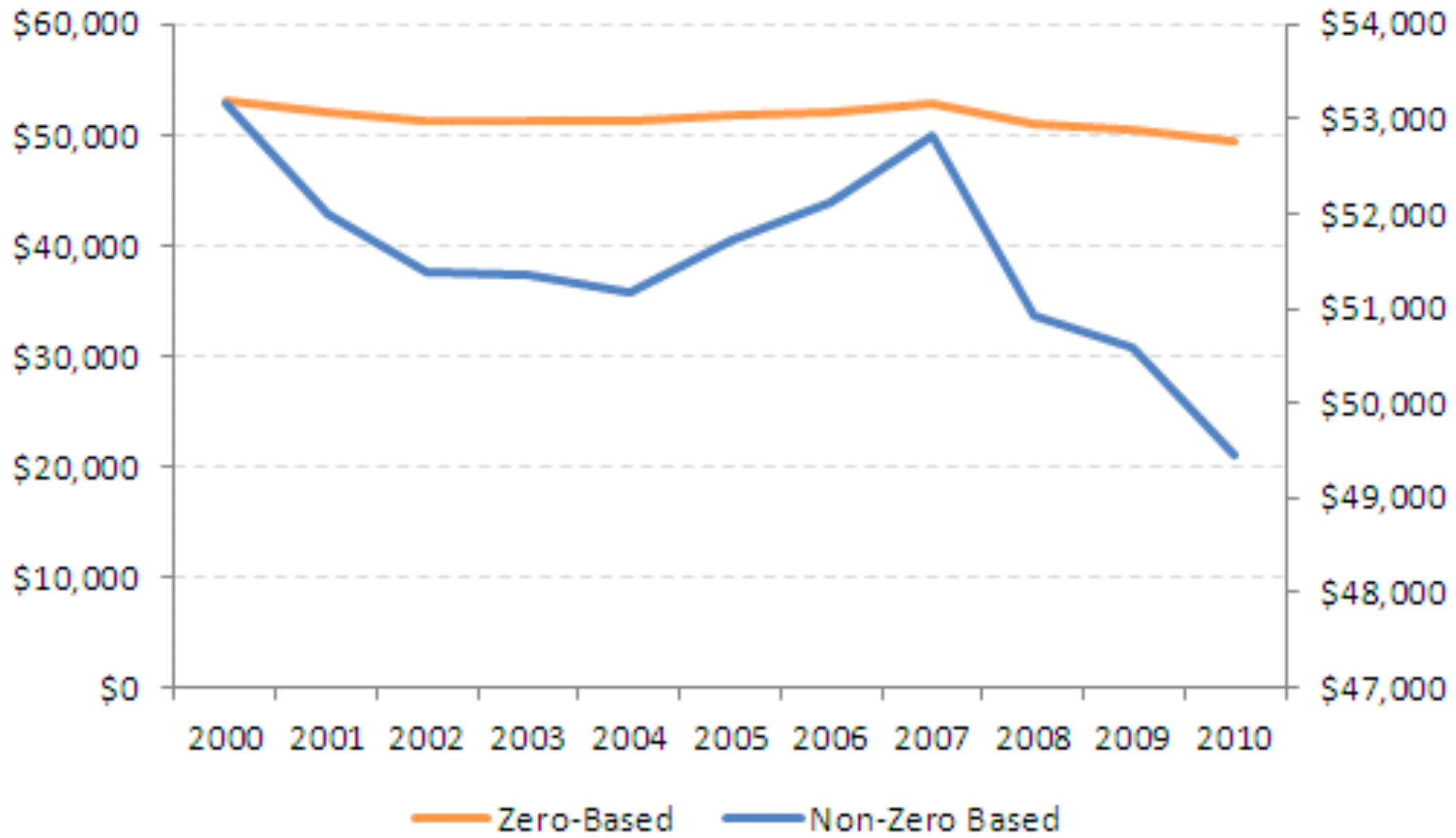
DOW 13008.68  $\nabla$  64.33

S&P 1379.32  $\nabla$  5.98

NASDAQ 2939.52  $\nabla$  6.32



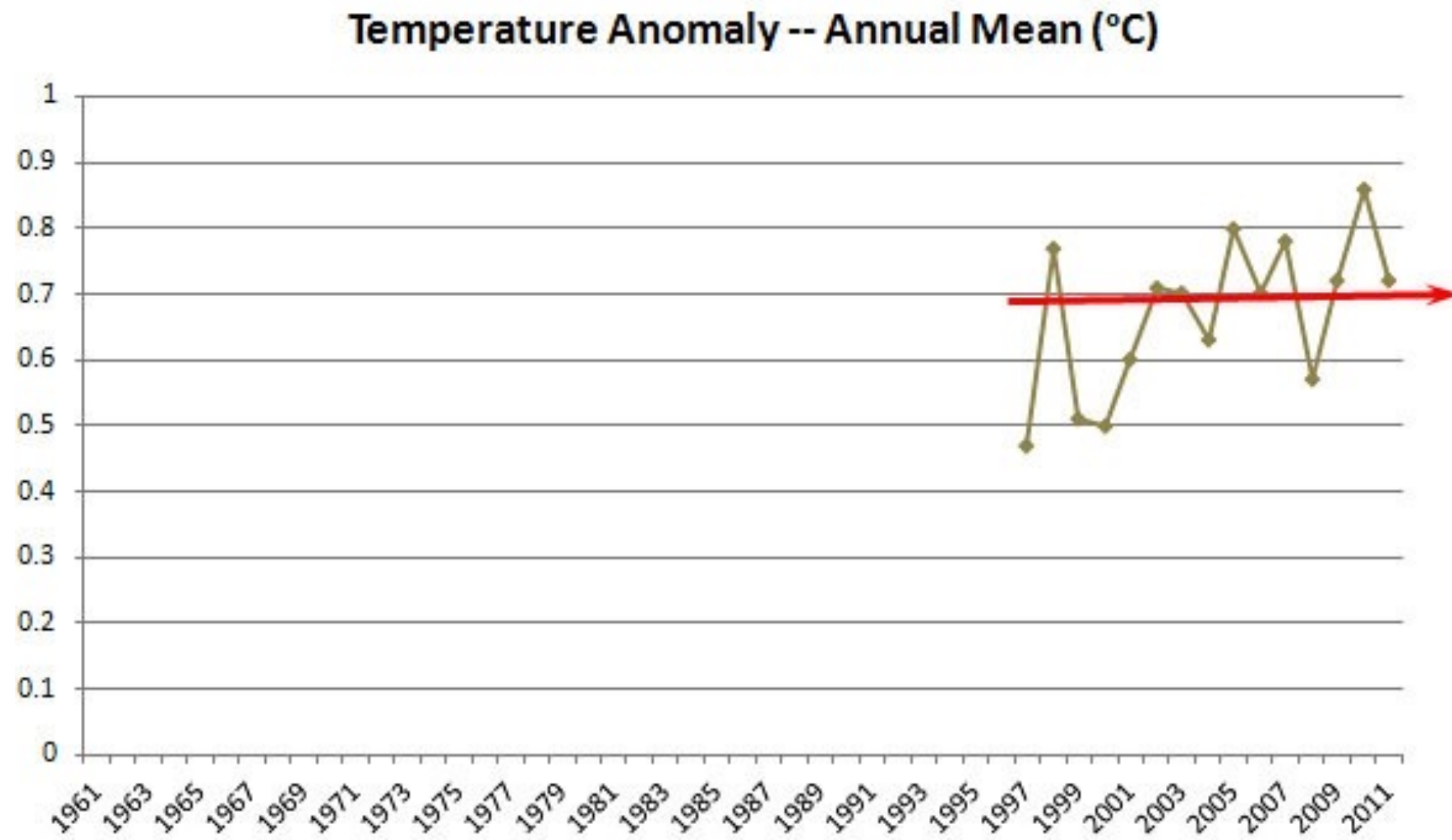
**Median household income in 2010 inflation adjusted dollars**



# 6. Context

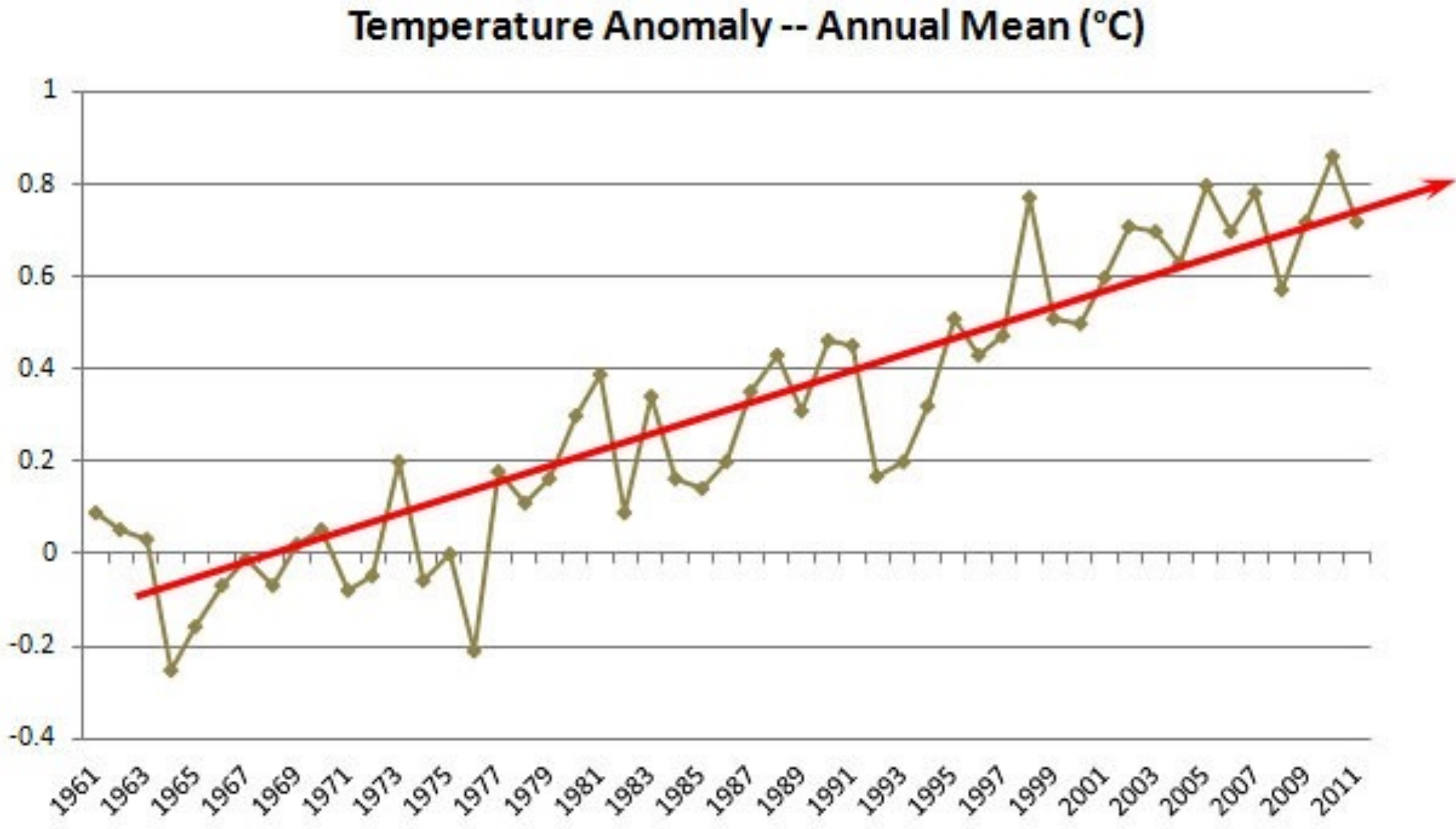
- Is the data shown in the appropriate context

# Global Warming?



Mother Jones

# Global Warming - Frame the Data



Mother Jones

# 7. Would derived data be better?

- E.g., show change instead of absolute values Show distribution instead of data points

# 8. Other Guidelines

- No Unjustified 3D
- Time progresses linearly
- Perception: color, colorblindness, shadows, etc. Use of gestalt principles
- Use of popout
- Use of interaction / animation Appropriate legends, labels



# Design Critique: COVID Spiral

1. What is the data shown in this visualization?
2. What might be the intention of the author?
3. What are the marks, what are the channels?
4. Is the Effectiveness Principle Followed? (best visual channel used?)
5. Is the Expressiveness Principle Followed? (just data, or also useful embellishments?)
6. Are the scales / legends appropriate?
7. Is the context appropriate?
8. Is the spiral layout appropriate?
9. What about color?
10. Why do you like / dislike this visualization?
11. Can you suggest any improvements? How would you redesign it?

