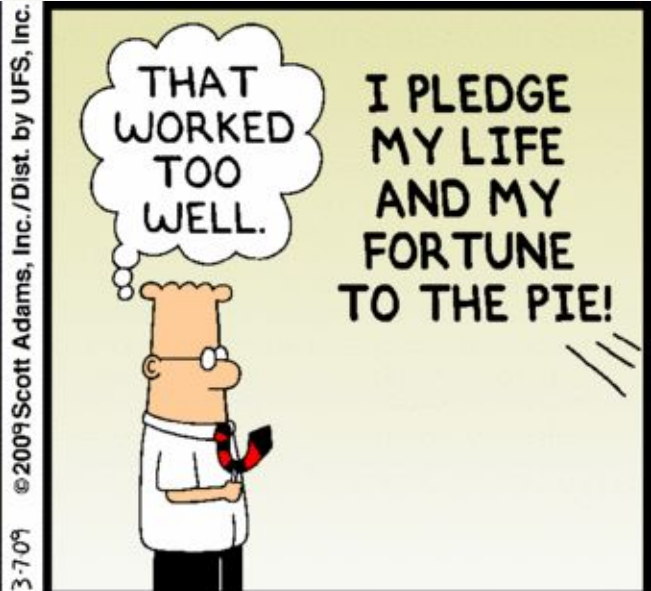
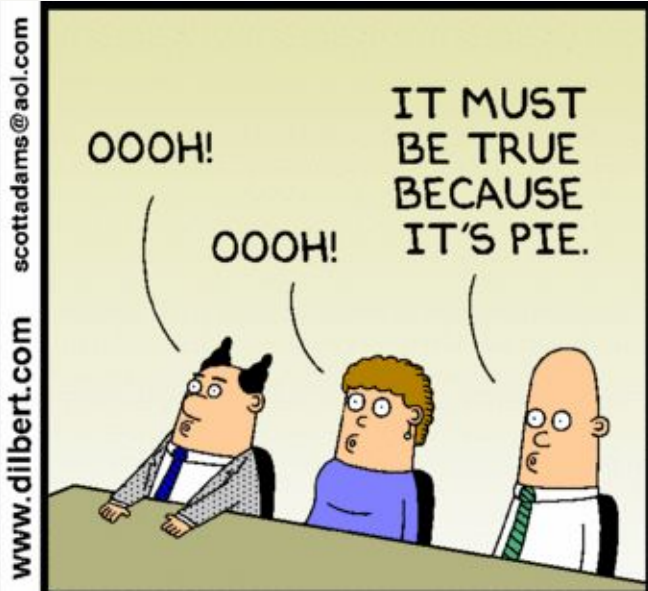
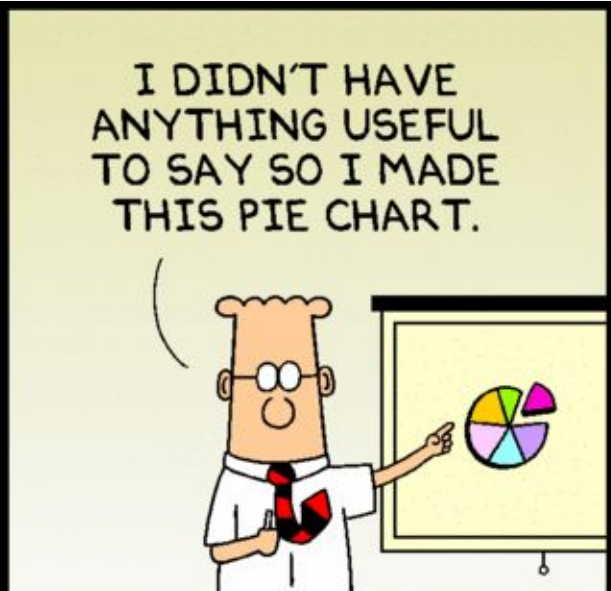


How To Draw A Really Bad Graph

Chris Harbron
PSI Conference June 2024



www.dilbert.com
scottadams@aol.com

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3-7-09

Why Worry? - Because Graphs Are Persuasive

Researchers compared the share of people persuaded by a verbal description of a drug trial (68%) with the share of those persuaded when a chart adding no new information was included (97%)

Source : *“Blinded With Science: Trivial Graphs and Formulas Increase Ad Persuasiveness and Belief in Product Efficacy”* by Aner Tal and Brian Wansink

Why Worry? - Because Graphs Are Persuasive

Researchers compared the share of people persuaded by a verbal description of a drug trial (68%) with the share of those persuaded when a chart adding no new information was included (97%)

Proportion of people who were persuaded by the information



Source : “Blinded With Science: Trivial Graphs and Formulas Increase Ad Persuasiveness and Belief in Product Efficacy” by Aner Tal and Brian Wansink

Doesn't it!



People and their responses are predictable

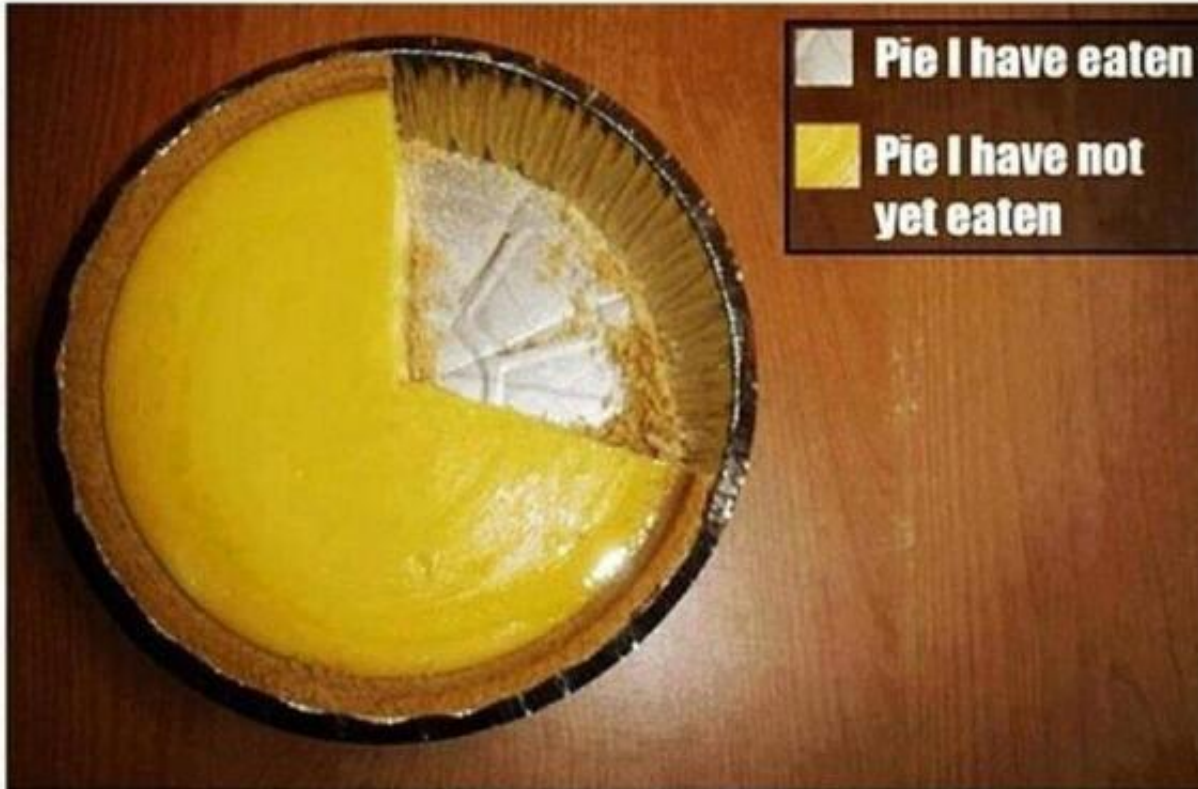
Oh yes they are

The order you're reading this proves my point

How To Draw A Really Bad Graph

**Whenever Possible :
Use A Pie Chart**

A Good Pie Chart



It's a Pie!
Logically labelled
Raw Data
I can see Details
- crumbs
- second cut



No Scale
No Sense of Depth

How much pie is left???

An Unacceptable Pie Chart

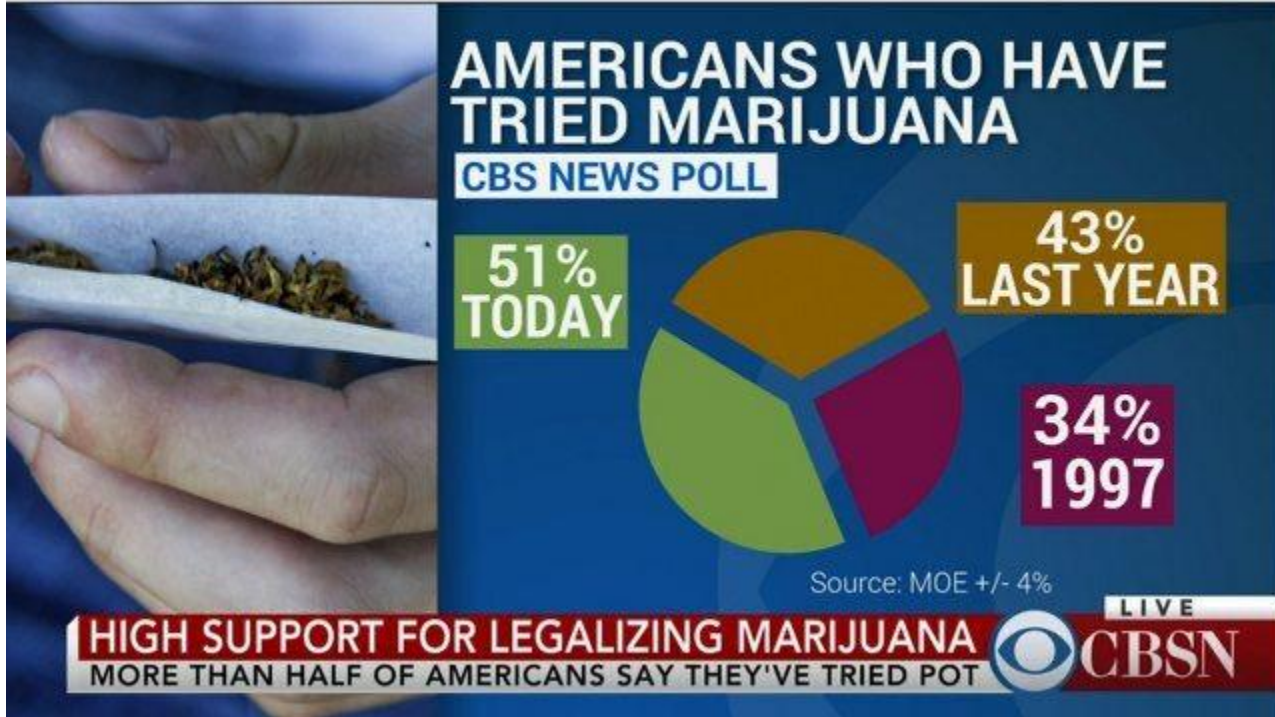


It's a Lot of Pies!
Clear Labels
Kidderminster's
Aggborough Pie is a Thing
of Wonder



This just isn't what a pie chart is meant to do

Just Say No : Never Smoke and Graph



Clear Labels
(Despite everything, I still know what's going on)



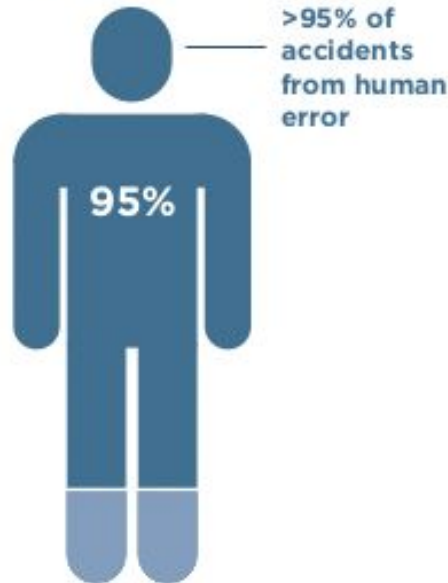
Everything else

Other Shapes Are Available

Avoid Gimmicks

DEATHS AND INJURIES/
YEAR ON ROAD

30,000 deaths in accidents
and 4X as many disabling
injuries²



Adding a picture increases
engagement



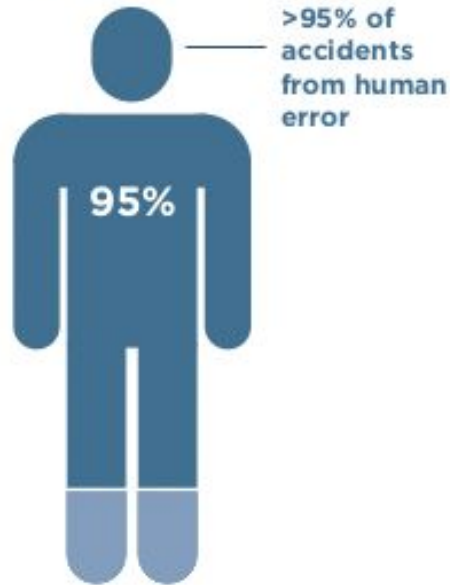
Not to scale
Why are feet the only part of the
body that doesn't cause an
accident?

Other Shapes Are Available

Avoid Gimmicks

DEATHS AND INJURIES/
YEAR ON ROAD

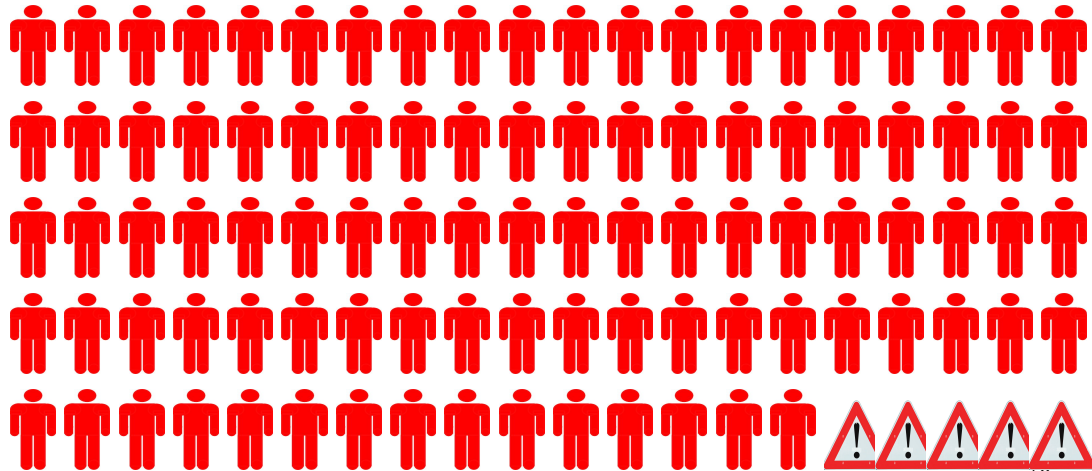
30,000 deaths in accidents
and 4X as many disabling
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Adding a picture increases engagement



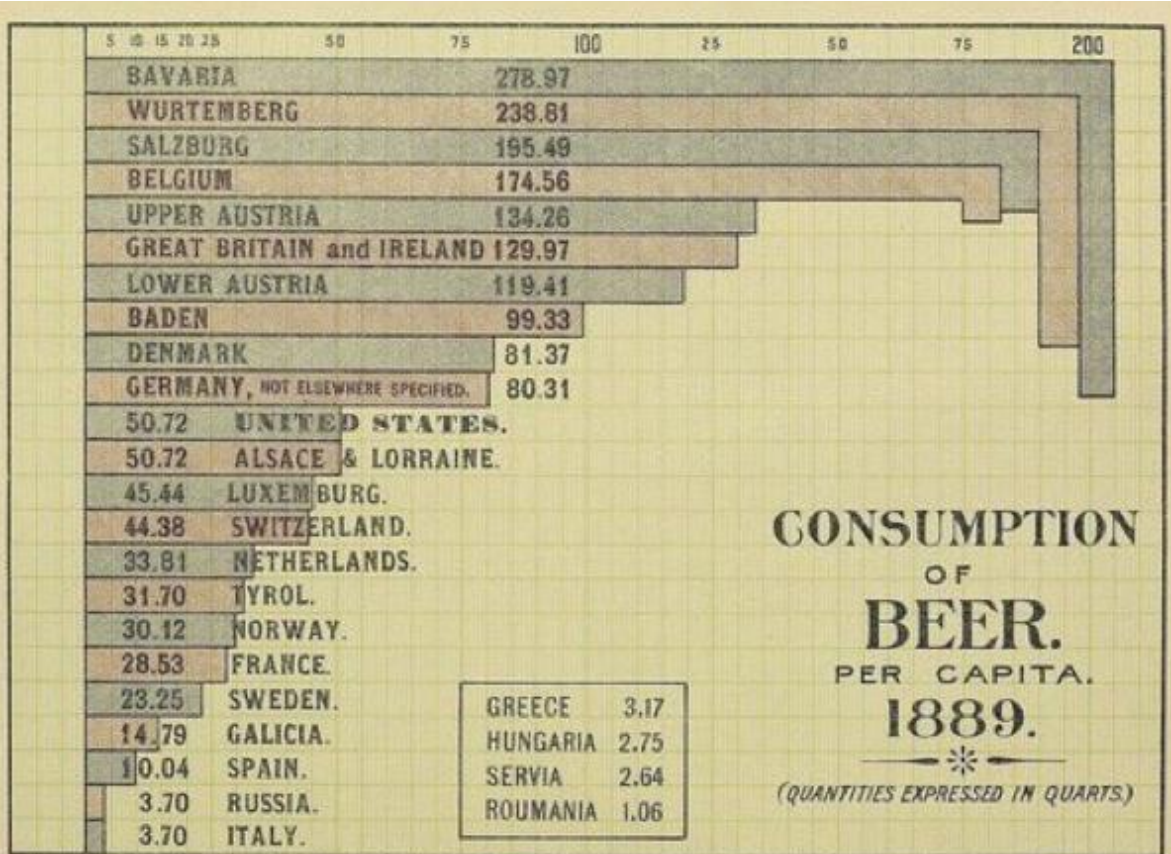
Not to scale
Why are feet the only part of the body that doesn't cause an accident?



How To Draw A Really Bad Graph

**Just Throw Something Together
Anything Will Be Good Enough**

Never Plan Ahead - What Could Go Wrong?

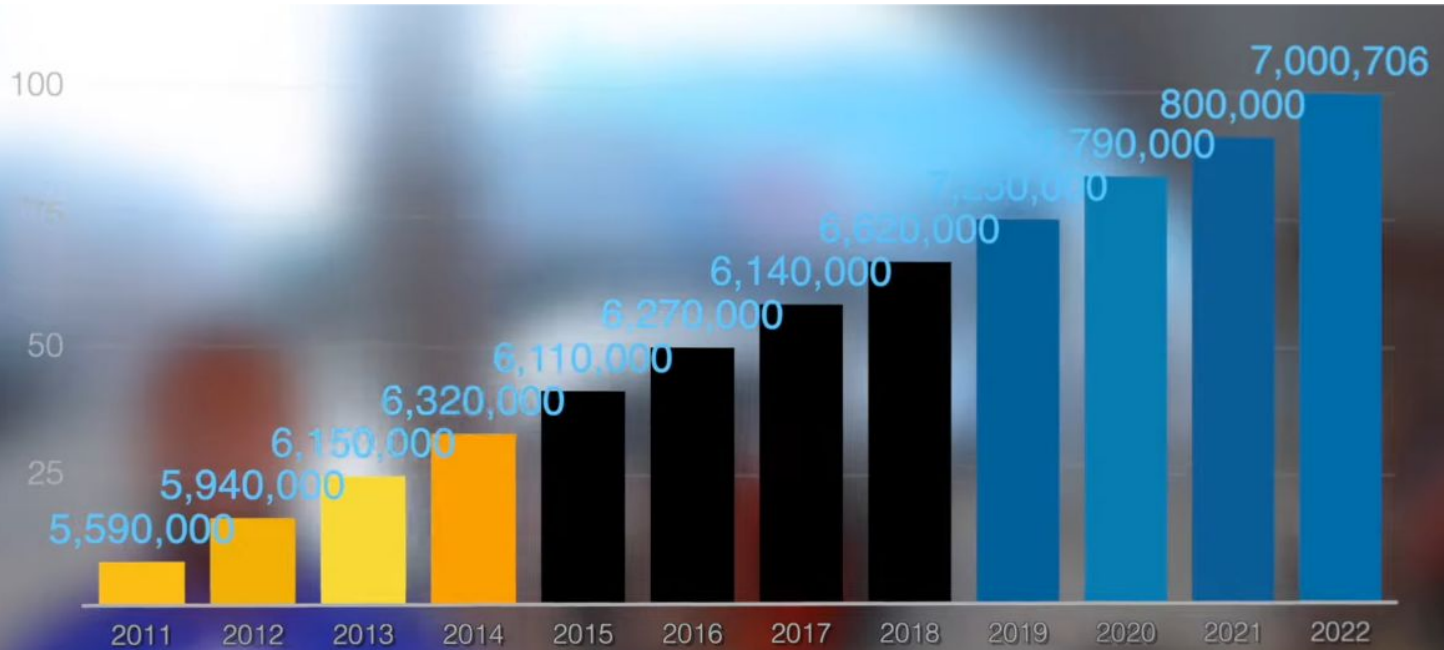


Clearly Labelled



“I never thought Bavarians could drink that much”

Never Ask A Friend For Feedback - They Might Just Provide It



Nothing



Everything

The Bahamas Tourism Statistics

How To Draw A Really Bad Graph

**Add Complexity To Make Life
As Difficult As Possible For
Your Audience**

If You Try Hard Enough, You Can Fit Everything On One Graph

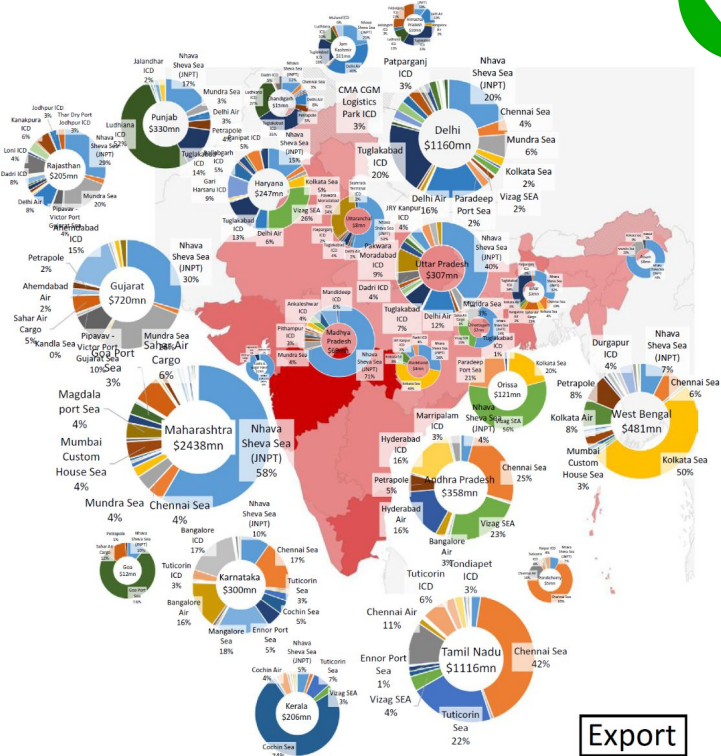
Embrace The Clutter



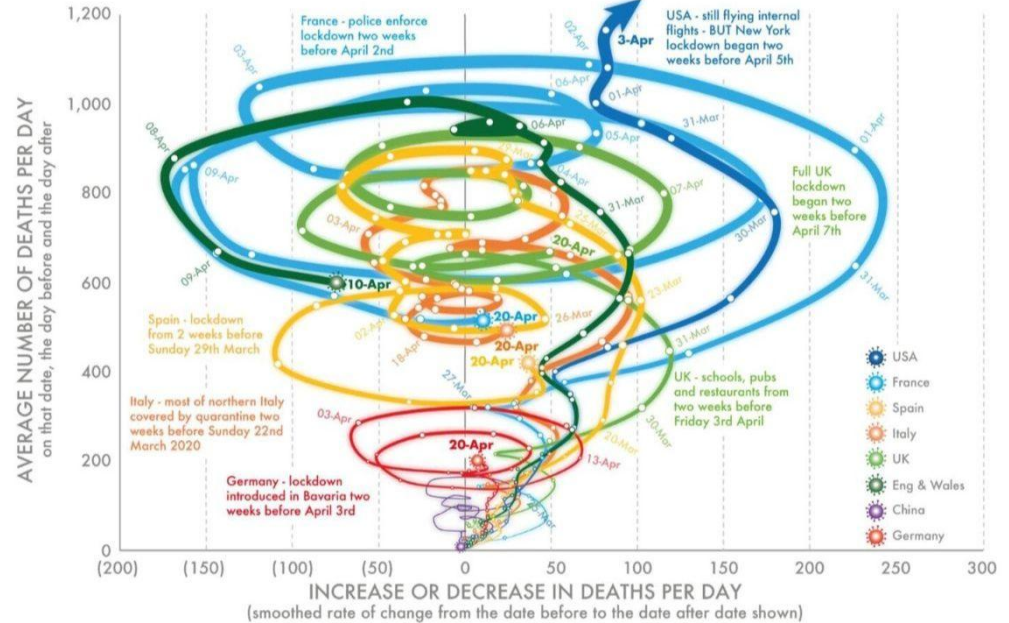
Labelled



What's Going On?

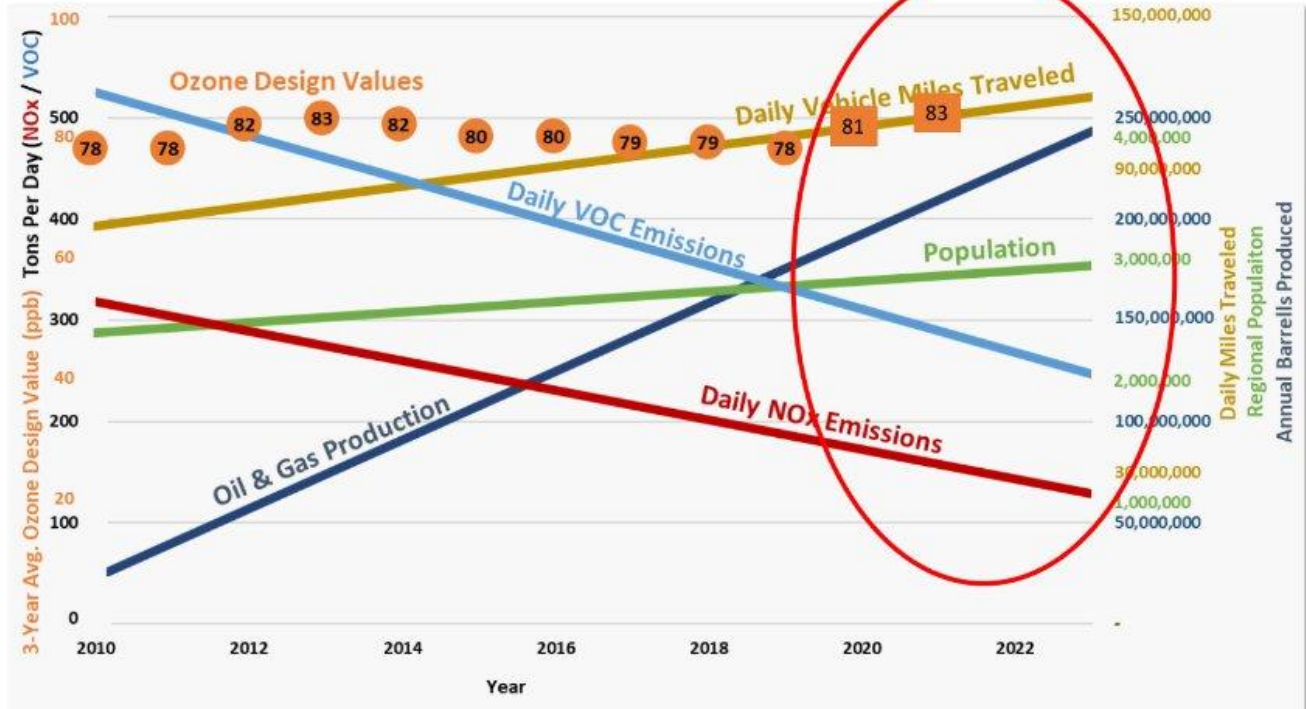


Export



Six Vertical Axes On One Graph

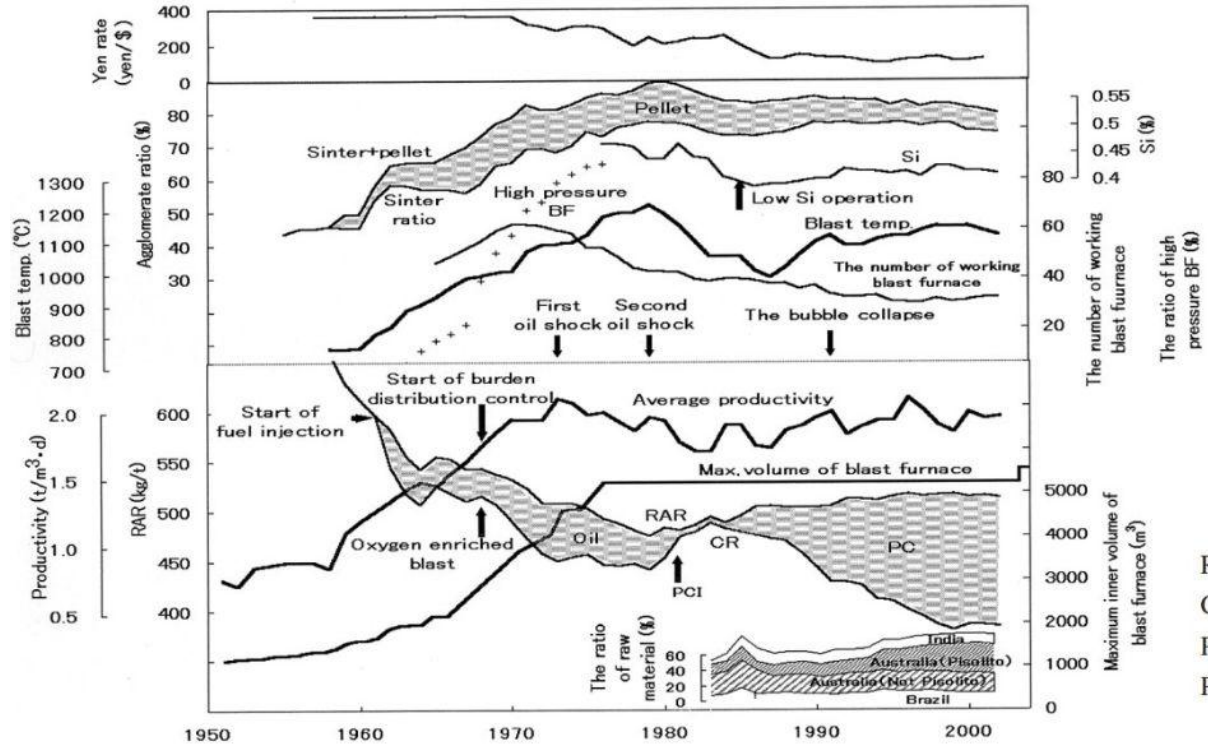
Regional Trends (2010-2023)



Labelled



Ten Vertical Axes On One Graph



Labelled



RAR: reducing agent rate

CR: coke rate

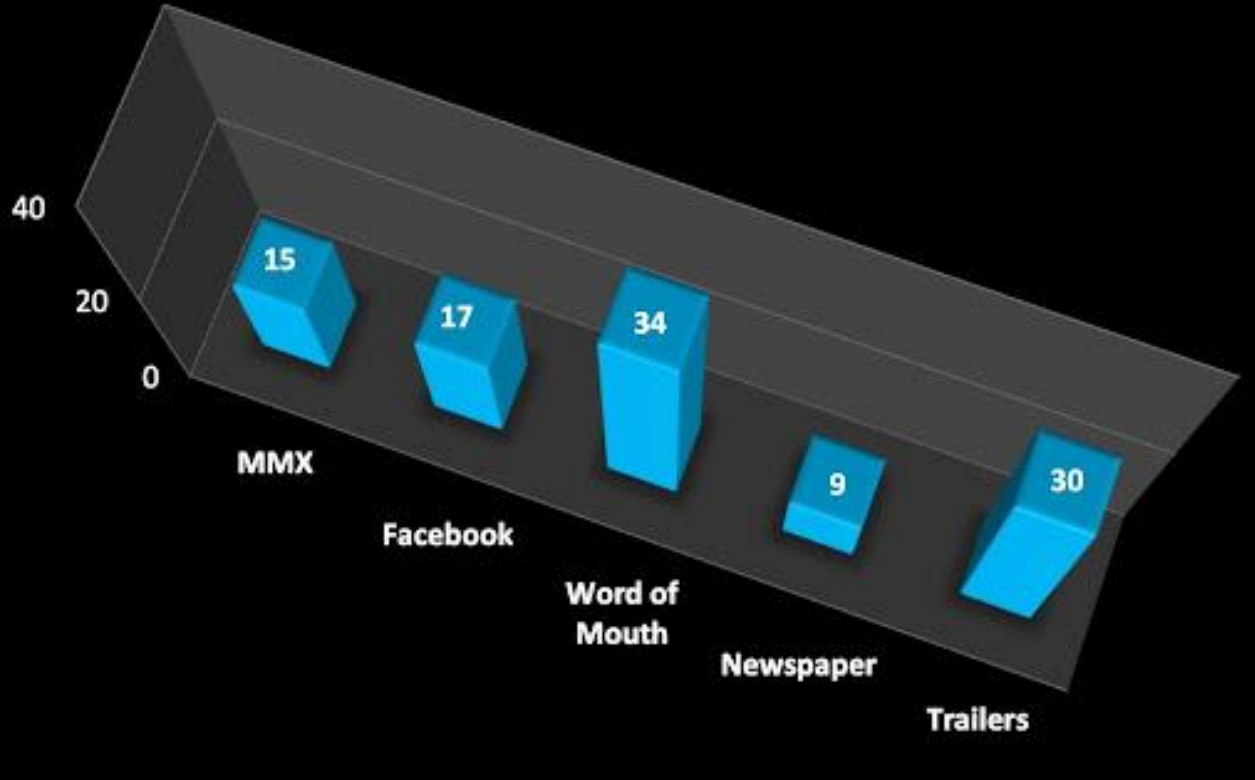
PCI: pulverized coal injection

PC: pulverized coal

Fig. 2 Trend of BF operation

And If You Must Go 3D , Keep the Important Dimension

Where do you hear about games?



Presents Data

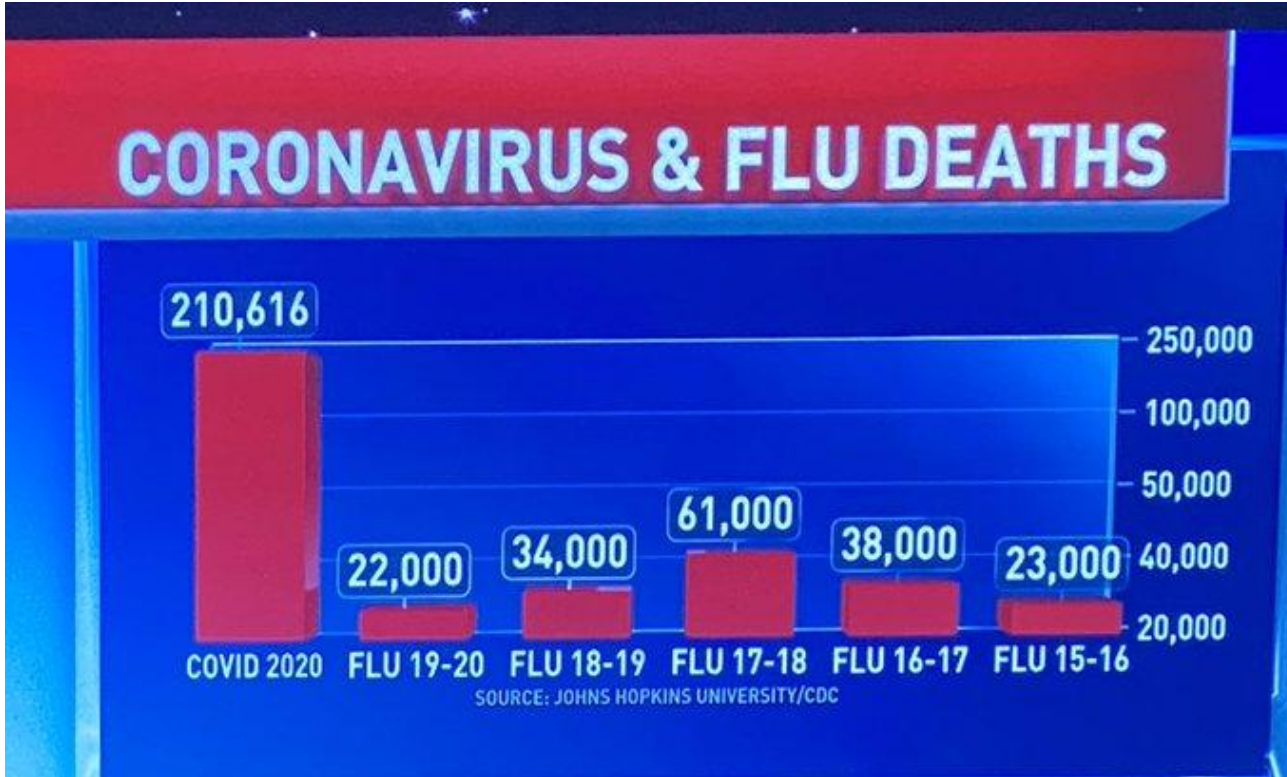


Hides the dimension showing the data
Effectively a table

How To Draw A Really Bad Graph

**Trust & Credibility Are Illusions
Quickly Kill Any Pretence Of Them**

QC is Critical

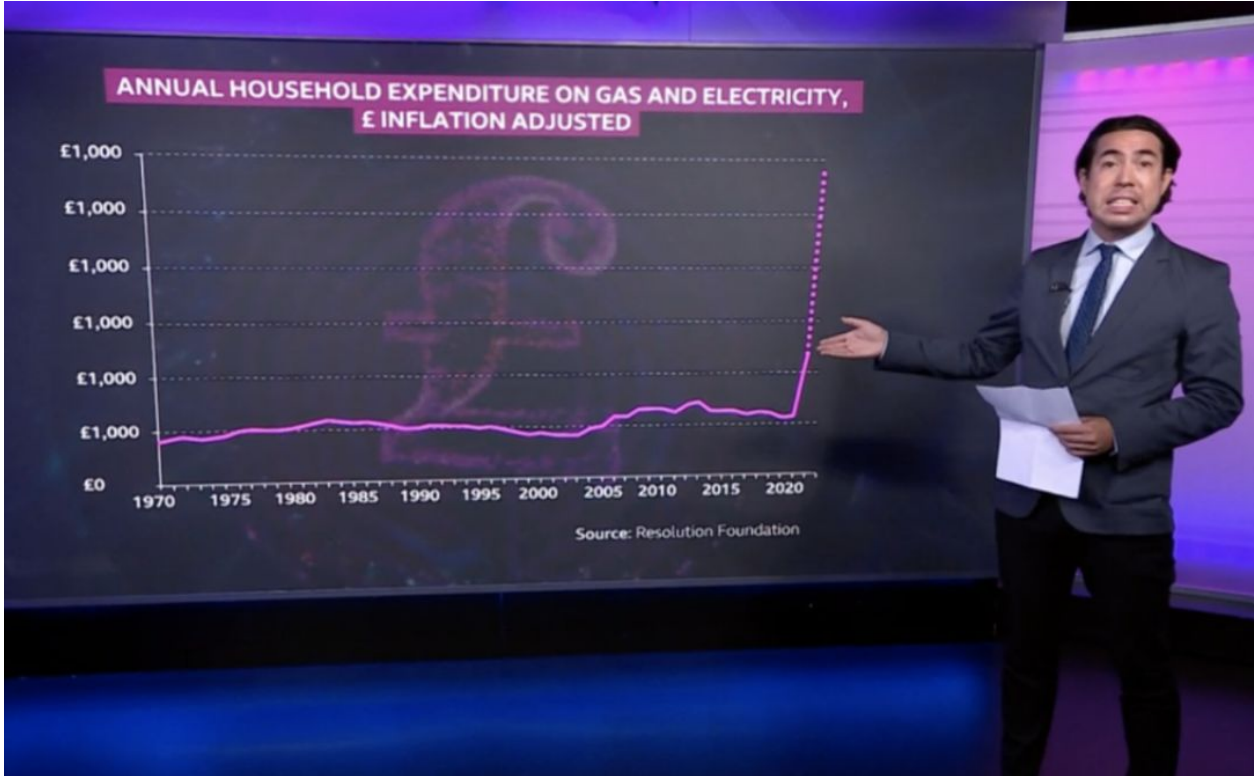


Well labelled
(Despite their best efforts, I still can understand what's going on)



What's the transformation behind that Y-axis
Why's time going backwards?

It's Not Just America Struggling with QC



My fuel bill is only going up by £0



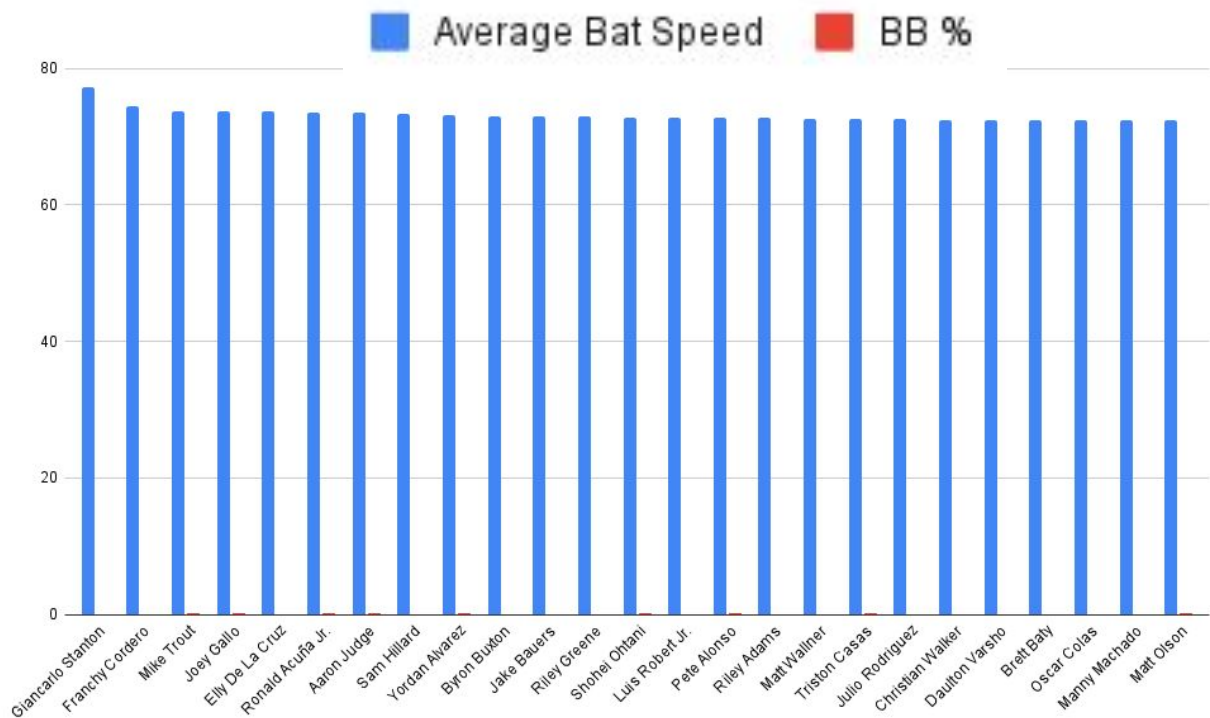
Another amazing y-axis transformation

How To Draw A Really Bad Graph

**Sometimes You Have To Make
Tough Decisions & Trade-Offs**

Sometimes You Need Dual y-Axes

There Are Two Variables Plotted Here!

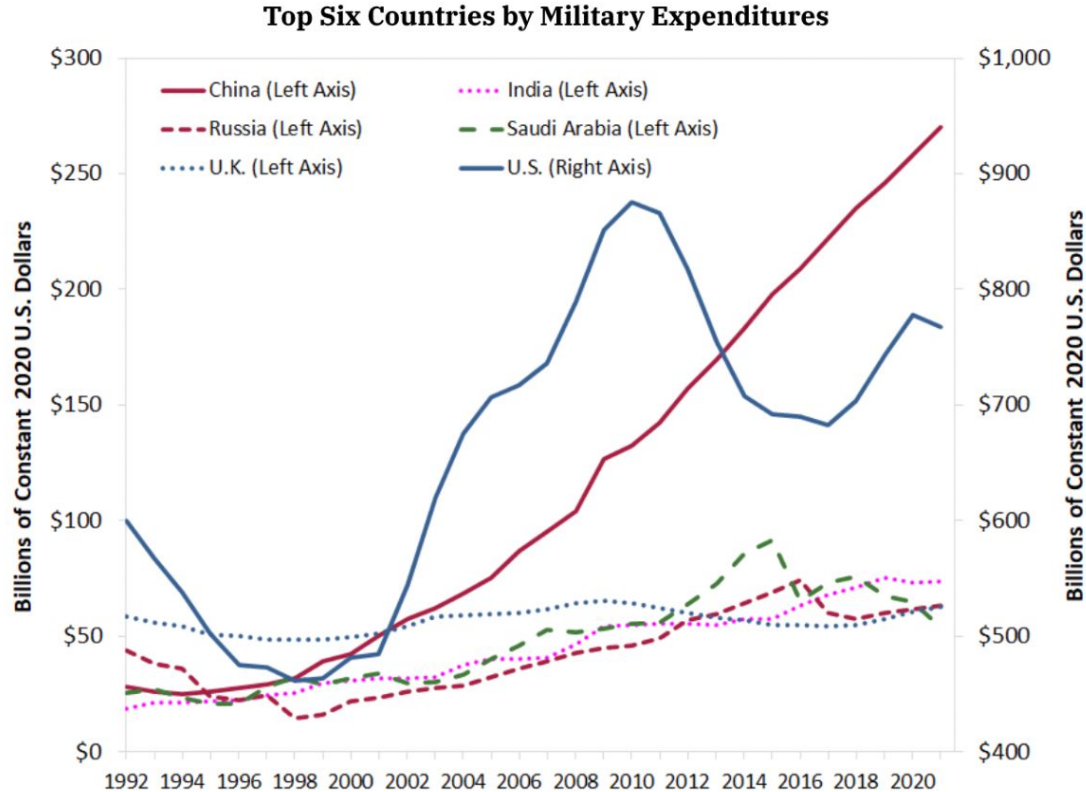


Clearly labelled
(could make text larger)



Can't see the BB variable
(need to use dual y-axes)

Sometimes You Don't Need Dual y-Axes



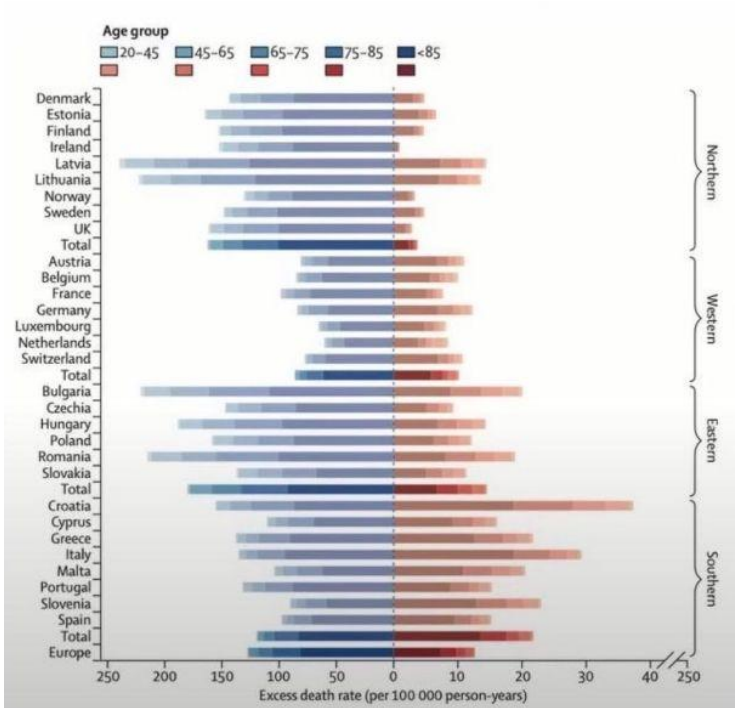
Clearly labelled



Unless you're really paying attention you'd think China has overtaken the U.S. in 2012

Misleading or Just Showing The Data?

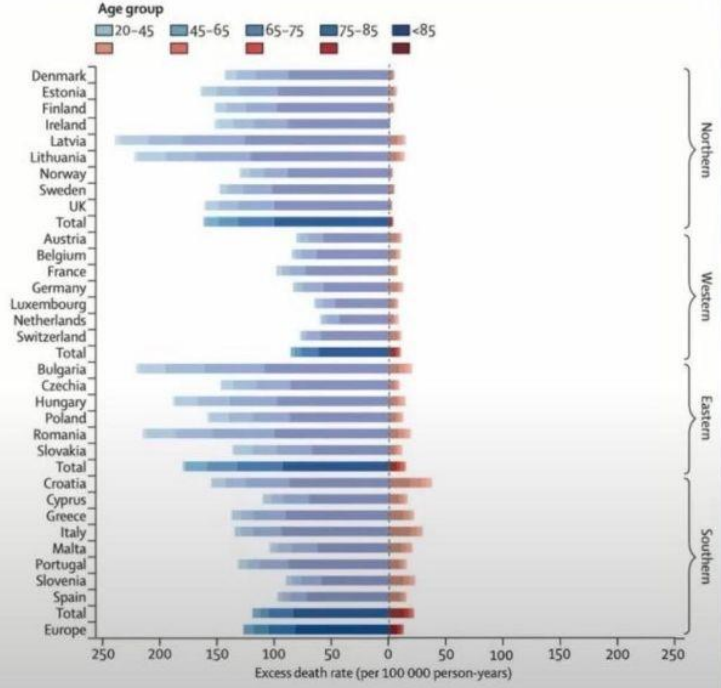
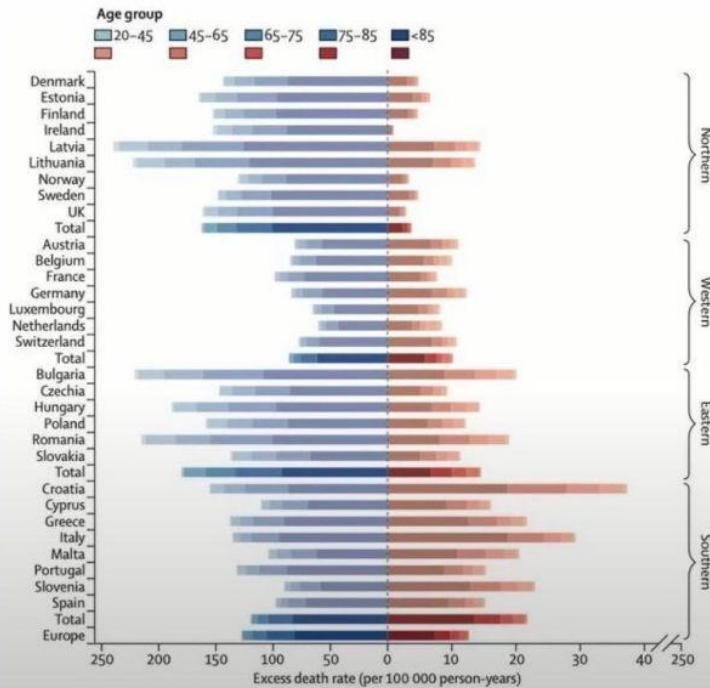
Cold Deaths and Heat Deaths



Misleading or Just Showing The Data?

Cold Deaths and Heat Deaths

Deliberately Misleading or Genuinely Trying To Display Data?

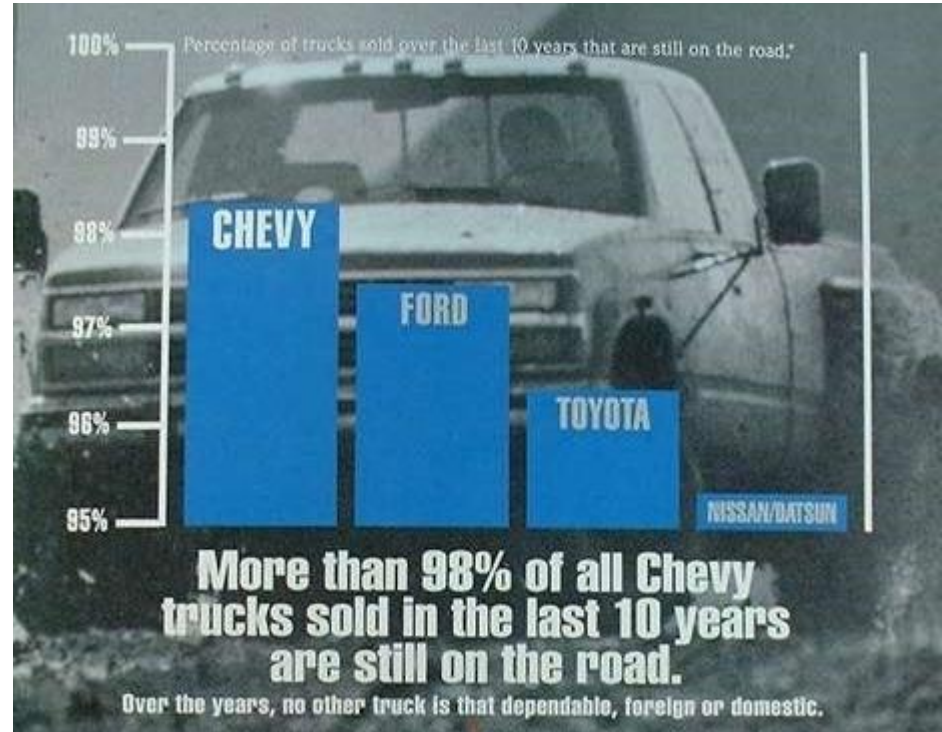
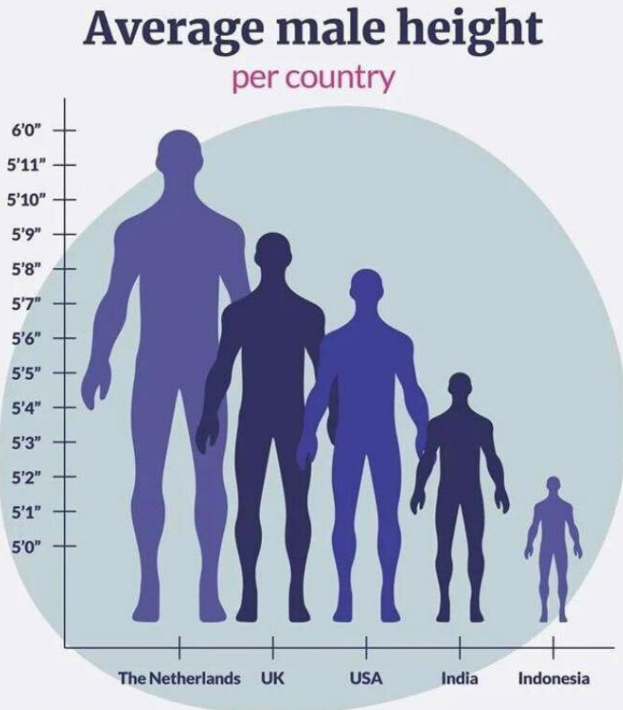


???

Misleading or Just Showing The Data?



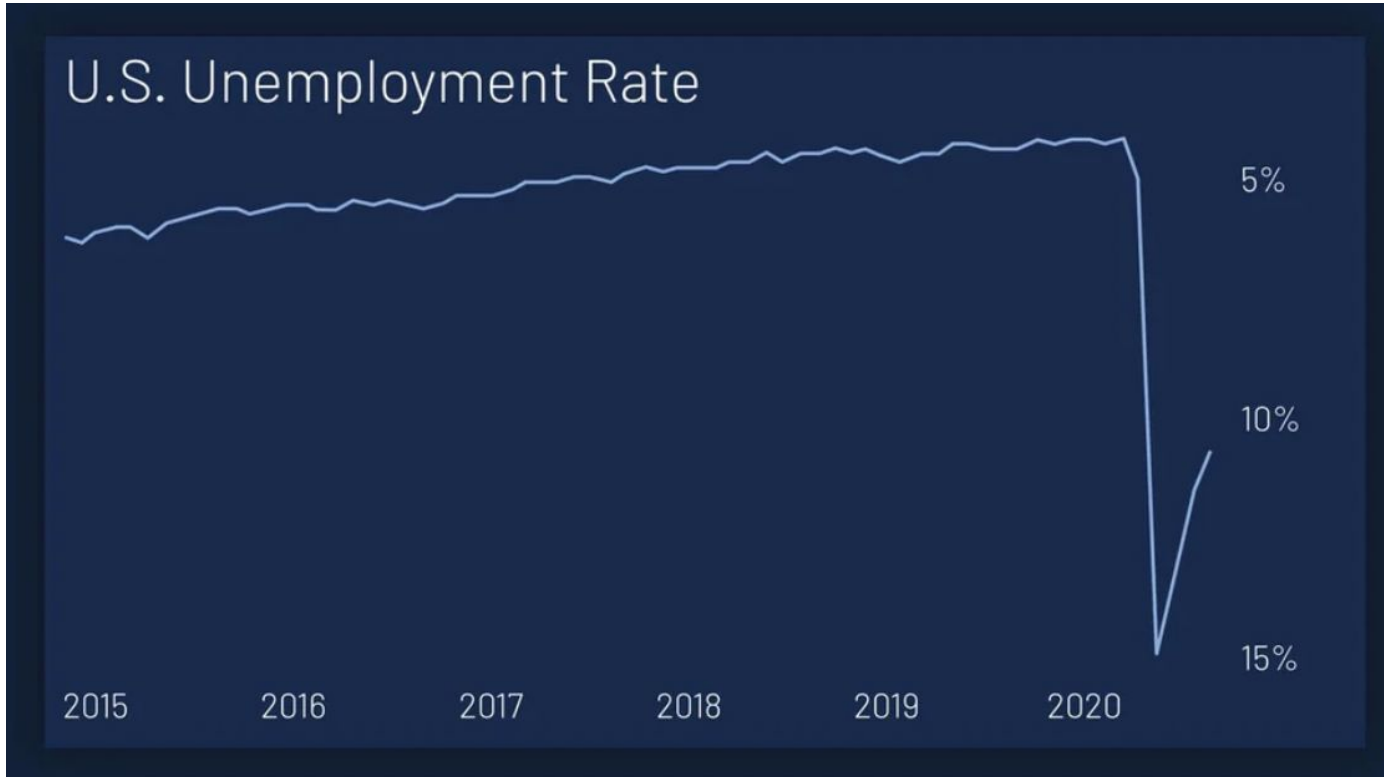
Misleading



How To Draw A Really Bad Graph

**Never Do The Expected
Keep Your Audience On Their
Toes And Make Them Work**

Up Is Down

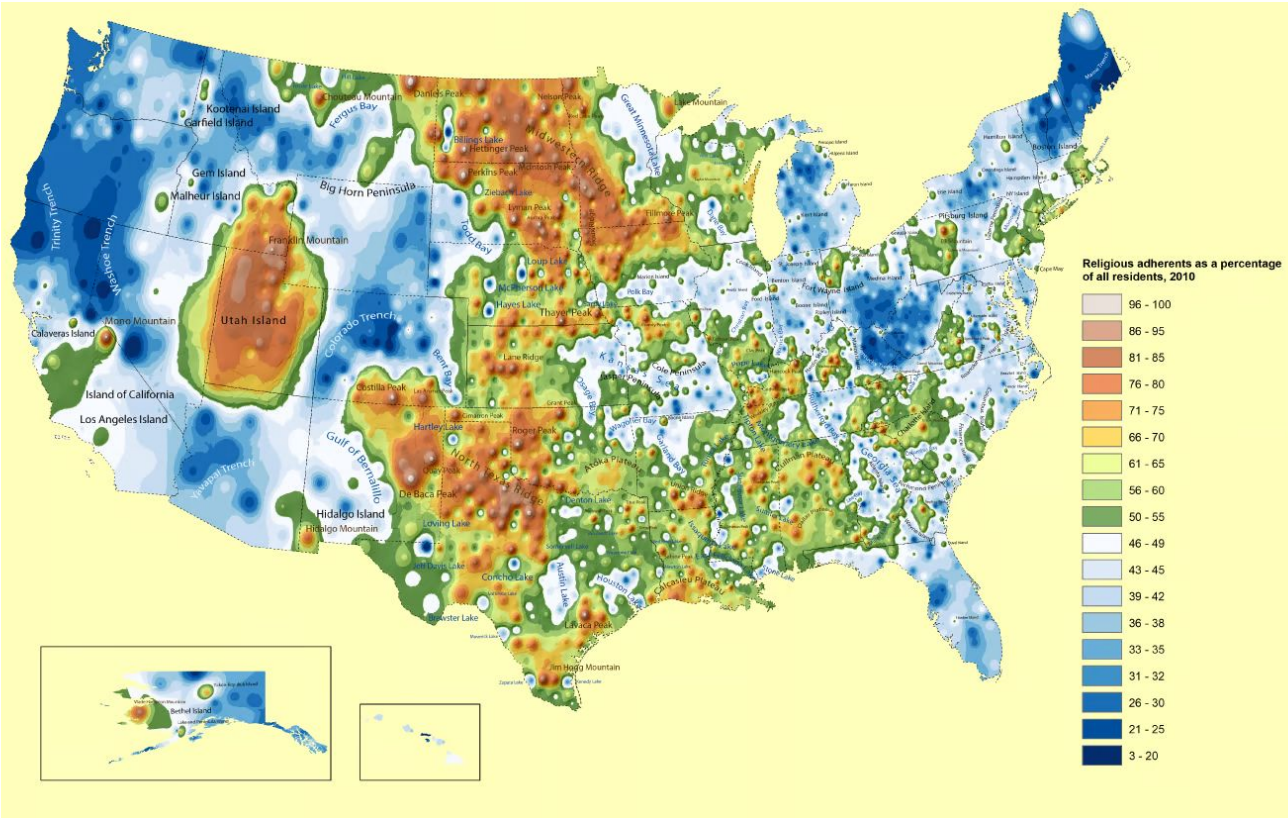


Clearly labelled axes (grid lines would help)



Generally :
Up=Bigger
Down=Lower

Colours Carry Connotations



Clear, detailed legend



These colours on a map intuitively mean height (Biblical - the non-believers will get washed away)

Don't Go Against People's Expectations

The State of the World's Government Debt



How to read this graph: The size of each country corresponds to its Debt to GDP ratio. Countries with ratios over 50% are colored red, like Lithuania. Countries under 50% are colored green, like Myanmar. Icons of countries with the higher Debt to GDP ratio are appearing bigger. Debt to GDP ratio is the ratio between a country's government debt and its gross domestic product (GDP).

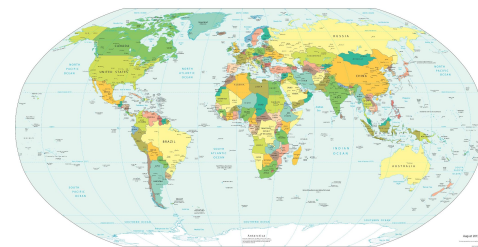
Article & Sources:
<https://howmuch.net/articles/state-of-the-worlds-government-debt-2021>
 International Monetary Fund (IMF), www.imf.org/



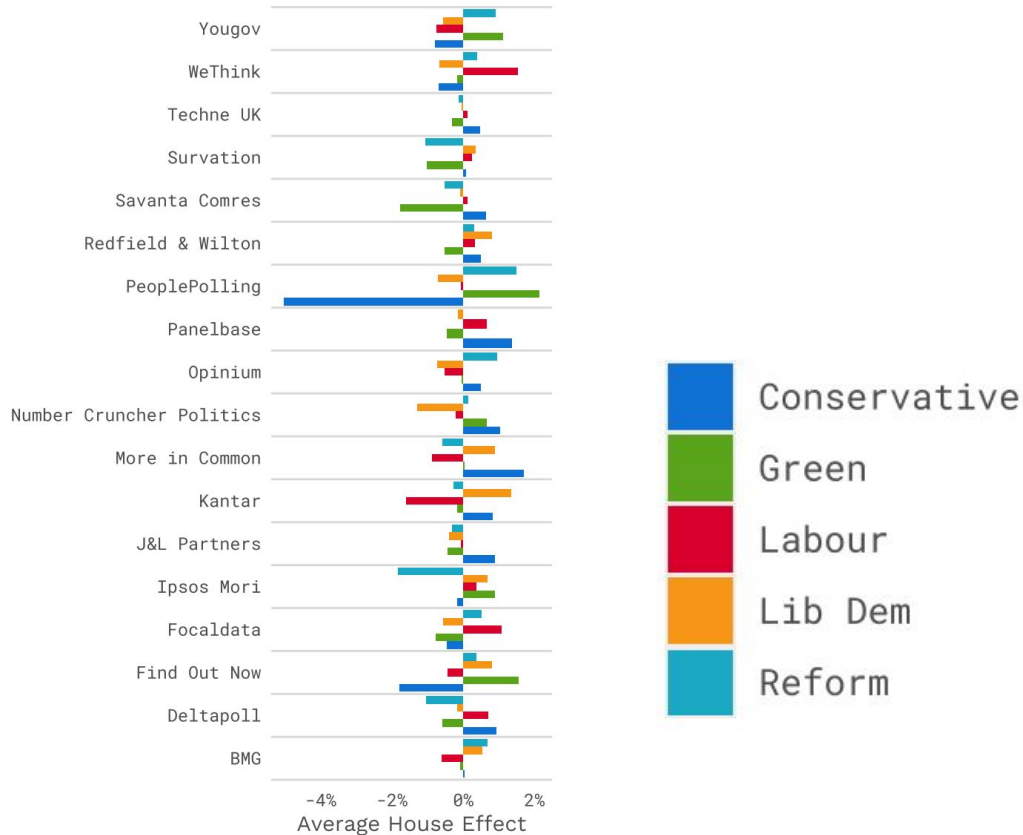
All data presented and labelled
 Logical colour scheme
 (except for the colour blind)



Where's my country?
 People are used to other visualisations



The Little Details Make A Difference

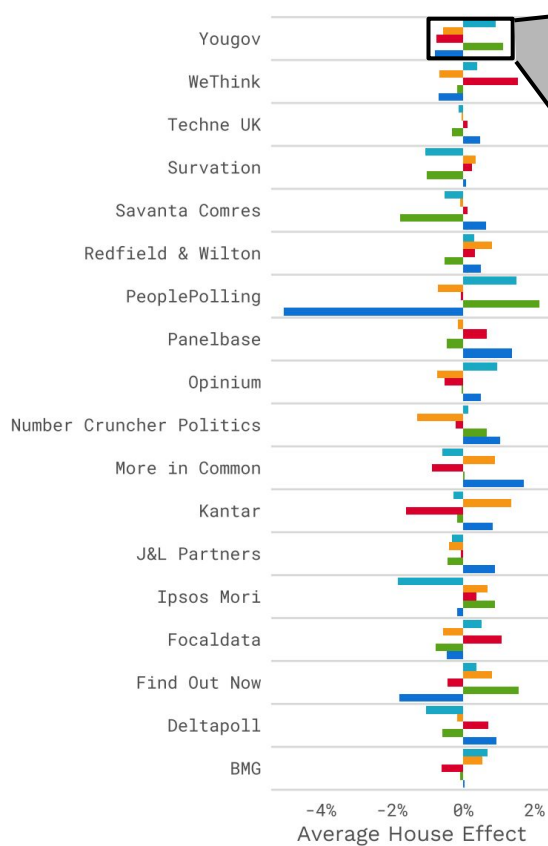


Well labelled
Legend
Colours match with
expectations

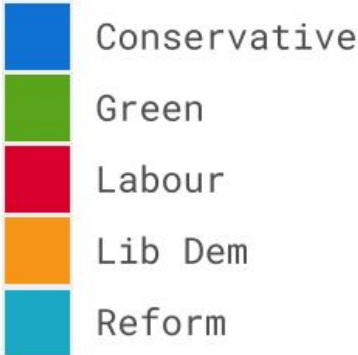


Order reversed between
graph and legend

The Little Details Make A Difference



Well labelled Legend
Colours match with expectations

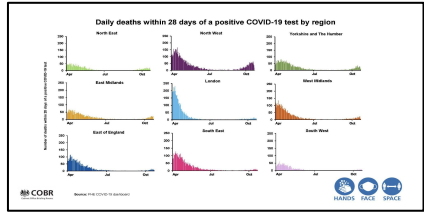
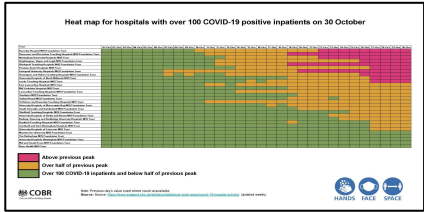
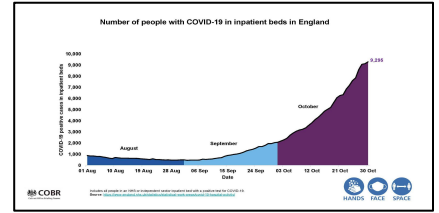
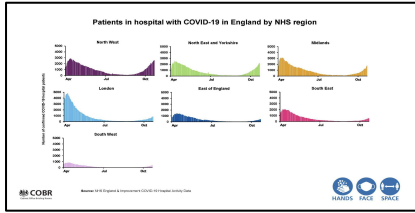
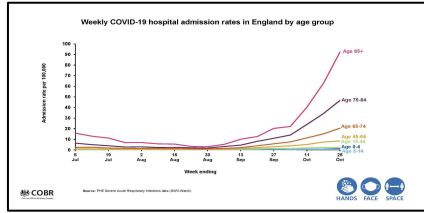
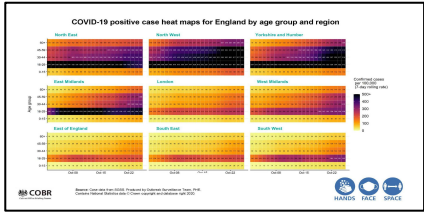
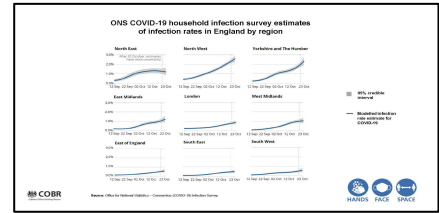
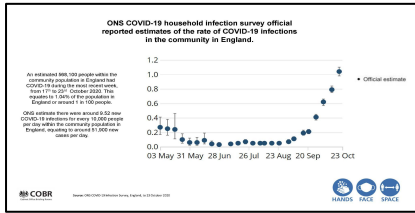
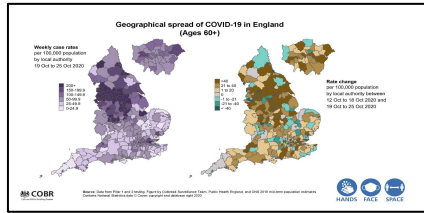
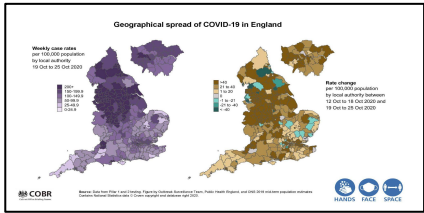


Order reversed between graph and legend

How To Draw A Really Bad Graph

**Inconsistency Stops Things
Getting Boring**

Next Slide Please (UK Government Briefing October 2020)



Map -> Points -> Lines -> Heatmap -> Lines -> Histograms -> Histogram -> Heatmap -> Histograms Exhausting!



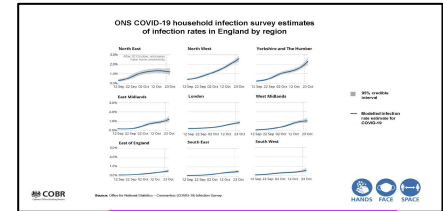
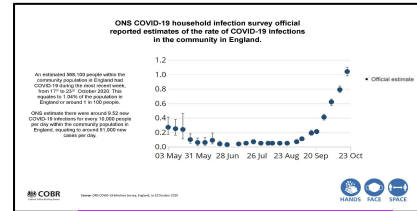
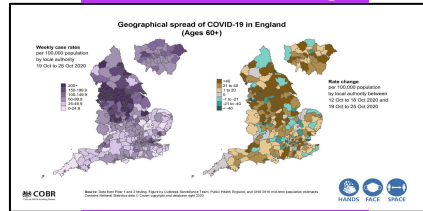
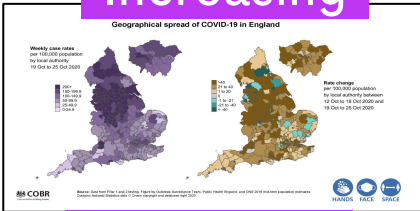
Data being used to communicate



Next Slide Please

Increasing

Increasing

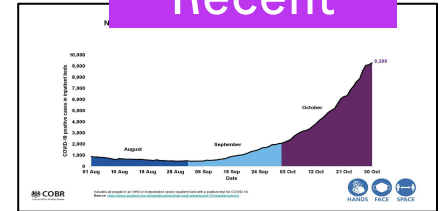
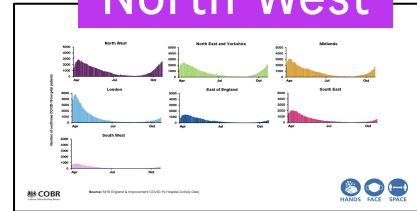
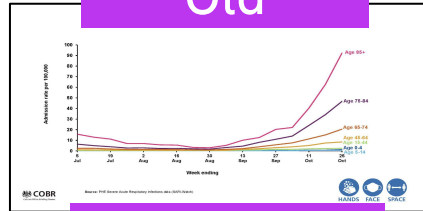
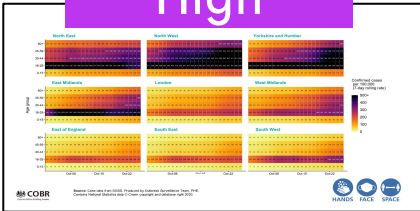


High

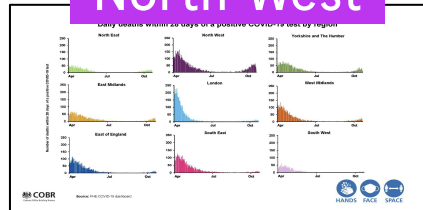
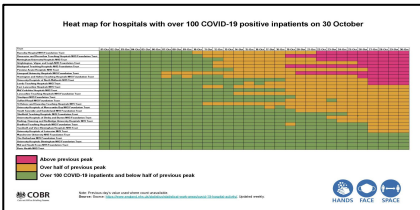
Old

North-West

Recent



North-West



Colouring :
 Purple = Increasing, High, Old,
 North-West & Recent



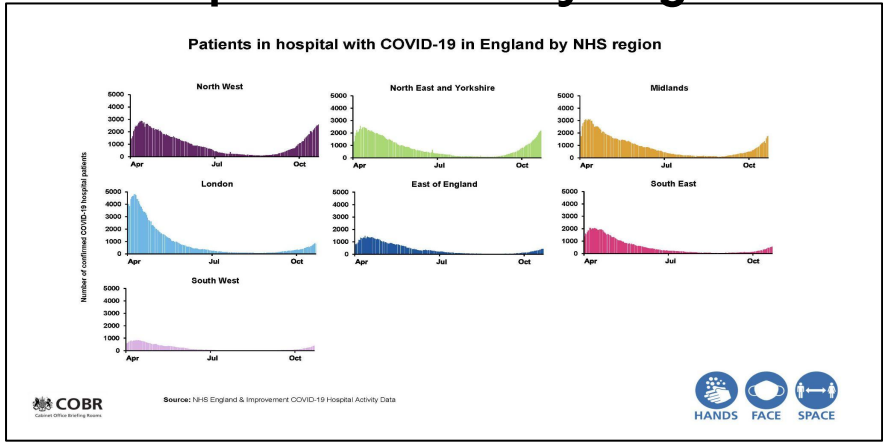
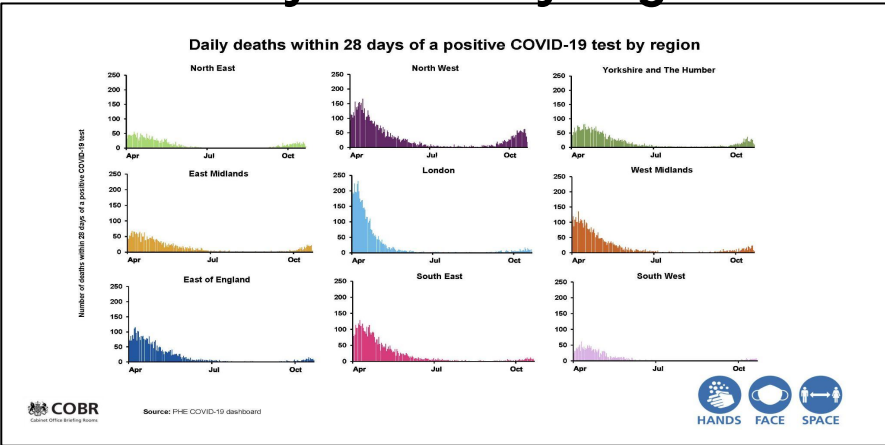
Data being used to communicate



Next Slide Please

Daily Deaths By Region

Hospitalisations By Region



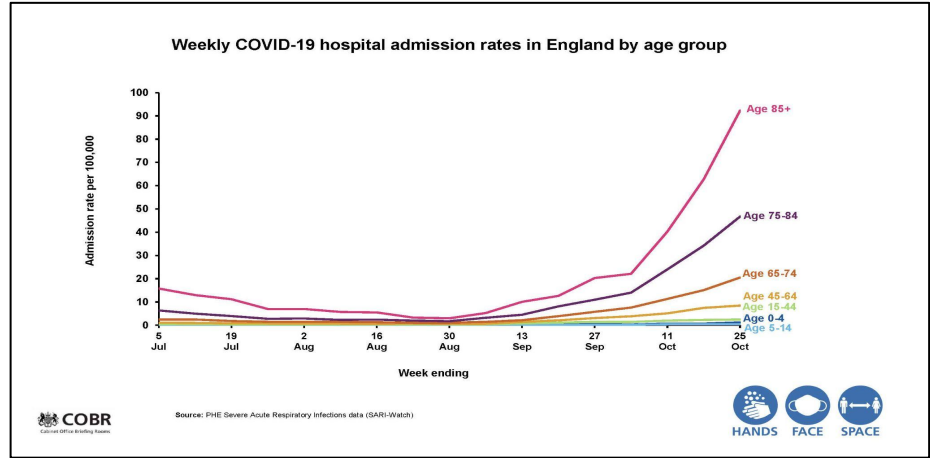
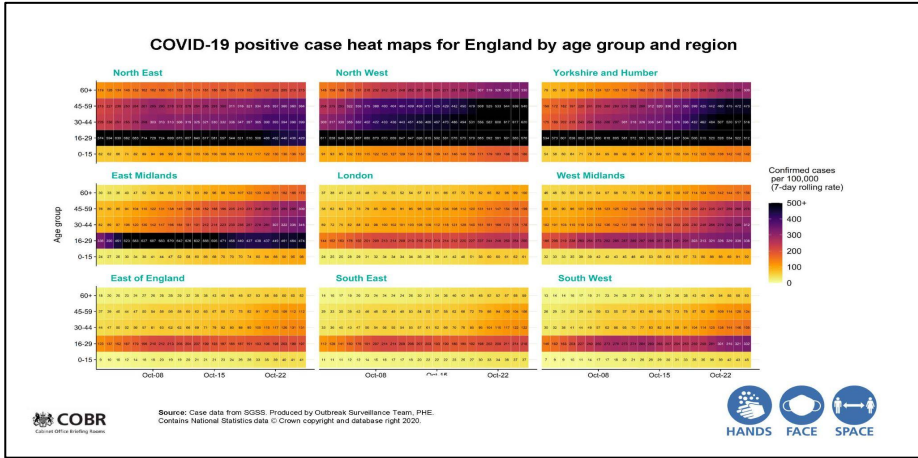
- | | | | | | |
|---------------|------------|---------------|------------|--------------|------------|
| North-East | North-West | Yorkshire | North-West | NE&Yorkshire | Midlands |
| East Midlands | London | West Midlands | London | East | South-East |
| East | South-East | South-West | South-West | | |

Data being used to communicate
 Changing Regions and Positions

Next Slide Please

COVID Cases By Age

Hospitalisations By Age

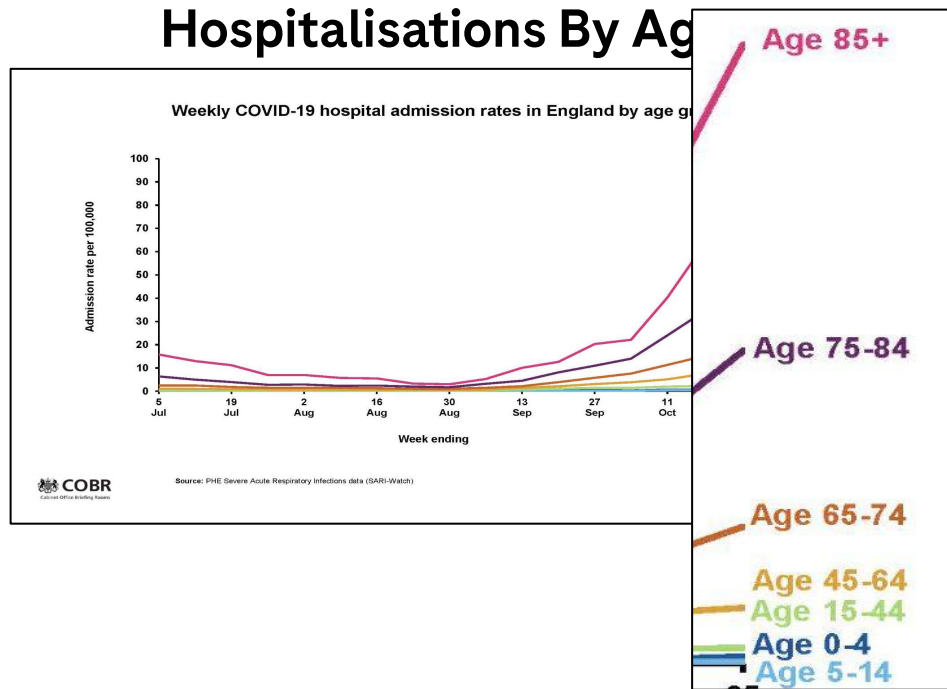
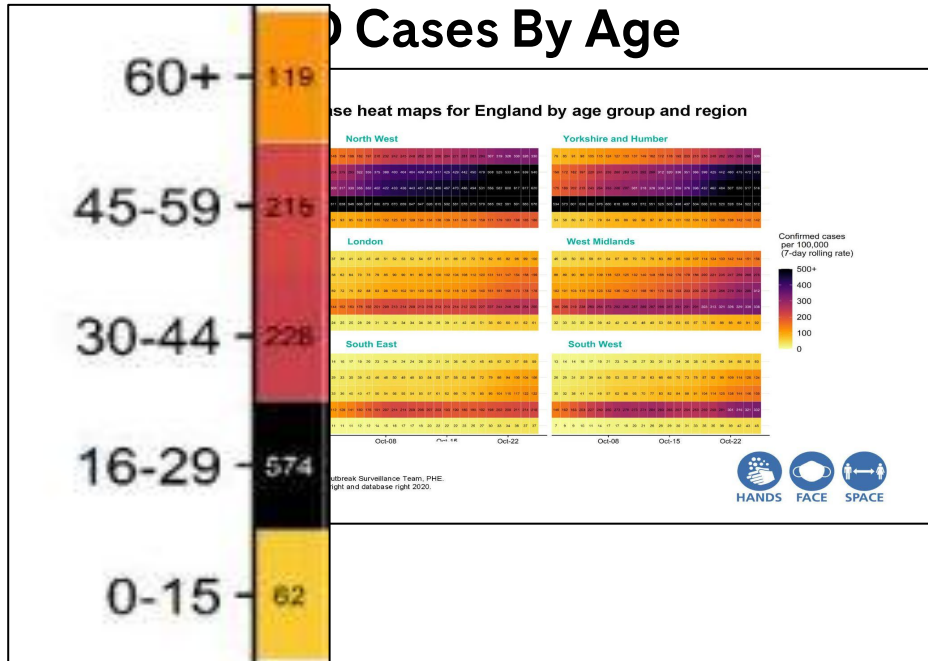


Data being used to communicate



Changing Age Groups

Next Slide Please



Data being used to communicate



Changing Age Groups

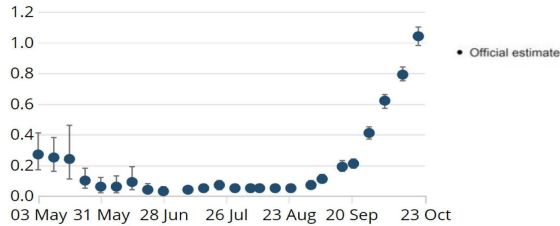
Next Slide Please

Infection Rates Nationally and By Region

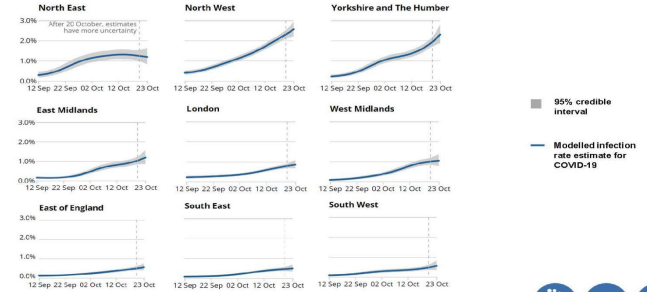
ONS COVID-19 household infection survey official reported estimates of the rate of COVID-19 infections in the community in England.

An estimated 568,100 people within the community population in England had COVID-19 during the most recent week, from 17th to 23rd October 2020. This equates to 1.04% of the population in England or around 1 in 100 people.

ONS estimate there were around 9.52 new COVID-19 infections for every 10,000 people per day within the community population in England, equating to around 51,900 new cases per day.



ONS COVID-19 household infection survey estimates of infection rates in England by region



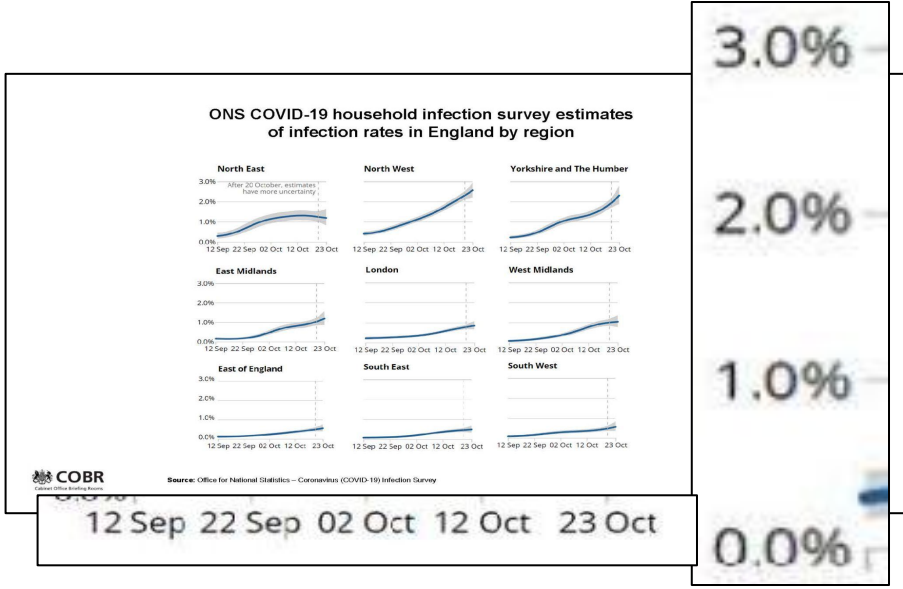
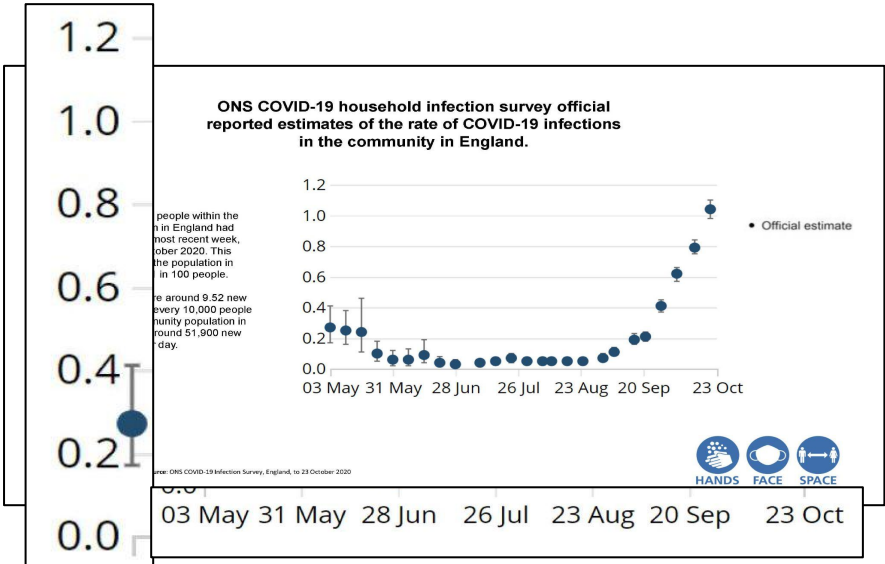
Data being used to communicate



Changing Scales for x- and y-axes

Next Slide Please

Infection Rates Nationally and By Region



Data being used to communicate



Changing Scales for x- and y-axes

So What Have We Learnt?

The Pie Chart of Good Graphics

Get another pair of eyes to do a check

What information are you sharing and how?

Use styles, symbols, colours and lines consistently

Present as much raw data as possible

Be clear if you have to make trade-offs

Avoid anything which could be misleading

Message & Plan

Feedback

Consistency

Transparency

Keep and Maintain Trust

Mind the details

Use all the space

Clear labels and legends, large enough to read

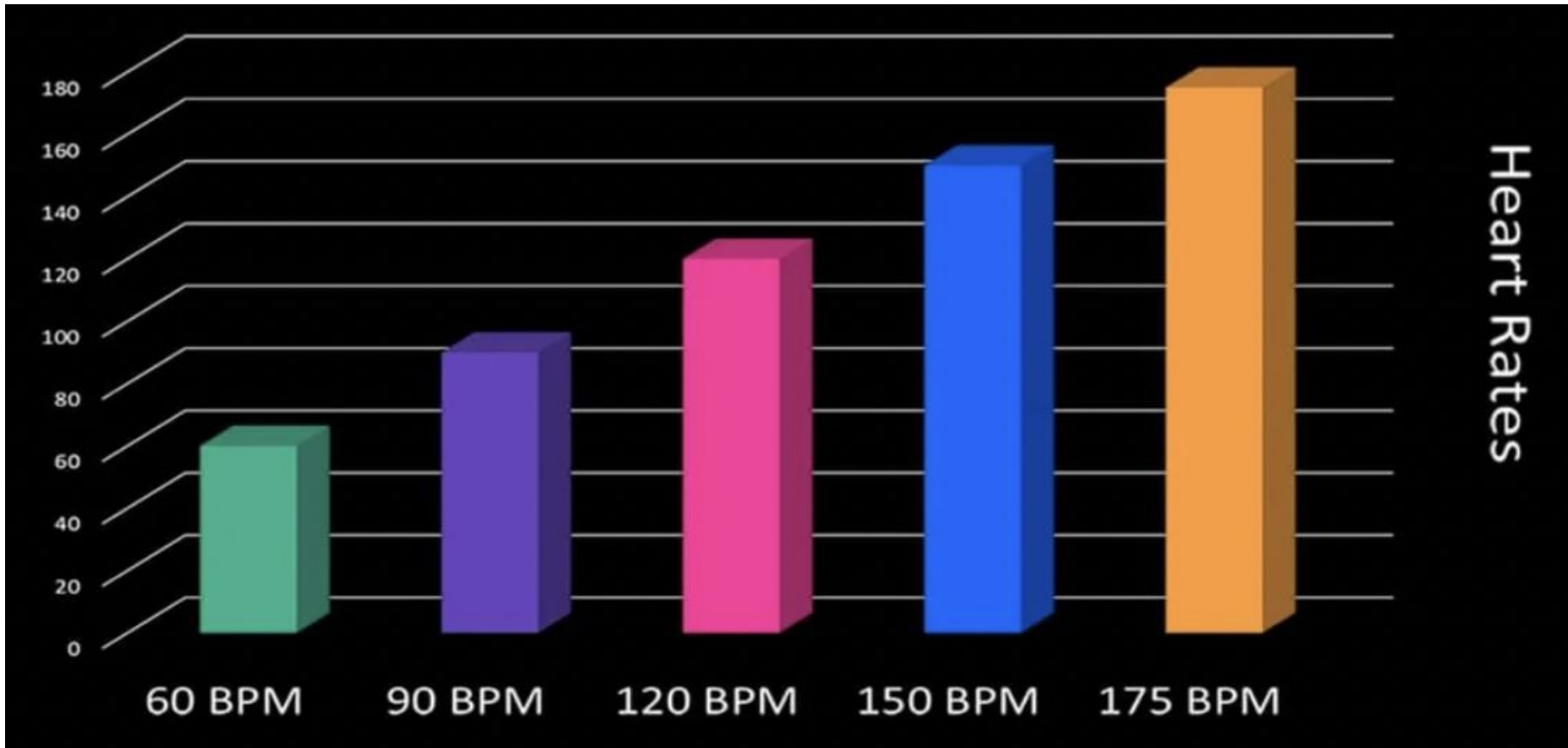
Use an intuitive colouring and layout

Don't clutter or add unnecessary gimmicks

Accuracy

Help Your Audience

**Good Luck With Your Graphs
And Remember To Plot
Something Interesting &
Informative**



Doing now what patients need next