Missing **data**

by Sina Rüeger

Notes & Material

⬇

https://github.com/sinarueeger/teaching/tree/master/missing_data

Aim of this video

Discover the different facets of missing data by learning about

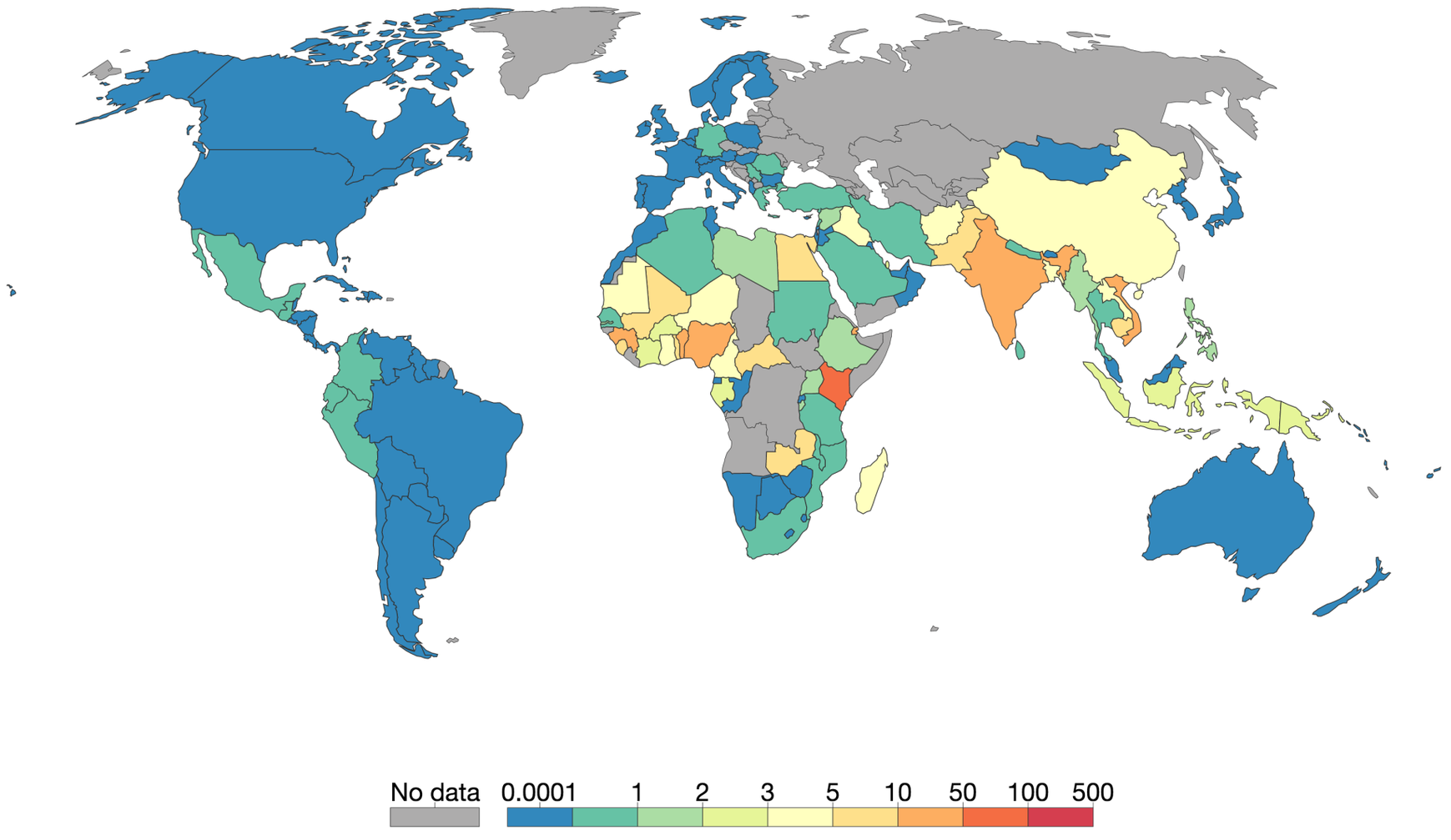
- why missing data occurs
- why missing data can be a problem
- how missing data can be turned in something meaningful

Example "Polio"

Reported paralytic polio cases (per 1 million people), 1990

This includes the wild and vaccine (VAPP) type poliovirus (occurring indigenously and imported)

Our World in Data



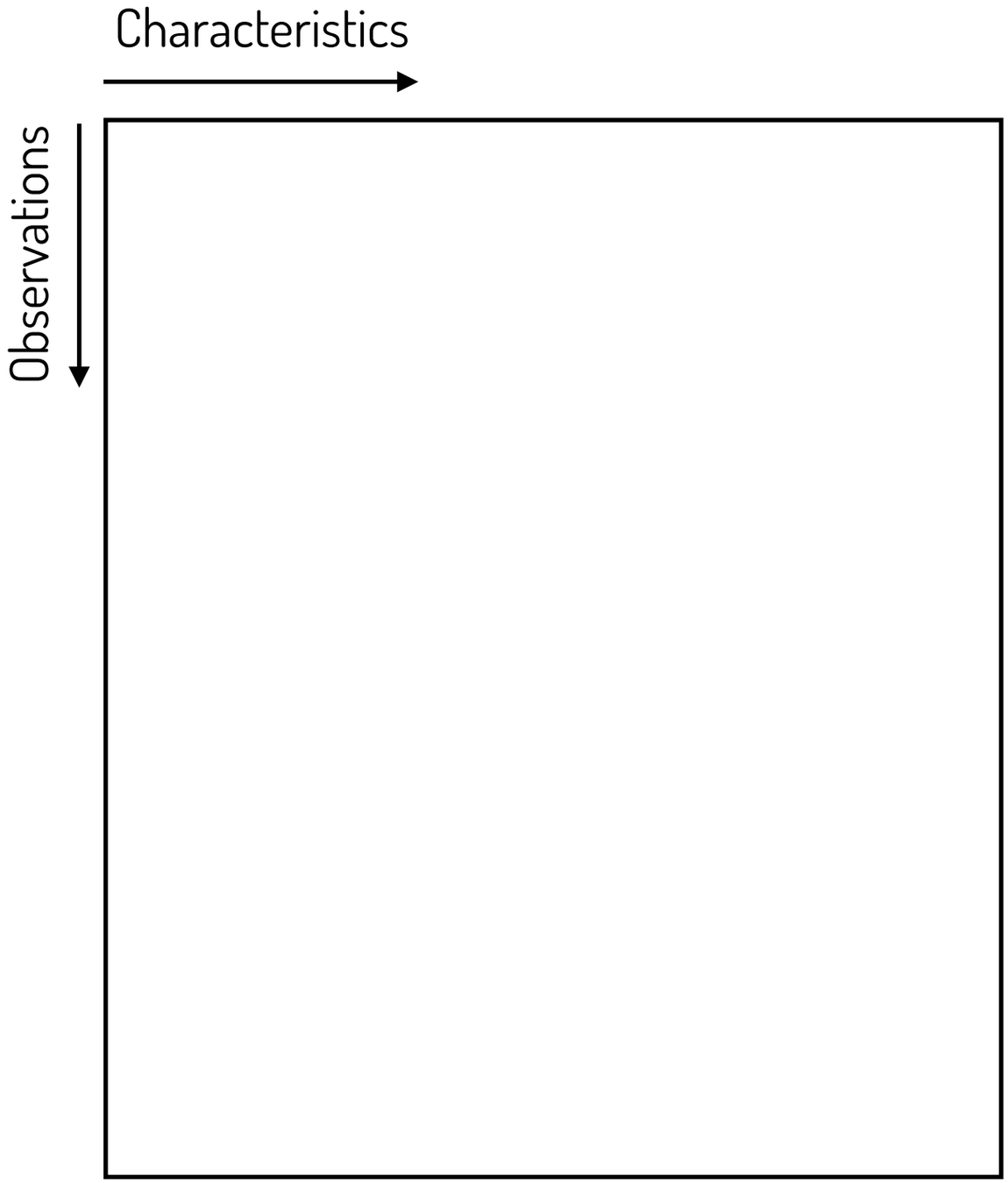
Source: Incidence Report of Selected Vaccine Preventable Diseases (VPDs) - WHO (2017)

OurWorldInData.org/polio/ • CC BY-SA

https://ourworldindata.org/grapher/reported-paralytic-polio-cases-per-1-million-people

Recap: data

- One observation per row
- One characteristics measured per column



Recap: data

Characteristics →

Observations ↓

Observation	Planet name	Surface [km2]	Discovered [dd-month-yyyy]
1	Pluto	1.779×10^{7}	18-Feb-1930
2	Uranus	8.116×10^{9}	13-Mar-1781
3	Saturn	4.270×10^{10}	no data
another observation	another planet	...	...

Information from:
https://en.wikipedia.org/wiki/Pluto
https://en.wikipedia.org/wiki/Uranus
https://en.wikipedia.org/wiki/Neptune

Reasons for missing data

Data not reported

Data collection of patient was not possible

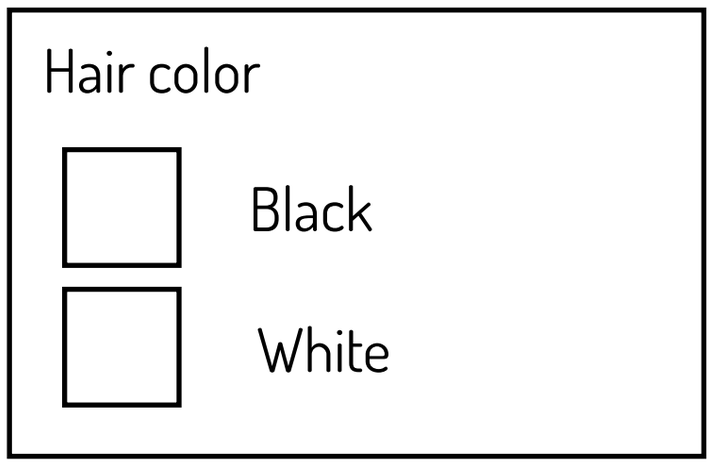
Technical issue > badly measured

Genotyping machine not working well

No measurement possible

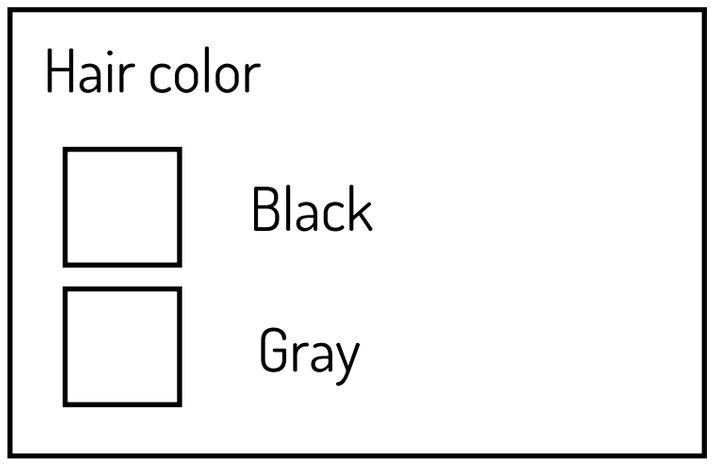
During war, official statistics not collected

Poorly designed surveys



When is missing data a problem

When missingness is not occuring randomly, but somehow related to another variable.



1. People with hair color other than black and gray will have missing values.
2. In this case, missing values can have the following origin:
   - Hair color correlates with ancestry.
   - Gray hair is associated with age.
   - Some people (mostly men) have no hair.

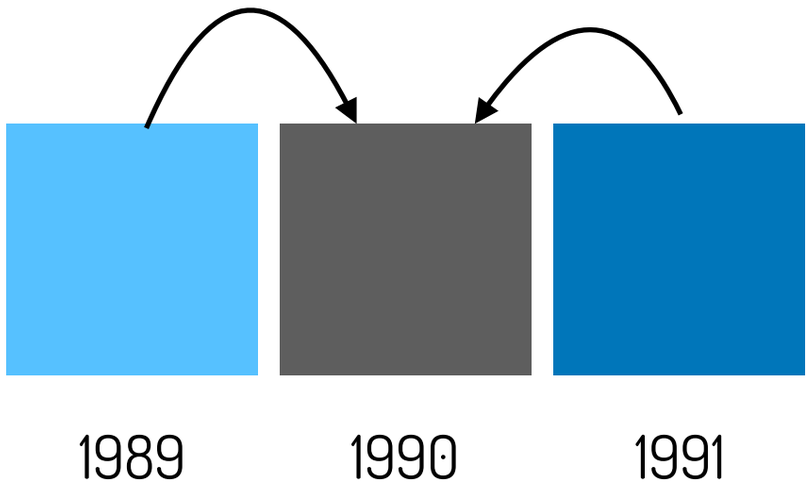
https://en.wikipedia.org/wiki/Human_hair_color

Why is missing data a problem

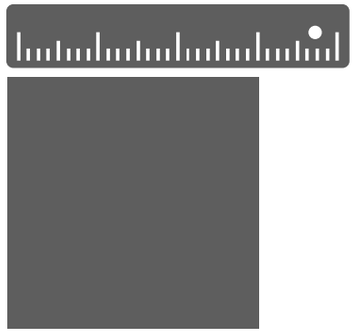
1. Bias
2. Potentially lower sample size

Solutions

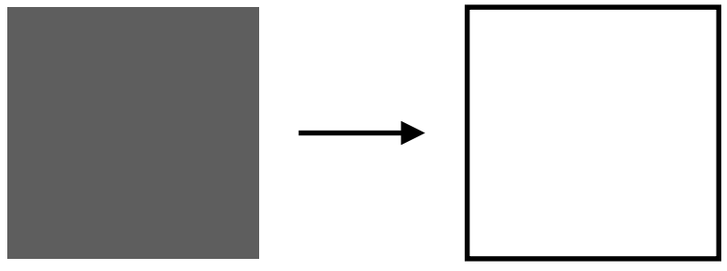
Imputation



Re-measuring



Removal



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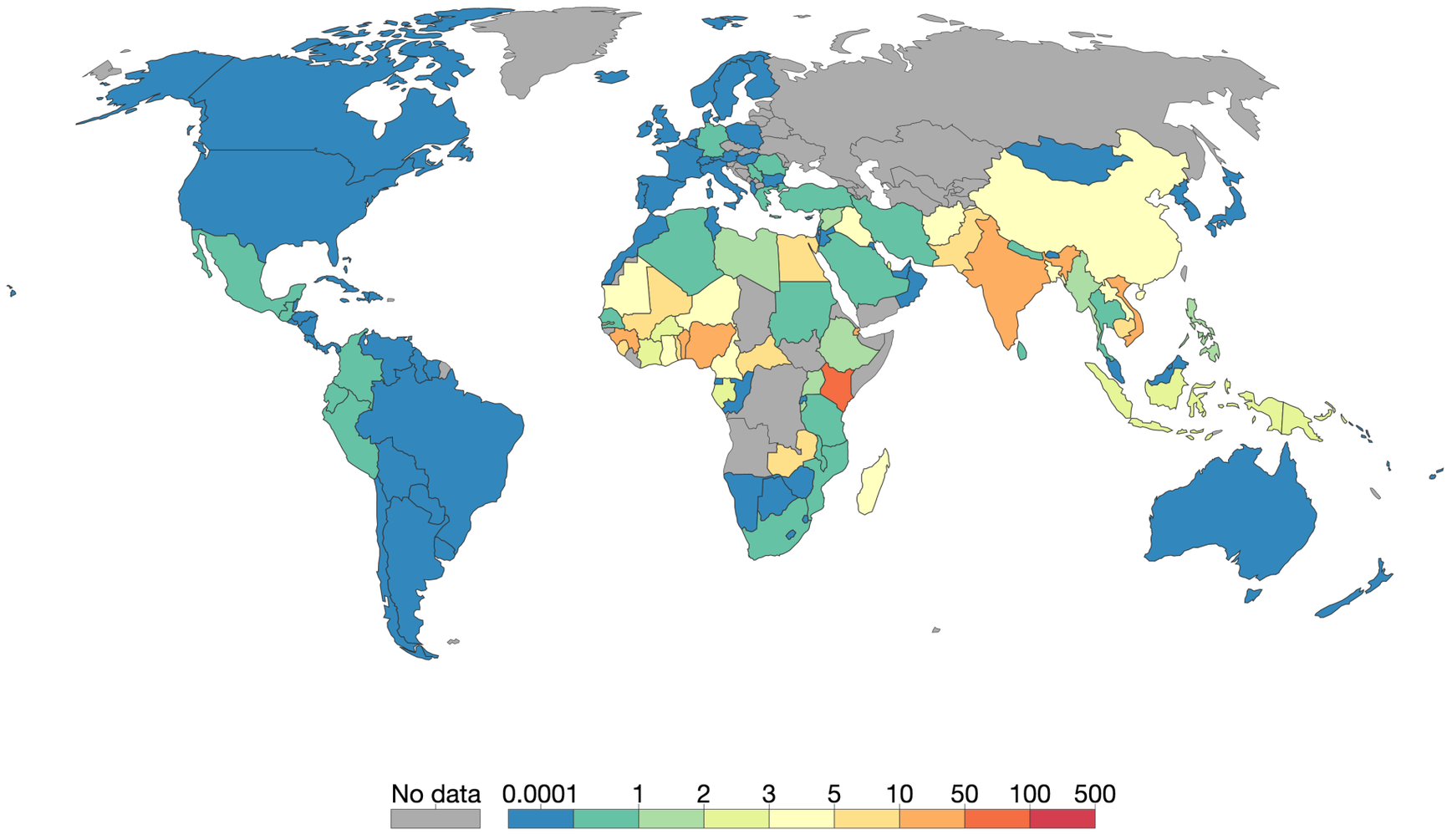

Source: Incidence Report of Selected Vaccine Preventable Diseases (VPDs) - WHO (2017)

OurWorldInData.org/polio/ • CC BY-SA

https://ourworldindata.org/polio#data-quality-and-measurement

Summary

- ✔ why missing data occurs
- ✔ why missing data can be a problem
- ✔ how missing data can be turned in something meaningful

Links

Explore human civilisation through the lens of data

https://ourworldindata.org/

Documentation of missing data

https://ourworldindata.org/