



Jean-Claude

Ankara

Aria

Nik

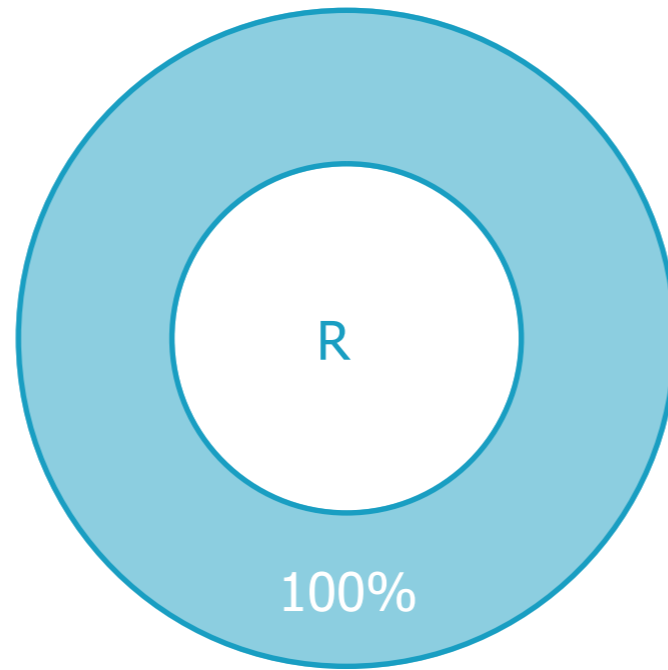
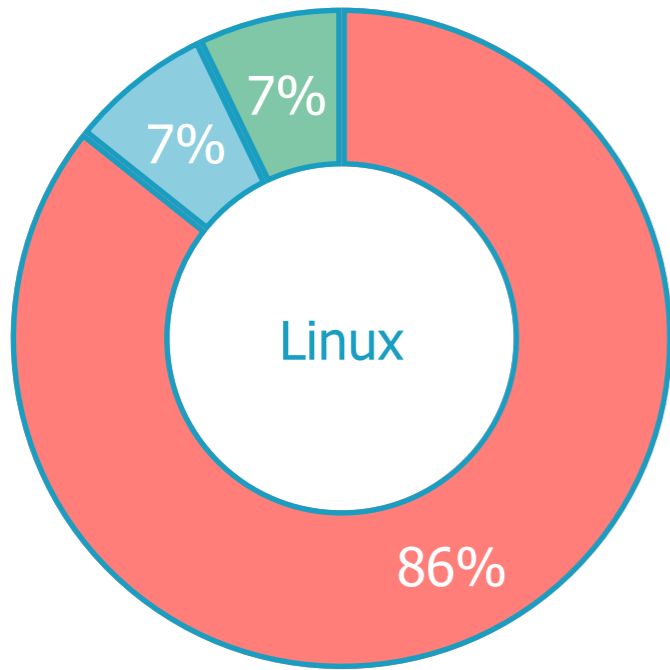


Silvia

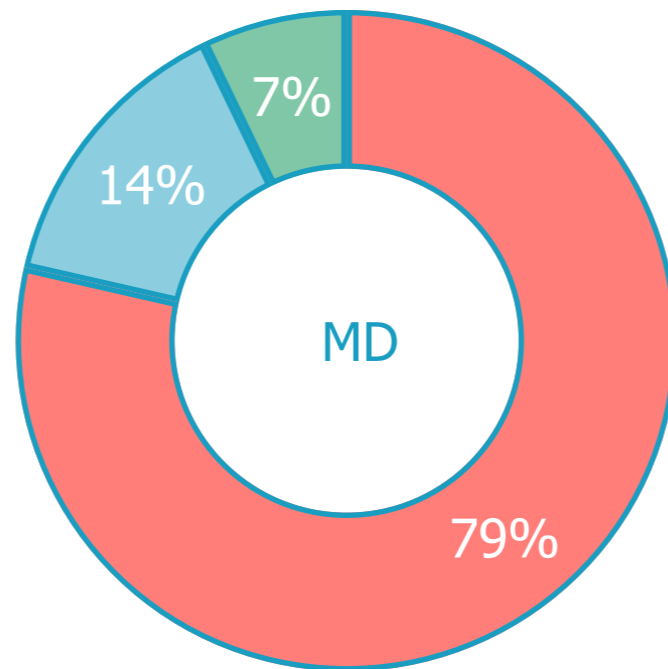
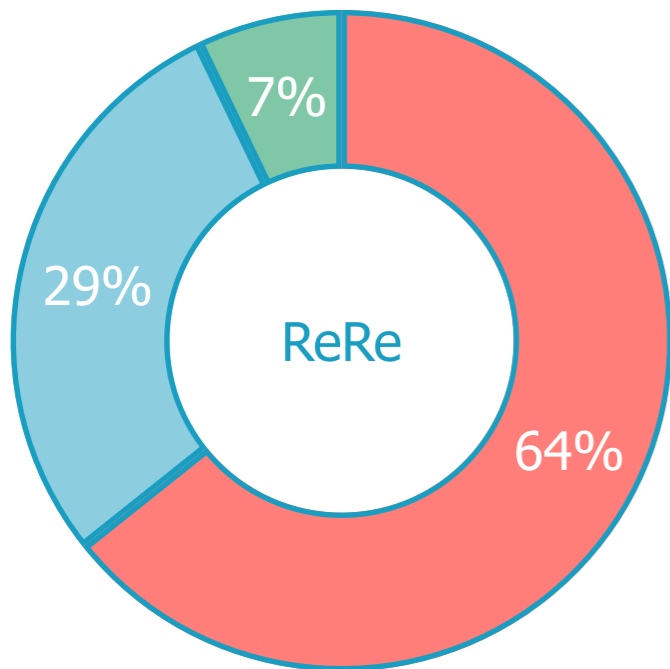
The Genetic Diversity Centre (**GDC**) is a knowledge and technology platform of the D-USYS Department at ETH Zurich. We provide scientific and technical support for research related to genetic and genomic diversity in a wide range of organisms with special focus on non-model organism.



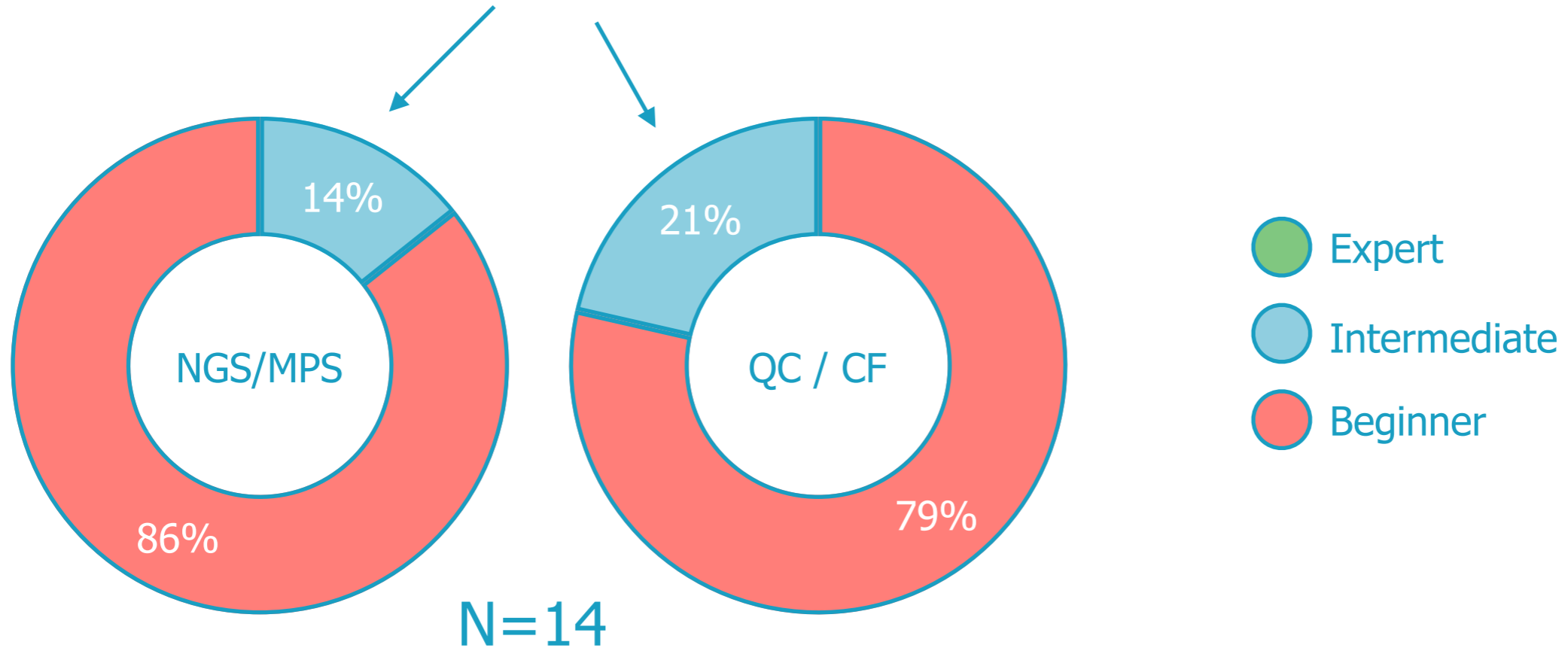
# COURSES

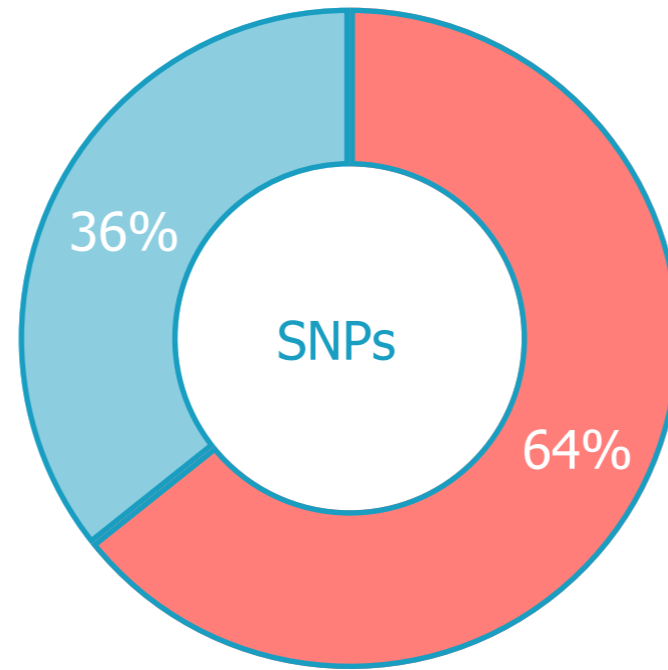
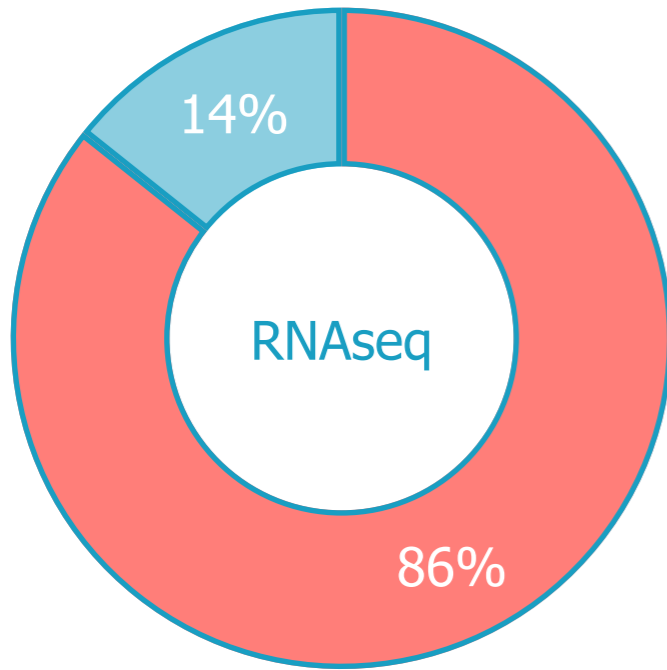


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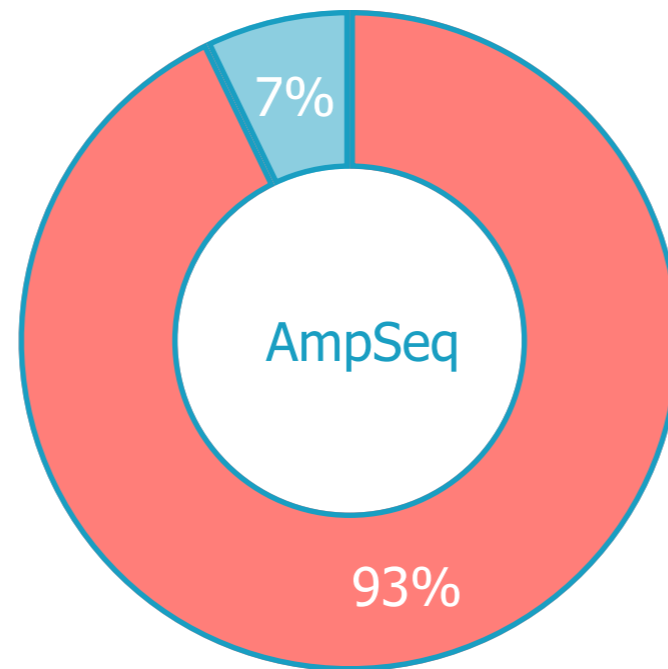
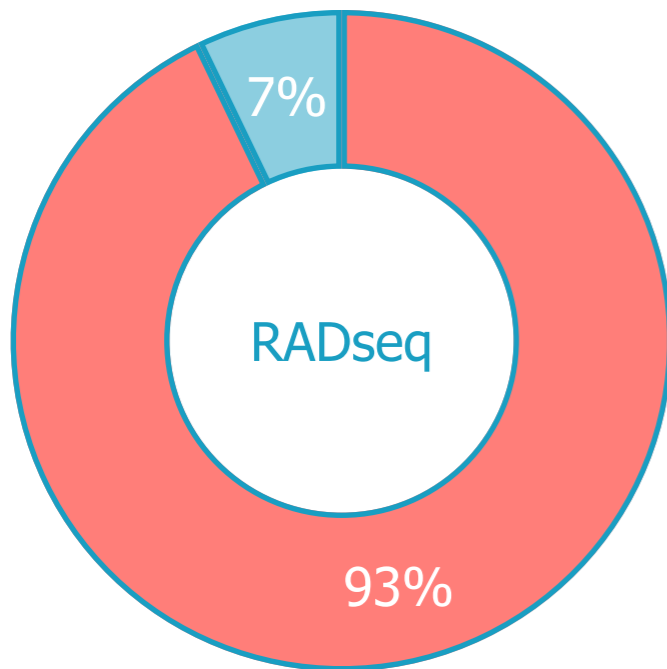


How is this possible?





N=14





# STRUCTURE



**Genetic Diversity: Analysis (GDA21) - 701-1425-00L**

**Zoom-ID**  
**674 4378 4759**

Welcome	Time	Topic	Lecturer
Monday, 21.06.21	09:00-10:00	Welcome / Info	JCW / NZ

NGS	Time	Topic	Lecturer
Monday, 21.06.21	10:00-12:00	NGS Introduction / Applications	JCW
		Challenges	
	15:00-16:00	Closing Discussion	JCW / NZ

BioComputing	Time	Topic	Lecturer
Tuesday, 22.06.21	09:00-11:00	Terminal / Biocomputing	JCW
	11:00-12:00	Biocomputing with R	NZ
		Challenges	
	15:00-16:00	Closing Discussion	JCW / NZ

Technical Issues	Time	Topic	Lecturer
Wednesday, 23.06.21	09:00-10:30	Open hours for technical issues (e.g. Terminal or R)	JCW / NZ

Reproducible Science	Time	Topic	Lecturer
Thursday, 24.06.21	09:00-10:00	Introduction / Markdown	NZ
		Challenges	
	15:00-16:00	Closing Discussion	JCW / NZ

Quality Control / Filtering	Time	Topic	Lecturer
Friday, 25.06.21	09:00-10:30	Quality Control	JCW
	10:45-11:45	Quality Filtering	NZ
		Challenges	
	15:00-16:00	Closing Discussion	JCW / NZ

[Google Docs: GDA21 - Organization](#)

9:00 - 12:00 Lecture

Selfstudy

15:00 - 16:00 Discussion

Genetic Diversity: Analysis ► **GDA21**

- Course Catalogue Number: 701-1425-00L
- Credit Points: 2 ECTS
- Date: 21.06.21 - 02.07.21
- Organizer: Genetic Diversity Centre (GDC), ETH Zurich
- Location: Online

The course **Genetic Diversity: Analysis** is organized by the Genetic Diversity Centre (**GDC**). The GDC is a knowledge and technology platform of the D-USYS Department at ETH Zurich offering two annual courses: A molecular laboratory technical course (Genetic diversity: Techniques) and a sequencing data analysis course (Genetic Diversity: Analysis).

Over 10 years, the GDC has supported researchers to plan their experiments, and helped to obtain and analyze the data. With this course we try to transfer our accumulated knowledge to young scientists.

- ➔ Infos
- ➔ Challenges
- ➔ Links
- ➔ Handouts

<https://www.gdc-docs.ethz.ch/GeneticDiversityAnalysis/GDA21/site/>

# Good to know!

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[niklaus.zemp\(at\)env.ethz.ch](mailto:niklaus.zemp@env.ethz.ch)

WWW [https://www.gdc-docs.ethz.ch/  
GeneticDiversityAnalysis/GDA21/site/](https://www.gdc-docs.ethz.ch/GeneticDiversityAnalysis/GDA21/site/)

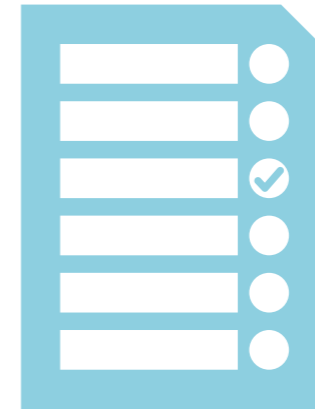
ZOOM Meeting ID: 674 4378 4759

MIRO Miro is a free online whiteboard to collaborate with others any time, anywhere. Let see if it works for us too.

Subject **GDA21: Question**



## Essentials:



- ➔ Internet access
- ➔ Terminal ready
- ➔ (S)FTP client installed (e.g. Cyberduck)
- ➔ Text editor installed (e.g. Atom)
- ➔ Markdown Editor installed (e.g. Haroopad)
- ➔ R and RStudio installed

Reviews

Student A	<input type="radio"/>
Student B	<input checked="" type="radio"/>
Student C	<input checked="" type="radio"/>
Student D	<input type="radio"/>
Student E	<input checked="" type="radio"/>
Student F	<input checked="" type="radio"/>

- it is your course
- it is your choice
- it is your decision



- pick a project
- hand in a report (md)
- hand it in before deadline
- feedback if you wish



## Video Meeting Etiquette

- ▶ Be on time
- ▶ Camera on, mic off
- ▶ Pay attention or do not join
- ▶ Eliminate distractions (e.g. cell off)

# CONCEPTS



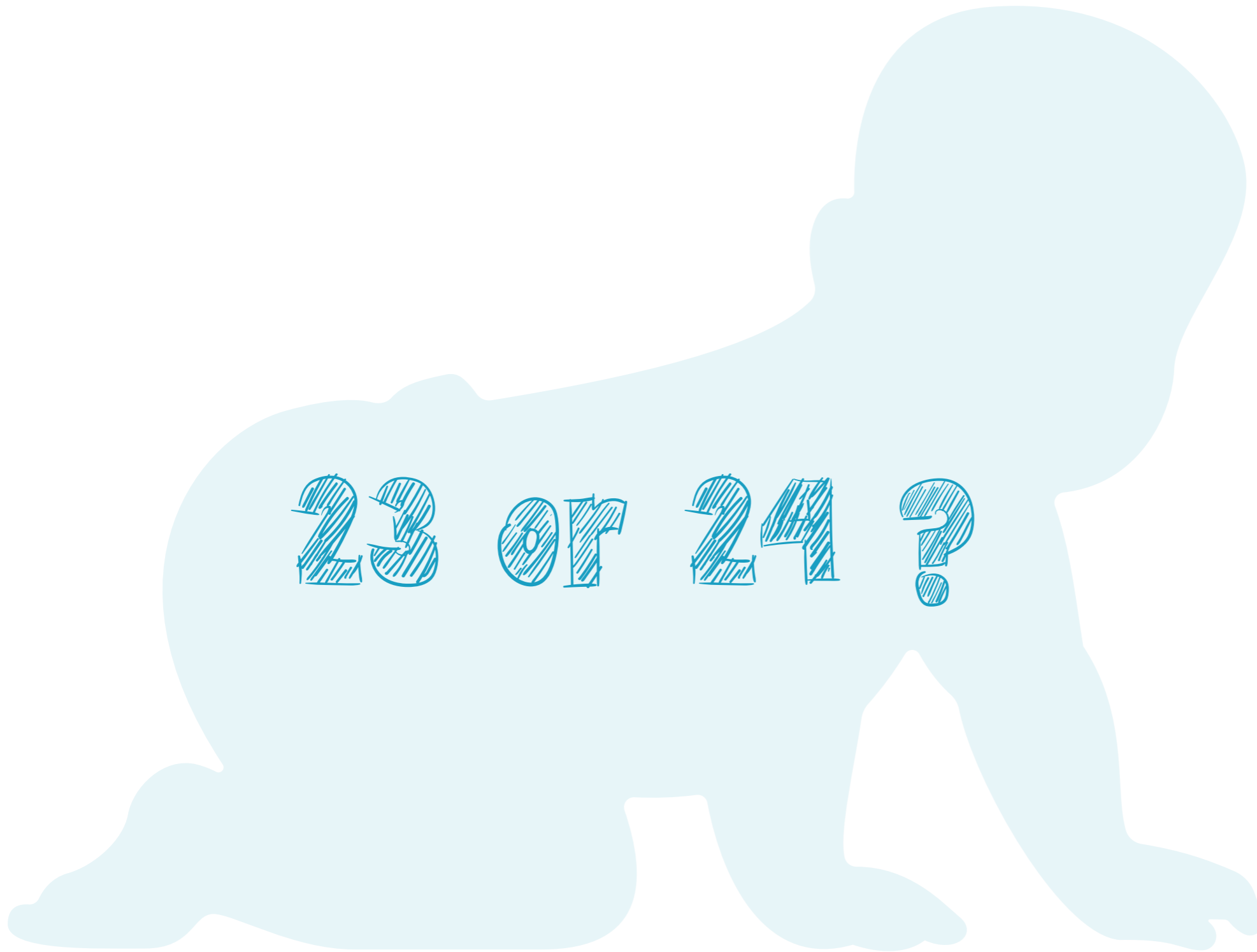
Their Master's Voice - Michael Sowa

# Master's Voice

stop copying!

start thinking!

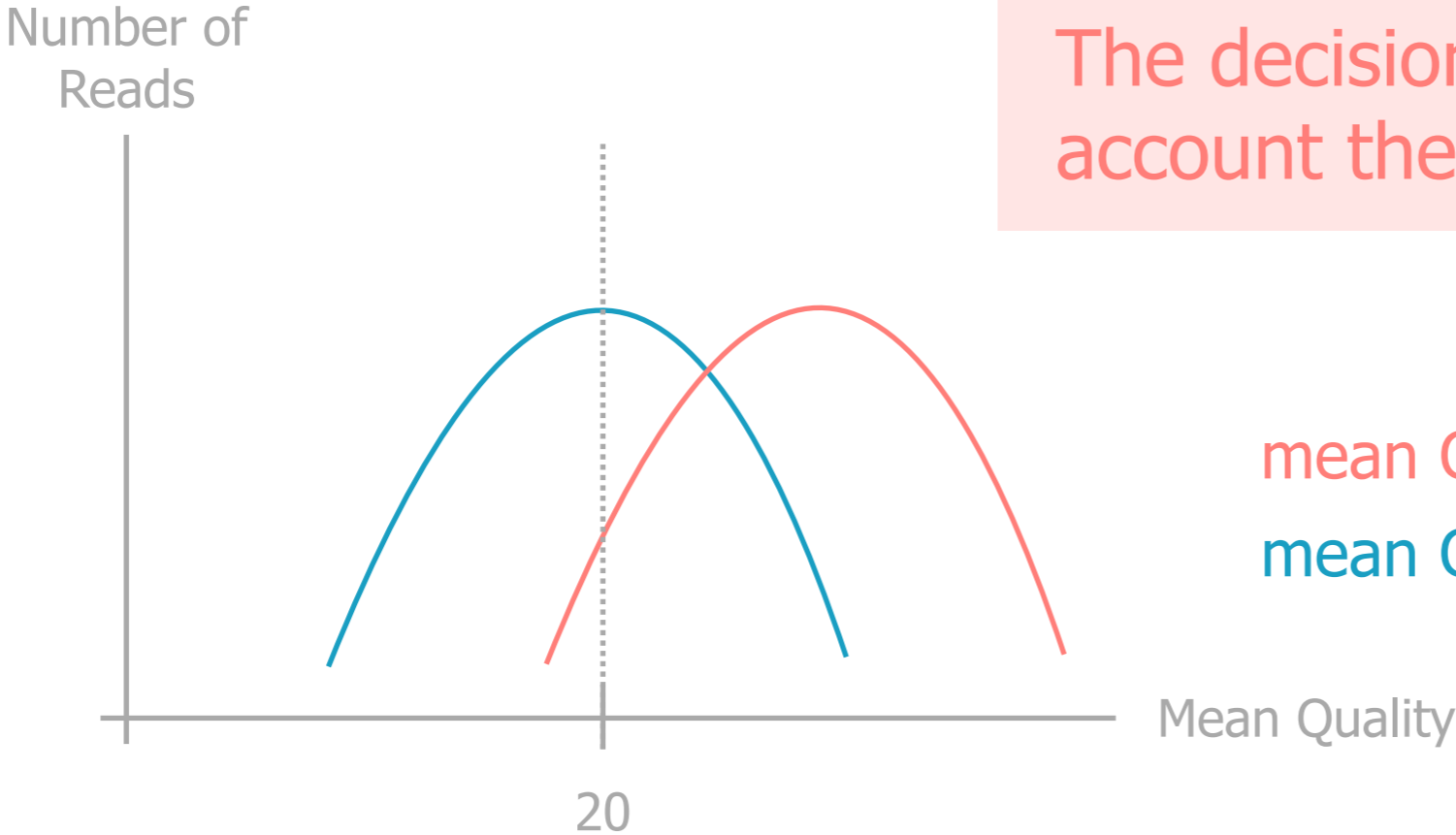




Gartler (2006) The Chromosome number in humans: a brief history.

20 Why?

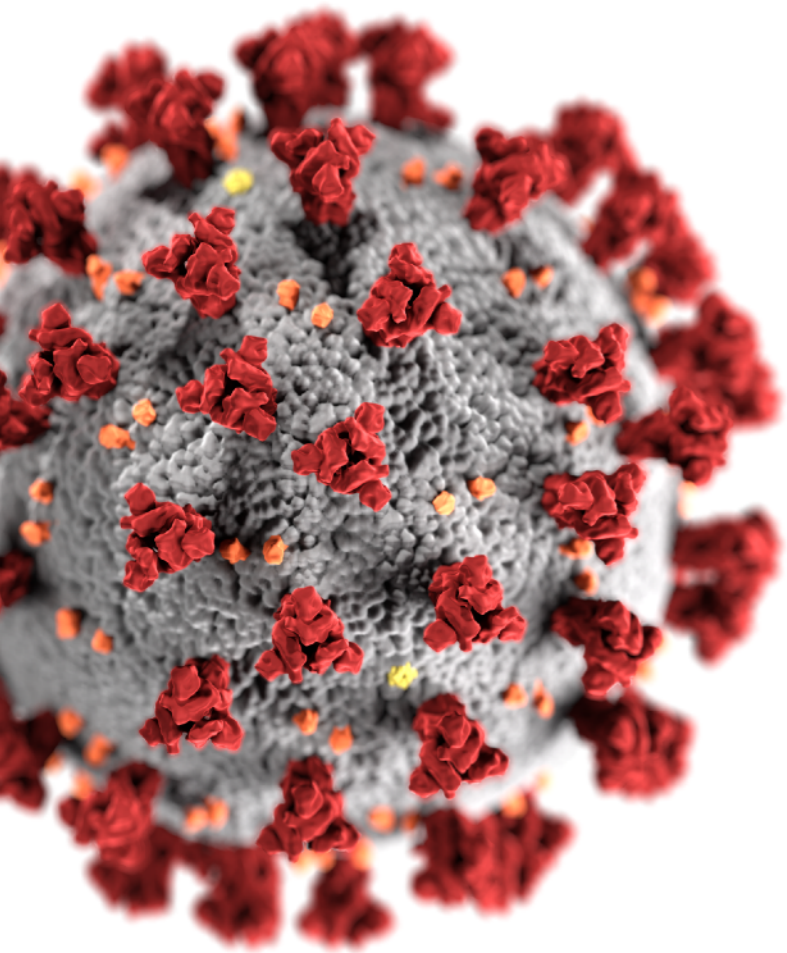
mean quality threshold



The decision should take into account the data structure.

mean Q=20 → -5%

mean Q=20 → -50%



# 5- $\mu$ m-threshold

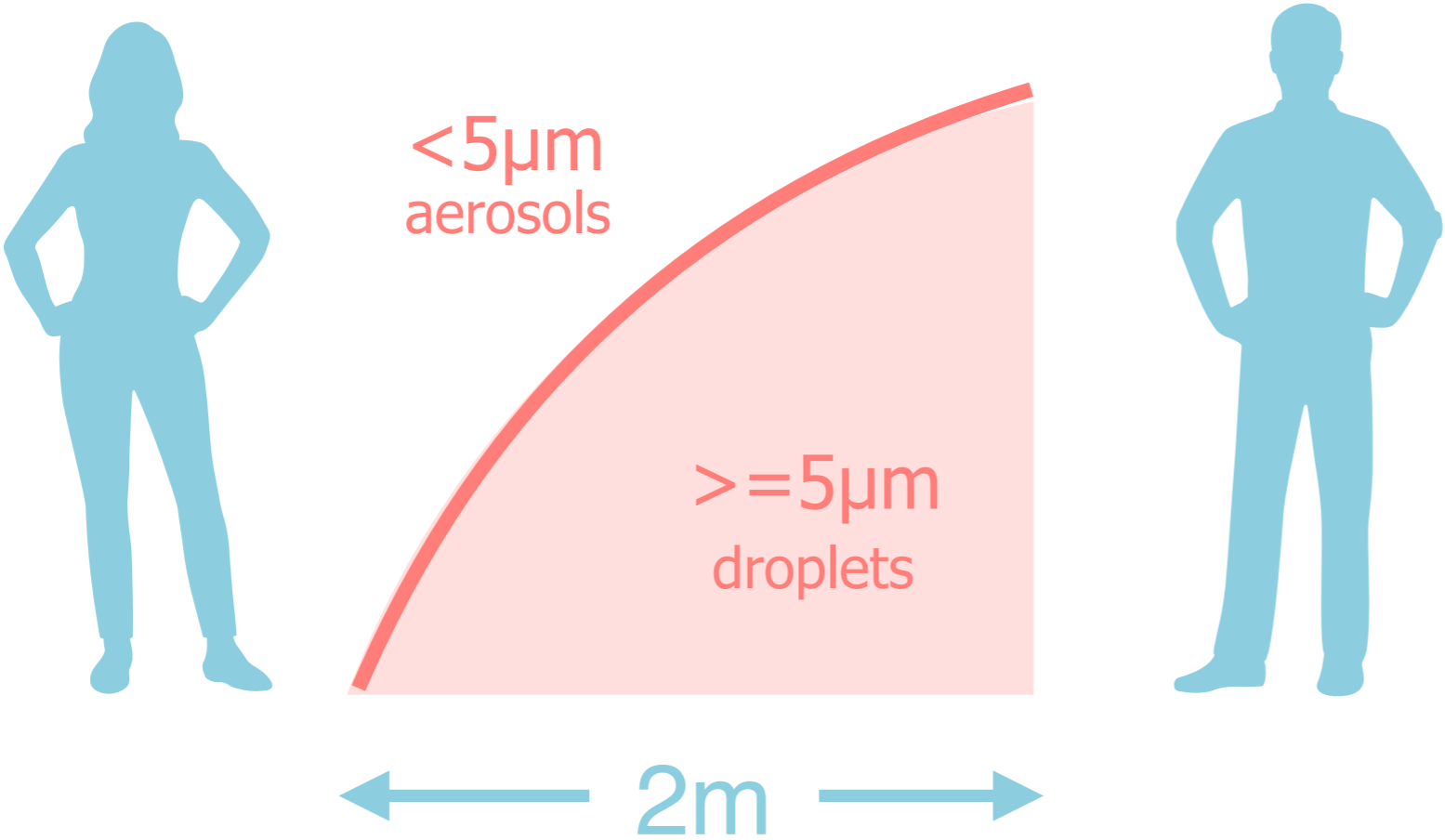
Red blood cell: 7 $\mu$ m

Bacillus: 0.5 $\mu$ m

Coronavirus: 0.1 $\mu$ m

Tang et al. (2021) Covid-19 has redefined airborne transmission - Improving indoor ventilation and air quality will help us all to stay safe. BMJ

# Social Distancing (?)







# ICYWW

in case you were wondering



You totally can make popcorn with a hair straightener!

## Dent Corn

*(Zea mays var. indentata)*

## Flint Corn

*(Zea mays var. indurata)*



## Popcorn

*(Zea mays var. everta)*



## Sweet Corn

*(Zea mays convar. saccharata var. rugosa)*

## Flour corn

*(Zea mays var. amylacea)*



A kernel of popcorn contains **moisture and oil**. Unlike most other grains, the outer hull of the popcorn kernel is both **strong and impervious** to moisture and the starch inside consists almost entirely of a hard type. As the oil and water within the kernel are heated, they turn the moisture in the kernel into **pressurized steam**. Under these conditions, the starch inside the kernel gelatinizes, softens, and becomes pliable. The internal pressure of the entrapped steam continues to increase until the breaking point of the hull is reached: a pressure of approximately **930 kPa** and a temperature of **180 °C**. The hull thereupon ruptures rapidly and explodes, causing a sudden drop in pressure inside the kernel and a corresponding rapid expansion of the steam, which expands the starch and proteins of the endosperm into airy foam. As the foam rapidly cools, the starch and protein polymers set into the familiar crispy puff. Special varieties are grown to give improved popping yield. Though the kernels of some wild types will pop, the cultivated strain is **Zea mays everta**, which is a special kind of flint corn.



Source: Wikipedia

Science is fun!



***As the  
father sees***

***As the  
child sees***

***As the  
mother sees***

***As the  
grandma sees***





Bed bugs (*Cimex lectularius*)

$$F_{ST} = 0.68$$

Saenz et al. (2012) Genetic Analysis of Bed Bug Populations Reveals Small Propagule Size Within Individual Infestations but High Genetic Diversity Across Infestations From the Eastern United States.



Bed bugs (*Cimex lectularius*)

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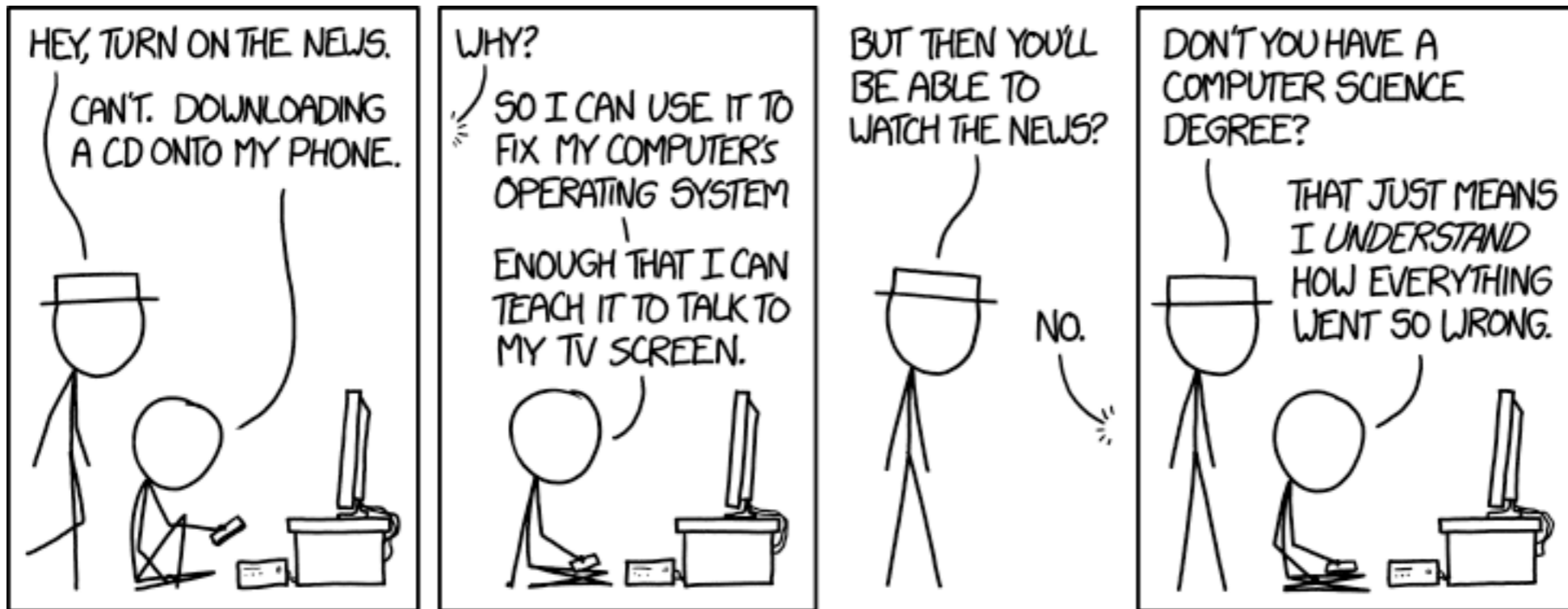
German cockroach (*Blattella germanica*)

$$F_{ST} = 0.099$$

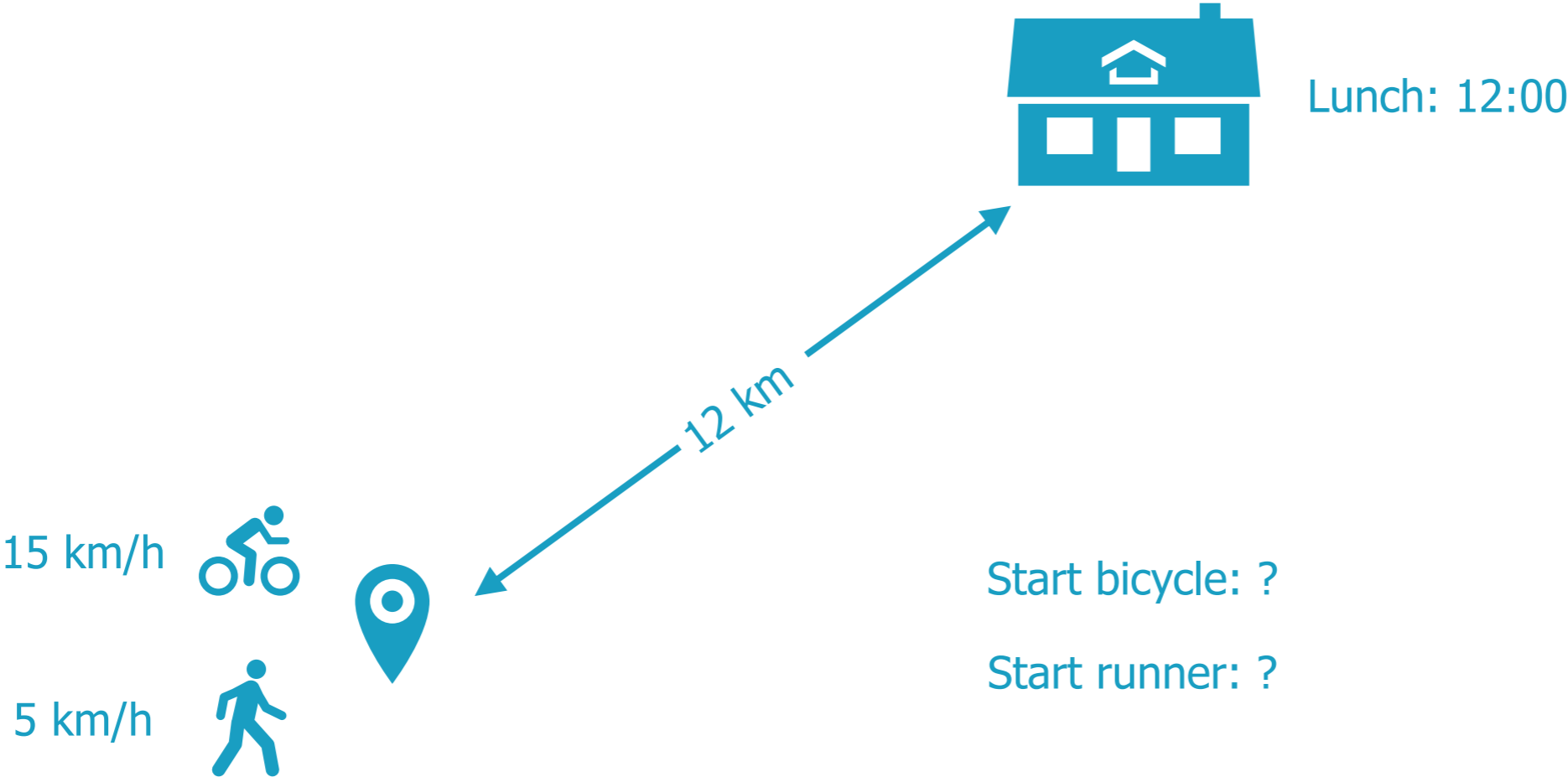


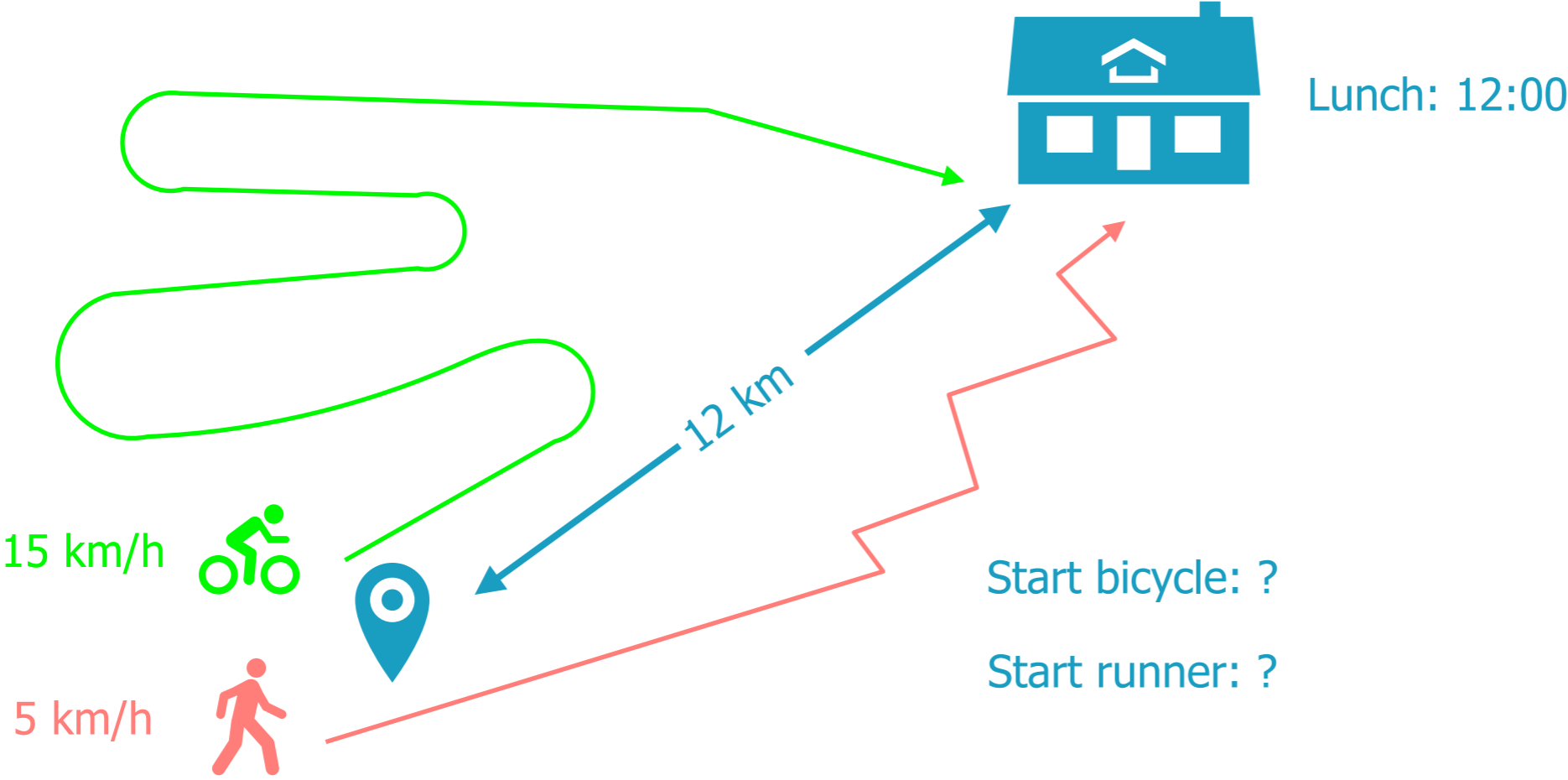
Saenz et al. (2012) Genetic Analysis of Bed Bug Populations Reveals Small Propagule Size Within Individual Infestations but High Genetic Diversity Across Infestations From the Eastern United States.

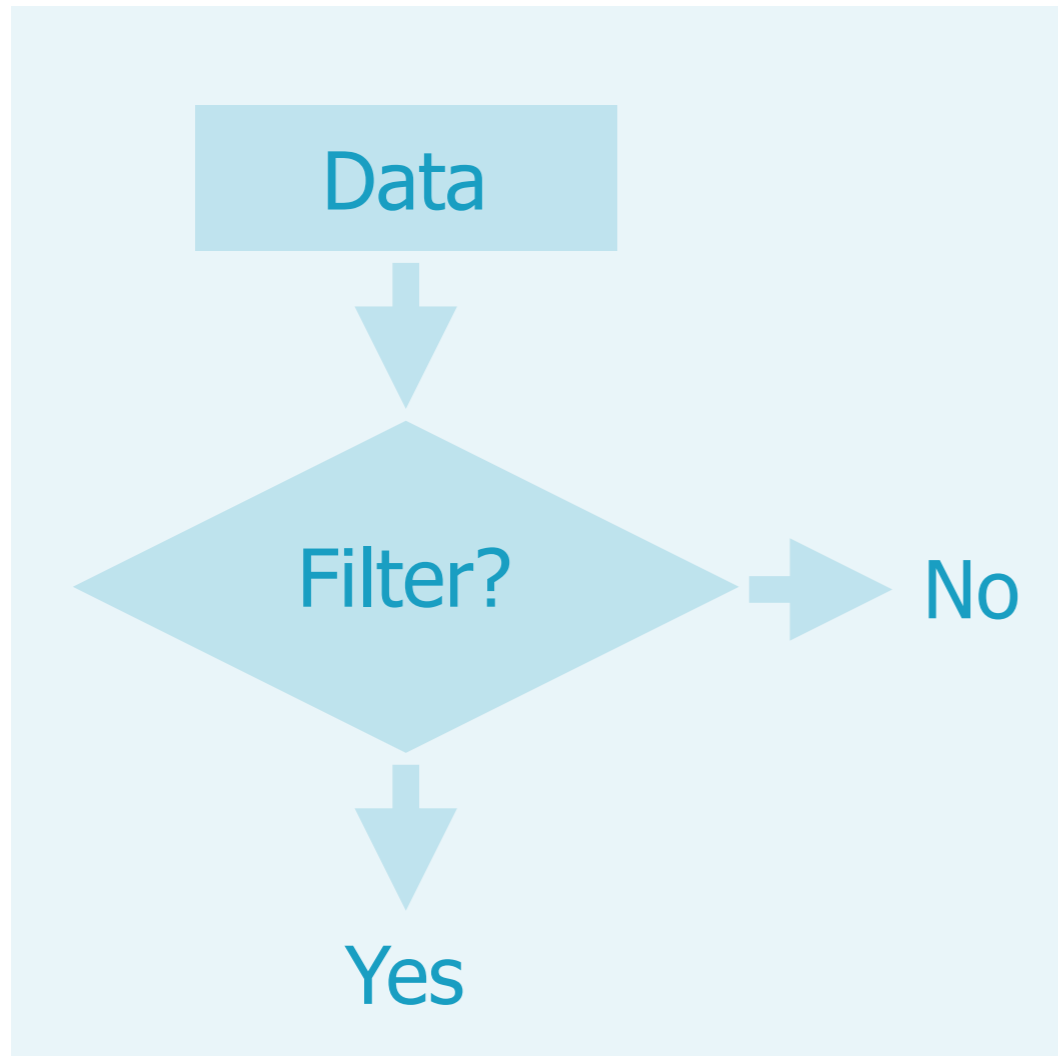
Add biology to  
numbers!











Filter data?

Subsample?

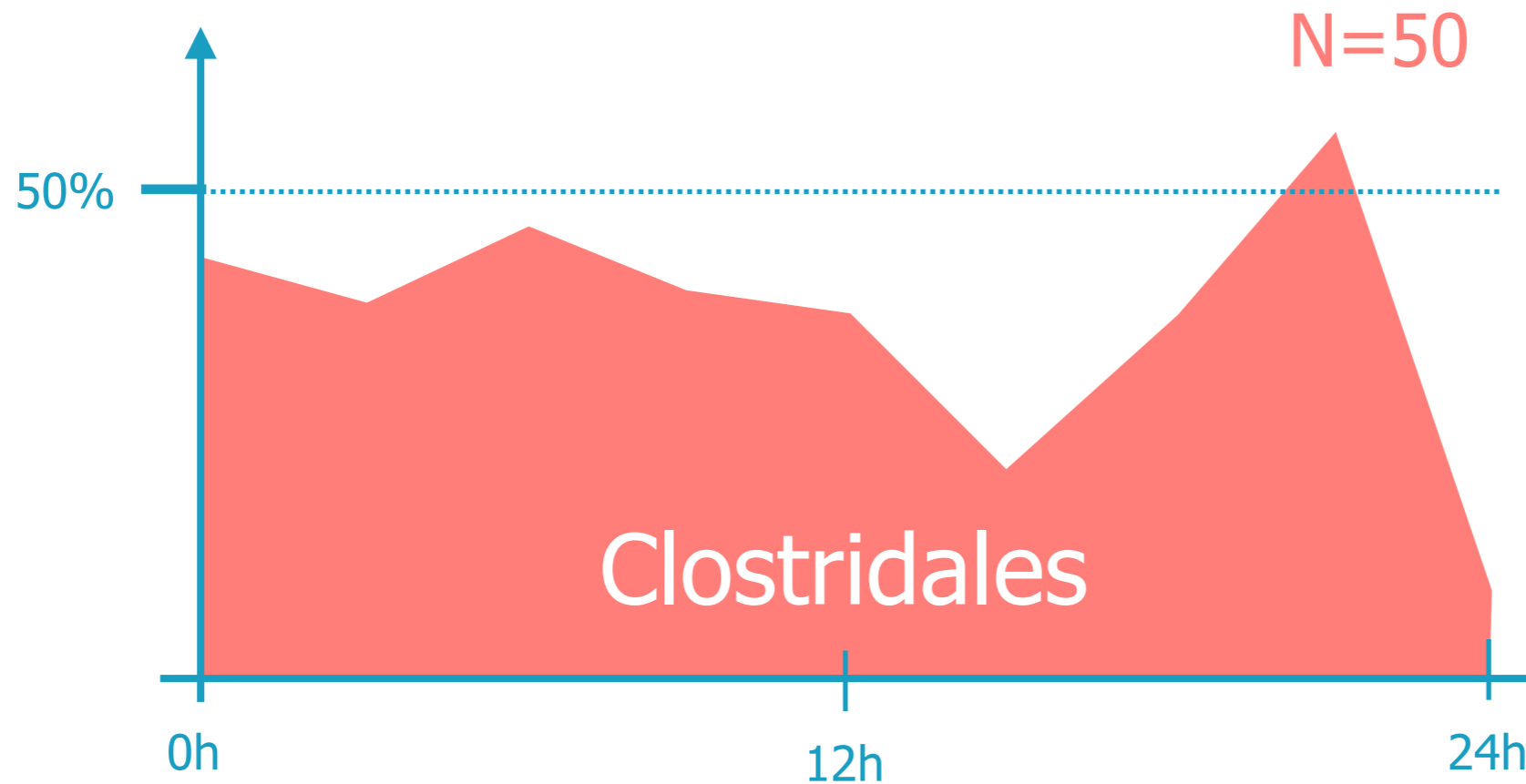
Subsample size?

Understand  
the aim!



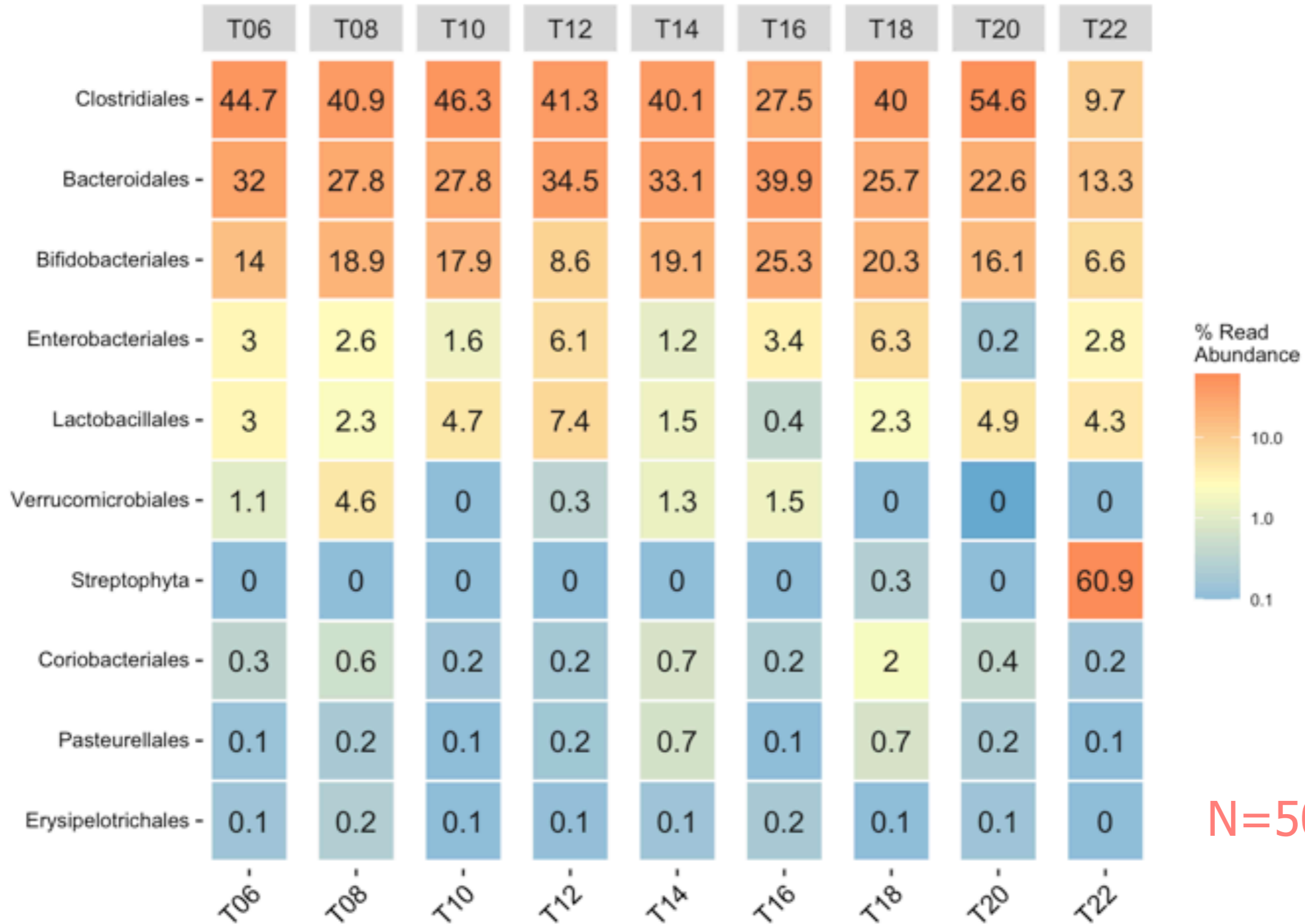
“Your chest x-ray is fine, but your driver’s license has expired.”

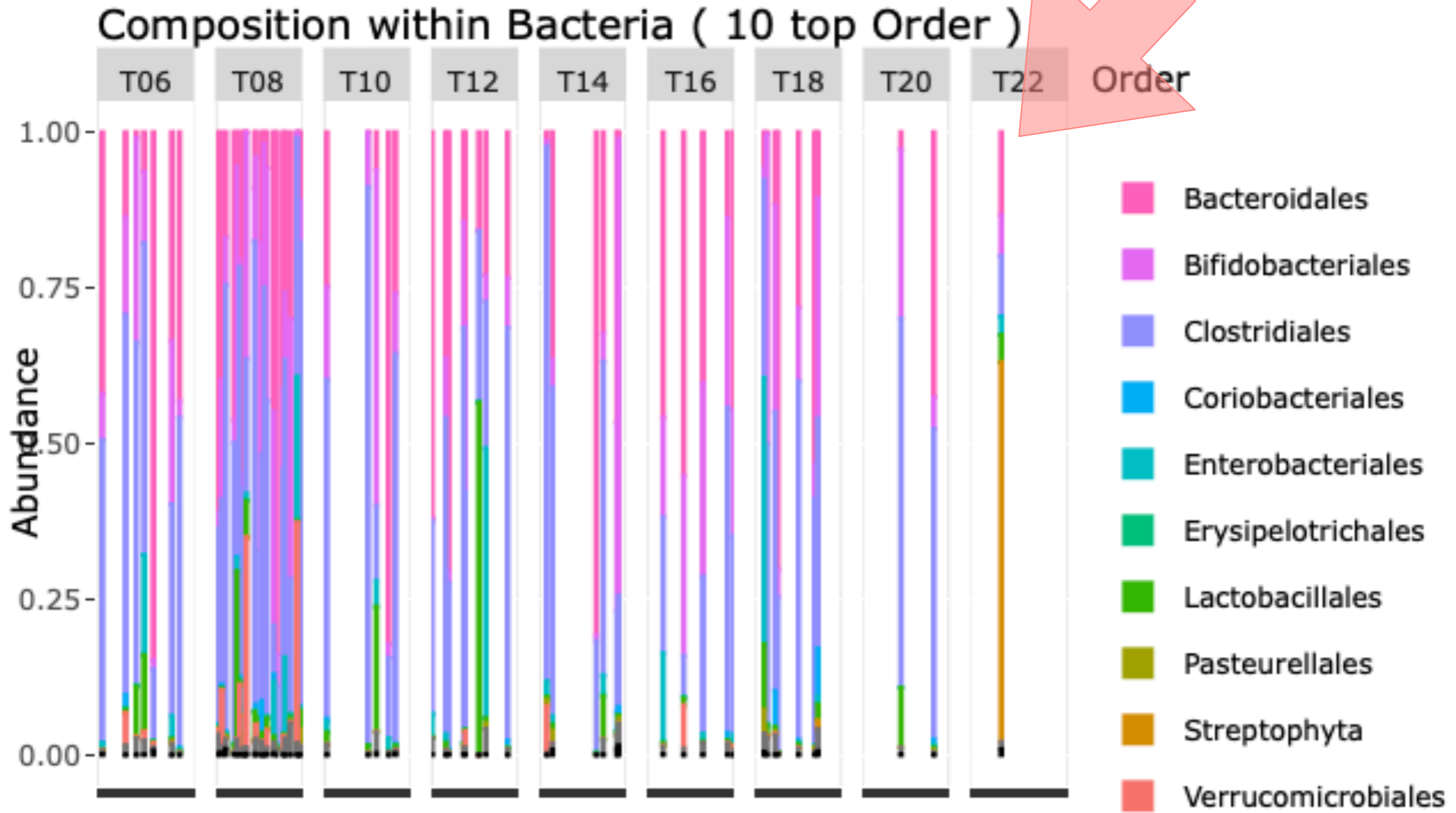




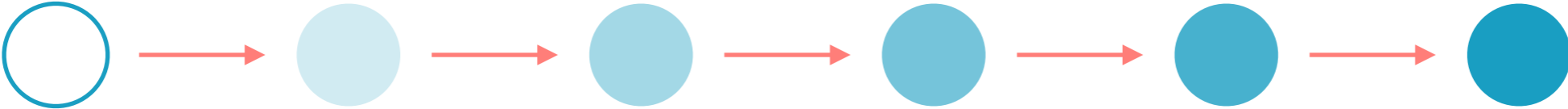
**Clostridia** are a polyphyletic class of Firmicutes, including Clostridium and other similar genera. They are distinguished from the Bacilli by lacking aerobic respiration. They are obligate anaerobes and oxygen is toxic to them.

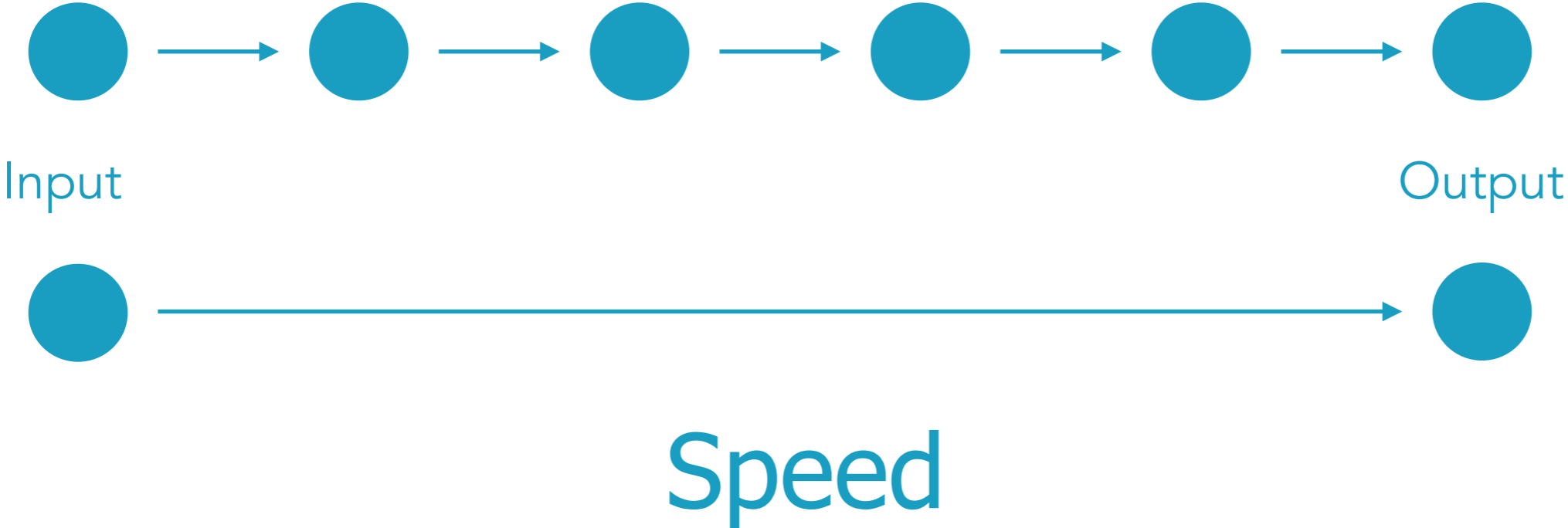
source: Wikipedia

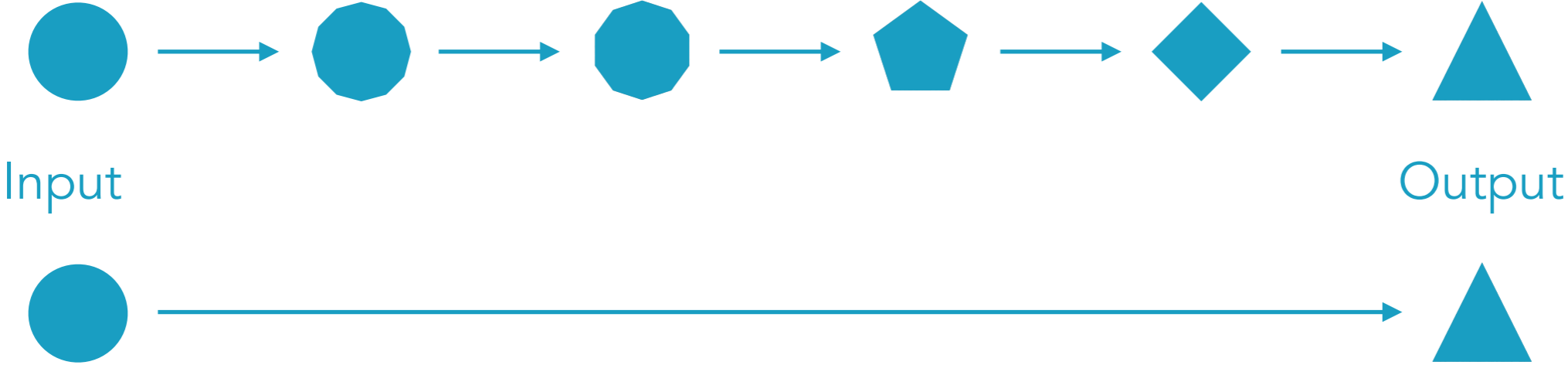




Do not get  
fooled by nice  
figures!







Simplicity