

What make a good biostatistician ? Various skills for various roles.

Prof. Catherine Legrand

Institute of Statistics, Biostatistics and Actuarial Sciences (ISBA-IMMAQ)
Université catholique de Louvain (UCL), Louvain-la-Neuve, Belgium

Catherine.legrand@uclouvain.be
www.uclouvain.be/isba
www.uclouvain.be/Isba

Biostatistics Symposium – March 2018 – Tokyo, Japan

Before we start

Athénée Royale Riva-Bella
Braine l'Alleud

"Master" in Mathematics, orientation
Statistics – ULB, Brussels



Skeletal Radiol (2001) 30:31–38
© International Skeletal Society 2001

ARTICLE

Bernard Stallenberg
Jacques Rommens
Catherine Legrand
Viviane de Maertelaer
Thierry Metens
Pierre Alain Gevenois

**Radiographic diagnosis of rotator cuff tear
based on the supraspinatus muscle
radiodensity**

ULB

Before we start

Athénée Royale Riva-Bella
Braine l'Alleud



3

Before we start

Athénée Royale Riva-Bella
Braine l'Alleud



UHASSELT

PhD in Statistics
(UHasselt)

"Master" in Mathematics, orientation
Statistics – ULB, Brussels

European Organisation for Research and
Treatment of Cancer (EORTC)

An Independent, pan-European
Clinical Research Organisation

Improving the Standards
of Cancer Care via Multidisciplinary
Clinical Research

EORTC
The future of cancer therapy

Before we start



LSBA: Louvain School of Statistics, Biostatistics and Actuarial Sciences

UCL QUICK ACCESS

4 Master Programs (120 ECTS):

- ☑ Master in Statistics – General
- ☑ Master in Statistics – Biostatistics
- ☑ Master in Data Sciences – Statistics
- ☑ Master in Actuarial Sciences

Staff:

- ▶ Full-time/Part-time academic professors
- ▶ Invited professors
- ▶ Research assistants

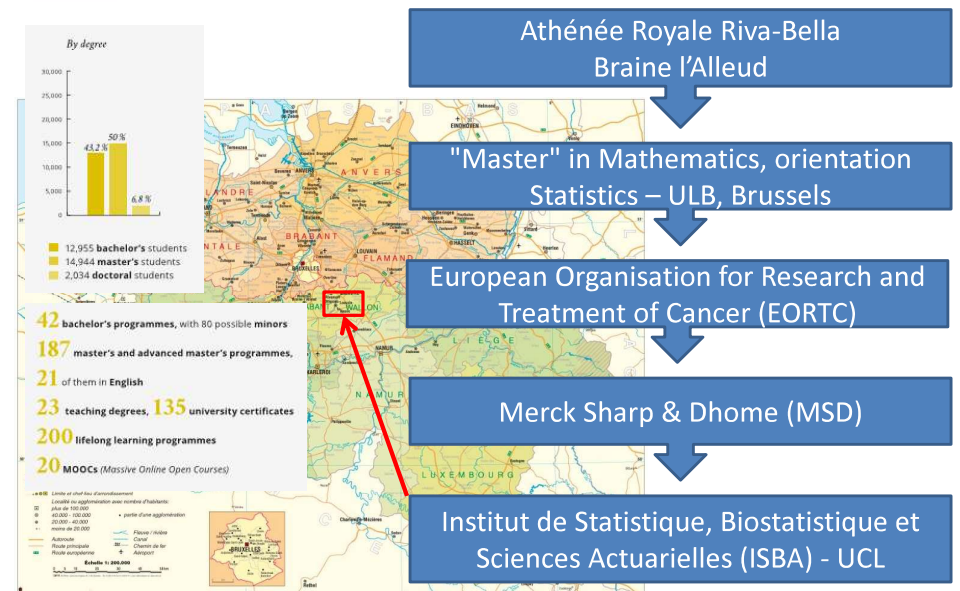
Other programs:

- ☑ Certificate (15-30 ECTS) in Statistics, Biostatistics, Data sciences
- ☑ Certificat in mathematical finances and actuarial sciences
- ☑ Junior Data Analyst
- ☑ Formation FOREM Biostatistics

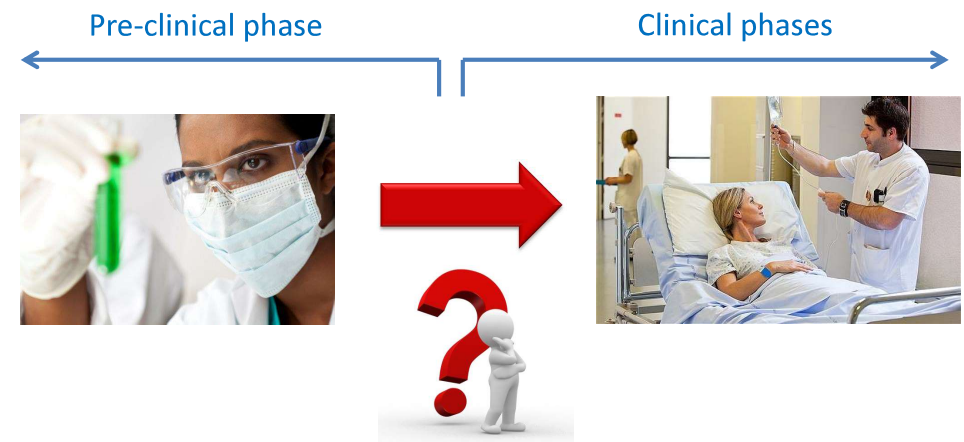
COORDINATION LSBA
NANCY GUILLAUME
MARIE-LOUISE LAFITE
CATHERINE THIERMANS
GRÉGOIRE VINCKE
COORDINATION CAV

www.uclouvain.be/lbsa

Before we start



From lab to patient



From lab to patient



Pre-clinical phase



- What is chemical makeup, stability, and solubility of the new drug ?
- Choice of the appropriate packaging (capsules, tablets, injectable formulations) ?
- Determine safe dose for first use in human ?
- ...

A lot of questions are raised ...

... requiring a lot of statistical skills to answer them



Protocol:
Objective, methodology



Selecting centers, investigators,
agreement from the EC

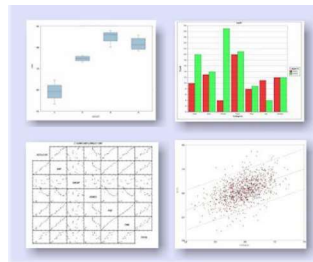


Selecting and
treating patients

Clinical trial in a nutshell



Publication /
presentation of the data



Statistical analysis of the data



Encoding data

From lab to patient



Clinical phases



- Which dose and schedule to be used ?
- Is this new drug really active in human ?
- How safe is the administration of this drug to patients ?
- How efficient is this drug compared to current standard ?
- ...

A lot of questions are raised ...

... requiring a lot of statistical skills to answer them



Protocol:
Objective, methodology



Selecting centers, investigators,
agreement from the EC

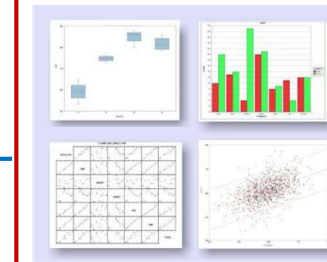


Selecting and
treating patients

Role of the statistician



Publication /
presentation of the data



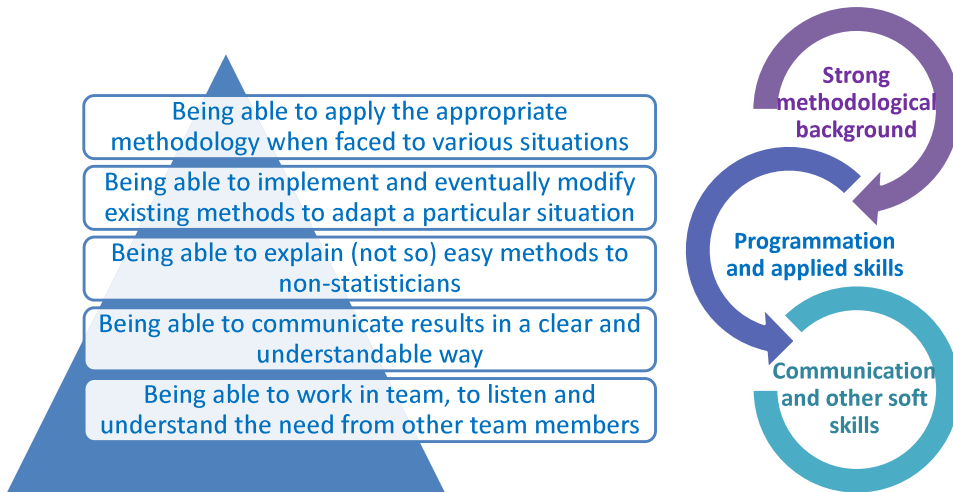
Statistical analysis of the data



Encoding data

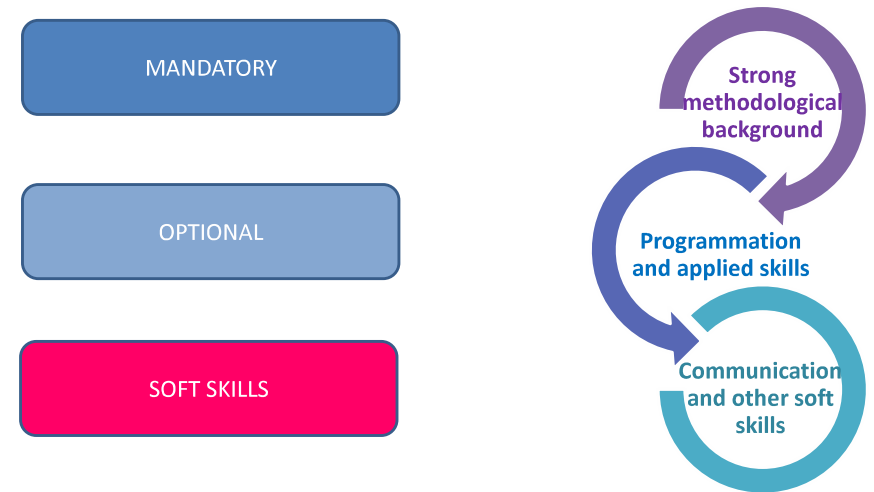
What do we expect from a biostatistician ?

13

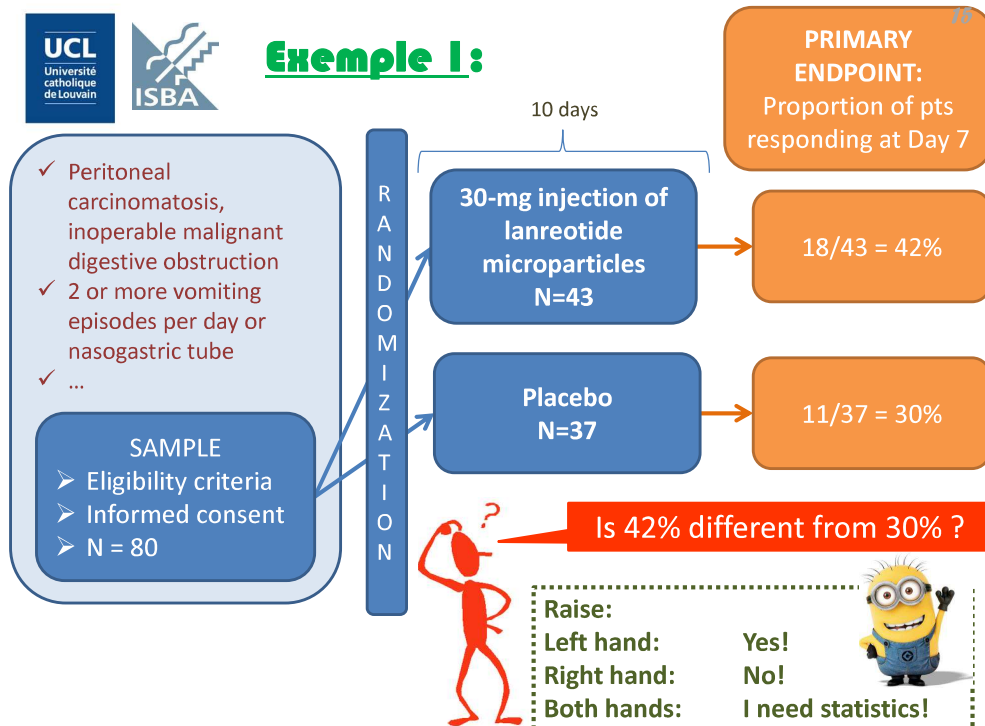


Required skills for a biostatistician ?

14

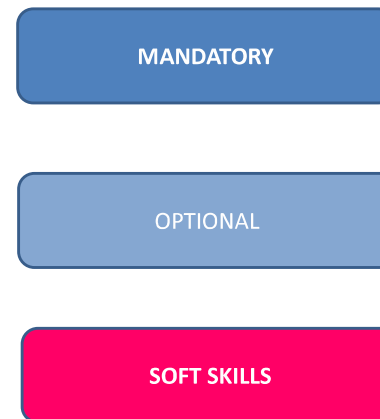


Exemple 1:

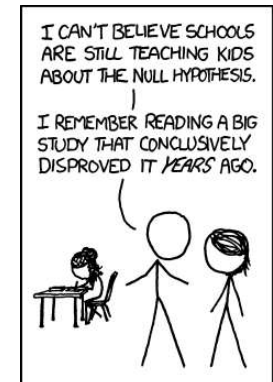


Required skills for a biostatistician ?

16



→ Good understanding of the concept of statistical inference



Exemple 2:

17

→ Often, a clinical trial starts from ...

Hello,

I'm sure the new drug *MarvelDrug* will be very efficient to treat the disease *Badhealth*.

I want to do a clinical trial to prove that it is more efficient than current drug.

How many patients do I need for this ?



Required skills for a biostatistician ?

19

MANDATORY

OPTIONAL

SOFT SKILLS



→ Be able to combine various skills to accurately and convincingly answer vague questions from medical team



<http://www.drugsdb.com/blog/the-placebo-effect.html>

Exemple 2:

18

→ As statistician, we can't actually answer this question ...



... unless everyone has agreed on:

- ✓ Appropriate phase, design and objective(s)
- ✓ Appropriate (primary) endpoint and associated methodology
- ✓ Appropriate control arm (if any)
- ✓ Type I and II error
- ✓ Targeted treatment effect

What make a good biostatistician ?

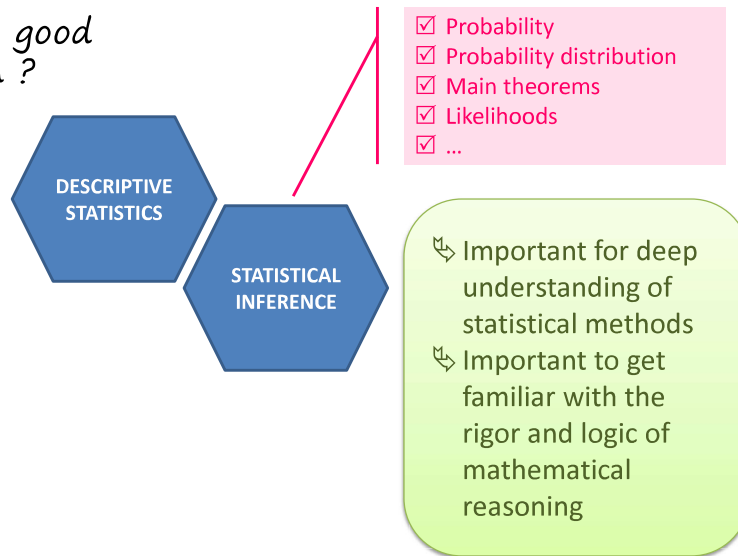
20

DESCRIPTIVE
STATISTICS

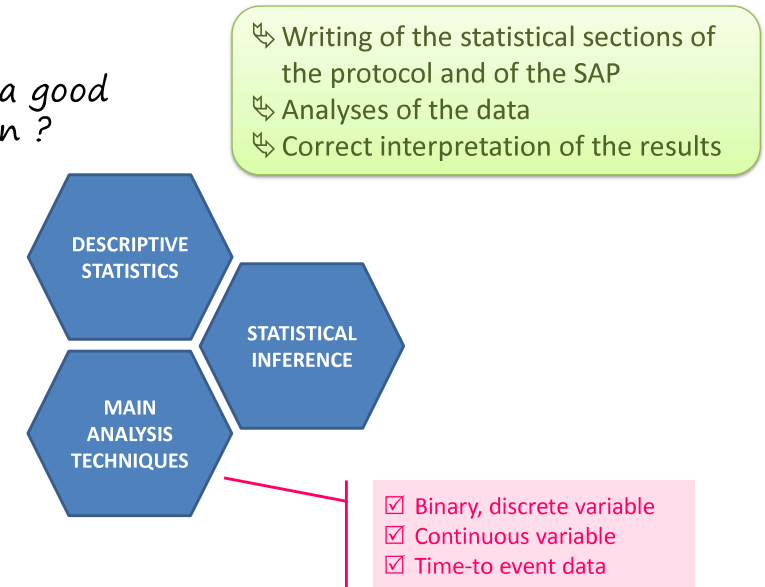
- ✓ Empirical distribution
- ✓ Summary measures
- ✓ Graphics and visualisation

- ↳ Basis of any statistical analyses
- ↳ Descriptive statistique of particular importance as no possibility of random sample
- ↳ Usefull tool for data presentation

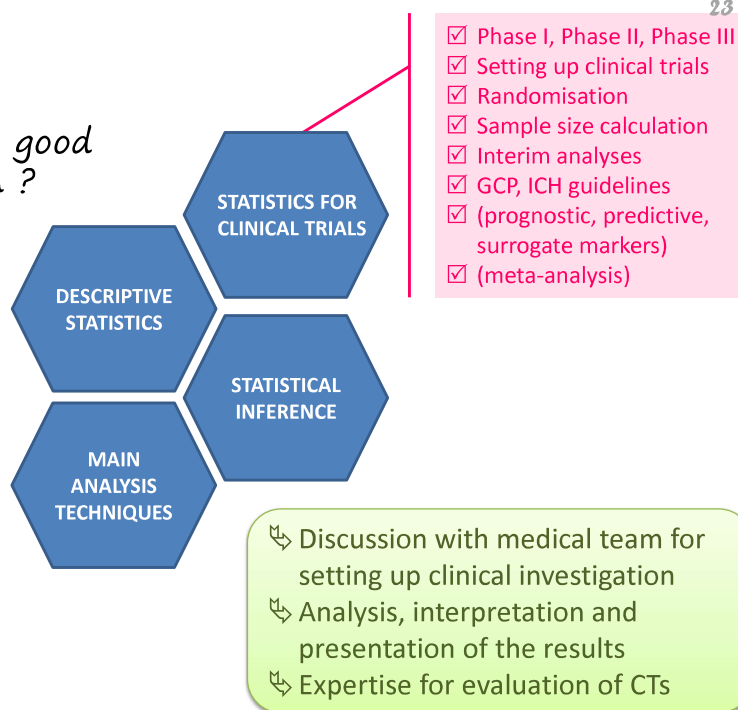
What make a good biostatistician ?



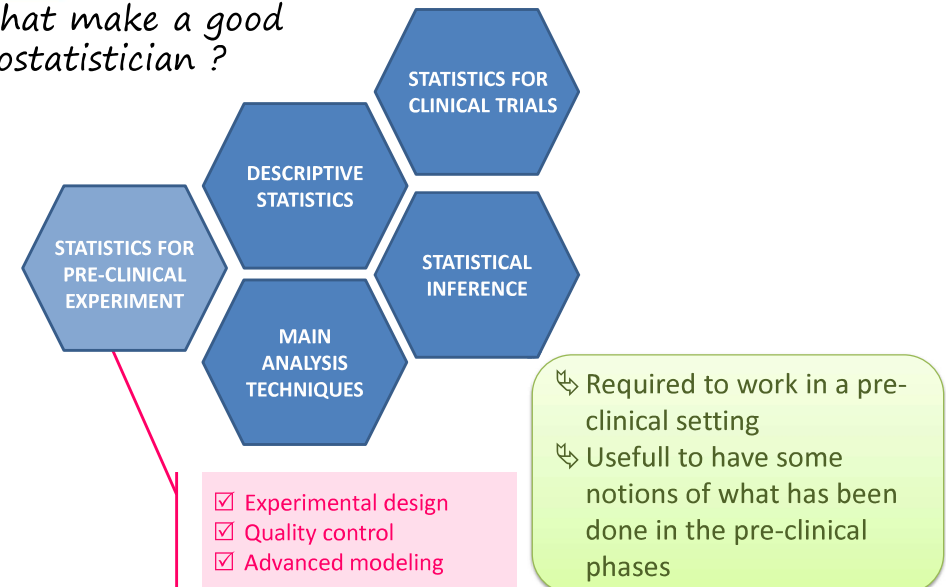
What make a good biostatistician ?



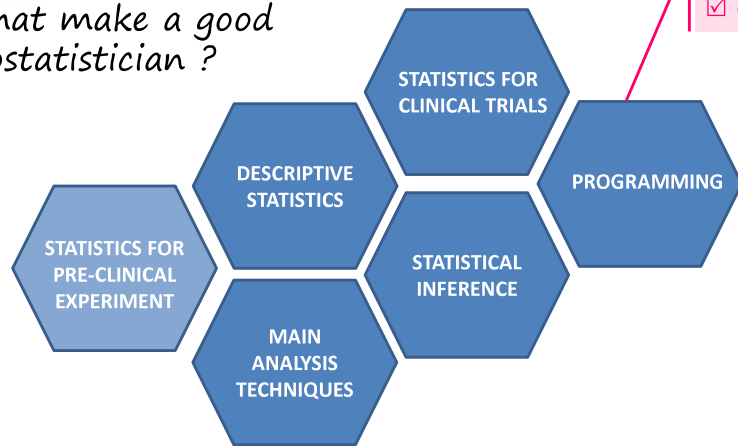
What make a good biostatistician ?



What make a good biostatistician ?



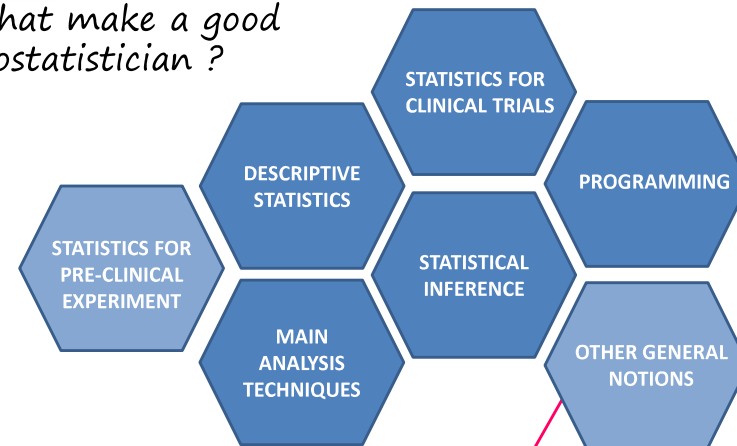
What make a good biostatistician ?



- ✓ SAS
- ✓ R
- ✓ (JMP, SPCSS, ...)
- ✓ (C++, Python, ...)

- ↪ Programmation of statistical analyses
- ↪ Interaction with statistical programmers
- ↪ Ability to modify implemented methods if needed

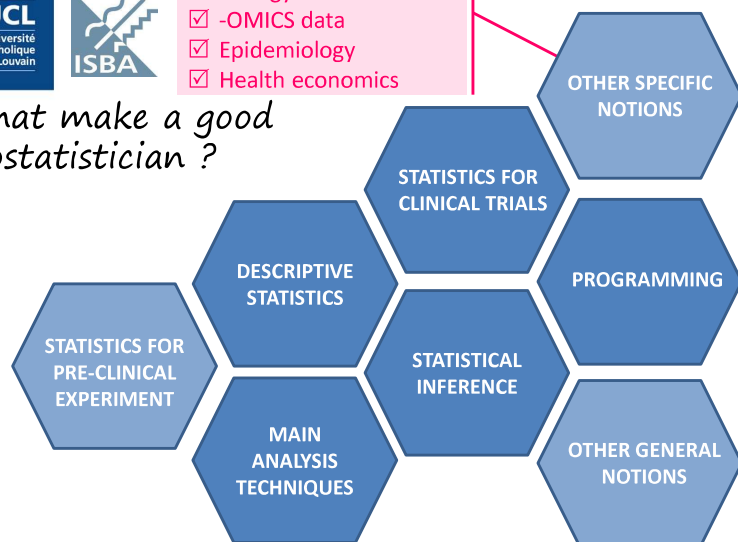
What make a good biostatistician ?



- ↪ May be necessary in some non-standard situations
- ↪ Follow quick evolution of the statistical field

- ✓ Bayesian statistics
- ✓ Non-parametric statistics
- ✓ Statistical simulations
- ✓ Bootstrap
- ✓ Machine learning approaches

What make a good biostatistician ?



- ✓ Biology
- ✓ -OMICS data
- ✓ Epidemiology
- ✓ Health economics

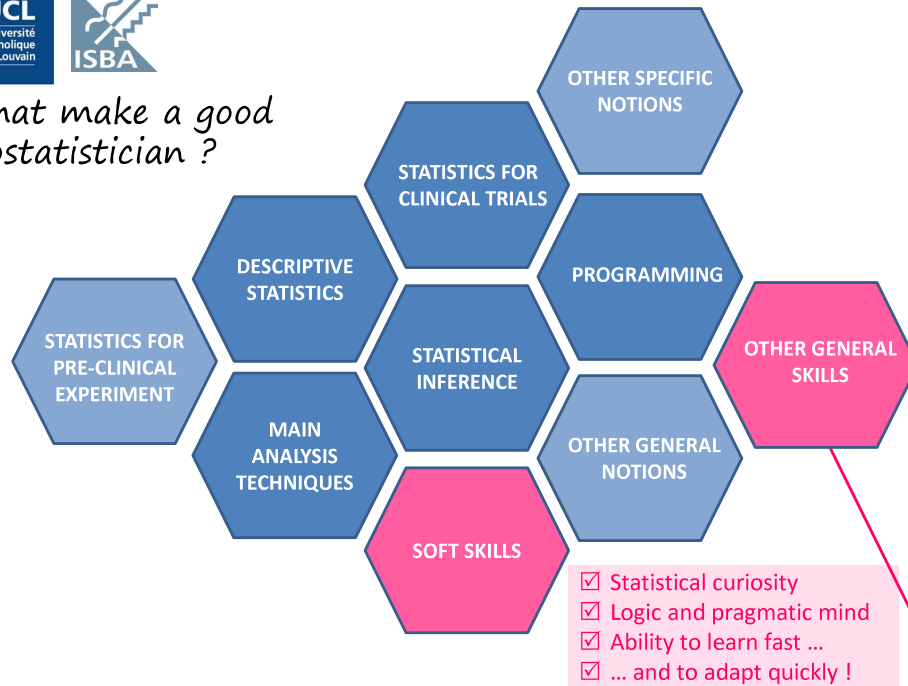
- ↪ -omics data are becoming important components of clinical research
- ↪ (pre-)clinical research has links with epidemiology (eg pharmacovigilance)
- ↪ Possible relations between clinical statisticians and health economists

What make a good biostatistician ?

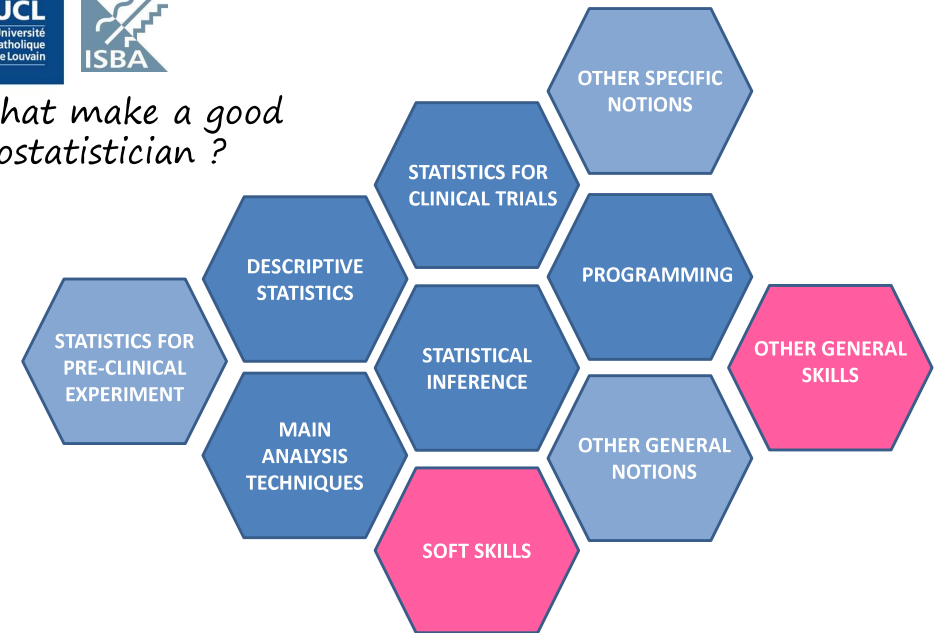


- ✓ Presentation skills
- ✓ Communication skills
- ✓ Team work

What make a good
biostatistician ?

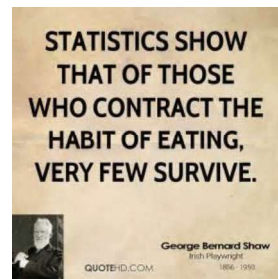


What make a good
biostatistician ?



→ Various skills for various roles.

Thank you for your
attention!



ON TEENAGERS, ADULT:

Statistics show that
teen pregnancy
drops off significantly
after age 25.

Mary Anne Tobolski, Republican state senator from Colorado Springs
(contributed by Harry F. Ponce)

Birthdays
are good for you.
Statistics show that
people who have the
most live the longest!

(Larry Lorenzoni)