



GÖTEBORGS  
UNIVERSITET

# Clinical epidemiology

## Chapter 3 - Abnormality



BOKCIRKEL 2022-04-19

Types of  
data

Criteria for  
abnormality

Performance of  
measurement

# Clinical epidemiology

## Chapter 3 - Abnormality

Regression to  
the mean



Variation

Distributions

# Types of data

## Types of data

- Nominal (**categorical** variables, no ranking)
- Dichotomous (two **categorical** variables, no ranking)
- Ordinal (**categorical** variables, ranking)
- Interval (**numeric** variables, ranking)
- Continuous (**numeric** variable, ranking, any value)
- Discrete (**numeric** variable, ranking, specific value)

# Types of data

Types of data in the IBD project

- Nominal – diagnosis of IBD (CD/UC/IBD-U)
- Dichotomous – gender (boy/girl)
- Ordinal – education level (elementary/high school/university)
- Interval
- Continuous – household crowding (sqm per household individual)
- Discrete – number of siblings (0, 1, 2, >3)

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*Is there a clear difference?*

*Practical example from celiac-study?*

# What affect performance of measurment?

## Three types of validity

- Content validity

”Do we measure what we intend to measure?”

- Criterion Validity

”To what extent do the method we use agree with golden standard?”

- Construct validity

”To what extent is the measurement coherent with other measures believed to be a part of the same phenomena?”

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*Practical example of construct validity?*

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## Responsiveness

”To what extent the result change as the condition change?”

”An instrument responsive to detect changes over time?”



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## Interpretability

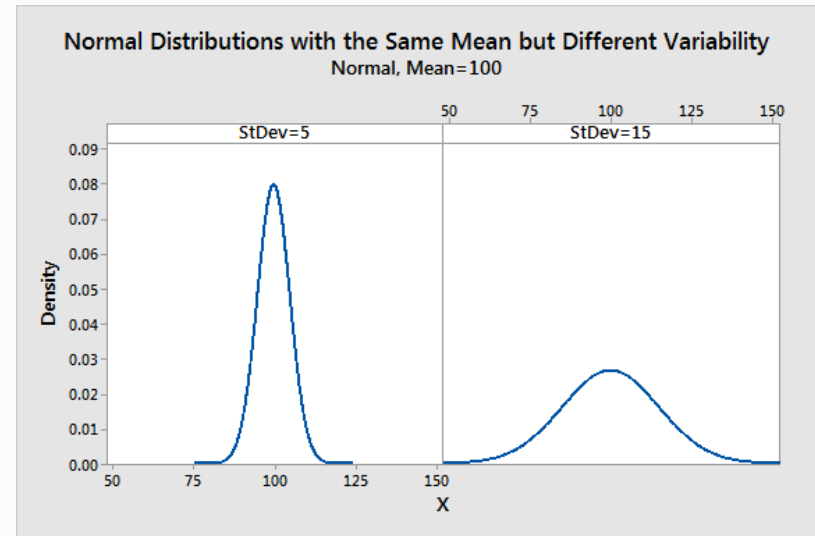
”Desirable to avoid interpretability disadvantages = where there is room for own interpretations of the result”

“Numbers of a scale can be anchored to a description, e.g., Karnofsky Performance Status Scale”

Performance	Karnofsky score
No evidence of disease	100
Normal activity, minor signs of disease	90
Normal activity, signs of disease with effort	80
Self-care, unable to carry out normal activity	70
Assistance needed, able to care for most of own needs	60
Considerable assistance required	50
Disabled, special care and assistance required	40
Severely disabled	30
Supportive treatment needed	20
Moribund	10

# Variation

- **Why does it arise?**
  - Human factor
  - We only measure a sampling fraction
  - Different methods
  - Biologic changes



# Variation

- **Why does it arise?**

- Human factor
- We only measure a sampling fraction
- Different methods
- Biologic changes

- **How does it effect us?**

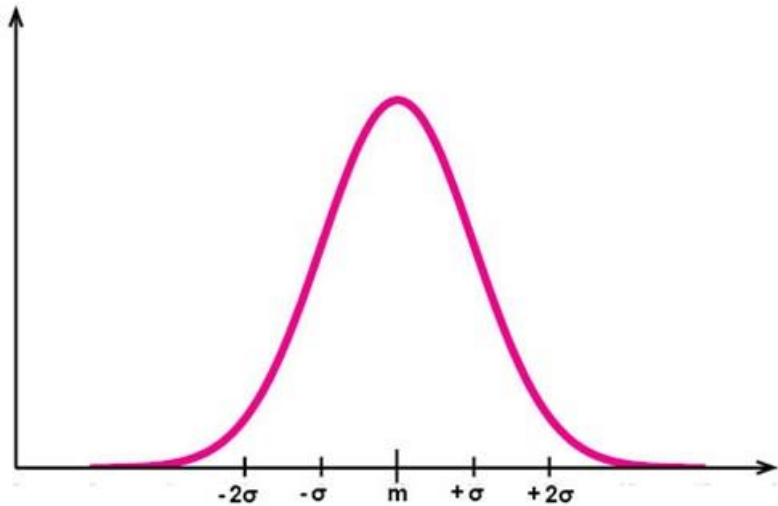
- Random variation → balances out
- Bias results → systematically values different from the true value



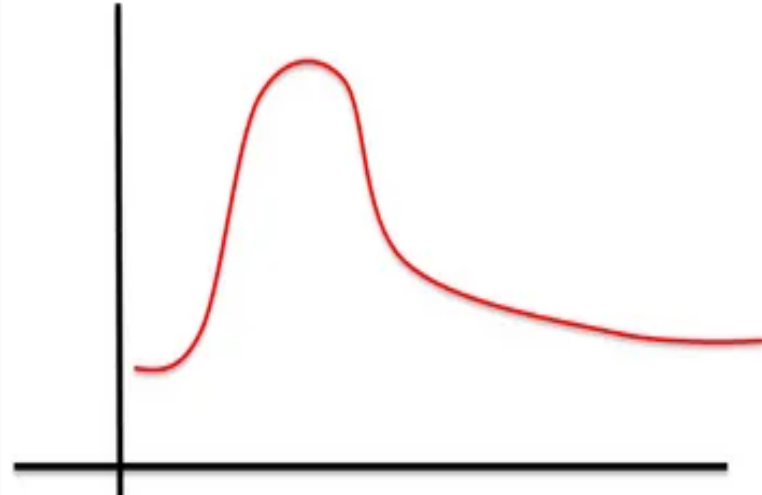
*To what extent can we reduce the variation by a high validity within the study (avoiding measurement- and selectionbias)?*

# Distributions

Normal distribution

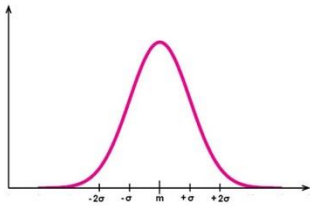


Skewed distribution



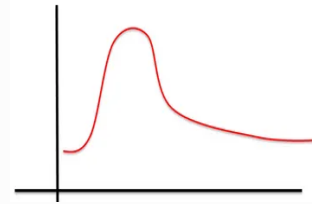
# Distributions

Normal distribution



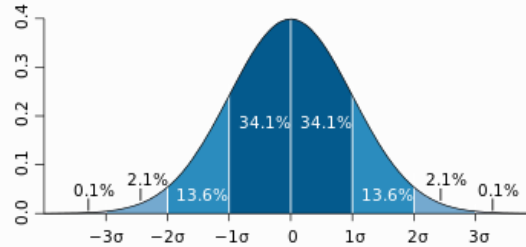
Mean  
SD

Skewed distribution



Median  
Range

Normal (Gaussian) distribution



# Criteria for abnormality

- Unusual
  - = occurs infrequently
  - Values beyond 2 SD from the mean (commonly used, but can be misleading)
  - A fraction/percentile of the actual distribution
- Associated with disease
  - =cases that clinically departures from good health
  - Highly depend on the health outcome of the question
- Treatment leads to better outcome
  - Good for symptomatic conditions → more difficult for asymptomatic conditions
  - Treatment of condition may not remove risk (can may be related to a damage already occurred)
  - What is the definition of a “better outcome”

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*Which way is the best way to define abnormality? Does it vary from case to case?*

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- Good for symptomatic conditions → more difficult for asymptomatic conditions
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- What is the definition of a “better outcome”

# Regression to the mean

*"Our performance always varies around some average true performance.  
Extreme performance tends to get less extreme the next time.*

*Why?*

*Testing measurements can never be exact. All measurements are made up of one true part and one random error part.*

*When the measurements are extreme, they are likely to be partly caused by chance. Chance is likely to contribute less on the second time we measure performance."*



*How to ensure measurement has not been  
affected by regression to the mean?  
Repeated measurement?*