

임상연구 설계와 분석을 위한 통계 방법

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16th November, 2017

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Chapter I: Overview of Statistics

*There are three types of lies: lies, damn lies, and **STATISTICS*** (Benjamin Disraeli)

*Fact are stubborn things, but **STATISTICS** are pliable* (Mark Twain)

and so on ...

Huge number of quotes about statistics commented it in sarcastic tone

→ mostly hard to refute

However ...

Statistics itself always provides useful information and allows us to maintain objective perspective based on DATA

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Statistics

Concerning with **collection**, **organization**, **summarization** and **analysis** of **DATA**

The most important things in statistics

1. Data (sample)

- Investigation, experiment, and survey
- Gathering numbers (for quantitative analysis)

2. Description or Summarization

- Table, chart, and so on
- Based on summarized statistics (e.g. mean, standard deviation, median, ...)

3. Inference

- Numerous statistical tests and models based on probability theory
- e.g. two-sample t-test, ANOVA, ANCOVA, regression, and so on

Why should we collect data (sample)?



Measure everything from POPULATION

- Benefits
 - You will get exactly correct answer
 - No need to meet an awkward statistician LIKE ME
- If you had a plenty of
 - Money (typing “SHOW ME THE MONEY” may help your budget)
 - Time (TOO SHORT TO COLLECT data of entire population)

Inferential approach based on SAMPLE

- If we have a proper sample that represents the whole population, you can get NEARLY the correct answer
- Estimation and hypothesis testing

Data consist of a set of independent sample and measured variables

Measurement is ubiquitous \rightarrow then error is also ubiquitous.

1. Nominal (명목척도): sex, marital status, blood type, race, ...
2. Ordinal scale (순서척도): grade, education level, preference, severity, ...
3. Interval scale (구간척도): temperature, IQ, ...
4. Ratio scale (비율척도): height, weight, BMI, blood pressure, ...

Type of Studies

Research or trial?

Research

자료의 수집과 분석 목적이 학술적 목적에 국한된 모든 종류의 연구 및 실험

Trial

자료의 수집과 분석 목적이 이윤추구 또는 허가에 목적이 있는 임상시험

Cross-sectional study (단면적 관찰연구)

1. prevalence study
2. Diagnostic test
3. Ecological study
4. Validity, Reliability, and agreement study

Longitudinal study (종단적 관찰연구)

1. Prospective study
2. Retrospective study

Randomized controlled trial

Pilot study

Exploratory study

Confirmative study

Type of outcome variables

Sample size calculation

Two approaches

1. Based on the marginal error rate \rightarrow population based observational study
2. Based on the effectiveness between concerning groups \rightarrow experimental study

Both approaches are based on previous studies

Is your study entirely new?

Observational study: prevalence study



Observational study: prevalence study



2×2 cross-over design



Multiple comparison

What makes data significant?



1. Data themselves contain unexpected errors
2. Bias
3. Just coincidence
4. Our hypothesis is working

Statistical Analysis

1. Too easy, but very useful methodology for the comparison of sample means between two groups

Analysis of Variance (ANOVA)



Simple or multiple regression



Cohen's κ

Cronbach's α

Intra Class Correlation (ICC)