Health Sciences Common Special Lecture IV, VIII

Minato Nakazawa

minato-nakazawa@people.kobe-u.ac.jp

https://minato.sip21c.org/ebhc/

Types of research

- To find the problem
  - Pilot study
  - Case report
  - Descriptive study
  - Formulation of the issue
- To solve the problem: Usually sampling with properly designed size and other appropriate study design are essentially important
  - Hypothesis testing: Sampling → Data → Graphic expression → Estimation of statistics with confidence interval or hypothesis testing → Detection of statistical significance or fitting models
  - Intervention study: Typically RCT (randomized controlled trial)

Approaches to the data

- Interview and/or questionnaire
  - Structured / Semi-structured / Non-structured (Free answered)
  - If not structured, usually the study type is qualitative study, which is mostly the type to find the problem
- Observation (including measurement)
- Experiment (including animal experiment, clinical trial [especially RCT]): Usually hypothesis testing
- Meta-analysis / Systematic review
  - Not collecting any original data, but getting information from ever-published papers and pooling them, then re-analyzing

Whole population and sample surveys

- Whole population survey (Complete study)
  - Usually the study type is to find the problem
  - Common statistical analysis is not directly applicable
- Sample survey
  - Adequate sampling is essential in hypothesis testing study, animal experiment, and intervention study
  - If the study is conducted in clinical settings for master course students, planned number of subjects may not be met within the study period. In such case, you have to assess the effect size of actual sample size and show it as limitation in discussion section.
  - Calculation of sample size is needed in principle (you have to describe it in method section). Software like PS and EZR is useful.
  - Adequacy of sample size is especially important in animal experiments and clinical trials (You cannot excuse the non-significant results by low statistical power due to small sample size).

Software for data analysis

- R (https://www.r-project.org/) and EZR are used. EZR is a kind of front-end menu for R, specialized for medical and health sciences, developed by Dr. Yoshinobu Kanda (https://www.jichi.ac.jp/saitama-sct/SaitamaHP.files/statmedEN.html).
    - Other front-end menu than EZR
        - RStudio (https://www.rstudio.com/products/rstudio/)
        - jamovi (https://www.jamovi.org/), SPSS-like menu
            - Free text "Learning statistics with jamovi" is useful. (https://sites.google.com/brookes.ac.uk/learning-stats-with-jamovi)
        - R Analytic Flow (https://r.analyticflow.com/en/), flow-chart made by mouse operation is automatically converted into executable R code.
- All softwares mentioned above are free software, can be used on Windows, MacOS and Linux. You can install those to your own computer, then you can use it any time.
- Highly reliable and new statistical methods are implemented very quickly.
- Top journals such as Science, Nature, ProNAS, Cell, BMJ, Lancet can accept the statistical results produced by R.
- Please visit (https://www.r-project.org/) in detail.