## **Statistical software**

Nowadays, we live in the "data era" where the use of statistical software or data analysis software is inevitable, in any research field. This means that the choice of the right software tool or platform is a strategic issue for a research department. Nevertheless, in many cases decision makers do not pay the right attention to a comprehensive and appropriate evaluation of what the market offers. Indeed, the choice still depends on few factors like, for instance, researcher's personal inclination, e.g., which software have been used at the university or is already known. This is not wrong in principle, but in some cases it's not enough at all and might lead to a "dead end" situation, typically after months or years of investments already done on the wrong software <sup>1)</sup>.

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BMDP
EGRET
EZR
JMP
Python
R
SAS
SPSS
STATA
STATISTIX
SYSTAT

## **Current Trends**

R and Python: Rapidly growing due to their open-source nature, flexibility, and integration with advanced technologies like machine learning and big data analytics. SAS and STATA: Still dominant in regulatory environments and established industries.

## Most employed

The most commonly employed statistical software in medicine depends on the specific needs of the analysis, the expertise of the users, and the institution's preferences. Below is a summary of the most widely used statistical software in medical research and their common use cases:

1. SPSS (Statistical Package for the Social Sciences) Popularity: Very popular in medical research, especially among clinicians and researchers without extensive statistical training. Strengths: User-

friendly interface with point-and-click features. Extensive range of statistical tests and procedures for medical data analysis. Widely used for survey data, clinical trials, and epidemiological studies. Limitations: Less flexibility for advanced or custom analyses compared to some other software. 2. R Popularity: Gaining widespread adoption in academia, clinical research, and public health due to its versatility. Strengths: Free and open-source. Highly customizable with thousands of packages (e.g., survival, caret for machine learning, dplyr for data manipulation). Powerful for advanced statistical modeling, bioinformatics, and visualization. Limitations: Steeper learning curve compared to pointand-click software. 3. SAS (Statistical Analysis System) Popularity: Historically a gold standard in clinical research and pharmaceutical industries. Strengths: Robust for large-scale clinical trial data. Excellent handling of complex datasets and regulatory compliance in clinical studies. Strong support for longitudinal and multilevel modeling. Limitations: Expensive licensing; not as user-friendly as SPSS. 4. STATA Popularity: Frequently used in biostatistics, epidemiology, and health economics. Strengths: Easy-to-learn syntax and good balance between ease of use and advanced functionality. Excellent for longitudinal data analysis, survival analysis, and epidemiological studies. Limitations: Limited scalability for very large datasets. 5. Excel (with Add-ons) Popularity: Widely used for basic statistical analysis in smaller-scale research projects. Strengths: Familiar interface for many users. Useful for guick data summaries and preliminary analysis. Add-ons like Analysis ToolPak or XLSTAT extend functionality. Limitations: Limited to basic statistical tests and not suitable for complex analyses. 6. Python Popularity: Increasingly popular for data science applications, including in medical research. Strengths: Free and open-source. Libraries like pandas, scipy, statsmodels, and sklearn support data manipulation, statistical analysis, and machine learning. Flexible and integrates well with other technologies (e.g., databases, visualization tools). Limitations: Requires programming skills; not tailored specifically for statistical analysis. 7. Epi Info Popularity: Common in public health for epidemiological studies. Strengths: Free software provided by the CDC. Designed for outbreak investigations, public health surveys, and surveillance data. Limitations: Limited to basic and intermediate statistical tools. Summary of Use Cases Basic Analyses: SPSS, Excel Advanced Modeling: R, SAS Regulatory Compliance (e.g., FDA): SAS Epidemiology and Public Health: STATA, Epi Info Machine Learning/AI: R, Python

## 1)

Cavaliere R. How to choose the right statistical software?-a method increasing the post-purchase satisfaction. J Thorac Dis. 2015 Dec;7(12):E585-98. doi: 10.3978/j.issn.2072-1439.2015.11.57. PubMed PMID: 26793368; PubMed Central PMCID: PMC4703648.

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