

# BST02: Using R for Statistics in Medical Research

## Part A: Introduction

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# Introduction to R

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**Statistics** have flourished in the recent years mainly due to the possibility of doing complex analysis using computers

- ▶ Many statistical software exist to do simple and specialized analysis

The **programming language R** is popular for data scientists

- ▶ Analysts must not only learn how to use the software but also the ideas behind it
- ▶ Learning statistical modelling and algorithm is more important than learning a programming language.

The most valuable tool of a modern quantitative researcher is his/her personal computer

## References

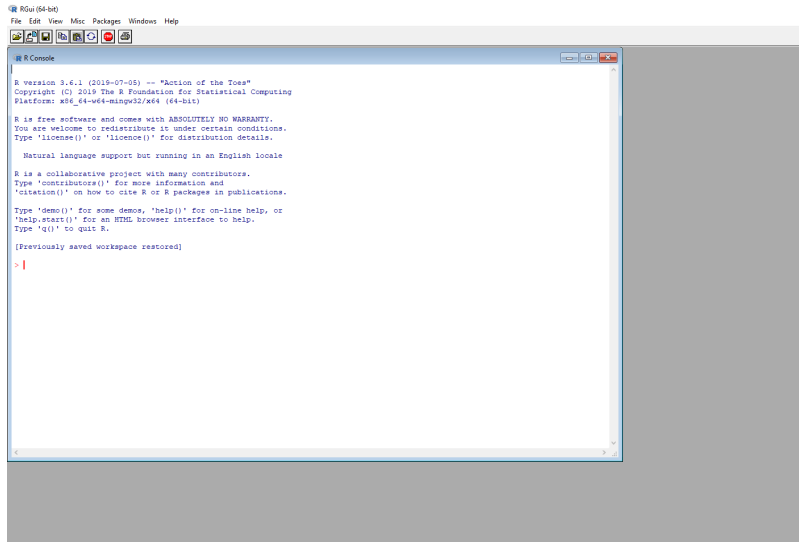
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- ▶ More books that use R (or S) can be found at:

<http://www.r-project.org/doc/bib/R-books.html>, or  
<http://www.r-project.org/doc/bib/R-jabref.html>

- ▶ R ships with a number of helpful manuals
- ▶ Other manuals and helpful material are available on-line via CRAN:  
<http://cran.r-project.org/other-docs.html>

# What does R look like ?



# What is R

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- ▶ **R** is a software environment for statistical computing and graphics
  - ▶ extensive catalog of statistical and graphical methods
- ▶ **R** is mainly used in academia. However, many large companies also use **R** programming language, including healthcare industries but also Uber, Google, Airbnb, Facebook and so on

# A brief history of R

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- ▶ **1993**: University of Auckland, New Zealand by Ross Ihaka and Robert Gentleman
- ▶ **1997**: R core Team was formed (20 members)
- ▶ **2000**: R 1.0.0 released
- ▶ **2004**: First international user conference in Vienna
- ▶ **2013**: 5026 packages available
- ▶ **2017**: 10875 packages available
- ▶ **Now**: `nrow(available.packages())`

## Why learn R ?

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- ▶ **R** is a free software environment for statistical computing and graphics
- ▶ It compiles and runs on LINUX, Windows and MacOS
- ▶ Open source language
- ▶ Users are allowed to modify and redistribute the code
- ▶ Advanced statistical language
- ▶ Supports extensions
- ▶ Related to other languages
- ▶ **Flexible and fun!**

# Where do I get R ?

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- ▶ <http://cran.r-project.org>
- ▶ choose your platform, e.g., Windows, Linux



# How does R work ?

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- ▶ Packages built for specific tasks
- ▶ Download R packages from the CRAN web site → within R
  - ▶ Packages
  - ▶ Install package(s)\*
  - ▶ make you choice(s)
  - ▶ load the package using `new(library())` (**note**: install does not mean load)

\* use alternatively `new(install.packages())`

# How to get help in R

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- ▶ Within R
  - ▶ `help.search("topic")` or `??"topic"` (depends on the installed packages)
  - ▶ `RSiteSearch("topic")` (requires internet connection)
  - ▶ `help()` or `?` invoke the on-line help file for the specified function
  - ▶ checking the FAQ
- ▶ Online
  - ▶ R-help (<https://stat.ethz.ch/mailman/listinfo/r-help> – mailing list)
  - ▶ R-seek (<http://www.rseek.org> – Google-like searched engine)
  - ▶ CRAN Task Views (<http://cran.r-project.org/web/views/> – categorization of packages)
  - ▶ Crantastic (<http://crantastic.org/> – categorization of packages + reviews)
  - ▶ R4stats (<http://www.r4stats.com/> – examples of basic R programs)
  - ▶ R related Blogs (<http://www.r-bloggers.com/> – many useful illustrations of R and R packages)
  - ▶ Open community for developers (<https://stackoverflow.com/> – ask/answer a question)

## Disadvantages of R

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- ▶ Appears intimidating to the first-time user
- ▶ Output is not so nice looking (but there are some alternatives)
- ▶ Exporting output is more difficult
- ▶ Cannot easily handle very big data sets (depends on the installed RAM)
- ▶ A lot of things are available but it is sometimes hard to find your way
- ▶ The quality of the available packages is greatly varying
- ▶ Has been criticized for using only one CPU at a time (but the parallel packages helps you perform tasks in different cores)

# Summary

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- ▶ **R** is a great tool to explore and investigate the data
- ▶ Several statistical methods can be performed with **R**
- ▶ It is important to understand the methods before applying them in **R**

## How to use

**R** uses packages that perform specific tasks

- ▶ Install package only once
- ▶ Load package every time you open **R**