Introduction to R

Import Data

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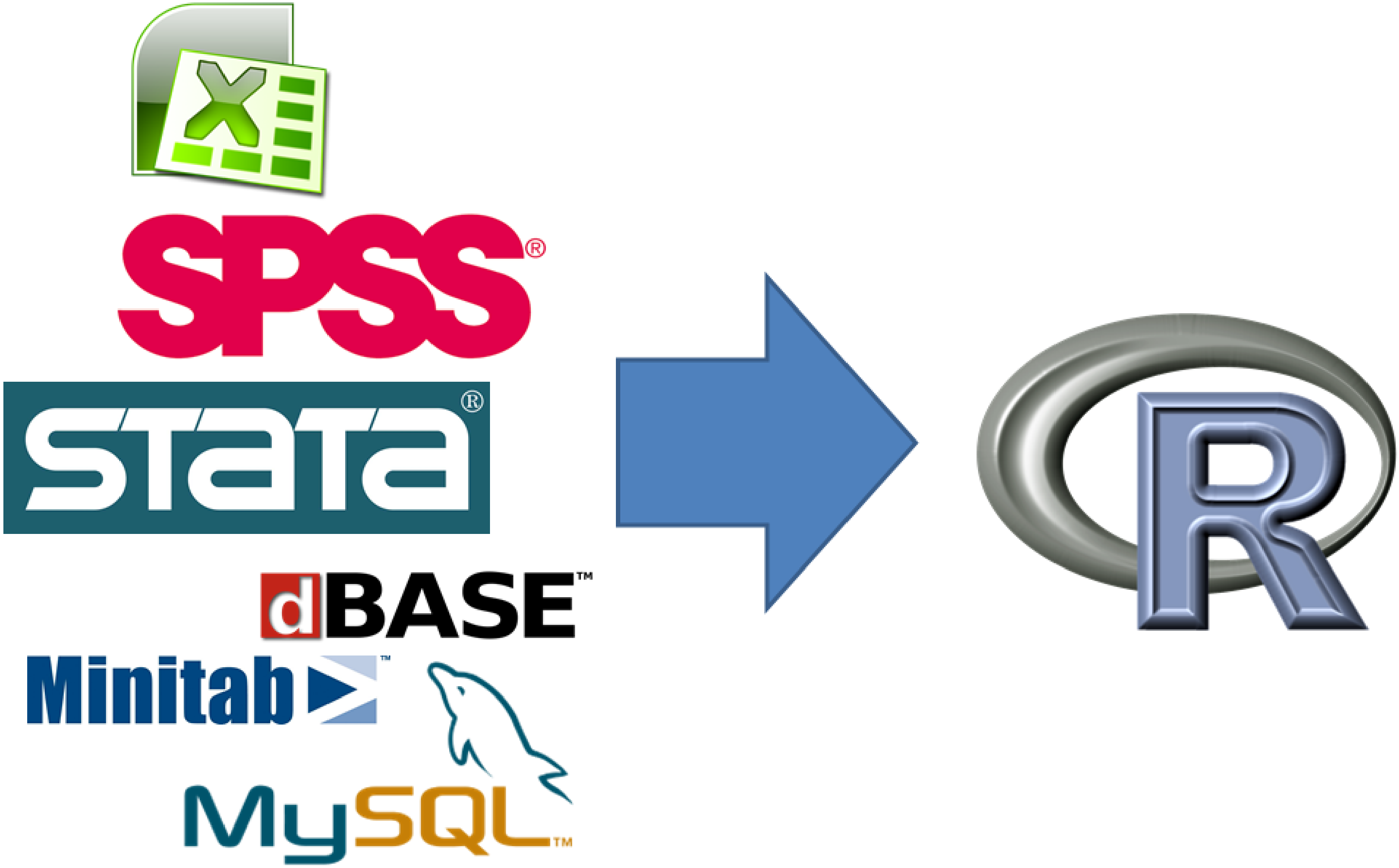
FIRST THINGS TO DO

Don’t try to kiss your data on the first date; rather, you just want to get to know the data:

1. **Import the data**
2. Review the codebook
3. Learn about the data
4. Quick visual understanding of the data

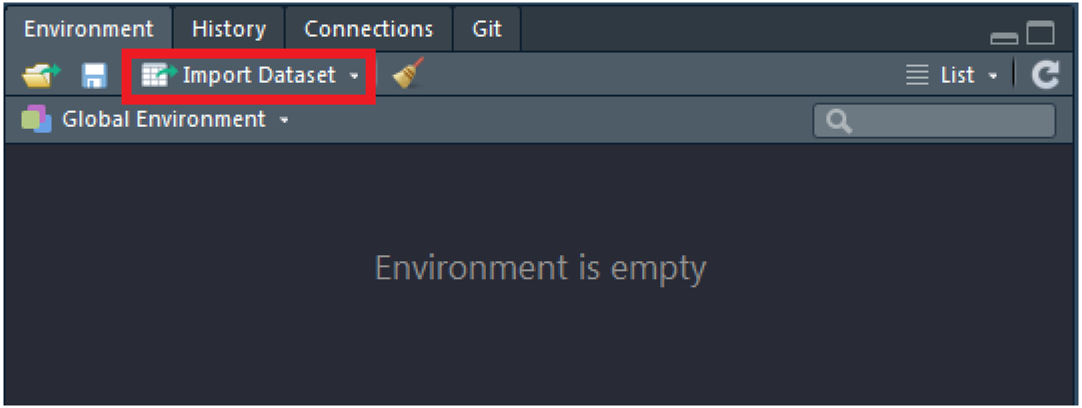
Data import



Import data with Rstudio

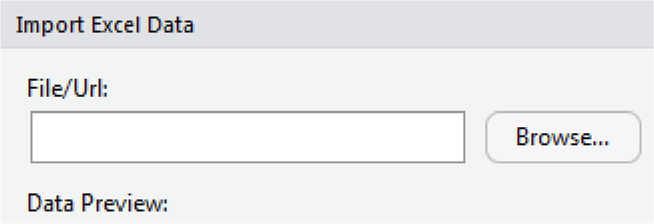
Rstudio functionality to import data

- Environment - Import Dataset - choose file type

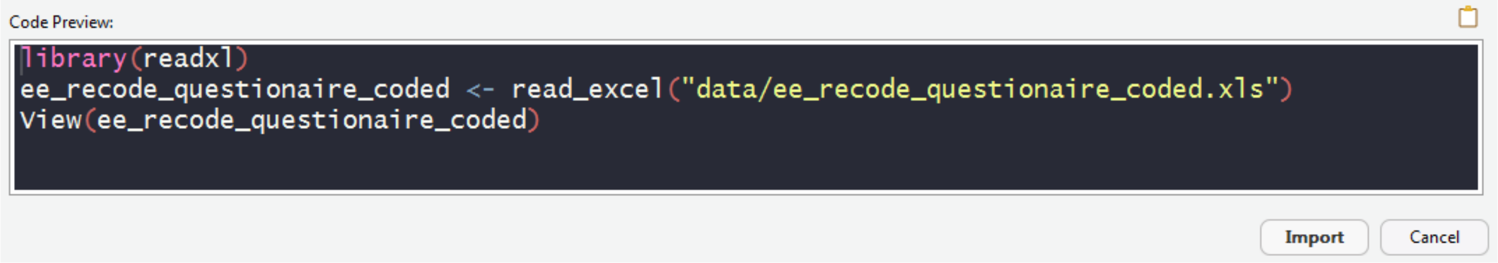


Where to find data

Browse Button in RStudio



Code preview in Rstudio



```
library(readxl)
ee_recode_questionaire_coded <- read_excel("data/ee_recode_questionaire_coded.xls")
View(ee_recode_questionaire_coded)
```

- You can change the object name under Import Options
- Use short object names like e.g. `dat`

Import of csv data

- `read.csv` is a command available in base package
- Excel data can be saved as `.csv` in Excel
- Then `read.csv()` can be used to read in the data.
- For German data, you may need `read.csv2()` because of the comma separation.

```
dat <- read.csv("../data/ZA5666_v1-0-0.csv")
```

If it's German data:

```
datd <- read.csv2("../data/ZA5666_v1-0-0.csv")
```

```
dat <- read.csv("../data/datahub_refugee.csv")
```

The result - a `data.frame`

- the following `data.frame` is a small excerpt from the data:

```
head(dat)
```

```
##   Country.Name Country.Code Year   Value
## 1   Arab World          ARB 1990 4235545
## 2   Arab World          ARB 1991 3811595
## 3   Arab World          ARB 1992 4000509
## 4   Arab World          ARB 1993 4189545
## 5   Arab World          ARB 1994 4352945
## 6   Arab World          ARB 1995 4337009
```

The package readxl

```
install.packages("readxl")
```

- **readxl has no external dependencies**
- readxl supports both the legacy .xls format and the modern xml-based .xlsx format.

```
library(readxl)
ab <- read_excel("../data/ma_stadtteile.xlsx")
head(ab)
```

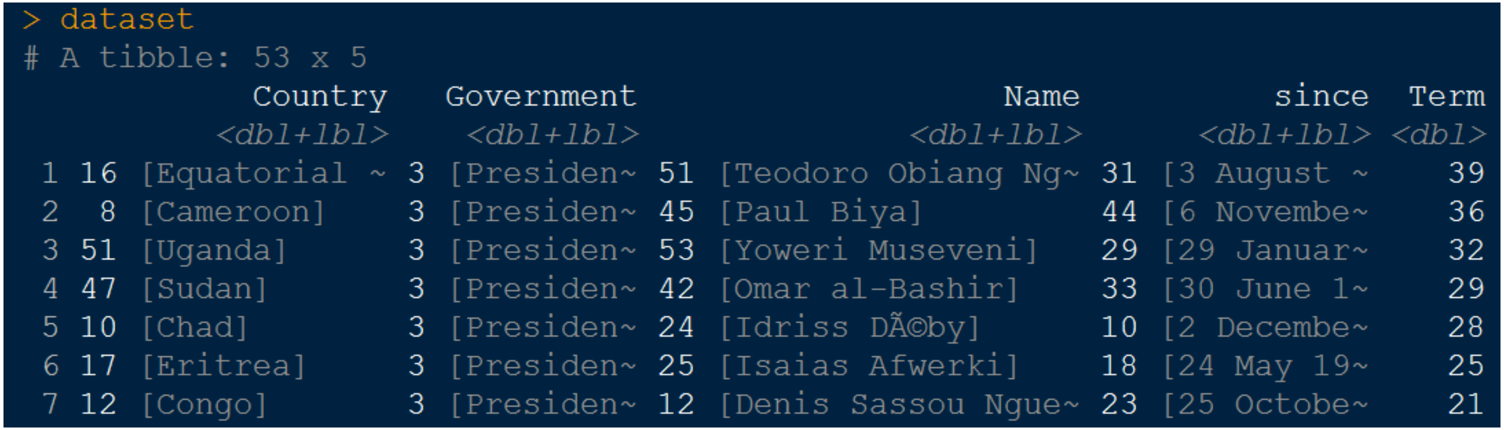
```
## # A tibble: 6 x 16
##   query   lat   lon lat_min lat_max lon_min lon_max place_id osm_type osm_
##   <chr> <dbl> <dbl>   <dbl>   <dbl>   <dbl>   <dbl>    <dbl> <chr>     <db
## 1 Inne~  49.5  8.45    49.5    49.5    8.44    8.48   2.36e8 relation 3.29
## 2 Neck~  49.5  8.47    49.5    49.5    8.42    8.48   2.36e8 relation 5.19
## 3 Neck~  49.5  8.48    49.5    49.5    8.47    8.51   2.36e8 relation 5.19
## 4 Osts~  49.5  8.48    49.5    49.5    8.46    8.50   1.69e7 node     1.64
## 5 Schw~  49.5  8.48    49.5    49.5    8.47    8.50   2.36e8 relation 3.29
## 6 Lind~  49.5  8.47    49.5    49.5    8.46    8.48   2.36e8 relation 3.29
## # ... with 5 more variables: display_name <chr>, class <chr>, type <chr>,
## #   importance <chr>, icon <chr>
```

Import SPSS files

Import GESIS Panel data

- library haven - import and export 'SPSS', 'Stata' and 'SAS' files
- the result of this import command is a tibble

```
library(haven)
dataset <- read_sav("../data/datahub_government_africa.sav")
```



```
> dataset
# A tibble: 53 x 5
            Country   Government                   Name          since  Term
          <dbl+lbl>    <dbl+lbl>              <dbl+lbl>      <dbl+lbl> <dbl>
 1 16 [Equatorial ~ 3 [Presiden~ 51 [Teodoro Obiang Ng~ 31 [3 August ~    39
 2  8 [Cameroon]    3 [Presiden~ 45 [Paul Biya]         44 [6 Novembe~    36
 3 51 [Uganda]      3 [Presiden~ 53 [Yoweri Museveni]   29 [29 Januar~    32
 4 47 [Sudan]       3 [Presiden~ 42 [Omar al-Bashir]    33 [30 June 1~    29
 5 10 [Chad]        3 [Presiden~ 24 [Idriss DÃ©by]      10 [2 Decembe~    28
 6 17 [Eritrea]     3 [Presiden~ 25 [Isaias Afwerki]    18 [24 May 19~    25
 7 12 [Congo]       3 [Presiden~ 12 [Denis Sassou Ngue~ 23 [25 Octobe~    21
```

Import data from the web

Austrian microcensus

Files can also be imported directly from the Internet:

```r
library(rio)
link <- "http://www.statistik.at/web_de/static/mz_2013_sds_-_datensat

?read.spss
Dat <- rio::import(link)
```

Import `stata` files

Import newer `.dta` files

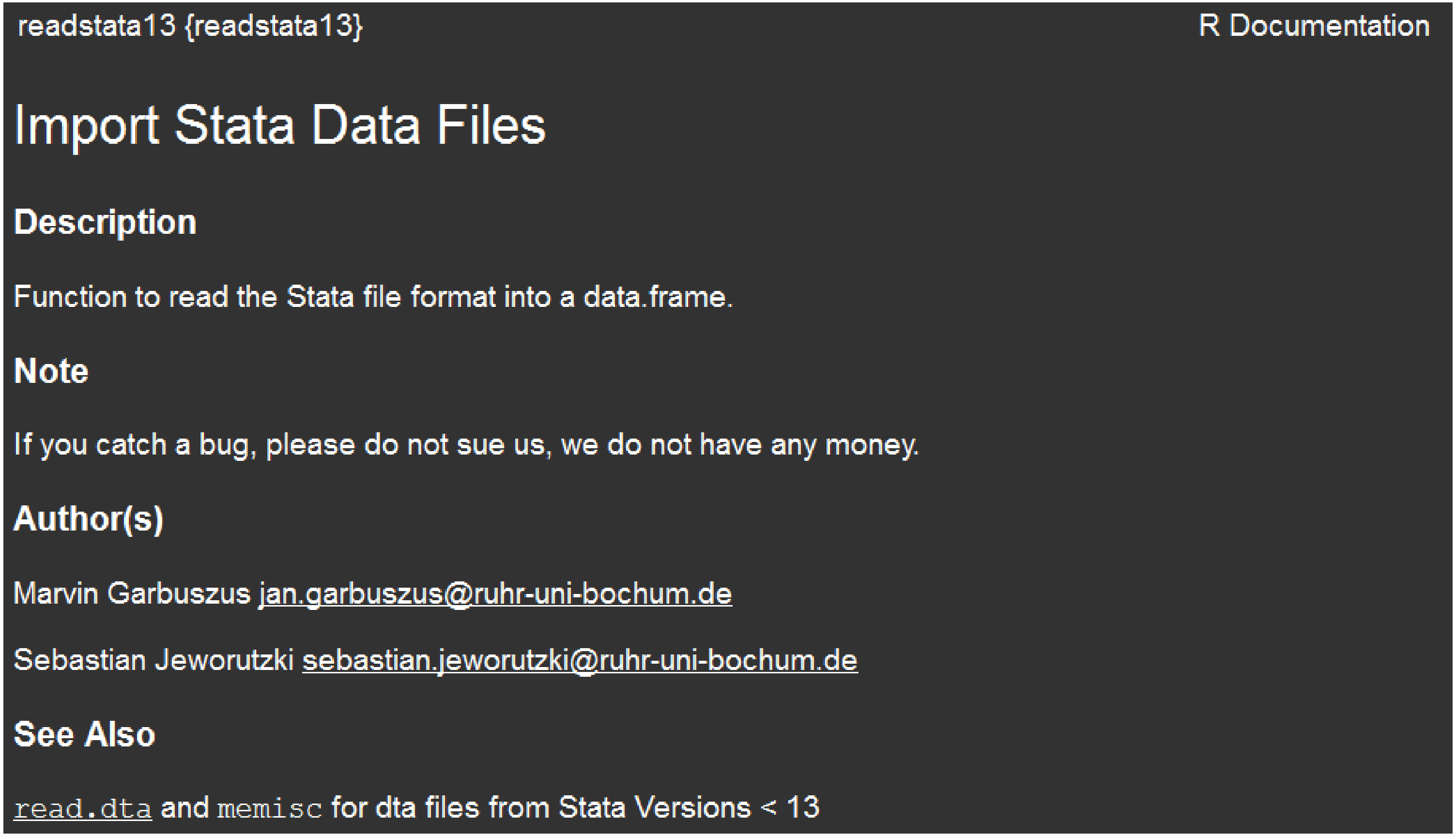
- With `read.dta13` stata files from version 13 (and higher) can be imported

```r
library(readstata13)
dat_stata <- read.dta13("../data/example_gp.dta")
```

Import `stata` files - older versions

```r
library(foreign)
dat_stata12 <- read.dta("../data/example_gp_stata12.dta")
```

The library `readstata13`



readstata13 {readstata13}   R Documentation

Import Stata Data Files

Description

Function to read the Stata file format into a data.frame.

Note

If you catch a bug, please do not sue us, we do not have any money.

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See Also

`read.dta` and `memisc` for dta files from Stata Versions < 13

Import - GESIS Panel data

`convert.factors` argument

```
library(readstata13)
```

```
datf <- read.dta13("../data/example_gp.dta",
                   convert.factors = F)
head(datf$bbzc007a)
```

```
## NULL
```

For comparison - import without this argument

```
dat <- read.dta13("../data/example_gp.dta")
head(dat$bbzc007a)
```

```
## NULL
```

The argument `convert.factors = F`

More information on `.dta` import

```
?read.dta13
```

- `convert.factors` - logical. If `TRUE`, factors from Stata value labels are created.
- It might be useful to import the dataset twice - with and without value labels…
- `nonint.factors`- logical. If `TRUE`, factors labels will be assigned to variables of type float and double.
- The import must be controlled, because otherwise errors can easily happen.

Get stata attributes

```
att_dat <- attributes(dat)
head(names(att_dat))
```

```
## NULL
```

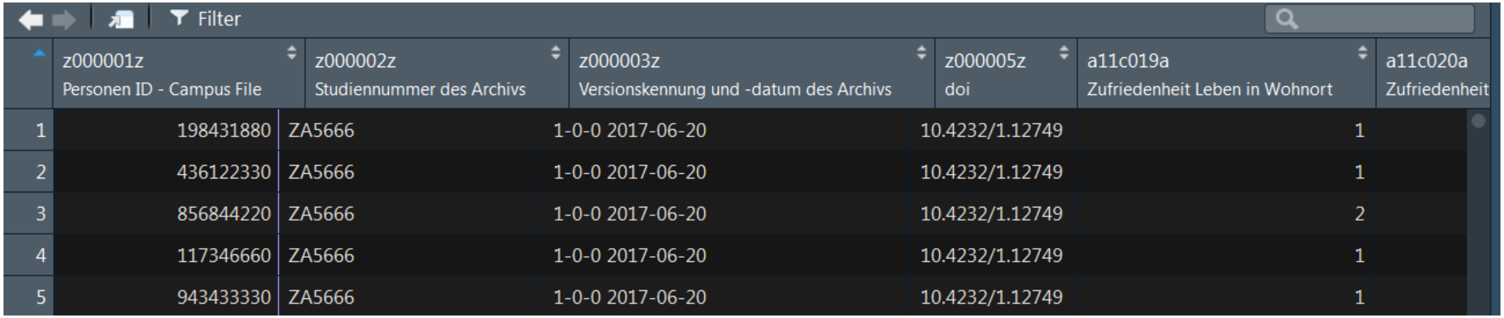
Example: the variable names

```
head(att_dat$names)
```

```
## NULL
```

Get an initial overview of the data

```
View(datf)
```



	z000001z Personen ID - Campus File	z000002z Studiennummer des Archivs	z000003z Versionskennung und -datum des Archivs	z000005z doi	a11c019a Zufriedenheit Leben in Wohnort	a11c020a Zufriedenheit
1	198431880	ZA5666	1-0-0 2017-06-20	10.4232/1.12749	1	
2	436122330	ZA5666	1-0-0 2017-06-20	10.4232/1.12749	1	
3	856844220	ZA5666	1-0-0 2017-06-20	10.4232/1.12749	2	
4	117346660	ZA5666	1-0-0 2017-06-20	10.4232/1.12749	1	
5	943433330	ZA5666	1-0-0 2017-06-20	10.4232/1.12749	1	

- You can get the same in RStudio if you click on the dataset icon in the environment menue

The library `rio`

```
install.packages("rio")
```

```
library("rio")
x <- import("../data/ZA5666_v1-0-0.csv")
y <- import("../data/ZA5666_v1-0-0_Stata12.dta")
z <- import("../data/ZA5666_v1-0-0_Stata14.dta")
```

- **rio: A Swiss-Army Knife for Data I/O**

The package `Hmisc`

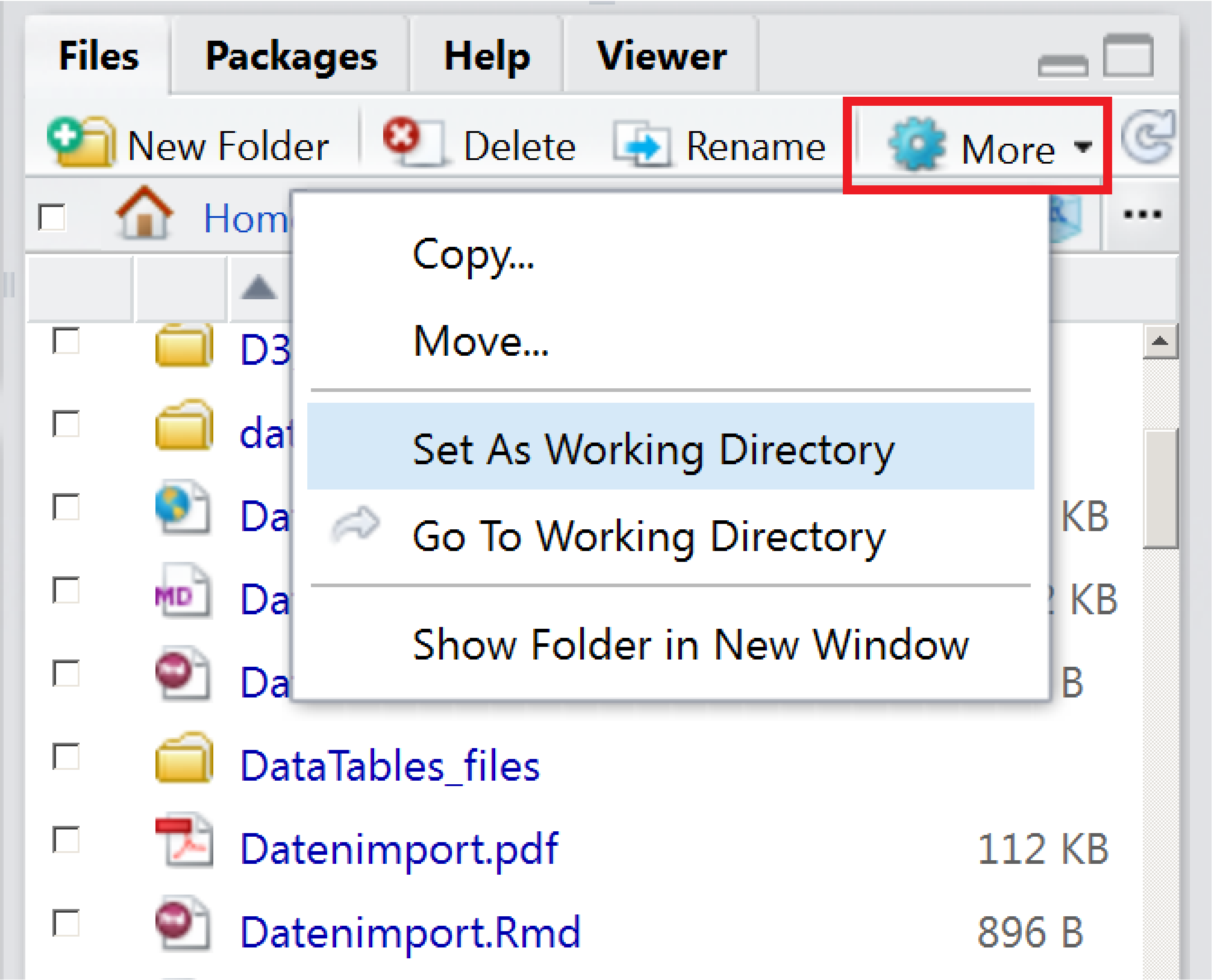
> For SPSS and SAS I would recommend the Hmisc package for ease and functionality.

```r
library(Hmisc)
mydata <- spss.get("c:/mydata.por", use.value.labels=TRUE)
# last option converts value labels to R factors
```

Import SAS data

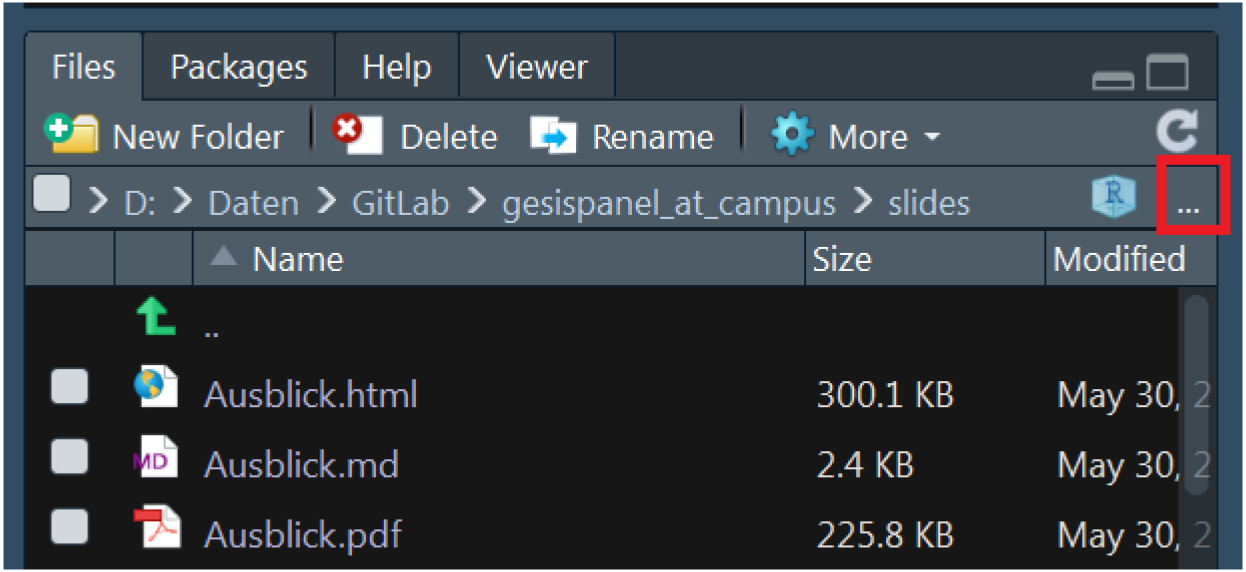
```r
mydata <- sasxport.get("c:/mydata.xpt")
# character variables are converted to R factors
```

The working directory



...

- If the data is on a different drive in Windows



D: > Daten > GitLab > gesispanel_at_campus > slides

		Name	Size	Modified
		..		
□		Ausblick.html	300.1 KB	May 30, 2
□		Ausblick.md	2.4 KB	May 30, 2
□		Ausblick.pdf	225.8 KB	May 30, 2

The working directory II

This way you can find out which directory you are currently in

```
getwd()
```

So you can change the working directory:

You create an object in which you save the path:

```
main.path <- "C:/" # Example for Windows
main.path <- "/users/Name/" # Example for Mac
main.path <- "/home/user/" # Example for Linux
```

And then change the path with `setwd()`

```
setwd(main.path)
```

On Windows it is important to use slashs instead of backslashes.

Change working directory

- You can also use the tab key to get the autocompletion.

```
getwd()
```

```
## [1] "D:/github/intror2020/slides"
```

```
setwd("..")
getwd()
```

```
## [1] "D:/github/intror2020"
```

Built-In datasets

- Often an example dataset is provided to show the functionality of a package
- These datasets can be loaded with the command `data`

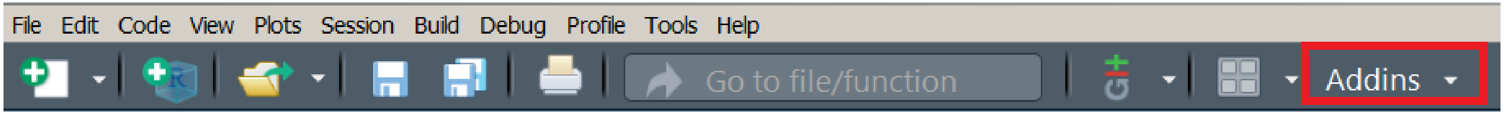
```
data(iris)
```

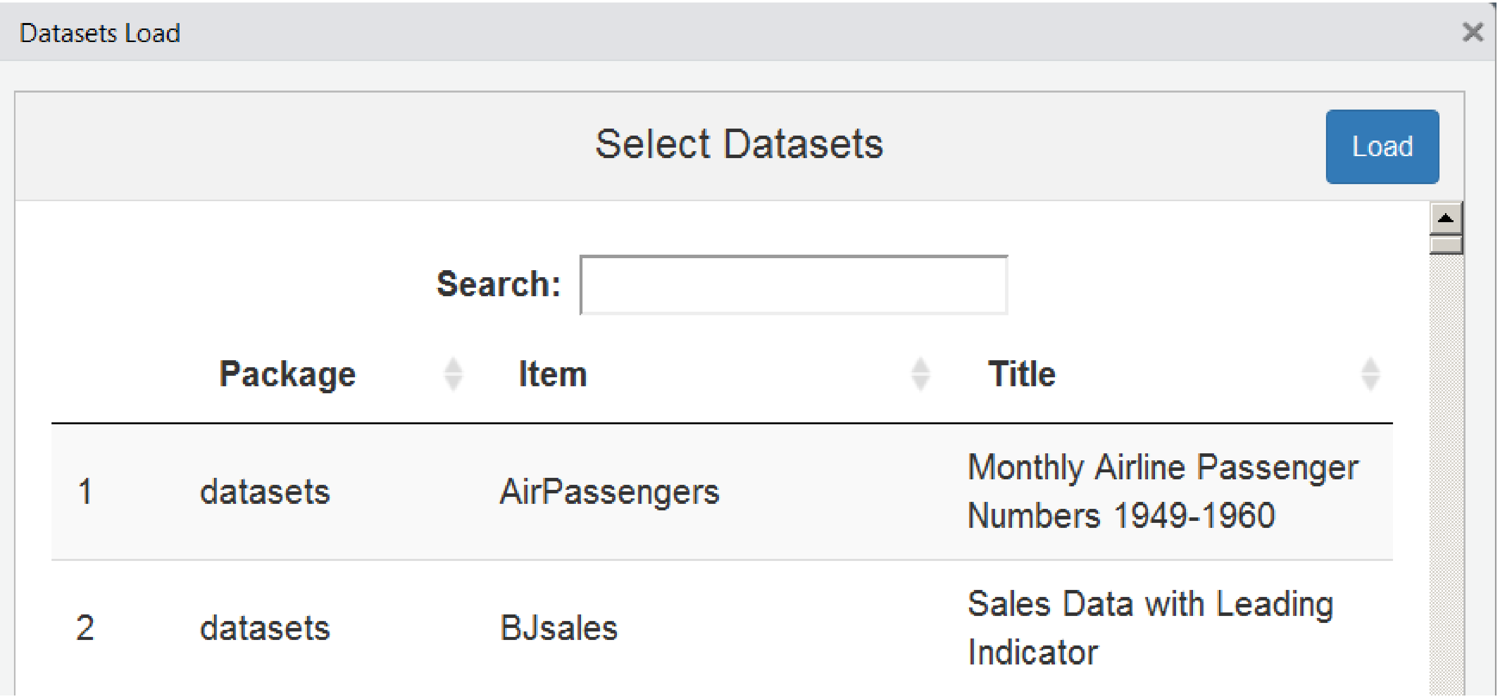
- There is also an **RStudio add-in** that helps to find a dataset

```
install.packages("datasets.load")
```

Excursus RStudio Addins

- In the upper right corner there is a button Addins





Search:

	Package	Item	Title
1	datasets	AirPassengers	Monthly Airline Passenger Numbers 1949-1960
2	datasets	BJsales	Sales Data with Leading Indicator

Exercise: load built-in data

Load the the built-in dataset `mtcars`

1) How many observations and variables are available? 2) What is the object structure of the variables?

Interactive data table

3) Create an interactive data table

Inserting data

- **RStudio addin for inserting data**

```
devtools::install_github("lbusett/insert_table")
```

The `file.choose` option

- You can browse through the directory with `file.choose`:

```
dat <- read.csv(file.choose())
```

- If you run the command line above a window is opened and you can browse in the file system.
- That also works with other import functions

Creating an example data record

```
A <- c(1,2,3,4)
B <- c("A","B","C","D")

mydata <- data.frame(A,B)
```

```
mydata
```

A B

---

1 A
2 B
3 C
4 D

Overview data import/export

- if you continue working with R, `.RData` or **`rds`** format is the best choice:

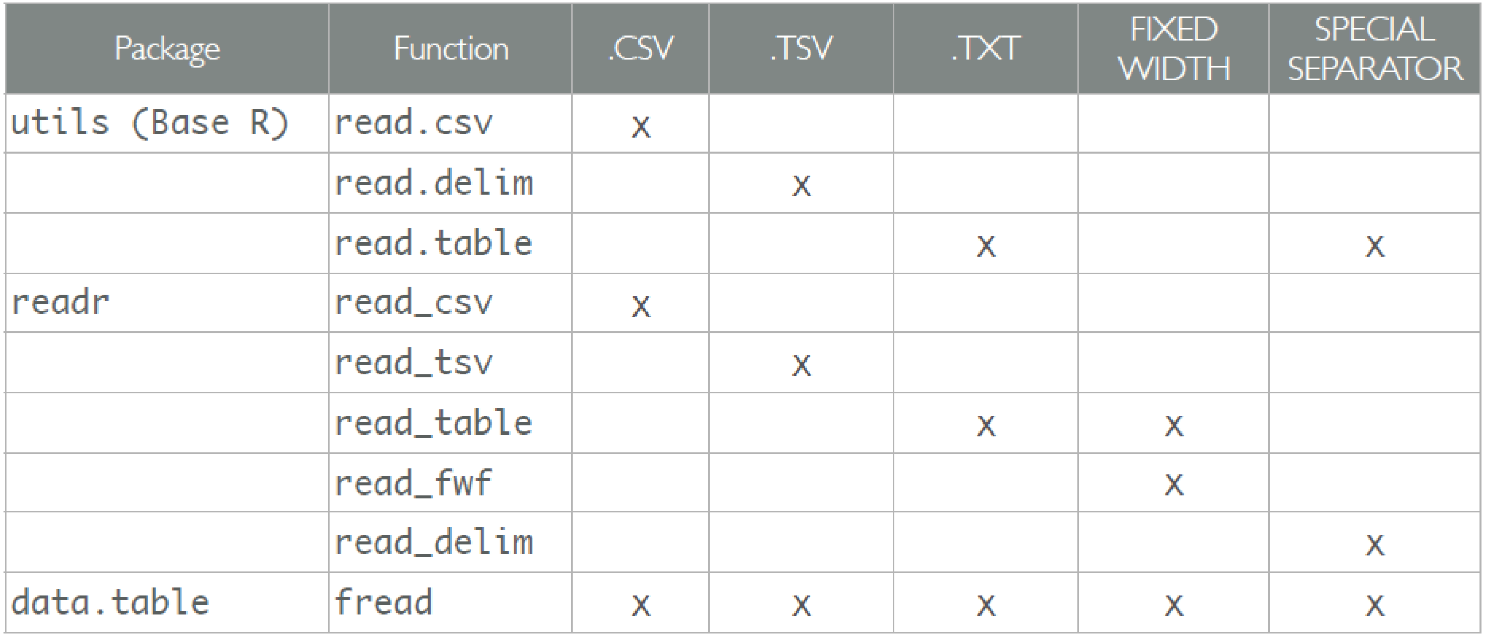
```
save(mydata, file="mydata.RData")
saveRDS(mydata, "mydata.rds")
```

- The data set can be imported with `load`.

```
load("mydata.RData")
mydata <- readRDS("mydata.rds")
```

- `saveRDS()` doesn’t save the both the object and its name it just saves a representation of the object

Overview import functions



Package	Function	.CSV	.TSV	.TXT	FIXED WIDTH	SPECIAL SEPARATOR
`utils (Base R)`	`read.csv`	x				
	`read.delim`		x			
	`read.table`			x		x
`readr`	`read_csv`	x				
	`read_tsv`		x			
	`read_table`			x	x	
	`read_fwf`				x	
	`read_delim`					x
`data.table`	`fread`	x	x	x	x	x

Links and resources

- Introduction to import with R (**is.R**)
- **Youtube video** on importing data
- Statistical tools for high-throughput data analysis (STHDA) - **Importing Data Into R**
- Karlijn Willems - **This R Data Import Tutorial Is Everything You Need**
- **R for data science book**
- The **R-package `labelled`** to work with labelled data imported from SPSS or stata
- Overview - **all import functionalities**