Data import with the tidyverse :: Cheatsheet

One of the first steps of a project is to import outside data into R. Data is often stored in tabular formats, like csv files or spreadsheets.

- The first half of this cheatsheet shows how to import and save text files into R using **readr**.
- The second half shows how to import spreadsheet data from Excel files using **readxl** or Google Sheets using **googlesheets4**.

```
library(readr)
library(readxl)
library(googlesheets4)
```

For importing other types of data try one of the following packages:

- **haven**: SPSS, Stata, and SAS files
- **DBI**: databases
- **jsonlite**: json
- **xml2**: XML
- **httr**: Web APIs
- **rvest**: HTML (Web Scraping)
- **readr::read_lines()**: text data

Read Tabular Data with readr

See `?read_delim`.

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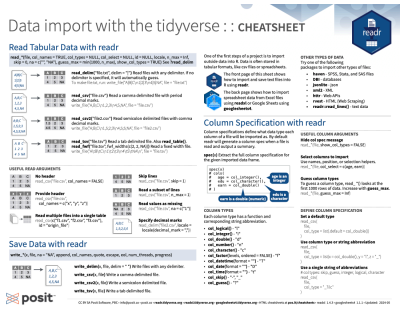

Translations (PDF)

- Bengali
- Persian
- Portuguese
- Russian
- Spanish
- Turkish
- Ukrainian
- Uzbek

```
read_*(
  file,
  col_names = TRUE, col_types = NULL, col_select = NULL,
  show_col_types = TRUE
  id = NULL, locale,
  n_max = Inf, skip = 0, guess_max = min(1000, n_max),
  na = c("", "NA")
)
```

Examples

- Read files with any delimiter: `read_delim()`. If no delimiter is specified, it will automatically guess.
  - If the file you want to import is the following:

    ```
    A|B|C
    1|2|3
    4|5|NA
    ```

  - Read it with `read_delim()` and it will look like the following when imported:

    ```
    read_delim("file.txt", delim = "|", show_col_types = FALSE)
    ```

  - To make `file.txt`, run:

    ```
    write_file("A|B|C\n1|2|3\n4|5|NA", file = "file.txt")
    ```

- Read a comma delimited file with period decimal marks: `read_csv()`.
  - If the file you want to import is the following:

    ```
    A,B,C
    1,2,3
    4,5,NA
    ```

  - Read it with `read_csv()` and it will look like the following when imported:

```
read_csv("file.csv", show_col_types = FALSE)
```

- To make `file.csv`, run:

```
write_file("A,B,C\n1,2,3\n4,5,NA", file = "file.csv")
```

- Read semicolon delimited files with comma decimal marks: `read_csv2()`.
  - If the file you want to import is the following:

```
A;B;C
1,5;2;3
4,5;5;NA
```

  - Read it with `read_csv2()` and it will look like the following when imported:

```
read_csv2("file2.csv", show_col_types = FALSE)
```

  - To make `file2.csv`, run:

```
write_file("A;B;C\n1,5;2;3\n4,5;5;NA", file = "file2.csv")
```

- Read a tab delimited file: `read_tsv()` or `read_table()`.

  Read a fixed width file: `read_fwf("file.tsv", fwf_widths(c(2, 2, NA)))`.
  - If the file you want to import is the following:

```
A B C
1 2 3
4 5 NA
```

  - Read it with `read_tsv()` and it will look like the following when imported:

```
read_tsv("file.tsv", show_col_types = FALSE)
```

  - To make `tsv`, run:

```
write_file("A\tB\tC\n1\t2\t3\n4\t5\tNA\n", file = "file.tsv")
```

Useful read arguments

Suppose you have the following CSV files that you want to read in, called `file.csv`:

`file.csv`

```
A,B,C
1,2,3
4,5,NA
```

`file3.csv`

```
A,B,C
7,8,9
NA,11,12
```

To make these files, run:

```
write_file("A,B,C\n1,2,3\n4,5,NA", file = "file.csv")
write_file("A,B,C\n7,8,9\nNA,11,12", file = "file3.csv")
```

- No header: `col_names = FALSE`

```
read_csv("file.csv", col_names = FALSE)
```

- Provide header: `col_names = c("x", "y", "z")`

```
read_csv("file.csv", col_names = c("x", "y", "z"))
```

- Skip lines:

```
read_csv("file.csv", skip = 1)
```

- Read a subset of lines:

```
read_csv("file.csv", n_max = 1)
```

- Read values as missing:

```
read_csv("file.csv", na = c("1"))
```

- Specify decimal marks:

```
read_delim("file2.csv", locale = locale(decimal_mark = ","))
```

- Read multiple files into a single table:

```
read_csv(c("file.csv", "file3.csv"), id = "origin_file")
```

Save data with readr

```
write_*(
  x, file,
  na = "NA",
  append, col_names, quote, escape, eol, num_threads, progress
)
```

- Write files with any delimiter: `write_delim(x, file, delim = " ")`
- Write a comma delimited file: `write_csv(x, file)`
- Write a semicolon delimited file: `write_csv2(x, file)`
- Write a tab delimited file: `write_tsv(x, file)`

Column specification with readr

Column specifications define what data type each column of a file will be imported as. By default readr will generate a column spec when a file is read and output a summary.

`spec(df)` : Extract the full column specification for the given imported data frame.

```
spec(df)
# cols(
#   age = col_integer(),   # age is an integer
#   edu = col_character(), # edu is a character
#   earn = col_double()    # earn is a double (numeric)
# )
```

Column types

Each column type has a function and corresponding string abbreviation.

- `col_logical()` - `"l"`
- `col_integer()` - `"i"`
- `col_double()` - `"d"`
- `col_number()` - `"n"`
- `col_character()` - `"c"`
- `col_factor(levels, ordered = FALSE)` - `"f"`
- `col_datetime(format = "")` - `"T"`
- `col_date(format = "")` - `"D"`
- `col_time(format = "")` - `"t"`
- `col_skip()` - `"-"`, `"_"`
- `col_guess()` - `"?"`

Useful column arguments

- Hide col spec message:

```
read_*(file, show_col_types = FALSE)
```

- Select columns to import: Use names, position, or selection helpers.

```
read_*(file, col_select = c(age, earn))
```

- Guess column types: To guess a column type, `read_ *()` looks at the first `1000` rows of data. Increase with `guess_max`.

```
read_*(file, guess_max = Inf)
```

Define column specification

- Set a default type:

```
read_csv(
  file,
  col_type = list(.default = col_double())
)
```

- Use column type or string abbreviation:

```
read_csv(
  file,
  col_type = list(x = col_double(), y = "l", z = "_")
)
```

- Use a single string of abbreviations:

```
# col types: skip, guess, integer, logical, character
read_csv(
  file,
  col_type = "_?ilc"
)
```

Import spreadsheets with readxl

Read Excel files

Read a .xls or .xlsx file based on the file extension, e.g. `read_excel("excel_file.xlsx")`. See Useful read arguments for more read arguments. Also `read_xls()` and `read_xlsx()`.

```
read_excel(path, sheet = NULL, range = NULL)
```

- If the Google sheet you want to import is the following:

Spreadsheet with 5 columns (A through E) and three rows. First row reads x1 through x5. Second and third row have some missing values.

A	B	C	D	E
x1	x2	x3	x4	x5
x		z	8	
y	7		9	10

- It will look like the following when imported:

Read sheets

- Specify which sheet to read by position or name: `read_excel(path, sheet = NULL)`
  - `read_excel(path, sheet = 1)`
  - `read_excel(path, sheet = "s1")`
- Get a vector of sheet names: `excel_sheets(path)`

```
excel_sheets("excel_file.xlsx")
```

- To read multiple sheets:
  1. Get a vector of sheet names from the file path.
  2. Set the vector names to be the sheet names.
  3. Use `purrr::map()` and `purrr::list_rbind()` to read multiple files into one data frame.

```
path <- "your_file_path.xlsx"
path |>
```

```
  excel_sheets() |>
  set_names() |>
  map(read_excel, path = path) |>
  list_rbind()
```

readxl column specification

- Column specifications define what data type each column of a file will be imported as.
- Use the `col_types` argument of `read_excel()` to set the column specification.
- Guess column types: To guess a column type, `read_excel()` looks at the first `1000` rows of data. Increase with the `guess_max` argument.

```
read_excel(path, guess_max = Inf)
```

- Set all columns to same type, e.g. character:

```
read_excel(path, col_types = "text")
```

- Set each column individually:

```
read_excel(
  path,
  col_types = c("text", "guess", "guess","numeric")
)
```

- **Column types:**

Table with 5 columns. Column headers are various data types (logical, numeric, text, date, and list). The data in two rows show examples of data for the given column type.

logical	numeric	text	date	list
TRUE	2	hello	1947-01-08	hello

logical	numeric	text	date	list
FALSE	3.45	world	1956-10-21	1

- `skip`
- `guess`
- `logical`
- `date`
- `numeric`
- `text`
- Use `list` for columns that include multiple data types. See **tidyr** and **purrr** for list-column data.

Other useful Excel packages

- For functions to write data to Excel files: **openxlsx** and **writexl**
- For working with non-tabular Excel data: **tidyxl**

Import spreadsheets with googlesheets4

Read sheets

Read a sheet from a URL, a Sheet ID, or a dribble samefrom the googledrive package. See Useful read arguments for more read arguments.

```
read_sheet(ss, sheet = NULL, range = NULL)
```

Same as `range_read()`.

- If the Google sheet you want to import is the following:

Spreadsheet with 5 columns (A through E) and three rows. First row reads x1 through x5. Second and third row have some missing values.

A	B	C	D	E
x1	x2	x3	x4	x5
x		z	8	
y	7		9	10

- It will look like the following when imported:

Sheet metadata

- **URLs** are in the form:

```
https://docs.google.com/spreadsheets/d/
            SPREADSHEET_ID/edit#gid=SHEET_ID
```

- Get spreadsheet meta data: `gs4_get(ss)`
- Get data on all spreadsheet files: `gs4_find(...)`
- Get a tibble of properties for each worksheet: `sheet_properties(ss)`. Also `sheet_names()`.

Write sheets

- `write_sheet(data, ss = NULL, sheet = NULL)`: Write a data frame into a new or existing Sheet.
- `gs4_create(name, ..., sheets = NULL)`: Create a new Sheet with a vector of names, a data frame, or a (named) list of data frames.
- `sheet_append(ss, data, sheet = 1)`: Add rows to the end of a worksheet.

googlesheets4 column specification

Column specifications define what data type each column of a file will be imported as.

Use the `col_types` argument of `read_sheet()` / `range_read()` to set the column specification.

- Guess column types: To guess a column type `read_sheet()` / `range_read()` looks at the first 1000 rows of data. Increase with `guess_max`.

```
read_sheet(path, guess_max = Inf)
```

- Set all columns to same type, e.g. character:

```
read_sheet(path, col_types = "c")
```

- Set each column individually:

```
# col types: skip, guess, integer, logical, character
read_sheets(ss, col_types = "_?ilc")
```

- Column types:
  - skipped my lunch   and: “_” or “-”
  - guess: “?”
  - logical: “l”
  - integer: “i”
  - double: “d”
  - numeric: “n”
  - date: “D”
  - datetime: “T”
  - character: “c”
  - list-column: “L”
  - cell: “C” (returns list of raw cell data)

- Use list for columns that include multiple data types. See **tidyr** and **purrr** for list-column data.

File level operations

- **googlesheets4** also offers ways to modify other aspects of Sheets (e.g. freeze rows, set column width, manage (work)sheets). Go to googlesheets4.tidyverse.org to read more.
- For whole-file operations (e.g. renaming, sharing, placing within a folder), see the tidyverse package **googledrive** at googledrive.tidyverse.org.

Cell specification for readxl and googlesheets4

Use the **range** argument of **readxl::read_excel()** or **googlesheets4::read_sheet()** to read a subset of cells from a sheet.

```
read_excel(path, range = "Sheet1!B1:D2")
read_sheet(ss, range = "B1:D2")
```

Also use the range argument with cell specification functions `cell_limits()`, `cell_rows()`, `cell_cols()`, and `anchored()`.

Learn more at

- readr: readr.tidyverse.org
- readxl: readxl.tidyverse.org
- googlesheets4: googlesheets4.tidyverse.org

Updated: 2024-05.

```
packageVersion("readr")
```

```
[1] '2.1.5'
```

```
packageVersion("readxl")
```

```
[1] '1.4.3'
```

```
packageVersion("googlesheets4")
```

```
[1] '1.1.1'
```