R

RStudio pane

RStudio RStudio Cloud Figure 1

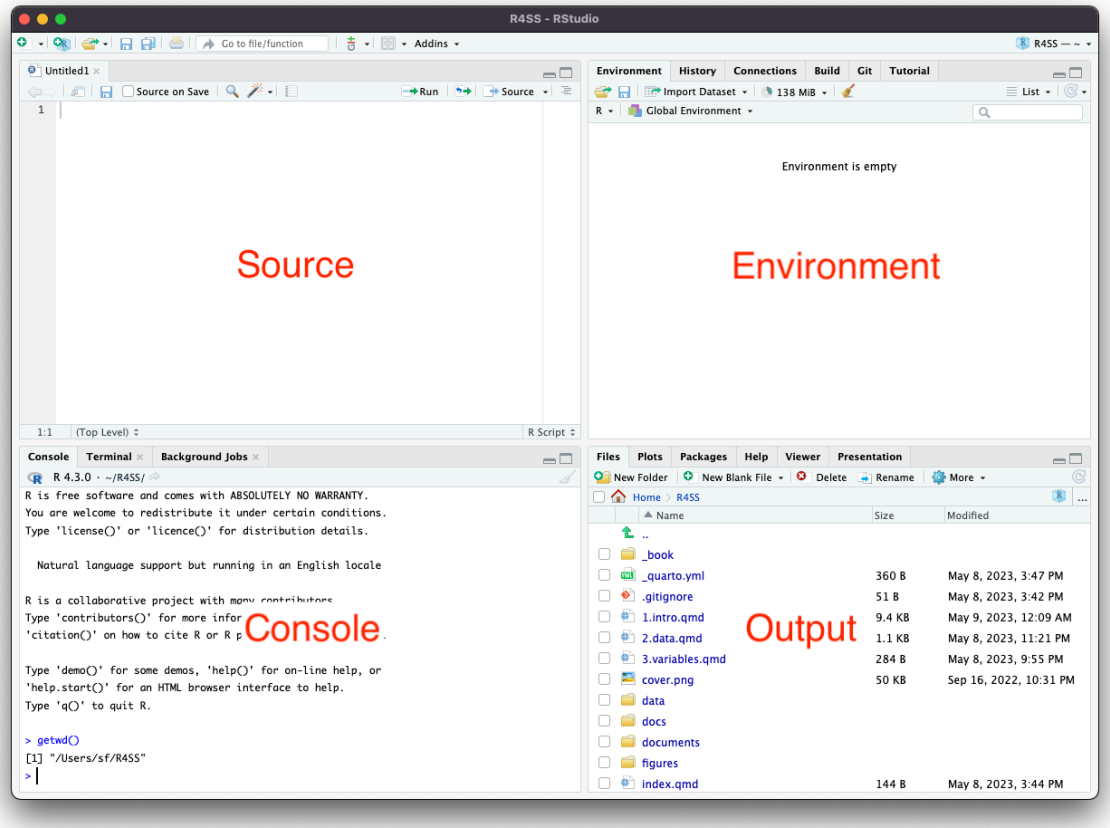


Figure 1: RStudio

4 pane

- Source pane

- Console pane Console Terminal, Background Jobs
- Environment pane Environment History Connection Built Git Tutorial
- Output pane

pane Figure 3 pane Edit → Preferences... → Pane Layout Console on Right Console pane

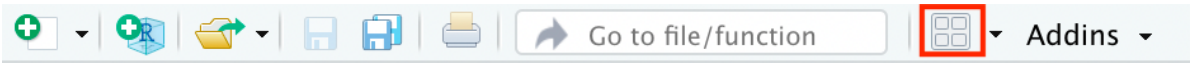


Figure 2: Pane

R

Figure 3

Figure 3:

```
[1]
```

```
    [1]                                   1       1       [1]
```

ESC

?@fig-esc ESC > ESC

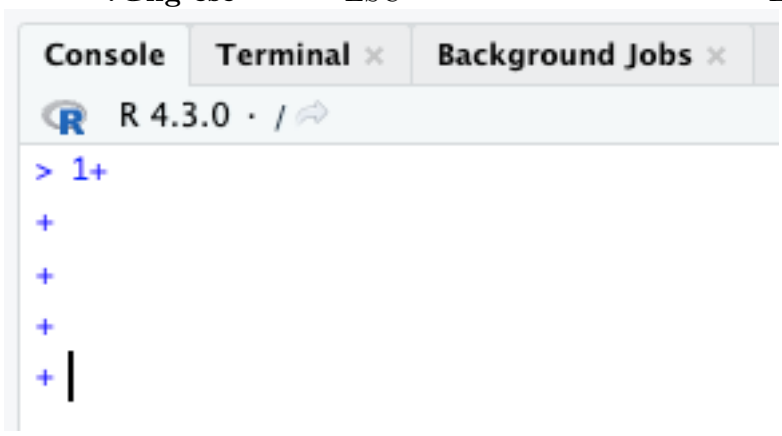


Figure 4 R

Figure 4:

R # #

```
#
1 + 1
#
2 - 100
#
7 * 8
#
123456 / 3
#
2^3
```

Untitled1* demo_1.R .R

Source Source with Echo R Run Source with Echo Source R

R Ctrl + Enter command + Enter Ctrl + A + Enter con

```
#
1 + 1
```

```
[1] 2
```

```
#
2 - 100
```

```
[1] -98
```

```
#
7 * 8
```

```
[1] 56
```

```
#
123456 / 3
```

```
[1] 41152
```

```
#
2^3
```

```
[1] 8
```

R R

```
#
```

#

```
#
1 + 2
```

```
[1] 3
```

```
  1 + 2   #
```

```
[1] 3
```

```
  # --------------------------
  # 2023 5 9
  # --------------------------
  # R

  #
  1 + 2
```

```
[1] 3
```

function () () argument TRUE FALSE NULL

```
#
sqrt(8)
```

```
[1] 2.828427
```

```
#  2
log2(8)
```

```
[1] 3
```

```
#  2   log()    base = 2
log(8, base = 2)
```

```
[1] 3
```

```
#    log     base = exp(1)
log(8)
```

```
[1] 2.079442
```

```
#
exp(8)
```

```
[1] 2980.958
```

`sqrt(x = 8)` 1 `sqrt(8)` `log(8, base = 2)` `log(8, 2)`

(a^x) $(\sqrt{x})$ $(\log_e x)$ (e^x) e $e = 2.718...$

c combine ,

4

$$\{1, 2, 2, 3\}$$

R

```
#
c(1,2,2,3)
```

```
[1] 1 2 2 3
```

ID

$$\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18\}$$

```
#
1:18
```

```
 [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18
```

$$\{0, 2, 4, 6, 8, 10\}$$

```
#
seq(0,10,2) # 0 10 2
```

```
[1]  0  2  4  6  8 10
```

$$\{1, 1, 1, 1, 1, 1, 1, 1, 1, 1\}$$

```
#
rep(1,10) # 1 10
```

```
 [1] 1 1 1 1 1 1 1 1 1 1
```

> mean() ?mean %in% ?"%in%" " ? [] ?
> help.search("mean") RjpWiki

a 4

```
# a 4
a <- 4
```

a

```
#
a
```

```
[1] 4
```

$\{1, 2, 3, 4, 5, 5\}$

```
# b       [1,2,3,4,5,5]
b <- c(1,2,3,4,5,5)
#
b
```

```
[1] 1 2 3 4 5 5
```

```
c q t    pi                          TRUE FALSE    T F         C D I
```

```
# pi 3.141593
pi
```

```
[1] 3.141593
```

R

50 10 100 rnorm() n = 100 mean = 50 sd = 10
x

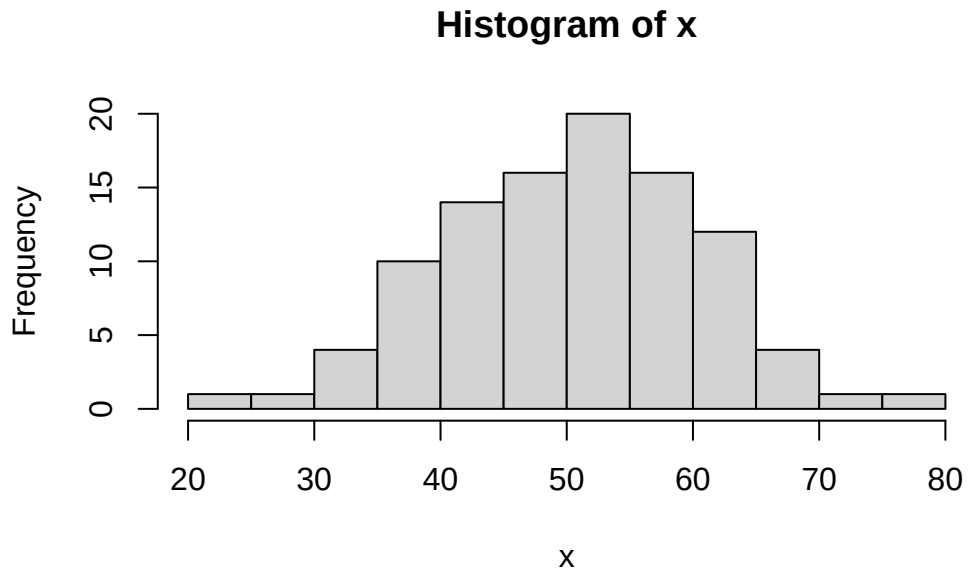
```
#  50   10       100
#
set.seed(123456)
x <- rnorm(n = 100, mean = 50, sd = 10)
x
```

```
  [1] 58.33733 47.23952 46.44998 50.87487 72.52256 58.34460 63.12416 75.02645
  [9] 61.68232 45.73834 40.03870 38.86050 49.44268 61.74432 60.53219 50.57606
 [17] 42.64957 59.30528 66.68211 55.59688 42.46025 62.56554 50.38493 51.89540
 [25] 54.62595 45.72637 50.16586 57.04879 59.71849 43.79508 41.44133 50.69558
 [33] 39.53802 22.51132 38.70140 41.38315 65.60074 60.15088 60.43994 38.84095
```

```
 [41] 39.28696 59.67821 51.71033 41.03750 51.58289 44.98052 40.34077 48.86266
 [49] 60.85950 37.88352 32.32278 45.08308 53.21466 64.60661 65.37243 46.60431
 [57] 39.22551 35.09235 47.47253 48.78077 43.51017 53.13076 51.22811 41.63160
 [65] 56.00422 47.54065 48.15335 50.23157 45.15348 42.62094 63.02508 55.64499
 [73] 31.94956 54.38339 35.58911 59.52829 42.77018 50.48760 34.36468 26.97634
 [81] 61.57964 42.95265 34.26178 55.18352 39.35069 50.47054 58.48047 54.32678
 [89] 55.22805 47.46114 45.03148 62.60101 55.64980 46.55362 57.24810 58.64092
 [97] 53.69247 65.83596 50.60370 51.28711
```

hist()

```
#
hist(x)
```



$$\sum_{i=1}^{n} x.$$

```
#
sum(x)
```

```
[1] 5016.82
```

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x.$$

```
#
mean(x)
```

```
[1] 50.1682
```

round()　　digits　　mean_x　　round()

```
#    mean_x
mean_x <- mean(x)
# mean_x       round()
round(mean_x, digits = 1)
```

```
[1] 50.2
```

mean_x

```
#
round(mean(x), digits = 1)
```

```
[1] 50.2
```

-

```
#
median(x)
```

```
[1] 50.47907
```

-

$$\frac{1}{n-1}\sum_{i=1}^{n}(x-\bar{x})\,.$$

```
#
var(x)
```

```
[1] 98.70409
```

- $$\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(x-\bar{x}).}$$

```
#
sd(x)
```

```
[1] 9.934993
```

-

```
#
max(x)
```

```
[1] 75.02645
```

```
#
min(x)
```

```
[1] 22.51132
```

-

```
#
length(x)
```

```
[1] 100
```

length()

length()　　sum(!is.na(x))　　complete_obs()

```
# x
x_mis <- x
# 10 20   NA
x_mis[10:20] <- NA
#
x_mis
```

```
 [1] 58.33733 47.23952 46.44998 50.87487 72.52256 58.34460 63.12416 75.02645
 [9] 61.68232       NA       NA       NA       NA       NA       NA       NA
[17]       NA       NA       NA       NA 42.46025 62.56554 50.38493 51.89540
[25] 54.62595 45.72637 50.16586 57.04879 59.71849 43.79508 41.44133 50.69558
[33] 39.53802 22.51132 38.70140 41.38315 65.60074 60.15088 60.43994 38.84095
[41] 39.28696 59.67821 51.71033 41.03750 51.58289 44.98052 40.34077 48.86266
[49] 60.85950 37.88352 32.32278 45.08308 53.21466 64.60661 65.37243 46.60431
[57] 39.22551 35.09235 47.47253 48.78077 43.51017 53.13076 51.22811 41.63160
[65] 56.00422 47.54065 48.15335 50.23157 45.15348 42.62094 63.02508 55.64499
[73] 31.94956 54.38339 35.58911 59.52829 42.77018 50.48760 34.36468 26.97634
[81] 61.57964 42.95265 34.26178 55.18352 39.35069 50.47054 58.48047 54.32678
[89] 55.22805 47.46114 45.03148 62.60101 55.64980 46.55362 57.24810 58.64092
[97] 53.69247 65.83596 50.60370 51.28711
```

```
#
length(x_mis)
```

```
[1] 100
```

```
#
sum(!is.na(x_mis))
```

```
[1] 89
```

```
#
complete_obs <- function(x) sum(!is.na(x))
complete_obs(x)
```

```
[1] 100
```

length()　　nrow()

-

```
#
quantile(x)
```

```
      0%       25%       50%       75%      100%
22.51132 42.74002 50.47907 58.33915 75.02645
```

- summary()

```
#
summary(x)
```

```
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  22.51   42.74   50.48   50.17   58.34   75.03
```

var sd n $n-1$

R RStudio Output pane Packages install.packages(" ") install.packages(" ", dependencies = TRUE) dependencies = TRUE

```
#
install.packages("tidyverse", dependencies = TRUE)  #
install.packages("haven", dependencies = TRUE)  #
install.packages("janitor", dependencies = TRUE)  #
```

library( ) RStudio

```
library(tidyverse)  #
library(haven)  #
library(janitor)  #
```

Output pane Packages .packages(all.available=TRUE)

pacman p_load()

```
# pacman
#install.packages("pacman")
#
pacman::p_load(tidyverse,
               haven,
               janitor)
```

::

( ) |> () 1 |> |> () |> ()

```
#
x |> sum()
```

```
[1] 5016.82
```

```
#
x |> mean()
```

```
[1] 50.1682
```

```
#
x |> mean() |> round(digits = 1)
```

```
[1] 50.2
```

```
#
x |> median()
```

```
[1] 50.47907
```

```
#
x |> var()
```

```
[1] 98.70409
```

```
#
x |> sd()
```

```
[1] 9.934993
```

```
#
x |> max()
```

```
[1] 75.02645
```

```
#
x |> min()
```

```
[1] 22.51132
```

```
#
x |> length()
```

```
[1] 100
```

```
#
x |> quantile()
```

```
      0%      25%      50%      75%     100%
22.51132 42.74002 50.47907 58.33915 75.02645
```

```
#
x |> summary()
```

```
 Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
22.51   42.74   50.48   50.17   58.34   75.03
```

2

magrittr %>% R4.1+ |> |> magrittr %>%
↑ + Command + m

```
library(magrittr)
```

```
Attaching package: 'magrittr'

The following object is masked from 'package:purrr':

    set_names

The following object is masked from 'package:tidyr':

    extract
```

```
x %>% mean()
```

```
[1] 50.1682
```

```
x |> mean()
```

```
[1] 50.1682
```

Working Directory R4SS

R4SS R R4SS

Session → Set Working Directory → Choose Directory... R4SS Open
R4SS

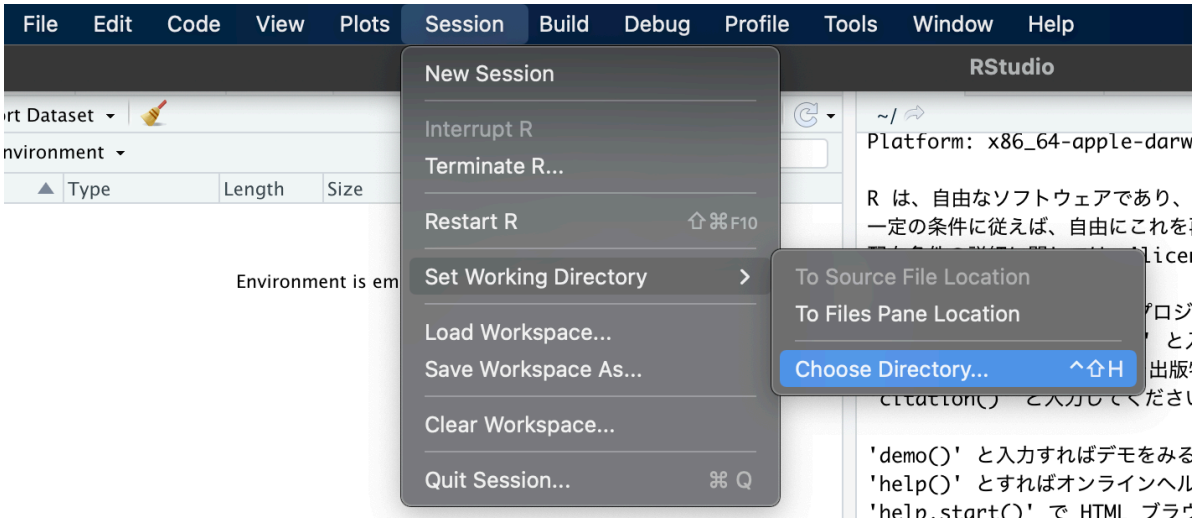


Figure 5:

```
getwd()
```

```
[1] "/Users/sf/GitHub/R4SS"
```

RStudio

Figure 7 R4SS

Figure 8 New Directory Existing Directory Browse O
working directory: Create Project

R4SS R4SS.Rproj R4SS.Rproj .Rproj .Rproj

1. Console
2. Files Files
3. getwd()
4. here here()

```
#
getwd()
```

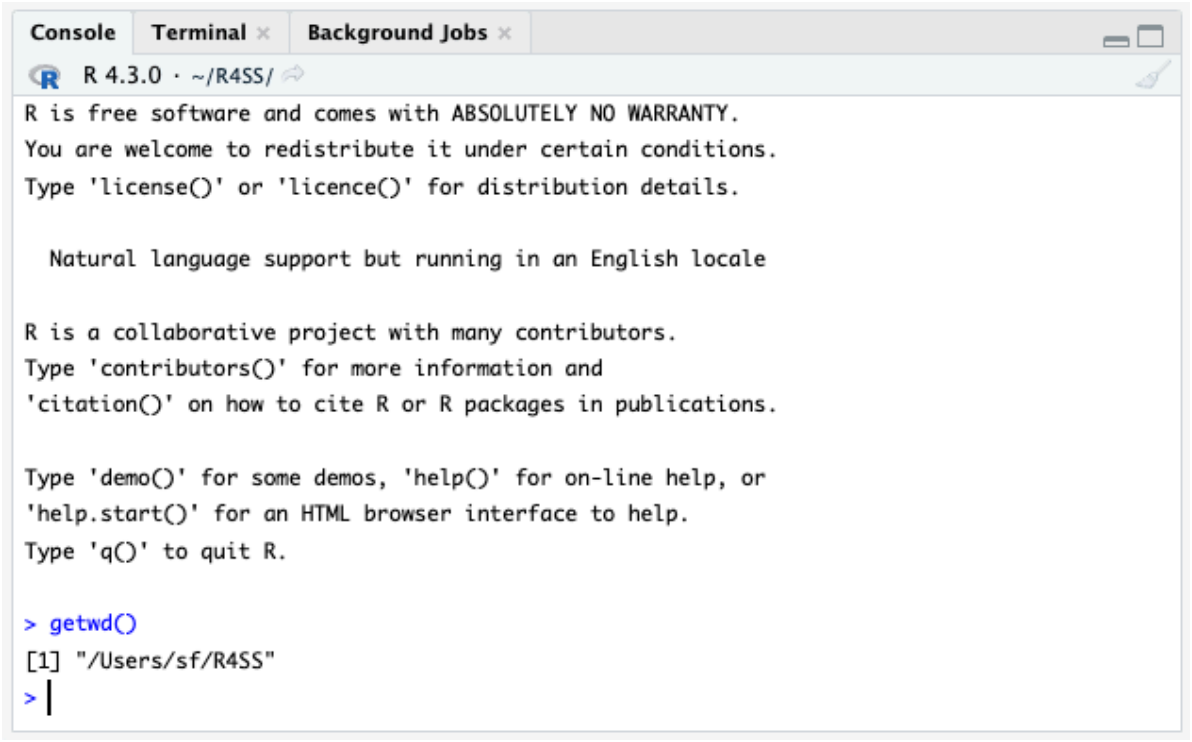

Console
Terminal
Background Jobs
R 4.3.0 · ~/R4SS/
R is free software and comes with ABSOLUTELY NO WARRANTY.
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.
Natural language support but running in an English locale
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.
Type 'demo()' for some demos, 'help()' for on-line help, or
'help.start()' for an HTML browser interface to help.
Type 'q()' to quit R.
> getwd()
[1] "/Users/sf/R4SS"
>

Figure 6:

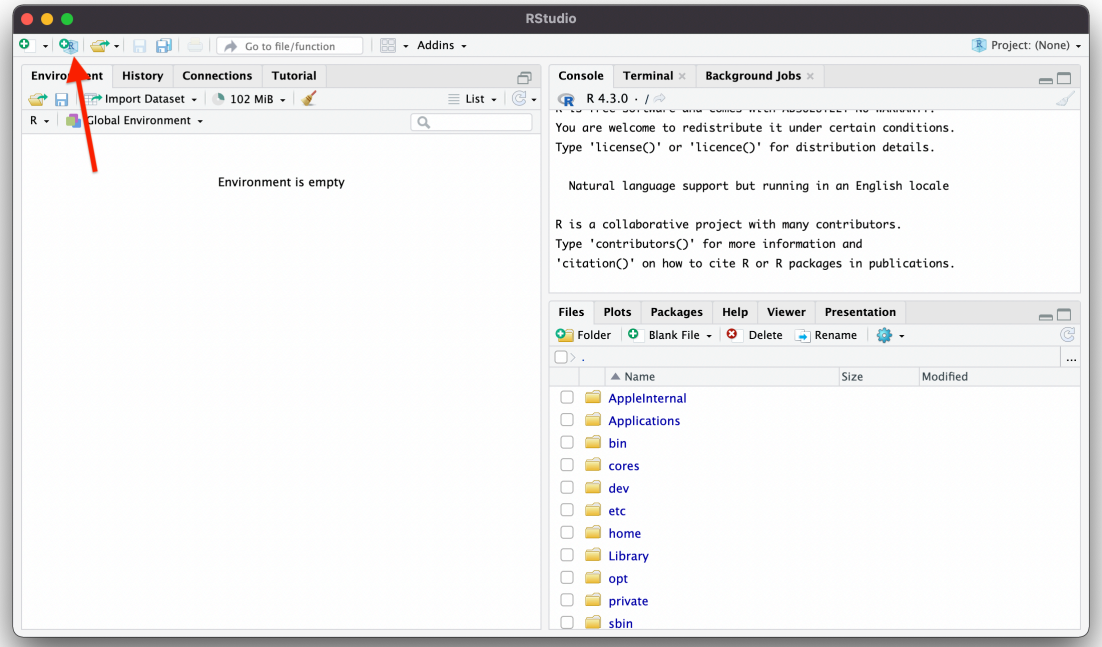

RStudio
Go to file/function
Addins
Project: (None)
History
Connections
Tutorial
Import Dataset
102 MiB
List
Global Environment
Environment is empty
Console
Terminal
Background Jobs
R 4.3.0 · /
You are welcome to redistribute it under certain conditions.
Type 'license()' or 'licence()' for distribution details.
Natural language support but running in an English locale
R is a collaborative project with many contributors.
Type 'contributors()' for more information and
'citation()' on how to cite R or R packages in publications.
Files
Plots
Packages
Help
Viewer
Presentation
Folder
Blank File
Delete
Rename
Name
Size
Modified
AppleInternal
Applications
bin
cores
dev
etc
home
Library
opt
private
sbin

Figure 7:

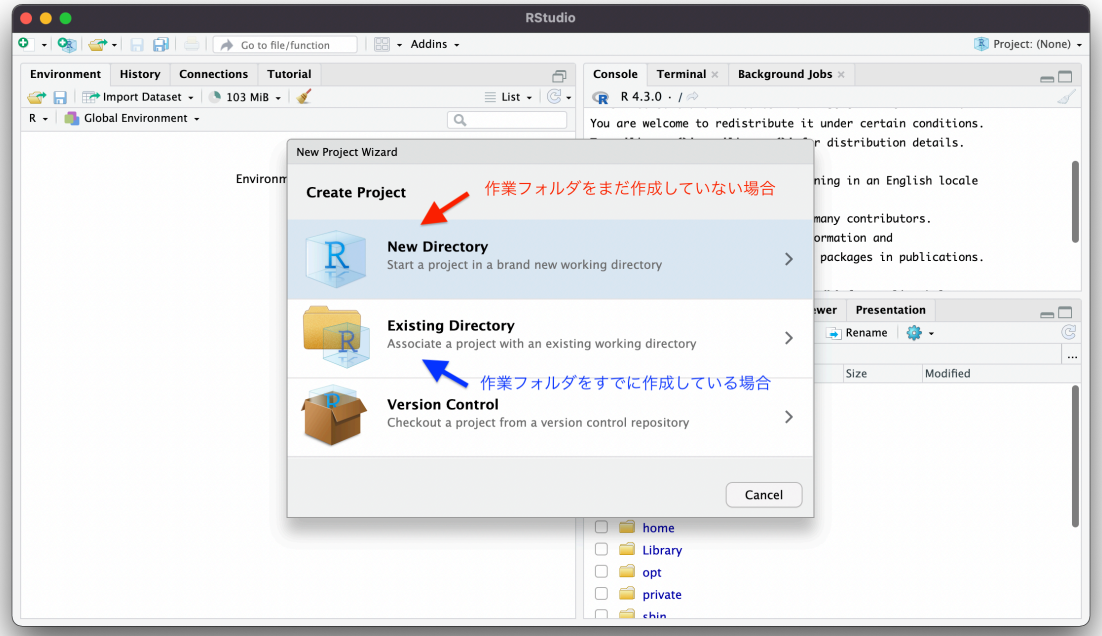

RStudio
New Project Wizard
Create Project
作業フォルダをまだ作成していない場合
New Directory
Start a project in a brand new working directory
Existing Directory
Associate a project with an existing working directory
作業フォルダをすでに作成している場合
Version Control
Checkout a project from a version control repository
Cancel

Figure 8:

```
[1] "/Users/sf/GitHub/R4SS"
```

here here()

```
#
here::here()
```

```
[1] "/Users/sf/GitHub/R4SS"
```

```
#       data
here::here("data")
```

```
[1] "/Users/sf/GitHub/R4SS/data"
```

```
#      data   csv
here::here("data", "u001.csv")
```

```
[1] "/Users/sf/GitHub/R4SS/data/u001.csv"
```

```
here::here("data")
```

```
[1] "/Users/sf/GitHub/R4SS/data"
```

R

- .R
- Save Workspace... No