

# Package ‘EQUALSTATS’

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**Title** Algorithm Driven Statistical Analysis for Researchers without Coding Skills

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**Depends** stringr, shiny, zip

**Imports** ggplot2, DescTools, cowplot, boot, pwr, ggcorrplot, survival, nnet, MASS, lmtest, pROC, ThresholdROC, ggsurvfit, lme4, mclogit, ordinal, coxme, MuMIn

**Description** Support functions for R-based 'EQUAL-STATS' software which automatically classifies the data and performs appropriate statistical tests. 'EQUAL-STATS' software is a shiny application with an user-friendly interface to perform complex statistical analysis. Gurusamy, K (2024) <[doi:10.5281/zenodo.13354162](https://doi.org/10.5281/zenodo.13354162)>.

**License** GPL (>= 3)

**Encoding** UTF-8

**URL** <https://sites.google.com/view/equal-group/home>

**Note** This update fixes bugs noted because of global variables not being recognised as global variables in some environments and some errors noted on specific choices in mixed effects regression.

**NeedsCompilation** no

**Repository** CRAN

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## Contents

compile_questions . . . . .	2
convert_to_user_interface . . . . .	7
function.Check_Distribution . . . . .	9
function.Compare_Groups . . . . .	13

function.Compare_Sample_Pop_Means . . . . .	17
function.Correlation . . . . .	21
function.Create_Plots . . . . .	25
function.Diagnostic_Accuracy_Primary . . . . .	29
function.Diagnostic_Accuracy_Tables . . . . .	34
function.Generate_Hypothesis . . . . .	36
function.Make_Conclusions_Effect_size . . . . .	39
function.Mixed_Effects_Regression . . . . .	42
function.Multivariate_Regression . . . . .	47
function.plan_upload . . . . .	51
function.plan_upload_no_data . . . . .	55
function.rbind_different_column_numbers . . . . .	57
function.read_data . . . . .	59
function.read_metadata . . . . .	61
function.Regression_Analysis . . . . .	65
function.Sample_Size_Calculations_Effect_size . . . . .	70
function.Sample_Size_Calculations_Primary . . . . .	72
function.submit_choices . . . . .	76
function.Summary_Measures . . . . .	80
function.Survival_Analysis . . . . .	84
round_near . . . . .	89
text_to_evaluate_first_menu_selection . . . . .	90

<b>Index</b>	<b>96</b>
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compile_questions	<i>Compiles Questions for User Interface</i>
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## Description

Obtains the questions related to a particular selection and converts them to shiny commands so that the user interface is created.

## Usage

```
compile_questions(Predefined_lists, rv)
```

## Arguments

Predefined\_lists

A list supplied by 'EQUAL-STATS' application

rv

A list supplied by 'EQUAL-STATS' application based on user input

**Value**

UI\_Initial\_texts  
User interface initial texts

UI\_Update\_texts  
User interface updated texts

submit\_button\_appear\_text  
When the submit button should appear in the user interface

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots'
  ),
  second_menu_choices = c(
    '',
    'EQUAL-STATS choice%_%Histogram'
  ),
  label_1 = c(
    'Select the variable for which summary measures are required',
    'Select the variable%_%Select the variable'
  ),
  label_2 = c(
    'Select the variable for which you want separate summary (optional)',
    'NULL%_%NULL'
  ),
  label_3 = c(
    'Select the summary measures that you want in the report',
    'Enter the title for the plot%_%Enter the title for the plot'
  ),
)
```

```
label_4 = c(
  '',
  'Select the variable%_%Select the variable'
),
label_5 = c(
  '',
  ''
),
label_6 = c(
  '',
  ''
),
label_7 = c(
  '',
  ''
),
label_8 = c(
  '',
  ''
),
label_9 = c(
  '',
  ''
),
label_10 = c(
  '',
  ''
),
label_11 = c(
  '',
  ''
),
label_12 = c(
  '',
  ''
),
label_13 = c(
  '',
  ''
),
label_14 = c(
  '',
  ''
),
label_15 = c(
  '',
  ''
),
entry_1 = c(
  '%_selectInput%_%rv$import_data$any_type',
  '%_selectInput%_%rv$import_data$any_type'
),
entry_2 = c(
```

```
'_%selectInput%_c("",setdiff(rv$import_data$categorical, rv$entry[[1]]))',  
'NULL%_NULL'  
)  
entry_3 = c(  
'_%checkbox%_rv$summary_measures_choices',  
'_%text%_Plot title%_text%_Plot title'  
)  
entry_4 = c(  
'',  
'',  
'_%selectInput%_rv$entry[[1]]%_selectInput%_rv$entry[[1]]'  
)  
entry_5 = c(  
'',  
'',  
)  
entry_6 = c(  
'',  
'',  
)  
entry_7 = c(  
'',  
'',  
)  
entry_8 = c(  
'',  
'',  
)  
entry_9 = c(  
'',  
'',  
)  
entry_10 = c(  
'',  
'',  
)  
entry_11 = c(  
'',  
'',  
)  
entry_12 = c(  
'',  
'',  
)  
entry_13 = c(  
'',  
'',  
)  
entry_14 = c(  
'',  
'',  
)  
entry_15 = c(  
'',  
'',
```

```
''
),
mandatory_1 = c(
  'yes',
  'yes%_%yes'
),
mandatory_2 = c(
  'no',
  'NULL%_%NULL'
),
mandatory_3 = c(
  'yes',
  'no%_%no'
),
mandatory_4 = c(
  '',
  'no%_%no'
),
mandatory_5 = c(
  '',
  ''
),
mandatory_6 = c(
  '',
  ''
),
mandatory_7 = c(
  '',
  ''
),
mandatory_8 = c(
  '',
  ''
),
mandatory_9 = c(
  '',
  ''
),
mandatory_10 = c(
  '',
  ''
),
mandatory_11 = c(
  '',
  ''
),
mandatory_12 = c(
  '',
  ''
),
mandatory_13 = c(
  '',
  ''
```

```

),
mandatory_14 = c(
'',
''
),
mandatory_15 = c(
'',
''
),
numeric_exemptions = c(
'',
''
)
)
)
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = "Create_Plots",
  second_menu_choice = "EQUAL-STATS choice",
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Functions and packages required to run
library(stringr)
# Final function #####
UI_texts <- compile_questions(Predefined_lists = Predefined_lists, rv = rv)

```

---

convert\_to\_user\_interface

*Converts the Compiled Questions to User Interface*

---

### **Description**

Obtains the compiled questions related to a particular selection and converts each of these questions them to shiny commands so that user interface is created.

### **Usage**

```
convert_to_user_interface(UI_name, label, entry_text, rv)
```

**Arguments**

UI_name	Text provided by the <code>compile_questions()</code> function
label	Text provided by the <code>compile_questions()</code> function
entry_text	Text provided by the <code>compile_questions()</code> function
rv	A list supplied by 'EQUAL-STATS' application based on user input

**Value**

output_1	User interface initial text
output_2	User interface updated text

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
UI_name <- "entry_1_UI"
label = "Select the variable for which summary measures are required"
entry_text = "%selectInput%rv$import_data$any_type"
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = "Summary_Measures",
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Packages required to run
```



```
library(stringr)
# Final function ####
UI_texts <- convert_to_user_interface(UI_name = UI_name,
label = label, entry_text = entry_text, rv = rv)
```

---

```
function.Check_Distribution
```

*Check the Distribution of Data*

---

## Description

Uses the functions from **stats** and reports the results of Shapiro-Wilk test for normality along with Kolmogorov Smirnov tests for multiple distribution types. It uses **ggplot2** to create plots and **cowplot** to combine multiple plots.

## Usage

```
function.Check_Distribution(Predefined_lists, rv)
```

## Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

## Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices stats::shapiro.test() stats::ks.test() ggplot2::ggplot() cowplot::plot\_grid()

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"))
```

```

`Unable to walk independently at 6 weeks` = c(
  "unable", "able", "able", "unable", "able",
  "able", "unable", "unable", "unable", "unable",
  "able", "unable", "able", "unable", "unable",
  "able", "unable", "unable", "unable", "unable",
  "able", "able", "able", "able", "unable",
  "able", "able", "unable", "able", "unable"),
`Mobility score at 6 months` = c(
  86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
  41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
  108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
`Pain at 6 weeks` = c(
  "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
  "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
  "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
  "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
  "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
  "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
`Number of falls within 6 months` = c(
  3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
  3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
  3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
`Mobility score at 12 months` = c(
  90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
  45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
  112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
`Admission to care home` = c(
  "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
  "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
  "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
  "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
`Follow-up` = c(
  10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
  8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
  6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
  )
)

```

```

    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####

```

```

library(stringr)
library(ggplot2)
library(cowplot)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Check_Distribution"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Mobility score at 6 months"
# Final function #####
Results <- function.Check_Distribution(Predefined_lists, rv)

```

---

```
function.Compare_Groups
```

*Compare Differences Between Groups*

---

## Description

Calculates the skewness and kurtosis and results of Shapiro-Wilk test and Kolmogrov-Smirnov tests using **DescTools** and **stats** to determine normality. It uses the the appropriate tests from **stats** to compare groups. It uses **ggplot2** to create plots and **cowplot** to combine multiple plots.

## Usage

```
function.Compare_Groups(Predefined_lists, rv)
```

## Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

## Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.

plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices stats::shapiro.test() stats::ks.test() DescTools::Kurt() DescTools::Skew()  
 stats::fisher.test() stats::prop.trend.test() stats::chisq.test() stats::t.test()  
 stats::aov() stats::wilcox.test() stats::kruskal.test() boot::boot() ggplot2::ggplot()  
 cowplot::plot\_grid()

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
```

```

"Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
"Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
"Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
"Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
"Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
"Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
`Obesity status` = c(
  "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
  "Obese", "Obese", "Obese", "Non-obese", "Obese",
  "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
  "Obese", "Non-obese", "Obese", "Obese", "Obese",
  "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
  "Non-obese", "Obese", "Obese", "Obese", "Obese"),
`Unable to walk independently at 6 weeks` = c(
  "unable", "able", "able", "unable", "able",
  "able", "unable", "unable", "unable", "unable",
  "able", "unable", "able", "unable", "unable",
  "able", "unable", "unable", "unable", "unable",
  "able", "able", "able", "able", "unable",
  "able", "able", "unable", "able", "unable"),
`Mobility score at 6 months` = c(
  86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
  41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
  108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
`Pain at 6 weeks` = c(
  "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
  "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
  "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
  "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
  "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
  "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
`Number of falls within 6 months` = c(
  3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
  3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
  3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
`Mobility score at 12 months` = c(
  90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
  45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
  112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
`Admission to care home` = c(
  "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
  "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
  "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
  "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
`Follow-up` = c(
  10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
  8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
  6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(

```

```

main_menu = c(
  'Calculate summary measures',
  'Create plots',
  'Check distribution',
  'Compare sample mean versus population mean',
  'Compare groups/variables (independent samples)',
  'Compare groups/variables (paired samples or repeated measures)',
  'Find the correlation (quantitative variables)',
  'Calculate measurement error',
  'Find the diagnostic accuracy (primary data)',
  'Perform sample size and power calculations (primary data)',
  'Perform survival analysis',
  'Perform regression analysis',
  'Analyse time series',
  'Perform mixed-effects regression',
  'Perform multivariate regression',
  'Generate hypothesis',
  'Perform sample size and power calculations (effect size approach)',
  'Make correct conclusions (effect size approach)',
  'Find the diagnostic accuracy (tabulated data)'
),
menu_short = c(
  'Summary_Measures',
  'Create_Plots',
  'Check_Distribution',
  'Compare_Sample_Pop_Means',
  'Compare_Groups',
  'Repeated_Measures',
  'Correlation',
  'Measurement_Error',
  'Diagnostic_Accuracy_Primary',
  'Sample_Size_Calculations_Primary',
  'Survival_Analysis',
  'Regression_Analysis',
  'Time_Series',
  'Mixed_Effects_Regression',
  'Multivariate_Regression',
  'Generate_Hypothesis',
  'Sample_Size_Calculations_Effect_size',
  'Make_Conclusions_Effect_size',
  'Diagnostic_Accuracy_Tables'
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,

```



```

summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
"Missing observations", "Available observations"),
analysis_outcome = list(),
code = list(),
plan = list(),
results = list(),
plots_list = list(),
reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
library(ggplot2)
library(cowplot)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Compare_Groups"
rv$second_menu_choice <- "EQUAL-STATS choice"
rv$entry[[1]] <- "Unable to walk independently at 6 weeks"
rv$entry[[2]] <- "Treatment"
rv$entry[[3]] <- "0.05"
# Final function #####
Results <- function.Compare_Groups(Predefined_lists, rv)

```

---

```
function.Compare_Sample_Pop_Means
```

*Compare the Sample Mean with Population Mean*

---

## Description

Uses the appropriate tests from **stats** to compare the sample mean with the population mean.

## Usage

```
function.Compare_Sample_Pop_Means(Predefined_lists, rv)
```

## Arguments

Predefined\_lists

A list supplied by 'EQUAL-STATS' application

rv

A list supplied by 'EQUAL-STATS' application based on user input

## Value

analysis\_outcome

Whether the analysis was performed successfully

plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices `stats::t.test()` `stats::binom.test()`

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
```

```

"C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
"C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
"C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
"C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
`Treatment` = c(
  "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
  "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
`Obesity status` = c(
  "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
  "Obese", "Obese", "Obese", "Non-obese", "Obese",
  "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
  "Obese", "Non-obese", "Obese", "Obese", "Obese",
  "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
  "Non-obese", "Obese", "Obese", "Obese", "Obese"),
`Unable to walk independently at 6 weeks` = c(
  "unable", "able", "able", "unable", "able",
  "able", "unable", "unable", "unable", "unable",
  "able", "unable", "able", "unable", "unable",
  "able", "unable", "unable", "unable", "unable",
  "able", "able", "able", "able", "unable",
  "able", "able", "unable", "able", "unable"),
`Mobility score at 6 months` = c(
  86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
  41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
  108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
`Pain at 6 weeks` = c(
  "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
  "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
  "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
  "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
  "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
  "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
`Number of falls within 6 months` = c(
  3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
  3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
  3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
`Mobility score at 12 months` = c(
  90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
  45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
  112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
`Admission to care home` = c(
  "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
  "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
  "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",

```

```

    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()

```

```

entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Compare_Sample_Pop_Means"
rv$second_menu_choice <- "Categorical variable"
rv$entry[[1]] <- "Obesity status"
rv$entry[[2]] <- 0.4
# Final function #####
Results <- function.Compare_Sample_Pop_Means(Predefined_lists, rv)

```

---

function.Correlation    *Calculate the Correlation between Quantitative Variables*

---

### Description

Calculates the correlation between two quantitative variables using **stats**. It uses **ggcorrplot** to provide a visual representation of the correlation.

### Usage

```
function.Correlation(Predefined_lists, rv)
```

### Arguments

Predefined\_lists

A list supplied by 'EQUAL-STATS' application

rv

A list supplied by 'EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices stats::shapiro.test() stats::ks.test() DescTools::Kurt() DescTools::Skew()  
stats::cor() ggcorrplot::ggcorrplot()

**Examples**

```
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
```

```

    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(

```

```

    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
  )
)

```



```

    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
library(ggcorrplot)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Correlation"
rv$second_menu_choice <- "EQUAL-STATS choice"
rv$entry[[1]] <- "Mobility score at 6 months"
rv$entry[[2]] <- "Mobility score at 12 months"
# Final function #####
Results <- function.Correlation(Predefined_lists, rv)

```

---

function.Create\_Plots *Create Plots*

---

## Description

Uses **ggplot2** to create various plots.

## Usage

```
function.Create_Plots(Predefined_lists, rv)
```

**Arguments**

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices [ggplot2::ggplot\(\)](#)

**Examples**

```

# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",

```

```

    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',

```

```

    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(ggplot2)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Create_Plots"
rv$second_menu_choice <- "EQUAL-STATS choice"
rv$entry[[1]] <- "Mobility score at 6 months"
rv$entry[[2]] <- ""
rv$entry[[3]] <- ""
rv$entry[[4]] <- ""
# Final function #####
Results <- function.Create_Plots(Predefined_lists, rv)

```

---

function.Diagnostic\_Accuracy\_Primary

*Calculate the Diagnostic accuracy using Primary Data*

---

## Description

Uses **ThresholdROC** and **pROC** to calculate the diagnostic accuracy of a test using a reference standard. This function is used when primary data is available. Use [function.Diagnostic\\_Accuracy\\_Tables\(\)](#) when the data is provided as a 2 x 2 contingency table.

## Usage

```
function.Diagnostic_Accuracy_Primary(Predefined_lists, rv)
```

## Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

## Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

## Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**<https://sites.google.com/view/equal-group/home>**See Also**

function.submit\_choices function.Diagnostic\_Accuracy\_Tables pROC::roc() pROC::ggroc() ThresholdROC::diagnosti

**Examples**

```

# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable")

```

```

    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
  )
)

```



```

      'Make correct conclusions (effect size approach)',
      'Find the diagnostic accuracy (tabulated data)'
    ),
    menu_short = c(
      'Summary_Measures',
      'Create_Plots',
      'Check_Distribution',
      'Compare_Sample_Pop_Means',
      'Compare_Groups',
      'Repeated_Measures',
      'Correlation',
      'Measurement_Error',
      'Diagnostic_Accuracy_Primary',
      'Sample_Size_Calculations_Primary',
      'Survival_Analysis',
      'Regression_Analysis',
      'Time_Series',
      'Mixed_Effects_Regression',
      'Multivariate_Regression',
      'Generate_Hypothesis',
      'Sample_Size_Calculations_Effect_size',
      'Make_Conclusions_Effect_size',
      'Diagnostic_Accuracy_Tables'
    )
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(pROC)
library(ThresholdROC)
library(ggplot2)
rv$import_data <- function.read_data(data_file_path)

```

```
# Update choices ####
rv$first_menu_choice <- "Diagnostic_Accuracy_Primary"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Treatment"
rv$entry[[2]] <- "Unable to walk independently at 6 weeks"
# Final function ####
Results <- function.Diagnostic_Accuracy_Primary(Predefined_lists, rv)
```

---

```
function.Diagnostic_Accuracy_Tables
```

*Calculate the Diagnostic accuracy using Summary Data*

---

## Description

Uses **ThresholdROC** and **pROC** to calculate the diagnostic accuracy of a test using a reference standard. This function is used when the data is provided as a 2 x 2 contingency table. Use [function.Diagnostic\\_Accuracy\\_Primary\(\)](#) when primary data is available.

## Usage

```
function.Diagnostic_Accuracy_Tables(Predefined_lists, rv)
```

## Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

## Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices function.Diagnostic\_Accuracy\_Primary pROC::roc() pROC::ggroc() ThresholdROC::diagnost

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
  )
)
```

```

'Survival_Analysis',
'Regression_Analysis',
'Time_Series',
'Mixed_Effects_Regression',
'Multivariate_Regression',
'Generate_Hypothesis',
'Sample_Size_Calculations_Effect_size',
'Make_Conclusions_Effect_size',
'Diagnostic_Accuracy_Tables'
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Load the necessary packages and functions ####
library(stringr)
library(pROC)
library(ThresholdROC)
library(ggplot2)
rv$first_menu_choice <- "Diagnostic_Accuracy_Tables"
rv$second_menu_choice <- NA
rv$entry[[1]] <- 30
rv$entry[[2]] <- 2
rv$entry[[3]] <- 1
rv$entry[[4]] <- 40
# Final function ####
Results <- function.Diagnostic_Accuracy_Tables(Predefined_lists, rv)

```

---

function.Generate\_Hypothesis

*Generate Research Hypothesis*

---

**Description**

Generates the research hypothesis that can be used in grant applications, study protocols, and scientific reports when information is provided in plain language.

**Usage**

```
function.Generate_Hypothesis(Predefined_lists, rv)
```

**Arguments**

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
```

```

rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Load the necessary packages and functions ####
library(stringr)
rv$first_menu_choice <- "Generate_Hypothesis"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Intensive rehabilitation"
rv$entry[[2]] <- "Standard rehabilitation"
rv$entry[[3]] <- "Intervention is better or worse than comparator"
rv$entry[[4]] <- "Mobility score"
rv$entry[[5]] <- "Higher values of the outcome (or more events) are better for the subject"
rv$entry[[6]] <- 10
rv$entry[[7]] <- ""
# Final function ####
Results <- function.Generate_Hypothesis(Predefined_lists, rv)

```

---

```

function.Make_Conclusions_Effect_size
  Make Conclusions

```

---

## Description

Generates conclusions when summary information, information used for sample size, and the differences between the groups are provided. The summary information can be generated from function.Summary\_Measures and the difference between the groups can be calculated using function.Compare\_Groups. It uses the **pwr** to calculate the sample size.

## Usage

```
function.Make_Conclusions_Effect_size(Predefined_lists, rv)
```

## Arguments

```

Predefined_lists
  A list supplied by 'EQUAL-STATS' application
rv
  A list supplied by 'EQUAL-STATS' application based on user input

```

**Value**

<code>analysis_outcome</code>	Whether the analysis was performed successfully
<code>plan</code>	Plan used for analysis
<code>code</code>	Part of code generated for performing the analysis in a standalone version of R
<code>results</code>	Analysis results
<code>results_display</code>	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
<code>plots_list</code>	A list of plots generated. Returns "" if no plots are generated.
<code>plots_list_display</code>	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
<code>selections</code>	Selections made by the user for display.
<code>display_table</code>	Whether the results table should be displayed in the shiny app.
<code>display_plot</code>	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

`function.submit_choices` `function.Summary_Measures` `function.Compare_Groups` `pwr::pwr.t.test()`  
`pwr::pwr.2p.test()` `ggplot2::ggplot()`

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
```



```

    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),

```

```

    results = list(),
    plots_list = list(),
    reports = list()
  )
  # Load the necessary packages and functions ####
  library(stringr)
  library(pwr)
  library(ggplot2)
  rv$first_menu_choice <- "Make_Conclusions_Effect_size"
  rv$second_menu_choice <- "Intervention study (binary outcome)"
  rv$entry[[1]] <- 0.67
  rv$entry[[2]] <- 0.7
  rv$entry[[3]] <- -0.12
  rv$entry[[4]] <- 0.09
  rv$entry[[5]] <- 40
  rv$entry[[6]] <- 40
  rv$entry[[7]] <- "Intervention is better or worse than comparator"
  rv$entry[[8]] <- "Independent samples"
  rv$entry[[9]] <- "Higher values of the outcome (or more events) are better for the subject"
  rv$entry[[10]] <- 0.05
  rv$entry[[11]] <- "0.05"
  rv$entry[[12]] <- "0.80"
  # Final function ####
  Results <- function.Make_Conclusions_Effect_size(Predefined_lists, rv)

```

---

```

function.Mixed_Effects_Regression
      Perform Mixed Effects Regression

```

---

## Description

Performs mixed effects regression analysis using **lme4** for mixed-effects linear, logistic, and Poisson regression, **mclgit** for mixed-effects multinomial logistic regression, **ordinal** for mixed-effects ordinal regression, and **coxme** for mixed-effects Cox regression for binary outcomes. It uses **lmerTest** and **MuMIn** for performing stepwise regression. For linear, logistic, and Poisson regression, it chooses the best optimizer using `lme4::allFit()`.

## Usage

```
function.Mixed_Effects_Regression(Predefined_lists, rv)
```

## Arguments

Predefined\_lists

A list supplied by 'EQUAL-STATS' application

rv

A list supplied by 'EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices function.Regression\_Analysis function.Multivariate\_Regression DescTools::BoxCox()  
 lme4::lmer() lme4::glmer() mclogit::mblogit() ordinal::clmm() coxme::coxme() lmerTest::step()  
 MuMIn::dredge() lme4::allFit() ggplot2::ggplot() cowplot::plot\_grid() ggcorrplot::ggcorrplot()  
 ggsurvfit::ggsurvfit()

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
```

```

"S0011", "S0012", "S0013", "S0014", "S0015",
"S0016", "S0017", "S0018", "S0019", "S0020",
"S0021", "S0022", "S0023", "S0024", "S0025",
"S0026", "S0027", "S0028", "S0029", "S0030"),
`Centre` = c(
  "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
  "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
  "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
  "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
  "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
  "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
`Treatment` = c(
  "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
  "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
  "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
`Obesity status` = c(
  "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
  "Obese", "Obese", "Obese", "Non-obese", "Obese",
  "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
  "Obese", "Non-obese", "Obese", "Obese", "Obese",
  "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
  "Non-obese", "Obese", "Obese", "Obese", "Obese"),
`Unable to walk independently at 6 weeks` = c(
  "unable", "able", "able", "unable", "able",
  "able", "unable", "unable", "unable", "unable",
  "able", "unable", "able", "unable", "unable",
  "able", "unable", "unable", "unable", "unable",
  "able", "able", "able", "able", "unable",
  "able", "able", "unable", "able", "unable"),
`Mobility score at 6 months` = c(
  86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
  41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
  108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
`Pain at 6 weeks` = c(
  "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
  "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
  "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
  "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
  "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
  "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
`Number of falls within 6 months` = c(
  3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
  3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
  3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
`Mobility score at 12 months` = c(
  90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,

```

```

45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
`Admission to care home` = c(
  "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
  "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
  "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
  "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
`Follow-up` = c(
  10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
  8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
  6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',

```

```

    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
library(lme4)
library(MuMIn)
library(ggplot2)
library(ggcorrplot)
library(cowplot)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Mixed_Effects_Regression"
rv$second_menu_choice <- "Logistic regression"
rv$entry[[1]] <- "Unable to walk independently at 6 weeks"
rv$entry[[2]] <- ""
rv$entry[[3]] <- "Centre"
rv$entry[[4]] <- "Treatment"
rv$entry[[5]] <- ""
rv$entry[[6]] <- ""
rv$entry[[7]] <- ""
rv$entry[[8]] <- "No"
# Final function #####
Results <- function.Mixed_Effects_Regression(Predefined_lists, rv)

```

---

```
function.Multivariate_Regression
      Perform Multivariate Regression
```

---

### Description

Performs multivariate regression analysis using **lme4** for multivariate linear, logistic, and Poisson regression and **stats** for performing stepwise regression. The user interface accepts multinomial and ordinal variables, but the results for regression types other than multivariate linear and logistic regressions are unverified.

### Usage

```
function.Multivariate_Regression(Predefined_lists, rv)
```

### Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by "EQUAL-STATS" application based on user input

### Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

### Note

This is part of a suite of functions required to allow "EQUAL-STATS" program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**<https://sites.google.com/view/equal-group/home>**See Also**

function.submit\_choices function.Regression\_Analysis function.Mixed\_Effects\_Regression DescTools::BoxCox()  
 stats::lm() stats::glm() nnet::multinom() MASS::polr() survival::coxph() ggplot2::ggplot()  
 ggcorrplot::ggcorrplot() cowplot::plot\_grid()

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable")
```



```

    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',

```

```

    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
library(ggplot2)

```

```
library(ggcorrplot)
library(cowplot)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Multivariate_Regression"
rv$second_menu_choice <- "Linear regression"
rv$entry[[1]] <- c("Mobility score at 6 months", "Mobility score at 12 months")
rv$entry[[2]] <- ""
rv$entry[[3]] <- "Treatment"
rv$entry[[4]] <- ""
rv$entry[[5]] <- ""
rv$entry[[6]] <- ""
rv$entry[[7]] <- "No"
# Final function #####
Results <- function.Multivariate_Regression(Predefined_lists, rv)
```

---

function.plan\_upload    *Upload a Plan to Rerun the Analysis*

---

### Description

Once an analysis has been performed, a plan is automatically generated by 'EQUAL-STATS'. This plan can be used to rerun the analysis allowing transparency and reproducibility of analysis. For this function to run successfully, additional information is provided directly by 'EQUAL-STATS' software. For analysis without requiring data upload, function.plan\_upload\_no\_data is used

### Usage

```
function.plan_upload(plan_file_path, Predefined_lists, rv)
```

### Arguments

plan\_file\_path    The path to the plan file.  
Predefined\_lists    A list supplied by EQUAL-STATS application  
rv    A list supplied by 'EQUAL-STATS' application based on user input.

### Value

Depending upon whether the plan aligned to the data uploaded, either the results of the analysis or message for reason for failure is provided.

### Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**<https://sites.google.com/view/equal-group/home>**See Also**[function.read\\_data\(\)](#) [function.plan\\_upload\\_no\\_data\(\)](#)**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable")
)
```

```

    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8)
)
# Create a plan file
# Several additional functions are necessary to execute the plan.
# Therefore, the plan contains wrong field names which are not present in the data
plan <- cbind.data.frame(
  "AN0001", "Check_Distribution", "", "Mobility score at 60 months", "", "",
  "", "", "", "", "", "", "", "", "", "", "", "", "", "")
colnames(plan) <- c(
  "analysis_number", "first_menu_choice", "second_menu_choice", "entry_1", "entry_2",
  "entry_3", "entry_4", "entry_5", "entry_6", "entry_7", "entry_8", "entry_9", "entry_10",
  "entry_11", "entry_12", "entry_13", "entry_14", "entry_15", "same_row_different_row")
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
  )

```

```

    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data and plan in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
plan_file_path = paste0(tempdir(), "/plan.csv")
write.csv(plan, file = plan_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions
library(stringr)
# Read the data
rv$import_data <- function.read_data(data_file_path)
# Final function #####

```

```
plan_outcome <- function.plan_upload(plan_file_path, Predefined_lists, rv)
```

---

```
function.plan_upload_no_data
```

*Upload a Plan to Rerun the Analysis without Data Upload*

---

## Description

Once an analysis has been performed, a plan is automatically generated by 'EQUAL-STATS'. This plan can be used to rerun the analysis allowing transparency and reproducibility of analysis. For this function to run successfully, additional information is provided directly by 'EQUAL-STATS' software. For analysis requiring data upload, [function.plan\\_upload\(\)](#) is used

## Usage

```
function.plan_upload_no_data(plan_file_path, Predefined_lists, rv, no_data_choices)
```

## Arguments

`plan_file_path` The path to the plan file.

`Predefined_lists`

A list supplied by EQUAL-STATS application

`rv` A list supplied by 'EQUAL-STATS' application based on user input.

`no_data_choices`

A list of functions that do not require data upload

## Value

Depending upon whether the plan aligned to the data uploaded, either the results of the analysis or message for reason for failure is provided.

## Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

## Author(s)

Kurinchi Gurusamy

## References

<https://sites.google.com/view/equal-group/home>

## See Also

[function.plan\\_upload\(\)](#)

## Examples

```

# This requires several additional functions to complete successfully.
# Therefore, column names was altered to demonstrate the unsuccessful results.
# Create plan
plan <- cbind.data.frame(
  "AN0001", "Generate_Hypothesis", "", "Intensive rehabilitation", "Standard rehabilitation",
  "Intervention is better or worse than comparator", "Mobility score",
  "Higher values of the outcome (or more events) are better for the subject", "10",
  "", "", "", "", "", "", "", "", "", "", "")
colnames(plan) <- c(
  "analysis_number", "menu_choice", "second_menu_choice", "entry_1", "entry_2", "entry_3",
  "entry_4", "entry_5", "entry_6", "entry_7", "entry_8", "entry_9", "entry_10",
  "entry_11", "entry_12", "entry_13", "entry_14", "entry_15", "same_row_different_row")
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',

```



```

      'Generate_Hypothesis',
      'Sample_Size_Calculations_Effect_size',
      'Make_Conclusions_Effect_size',
      'Diagnostic_Accuracy_Tables'
    )
  )
  entry <- list()
  entry <- lapply(1:15, function(x) entry[[x]] <- '')
  rv <- list(
    StorageFolder = tempdir(),
    first_menu_choice = NA,
    second_menu_choice = NA,
    entry = entry,
    import_data = NULL,
    same_row_different_row = NA,
    submit_button_to_appear = FALSE,
    summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
    analysis_outcome = list(),
    code = list(),
    plan = list(),
    results = list(),
    plots_list = list(),
    reports = list()
  )
  no_data_choices <- c("Generate_Hypothesis", "Sample_Size_Calculations_Effect_size",
  "Make_Conclusions_Effect_size", "Diagnostic_Accuracy_Tables")
  # Store the plan
  plan_file_path = paste0(tempdir(), "/plan.csv")
  write.csv(plan, file = plan_file_path, row.names = FALSE, na = "")
  # Load the necessary packages and functions
  library(stringr)
  # Final function #####
  plan_outcome <- function.plan_upload_no_data(plan_file_path, Predefined_lists, rv, no_data_choices)

```

---

```
function.rbind_different_column_numbers
```

*Combine Multiple Dataframes with Different Column Numbers*

---

## Description

**Base** function `rbind.data.frame` requires that the multiple data frames to be combined must have the same column numbers and names. For producing reports for 'EQUAL-STATS', data frames with different column numbers and names are required. This function allows this combination.

## Usage

```
function.rbind_different_column_numbers(list, include_columns)
```

**Arguments**

`list` A list of data frames to be combined provided as a list object.

`include_columns` Whether the column names of each data frame should be included as the first row indicated as "Yes" or "No". Default is "Yes". It is unusual to require "No" in this function.

**Value**

`output` A data frame with the multiple rows combined.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

[base::rbind.data.frame\(\)](#)

**Examples**

```
# Create a simulated data frames
df <- cbind.data.frame(
  Age = rnorm(3000, 40, 10),
  Height = rnorm(3000,165,15),
  `Length of hospital stay` = rpois(3000, 8),
  `Number of infections` = rpois(3000, 3)
)
# Calculate means and standard deviations for normally distributed variables
# and median and upper and lower quartiles for non-normally distributed variables
summary_measures <- lapply(1:ncol(df), function(y) {
  if (y<=2) {
    output <- cbind.data.frame(
      Variable = colnames(df)[y],
      Mean = mean(df[,y]),
      `Standard deviation` = sd(df[,y])
    )
  } else {
    output <- cbind.data.frame(
      Variable = colnames(df)[y],
      Median = quantile(df[,y], probs = 0.5),
      `Lower quartile` = quantile(df[,y], probs = 0.25),
```

```

        `Upper quartile` = quantile(df[,y], probs = 0.75)
    )
}
return(output)
})
# Combine the normally and non-normally distributed variables
normally_distributed_variables <- rbind.data.frame(summary_measures[[1]], summary_measures[[2]])
non_normally_distributed_variables <- rbind.data.frame(summary_measures[[3]], summary_measures[[4]])
# Combining the variables in a single data frame using
# rbind.data.frame causes error
combined_data_frame <- try(rbind.data.frame(normally_distributed_variables,
non_normally_distributed_variables))
combined_data_frame
# Combining the variables in a single data_frame using
# function.rbind_different_column_numbers does not cause error
# Note that data frames must be supplied as a list
# (any number of data frames can be present in the list)
# Final function #####
combined_data_frame_new_function <- function.rbind_different_column_numbers(
list(normally_distributed_variables, non_normally_distributed_variables)
)
combined_data_frame_new_function

```

---

function.read\_data      *Read a CSV File and Classify Variable Type*

---

### Description

When an user uploads a file in 'EQUAL-STATS' program, the program can automatically classify the variable types based on the nature of the data uploaded. The data and data types are stored in memory. This then determines the options available for questions and the analysis performed. The variable types can be altered using function.read\_metadata.

### Usage

```
function.read_data(data_file_path)
```

### Arguments

data\_file\_path    The path to the data file.

### Value

outcome	Whether the import was successful.
message	The message displayed to the user after the processing. This message also contains the reason for failure if the import was unsuccessful.
data	Imported data
any_type	All variables in the data

quantitative	Quantitative variables in the data
counts	Count variables in the data
categorical	Categorical variables in the data
nominal	Categorical variables without any order in the data
binary	Categorical variables with only two possible categories (factors/levels) in the data
ordinal	Ordered categorical variables
date	Any variables that appear like date
time	Any variables that appear like time

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

[function.read\\_metadata\(\)](#)

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
```

```

    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8)
)
# Store this in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages
library(stringr)
# Final function #####
imported_data_types <- function.read_data(data_file_path)

```

---

function.read\_metadata

*Change the Data Type and Reference Category*

---

### Description

When an user uploads a file in 'EQUAL-STATS' program, the program classify the variable types based on the nature of the data uploaded using the function function.read\_data. However, the levels in the categorical data are determined by alphabetical order, which may not be appropriate in many situations, particularly when needs to compare a new treatment to the standard treatment (reference category) and when the event and no event have to be defined correctly. This can be addressed by uploading metadata.

### Usage

```
function.read_metadata(rv, metadata_file_path)
```

### Arguments

rv                    A list supplied by 'EQUAL-STATS' application based on user input.  
 metadata\_file\_path                    The path to the metadata file.

### Value

outcome	Whether the data types and the order of the categories (levels/factors) were modified successfully.
message	The message displayed to the user after the processing. This message also contains the reason for failure if the modification was unsuccessful.
data	Imported data (with the structure modified as per the metadata)
any_type	All variables in the data
quantitative	Quantitative variables in the data
counts	Count variables in the data
categorical	Categorical variables in the data
nominal	Categorical variables without any order in the data
binary	Categorical variables with only two possible values (factors/levels) in the data
ordinal	Ordered categorical variables
date	Any variables that were declared as date and could be converted to date
date	Any variables that were declared as time and could be converted to time

### Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**<https://sites.google.com/view/equal-group/home>**See Also**[function.read\\_data\(\)](#)**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable")
)
```

```

    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8)
)
# Create a meta-data file
# The first row indicates data type and the second row indicates
# the reference category (for all types of categorical variables)
metadata_first_two_rows <- cbind.data.frame(
  c("nominal", "S0001"), c("nominal", "C_0001"), c("binary", "Standard rehabilitation"),
  c("binary", "Non-obese"), c("binary", "able"), c("quantitative", NA), c("ordinal", "1_mild"),
  c("counts", NA), c("quantitative", NA))
colnames(metadata_first_two_rows) <- colnames(data)
# The subsequent rows indicate the levels in the user-defined order
# for all categorical variables
# For this simulation, we will change the reference category
# but retain the remaining default order of variable levels
# First find the maximum number of levels
maximum_number_of_levels <- max(as.numeric(sapply(1:ncol(data), function(y) {
  if ((metadata_first_two_rows[1,y] == "quantitative") |
      (metadata_first_two_rows[1,y] == "counts")) {
    NA
  } else {
    nlevels(factor(data[,y]))
  }
})), na.rm = TRUE)
metadata_subsequent_rows <- lapply(1:ncol(data), function(y) {
  if ((metadata_first_two_rows[1,y] == "quantitative") |
      (metadata_first_two_rows[1,y] == "counts")) {
    output <- rep(NA, (maximum_number_of_levels-1))
  } else {
    categories <- sort(unique(data[,y]))
    categories <- categories[categories != metadata_first_two_rows[2,y]]
    output <- c(categories, rep(NA, (maximum_number_of_levels-1-length(categories))))
  }
})
}

```



```

)
metadata_subsequent_rows <- do.call(cbind.data.frame, metadata_subsequent_rows)
colnames(metadata_subsequent_rows) <- colnames(data)
metadata <- rbind.data.frame(metadata_first_two_rows, metadata_subsequent_rows)
# Simulate lists provided by EQUAL-STATS #####
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = "Summary_Measures",
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data and metadata in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
metadata_file_path = paste0(tempdir(), "/metadata.csv")
write.csv(metadata, file = metadata_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions
library(stringr)
# Read the data
rv$import_data <- function.read_data(data_file_path)
# Final function #####
meta_data_implemented_data_types <- function.read_metadata(rv, metadata_file_path)

```

---

```
function.Regression_Analysis
```

*Perform Regression Analysis*

---

## Description

Performs regression analysis without mixed-effects for a single reponse using **stats** for linear, logistic, and Poisson regression, **nnet** for multinomial logistic regression, **MASS** for ordinal regression, and **survival** for Cox regression for binary outcomes. It uses **stats** for performing stepwise regression.

## Usage

```
function.Regression_Analysis(Predefined_lists, rv)
```

**Arguments**

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by "EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow "EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

[function.submit\\_choices\(\)](#) [function.Mixed\\_Effects\\_Regression\(\)](#) [function.Multivariate\\_Regression\(\)](#)  
[DescTools::BoxCox\(\)](#) [stats::lm\(\)](#) [stats::glm\(\)](#) [nnet::multinom\(\)](#) [MASS::polr\(\)](#) [survival::coxph\(\)](#)  
[stats::step\(\)](#) [ggplot2::ggplot\(\)](#) [ggcorrplot::ggcorrplot\(\)](#) [cowplot::plot\\_grid\(\)](#)

## Examples

```

data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),

```

```

`Number of falls within 6 months` = c(
  3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
  3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
  3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
`Mobility score at 12 months` = c(
  90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
  45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
  112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
`Admission to care home` = c(
  "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
  "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
  "Admitted", "Admitted", "Not admitted", "Admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
  "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
  "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
`Follow-up` = c(
  10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
  8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
  6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',

```

```

    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
rv$import_data <- function.read_data(data_file_path)
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
library(ggplot2)
library(ggcorrplot)
library(cowplot)
# Update choices #####
rv$first_menu_choice <- "Regression_Analysis"
rv$second_menu_choice <- "EQUAL-STATS choice"
rv$entry[[1]] <- "Unable to walk independently at 6 weeks"
rv$entry[[2]] <- ""
rv$entry[[3]] <- "Treatment"
rv$entry[[4]] <- "Obesity status"
rv$entry[[5]] <- ""
rv$entry[[6]] <- ""
rv$entry[[7]] <- "Yes"
# Final function #####
Results <- function.Regression_Analysis(Predefined_lists, rv)

```

---

```
function.Sample_Size_Calculations_Effect_size
```

*Perform Sample Size Calculations using Effect Size Approach*

---

### Description

Performs the power and sample size calculations using **pwr** to calculate the power and sample size for binary and continuous outcomes. It uses **ggplot2** to create plots. This functions takes summary information as input. If you want to calculate the sample size based on primary data, use function.Sample\_Size\_Calculations\_Primary.

### Usage

```
function.Sample_Size_Calculations_Effect_size(Predefined_lists, rv)
```

### Arguments

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

### Value

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

### Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices function.Sample\_Size\_Calculations\_Primary pwr::pwr.t.test() pwr::pwr.anova.test()  
pwr::pwr.2p.test() ggplot2::ggplot()

**Examples**

```
# Simulate lists provided by EQUAL-STATS ####
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
```

```

    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Load the necessary packages and functions #####
library(stringr)
library(pwr)
library(ggplot2)
rv$first_menu_choice <- "Sample_Size_Calculations_Effect_size"
rv$second_menu_choice <- "Intervention study (binary outcome)"
rv$entry[[1]] <- 0.5
rv$entry[[2]] <- 0.4
rv$entry[[3]] <- "Intervention is better or worse than comparator"
rv$entry[[4]] <- "Independent samples"
# Final function #####
Results <- function.Sample_Size_Calculations_Effect_size(Predefined_lists, rv)

```

---

```
function.Sample_Size_Calculations_Primary
```

*Perform Sample Size Calculations from Primary Data*

---

## Description

Performs the power and sample size calculations using **pwr** to calculate the power and sample size for binary and continuous outcomes. It uses **ggplot2** to create plots. This functions takes primary data as input. If you want to calculate the sample size based on summary information, use `function.Sample_Size_Calculations_Effect_size`.



**Usage**

```
function.Sample_Size_Calculations_Primary(Predefined_lists, rv)
```

**Arguments**

`Predefined_lists` A list supplied by 'EQUAL-STATS' application

`rv` A list supplied by 'EQUAL-STATS' application based on user input

**Value**

`analysis_outcome` Whether the analysis was performed successfully

`plan` Plan used for analysis

`code` Part of code generated for performing the analysis in a standalone version of R

`results` Analysis results

`results_display` In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.

`plots_list` A list of plots generated. Returns "" if no plots are generated.

`plots_list_display` In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.

`selections` Selections made by the user for display.

`display_table` Whether the results table should be displayed in the shiny app.

`display_plot` Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

`function.submit_choices` `function.Sample_Size_Calculations_Effect_size` `pwr::pwr.t.test()` `pwr::pwr.anova.test()` `pwr::pwr.2p.test()` `ggplot2::ggplot()`

**Examples**

```

# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",

```

```

    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',

```

```

'Diagnostic_Accuracy_Primary',
'Sample_Size_Calculations_Primary',
'Survival_Analysis',
'Regression_Analysis',
'Time_Series',
'Mixed_Effects_Regression',
'Multivariate_Regression',
'Generate_Hypothesis',
'Sample_Size_Calculations_Effect_size',
'Make_Conclusions_Effect_size',
'Diagnostic_Accuracy_Tables'
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(pwr)
library(ggplot2)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Sample_Size_Calculations_Primary"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Mobility score at 6 months"
rv$entry[[2]] <- "Treatment"
rv$entry[[3]] <- 10
# Final function #####
Results <- function.Sample_Size_Calculations_Primary(Predefined_lists, rv)

```

---

```
function.submit_choices
```

*Wrapper Function That Performs the Analysis and Generates the Standalone Codes*

---

## Description

This function is a wrapper function that chooses the correct analysis function to perform, saves the results in a zip folder, and generates the code for the standalone analysis.

## Usage

```
function.submit_choices(Predefined_lists, rv, code_prefix, no_data_choices)
```

## Arguments

`Predefined_lists`

A list supplied by 'EQUAL-STATS' application

`rv`

A list supplied by 'EQUAL-STATS' application based on user input

`code_prefix`

Code that forms the start of the standalone code

`no_data_choices`

A list of functions that do not require data upload

## Value

`Analysis_results`

Analysis results includes the results of the last called analysis, a plan which includes all previous analysis performed in the session with the data set, and a standard alone R code which allows reproducibility of results.

## Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

## Author(s)

Kurinchi Gurusamy

## References

<https://sites.google.com/view/equal-group/home>

## See Also

`function.Diagnostic_Accuracy_Tables`

## Examples

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
```

```

    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',

```

```

    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA
)
no_data_choices <- c("Generate_Hypothesis", "Sample_Size_Calculations_Effect_size",
"Make_Conclusions_Effect_size", "Diagnostic_Accuracy_Tables")
code_prefix <- ""
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions ####
library(stringr)
library(DescTools)
library(zip)
rv$import_data <- function.read_data(data_file_path)
# Update choices ####
rv$first_menu_choice <- "Summary_Measures"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Obesity status"
rv$entry[[2]] <- "Treatment"
rv$entry[[3]] <- "EQUAL-STATS choice"
Results <- function.submit_choices(Predefined_lists, rv, code_prefix, no_data_choices)

```

---

function.Summary\_Measures

*Calculate Summary Measures*

---

### Description

Calculates the summary (descriptive) measures of data, such as proportions and the confidence intervals for categorical data and mean, standard deviation, confidence intervals, median, quartiles, skewness and kurtosis. It uses **base** and **DescTools** to calculate these measures.



**Usage**

```
function.Summary_Measures(Predefined_lists, rv)
```

**Arguments**

`Predefined_lists` A list supplied by 'EQUAL-STATS' application

`rv` A list supplied by 'EQUAL-STATS' application based on user input

**Value**

`analysis_outcome` Whether the analysis was performed successfully

`plan` Plan used for analysis

`code` Part of code generated for performing the analysis in a standalone version of R

`results` Analysis results

`results_display` In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.

`plots_list` A list of plots generated. Returns "" if no plots are generated.

`plots_list_display` In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.

`selections` Selections made by the user for display.

`display_table` Whether the results table should be displayed in the shiny app.

`display_plot` Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

`function.submit_choices` [DescTools::MeanCI\(\)](#) [DescTools::MedianCI\(\)](#) [DescTools::Kurt\(\)](#)  
[DescTools::Skew\(\)](#) [DescTools::BinomCI\(\)](#) [DescTools::MultinomCI\(\)](#)

## Examples

```

# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",

```

```

    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',
    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',

```

```

'Diagnostic_Accuracy_Primary',
'Sample_Size_Calculations_Primary',
'Survival_Analysis',
'Regression_Analysis',
'Time_Series',
'Mixed_Effects_Regression',
'Multivariate_Regression',
'Generate_Hypothesis',
'Sample_Size_Calculations_Effect_size',
'Make_Conclusions_Effect_size',
'Diagnostic_Accuracy_Tables'
)
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(DescTools)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Summary_Measures"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Obesity status"
rv$entry[[2]] <- "Treatment"
rv$entry[[3]] <- "EQUAL-STATS choice"
# Final function #####
Results <- function.Summary_Measures(Predefined_lists, rv)

```

---

function.Survival\_Analysis

*Perform Survival Analysis*


---

**Description**

Performs analysis of survival data (time-to-event data). It uses the **survival** to calculate the survival tables and **survfit** to generate the Kaplan-Meier plot.

**Usage**

```
function.Survival_Analysis(Predefined_lists, rv)
```

**Arguments**

Predefined_lists	A list supplied by 'EQUAL-STATS' application
rv	A list supplied by 'EQUAL-STATS' application based on user input

**Value**

analysis_outcome	Whether the analysis was performed successfully
plan	Plan used for analysis
code	Part of code generated for performing the analysis in a standalone version of R
results	Analysis results
results_display	In order to present a single table, multiple results are combined. This results in some numbers stored as text and can cause very wide tables in the shiny output. This issue is fixed with some modifications to the results table for display purposes.
plots_list	A list of plots generated. Returns "" if no plots are generated.
plots_list_display	In the shiny application, only one figure is displayed. Therefore, a composite image is created from the plots for display purposes. Some analysis functions may return NULL.
selections	Selections made by the user for display.
display_table	Whether the results table should be displayed in the shiny app.
display_plot	Whether the plot should be displayed in the shiny app.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

function.submit\_choices [survival::coxph\(\)](#) [ggsurvfit::ggsurvfit\(\)](#)

**Examples**

```
# Create simulated data ####
data <- cbind.data.frame(
  `Subject ID` = c(
    "S0001", "S0002", "S0003", "S0004", "S0005",
    "S0006", "S0007", "S0008", "S0009", "S0010",
    "S0011", "S0012", "S0013", "S0014", "S0015",
    "S0016", "S0017", "S0018", "S0019", "S0020",
    "S0021", "S0022", "S0023", "S0024", "S0025",
    "S0026", "S0027", "S0028", "S0029", "S0030"),
  `Centre` = c(
    "C_0001", "C_0002", "C_0002", "C_0002", "C_0002",
    "C_0001", "C_0001", "C_0003", "C_0001", "C_0003",
    "C_0001", "C_0002", "C_0002", "C_0001", "C_0003",
    "C_0002", "C_0002", "C_0003", "C_0001", "C_0002",
    "C_0002", "C_0002", "C_0002", "C_0003", "C_0002",
    "C_0001", "C_0003", "C_0001", "C_0001", "C_0001"),
  `Treatment` = c(
    "Intensive rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Standard rehabilitation",
    "Standard rehabilitation", "Intensive rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Standard rehabilitation",
    "Intensive rehabilitation", "Standard rehabilitation", "Intensive rehabilitation"),
  `Obesity status` = c(
    "Obese", "Non-obese", "Obese", "Non-obese", "Non-obese",
    "Obese", "Obese", "Obese", "Non-obese", "Obese",
    "Non-obese", "Non-obese", "Obese", "Non-obese", "Obese",
    "Obese", "Non-obese", "Obese", "Obese", "Obese",
    "Non-obese", "Non-obese", "Non-obese", "Obese", "Obese",
    "Non-obese", "Obese", "Obese", "Obese", "Obese"),
  `Unable to walk independently at 6 weeks` = c(
    "unable", "able", "able", "unable", "able",
    "able", "unable", "unable", "unable", "unable",
    "able", "unable", "able", "unable", "unable",
    "able", "unable", "unable", "unable", "unable",
    "able", "able", "able", "able", "unable",
    "able", "able", "unable", "able", "unable"),
  `Mobility score at 6 months` = c(
    86, 65.1, 48, 99.8, 73.4, 70, 74.7, 36.5, 64.6, 85.4,
    41.7, 60.1, 73.3, 42.4, 55.3, 47.3, 85.9, 63, 64.6, 101.8,
    108.1, 72.3, 96.4, 87.5, 66.2, 92.9, 47.7, 55.8, 56.4, 133.8),
  `Pain at 6 weeks` = c(
    "3_severe", "1_mild", "1_mild", "2_moderate", "1_mild",
```

```

    "1_mild", "2_moderate", "2_moderate", "1_mild", "3_severe",
    "1_mild", "2_moderate", "1_mild", "3_severe", "3_severe",
    "1_mild", "2_moderate", "3_severe", "2_moderate", "2_moderate",
    "1_mild", "1_mild", "1_mild", "1_mild", "2_moderate",
    "1_mild", "1_mild", "2_moderate", "1_mild", "2_moderate"),
  `Number of falls within 6 months` = c(
    3, 2, 3, 2, 2, 1, 4, 2, 2, 5,
    3, 2, 2, 2, 5, 3, 2, 2, 3, 4,
    3, 1, 2, 2, 2, 7, 2, 1, 1, 8),
  `Mobility score at 12 months` = c(
    90, 69.1, 52, 103.8, 77.4, 74, 78.7, 40.5, 68.6, 89.4,
    45.7, 64.1, 77.3, 46.4, 59.3, 51.3, 89.9, 67, 68.6, 105.8,
    112.1, 76.3, 100.4, 91.5, 70.2, 96.9, 51.7, 59.8, 60.4, 137.8) ,
  `Admission to care home` = c(
    "Not admitted", "Not admitted", "Admitted", "Not admitted", "Admitted",
    "Admitted", "Not admitted", "Admitted", "Admitted", "Not admitted",
    "Admitted", "Admitted", "Not admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Admitted", "Not admitted", "Not admitted",
    "Not admitted", "Admitted", "Not admitted", "Admitted", "Admitted",
    "Admitted", "Admitted", "Admitted", "Admitted", "Not admitted"),
  `Follow-up` = c(
    10, 8, 8, 8, 12, 12, 11, 10, 8, 7,
    8, 6, 9, 6, 9, 8, 10, 8, 11, 9,
    6, 9, 12, 9, 8, 11, 12, 9, 10, 11)
)
# Simulate lists provided by EQUAL-STATS
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots',
    'Check distribution',
    'Compare sample mean versus population mean',
    'Compare groups/variables (independent samples)',
    'Compare groups/variables (paired samples or repeated measures)',
    'Find the correlation (quantitative variables)',
    'Calculate measurement error',
    'Find the diagnostic accuracy (primary data)',
    'Perform sample size and power calculations (primary data)',
    'Perform survival analysis',
    'Perform regression analysis',
    'Analyse time series',
    'Perform mixed-effects regression',
    'Perform multivariate regression',
    'Generate hypothesis',
    'Perform sample size and power calculations (effect size approach)',
    'Make correct conclusions (effect size approach)',
    'Find the diagnostic accuracy (tabulated data)'
  ),
  menu_short = c(
    'Summary_Measures',
    'Create_Plots',
    'Check_Distribution',
    'Compare_Sample_Pop_Means',

```

```

    'Compare_Groups',
    'Repeated_Measures',
    'Correlation',
    'Measurement_Error',
    'Diagnostic_Accuracy_Primary',
    'Sample_Size_Calculations_Primary',
    'Survival_Analysis',
    'Regression_Analysis',
    'Time_Series',
    'Mixed_Effects_Regression',
    'Multivariate_Regression',
    'Generate_Hypothesis',
    'Sample_Size_Calculations_Effect_size',
    'Make_Conclusions_Effect_size',
    'Diagnostic_Accuracy_Tables'
  )
)
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = NA,
  second_menu_choice = NA,
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
    "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Store the data in a folder
data_file_path = paste0(tempdir(), "/data.csv")
write.csv(data, file = data_file_path, row.names = FALSE, na = "")
# Load the necessary packages and functions #####
library(stringr)
library(survival)
library(ggsurvfit)
rv$import_data <- function.read_data(data_file_path)
# Update choices #####
rv$first_menu_choice <- "Survival_Analysis"
rv$second_menu_choice <- NA
rv$entry[[1]] <- "Admission to care home"
rv$entry[[2]] <- "Follow-up"
rv$entry[[3]] <- "Treatment"
# Final function #####
Results <- function.Survival_Analysis(Predefined_lists, rv)

```



---

round_near	<i>Rounds a Variable to the Nearest Pretty Number</i>
------------	---

---

**Description**

For some graphs, **Base** pretty function may not provide the correct rounding. This is a different algorithm suitable for the graphs produced in 'EQUAL-STATS' software.

**Usage**

```
round_near(x)
```

**Arguments**

x                    A numeric variable.

**Value**

A "pretty number" suitable for use in graphs.

**Note**

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

**Author(s)**

Kurinchi Gurusamy

**References**

<https://sites.google.com/view/equal-group/home>

**See Also**

[base::pretty\(\)](#)

**Examples**

```
x <- 7
round_near(x)
```

```
x <- 754
round_near(x)
```

---

text\_to\_evaluate\_first\_menu\_selection

*Converts the List Provided to Create User Interface*

---

### Description

Obtains the processed list related to a particular selection and converts them to questions, if there are no second level selections so that the shiny user interface is created. If there are second level selections, it creates the text for second menu.

### Usage

```
text_to_evaluate_first_menu_selection(Predefined_lists, rv)
```

### Arguments

Predefined\_lists

A list supplied by 'EQUAL-STATS' application based on user input

rv

A list supplied by 'EQUAL-STATS' application based on user input

### Value

output

Either a list of texts to create the shiny interface for questions when there are no second menu choices or character text to create the second menu.

### Note

This is part of a suite of functions required to allow 'EQUAL-STATS' program to run. This is unlikely to be used as a stand alone function.

### Author(s)

Kurinchi Gurusamy

### References

<https://sites.google.com/view/equal-group/home>

### Examples

```
# Simulate lists provided by EQUAL-STATS ####
entry <- list()
entry <- lapply(1:15, function(x) entry[[x]] <- '')
Predefined_lists <- list(
  main_menu = c(
    'Calculate summary measures',
    'Create plots'
  ),
)
```

```

menu_short = c(
  'Summary_Measures',
  'Create_Plots'
),
second_menu_choices = c(
  '',
  'EQUAL-STATS choice%_%Histogram'
),
label_1 = c(
  'Select the variable for which summary measures are required',
  'Select the variable%_%Select the variable'
),
label_2 = c(
  'Select the variable for which you want separate summary (optional)',
  'NULL%_%NULL'
),
label_3 = c(
  'Select the summary measures that you want in the report',
  'Enter the title for the plot%_%Enter the title for the plot'
),
label_4 = c(
  '',
  'Select the variable%_%Select the variable'
),
label_5 = c(
  '',
  ''
),
label_6 = c(
  '',
  ''
),
label_7 = c(
  '',
  ''
),
label_8 = c(
  '',
  ''
),
label_9 = c(
  '',
  ''
),
label_10 = c(
  '',
  ''
),
label_11 = c(
  '',
  ''
),
label_12 = c(

```

```

'',
'',
),
label_13 = c(
'',
''
),
label_14 = c(
'',
''
),
label_15 = c(
'',
''
),
entry_1 = c(
'_%selectInput%_rv$import_data$any_type',
'_%selectInput%_rv$import_data$any_type'
),
entry_2 = c(
'_%selectInput%_c("", setdiff(rv$import_data$categorical, rv$entry[[1]]))',
'NULL%_NULL'
),
entry_3 = c(
'_%checkbox%_rv$summary_measures_choices',
'_%text%_Plot title"%_%%_text%_Plot title"'
),
entry_4 = c(
'',
'_%selectInput%_rv$entry[[1]]%_%%_selectInput%_rv$entry[[1]]'
),
entry_5 = c(
'',
''
),
entry_6 = c(
'',
''
),
entry_7 = c(
'',
''
),
entry_8 = c(
'',
''
),
entry_9 = c(
'',
''
),
entry_10 = c(
'',

```

```
    ''
  ),
  entry_11 = c(
    '',
    ''
  ),
  entry_12 = c(
    '',
    ''
  ),
  entry_13 = c(
    '',
    ''
  ),
  entry_14 = c(
    '',
    ''
  ),
  entry_15 = c(
    '',
    ''
  ),
  mandatory_1 = c(
    'yes',
    'yes%_%yes'
  ),
  mandatory_2 = c(
    'no',
    'NULL%_%NULL'
  ),
  mandatory_3 = c(
    'yes',
    'no%_%no'
  ),
  mandatory_4 = c(
    '',
    'no%_%no'
  ),
  mandatory_5 = c(
    '',
    ''
  ),
  mandatory_6 = c(
    '',
    ''
  ),
  mandatory_7 = c(
    '',
    ''
  ),
  mandatory_8 = c(
    '',
    ''
  )
```

```
),
mandatory_9 = c(
'',
''
),
mandatory_10 = c(
'',
''
),
mandatory_11 = c(
'',
''
),
mandatory_12 = c(
'',
''
),
mandatory_13 = c(
'',
''
),
mandatory_14 = c(
'',
''
),
mandatory_15 = c(
'',
''
),
numeric_exemptions = c(
'',
''
)
)
)
rv <- list(
  StorageFolder = tempdir(),
  first_menu_choice = "Create_Plots",
  second_menu_choice = "EQUAL-STATS choice",
  entry = entry,
  import_data = NULL,
  same_row_different_row = NA,
  submit_button_to_appear = FALSE,
  summary_measures_choices = c("EQUAL-STATS choice", "Total observations",
  "Missing observations", "Available observations"),
  analysis_outcome = list(),
  code = list(),
  plan = list(),
  results = list(),
  plots_list = list(),
  reports = list()
)
# Functions and packages required to run
library(stringr)
```

```
# Final function ####
# When there is no second menu
rv$first_menu_choice <- "Summary_Measures"
rv$second_menu_choice <- NA
first_menu_questions <- text_to_evaluate_first_menu_selection(
Predefined_lists = Predefined_lists, rv = rv)
# When there is a second menu
rv$first_menu_choice <- "Create_Plots"
rv$second_menu_choice <- "EQUAL-STATS choice"
second_menu_text <- text_to_evaluate_first_menu_selection(
Predefined_lists = Predefined_lists, rv = rv)
```

# Index

## \* EQUAL-STATS

- compile\_questions, 2
- convert\_to\_user\_interface, 7
- function.Check\_Distribution, 9
- function.Compare\_Groups, 13
- function.Compare\_Sample\_Pop\_Means, 17
- function.Correlation, 21
- function.Create\_Plots, 25
- function.Diagnostic\_Accuracy\_Primary, 30
- function.Diagnostic\_Accuracy\_Tables, 34
- function.Generate\_Hypothesis, 36
- function.Make\_Conclusions\_Effect\_size, 39
- function.Mixed\_Effects\_Regression, 42
- function.Multivariate\_Regression, 47
- function.plan\_upload, 51
- function.plan\_upload\_no\_data, 55
- function.rbind\_different\_column\_numbers, 57
- function.read\_data, 59
- function.read\_metadata, 62
- function.Regression\_Analysis, 65
- function.Sample\_Size\_Calculations\_Effect\_size, 70
- function.Sample\_Size\_Calculations\_Primary, 72
- function.submit\_choices, 77
- function.Summary\_Measures, 80
- function.Survival\_Analysis, 84
- round\_near, 89
- text\_to\_evaluate\_first\_menu\_selection, 90
- base::pretty(), 89
- base::rbind.data.frame(), 58
- boot::boot(), 14
- compile\_questions, 2
- compile\_questions(), 8
- convert\_to\_user\_interface, 7
- cowplot::plot\_grid(), 10, 14, 43, 48, 66
- coxme::coxme(), 43
- DescTools::BinomCI(), 81
- DescTools::BoxCox(), 43, 48, 66
- DescTools::Kurt(), 14, 22, 81
- DescTools::MeanCI(), 81
- DescTools::MedianCI(), 81
- DescTools::MultinomCI(), 81
- DescTools::Skew(), 14, 22, 81
- function.Check\_Distribution, 9
- function.Compare\_Groups, 13
- function.Compare\_Sample\_Pop\_Means, 17
- function.Correlation, 21
- function.Create\_Plots, 25
- function.Diagnostic\_Accuracy\_Primary, 29
- function.Diagnostic\_Accuracy\_Primary(), 34
- function.Diagnostic\_Accuracy\_Tables, 34
- function.Diagnostic\_Accuracy\_Tables(), 30
- function.Generate\_Hypothesis, 36
- function.Make\_Conclusions\_Effect\_size, 39
- function.Mixed\_Effects\_Regression, 42
- function.Multivariate\_Regression, 47
- function.plan\_upload, 51
- function.plan\_upload(), 55
- function.plan\_upload\_no\_data, 55
- function.plan\_upload\_no\_data(), 52
- function.rbind\_different\_column\_numbers, 57



function.read\_data, 59  
 function.read\_data(), 52, 63  
 function.read\_metadata, 61  
 function.read\_metadata(), 60  
 function.Regression\_Analysis, 65  
 function.Sample\_Size\_Calculations\_Effect\_size, 70  
 function.Sample\_Size\_Calculations\_Primary, 72  
 function.submit\_choices, 76  
 function.Summary\_Measures, 80  
 function.Survival\_Analysis, 84  
  
 ggcorrplot::ggcorrplot(), 22, 43, 48, 66  
 ggplot2::ggplot(), 10, 14, 26, 40, 43, 48, 66, 71, 73  
 ggsurvfit::ggsurvfit(), 43, 86  
  
 lme4::allFit(), 42, 43  
 lme4::glmer(), 43  
 lme4::lmer(), 43  
 lmerTest::step(), 43  
  
 MASS::polr(), 48, 66  
 mclogit::mblogit(), 43  
 MuMIn::dredge(), 43  
  
 nnet::multinom(), 48, 66  
  
 ordinal::clmm(), 43  
  
 pROC::ggroc(), 31, 35  
 pROC::roc(), 31, 35  
 pwr::pwr.2p.test(), 40, 71, 73  
 pwr::pwr.anova.test(), 71, 73  
 pwr::pwr.t.test(), 40, 71, 73  
  
 round\_near, 89  
  
 stats::aov(), 14  
 stats::binom.test(), 18  
 stats::chisq.test(), 14  
 stats::cor(), 22  
 stats::fisher.test(), 14  
 stats::glm(), 48, 66  
 stats::kruskal.test(), 14  
 stats::ks.test(), 10, 14, 22  
 stats::lm(), 48, 66  
 stats::prop.trend.test(), 14  
 stats::shapiro.test(), 10, 14, 22  
  
 stats::step(), 66  
 stats::t.test(), 14, 18  
 stats::wilcox.test(), 14  
 survival::coxph(), 48, 66, 86  
 text\_to\_evaluate\_first\_menu\_selection, 90  
 ThresholdROC::diagnostic(), 31, 35