EasyDescribe: a convenient R language basic statistics integration package

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In our daily statistical analysis, we often need to do the basic statistical description and basic statistical analysis of variables, such as calculating the mean (standard deviation), median (interquartile spacing), t-test, analysis of variance, multiple test correction and so on. However, the R language, which is specifically designed for statistics, has "an embarrassment of riches" (R in Action - First Edition, page 145) of choices for descriptive statistics!", which is a nightmare for many beginners of R and statistics, and those with selection difficulties: Whenever you want to perform a simple statistical analysis, you have to compare and choose from a large number of methods. To solve this problem, I developed EasyDescribe, a package that solves almost all common basic statistical descriptions with a single function, so that R programmers no longer have difficulty in choosing.

Next, let's introduce the usage logic of EasyDescribe package:

In order to eliminate the choice, EasyDescribe only has the function fundescribe(), so you don't need to choose again! How does this function handle these basic statistical analyses?

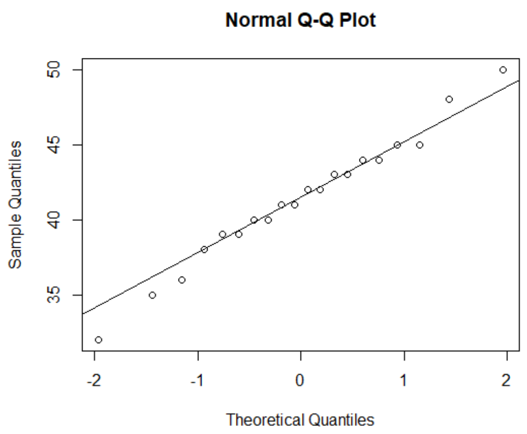
fundescribe(x, y, data = NULL, na.rm = TRUE, norm.t = NULL)

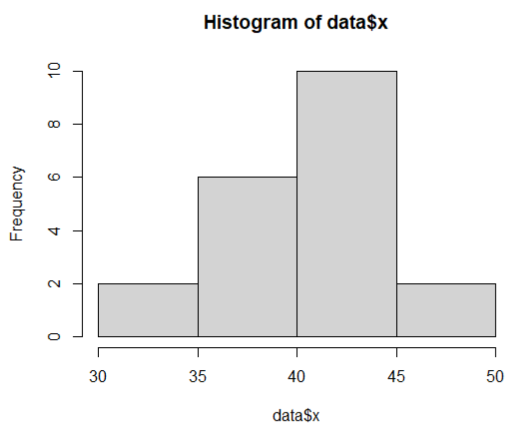
fundescribe() has two basic parameters: x and y, x is the basic variable you want to analyze, and y is the grouping variable that groups x.

Data types can be basically divided into three main categories: continuous variables, ordered categorical variables and unordered categorical variables. When we do basic statistical analysis for method selection, we are actually making method selection based on data types in most cases. The fundescribe() function automatically selects the method based on the data type you enter for x and y.

For example, if you simply input a continuous variable fundescribe(data $age), the function will automatically output the mean, standard deviation, median, quartile, etc., and also output a histogram and QQ chart to facilitate you to understand the normality and distribution of data:

```
The histogram and QQ plot of variable x have been drawn.
  vars  n  mean   sd median trimmed  mad min max range  skew kurtosis   se Q0.05 Q0.1 Q0.25 Q0.5 Q0.75 Q0.9 Q0.95
1    1 20 41.35 4.28   41.5   41.38 3.71  32  50    18 -0.13    -0.28 0.96 34.85 35.9    39 41.5    44 45.3  48.1
```





If you simply enter a categorical variable fundescribe(data$gender), the function will automatically output the number and percentage of each category.

```
   Cell Contents
|-------------------------|
|                       N |
|         N / Table Total |
|-------------------------|


Total Observations in Table:  20


          |          F |          M |
          |------------|------------|
          |          9 |         11 |
          |    0.45000 |    0.55000 |
          |------------|------------|
```

Therefore, we can see that the use logic of the fundescribe () function is minimalism. You don't need to worry about the input data type. It will automatically select methods according to the input variable type.

The above is the case where only x is input. If x and y are input at the same time, fundescribe() can also automatically identify the data types of x and y and automatically select the corresponding basic statistical method:

Example 1. x is continuous variable; y is unordered categorical variable: fundescribe(data$age, data$gender)

```
The histogram and QQ plot of variable x have been drawn.
--------------------------------------------------------------------------------
Two sample t-test:

        Welch Two Sample t-test                                    两独立样本t检验

data:  x by y
t = 2.3267, df = 4961.6, p-value = 0.02002
alternative hypothesis: true difference in means between group 1 and group 2 is not equal to 0
95 percent confidence interval:
 0.1166846 1.3659512
sample estimates:
mean in group 1 mean in group 2
       54.65754        53.91623

--------------------------------------------------------------------------------
Wilcoxon rank sum test:
Mann-Whitney U test = Wilcoxon rank sum test
                                                                   两独立样本Wilcoxon秩和检验
        Wilcoxon rank sum test with continuity correction

data:  x by y
W = 5718685, p-value = 0.002617
alternative hypothesis: true location shift is not equal to 0

--------------------------------------------------------------------------------   对x的基本统计描述
Descriptive statistical results:
  vars    n  mean    sd median trimmed  mad  min   max range  skew kurtosis   se Q0.05  Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1    1 7083 54.42 13.04  55.53   54.88 12.3 6.92 94.81 87.89 -0.35     0.09 0.15 30.92 36.84 46.25 55.53 63.08 70.34 74.82
--------------------------------------------------------------------------------
Descriptive statistical results stratified by y:

 Descriptive statistics by group                                   对x按照y分层基本统计描述
group: 1
  vars    n  mean    sd median trimmed   mad  min   max range  skew kurtosis   se Q0.05  Q0.1 Q0.25  Q0.5 Q0.75 Q0.9 Q0.95
1    1 4802 54.66 13.48  55.83   55.21 12.47 6.92 94.81 87.89 -0.39     0.15 0.19 29.75 36.26 46.75 55.83 63.57   71 75.49
----------------------------------------------------------------------------------------------------
group: 2
  vars    n  mean    sd median trimmed   mad   min   max range  skew kurtosis    se Q0.05  Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1    1 2281 53.92 12.05  55.14   54.22 11.99 16.44 86.27 69.83 -0.25    -0.18 0.25 32.97 37.73 45.66 55.14 62.28 68.45 73.17
```

Example 2. x is continuous variable; y is ordered categorical variable: fundescribe(age, income, data=data)

```
The histogram and QQ plot of variable x have been drawn.
---------------------------------------------------------------------------------
Variance analysis (one-way ANOVA):
              Df  Sum Sq Mean Sq F value Pr(>F)
y              3   14993    4998   29.75 <2e-16 ***      方差分析
Residuals   7079 1189213     168
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
---------------------------------------------------------------------------------
Kruskal-Wallis rank sum test:

        Kruskal-Wallis rank sum test                     K-W秩和检验

data:  x by y
Kruskal-Wallis chi-squared = 88.649, df = 3, p-value < 2.2e-16

---------------------------------------------------------------------------------
Tukey's HSD post hoc tests for normal x between different groups of y:
  Tukey multiple comparisons of means
    95% family-wise confidence level

Fit: aov(formula = x ~ y, data = data)

$y
          diff       lwr        upr     p adj
2-1 -0.2567654 -1.642604  1.1290734 0.9643674           Tukey's HSD多重检验
3-1 -0.9763462 -2.398963  0.4462706 0.2911377
4-1 -4.5323027 -6.158426 -2.9061792 0.0000000
3-2 -0.7195808 -1.636949  0.1977877 0.1822280
4-2 -4.2755373 -5.484671 -3.0664037 0.0000000
4-3 -3.5559565 -4.807073 -2.3048396 0.0000000

---------------------------------------------------------------------------------
Dunn's post hoc tests for non-normal x between different groups of y:
Dunn (1964) Kruskal-Wallis multiple comparison
  p-values adjusted with the Benjamini-Hochberg method.

  Comparison         Z      P.unadj        P.adj
1      1 - 2 0.5630095 5.734284e-01 5.734284e-01        Dunn's秩和多重检验
2      1 - 3 1.2157638 2.240749e-01 3.361123e-01
3      2 - 3 1.0348356 3.007457e-01 3.608948e-01
4      1 - 4 7.1188952 1.087956e-12 2.175912e-12
5      2 - 4 8.9286762 4.311367e-19 2.586820e-18
6      3 - 4 7.8702772 3.538564e-15 1.061569e-14
---------------------------------------------------------------------------------
The Variance Analysis Trend Test for y:

        The Variance Analysis Trend Test                 趋势性检验

data:  x and y
F.value = 64.336, p-value = 1.219e-15

---------------------------------------------------------------------------------
Descriptive statistical results:                          对x进行基本统计描述
  vars    n  mean    sd median trimmed  mad  min   max range  skew kurtosis   se
1    1 7083 54.42 13.04  55.53   54.88 12.3 6.92 94.81 87.89 -0.35     0.09 0.15
  Q0.05  Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1 30.92 36.84 46.25 55.53 63.08 70.34 74.82
---------------------------------------------------------------------------------
Descriptive statistical results stratified by y:
                                                          对x按y分层基本统计描述
 Descriptive statistics by group
group: 1
  vars   n mean    sd median trimmed   mad   min   max range  skew kurtosis   se
1    1 715 55.5 11.59  56.47   55.93 11.02 10.25 94.81 84.56 -0.47     0.86 0.43
  Q0.05  Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1 36.07 41.28 48.23 56.47 63.02 68.69 73.62
------------------------------------------------------------
group: 2
  vars    n  mean    sd median trimmed   mad  min   max range  skew kurtosis   se
1    1 3005 55.24 12.67  56.13   55.61 12.06 7.17 92.08 84.91 -0.32     0.26 0.23
  Q0.05  Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1 32.72 39.33 47.39 56.13 63.83 70.68  75.3
------------------------------------------------------------
group: 3
  vars    n  mean    sd median trimmed   mad min   max range  skew kurtosis   se
1    1 2348 54.52 13.73     56   55.13 12.73   7 89.86 82.86 -0.41    -0.06 0.28
  Q0.05  Q0.1 Q0.25 Q0.5 Q0.75  Q0.9 Q0.95
1 29.23 35.25 46.05   56 63.54 71.17 75.25
------------------------------------------------------------
group: 4
  vars    n  mean    sd median trimmed   mad  min   max range  skew kurtosis  se
1    1 1015 50.97 12.89  51.78   51.14 13.48 6.92 86.27 79.35 -0.16    -0.32 0.4
  Q0.05 Q0.1 Q0.25  Q0.5 Q0.75  Q0.9 Q0.95
1 29.68 33.4 41.76 51.78 60.37 67.14 71.89
```

Example 3. x is unordered categorical variable; y is unordered categorical variable: fundescribe(gender, exercise, data=data)

```
   Cell Contents
|-------------------------|
|                       N |
|              Expected N |
| Chi-square contribution |
|           N / Row Total |
|           N / Col Total |
|         N / Table Total |
|-------------------------|


Total Observations in Table:  7083
```

画出R×C列联表

```
             | data$y
      data$x |         0 |         1 | Row Total |
-------------|-----------|-----------|-----------|
           1 |      1330 |       998 |      2328 |
             | 1336.38967 | 991.61033 |          |
             |   0.03055 |   0.04117 |           |
             |   0.57131 |   0.42869 |   0.32867 |
             |   0.32710 |   0.33079 |           |
             |   0.18777 |   0.14090 |           |
-------------|-----------|-----------|-----------|
           2 |      2736 |      2019 |      4755 |
             | 2729.61033 | 2025.38967 |          |
             |   0.01496 |   0.02016 |           |
             |   0.57539 |   0.42461 |   0.67133 |
             |   0.67290 |   0.66921 |           |
             |   0.38628 |   0.28505 |           |
-------------|-----------|-----------|-----------|
Column Total |      4066 |      3017 |      7083 |
             |   0.57405 |   0.42595 |           |
-------------|-----------|-----------|-----------|


Statistics for All Table Factors
```

卡方检验

```
Pearson's Chi-squared test
------------------------------------------------------------
Chi^2 =  0.1068395     d.f. =  1     p =  0.7437714

Pearson's Chi-squared test with Yates' continuity correction
------------------------------------------------------------
Chi^2 =  0.09077302     d.f. =  1     p =  0.7631967


Fisher's Exact Test for Count Data
```

Fisher精确概率

```
------------------------------------------------------------
Sample estimate odds ratio:  0.9834229

Alternative hypothesis: true odds ratio is not equal to 1
p =  0.758903
95% confidence interval:  0.8885556 1.088572

Alternative hypothesis: true odds ratio is less than 1
p =  0.3814504
95% confidence interval:  0 1.071151

Alternative hypothesis: true odds ratio is greater than 1
p =  0.6378859
95% confidence interval:  0.9029556 Inf
```

Example 4. x is unordered categorical variable; y is unordered categorical variable:

fundescribe(data$drink, data$gender)

```
   Cell Contents
|-------------------------|
|                       N |
|              Expected N |
| Chi-square contribution |
|           N / Row Total |
|           N / Col Total |
|         N / Table Total |
|-------------------------|


Total Observations in Table:  7083
```

R×C列联表

```
             | data$y
      data$x |         1 |         2 | Row Total |
-------------|-----------|-----------|-----------|
           1 |       863 |       204 |      1067 |
             | 350.69547 | 716.30453 |           |
             | 748.38701 | 366.40273 |           |
             |   0.80881 |   0.19119 |   0.15064 |
             |   0.37070 |   0.04290 |           |
             |   0.12184 |   0.02880 |           |
-------------|-----------|-----------|-----------|
           2 |       278 |        94 |       372 |
             | 122.26684 | 249.73316 |           |
             | 198.35974 |  97.11493 |           |
             |   0.74731 |   0.25269 |   0.05252 |
             |   0.11942 |   0.01977 |           |
             |   0.03925 |   0.01327 |           |
-------------|-----------|-----------|-----------|
           3 |      1187 |      4457 |      5644 |
             | 1855.03770 | 3788.96230 |           |
             | 240.57428 | 117.78274 |           |
             |   0.21031 |   0.78969 |   0.79684 |
             |   0.50988 |   0.93733 |           |
             |   0.16758 |   0.62925 |           |
-------------|-----------|-----------|-----------|
Column Total |      2328 |      4755 |      7083 |
             |   0.32867 |   0.67133 |           |
-------------|-----------|-----------|-----------|


Statistics for All Table Factors
```

卡方检验

```
Pearson's Chi-squared test
------------------------------------------------------------
Chi^2 =  1768.621     d.f. =  2     p =  0
```

两两比较多重检验

```
--------------------------------------------------------------------------------
Post hoc multiple comparisons between different groups of x:
  Comparison  p.Fisher p.adj.Fisher p.Gtest p.adj.Gtest   p.Chisq p.adj.Chisq
1      1 : 2  1.41e-02     1.41e-02  0.0131      0.0131  1.44e-02    1.44e-02
2      1 : 3 6.74e-309    2.02e-308  0.0000      0.0000  0.00e+00    0.00e+00
3      2 : 3 3.62e-100    5.43e-100  0.0000      0.0000 3.43e-120   5.14e-120
```

Example 5. x is unordered categorical variable; y is ordered categorical variable: fundescribe(data$gender, data$income)

```
   Cell Contents
|-------------------------|
|                       N |
|              Expected N |
| Chi-square contribution |
|           N / Row Total |
|           N / Col Total |
|         N / Table Total |
|-------------------------|


Total Observations in Table:  7083                                R×C列联表


             | data$y
      data$x |         1 |         2 |         3 |         4 | Row Total |
-------------|-----------|-----------|-----------|-----------|-----------|
           1 |       216 |       981 |       752 |       379 |      2328 |
             | 235.00212 | 987.66624 | 771.72723 | 333.60440 |           |
             |   1.53650 |   0.04499 |   0.50428 |   6.17726 |           |
             |   0.09278 |   0.42139 |   0.32302 |   0.16280 |   0.32867 |
             |   0.30210 |   0.32646 |   0.32027 |   0.37340 |           |
             |   0.03050 |   0.13850 |   0.10617 |   0.05351 |           |
-------------|-----------|-----------|-----------|-----------|-----------|
           2 |       499 |      2024 |      1596 |       636 |      4755 |
             | 479.99788 | 2017.33376 | 1576.27277 | 681.39560 |           |
             |   0.75225 |   0.02203 |   0.24689 |   3.02432 |           |
             |   0.10494 |   0.42566 |   0.33565 |   0.13375 |   0.67133 |
             |   0.69790 |   0.67354 |   0.67973 |   0.62660 |           |
             |   0.07045 |   0.28575 |   0.22533 |   0.08979 |           |
-------------|-----------|-----------|-----------|-----------|-----------|
Column Total |       715 |      3005 |      2348 |      1015 |      7083 |
             |   0.10095 |   0.42426 |   0.33150 |   0.14330 |           |
-------------|-----------|-----------|-----------|-----------|-----------|


Statistics for All Table Factors
                                                                  卡方检验

Pearson's Chi-squared test
------------------------------------------------------------
Chi^2 =  12.30852     d.f. =  3     p =  0.006397676



--------------------------------------------------------------------------------
Wilcoxon rank sum test:
Mann-Whitney U test = Wilcoxon rank sum test
                                                                  秩和检验
        Wilcoxon rank sum test with continuity correction

data:  yn by x
W = 5715198, p-value = 0.01758
alternative hypothesis: true location shift is not equal to 0

----------------------------------------------------------------- 两两比较多重检验
Post hoc multiple comparisons between different groups of y:
  Comparison p.Fisher p.adj.Fisher p.Gtest p.adj.Gtest p.Chisq p.adj.Chisq
1      1 : 2  0.21300      0.32000 0.20800     0.31200 0.22700     0.34000
2      1 : 3  0.38300      0.46000 0.35900     0.43100 0.38500     0.46200
3      1 : 4  0.00241      0.00861 0.00203     0.00867 0.00250     0.00942
4      2 : 3  0.63800      0.63800 0.63100     0.63100 0.65200     0.65200
5      2 : 4  0.00722      0.01440 0.00655     0.01310 0.00705     0.01410
6      3 : 4  0.00287      0.00861 0.00289     0.00867 0.00314     0.00942
--------------------------------------------------------------------------------
The Cochran-Armitage trend test for y:
                                                                  趋势性检验
        The Cochran-Armitage Trend Test

data:  The type of data is variable!
Z = 2.169, p-value = 0.0301
```

From the above five examples, I think the user can already have a basic glimpse of the EasyDescribe package and fundescribe() function to understand. The author will continue to maintain and update this package. Welcome to use, and more welcome to make suggestions and comments, contact email: niexiuquan1995@foxmail.com.