Statistical Software & Social Work: Training on Jamovi & R

presented by Dr. Leia Saltzman
& Dr. Lauren Terzis

A free continuing education workshop from
Tulane University School of Social Work

Wednesday, May 19, 2021
from 5 to 7:30 pm CT

Learning Objectives

1. Participants will discuss common barriers, anxiety, and benefits around social work research and statistics.

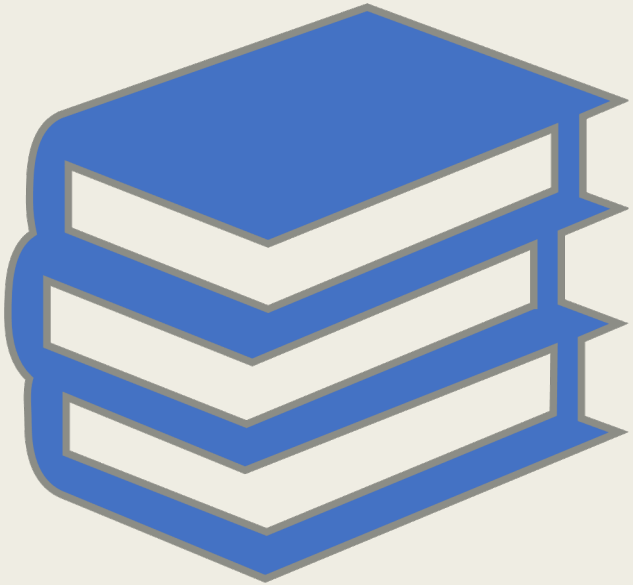
2. Participants will review common research terminology and statistical tests for Social Work research.

3. Participants will identify components and uses (statistics, syntax, etc.) for Jamovi and R.

4. Participants will carry out statistical analysis using Jamovi and R.

AGENDA

- Introduction
- Software for Statistics with social work students
- Introduction to Jamovi
- Break
- Introduction to R studio
- Demonstration
- Q&A



TEACHING STATISTICS TO SOCIAL WORK STUDENTS

Categorical Variables
=
Nominal and Ordinal

Continuous Variables
=
Interval and Ratio

Chi-Square

- IV = categorical, DV = categorical

T-test

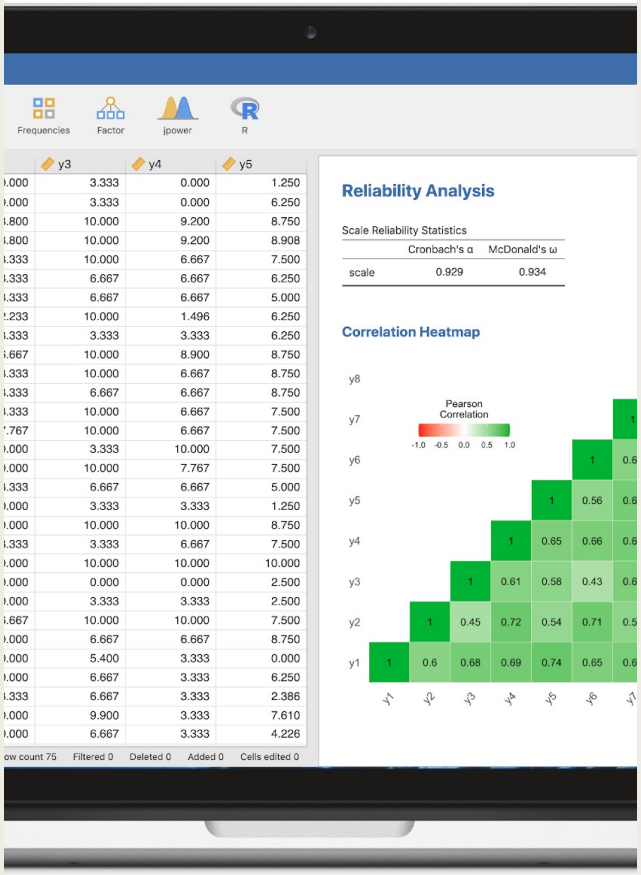
- IV = categorical (2), DV = continuous

ANOVA

- IV = categorical (3+), DV= continuous

Correlation

- IV = continuous, DV = continuous



The jamovi project (2021). *jamovi* (Version 1.6) [Computer Software]. Retrieved from https://www.jamovi.org

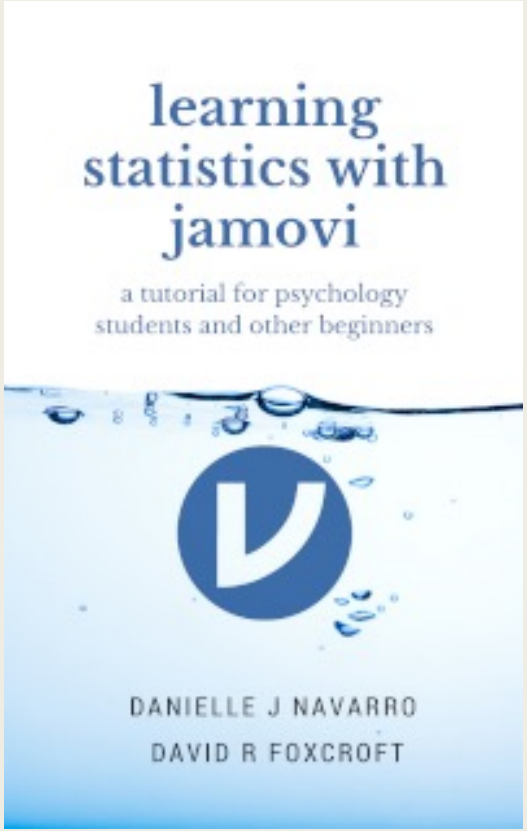
Downloading Jamovi

Visit Jamovi website: https://www.jamovi.org/

Determine which download option works for your computer

- Windows
- macOS
- Linux and Chromebook (through flathub)

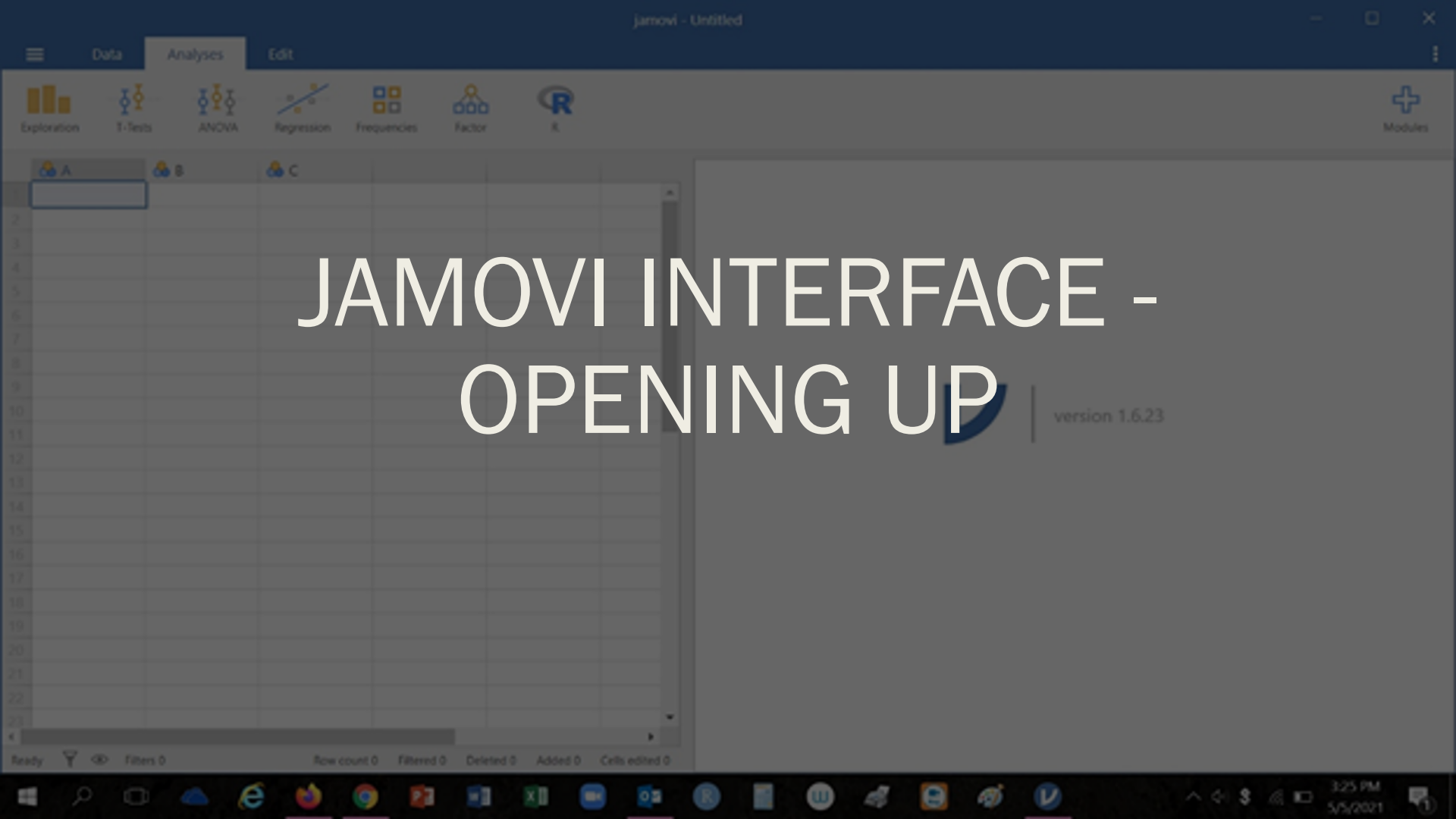
*NOTE: Jamovi may not download on older computers/not updated software

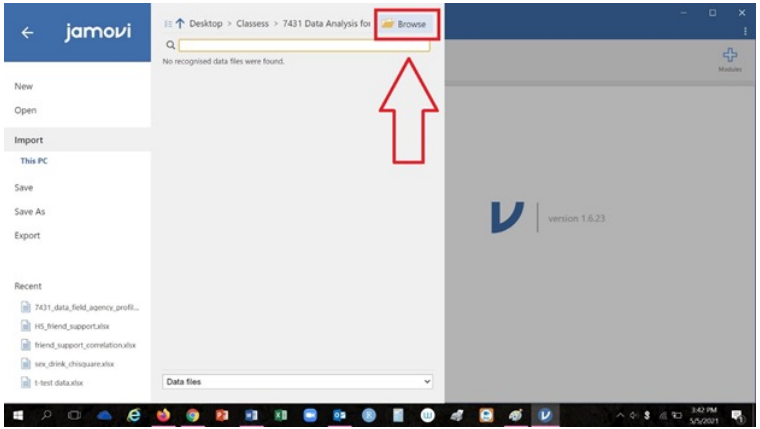


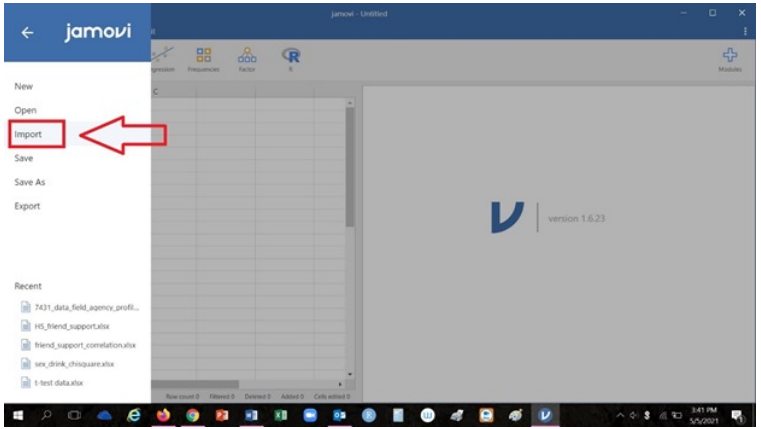
Jamovi Textbook

Navarro DJ and Foxcroft DR (2019). learning statistics with jamovi: a tutorial for psychology students and other beginners. (Version 0.70). DOI: 10.24384/hgc3-7p15

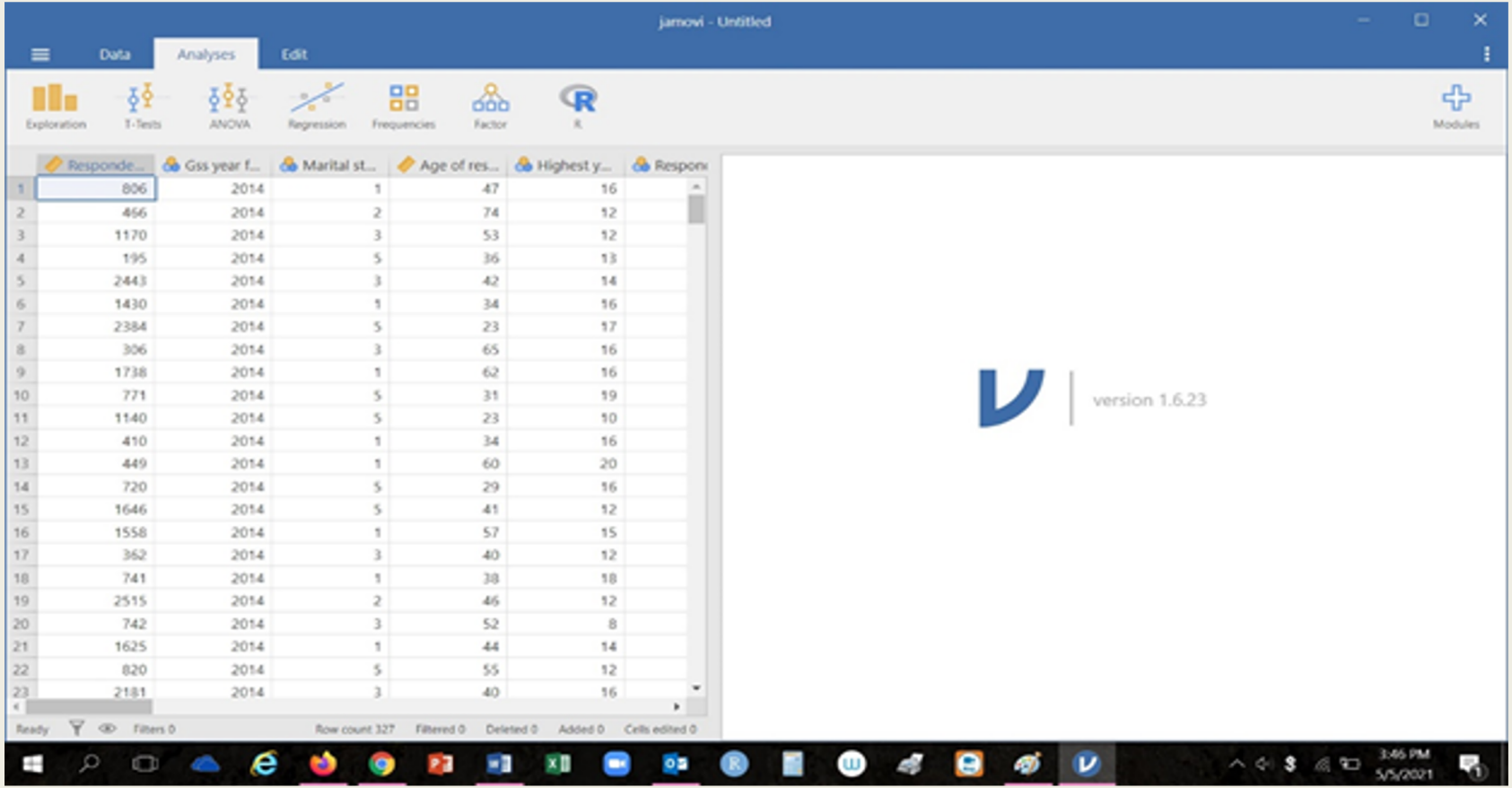
https://www.learnstatswithjamovi.com/


jamovi - Untitled
Data
Analyses
Edit
Exploration
T-Tests
ANOVA
Regression
Frequencies
Factor
R
Modules
A
B
C
Ready
Filters 0
Row count 0
Filtered 0
Deleted 0
Added 0
Cells edited 0
JAMOVI INTERFACE - OPENING UP
version 1.6.23
3:25 PM
5/5/2021


jamovi
Desktop > Classess > 7431 Data Analysis fo
Browse
No recognised data files were found.
New
Open
Import
This PC
Save
Save As
Export
Recent
7431_data_field_agency_profil...
HS_friend_support.xlsx
friend_support_correlation.xlsx
sex_drink_chisquare.xlsx
t-test data.xlsx
Data files
Modules
version 1.6.23


jamovi
New
Open
Import
Save
Save As
Export
Recent
7431_data_field_agency_profil...
HS_friend_support.xlsx
friend_support_correlation.xlsx
sex_drink_chisquare.xlsx
t-test data.xlsx
Modules
version 1.6.23

Data View


jamovi - Untitled
Data
Analyses
Edit
Exploration
T-Tests
ANOVA
Regression
Frequencies
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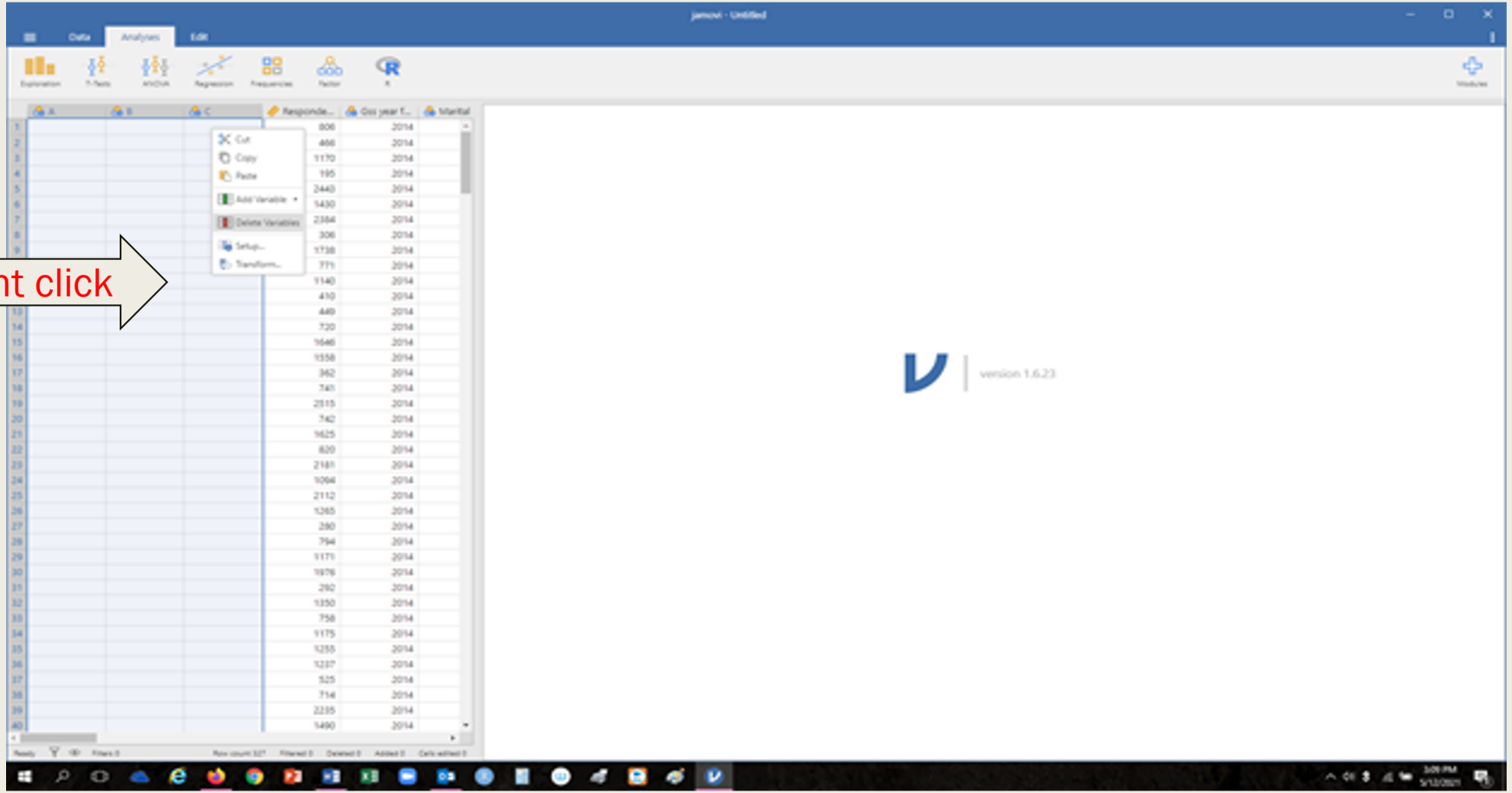
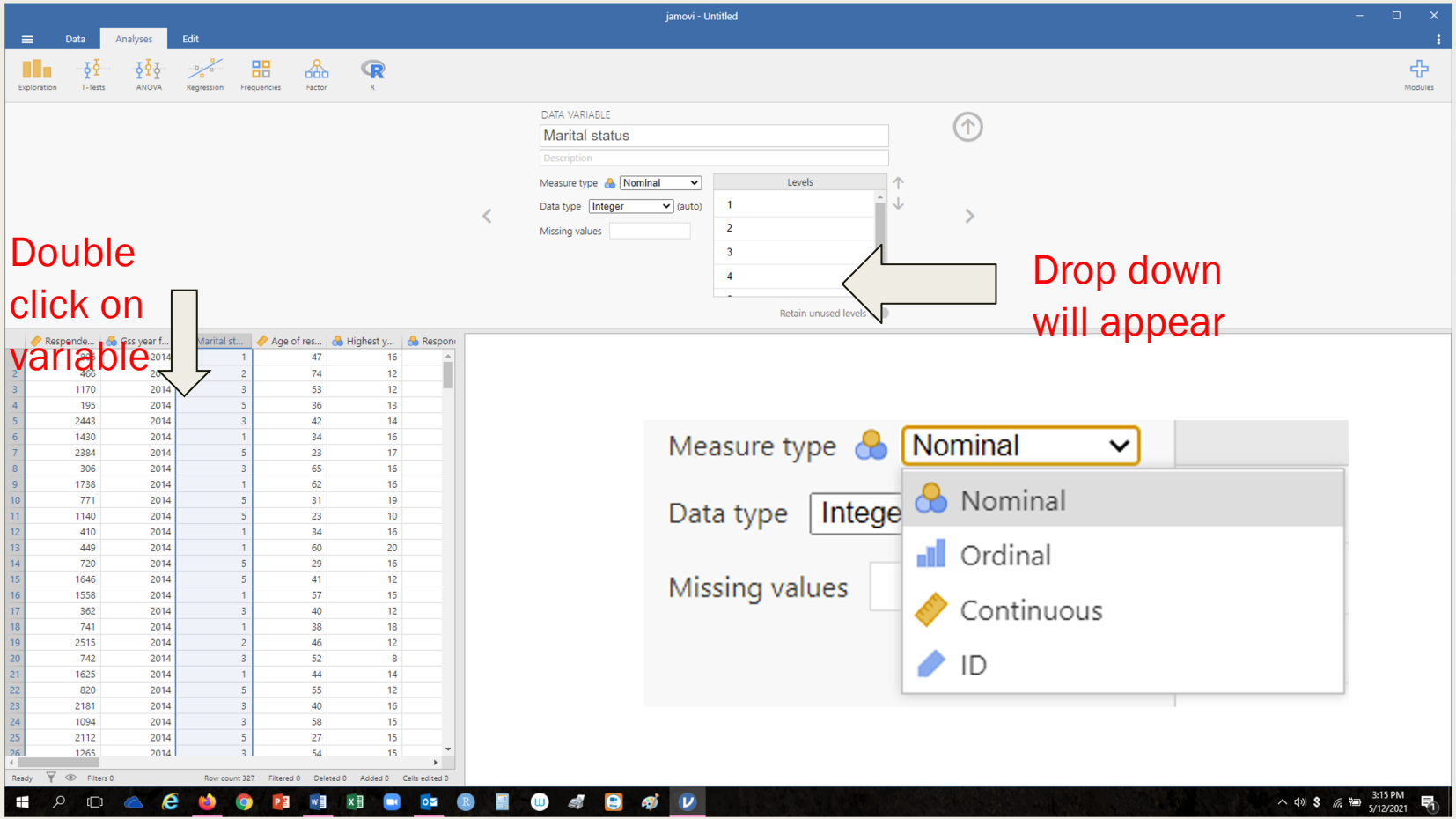
Responde...
Gss year f...
Marital st...
Age of res...
Highest y...
Respon
1 806 2014 1 47 16
2 466 2014 2 74 12
3 1170 2014 3 53 12
4 195 2014 5 36 13
5 2443 2014 3 42 14
6 1430 2014 1 34 16
7 2384 2014 5 23 17
8 306 2014 3 65 16
9 1738 2014 1 62 16
10 771 2014 5 31 19
11 1140 2014 5 23 10
12 410 2014 1 34 16
13 449 2014 1 60 20
14 720 2014 5 29 16
15 1646 2014 5 41 12
16 1558 2014 1 57 15
17 362 2014 3 40 12
18 741 2014 1 38 18
19 2515 2014 2 46 12
20 742 2014 3 52 8
21 1625 2014 1 44 14
22 820 2014 5 55 12
23 2181 2014 3 40 16
Ready
Filters 0
Row count 327
Filtered 0
Deleted 0
Added 0
Cells edited 0
version 1.6.23
3:46 PM
5/5/2021

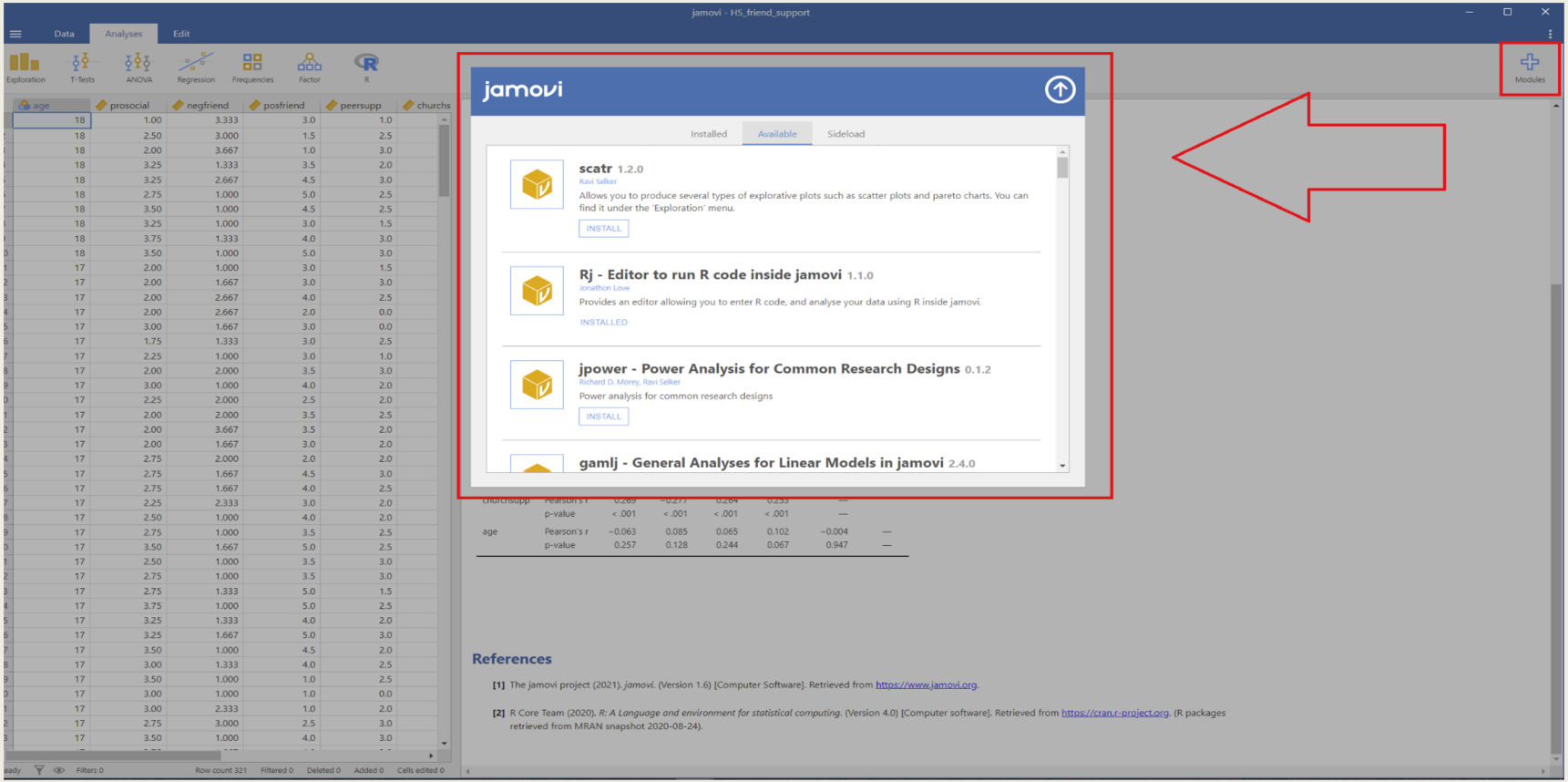
Cleaning & Coding in Jamovi



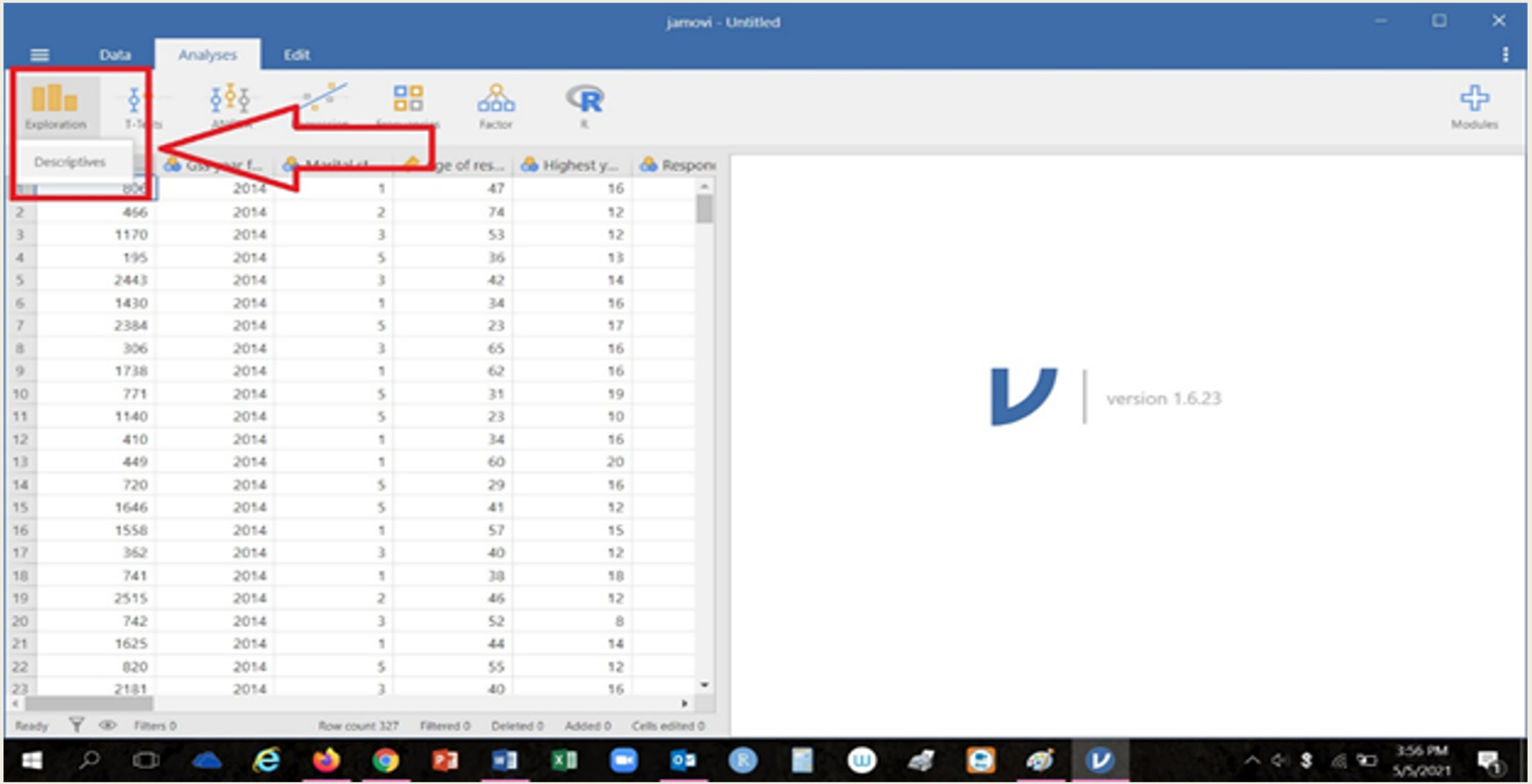
Cleaning & Coding: Renaming Variables



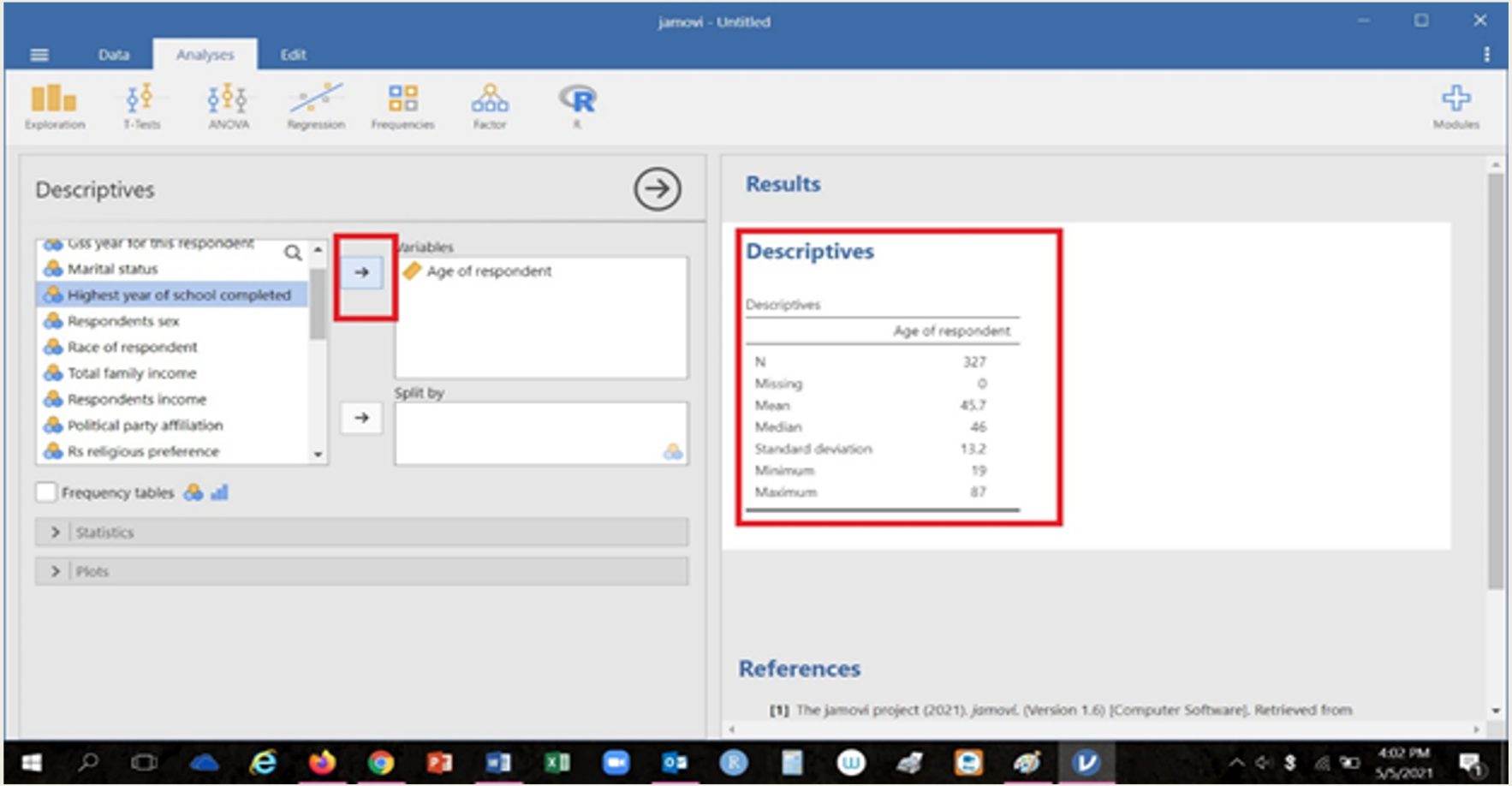
Packages/Modules in Jamovi



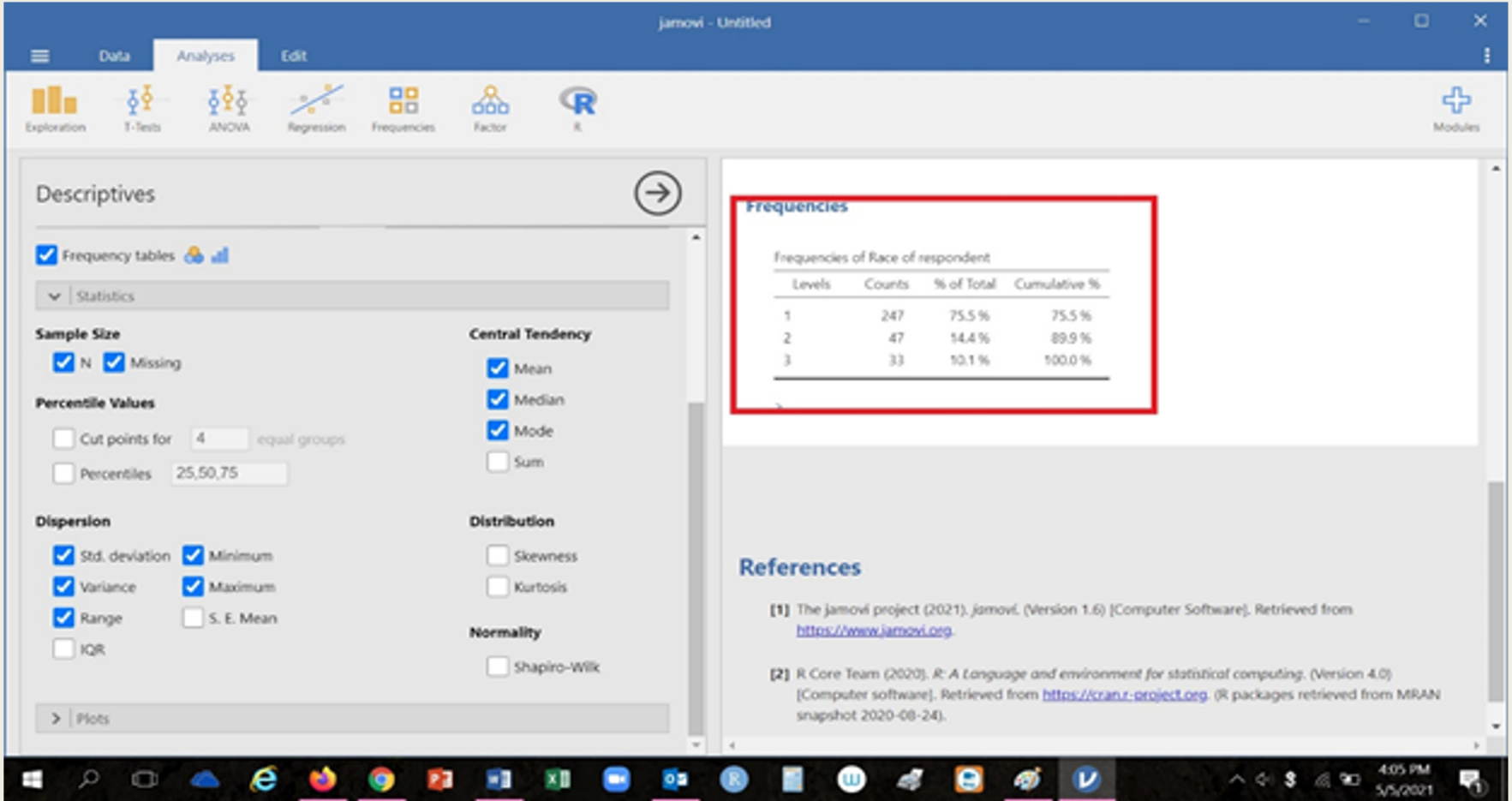
Descriptive Statistics



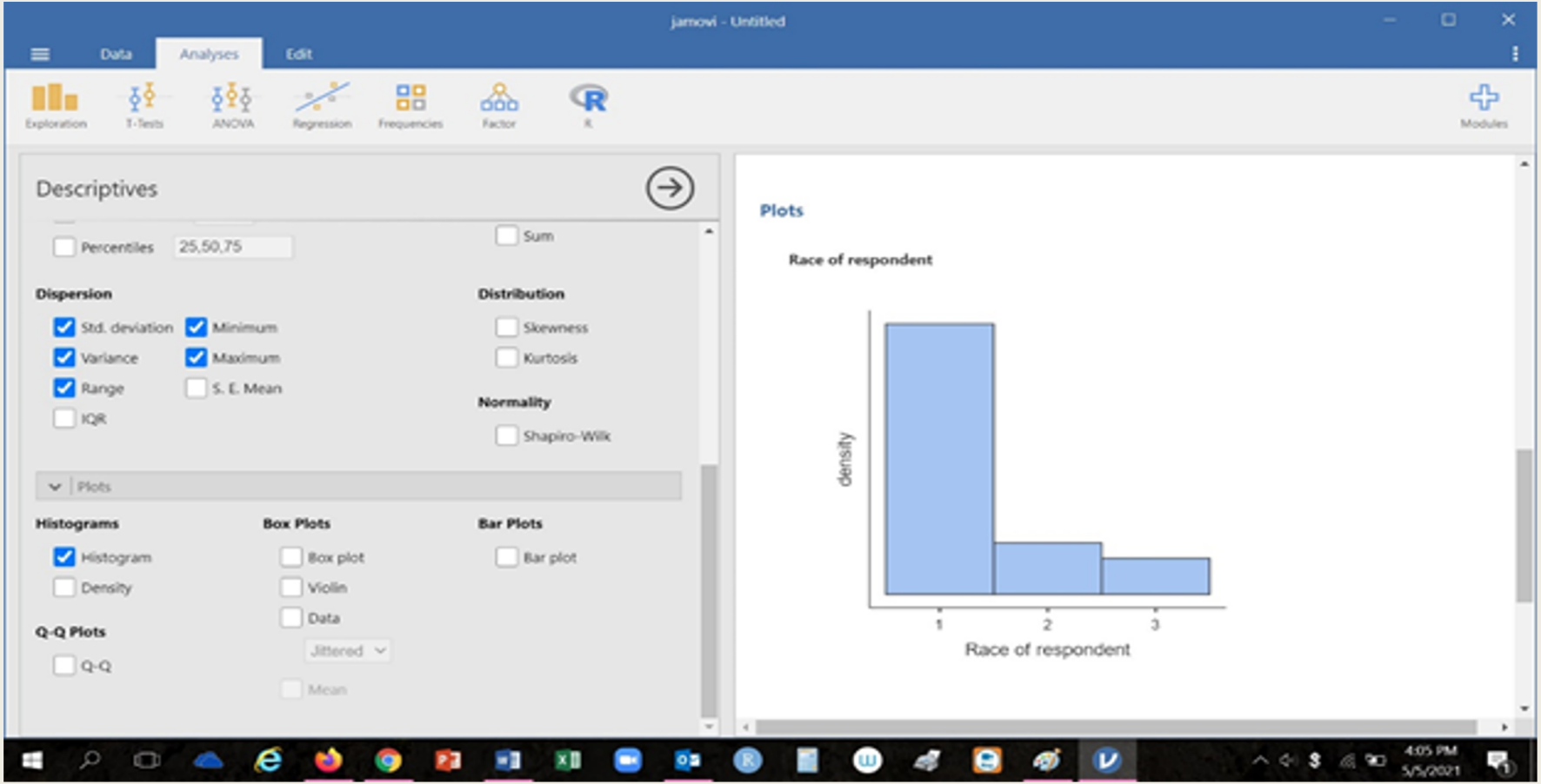
Interpreting Output: Descriptive Statistics



Interpreting Output: Descriptive Statistics



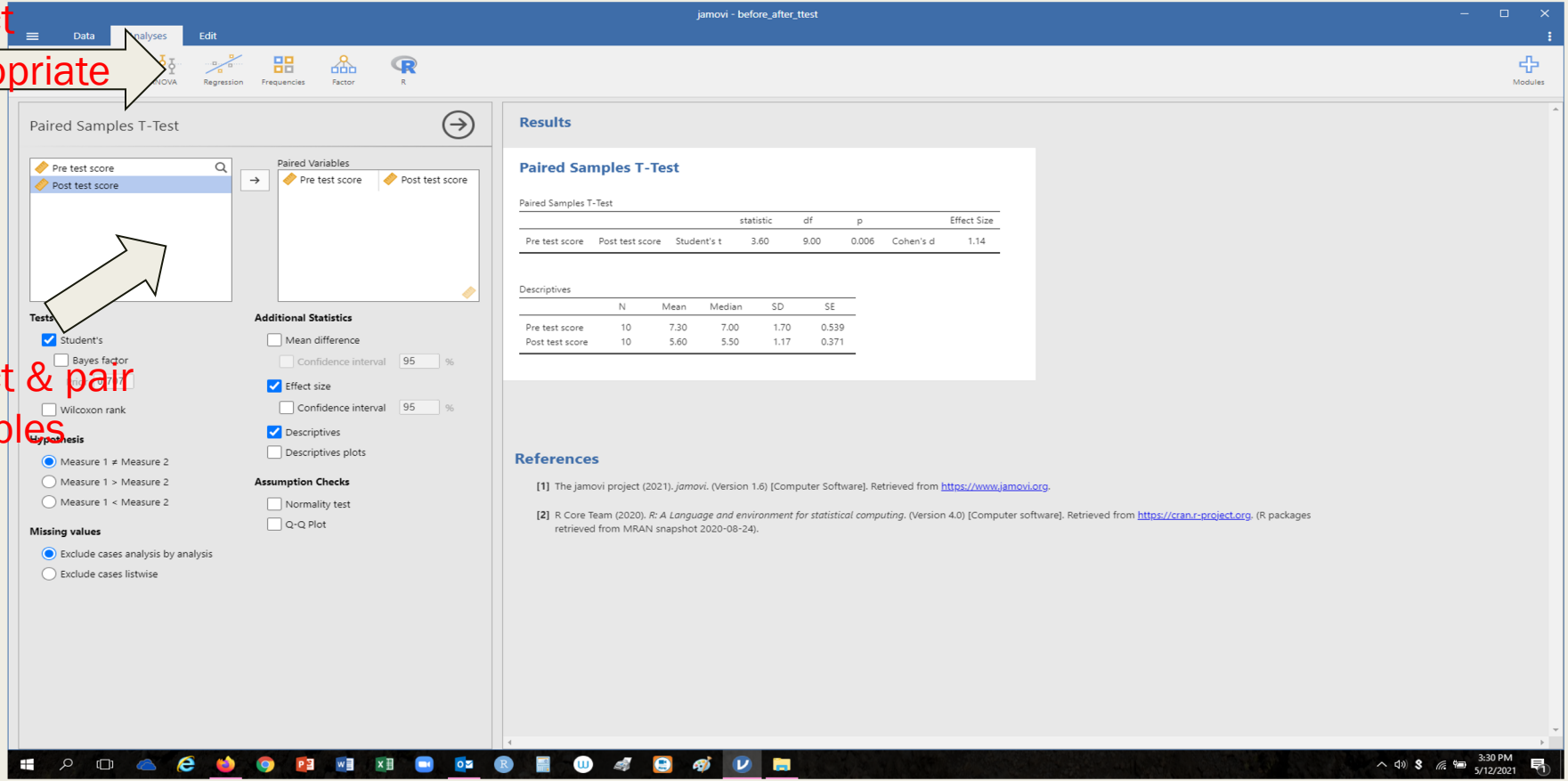
Interpreting Output: Descriptive Statistics



T-test: Paired Samples

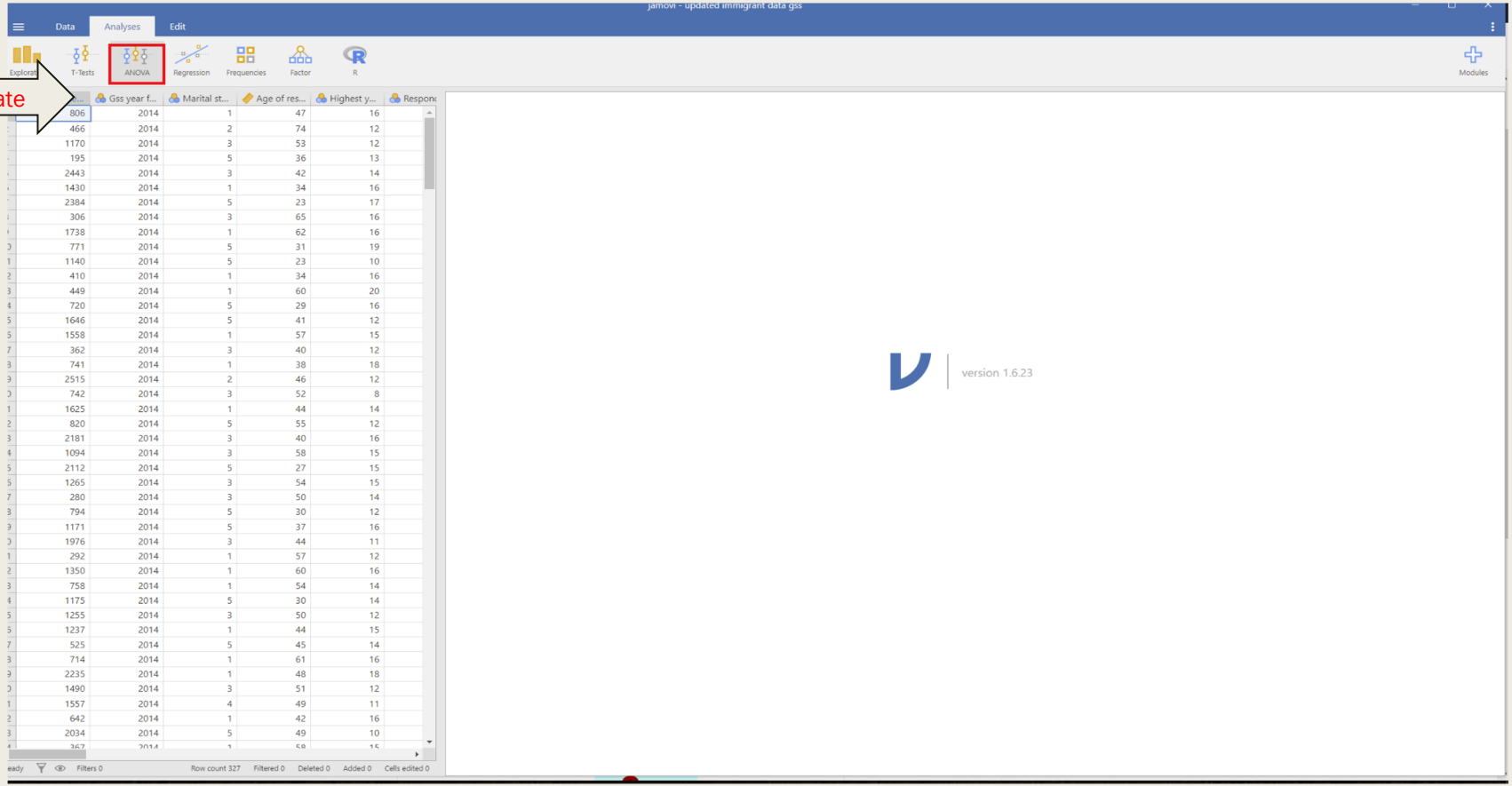
Select appropriate t-test

Select & pair variables

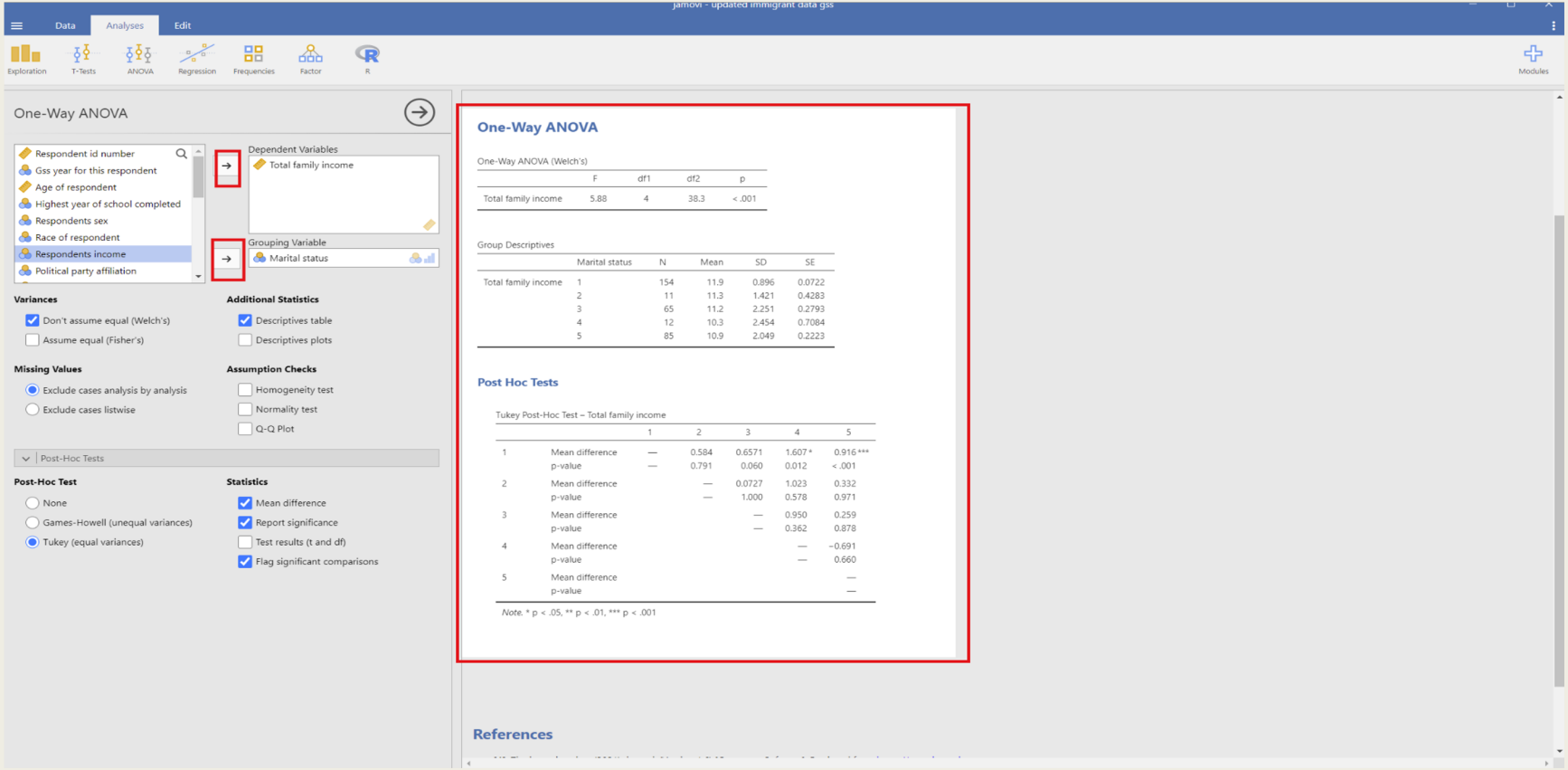


ANOVA

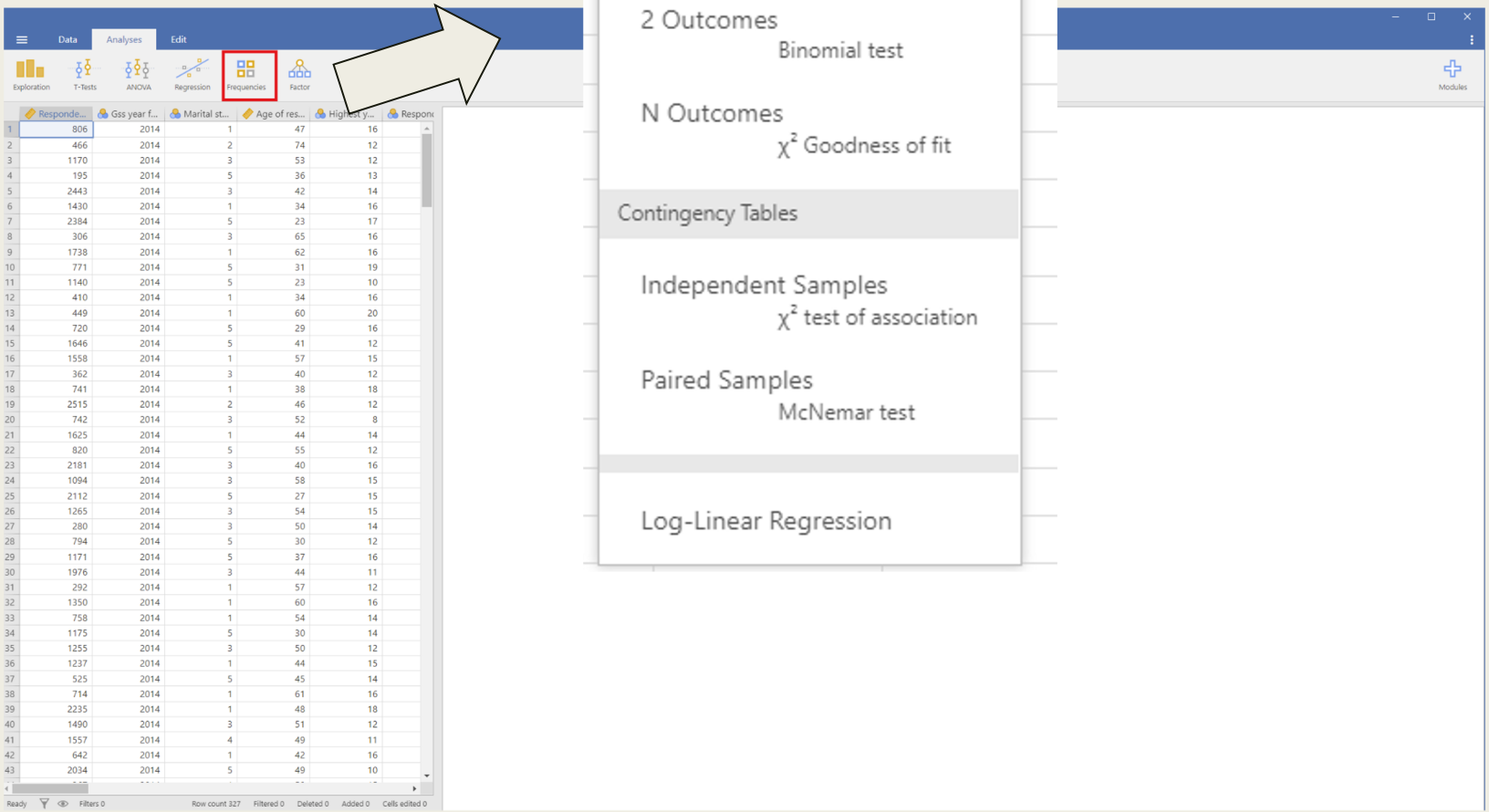
Select appropriate ANOVA



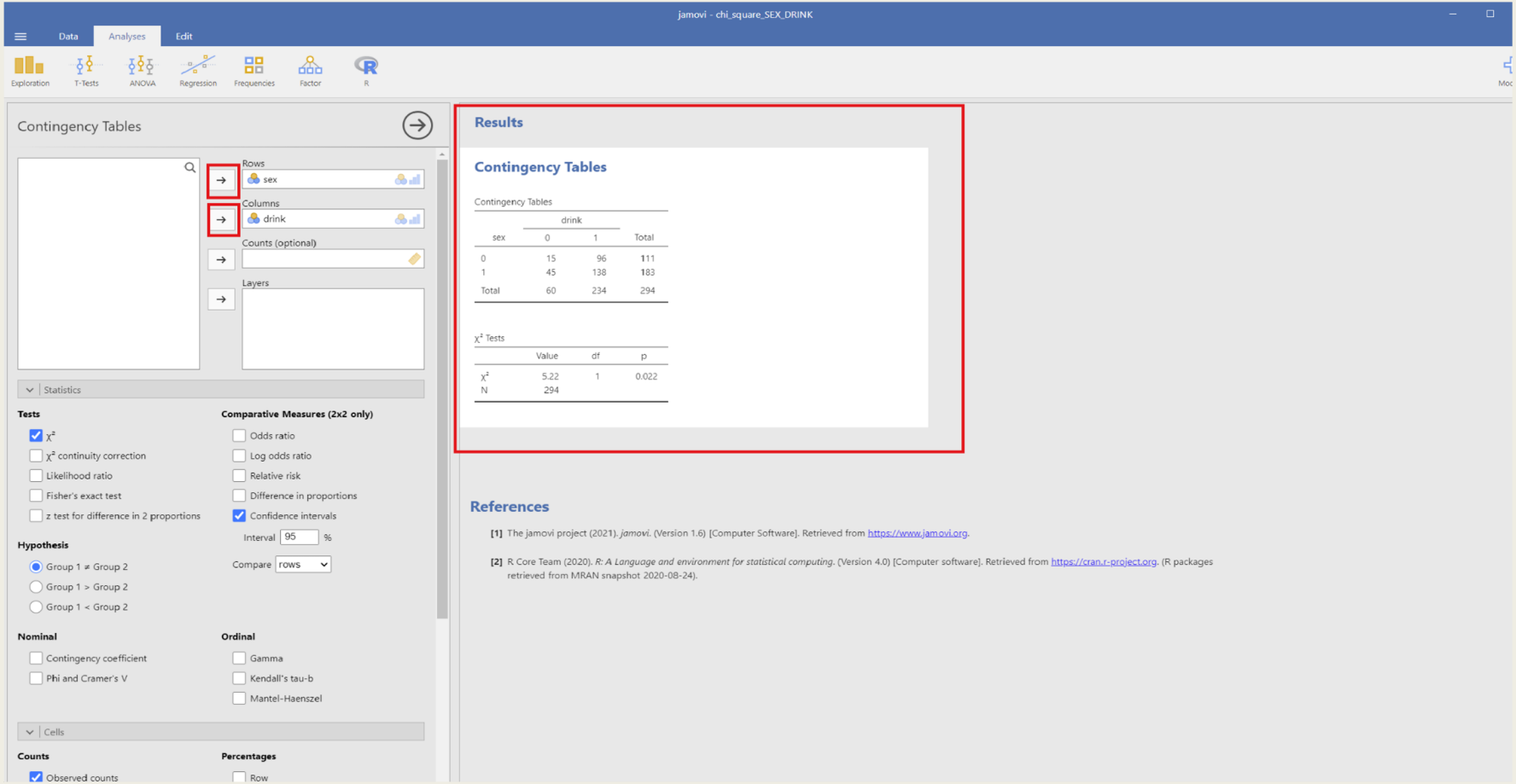
ANOVA


jamovi - updated immigrant data gss
Data
Analyses
Edit
Exploration
T-Tests
ANOVA
Regression
Frequencies
Factor
R
Modules
One-Way ANOVA
Respondent id number
Gss year for this respondent
Age of respondent
Highest year of school completed
Respondents sex
Race of respondent
Respondents income
Political party affiliation
Dependent Variables
Total family income
Grouping Variable
Marital status
Variances
Don't assume equal (Welch's)
Assume equal (Fisher's)
Additional Statistics
Descriptives table
Descriptives plots
Missing Values
Exclude cases analysis by analysis
Exclude cases listwise
Assumption Checks
Homogeneity test
Normality test
Q-Q Plot
Post-Hoc Tests
Post-Hoc Test
None
Games-Howell (unequal variances)
Tukey (equal variances)
Statistics
Mean difference
Report significance
Test results (t and df)
Flag significant comparisons
One-Way ANOVA
One-Way ANOVA (Welch's)
F df1 df2 p
Total family income 5.88 4 38.3 < .001
Group Descriptives
Marital status N Mean SD SE
Total family income 1 154 11.9 0.896 0.0722
2 11 11.3 1.421 0.4283
3 65 11.2 2.251 0.2793
4 12 10.3 2.454 0.7084
5 85 10.9 2.049 0.2223
Post Hoc Tests
Tukey Post-Hoc Test – Total family income
1 2 3 4 5
1 Mean difference — 0.584 0.6571 1.607 * 0.916 ***
p-value — 0.791 0.060 0.012 < .001
2 Mean difference — 0.0727 1.023 0.332
p-value — 1.000 0.578 0.971
3 Mean difference — 0.950 0.259
p-value — 0.362 0.878
4 Mean difference — −0.691
p-value — 0.660
5 Mean difference —
p-value —
Note. * p < .05, ** p < .01, *** p < .001
References

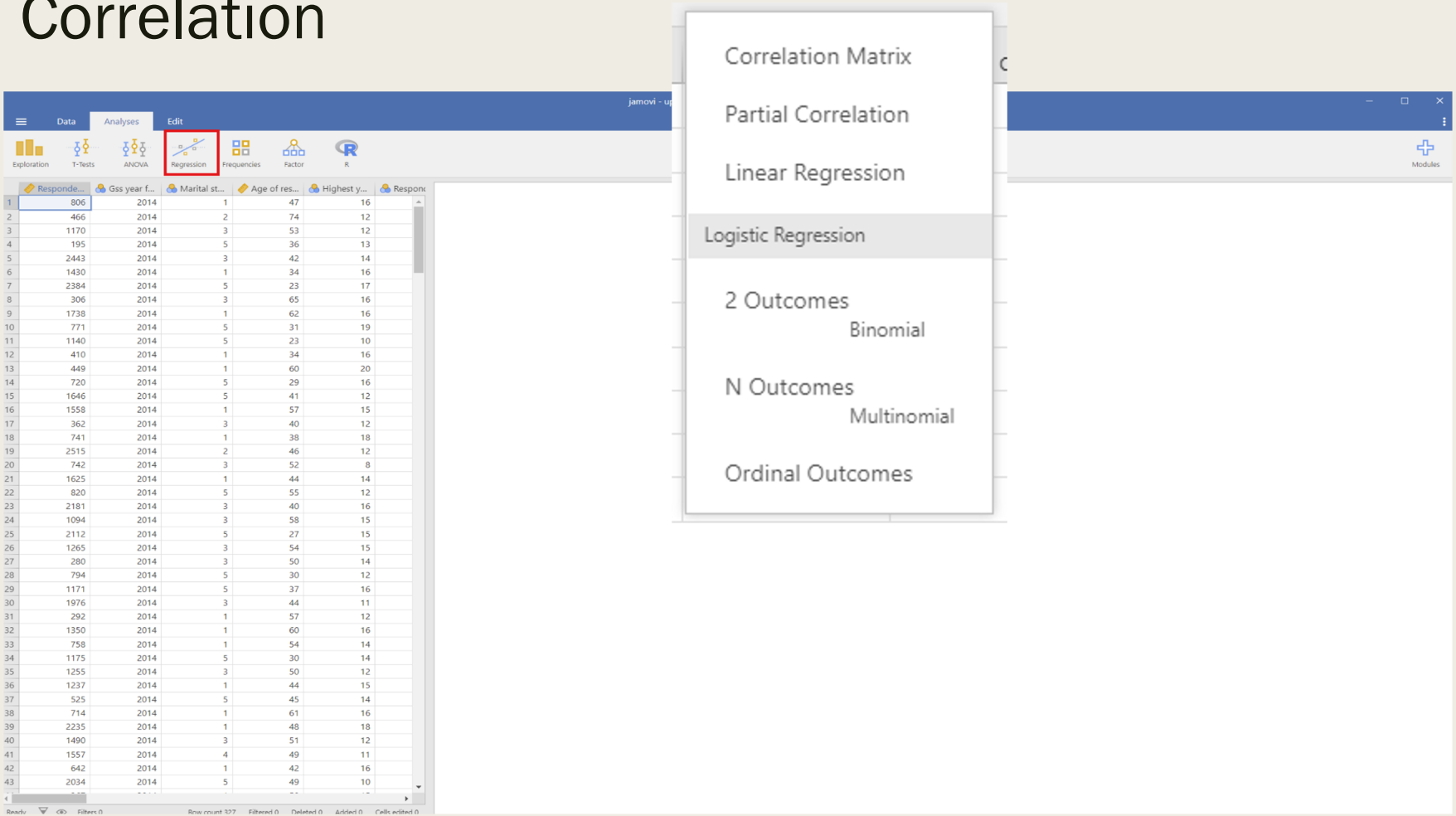
Chi-Square


Data
Analyses
Edit
Exploration
T-Tests
ANOVA
Regression
Frequencies
Factor
Modules
One Sample Proportion Tests
2 Outcomes
Binomial test
N Outcomes
χ² Goodness of fit
Contingency Tables
Independent Samples
χ² test of association
Paired Samples
McNemar test
Log-Linear Regression

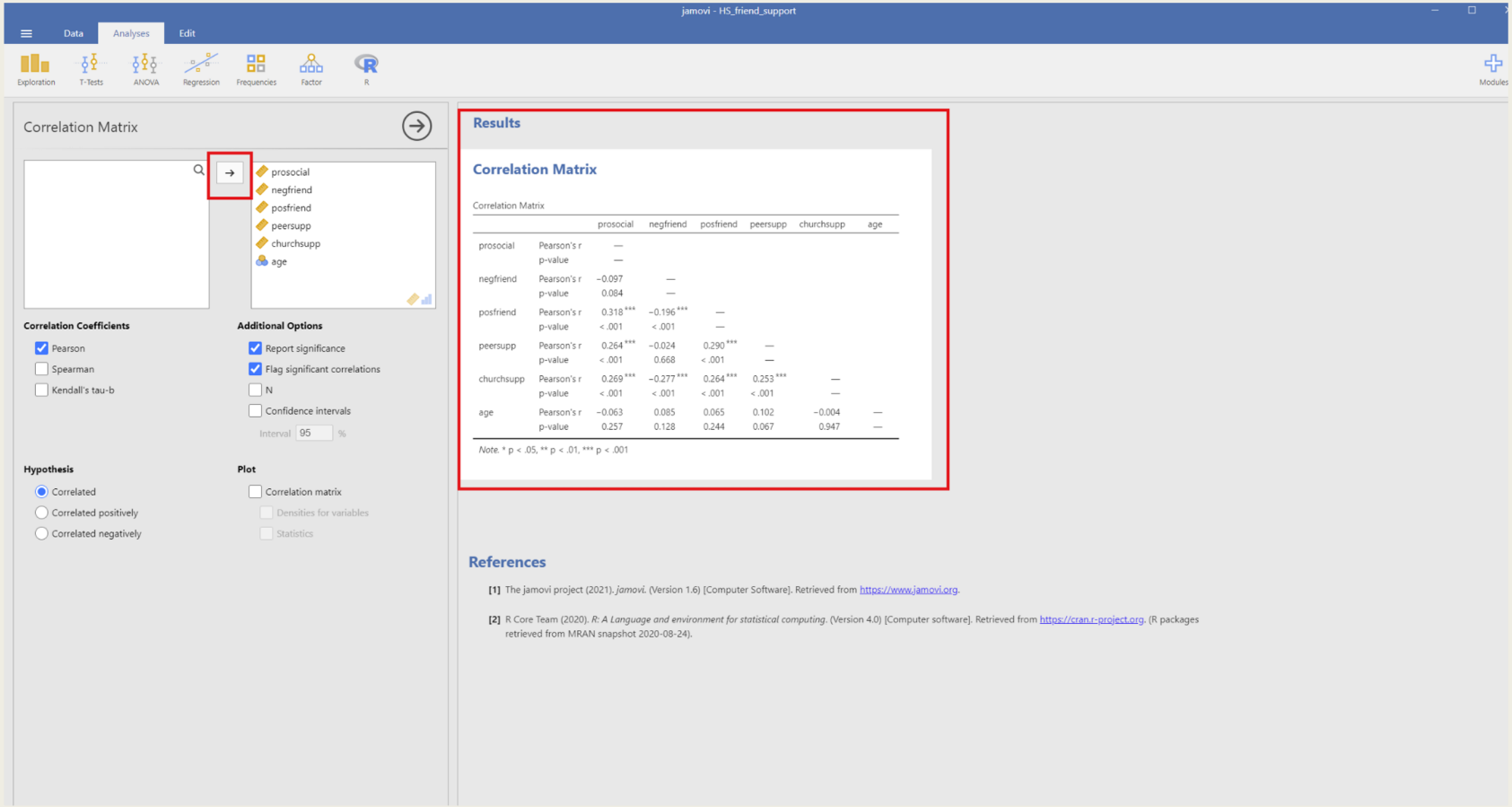
Chi-Square


jamovi - chi_square_SEX_DRINK
Data
Analyses
Edit
Exploration
T-Tests
ANOVA
Regression
Frequencies
Factor
R
Contingency Tables
Rows
sex
Columns
drink
Counts (optional)
Layers
Statistics
Tests
χ²
χ² continuity correction
Likelihood ratio
Fisher's exact test
z test for difference in 2 proportions
Comparative Measures (2x2 only)
Odds ratio
Log odds ratio
Relative risk
Difference in proportions
Confidence intervals
Interval 95 %
Hypothesis
Group 1 ≠ Group 2
Group 1 > Group 2
Group 1 < Group 2
Compare rows
Nominal
Contingency coefficient
Phi and Cramer's V
Ordinal
Gamma
Kendall's tau-b
Mantel-Haenszel
Cells
Counts
Observed counts
Percentages
Row
Results
Contingency Tables
Contingency Tables
drink
sex 0 1 Total
0 15 96 111
1 45 138 183
Total 60 234 294
χ² Tests
Value df p
χ² 5.22 1 0.022
N 294
References
[1] The jamovi project (2021). jamovi. (Version 1.6) [Computer Software]. Retrieved from https://www.jamovi.org.
[2] R Core Team (2020). R: A Language and environment for statistical computing. (Version 4.0) [Computer software]. Retrieved from https://cran.r-project.org. (R packages retrieved from MRAN snapshot 2020-08-24).

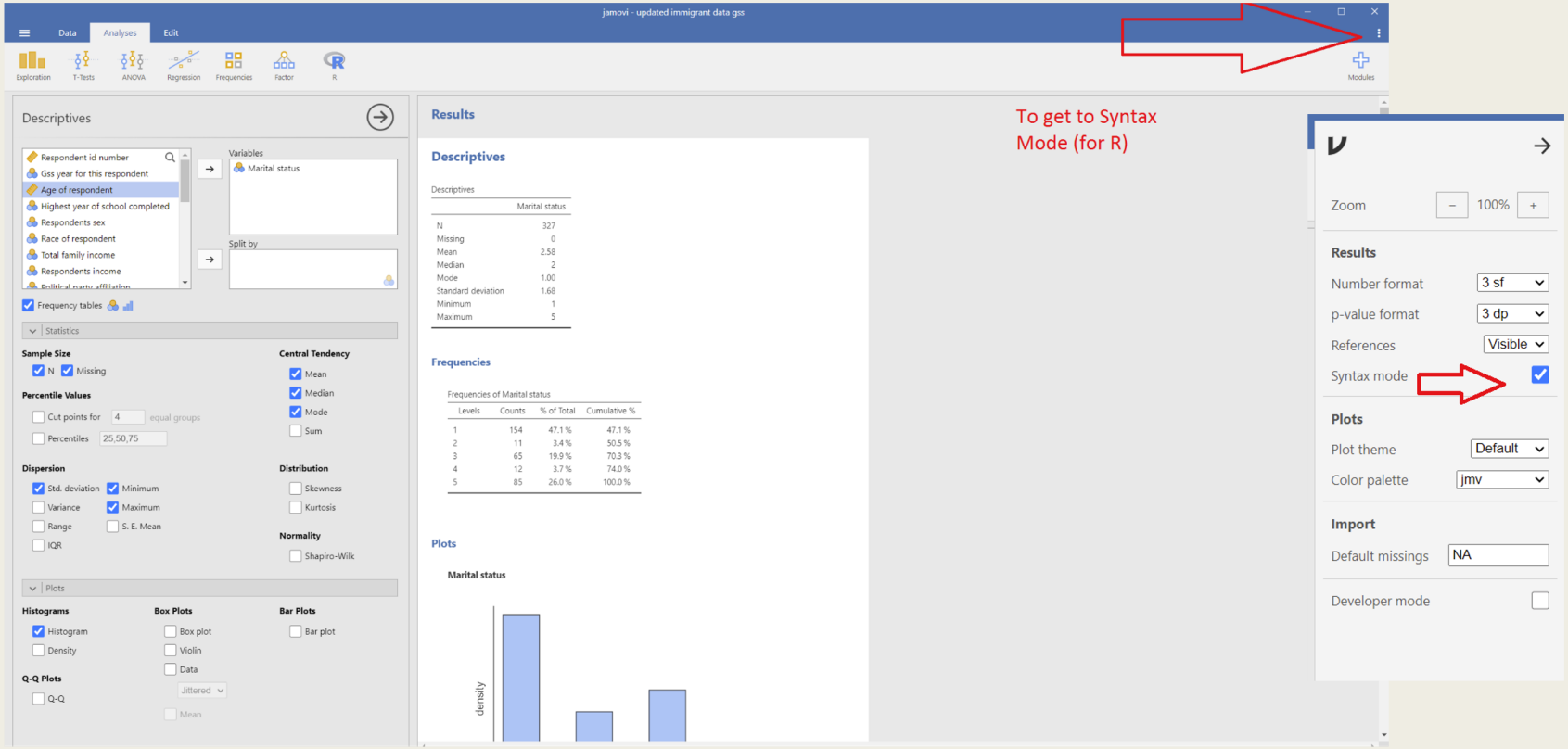
Correlation



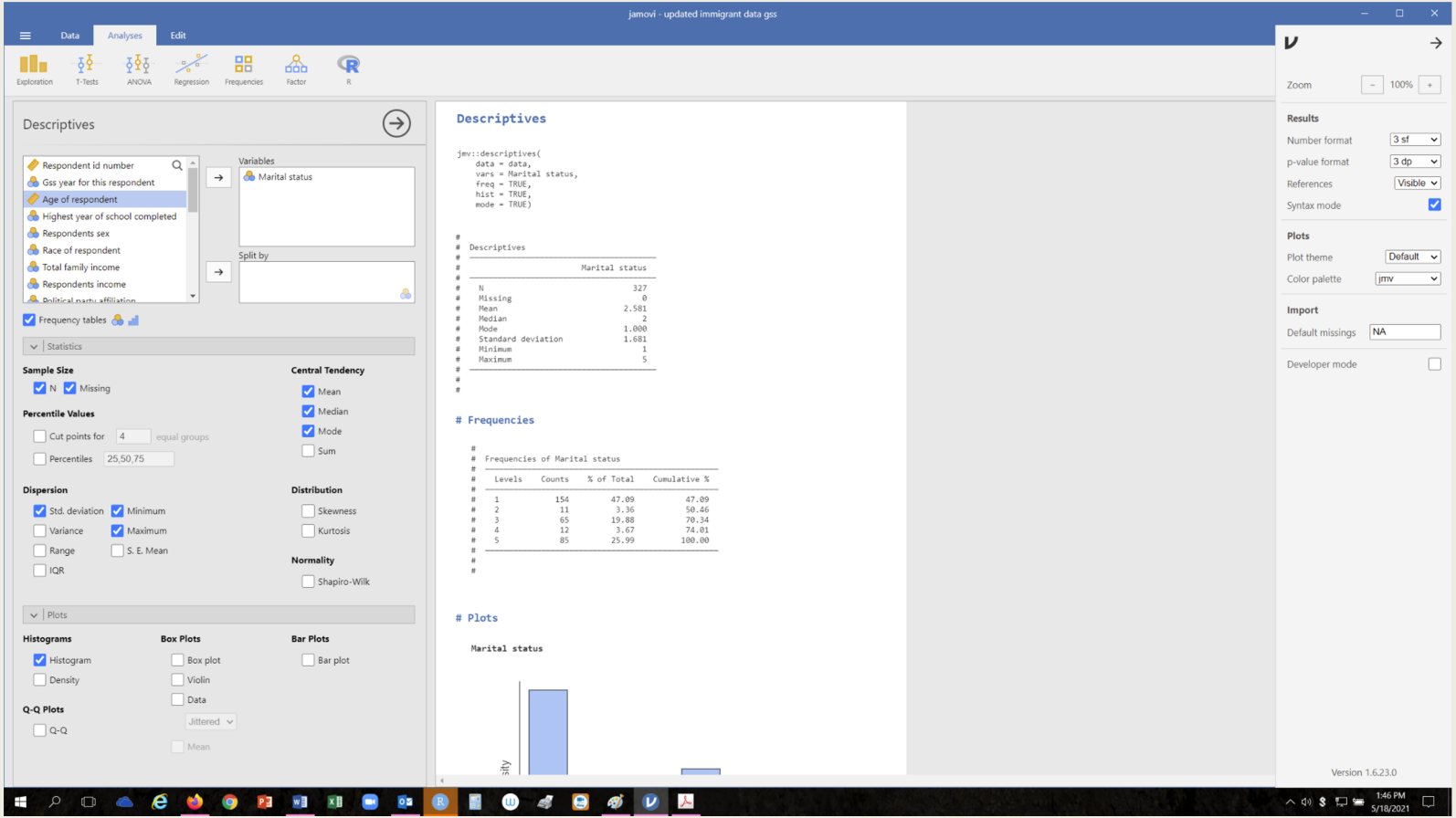
Correlation Matrix



Jamovi to R Syntax



Jamovi to R Syntax



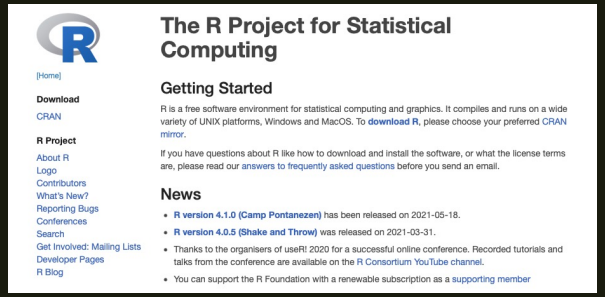
Other Resources:

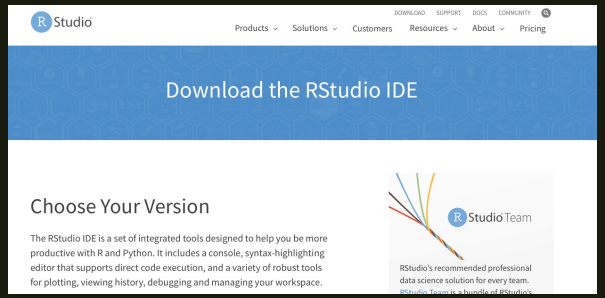
Jamovi User Guide: https://www.jamovi.org/user-manual.html

DataLabCC has useful youtube tutorials for both Jamovi and R:

- https://www.youtube.com/user/datalabcc
  - *Jamovi: https://www.youtube.com/playlist?list=PLkk92zzyru5OAtc_ItUubaSSq6S_TGfRn*
  - *R: An Introduction - https://www.youtube.com/playlist?list=PLkk92zzyru5OOYKXfC4OWzc4Lzo_IBOLP*

BREAK



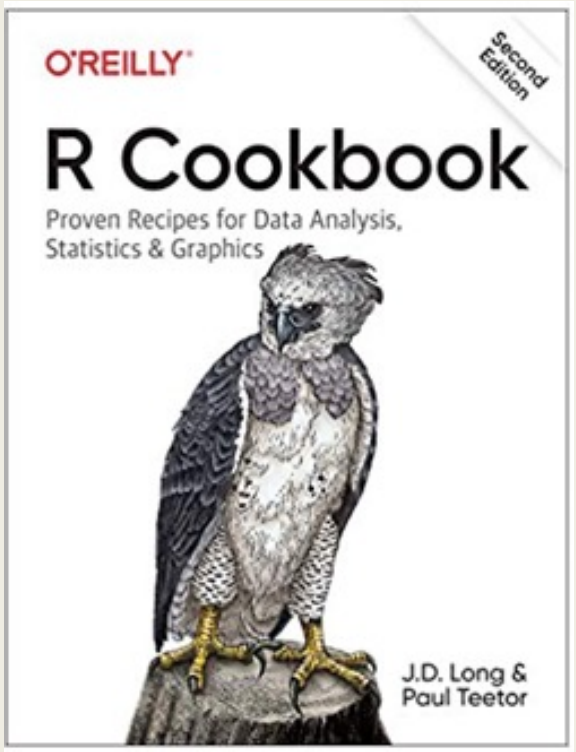


Downloading R and R Studio

You need to install BOTH R and R Studio.

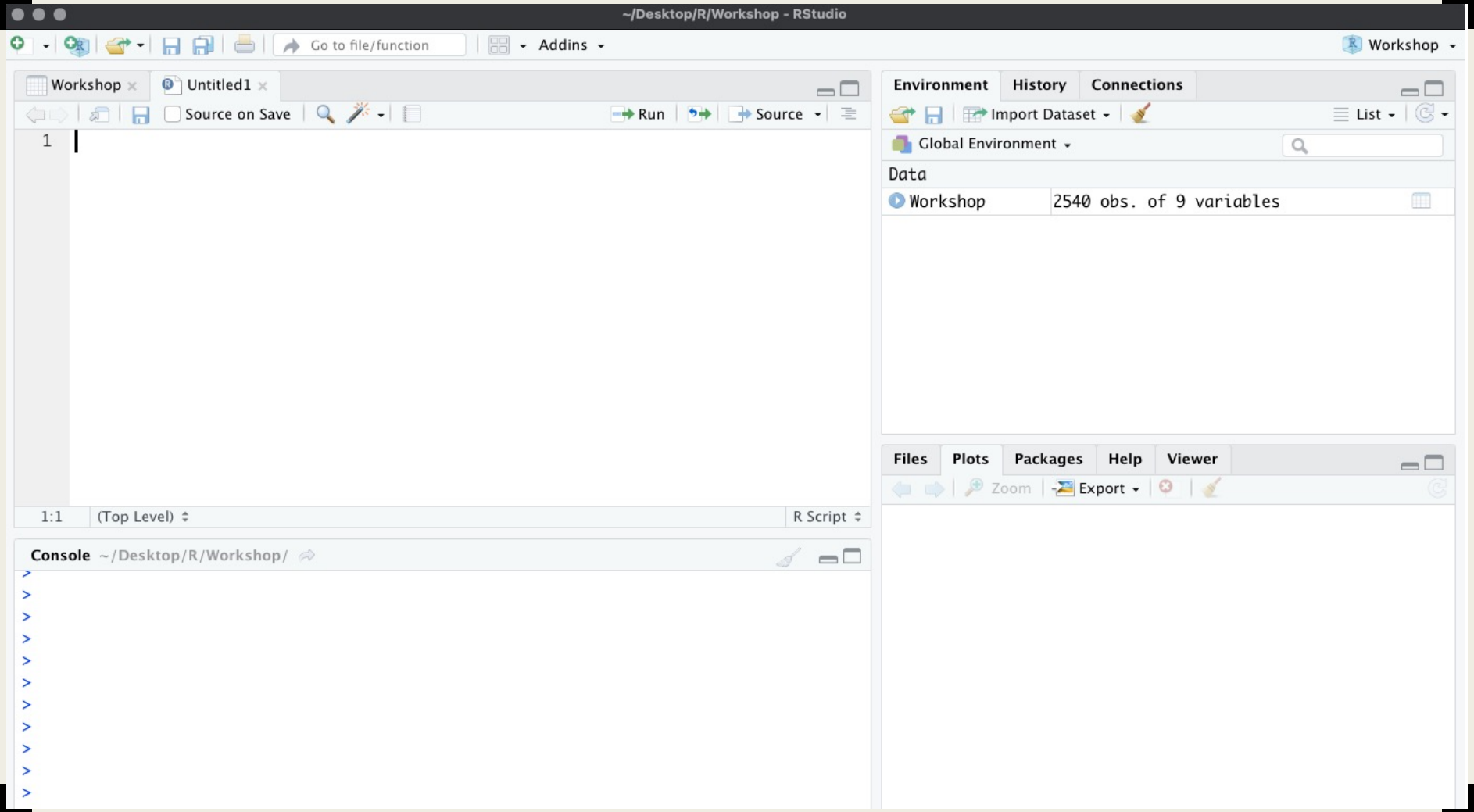
- Install R https://www.r-project.org
- Install R Studio https://www.rstudio.com

RStudio Team (2020). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL http://www.rstudio.com/.



Helpful Resources

Long, J.D., & Teetor, P. (2011). R Cookbook: Proven Recipes for Data Analysis, Statisticas and Graphics


~/Desktop/R/Workshop - RStudio
Go to file/function
Addins
Workshop
Workshop
Untitled1
Source on Save
Run
Source
1
1:1
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
Environment
History
Connections
Import Dataset
List
Global Environment
Data
Workshop
2540 obs. of 9 variables
Files
Plots
Packages
Help
Viewer
Zoom
Export

WRITING SYNTAX IN R STUDIO

- Creating Objects

  NewObject <- All the things I want in the new object listed here with

- Basic

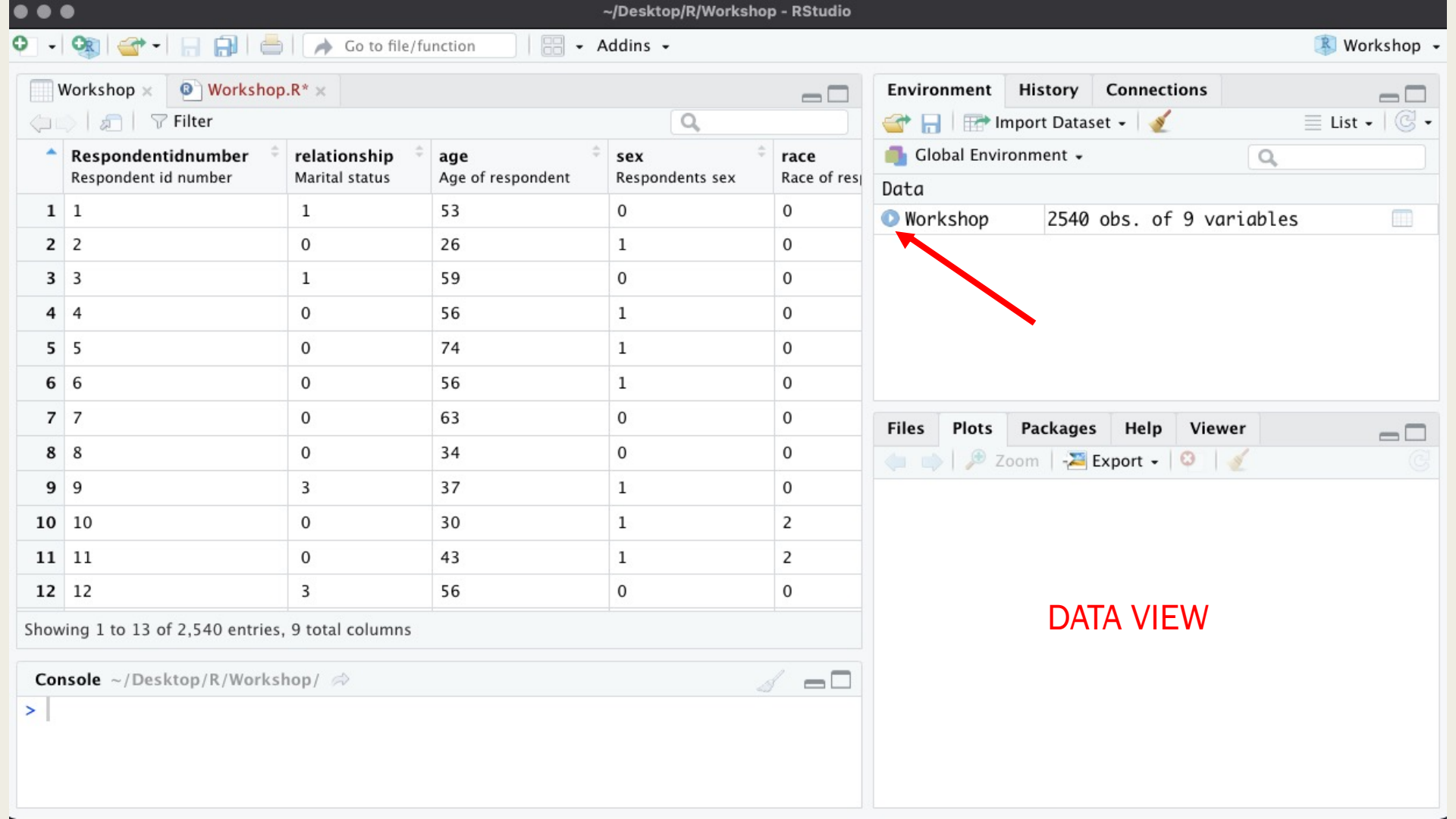
  Command (object)

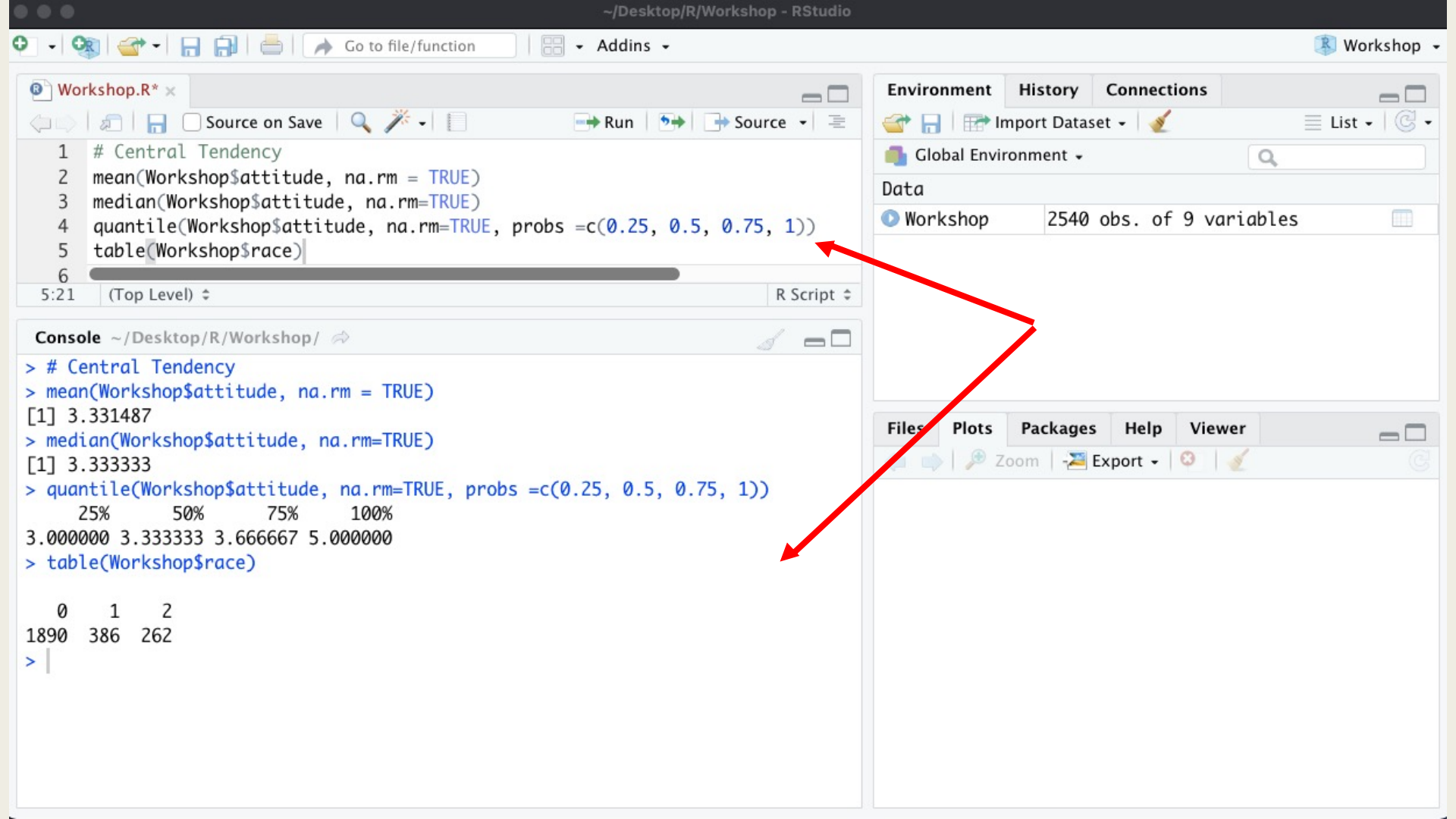
- Complex

  Command (object, option)

- $ - links to objects together
- () – separates the command from the object
- , - separates a list of objects
- <- - assign to the object listed on the left of the arrow
- -> - assign to the object listed on the right of the arrow
- ; - allows us to run more than one line of code
- %>% - allows us to run more than one line of code

IMPORTANT SYMBOLS TO KNOW


~/Desktop/R/Workshop - RStudio
Go to file/function
Addins
Workshop
Workshop
Workshop.R*
Filter
Respondentidnumber
Respondent id number
relationship
Marital status
age
Age of respondent
sex
Respondents sex
race
Race of res
1 1 1 53 0 0
2 2 0 26 1 0
3 3 1 59 0 0
4 4 0 56 1 0
5 5 0 74 1 0
6 6 0 56 1 0
7 7 0 63 0 0
8 8 0 34 0 0
9 9 3 37 1 0
10 10 0 30 1 2
11 11 0 43 1 2
12 12 3 56 0 0
Showing 1 to 13 of 2,540 entries, 9 total columns
Console ~/Desktop/R/Workshop/
>
Environment
History
Connections
Import Dataset
List
Global Environment
Data
Workshop
2540 obs. of 9 variables
Files
Plots
Packages
Help
Viewer
Zoom
Export
DATA VIEW


~/Desktop/R/Workshop - RStudio
Go to file/function
Addins
Workshop
Workshop.R*
Source on Save
Run
Source
1 # Central Tendency
2 mean(Workshop$attitude, na.rm = TRUE)
3 median(Workshop$attitude, na.rm=TRUE)
4 quantile(Workshop$attitude, na.rm=TRUE, probs =c(0.25, 0.5, 0.75, 1))
5 table(Workshop$race)
6
5:21
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
> # Central Tendency
> mean(Workshop$attitude, na.rm = TRUE)
[1] 3.331487
> median(Workshop$attitude, na.rm=TRUE)
[1] 3.333333
> quantile(Workshop$attitude, na.rm=TRUE, probs =c(0.25, 0.5, 0.75, 1))
25% 50% 75% 100%
3.000000 3.333333 3.666667 5.000000
> table(Workshop$race)
0 1 2
1890 386 262
>
Environment
History
Connections
Import Dataset
List
Global Environment
Data
Workshop
2540 obs. of 9 variables
Files
Plots
Packages
Help
Viewer
Zoom
Export

~/Desktop/R/Workshop - RStudio

Go to file/function | Addins | Workshop

Workshop.R

Source on Save | Run | Source

```
7  #Variability
8  library(e1071)
9  skewness(Workshop$attitude, na.rm=TRUE)
10 kurtosis(Workshop$attitude, na.rm=TRUE)
11 sd(Workshop$attitude, na.rm=TRUE)
12 var(Workshop$attitude, na.rm=TRUE)
13 #graphs
14 hist(Workshop$attitude, xlab = "Attitudes", ylab ="Frequency", main = "Histogram of Attitudes")
```

15:1 (Top Level) R Script

Console ~/Desktop/R/Workshop/

```
> #Variability
> library(e1071)
> skewness(Workshop$attitude, na.rm=TRUE)
[1] -0.1133799
> kurtosis(Workshop$attitude, na.rm=TRUE)
[1] 0.7069101
> sd(Workshop$attitude, na.rm=TRUE)
[1] 0.4804584
> var(Workshop$attitude, na.rm=TRUE)
[1] 0.2308403
> #graphs
> hist(Workshop$attitude, xlab = "Attitudes", ylab ="Frequency", main = "Histogram of Attitudes")
>
```

Environment | History | Connections

Import Dataset | List

Global Environment

Data

Workshop	2540 obs. of 9 variables

Files | Plots | Packages | Help | Viewer

Zoom | Export

- Save as Image...
- Save as PDF...
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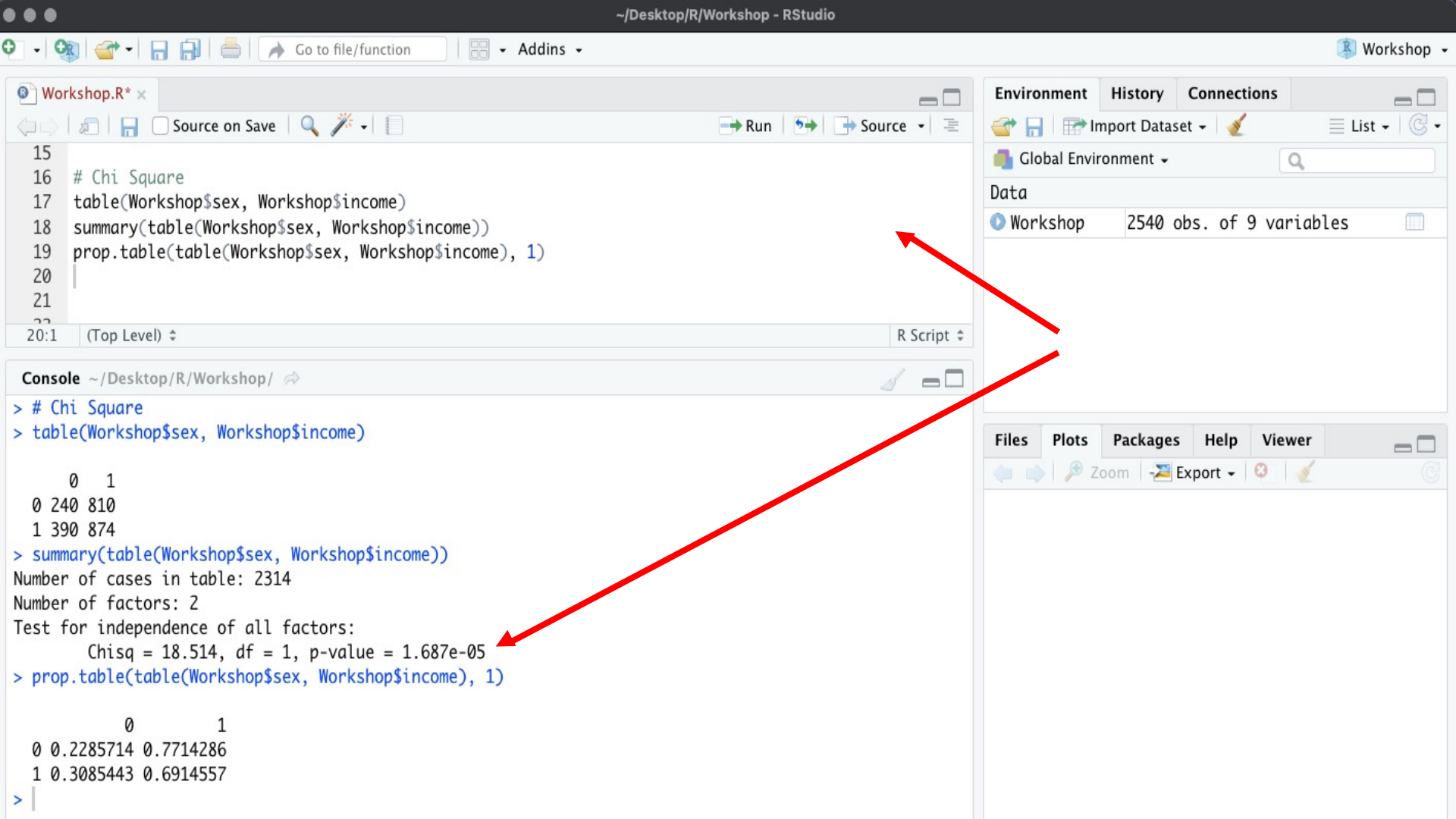
~/Desktop/R/Workshop - RStudio
Go to file/function
Addins
Workshop
Workshop.R*
Source on Save
Run
Source
15
16 # Chi Square
17 table(Workshop$sex, Workshop$income)
18 summary(table(Workshop$sex, Workshop$income))
19 prop.table(table(Workshop$sex, Workshop$income), 1)
20
21
20:1
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
> # Chi Square
> table(Workshop$sex, Workshop$income)
0 1
0 240 810
1 390 874
> summary(table(Workshop$sex, Workshop$income))
Number of cases in table: 2314
Number of factors: 2
Test for independence of all factors:
Chisq = 18.514, df = 1, p-value = 1.687e-05
> prop.table(table(Workshop$sex, Workshop$income), 1)
0 1
0 0.2285714 0.7714286
1 0.3085443 0.6914557
>
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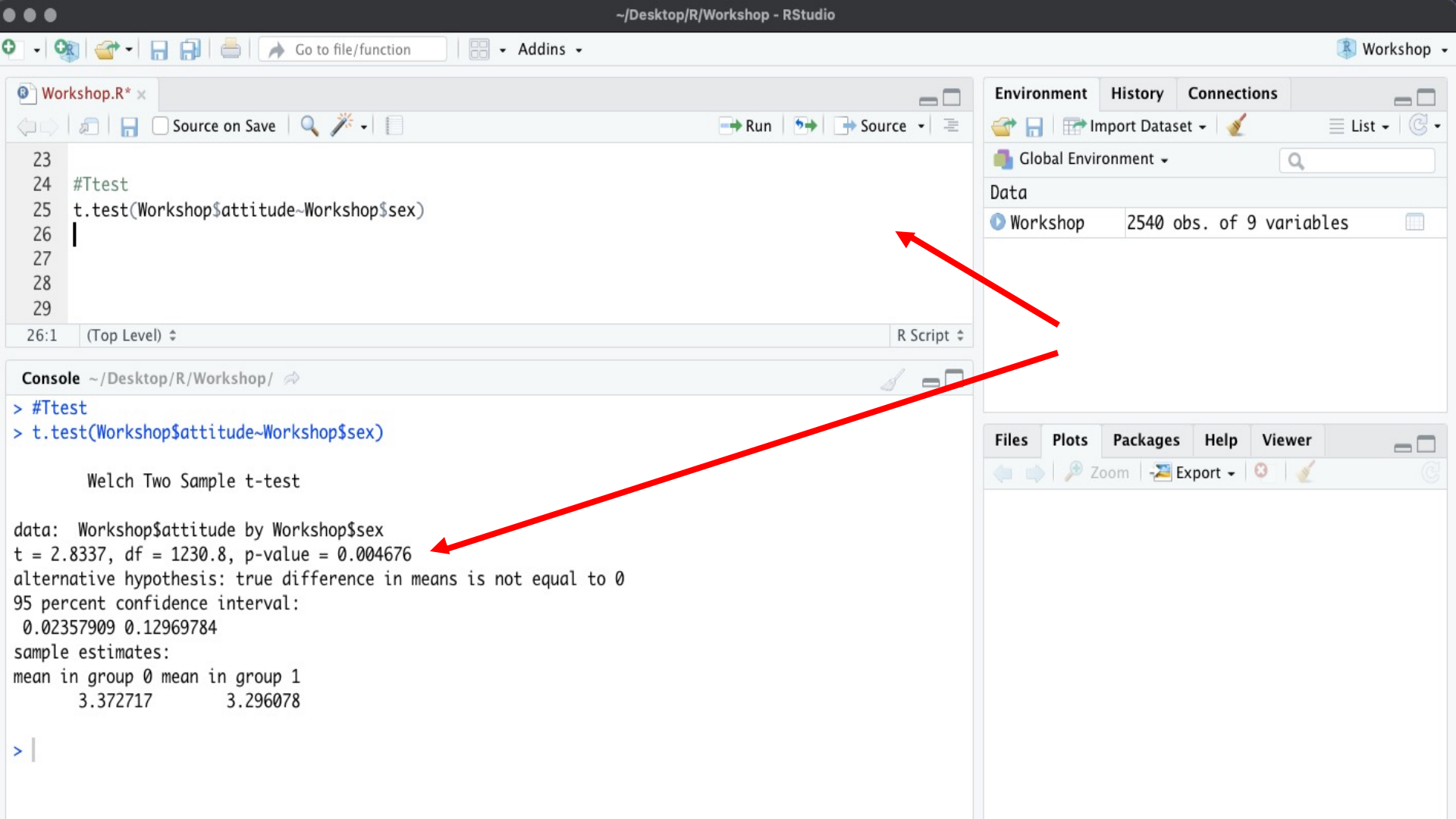
~/Desktop/R/Workshop - RStudio
Go to file/function
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Workshop.R*
Source on Save
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Source
23
24 #Ttest
25 t.test(Workshop$attitude~Workshop$sex)
26
27
28
29
26:1
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
> #Ttest
> t.test(Workshop$attitude~Workshop$sex)
Welch Two Sample t-test
data: Workshop$attitude by Workshop$sex
t = 2.8337, df = 1230.8, p-value = 0.004676
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
0.02357909 0.12969784
sample estimates:
mean in group 0 mean in group 1
3.372717 3.296078
>
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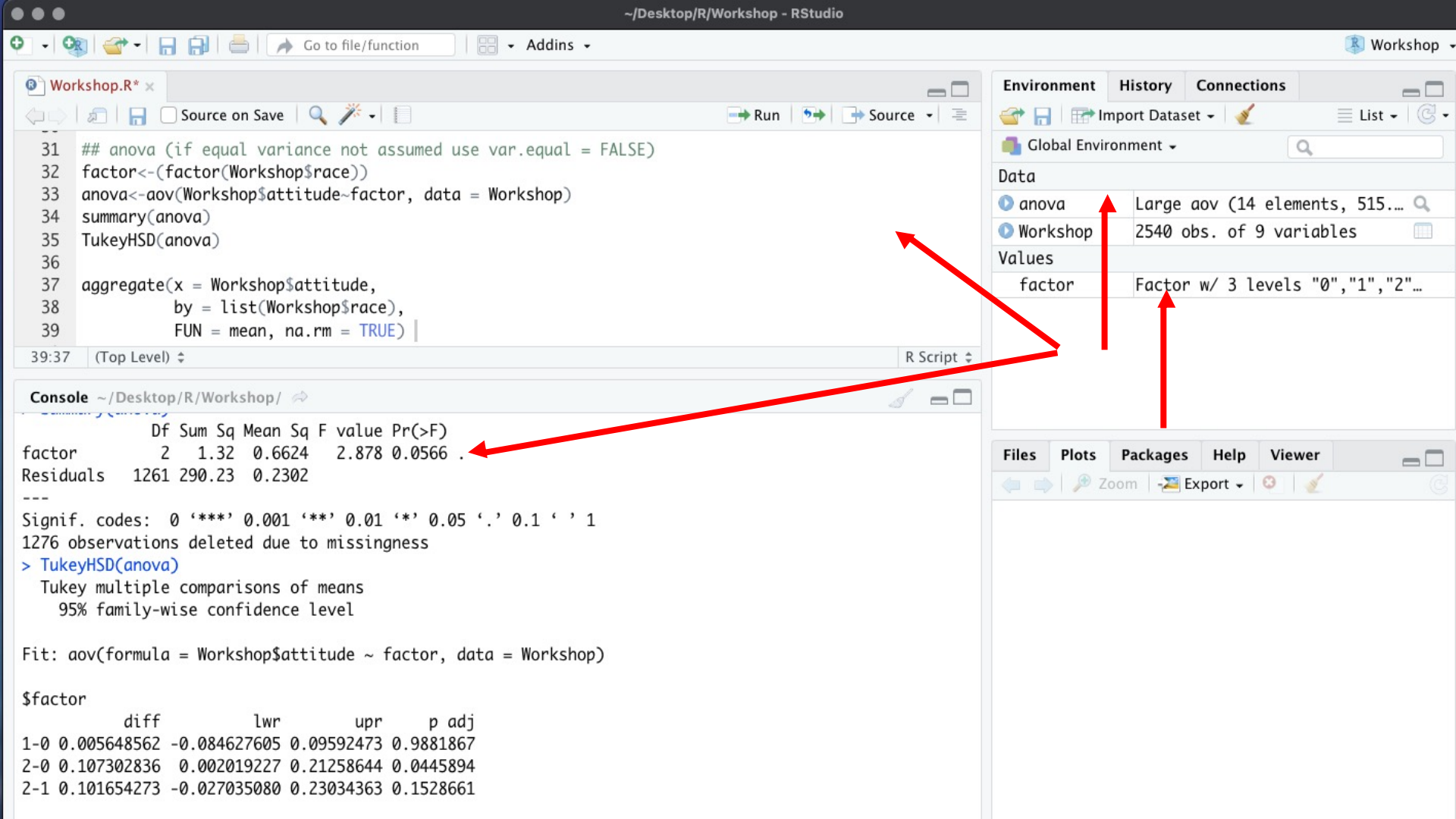
~/Desktop/R/Workshop - RStudio
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Source
31 ## anova (if equal variance not assumed use var.equal = FALSE)
32 factor<-(factor(Workshop$race))
33 anova<-aov(Workshop$attitude~factor, data = Workshop)
34 summary(anova)
35 TukeyHSD(anova)
36
37 aggregate(x = Workshop$attitude,
38 by = list(Workshop$race),
39 FUN = mean, na.rm = TRUE)
39:37 (Top Level)
R Script
Console ~/Desktop/R/Workshop/
Df Sum Sq Mean Sq F value Pr(>F)
factor 2 1.32 0.6624 2.878 0.0566 .
Residuals 1261 290.23 0.2302

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
1276 observations deleted due to missingness
> TukeyHSD(anova)
Tukey multiple comparisons of means
95% family-wise confidence level
Fit: aov(formula = Workshop$attitude ~ factor, data = Workshop)
$factor
diff lwr upr p adj
1-0 0.005648562 -0.084627605 0.09592473 0.9881867
2-0 0.107302836 0.002019227 0.21258644 0.0445894
2-1 0.101654273 -0.027035080 0.23034363 0.1528661
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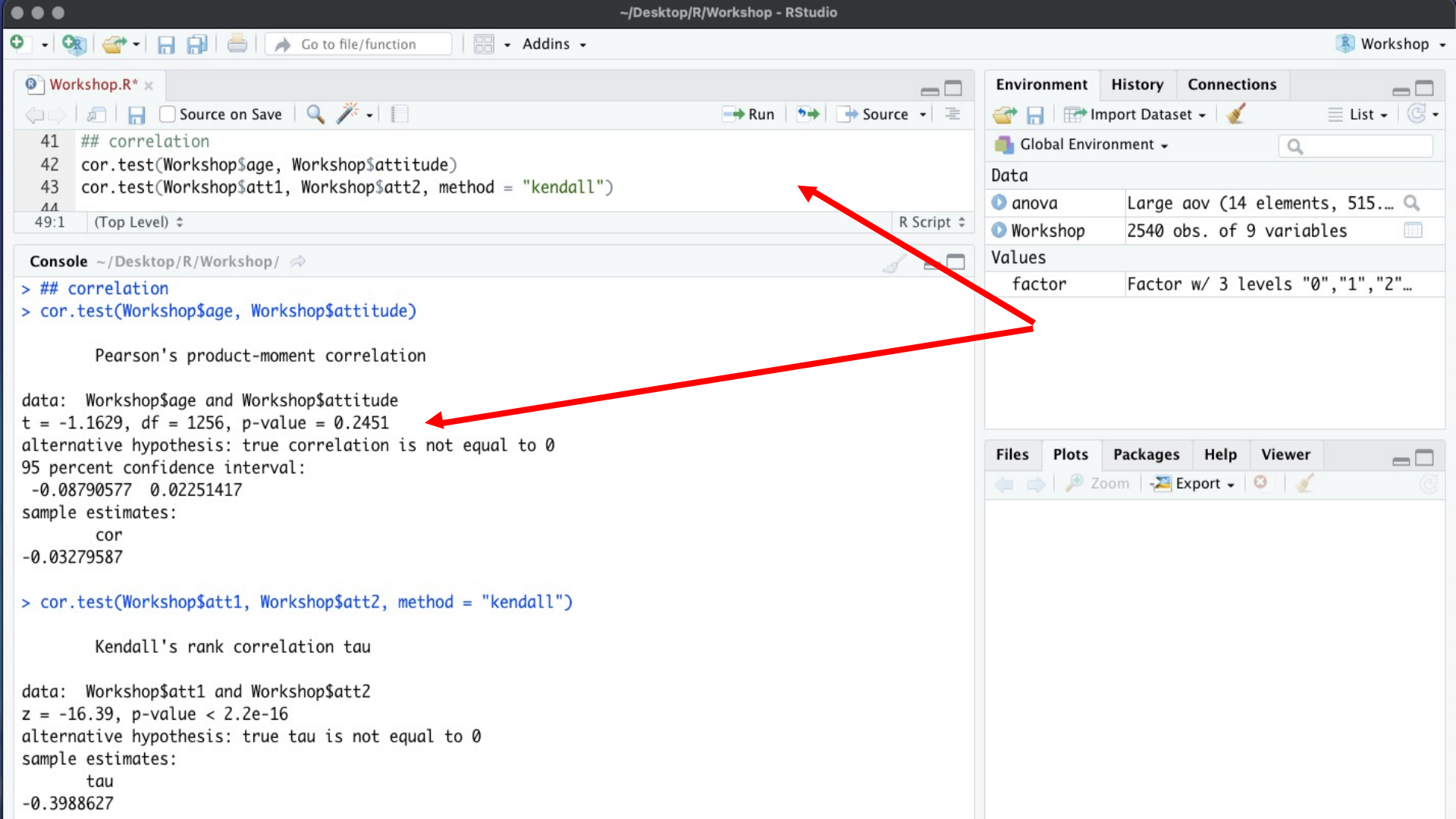
~/Desktop/R/Workshop - RStudio
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Workshop.R*
Source on Save
Run
Source
41 ## correlation
42 cor.test(Workshop$age, Workshop$attitude)
43 cor.test(Workshop$att1, Workshop$att2, method = "kendall")
49:1
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
> ## correlation
> cor.test(Workshop$age, Workshop$attitude)
Pearson's product-moment correlation
data: Workshop$age and Workshop$attitude
t = -1.1629, df = 1256, p-value = 0.2451
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
-0.08790577 0.02251417
sample estimates:
cor
-0.03279587
> cor.test(Workshop$att1, Workshop$att2, method = "kendall")
Kendall's rank correlation tau
data: Workshop$att1 and Workshop$att2
z = -16.39, p-value < 2.2e-16
alternative hypothesis: true tau is not equal to 0
sample estimates:
tau
-0.3988627
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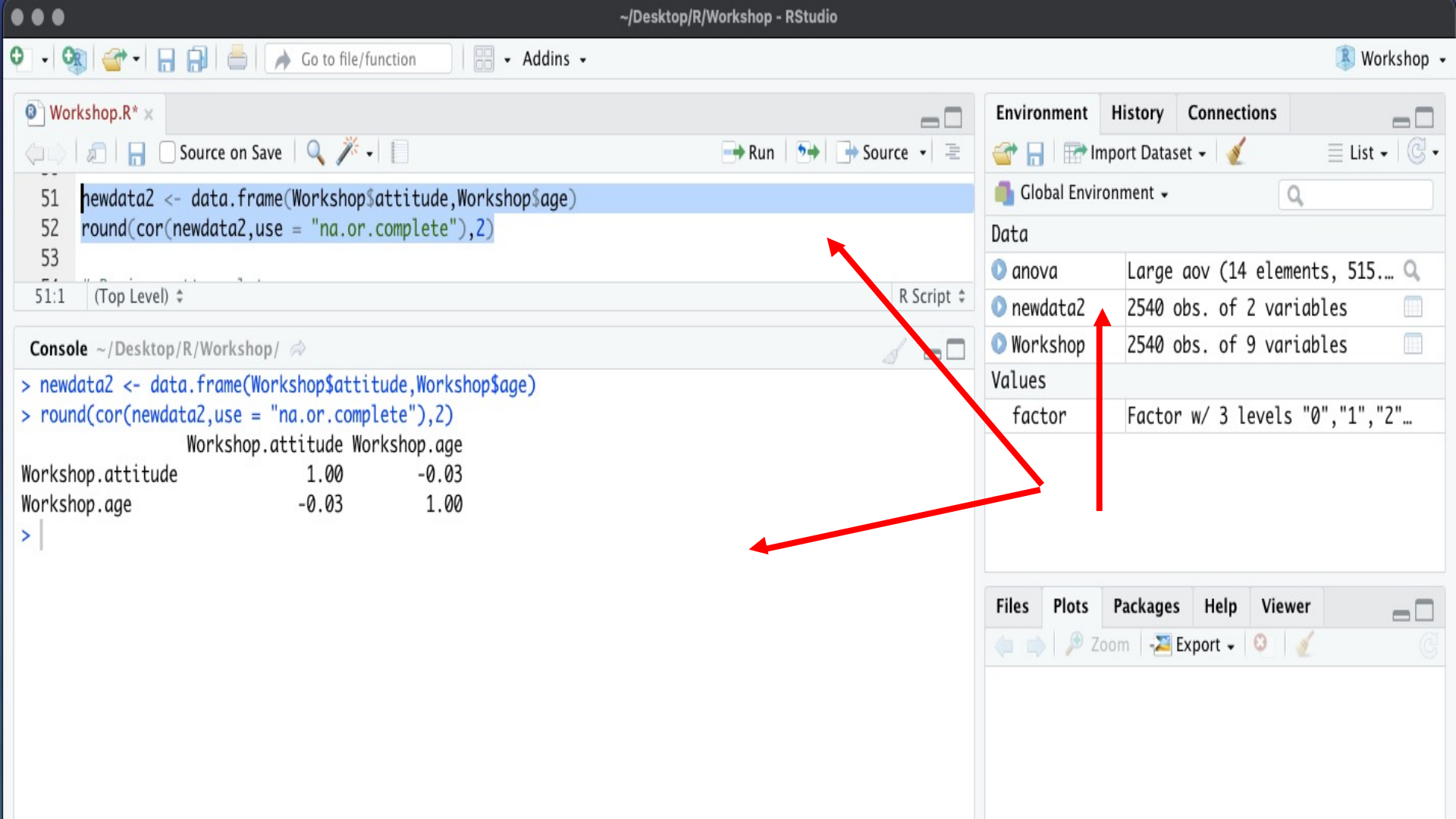
~/Desktop/R/Workshop - RStudio
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Source
51 newdata2 <- data.frame(Workshop$attitude,Workshop$age)
52 round(cor(newdata2,use = "na.or.complete"),2)
53
51:1
(Top Level)
R Script
Console ~/Desktop/R/Workshop/
> newdata2 <- data.frame(Workshop$attitude,Workshop$age)
> round(cor(newdata2,use = "na.or.complete"),2)
Workshop.attitude Workshop.age
Workshop.attitude 1.00 -0.03
Workshop.age -0.03 1.00
>
Environment
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Data
anova Large aov (14 elements, 515...
newdata2 2540 obs. of 2 variables
Workshop 2540 obs. of 9 variables
Values
factor Factor w/ 3 levels "0","1","2"...
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~/Desktop/R/Workshop - RStudio

Go to file/function | Addins | Workshop

Workshop.R*

Source on Save | Run | Source

```
54  # Basic scatter plot
55  library(ggplot2)
56  ggplot(Workshop, aes(x=attitude, y=age)) + geom_point(size=2, shape=23)+geom_smooth(method=lm)
57
```

57:1 (Top Level) | R Script

Console ~/Desktop/R/Workshop/

```
> # Basic scatter plot
> library(ggplot2)
> ggplot(Workshop, aes(x=attitude, y=age)) + geom_point(size=2, shape=23)+geom_smooth(method=lm)
`geom_smooth()` using formula 'y ~ x'
Warning messages:
1: Removed 1282 rows containing non-finite values (stat_smooth).
2: Removed 1282 rows containing missing values (geom_point).
>
```

Environment | History | Connections

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Global Environment

Data	
anova	Large aov (14 elements, 515.…
newdata2	2540 obs. of 2 variables
Workshop	2540 obs. of 9 variables
Values	
factor	Factor w/ 3 levels "0","1","2"…

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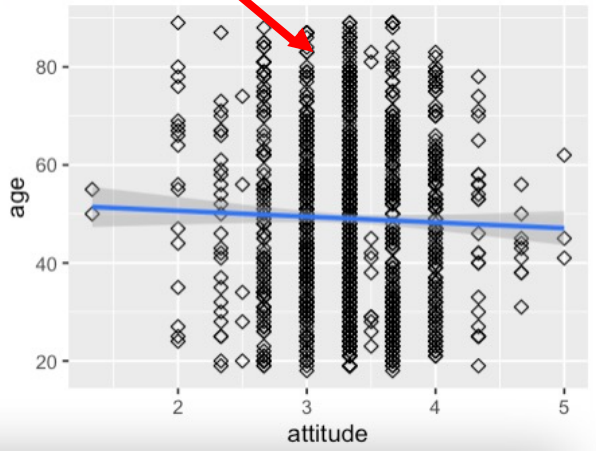
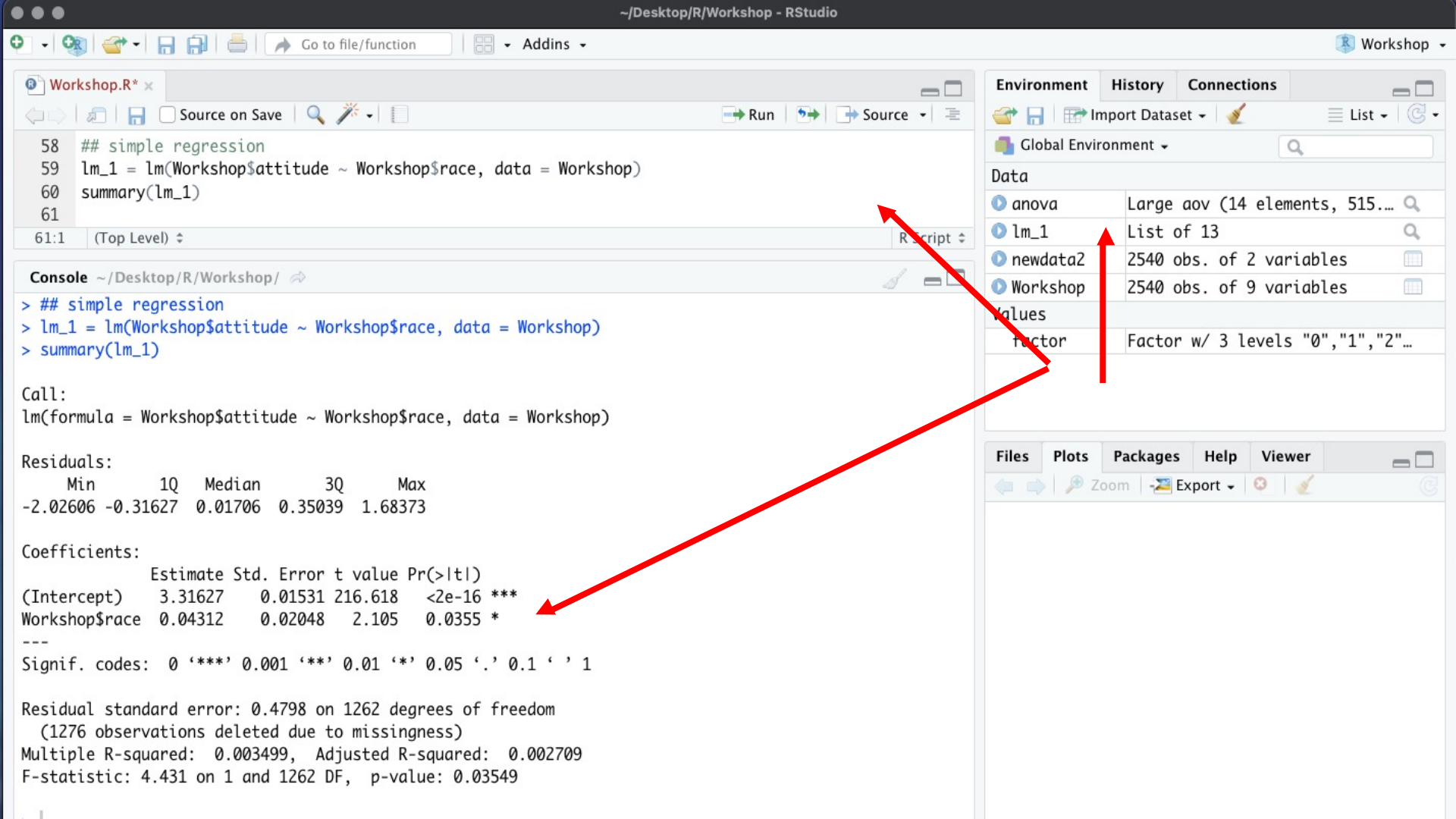


Screenshot


~/Desktop/R/Workshop - RStudio
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Source
58 ## simple regression
59 lm_1 = lm(Workshop$attitude ~ Workshop$race, data = Workshop)
60 summary(lm_1)
61
61:1 (Top Level)
R Script
Console ~/Desktop/R/Workshop/
> ## simple regression
> lm_1 = lm(Workshop$attitude ~ Workshop$race, data = Workshop)
> summary(lm_1)
Call:
lm(formula = Workshop$attitude ~ Workshop$race, data = Workshop)
Residuals:
Min 1Q Median 3Q Max
-2.02606 -0.31627 0.01706 0.35039 1.68373
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 3.31627 0.01531 216.618 <2e-16 ***
Workshop$race 0.04312 0.02048 2.105 0.0355 *

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 0.4798 on 1262 degrees of freedom
(1276 observations deleted due to missingness)
Multiple R-squared: 0.003499, Adjusted R-squared: 0.002709
F-statistic: 4.431 on 1 and 1262 DF, p-value: 0.03549
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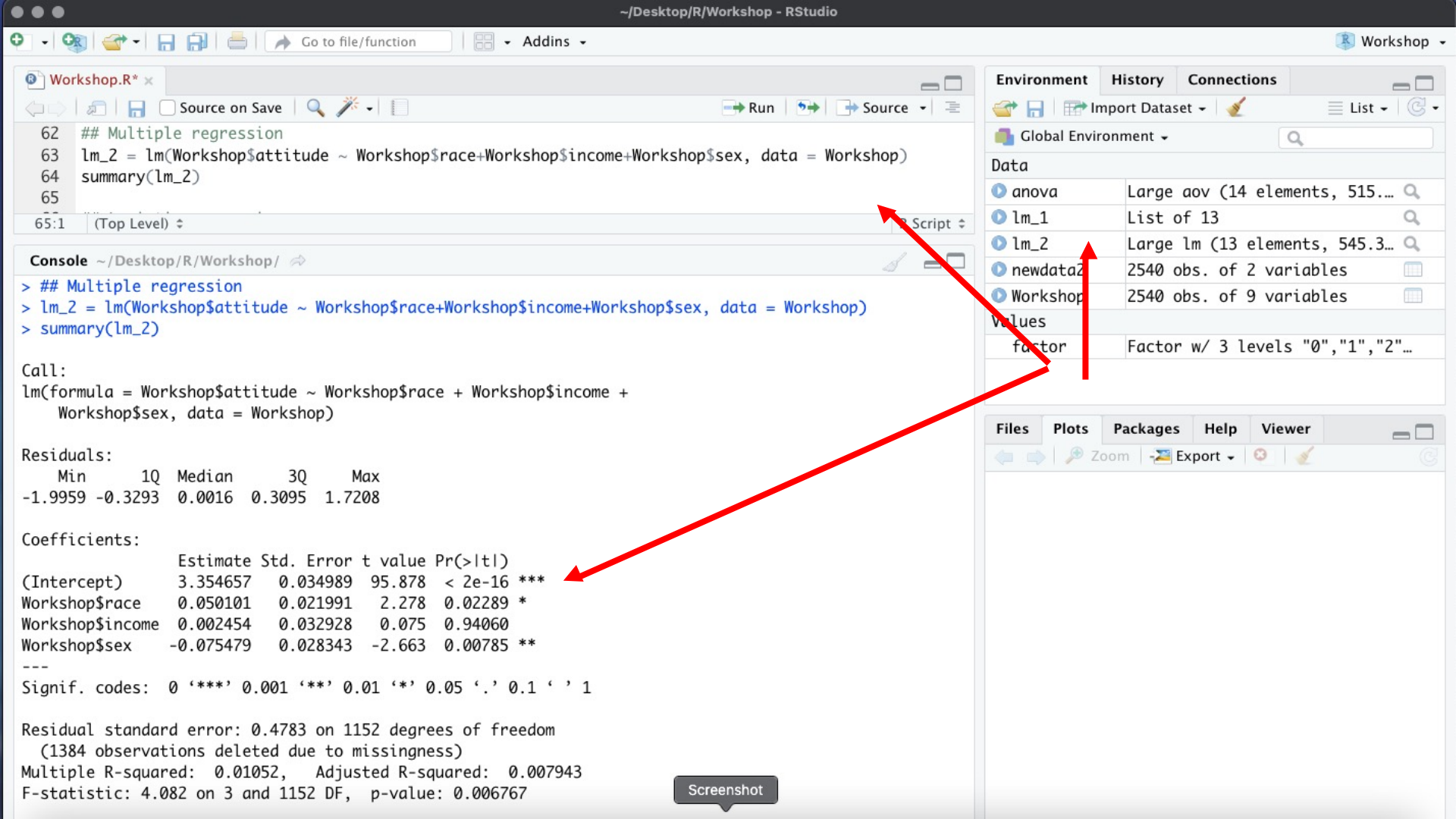
~/Desktop/R/Workshop - RStudio
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Run
Source
62 ## Multiple regression
63 lm_2 = lm(Workshop$attitude ~ Workshop$race+Workshop$income+Workshop$sex, data = Workshop)
64 summary(lm_2)
65
65:1 (Top Level)
Script
Console ~/Desktop/R/Workshop/
> ## Multiple regression
> lm_2 = lm(Workshop$attitude ~ Workshop$race+Workshop$income+Workshop$sex, data = Workshop)
> summary(lm_2)
Call:
lm(formula = Workshop$attitude ~ Workshop$race + Workshop$income +
Workshop$sex, data = Workshop)
Residuals:
Min 1Q Median 3Q Max
-1.9959 -0.3293 0.0016 0.3095 1.7208
Coefficients:
Estimate Std. Error t value Pr(>|t|)
(Intercept) 3.354657 0.034989 95.878 < 2e-16 ***
Workshop$race 0.050101 0.021991 2.278 0.02289 *
Workshop$income 0.002454 0.032928 0.075 0.94060
Workshop$sex -0.075479 0.028343 -2.663 0.00785 **

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 0.4783 on 1152 degrees of freedom
(1384 observations deleted due to missingness)
Multiple R-squared: 0.01052, Adjusted R-squared: 0.007943
F-statistic: 4.082 on 3 and 1152 DF, p-value: 0.006767
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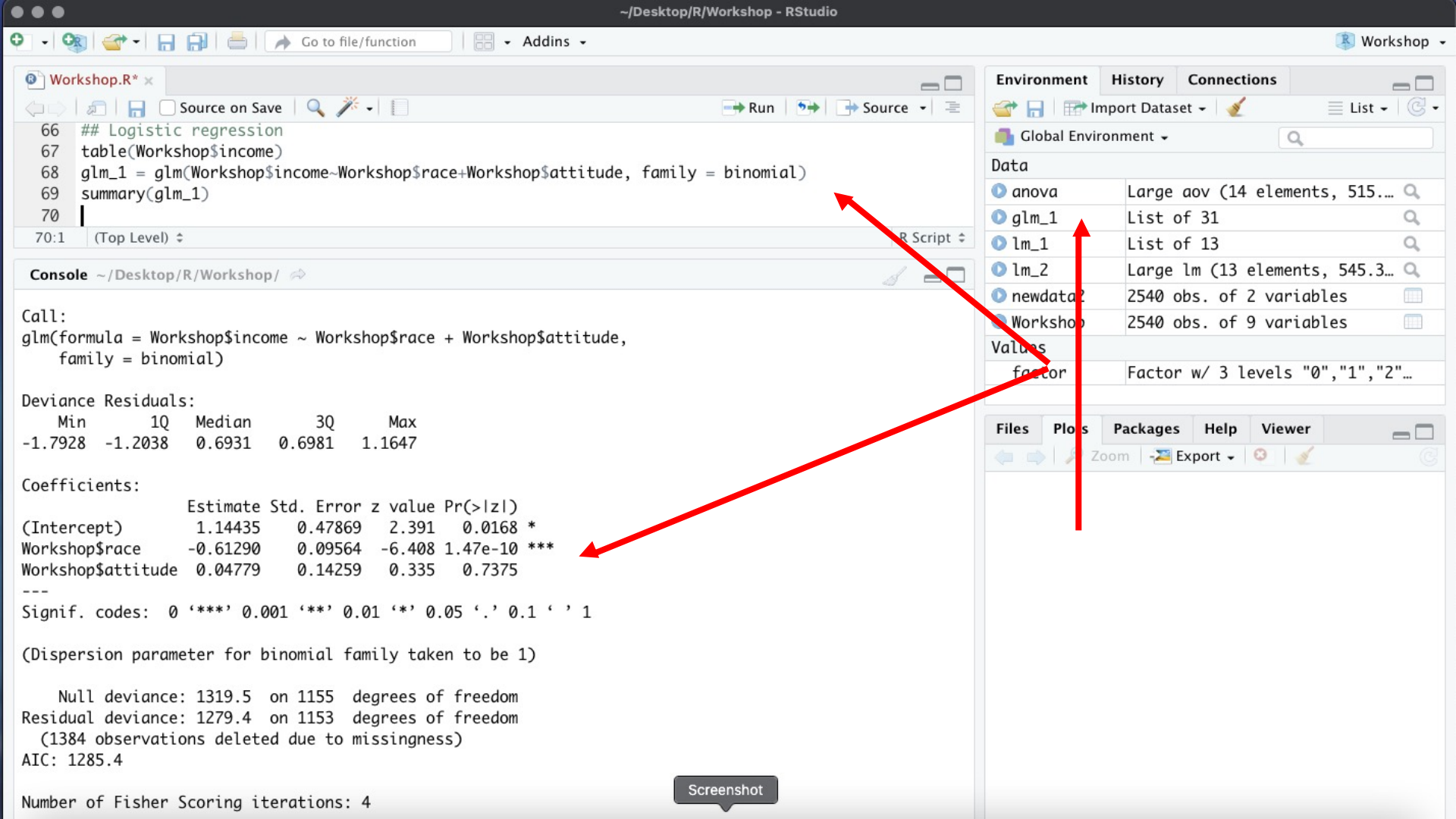
~/Desktop/R/Workshop - RStudio
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Source on Save
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Source
66 ## Logistic regression
67 table(Workshop$income)
68 glm_1 = glm(Workshop$income~Workshop$race+Workshop$attitude, family = binomial)
69 summary(glm_1)
70
70:1 (Top Level)
R Script
Console ~/Desktop/R/Workshop/
Call:
glm(formula = Workshop$income ~ Workshop$race + Workshop$attitude,
family = binomial)
Deviance Residuals:
Min 1Q Median 3Q Max
-1.7928 -1.2038 0.6931 0.6981 1.1647
Coefficients:
Estimate Std. Error z value Pr(>|z|)
(Intercept) 1.14435 0.47869 2.391 0.0168 *
Workshop$race -0.61290 0.09564 -6.408 1.47e-10 ***
Workshop$attitude 0.04779 0.14259 0.335 0.7375

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
(Dispersion parameter for binomial family taken to be 1)
Null deviance: 1319.5 on 1155 degrees of freedom
Residual deviance: 1279.4 on 1153 degrees of freedom
(1384 observations deleted due to missingness)
AIC: 1285.4
Number of Fisher Scoring iterations: 4
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lm_1
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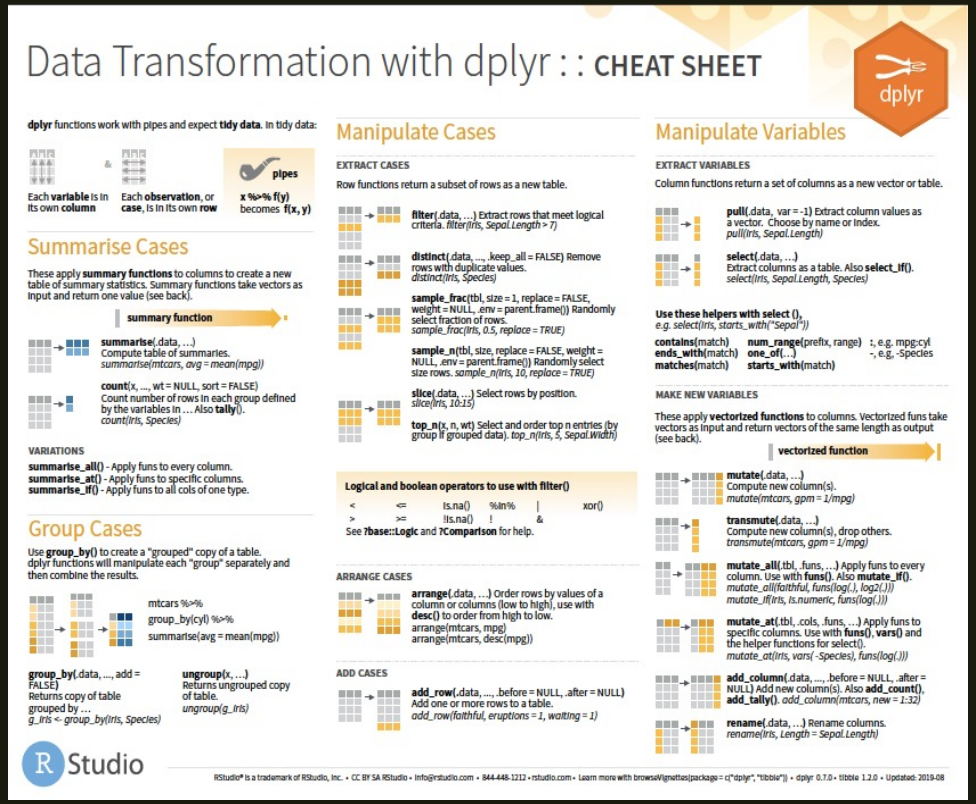

Other Resources for R Studio

- R Studio Education Center
  - https://education.rstudio.com
- R Studio Support Forum
  - https://support.rstudio.com/hc/en-us
- R Studio Cheat Sheets
  - https://www.rstudio.com/resources/cheatsheets/

Q&A

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&

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EVALUATION