

Statistical Software & Social Work: Training on Jamovi & R



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& 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

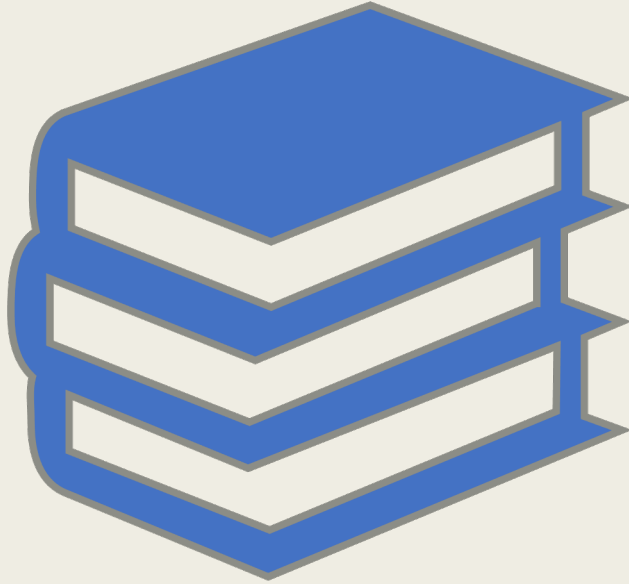
Introduction to Jamovi

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

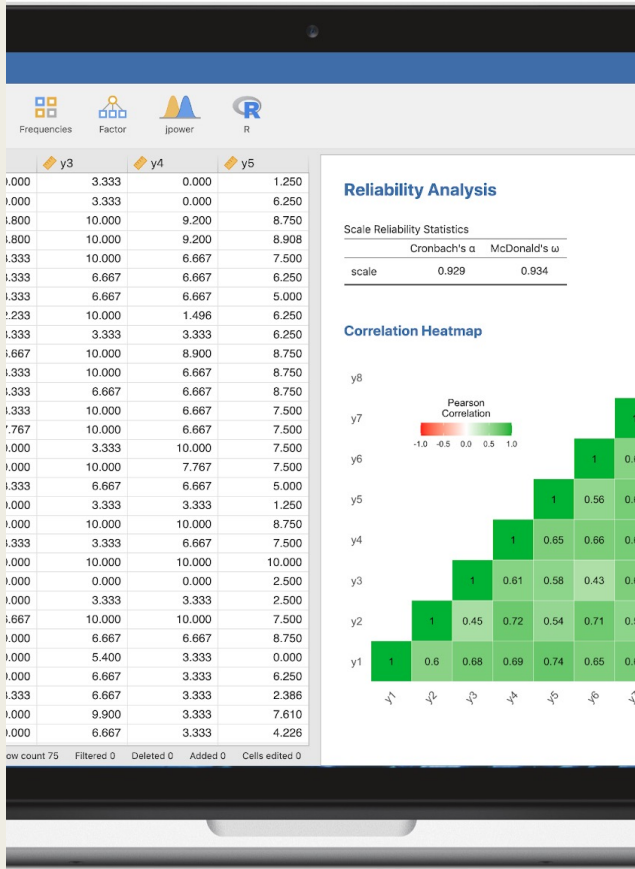
- IV = categorical (2), DV = continuous

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>

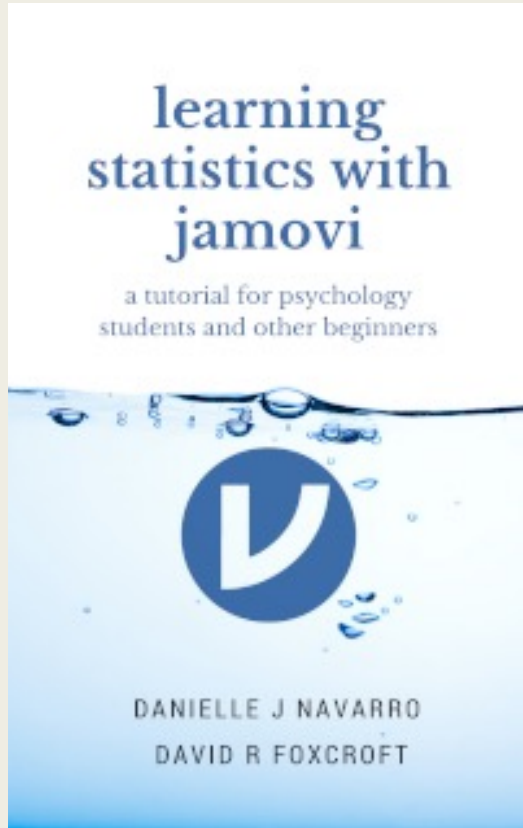
Downloading Jamovi

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/>



Data

Analyses

Edit



Exploration



T-Tests



ANOVA



Regression



Frequencies



Factor



R



Modules

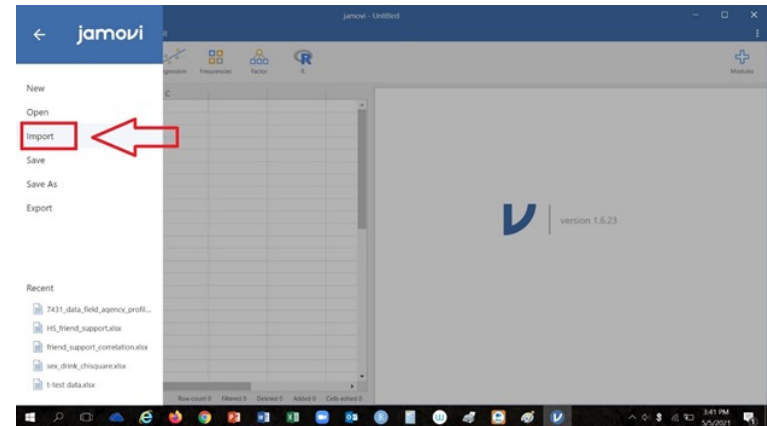
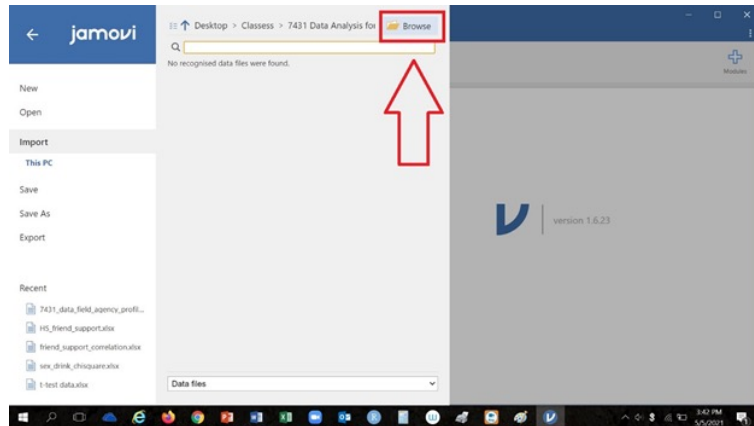
JAMOVİ INTERFACE - OPENING UP

version 1.6.23

Ready Filters 0 Row count 0 Filtered 0 Deleted 0 Added 0 Cells edited 0

3:25 PM

5/5/2021



Data View

jamovi - Untitled

Menu: Data, Analyses, Edit

Tools: Exploration, T-Tests, ANOVA, Regression, Frequencies, Factor, R, Modules

	Response...	Gss year f...	Marital st...	Age of res...	Highest y...	Response
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	

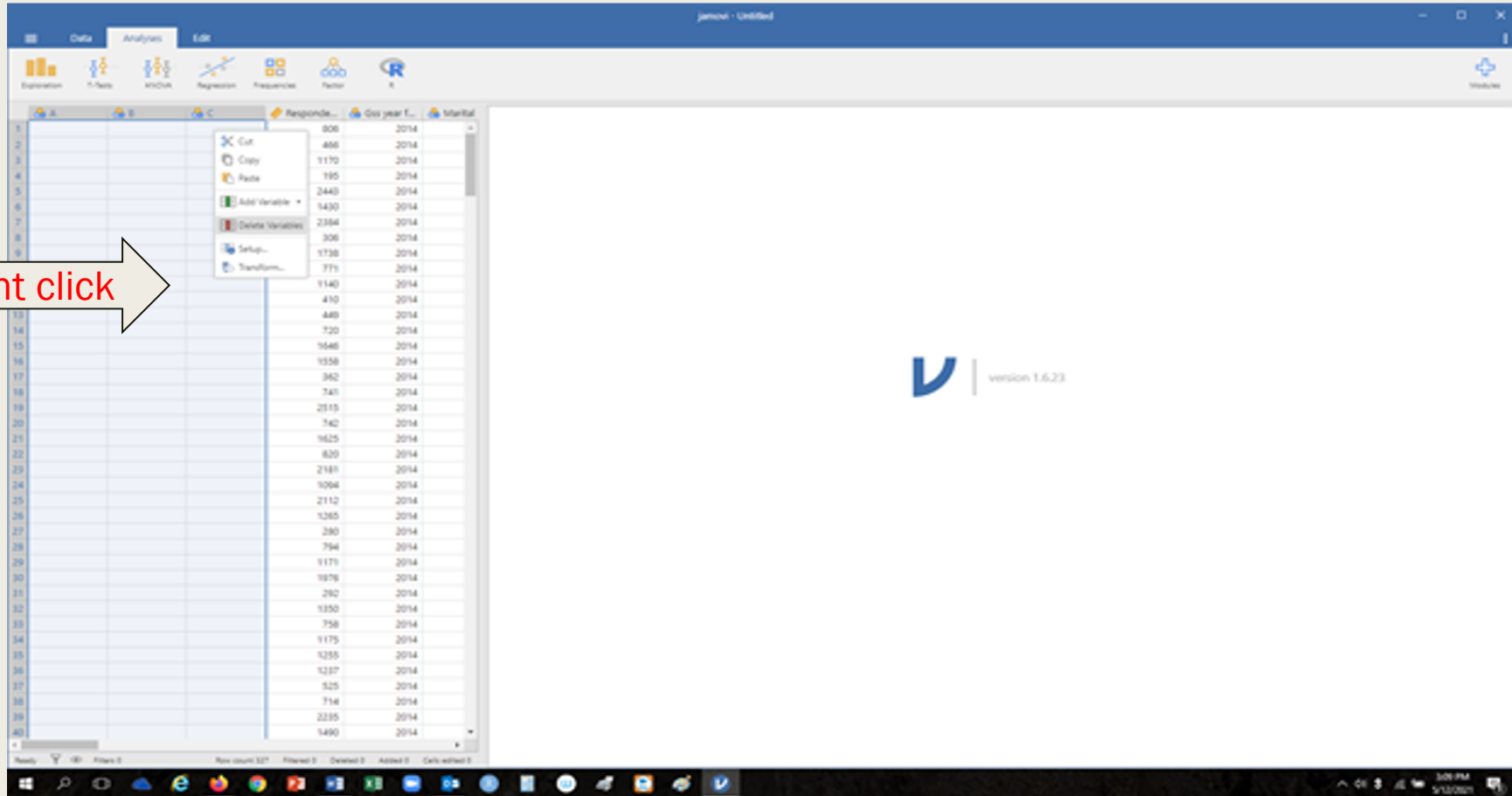
Ready | Filters 0 | Row count 327 | Filtered 0 | Deleted 0 | Added 0 | Cells edited 0

version 1.6.23

3:46 PM 5/5/2021

Cleaning & Coding in Jamovi

Right click



The screenshot displays the Jamovi software interface. The top menu bar includes 'Data', 'Analyses', and 'Edit'. Below the menu bar is a toolbar with icons for Exploration, T-Tests, ANCOVA, Regression, Frequencies, Factor, and R. The main window is divided into two panes. The left pane shows a data grid with columns labeled 'A', 'B', 'C', 'Response...', 'Gos year E...', and 'Island'. The right pane is empty. A right-click context menu is open over the data grid, showing options: Cut, Copy, Paste, Add Variable..., Delete Variables..., Setup..., and Transform... The status bar at the bottom indicates 'Row count: 327', 'Filtered: 0', 'Ordered: 0', 'Added: 0', and 'Cells edited: 0'. The Windows taskbar is visible at the bottom of the screen.

Row	A	B	C	Response...	Gos year E...	Island
1				806	2014	
2				466	2014	
3				1170	2014	
4				195	2014	
5				2440	2014	
6				1430	2014	
7				2384	2014	
8				306	2014	
9				1738	2014	
10				771	2014	
11				1140	2014	
12				410	2014	
13				449	2014	
14				720	2014	
15				1646	2014	
16				1358	2014	
17				362	2014	
18				741	2014	
19				2515	2014	
20				742	2014	
21				1625	2014	
22				820	2014	
23				2181	2014	
24				1094	2014	
25				2112	2014	
26				1265	2014	
27				280	2014	
28				794	2014	
29				1171	2014	
30				1876	2014	
31				262	2014	
32				1350	2014	
33				758	2014	
34				1175	2014	
35				1255	2014	
36				1237	2014	
37				525	2014	
38				714	2014	
39				2235	2014	
40				1490	2014	

Cleaning & Coding: Renaming Variables

Double click on variable

Drop down will appear

DATA VARIABLE

Marital status

Description

Measure type **Nominal**

Data type **Integer** (auto)

Missing values

Levels

1

2

3

4

Retain unused levels

Respondent ID	Year	Marital status	Age of respondent	Highest year of school completed	Response
1	2014	1	47	16	
2	2014	2	74	12	
3	2014	3	53	12	
4	2014	5	36	13	
5	2014	3	42	14	
6	2014	1	34	16	
7	2014	5	23	17	
8	2014	3	65	16	
9	2014	1	62	16	
10	2014	5	31	19	
11	2014	5	23	10	
12	2014	1	34	16	
13	2014	1	60	20	
14	2014	5	29	16	
15	2014	5	41	12	
16	2014	1	57	15	
17	2014	3	40	12	
18	2014	1	38	18	
19	2014	2	46	12	
20	2014	3	52	8	
21	2014	1	44	14	
22	2014	5	55	12	
23	2014	3	40	16	
24	2014	3	58	15	
25	2014	5	27	15	
26	2014	3	54	15	

Measure type **Nominal**

Data type **Integer**

Missing values

Nominal

Ordinal

Continuous

ID

Packages/Modules in Jamovi

The screenshot displays the Jamovi software interface. On the left, a data table is visible with columns: age, prosocial, negfriend, posfriend, peersupp, and churches. The table contains 32 rows of data. The main panel on the right is titled 'jamovi' and shows a list of available modules. A red box highlights the 'Modules' panel, and a red arrow points to the 'Modules' button in the top right corner of the interface.

Modules Panel:

- scatr 1.2.0** (Real Selzer)
Allows you to produce several types of explorative plots such as scatter plots and pareto charts. You can find it under the 'Exploration' menu.
[INSTALL](#)
- Rj - Editor to run R code inside jamovi 1.1.0** (Jonathan Love)
Provides an editor allowing you to enter R code, and analyse your data using R inside jamovi.
[INSTALLED](#)
- jpower - Power Analysis for Common Research Designs 0.1.2** (Richard D. Morey, Real Selzer)
Power analysis for common research designs
[INSTALL](#)
- gamlj - General Analyses for Linear Models in jamovi 2.4.0**

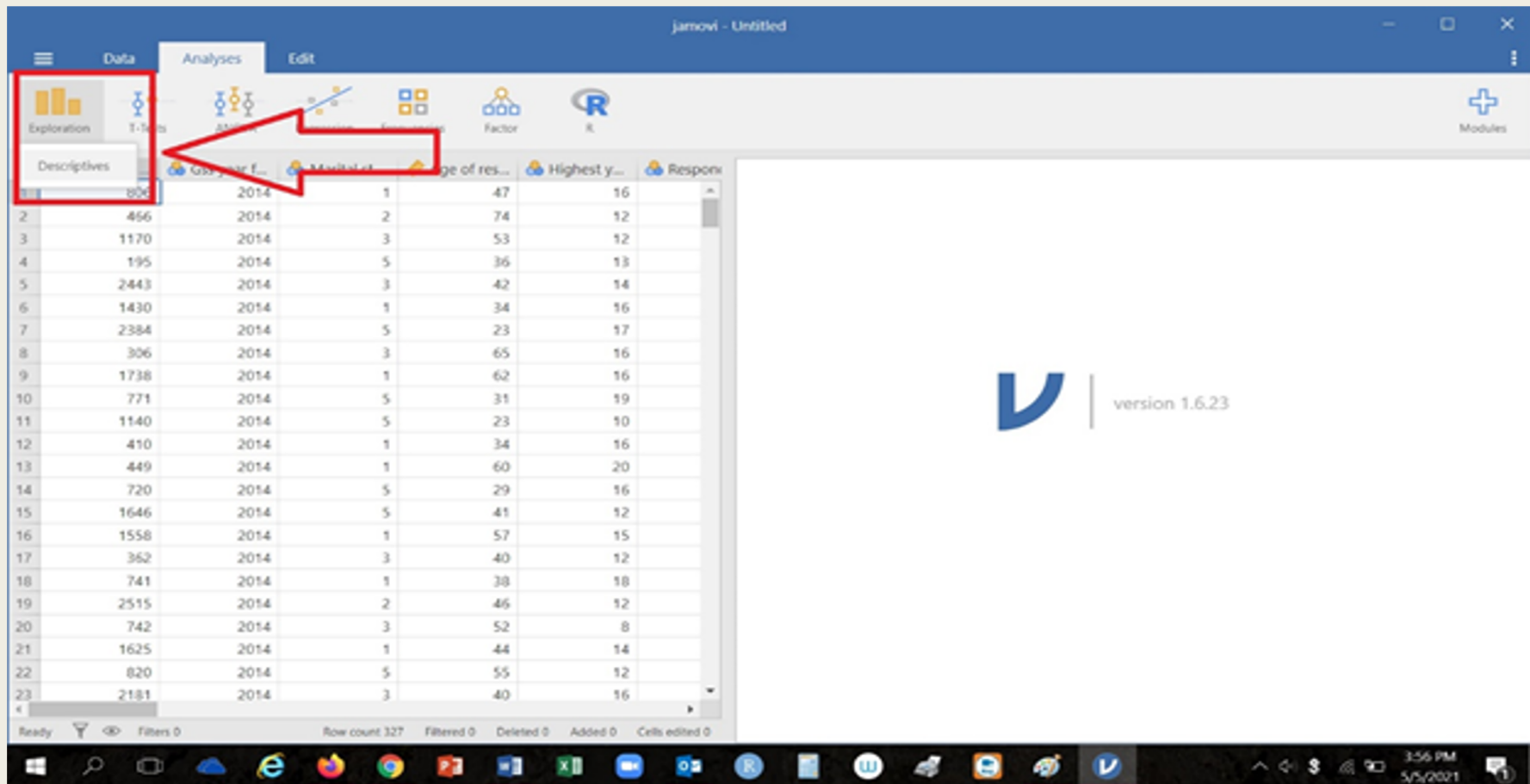
Data Table:

	age	prosocial	negfriend	posfriend	peersupp	churches
18	1.00	3.333	3.0	1.0		
18	2.50	3.000	1.5	2.5		
18	2.00	3.667	1.0	3.0		
18	3.25	1.333	3.5	2.0		
18	3.25	2.667	4.5	3.0		
18	2.75	1.000	5.0	2.5		
18	3.50	1.000	4.5	2.5		
18	3.25	1.000	3.0	1.5		
18	3.75	1.333	4.0	3.0		
18	3.50	1.000	5.0	3.0		
17	2.00	1.000	3.0	1.5		
17	2.00	1.667	3.0	3.0		
17	2.00	2.667	4.0	2.5		
17	2.00	2.667	2.0	0.0		
17	3.00	1.667	3.0	0.0		
17	1.75	1.333	3.0	2.5		
17	2.25	1.000	3.0	1.0		
17	2.00	2.000	3.5	3.0		
17	3.00	1.000	4.0	2.0		
17	2.25	2.000	2.5	2.0		
17	2.00	2.000	3.5	2.5		
17	2.00	3.667	3.5	2.0		
17	2.00	1.667	3.0	2.0		
17	2.75	2.000	2.0	2.0		
17	2.75	1.667	4.5	3.0		
17	2.75	1.667	4.0	2.5		
17	2.25	2.333	3.0	2.0		
17	2.50	1.000	4.0	2.0		
17	2.75	1.000	3.5	2.5		
17	3.50	1.667	5.0	2.5		
17	2.50	1.000	3.5	3.0		
17	2.75	1.000	3.5	3.0		
17	2.75	1.333	5.0	1.5		
17	3.75	1.000	5.0	2.5		
17	3.25	1.333	4.0	2.0		
17	3.25	1.667	5.0	3.0		
17	3.50	1.000	4.5	2.0		
17	3.00	1.333	4.0	2.5		
17	3.50	1.000	1.0	2.5		
17	3.00	1.000	1.0	0.0		
17	3.00	2.333	1.0	2.0		
17	2.75	3.000	2.5	3.0		
17	3.50	1.000	4.0	3.0		

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).

Descriptive Statistics



The screenshot displays the Jamovi software interface, titled "jamovi - Untitled". The "Analyses" menu is open, and the "Descriptives" option is highlighted with a red box. A red arrow points from the "Descriptives" option to the data table. The data table contains 23 rows of data with columns for various variables. The status bar at the bottom indicates "Ready", "Filters: 0", "Row count: 327", "Filtered: 0", "Deleted: 0", "Added: 0", and "Cells edited: 0". The Jamovi logo and version number "version 1.6.23" are visible on the right side of the interface.

1	804	2014	1	47	16
2	456	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	352	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

Interpreting Output: Descriptive Statistics

The screenshot displays the Jamovi software interface. The top menu bar includes 'Data', 'Analyses', and 'Edit'. Below the menu is a toolbar with icons for Exploration, T-Tests, ANOVA, Regression, Frequencies, Factor, and R. The main workspace is divided into two panels: 'Descriptives' on the left and 'Results' on the right.

In the 'Descriptives' panel, a list of variables is shown on the left, with 'Highest year of school completed' selected. A red box highlights the arrow button used to move variables to the 'Variables' list on the right. The 'Variables' list contains 'Age of respondent'. Below this, the 'Split by' section is empty.

The 'Results' panel displays the output for the 'Descriptives' analysis. A red box highlights the 'Descriptives' table, which shows the following statistics for 'Age of respondent':

Descriptives	
	Age of respondent
N	327
Missing	0
Mean	45.7
Median	46
Standard deviation	13.2
Minimum	19
Maximum	87

At the bottom of the 'Results' panel, there is a 'References' section with the following text:

[1] The jamovi project (2021). jamovi. (Version 1.6) [Computer Software]. Retrieved from

Interpreting Output: Descriptive Statistics

The screenshot shows the Jamovi software interface. The top menu bar includes 'Data', 'Analyses', and 'Edit'. The 'Analyses' menu is open, showing options like Exploration, T-Tests, ANOVA, Regression, Frequencies, Factor, and R. The 'Descriptives' panel on the left is active, showing various statistical options. The 'Frequencies' output is displayed on the right, showing a table of race frequencies.

Descriptives

☒ Frequency tables

Statistics

Sample Size

☒ N ☒ Missing

Percentile Values

☐ Cut points for 4 equal groups

☐ Percentiles 25,50,75

Dispersion

☒ Std. deviation ☒ Minimum

☒ Variance ☒ Maximum

☒ Range ☐ S. E. Mean

☐ IQR

Central Tendency

☒ Mean

☒ Median

☒ Mode

☐ Sum

Distribution

☐ Skewness

☐ Kurtosis

Normality

☐ Shapiro-Wilk

Frequencies

Frequencies of Race of respondent

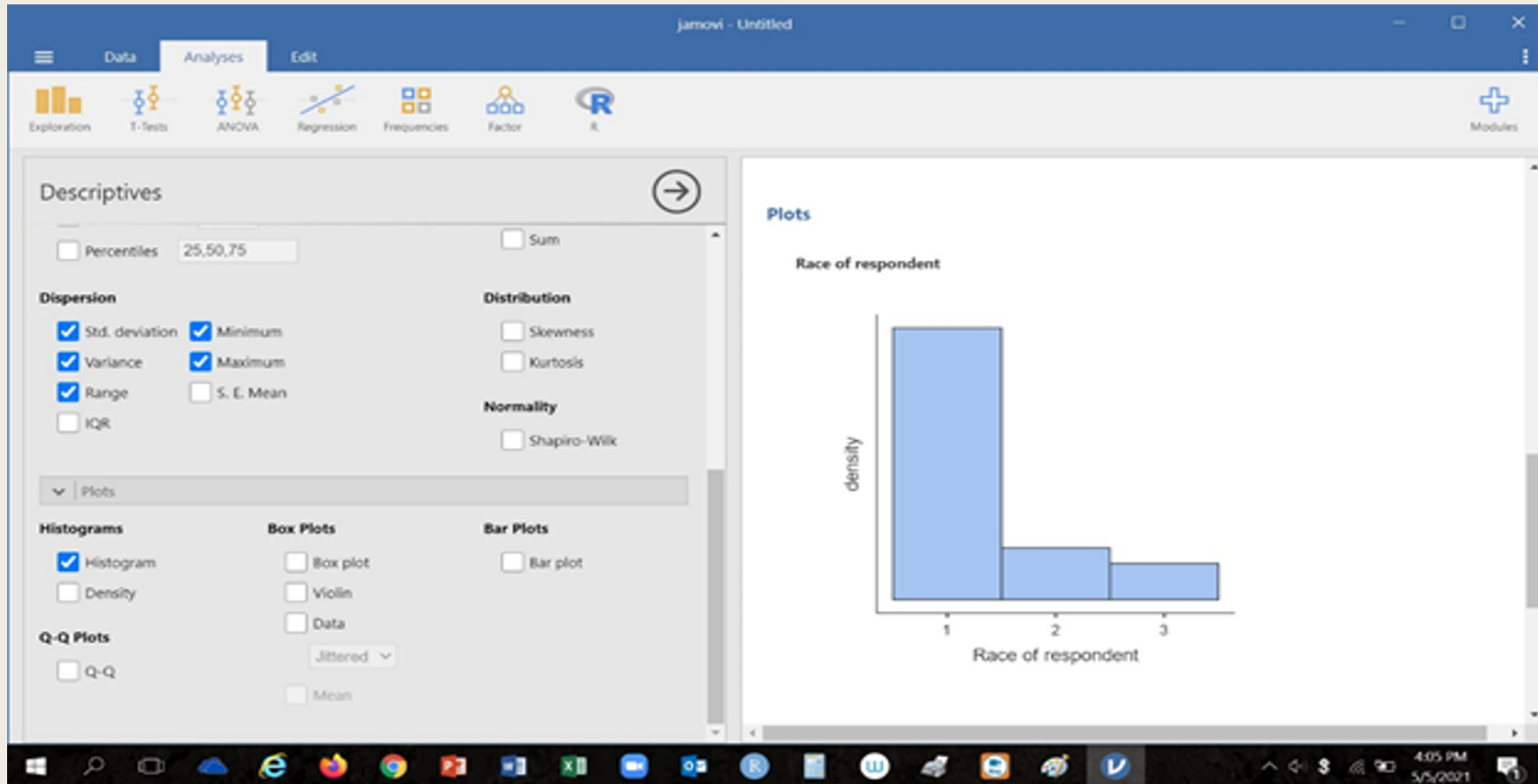
Levels	Counts	% of Total	Cumulative %
1	247	75.5 %	75.5 %
2	47	14.4 %	89.9 %
3	33	10.1 %	100.0 %

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).

Interpreting Output: Descriptive Statistics



T-test: Paired Samples

Select appropriate t-test

Select & pair variables

The screenshot displays the JAMOVI software interface for performing a Paired Samples T-Test. The window title is "jamovi - before_after_ttest". The "Analyses" menu is open, showing options like ANOVA, Regression, Frequencies, Factor, and R. The "Paired Samples T-Test" configuration panel is active, showing the following settings:

- Paired Variables:** "Pre test score" and "Post test score" are selected and paired.
- Tests:** "Student's" is selected (checked).
- Additional Statistics:** "Effect size" and "Descriptives" are selected (checked).
- Hypothesis:** "Measure 1 = Measure 2" is selected.
- Missing values:** "Exclude cases analysis by analysis" is selected.

The "Results" panel displays the following tables:

Paired Samples T-Test

		statistic	df	p	Effect Size	
Pre test score	Post test score	Student's t	3.60	9.00	0.006	Cohen's d
						1.14

Descriptives

	N	Mean	Median	SD	SE
Pre test score	10	7.30	7.00	1.70	0.539
Post test score	10	5.60	5.50	1.17	0.371

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).

ANOVA

Select
appropriate
ANOVA

The screenshot shows the jamovi software interface with the title bar "jamovi - updated immigrant data gss". The "Analyses" menu is open, and the "ANOVA" option is highlighted with a red box. A red arrow points from the text "Select appropriate ANOVA" to this box. The main window displays a data table with columns: "Gss year f...", "Marital st...", "Age of res...", "Highest y...", and "Response". The data table contains 327 rows of data. The status bar at the bottom indicates "Row count 327", "Filtered 0", "Deleted 0", "Added 0", and "Cells edited 0". The jamovi logo and version "version 1.6.23" are visible in the bottom right corner.

	Gss year f...	Marital st...	Age of res...	Highest y...	Response
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
24	1094	2014	3	58	15
25	2112	2014	5	27	15
26	1265	2014	3	54	15
27	280	2014	3	50	14
28	794	2014	5	30	12
29	1171	2014	5	37	16
30	1976	2014	3	44	11
31	292	2014	1	57	12
32	1350	2014	1	60	16
33	758	2014	1	54	14
34	1175	2014	5	30	14
35	1255	2014	3	50	12
36	1237	2014	1	44	15
37	525	2014	5	45	14
38	714	2014	1	61	16
39	2235	2014	1	48	18
40	1490	2014	3	51	12
41	1557	2014	4	49	11
42	642	2014	1	42	16
43	2034	2014	5	49	10
44	367	2014	1	60	16

ANOVA

jamovi - updated immigrant data.gss

One-Way ANOVA

Dependent Variables

- 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

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

- ☐ 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	0.4289
	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

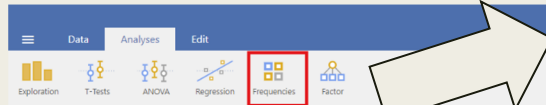
Tukey Post-Hoc Test - Total family income

		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



The screenshot shows the SPSS 'Analyses' menu with the 'Frequencies' option highlighted. A yellow arrow points from the 'Frequencies' icon to the 'Chi-Square' section of the overlay menu.

Response...	Gas year f...	Marital st...	Age of res...	Highest y...	Response
806	2014	1	47	16	
466	2014	2	74	12	
1170	2014	3	53	12	
195	2014	5	36	13	
2443	2014	3	42	14	
1430	2014	1	34	16	
2384	2014	5	23	17	
306	2014	3	65	16	
1738	2014	1	62	16	
771	2014	5	31	19	
1140	2014	5	23	10	
410	2014	1	34	16	
449	2014	1	60	20	
720	2014	5	29	16	
1646	2014	5	41	12	
1558	2014	1	57	15	
362	2014	3	40	12	
741	2014	1	38	18	
2515	2014	2	46	12	
742	2014	3	52	8	
1625	2014	1	44	14	
820	2014	5	55	12	
2181	2014	3	40	16	
1094	2014	3	58	15	
2112	2014	5	27	15	
1265	2014	3	54	15	
280	2014	3	50	14	
794	2014	5	30	12	
1171	2014	5	37	16	
1976	2014	3	44	11	
292	2014	1	57	12	
1350	2014	1	60	16	
758	2014	1	54	14	
1175	2014	5	30	14	
1255	2014	3	50	12	
1237	2014	1	44	15	
525	2014	5	45	14	
714	2014	1	61	16	
2235	2014	1	48	18	
1490	2014	3	51	12	
1557	2014	4	49	11	
642	2014	1	42	16	
2034	2014	5	49	10	

One Sample Proportion Tests

2 Outcomes

Binomial test

N Outcomes

χ^2 Goodness of fit

Contingency Tables

Independent Samples

χ^2 test of association

Paired Samples

McNemar test

Log-Linear Regression

Chi-Square

jamovi - chi_square_SEX_DRINK

ExplorationT-TestsANOVARegressionFrequenciesFactorR

Contingency Tables

Rows
sex

Columns
drink

Counts (optional)

Layers

Statistics

Tests
☒ χ^2
☐ χ^2 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 %
Compare rows

Hypothesis
☒ Group 1 \neq Group 2
☐ Group 1 > Group 2
☐ Group 1 < Group 2

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

sex	drink		Total
	0	1	
0	15	96	111
1	45	138	183
Total	60	234	294

χ^2 Tests

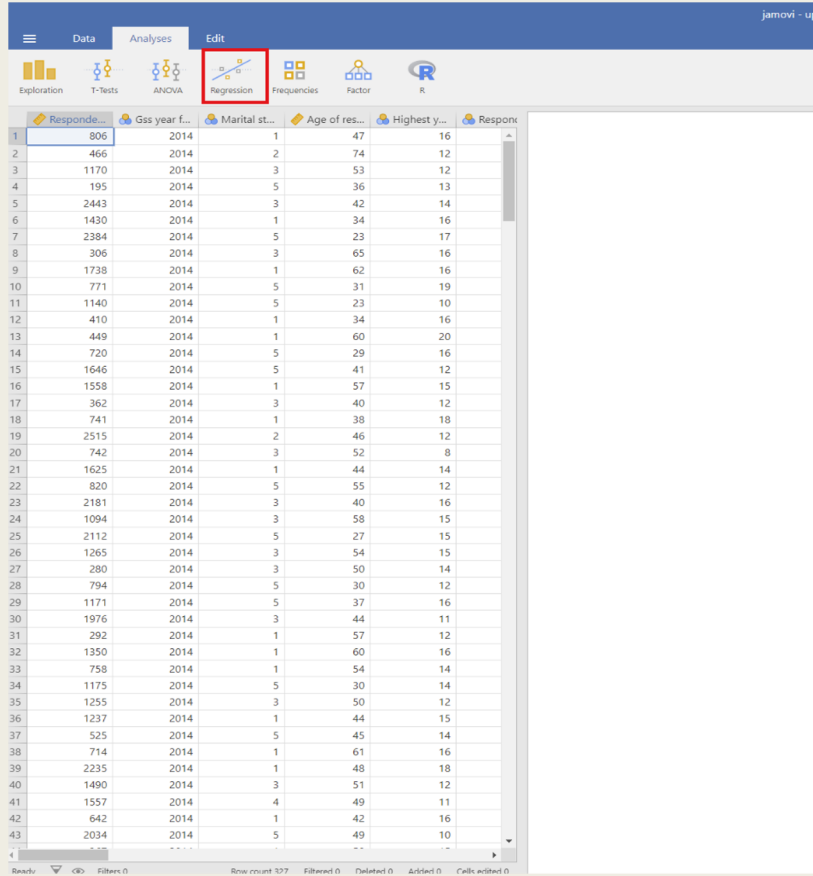
	Value	df	p
χ^2	5.22	1	0.022
N	294		

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



	Response	Gss year f...	Marital st...	Age of res...	Highest y...	Response
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	
24	1094	2014	3	58	15	
25	2112	2014	5	27	15	
26	1265	2014	3	54	15	
27	280	2014	3	50	14	
28	794	2014	5	30	12	
29	1171	2014	5	37	16	
30	1976	2014	3	44	11	
31	292	2014	1	57	12	
32	1350	2014	1	60	16	
33	758	2014	1	54	14	
34	1175	2014	5	30	14	
35	1255	2014	3	50	12	
36	1237	2014	1	44	15	
37	525	2014	5	45	14	
38	714	2014	1	61	16	
39	2235	2014	1	48	18	
40	1490	2014	3	51	12	
41	1557	2014	4	49	11	
42	642	2014	1	42	16	
43	2034	2014	5	49	10	

Correlation Matrix

Partial Correlation

Linear Regression

Logistic Regression

2 Outcomes

Binomial

N Outcomes

Multinomial

Ordinal Outcomes

Correlation Matrix

Correlation Matrix

→

prosocial
negfriend
posfriend
peersupp
churchsupp
age

Correlation Coefficients
☒ Pearson
☐ Spearman
☐ Kendall's tau-b

Additional Options
☒ Report significance
☒ Flag significant correlations
☐ N
☐ Confidence intervals
Interval 95 %

Hypothesis
☒ Correlated
☐ Correlated positively
☐ Correlated negatively

Plot
☐ Correlation matrix
☐ Densities for variables
☐ Statistics

Results

Correlation Matrix

Correlation Matrix

		prosocial	negfriend	posfriend	peersupp	churchsupp	age
prosocial	Pearson's r	—					
	p-value	—					
negfriend	Pearson's r	-0.097	—				
	p-value	0.084	—				
posfriend	Pearson's r	0.318***	-0.196***	—			
	p-value	< .001	< .001	—			
peersupp	Pearson's r	0.264***	-0.024	0.290***	—		
	p-value	< .001	0.668	< .001	—		
churchsupp	Pearson's r	0.269***	-0.277***	0.264***	0.253***	—	
	p-value	< .001	< .001	< .001	< .001	—	
age	Pearson's r	-0.063	0.085	0.065	0.102	-0.004	—
	p-value	0.257	0.128	0.244	0.067	0.947	—

Note: * p < .05, ** p < .01, *** p < .001

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).

Jamovi to R Syntax

The screenshot displays the Jamovi software interface with the file name "jamovi - updated immigrant data.gss". The top menu bar includes "Data", "Analyses", and "Edit". The left sidebar contains icons for "Exploration", "T-Tests", "ANOVA", "Regression", "Frequencies", "Factor", and "R". The main workspace is divided into three panels: "Descriptives", "Results", and "Plots".

In the "Descriptives" panel, the "Variables" list on the left includes "Respondent id number", "Gss year for this respondent", "Age of respondent", "Highest year of school completed", "Respondents sex", "Race of respondent", "Total family income", "Respondents income", and "Political party affiliation". The "Marital status" variable is selected and moved to the "Variables" box on the right. The "Frequency tables" checkbox is checked. The "Statistics" section includes "Sample Size" (N, Missing), "Percentile Values" (Cut points for 4 equal groups, Percentiles 25, 50, 75), "Dispersion" (Std. deviation, Minimum, Variance, Maximum, Range, S. E. Mean, IQR), "Central Tendency" (Mean, Median, Mode, Sum), "Distribution" (Skewness, Kurtosis), and "Normality" (Shapiro-Wilk).

The "Results" panel shows the "Descriptives" table for "Marital status":

Descriptives	
Marital status	
N	327
Missing	0
Mean	2.58
Median	2
Mode	1.00
Standard deviation	1.68
Minimum	1
Maximum	5

Below this is the "Frequencies" table for "Marital status":

Frequencies of Marital status			
Levels	Counts	% of Total	Cumulative %
1	154	47.1 %	47.1 %
2	11	3.4 %	50.5 %
3	65	19.9 %	70.3 %
4	12	3.7 %	74.0 %
5	85	26.0 %	100.0 %

The "Plots" panel shows a histogram for "Marital status" with a density scale on the y-axis.

A red arrow points from the top right of the main workspace to the "Modules" button in the top right corner. A red text label "To get to Syntax Mode (for R)" is positioned next to this arrow.

The "Modules" panel is open on the right, showing settings for "Results", "Plots", and "Import". The "Syntax mode" checkbox is checked, indicated by a red arrow. Other settings include "Number format" (3 sf), "p-value format" (3 dp), "References" (Visible), "Plot theme" (Default), "Color palette" (jmv), "Default missings" (NA), and "Developer mode" (unchecked).

Jamovi to R Syntax

jamovi - updated immigrant data.gss

≡

Data

Analyses

Edit

Bar chart

Exploration

T-test

T-Tests

ANOVA

ANOVA

Regression

Regression

Frequencies

Frequencies

Factor

Factor

R

R

Descriptives

→

Respondent id number

Gss year for this respondent

Age of respondent

Highest year of school completed

Respondents sex

Race of respondent

Total family income

Respondents income

Political party affiliation

Frequency tables

Statistics

Sample Size

☒ N
 ☒ Missing

Percentile Values

☐ Cut points for 4 equal groups
 ☐ Percentiles 25,50,75

Dispersion

☒ Std. deviation
 ☒ Minimum
 ☐ Variance
 ☒ Maximum
 ☐ Range
 ☐ S.E. Mean
 ☐ IQR

Central Tendency

☒ Mean
 ☒ Median
 ☒ Mode
 ☐ Sum

Dispersion

☐ Skewness
 ☐ Kurtosis

Normality

☐ Shapiro-Wilk

Box Plots

☒ Histogram
 ☐ Density
 ☐ Box plot
 ☐ Violin
 ☐ Data
 ☐ Mean

Bar Plots

☐ Bar plot

Descriptives

```

jmv::descriptives(
  data = data,
  vars = Marital status,
  freq = TRUE,
  hist = TRUE,
  mode = TRUE)

```

Descriptives

Marital status	
N	327
Missing	0
Mean	2.581
Median	2
Mode	1.000
Standard deviation	1.681
Minimum	1
Maximum	5

Frequencies

Levels	Counts	% of Total	Cumulative %
1	154	47.09	47.09
2	11	3.36	50.46
3	65	19.88	70.34
4	12	3.67	74.01
5	85	25.99	100.00

Plots

Marital status

Zoom

100%

Results

Number format 3 sf

p-value format 3 dp

References Visible

Syntax mode

Plots

Plot theme Default

Color palette jmv

Import

Default missing NA

Developer mode

Version 1.6.23.0

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=PLkk92zzyru50Atc_ItUubaSSq6S_TGfRn
 - *R: An Introduction -*
https://www.youtube.com/playlist?list=PLkk92zzyru500YKXfC4OWzc4Lzo_IBOLP

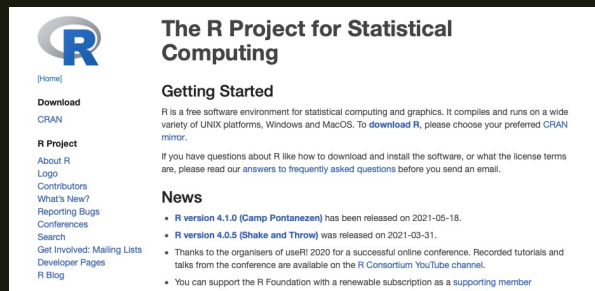


BREAK

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>



The R Project for Statistical Computing

Getting Started

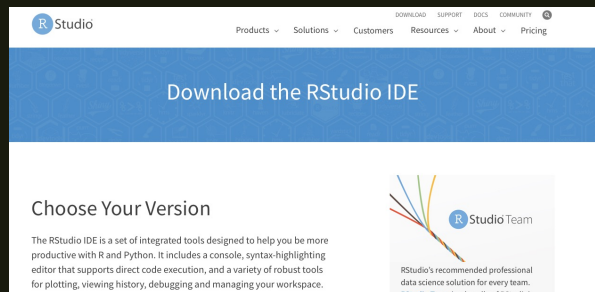
R is a free software environment for statistical computing and graphics. It compiles and runs on a wide variety of UNIX platforms, Windows and MacOS. To [download R](#), please choose your preferred CRAN mirror.

If you have questions about R like how to download and install the software, or what the license terms are, please read our [answers to frequently asked questions](#) before you send an email.

News

- **R version 4.1.0 (Camp Pontanezen)** has been released on 2021-05-18.
- **R version 4.0.5 (Shake and Throw)** was released on 2021-03-31.
- Thanks to the organisers of useR! 2020 for a successful online conference. Recorded tutorials and talks from the conference are available on the R Consortium YouTube channel.
- You can support the R Foundation with a renewable subscription as a [supporting member](#)

Navigation: [Home], Download, CRAN, R Project, About R, Logo, Contributors, What's New?, Reporting Bugs, Conferences, Search, Get Involved: Mailing Lists, Developer Pages, R Blog



R Studio


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DOWNLOAD SUPPORT DOCS COMMUNITY

Download the RStudio IDE

Choose Your Version

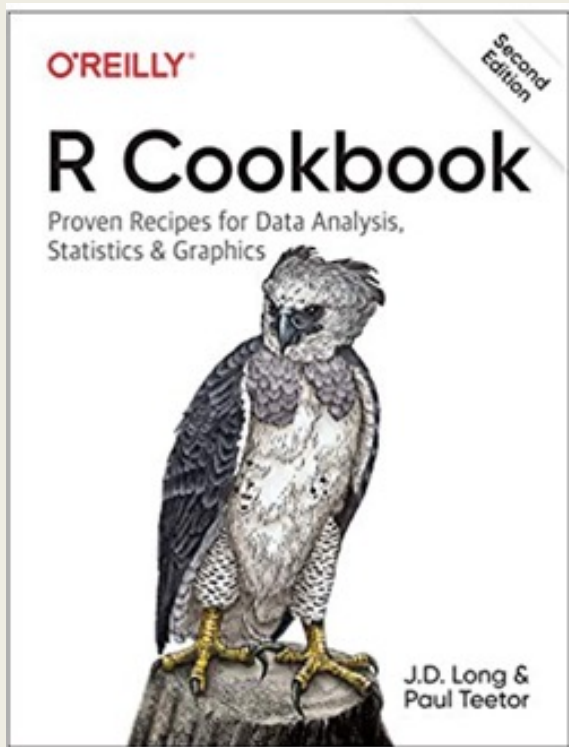
The RStudio IDE is a set of integrated tools designed to help you be more productive with R and Python. It includes a console, syntax-highlighting editor that supports direct code execution, and a variety of robust tools for plotting, viewing history, debugging and managing your workspace.



RStudio Team

RStudio's recommended professional data science solution for every team.
RStudio Team is a bundle of RStudio.

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, Statistics and Graphics



Workshop x Untitled1 x

Source on Save Run Source

```
1
```

1:1 (Top Level) R Script

Console ~/Desktop/R/Workshop/

```
>
>
>
>
>
>
>
>
>
>
```

Environment History Connections

Import Dataset

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



Workshop x

Workshop.R* x

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

Workshop.R* x

☐ 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)
```

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 ▾

Global Environment ▾

Data

Workshop

2540 obs. of 9 variables

Files

Plots

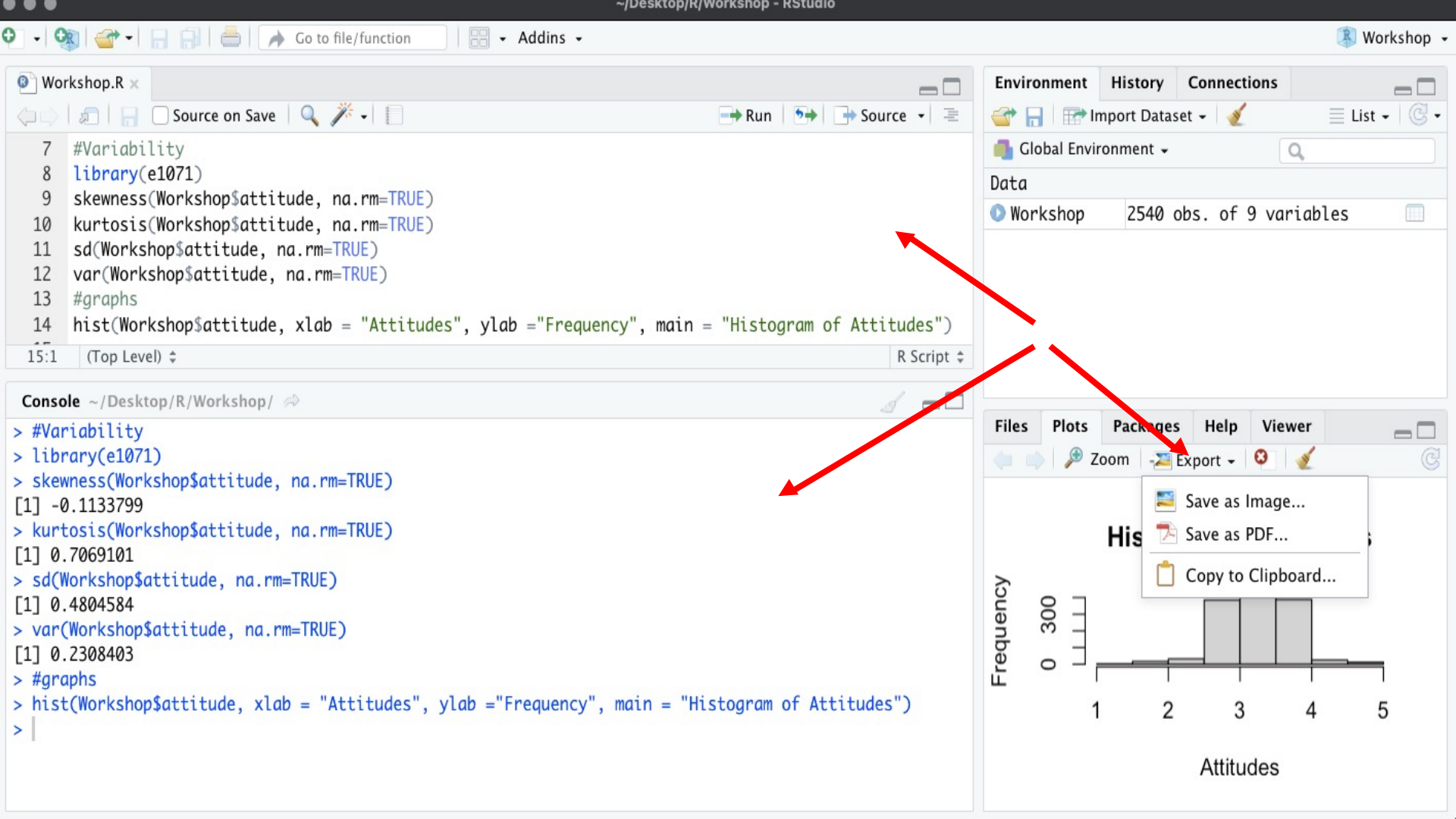
Packages

Help

Viewer

Zoom

Export ▾



```
Workshop.R* x
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
22
23
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

> |
```

Environment History Connections

Global Environment ▾

Data

Workshop 2540 obs. of 9 variables 

Files Plots Packages Help Viewer



```
Workshop.R* x
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
```

> |

Environment History Connections

 Import Dataset List

Global Environment

Data

Workshop 2540 obs. of 9 variables

Files Plots Packages Help Viewer

 Zoom Export

Workshop.R*

Source on Save

Run

Source

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

```

Environment

History

Connections

Import Dataset

List

Global Environment

Data

anova

Large aov (14 elements, 515...

Workshop

2540 obs. of 9 variables

Values

factor

Factor w/ 3 levels "0","1","2"...

Files

Plots

Packages

Help

Viewer

Zoom

Export

Workshop.R*

```
41 ## correlation
42 cor.test(Workshop$age, Workshop$attitude)
43 cor.test(Workshop$att1, Workshop$att2, method = "kendall")
44
49:1 (Top Level) ↕
```

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
```

Environment History Connections

 Import Dataset List

Global Environment

Data

anova	Large aov (14 elements, 515...
Workshop	2540 obs. of 9 variables

Values

factor	Factor w/ 3 levels "0","1","2"...
--------	-----------------------------------

Files Plots Packages Help Viewer

 Zoom Export

Workshop.R* x

 Source on Save Run 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 History Connections

 Import Dataset List

Global Environment



Data

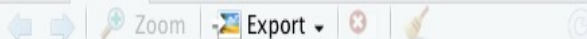
anova Large aov (14 elements, 515... newdata2 2540 obs. of 2 variables Workshop 2540 obs. of 9 variables 

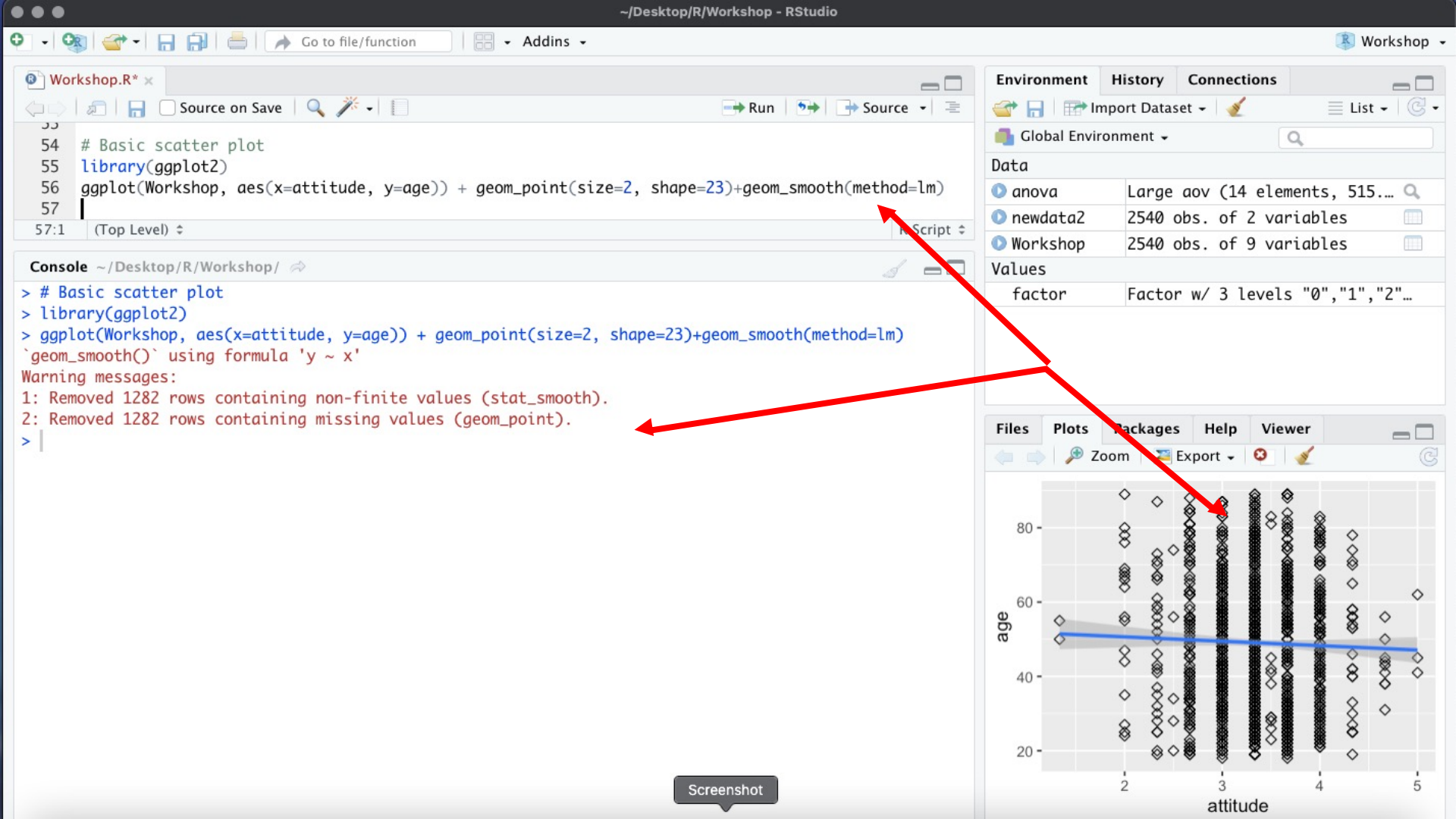
Values

factor

Factor w/ 3 levels "0","1","2"...

Files Plots Packages Help Viewer

 Zoom Export



Workshop.R*

Source on Save

Run 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

Environment

History

Connections

Import Dataset

List

Global Environment

Data

anova	Large aov (14 elements, 515...	🔍
lm_1	List of 13	🔍
newdata2	2540 obs. of 2 variables	📊
Workshop	2540 obs. of 9 variables	📊

Values

factor	Factor w/ 3 levels "0","1","2"...
--------	-----------------------------------

Files

Plots

Packages

Help

Viewer

Zoom

Export

Workshop.R*

Source on Save

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)

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

Environment History Connections

Import Dataset

Global Environment

Data

anova	Large aov (14 elements, 515...
lm_1	List of 13
lm_2	Large lm (13 elements, 545.3...
newdata2	2540 obs. of 2 variables
Workshop	2540 obs. of 9 variables

Values

factor Factor w/ 3 levels "0","1","2"...

Files Plots Packages Help Viewer

Zoom Export

Workshop.R*

```
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) ⇅

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

Screenshot

Environment

History

Connections

Import Dataset

Global Environment

Data

anova	Large aov (14 elements, 515...	🔍
glm_1	List of 31	🔍
lm_1	List of 13	🔍
lm_2	Large lm (13 elements, 545.3...	🔍
newdata2	2540 obs. of 2 variables	📊
Workshop	2540 obs. of 9 variables	📊

Values

factor Factor w/ 3 levels "0","1","2"...

Files

Plots

Packages

Help

Viewer

Zoom

Export

Data Transformation with dplyr : CHEAT SHEET

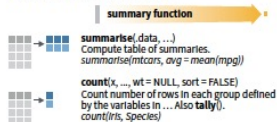


dplyr functions work with pipes and expect tidy data. In tidy data:



Summarise Cases

These apply **summary functions** to columns to create a new table of summary statistics. Summary functions take vectors as input and return one value (see back).



VARIATIONS

summarise_all() - Apply funs to every column.
summarise_at() - Apply funs to specific columns.
summarise_if() - Apply funs to all cols of one type.

Group Cases

Use **group_by()** to create a "grouped" copy of a table. dplyr functions will manipulate each "group" separately and then combine the results.



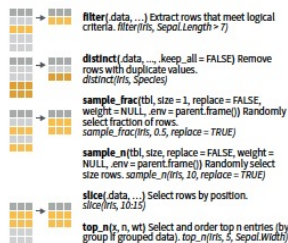
group_by(data, ..., add = FALSE)
Returns copy of table grouped by ...
g_iris <- group_by(iris, Species)

ungroup(x, ...)
Returns ungrouped copy of table.
ungroup(g_iris)

Manipulate Cases

EXTRACT CASES

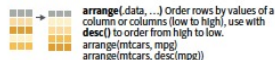
Row functions return a subset of rows as a new table.



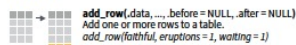
Logical and boolean operators to use with filter()

< <= is.na() %in% | xor()
> >= !is.na() !
See ?base::Logic and ?Comparison for help.

ARRANGE CASES



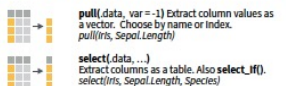
ADD CASES



Manipulate Variables

EXTRACT VARIABLES

Column functions return a set of columns as a new vector or table.

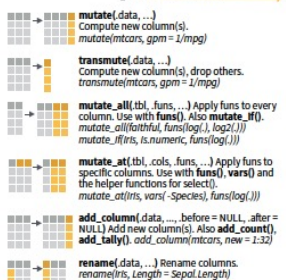


Use these helpers with **select()**, e.g. **select(iris, starts_with("Sepal"))**
contains(match) **num_range(prefix, range)** ; e.g. **mpg:cyl**
ends_with(match) **one_of(...)** ; e.g. **Species**
matches(match) **starts_with(match)**

MAKE NEW VARIABLES

These apply **vectorized functions** to columns. Vectorized funs take vectors as input and return vectors of the same length as output (see back).

vectorized function



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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EVALUATION

