

**Host**

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## Studentized Residuals

Regression model with studentized residual diagnostics

**Regression**

[StudentizedResidualsData] D:\DATA ANALYSIS\B Normality and Assumption Tests\Studentized Residuals\SPSS\_Output\sav\Studentized-Residuals-data.sav

**Variables Entered/Removed<sup>a</sup>**

Model	Variables Entered	Variables Removed	Method
1	age, studytime, absences, G2, failures, G1 <sup>b</sup>	.	Enter

- a. Dependent Variable: G3
- b. All requested variables entered.

**Model Summary<sup>b</sup>**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.922 <sup>a</sup>	.851	.849	1.254

- a. Predictors: (Constant), age, studytime, absences, G2, failures, G1
- b. Dependent Variable: G3

**ANOVA<sup>a</sup>**

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5753.053	6	958.842	609.353	.000 <sup>b</sup>
	Residual	1010.214	642	1.574		
	Total	6763.267	648			

- a. Dependent Variable: G3
- b. Predictors: (Constant), age, studytime, absences, G2, failures, G1

Regression model with studentized residual diagnostics

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics
		B	Std. Error	Beta			Tolerance
1	(Constant)	-.545	.763		-.715	.475	
	G1	.142	.037	.121	3.886	.000	.241
	G2	.883	.034	.797	25.823	.000	.244
	studytime	.095	.062	.024	1.526	.127	.919
	failures	-.233	.095	-.043	-2.456	.014	.766
	absences	.023	.011	.033	2.086	.037	.954
	age	.024	.043	.009	.544	.587	.866

**Coefficients<sup>a</sup>**

Model		Collinearity Statistics
		VIF
1	(Constant)	
	G1	4.155
	G2	4.091
	studytime	1.088
	failures	1.306
	absences	1.049
	age	1.155

a. Dependent Variable: G3

Regression model with studentized residual diagnostics

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Eigenvalue	Condition Index	(Constant)	Variance Proportions		
					G1	G2	studytime
1	1	5.344	1.000	.00	.00	.00	.00
	2	.921	2.409	.00	.00	.00	.00
	3	.567	3.071	.00	.00	.00	.01
	4	.116	6.798	.00	.01	.01	.97
	5	.043	11.188	.02	.06	.08	.01
	6	.008	26.235	.00	.87	.89	.00
	7	.002	49.066	.97	.06	.02	.00

**Collinearity Diagnostics<sup>a</sup>**

Model	Dimension	Variance Proportions		
		failures	absences	age
1	1	.00	.01	.00
	2	.64	.03	.00
	3	.10	.88	.00
	4	.00	.02	.00
	5	.21	.05	.03
	6	.00	.00	.00
	7	.04	.00	.96

a. Dependent Variable: G3

Regression model with studentized residual diagnostics

**Residuals Statistics<sup>a</sup>**

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	.31	19.58	11.91	2.980	649
Std. Predicted Value	-3.892	2.575	.000	1.000	649
Standard Error of Predicted Value	.059	.403	.122	.045	649
Adjusted Predicted Value	.32	19.59	11.91	2.979	649
Residual	-9.045	5.817	.000	1.249	649
Std. Residual	-7.210	4.637	.000	.995	649
Stud. Residual	-7.277	4.651	.000	1.002	649
Deleted Residual	-9.234	5.851	-.001	1.265	649
Stud. Deleted Residual	-7.591	4.727	-.003	1.019	649
Mahal. Distance	.414	65.945	5.991	6.491	649
Cook's Distance	.000	.177	.002	.010	649
Centered Leverage Value	.001	.102	.009	.010	649

a. Dependent Variable: G3

Studentized residual descriptive statistics

**Descriptives**

**Descriptive Statistics**

	N	Minimum	Maximum	Mean	Std. Deviation
raw_resid_G3	649	-9.04462	5.81680	.0000000	1.24858805
standardized_resid_G3	649	-7.27663	4.65072	-.0003575	1.00176810
studentized_deleted_resid_G3	649	-7.59071	4.72741	-.0027138	1.01877722
leverage_G3	649	.00064	.10177	.0092450	.01001647
cooks_distance_G3	649	.00000	.17695	.0018629	.00984723
dffits_G3	649	-.21108	.12933	-.0009017	.02027820
Valid N (listwise)	649				

Studentized residual normality and spread

Explore

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
studentized_deleted_resid_G3	649	100.0%	0	0.0%	649	100.0%
standardized_resid_G3	649	100.0%	0	0.0%	649	100.0%
raw_resid_G3	649	100.0%	0	0.0%	649	100.0%

Descriptives

		Statistic	Std. Error	
studentized_deleted_resid_G3	Mean	-.0027138	.03999050	
	95% Confidence Interval for Mean	Lower Bound	-.0812404	
		Upper Bound	.0758128	
	5% Trimmed Mean	.0560578		
	Median	-.0545304		
	Variance	1.038		
	Std. Deviation	1.01877722		
	Minimum	-7.59071		
	Maximum	4.72741		
	Range	12.31813		
	Interquartile Range	.86513		
	Skewness	-3.020	.096	
	Kurtosis	20.003	.192	
standardized_resid_G3	Mean	-.0003575	.03932284	
	95% Confidence Interval for Mean	Lower Bound	-.0775730	
		Upper Bound	.0768581	
	5% Trimmed Mean	.0560408		
	Median	-.0545728		
	Variance	1.004		
	Std. Deviation	1.00176810		
	Minimum	-7.27663		
	Maximum	4.65072		
	Range	11.92735		

Studentized residual normality and spread

**Descriptives**

		Statistic	Std. Error	
	Interquartile Range	.86567		
	Skewness	-2.869	.096	
	Kurtosis	18.677	.192	
raw_resid_G3	Mean	.0000000	.04901137	
	95% Confidence Interval for Mean	Lower Bound	-.0962403	
		Upper Bound	.0962403	
	5% Trimmed Mean	.0701572		
	Median	-.0682603		
	Variance	1.559		
	Std. Deviation	1.24858805		
	Minimum	-9.04462		
	Maximum	5.81680		
	Range	14.86142		
	Interquartile Range	1.08233		
	Skewness	-2.864	.096	
	Kurtosis	18.667	.192	

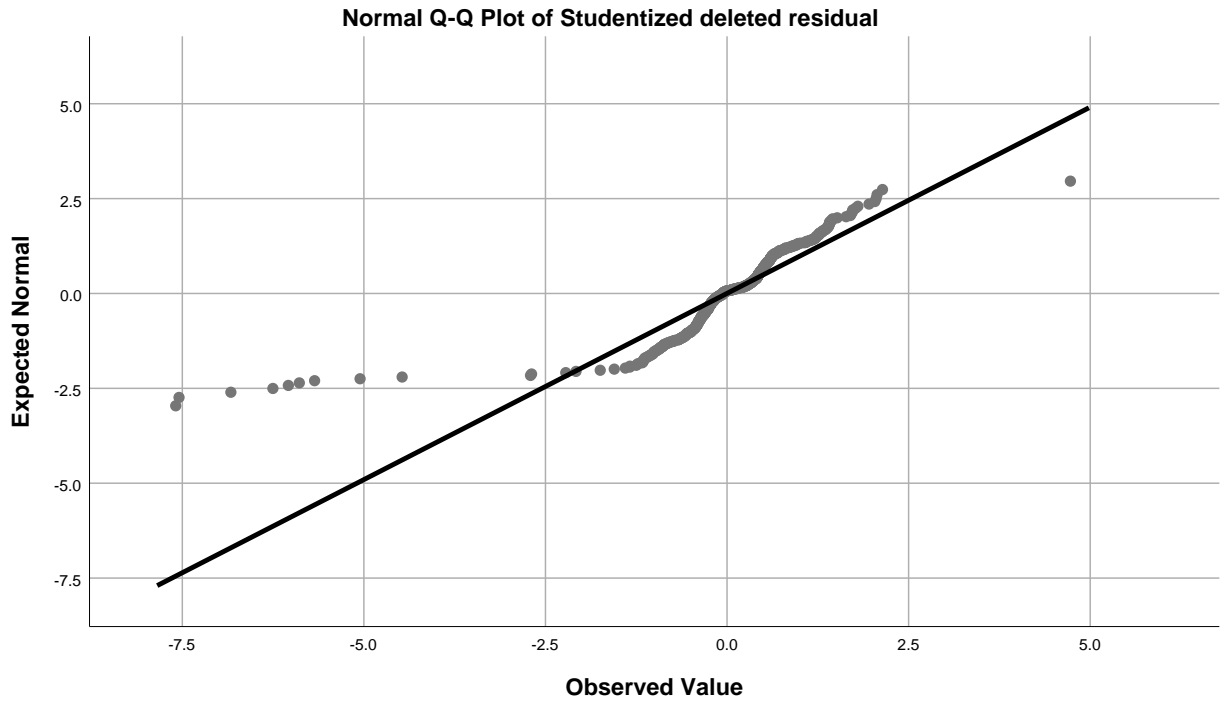
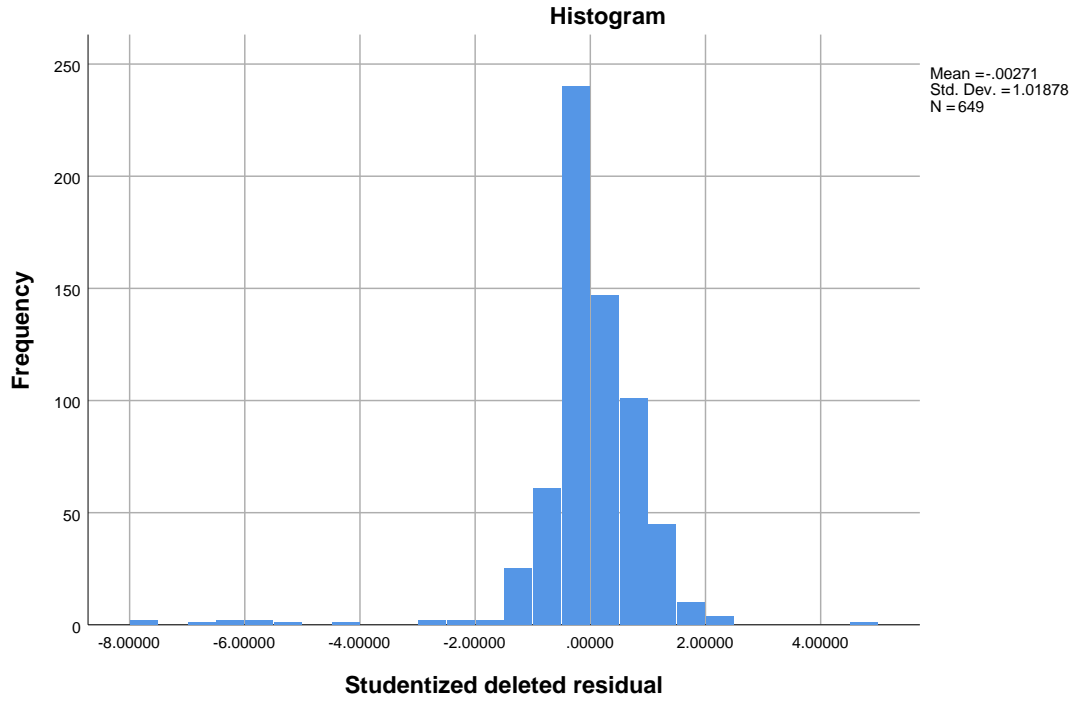
**Tests of Normality**

	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
studentized_deleted_resid_G3	.159	649	.000	.742	649	.000
standardized_resid_G3	.155	649	.000	.755	649	.000
raw_resid_G3	.155	649	.000	.755	649	.000

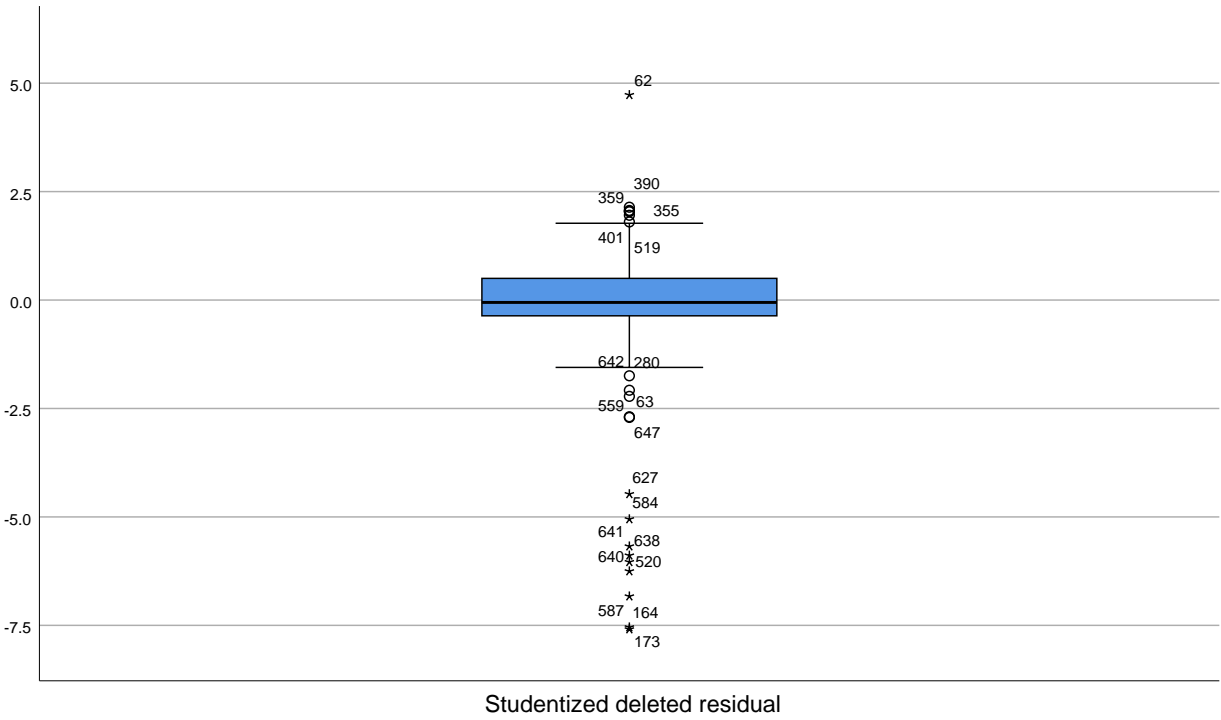
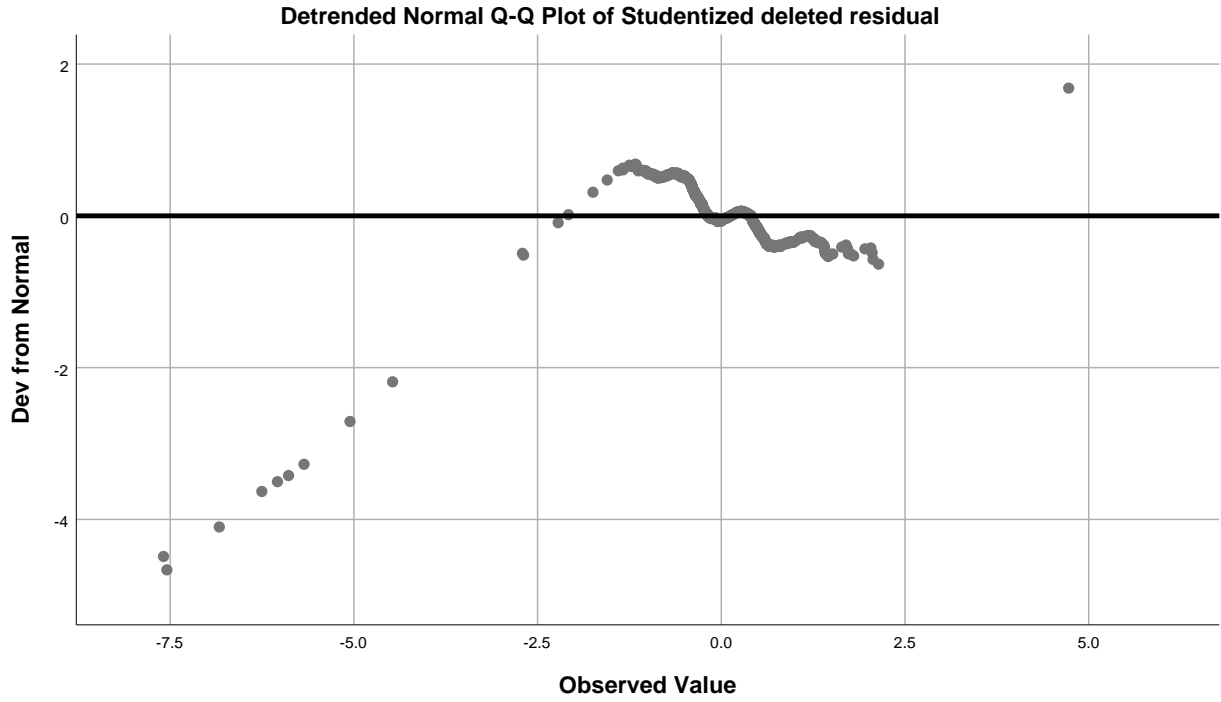
a. Lilliefors Significance Correction

**Studentized deleted residual**

# Studentized residual normality and spread

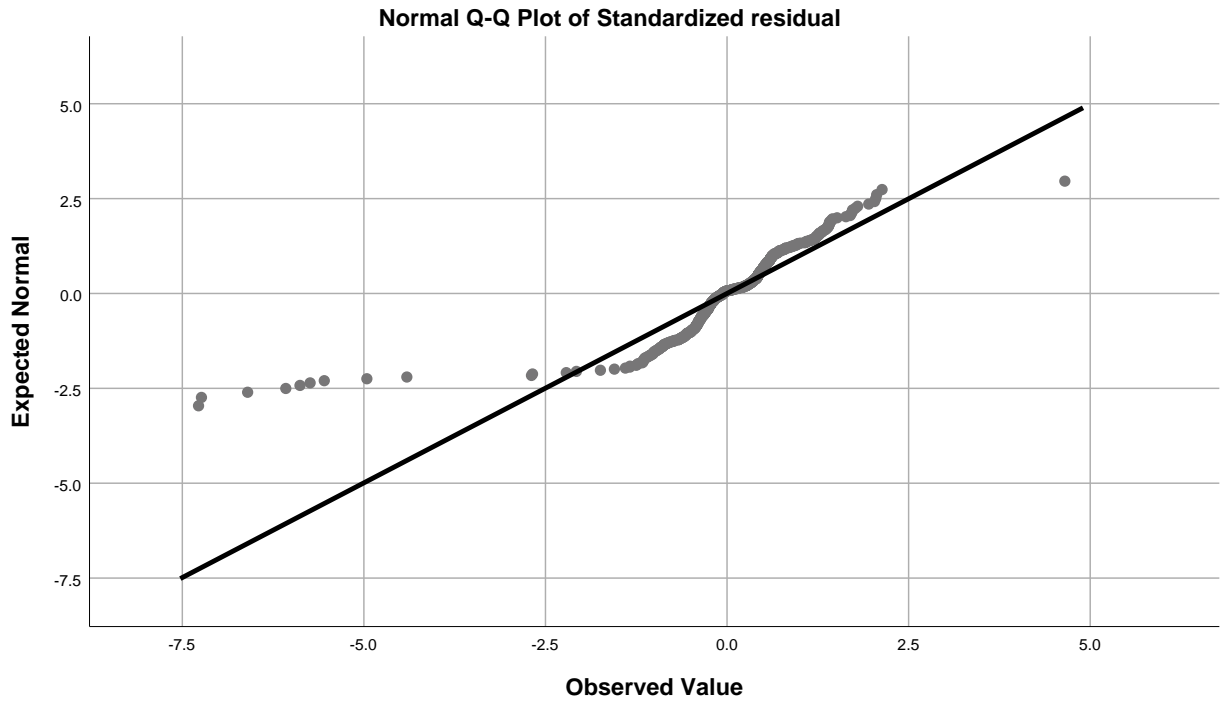
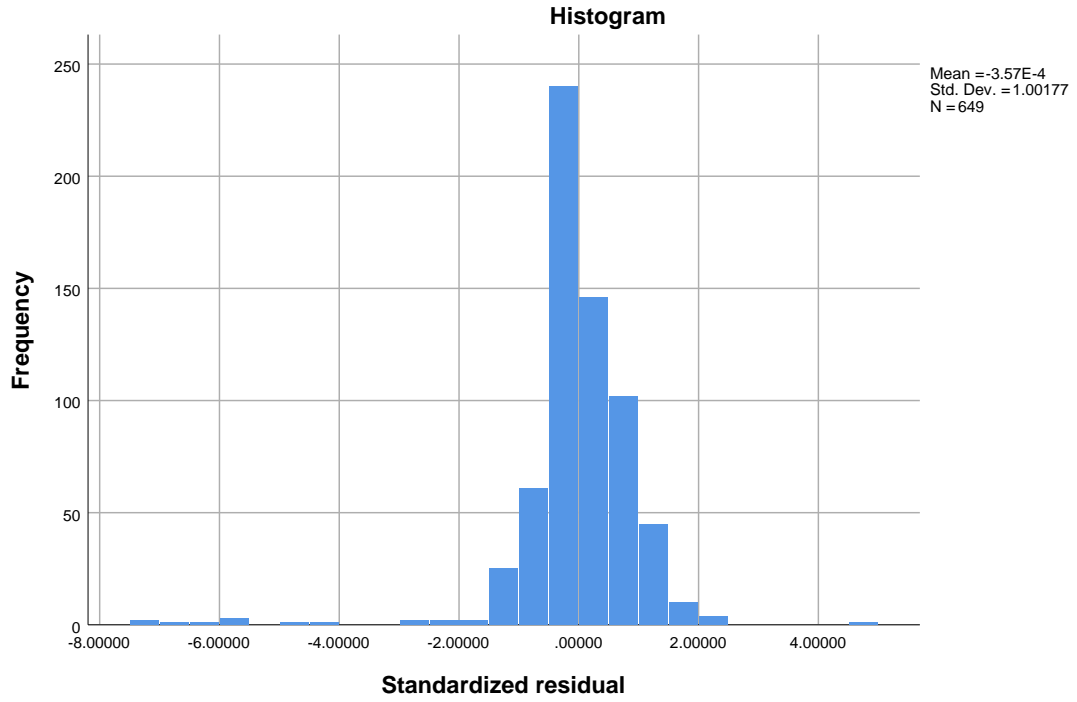


# Studentized residual normality and spread

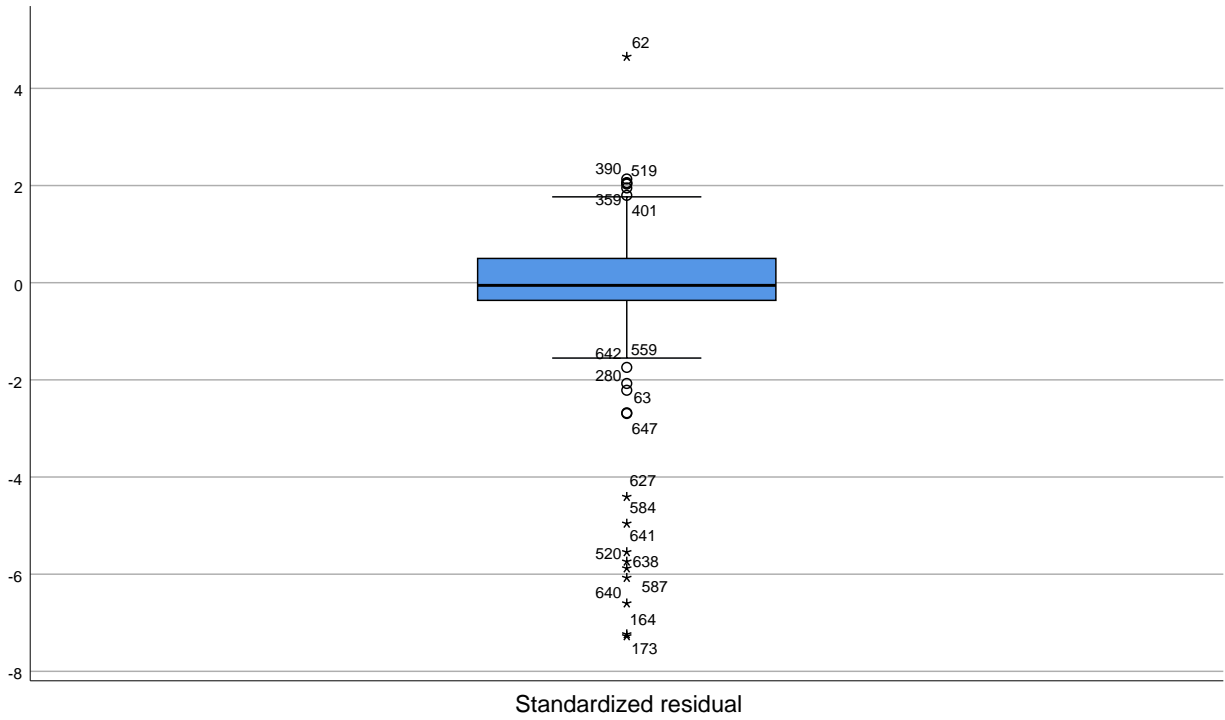
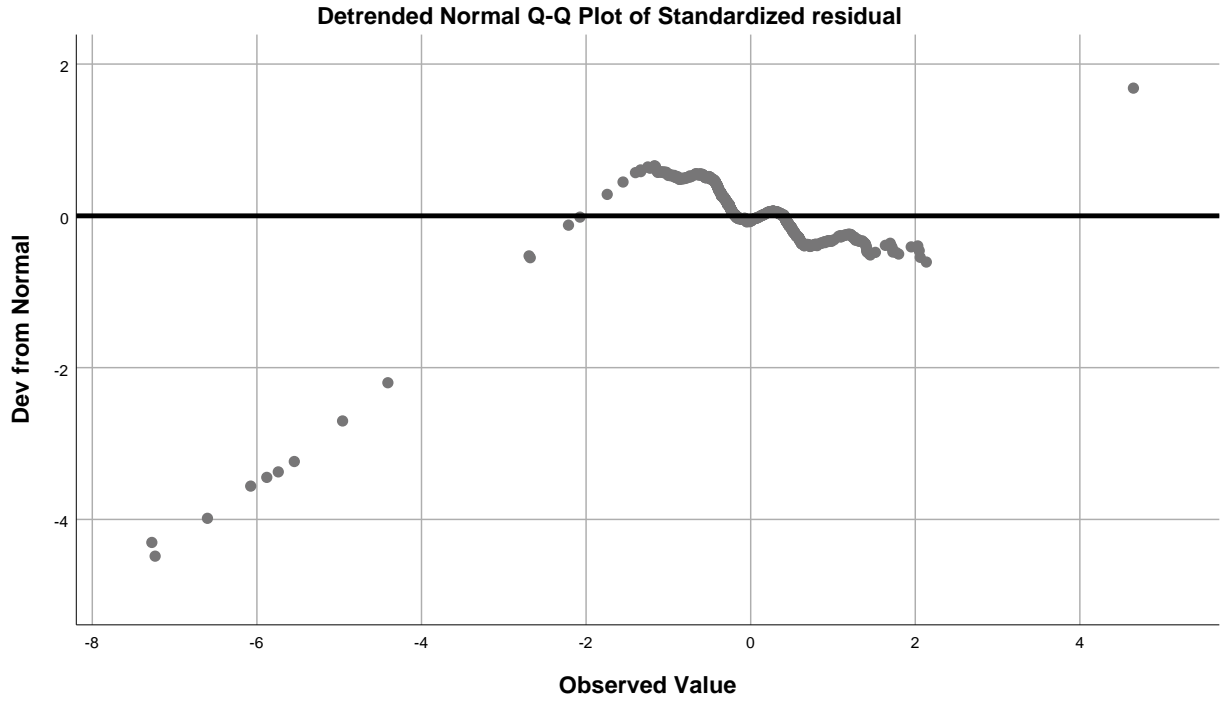


**Standardized residual**

# Studentized residual normality and spread

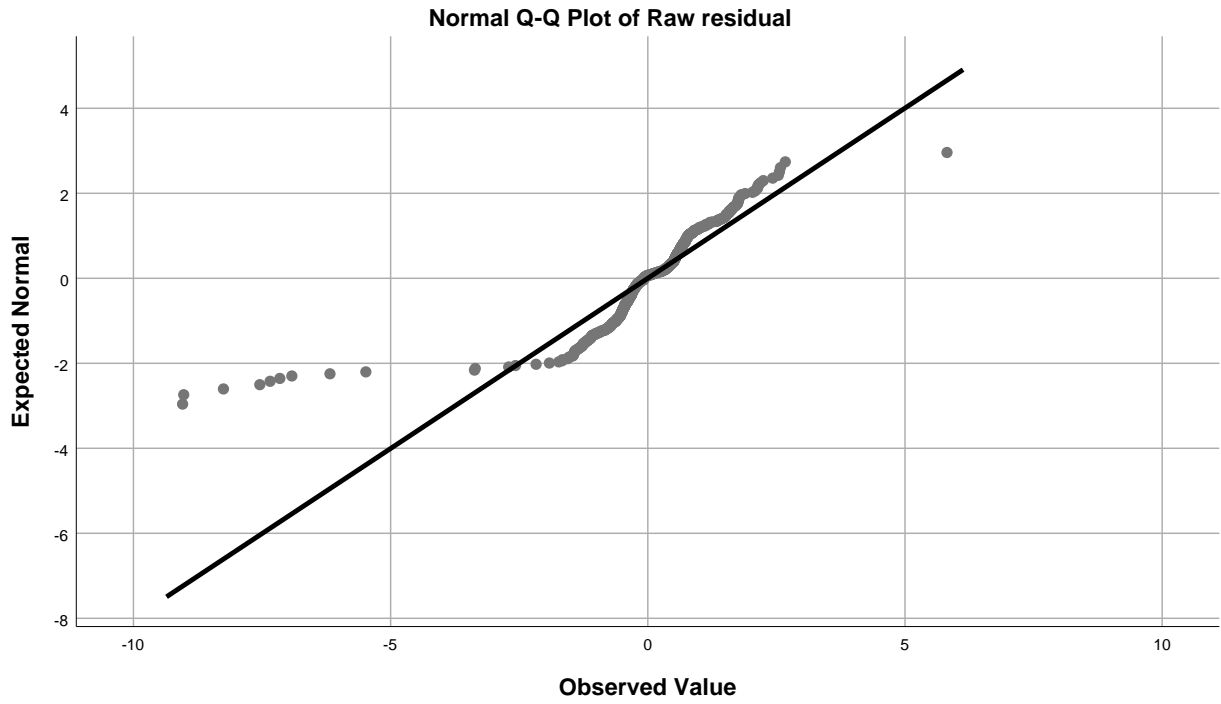
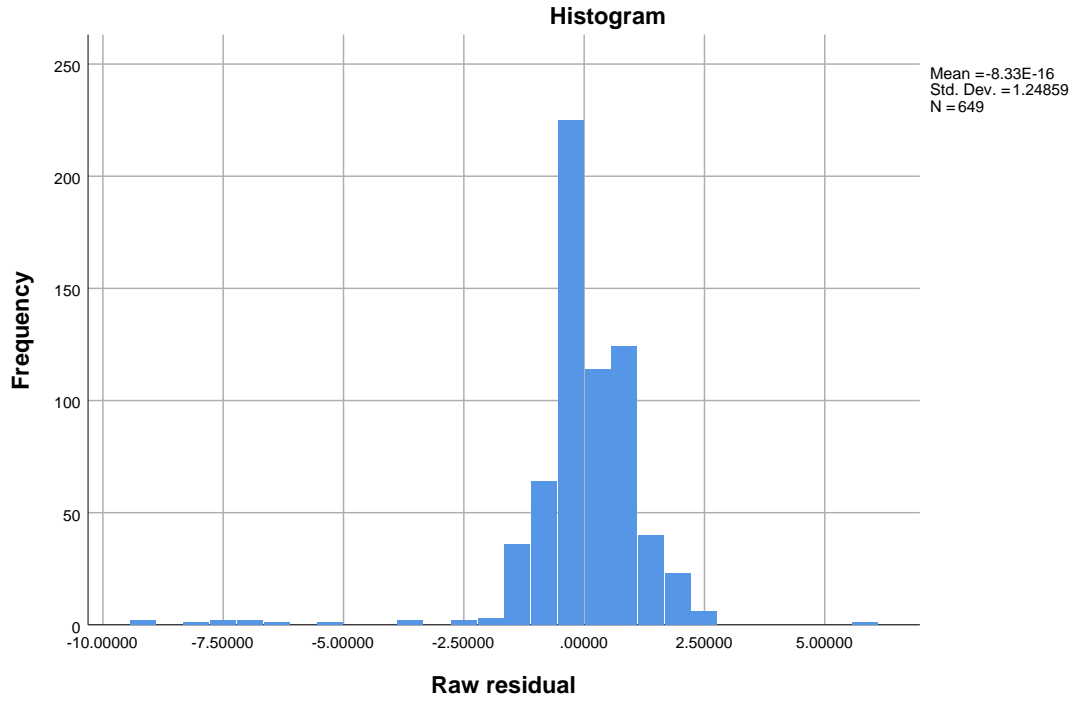


# Studentized residual normality and spread

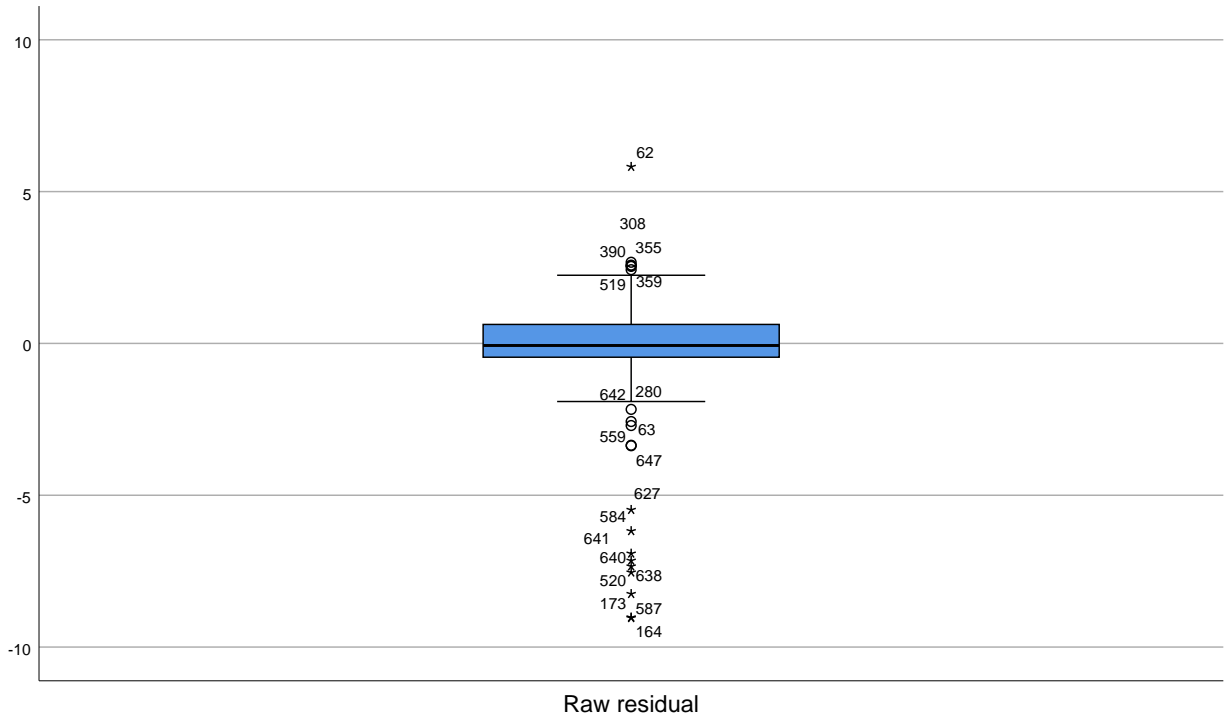
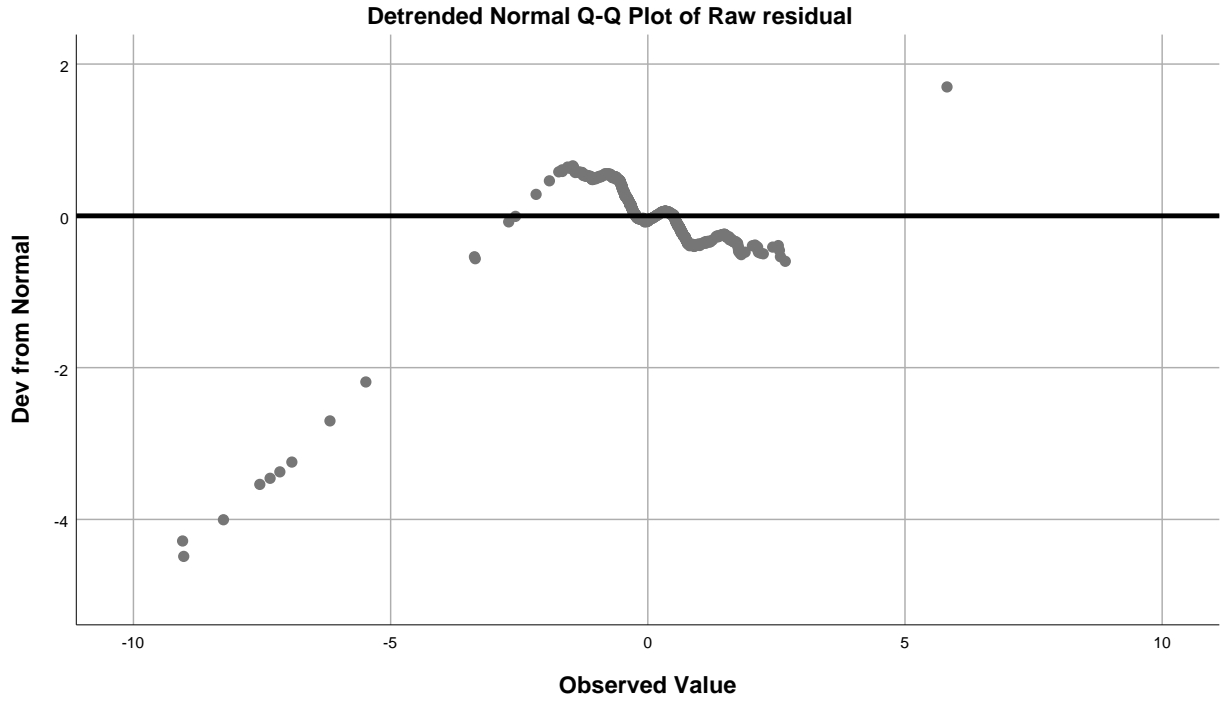


Raw residual

# Studentized residual normality and spread



# Studentized residual normality and spread



Studentized residual flag counts

**Frequencies**

**Statistics**

		flag_abs_standardized_gt_2	flag_abs_studentized_deleted_gt_3	flag_cooks_distance_gt_4_over_n
N	Valid	649	649	649
	Missing	0	0	0

**Frequency Table**

**flag\_abs\_standardized\_gt\_2**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	631	97.2	97.2	97.2
	1.00	18	2.8	2.8	100.0
Total		649	100.0	100.0	

**flag\_abs\_studentized\_deleted\_gt\_3**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	639	98.5	98.5	98.5
	1.00	10	1.5	1.5	100.0
Total		649	100.0	100.0	

**flag\_cooks\_distance\_gt\_4\_over\_n**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	623	96.0	96.0	96.0
	1.00	26	4.0	4.0	100.0
Total		649	100.0	100.0	

## Largest absolute studentized deleted residuals

### List

The variables are listed in the following order:

```
LINE 1: case_id school sex age G1 G2 G3 pred_G3 raw_resid_G3 standardized_re  
sid_G3 studentized_deleted_resid_G3 leverage_G3
```

```
LINE 2: cooks_distance_G3 dffits_G3
```

Largest absolute studentized deleted residuals

case_id:	164.00	GP	M	18	11	9	0
	9.02294	-9.02294	-7.27663	-7.59071	.02132		
cooks_distan:	.17695		-.21108				
case_id:	173.00	GP	M	16	10	10	1
	10.04462	-9.04462	-7.23659	-7.54523	.00572		
cooks_distan:	.05473		-.06617				
case_id:	587.00	MS	F	17	8	8	0
	8.25028	-8.25028	-6.60070	-6.83144	.00562		
cooks_distan:	.04489		-.05951				
case_id:	640.00	MS	M	19	5	8	0
	7.54332	-7.54332	-6.07521	-6.25288	.01869		
cooks_distan:	.10887		-.15576				
case_id:	520.00	MS	M	16	8	7	0
	7.34324	-7.34324	-5.87976	-6.04006	.00722		
cooks_distan:	.04366		-.06491				
case_id:	638.00	MS	M	18	7	7	0
	7.15378	-7.15378	-5.74028	-5.88893	.01144		
cooks_distan:	.06191		-.09408				
case_id:	641.00	MS	M	18	7	7	0
	6.92062	-6.92062	-5.54546	-5.67882	.00868		
cooks_distan:	.04539		-.07150				
case_id:	584.00	MS	F	18	8	6	0
	6.17939	-6.17939	-4.95898	-5.05284	.01166		
cooks_distan:	.04700		-.08268				
case_id:	62.00	GP	F	16	10	10	16
	10.18320	5.81680	4.65072	4.72741	.00431		
cooks_distan:	.01820		.03426				

Largest absolute studentized deleted residuals

case_id:	627.00	MS	F	18	7	5	0
	5.48156	-5.48156	-4.40859	-4.47339	.01596		
cooks_distan:	.04947		-.09766				
case_id:	647.00	MS	F	18	11	12	9
	12.37010	-3.37010	-2.69274	-2.70596	.00301		
cooks_distan:	.00473		-.01541				
case_id:	63.00	GP	F	16	13	13	10
	13.35448	-3.35448	-2.67837	-2.69136	.00161		
cooks_distan:	.00324		-.01060				
case_id:	280.00	GP	M	22	7	8	5
	7.70442	-2.70442	-2.21365	-2.22042	.04993		
cooks_distan:	.03798		-.14674				
case_id:	308.00	GP	M	17	11	11	14
	11.32698	2.67302	2.13434	2.14029	.00169		
cooks_distan:	.00211		.00865				
case_id:	559.00	MS	M	17	8	13	10
	12.57270	-2.57270	-2.07430	-2.07967	.02088		
cooks_distan:	.01409		-.05899				
case_id:	355.00	GP	F	18	12	12	15
	12.42155	2.57845	2.06016	2.06539	.00297		
cooks_distan:	.00275		.01168				
case_id:	390.00	GP	F	18	10	9	12
	9.44166	2.55834	2.04772	2.05284	.00649		
cooks_distan:	.00485		.02071				
case_id:	359.00	GP	F	18	12	12	15
	12.46305	2.53695	2.03027	2.03523	.00617		
cooks_distan:	.00458		.01971				
case_id:	519.00	MS	F	18	8	5	8
	5.57200	2.42800	1.95067	1.95495	.01388		
cooks_distan:	.00851		.03802				

Largest absolute studentized deleted residuals

case_id:	401.00	GP	M	18	15	14	17
14.75479	2.24521	1.79804	1.80118	.00754			
cooks_distan:	.00423	.02058					

Number of cases read: 20      Number of cases listed: 20

Group context for studentized residuals

**Means**

**Case Processing Summary**

	Cases					
	Included		Excluded		Total	
	N	Percent	N	Percent	N	Percent
abs_studentized_deleted * sex	649	100.0%	0	0.0%	649	100.0%
cooks_distance_G3 * sex	649	100.0%	0	0.0%	649	100.0%

**Report**

sex		abs_studentize d_deleted	cooks_distance _G3
F	N	383	383
	Mean	.5976891	.0011873
	Std. Deviation	.64878663	.00451574
	Minimum	.00242	.00000
	Maximum	6.83144	.04947
M	N	266	266
	Mean	.6727935	.0028358
	Std. Deviation	.98008539	.01435650
	Minimum	.01392	.00000
	Maximum	7.59071	.17695
Total	N	649	649
	Mean	.6284715	.0018629
	Std. Deviation	.80145394	.00984723
	Minimum	.00242	.00000
	Maximum	7.59071	.17695