

The variables used in the analysis are defined below.

Name	Description
GPA (Y)	Final GPA (Four point GPA scale)
HoursStudy (X1)	Hours spent studying per week
HoursOther (X2)	Hours spent working or in extracurricular activities per week
Absences (X3)	Number of days absent per year
HealthIndex (X4)	Health index (from 1 very poor to 5 very good)
Age (X5)	Student's age in years

Using the SPSS output on the following pages, or otherwise, answer the following items.

1. If used in a simple regression, what proportion of variance in GPA is explained by number of absences? Is this a significant amount?

Hours spent working or in extracurricular activities per week explains $.406^2 = .165$. It is a significant amount since from the correlation table the p-value $< .05$

Questions **3 – 6** refer to the model $\hat{Y}_i = b_0 + b_1X_1 + b_2X_2$

2. Do HoursStudy and HoursOther together significantly predict GPA? Report both F and R-Squared.

Yes, Since the F table from the ANOVA table (1) is 37.436, with a p-value $< .05$.

$$R^2 = \frac{18.621}{67.615} = .275$$

3. Is HoursStudy a significant predictor of GPA controlling for HoursOther?

Yes, since the t = 5.455 has a p-value less than .05.

4. Are there any problems with redundancy in this model? Report the tolerance?

Tolerance = $1 - .148^2 = .978$. Since tolerance is greater than .1, there is no problem with redundancy.

5. What GPA is predicted by this model for a student who studies 18 hours per week and spends a total of 10 hours per week working (and is not involved in any other extracurricular activities)?

$$\hat{Y}_i = 2.505 + .05(18) - .038(10) = 3.025$$

Questions **7 – 10** refer to the model $\hat{Y}_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$

6. Does the model above explain a significant proportion of variance in GPA (Report F and R-Squared)?

Yes, since $F = 21.598$ with a p-value less than .05. $R^2 = .358$

7. Is the number of absence a significant predictor of GPA above and beyond all other predictors in the model? Report t.

$$t = \frac{-.031}{.006} = -5.167$$

Yes, the number of absences is a significant predictor of GPA above and beyond the other predictors in the model, since the t value of -5.167 has a p-value less than .05.

8. What would be the predicted change (on average) in GPA for a student who increased their hours studied by 5, holding all other variables constant?

We would expect GPA to increase by $5 \times .042 = .21$

9. What proportion of variance in GPA is explained by the number of HoursOther when controlling for all other variables in the model?

HoursOther explains $-.350^2 = .1225$ or 12.3% of the variance in GPA controlling for the other variables in the model.

10. Does the addition of number of absences, health index and age of the student together significantly reduce error when controlling for hours studied and hours worked or spent on extracurricular activities? Report F and R-Squared.

$$R^2 = \frac{48.994 - 43.436}{48.994} = .113 \text{ and } F = \frac{.113/3}{(1-.113)/(194)} = 8.238$$

$F_{(3,195)} \approx F_{(3,200)} = 2.65$. Since f observed is greater than F critical, yes the addition of number of absences, health index and age of the student together significantly reduce error in explaining GPA when controlling for hours studied and hours worked or spent on extracurricular activities

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
GPA	200	.00	3.60	2.3180	.58290
HoursStudy	200	.00	21.00	6.5500	3.89272
HoursOther	200	2.00	30.00	13.6200	5.51158
HealthIndex	200	1	5	3.73	1.348
Absences	200	0	32	5.23	5.656
age	200	14	20	16.20	1.098
Valid N (listwise)	200				

Correlations

	GPA	HoursStudy	HoursOther	Absences	HealthIndex	age
GPA	1.000	.388	-.407	-.406	.048	-.024
HoursStudy	.388	1.000	-.148	-.190	-.008	.056
HoursOther	-.407	-.148	1.000	.186	-.123	.040
Absences	-.406	-.190	.186	1.000	.002	.213
HealthIndex	.048	-.008	-.123	.002	1.000	.098
age	-.024	.056	.040	.213	.098	1.000
Sig GPA	.	.000	.000	.000	.248	.365
HoursStudy	.000	.	.018	.003	.456	.214
HoursOther	.000	.018	.	.004	.041	.287
Absences	.000	.003	.004	.	.491	.001
HealthIndex	.248	.456	.041	.491	.	.084
age	.365	.214	.287	.001	.084	.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	^a		.268	.49870
2	.598 ^b	.358	.341	.47318

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	18.621	2	9.310	37.436	.000 ^b
	Residual	48.994	197	.249		
	Total	67.615	199			
2	Regression	24.179	5	4.836	21.598	.000 ^c
	Residual	43.436	194	.224		
	Total	67.615	199			

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.505	.119		20.993	.000					
	HoursStudy	.050	.009	.335	5.455	.000	.388	.362	.331		
	HoursOther	-.038	.006	-.358	-5.833	.000	-.407	-.384	-.354		
2	(Constant)	2.330	.511		4.557	.000					
	HoursStudy	.042	.009	.282	4.756	.000	.388	.323	.274	.940	1.064
	HoursOther	-.033	.006	-.310	-5.207	.000	-.407	-.350	-.300	.936	1.068
	Absences	-.031	.006	-.302		.000	-.406	-.335	-.285	.891	1.122
	HealthIndex	.004	.025	.009	.162	.871	.048	.012	.009	.973	1.028
	age	.019	.032	.035	.596	.552	-.024	.043	.034	.934	1.070

a. Dependent Variable: GPA