

Alcohol Consumption in Schools

Hypothesis Heroes - Drew Davison, Lisa Zhang, Ellie Culman, Austin Chang

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Introduction and data

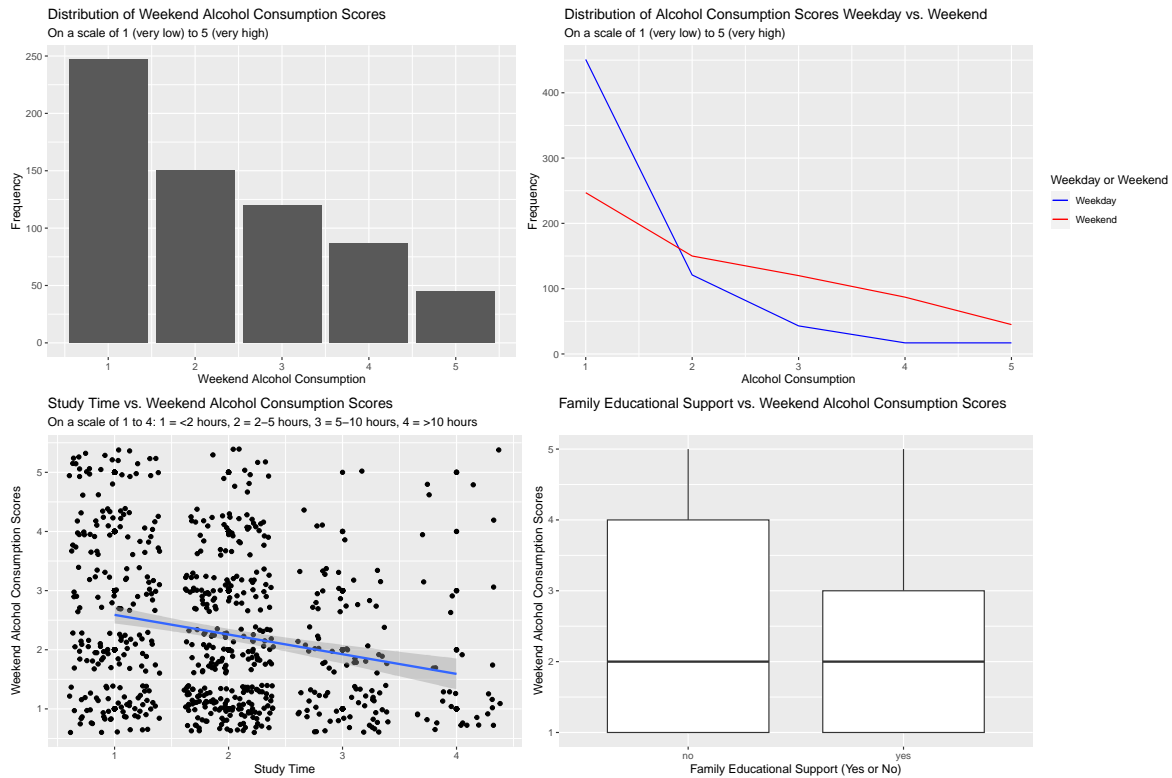
All around the world, underage drinking among students is a significant public health issue and takes a huge toll on the quality of students' lives and education. There is plenty of existing documentation on the effects of socioeconomic status on risky drinking behavior amongst college students. For example, a paper by Susan E. Collins, PhD, professor and licensed clinical psychologist, found that individuals with lower socioeconomic status as well as people of racial and ethnic minorities and homelessness experience greater alcohol-related consequences. Additionally, studies from the National Institutes of Health have found that “aspects of college life—such as unstructured time, widespread availability of alcohol, inconsistent enforcement of underage drinking laws, and limited interactions with parents and other adults” drives up rates of underage drinking, and “college students have higher binge-drinking rates and a higher incidence of driving under the influence of alcohol than their noncollege peers.” Since most existing literature on underage student drinking focuses on college students, we wanted to examine the factors contributing to drinking amongst secondary school students. Our research question is as follows:

How do social indicators affect student alcohol consumption in secondary schools?

We hypothesize that factors like gender, familial status, family and school support, and other social and economic indicators will strongly influence the rates that secondary school students consume alcohol and that increased alcohol consumption is correlated with their school performance.

This data is from a Kaggle public dataset, originally sourced from the UC Irvine Machine Learning Repository. The data consists of information collected in 2008 on secondary school students from two schools in Portugal: Gabriel Pereira and Mousinho da Silveira. There are 649 observations, each one being a student, and 33 variables which cover a range of characteristics about each student's family, education, social situation, alcohol consumption, and grades in their Portuguese language class. Some key variables we will be examining are sex, male or female, Pstatus, whether their parents are together or apart, schoolsup, whether or not their school provides them extra academic support, famsup, whether or not their family provides

them extra academic support, Mjob and Fjob, the categories that their parents' jobs fall under, freetime and studytime, the amount of free time after school and amount of time spent studying on a scale of 1-5, number of absences, and amount of class failures, on a scale of 1-4. Our response variable is Walc, which is the students' average weekend alcohol consumption, on a scale of 1-5, with 5 being very high.



Methodology

We are using a multivariable linear regression to examine the effects of the predictor variables sex, Pstatus, schoolsup, famsup, Mjob, Fjob, freetime, studytime, absences, and failures on the response variable Walc, or weekend alcohol consumption. We are using a linear model rather than logistic since Walc is not binary. In our model we are also including interactions between freetime and studytime, failures and studytime, failures and absences, as well as famsup and Mjob and famsup and Fjob. In our model we used `step_dummy()` to create dummy variables for all categorical variables, `step_interact()` to create all of our interaction variables, and `step_zv()` to remove all variables with only one value.

Results

```
# 5-fold cross-validation
# A tibble: 5 x 2
  splits      id
  <list>     <chr>
1 <split [388/98]> Fold1
2 <split [389/97]> Fold2
3 <split [389/97]> Fold3
4 <split [389/97]> Fold4
5 <split [389/97]> Fold5
```

Linear Regression Model Specification (regression)

Computational engine: lm

StepAIC Model

Start: AIC=102.15

```
Walc ~ (school + sex + age + address + famsize + Pstatus + Medu +
  Fedu + Mjob + Fjob + reason + guardian + traveltime + studytime +
  failures + schoolsup + famsup + paid + activities + nursery +
  higher + internet + romantic + famrel + freetime + goout +
  Dalc + health + absences + G1 + G2 + G3) - Dalc
```

	Df	Sum of Sq	RSS	AIC
- guardian	2	0.642	507.22	98.766
- G3	1	0.005	506.58	100.155
- G2	1	0.028	506.60	100.177
- school	1	0.033	506.61	100.181
- activities	1	0.050	506.62	100.198
- failures	1	0.071	506.64	100.218
- schoolsup	1	0.107	506.68	100.253
- romantic	1	0.109	506.68	100.254
- G1	1	0.169	506.74	100.312
- traveltime	1	0.243	506.82	100.383
- age	1	0.267	506.84	100.406
- higher	1	0.452	507.03	100.583
- Pstatus	1	0.669	507.24	100.791
- paid	1	1.066	507.64	101.172
- address	1	1.146	507.72	101.248
- internet	1	1.539	508.11	101.624

- famsup	1	1.546	508.12	101.631
- reason	3	5.773	512.35	101.657
<none>			506.57	102.150
- Mjob	4	9.380	515.95	103.066
- famsize	1	3.435	510.01	103.434
- freetime	1	4.025	510.60	103.996
- nursery	1	4.341	510.91	104.296
- Fedu	1	5.720	512.29	105.607
- Fjob	4	13.521	520.09	106.952
- studytime	1	7.696	514.27	107.478
- Medu	1	9.953	516.53	109.606
- health	1	10.118	516.69	109.762
- absences	1	11.374	517.95	110.941
- famrel	1	11.737	518.31	111.282
- sex	1	27.540	534.11	125.878
- goout	1	104.225	610.80	191.080

Step: AIC=98.77

Walc ~ school + sex + age + address + famsize + Pstatus + Medu +
 Fedu + Mjob + Fjob + reason + traveltime + studytime + failures +
 schoolsup + famsup + paid + activities + nursery + higher +
 internet + romantic + famrel + freetime + goout + health +
 absences + G1 + G2 + G3

	Df	Sum of Sq	RSS	AIC
- G3	1	0.000	507.22	96.766
- school	1	0.005	507.22	96.770
- activities	1	0.046	507.26	96.809
- G2	1	0.049	507.26	96.812
- failures	1	0.091	507.31	96.853
- romantic	1	0.123	507.34	96.884
- G1	1	0.132	507.35	96.892
- schoolsup	1	0.140	507.36	96.900
- age	1	0.168	507.38	96.926
- traveltime	1	0.281	507.50	97.035
- higher	1	0.389	507.60	97.138
- Pstatus	1	0.870	508.09	97.598
- paid	1	0.957	508.17	97.682
- address	1	1.037	508.25	97.758
- internet	1	1.605	508.82	98.301
- famsup	1	1.620	508.84	98.315
- reason	3	6.009	513.23	98.490
<none>			507.22	98.766

- Mjob	4	9.030	516.25	99.342
- famsize	1	3.490	510.71	100.098
- freetime	1	4.171	511.39	100.746
- nursery	1	4.380	511.60	100.945
- Fedu	1	6.470	513.69	102.925
- Fjob	4	13.329	520.54	103.372
- studytime	1	7.536	514.75	103.934
- health	1	10.423	517.64	106.652
- Medu	1	10.723	517.94	106.933
- absences	1	11.239	518.45	107.417
- famrel	1	11.668	518.88	107.819
- sex	1	28.519	535.73	123.351
- goout	1	104.246	611.46	187.607

Step: AIC=96.77

Walc ~ school + sex + age + address + famsize + Pstatus + Medu +
 Fedu + Mjob + Fjob + reason + traveltime + studytime + failures +
 schoolsup + famsup + paid + activities + nursery + higher +
 internet + romantic + famrel + freetime + goout + health +
 absences + G1 + G2

	Df	Sum of Sq	RSS	AIC
- school	1	0.004	507.22	94.770
- activities	1	0.045	507.26	94.810
- failures	1	0.092	507.31	94.854
- G2	1	0.105	507.32	94.867
- romantic	1	0.123	507.34	94.884
- G1	1	0.138	507.35	94.898
- schoolsup	1	0.141	507.36	94.901
- age	1	0.167	507.38	94.926
- traveltime	1	0.283	507.50	95.037
- higher	1	0.388	507.60	95.138
- Pstatus	1	0.871	508.09	95.600
- paid	1	0.960	508.18	95.685
- address	1	1.042	508.26	95.763
- internet	1	1.605	508.82	96.301
- famsup	1	1.631	508.85	96.326
- reason	3	6.135	513.35	96.609
<none>			507.22	96.766
- Mjob	4	9.032	516.25	97.344
- famsize	1	3.490	510.71	98.098
- freetime	1	4.172	511.39	98.747
- nursery	1	4.392	511.61	98.956

- Fedu	1	6.489	513.71	100.944
- Fjob	4	13.339	520.56	101.382
- studytime	1	7.551	514.77	101.948
- health	1	10.458	517.67	104.685
- Medu	1	10.725	517.94	104.935
- absences	1	11.239	518.45	105.417
- famrel	1	11.671	518.89	105.822
- sex	1	28.592	535.81	121.418
- goout	1	104.349	611.57	185.689

Step: AIC=94.77

Walc ~ sex + age + address + famsize + Pstatus + Medu + Fedu +
Mjob + Fjob + reason + traveltime + studytime + failures +
schoolsup + famsup + paid + activities + nursery + higher +
internet + romantic + famrel + freetime + goout + health +
absences + G1 + G2

	Df	Sum of Sq	RSS	AIC
- activities	1	0.044	507.26	92.813
- failures	1	0.093	507.31	92.860
- G2	1	0.105	507.33	92.871
- romantic	1	0.126	507.35	92.891
- G1	1	0.134	507.35	92.899
- schoolsup	1	0.155	507.38	92.919
- age	1	0.166	507.39	92.929
- traveltime	1	0.278	507.50	93.037
- higher	1	0.385	507.61	93.139
- Pstatus	1	0.871	508.09	93.604
- paid	1	0.964	508.18	93.693
- address	1	1.082	508.30	93.806
- famsup	1	1.633	508.85	94.332
- internet	1	1.640	508.86	94.339
- reason	3	6.145	513.37	94.623
<none>			507.22	94.770
- Mjob	4	9.073	516.29	95.387
- famsize	1	3.495	510.72	96.108
- freetime	1	4.193	511.41	96.772
- nursery	1	4.391	511.61	96.960
- Fedu	1	6.496	513.72	98.955
- Fjob	4	13.354	520.57	99.400
- studytime	1	7.613	514.83	100.010
- health	1	10.547	517.77	102.772
- Medu	1	10.729	517.95	102.943

- famrel	1	11.666	518.89	103.822
- absences	1	11.861	519.08	104.004
- sex	1	29.305	536.53	120.068
- goout	1	104.444	611.66	183.768

Step: AIC=92.81

Walc ~ sex + age + address + famsize + Pstatus + Medu + Fedu +
 Mjob + Fjob + reason + traveltime + studytime + failures +
 schoolsup + famsup + paid + nursery + higher + internet +
 romantic + famrel + freetime + goout + health + absences +
 G1 + G2

	Df	Sum of Sq	RSS	AIC
- failures	1	0.103	507.37	90.911
- G2	1	0.108	507.37	90.916
- G1	1	0.137	507.40	90.944
- romantic	1	0.145	507.41	90.952
- schoolsup	1	0.162	507.43	90.968
- age	1	0.179	507.44	90.984
- traveltime	1	0.281	507.55	91.082
- higher	1	0.376	507.64	91.173
- Pstatus	1	0.834	508.10	91.611
- paid	1	0.933	508.20	91.706
- address	1	1.077	508.34	91.843
- famsup	1	1.617	508.88	92.360
- internet	1	1.624	508.89	92.367
- reason	3	6.124	513.39	92.645
<none>			507.26	92.813
- Mjob	4	9.053	516.32	93.410
- famsize	1	3.501	510.77	94.155
- freetime	1	4.306	511.57	94.921
- nursery	1	4.433	511.70	95.042
- Fedu	1	6.514	513.78	97.014
- Fjob	4	13.462	520.73	97.542
- studytime	1	7.653	514.92	98.090
- health	1	10.589	517.85	100.854
- Medu	1	10.782	518.05	101.034
- famrel	1	11.680	518.95	101.877
- absences	1	11.882	519.15	102.065
- sex	1	29.390	536.66	118.186
- goout	1	104.500	611.76	181.848

Step: AIC=90.91

Walc ~ sex + age + address + famsize + Pstatus + Medu + Fedu +
 Mjob + Fjob + reason + traveltime + studytime + schoolsup +
 famsup + paid + nursery + higher + internet + romantic +
 famrel + freetime + goout + health + absences + G1 + G2

	Df	Sum of Sq	RSS	AIC
- G2	1	0.080	507.45	88.988
- age	1	0.120	507.49	89.026
- G1	1	0.137	507.50	89.043
- schoolsup	1	0.149	507.52	89.053
- romantic	1	0.150	507.52	89.055
- traveltime	1	0.265	507.63	89.165
- higher	1	0.467	507.83	89.358
- Pstatus	1	0.858	508.23	89.732
- paid	1	0.891	508.26	89.764
- address	1	1.119	508.49	89.982
- internet	1	1.660	509.03	90.498
- famsup	1	1.668	509.04	90.506
- reason	3	6.249	513.62	90.860
<none>			507.37	90.911
- Mjob	4	9.057	516.42	91.510
- famsize	1	3.598	510.97	92.346
- nursery	1	4.384	511.75	93.093
- freetime	1	4.491	511.86	93.194
- Fedu	1	6.548	513.92	95.144
- Fjob	4	13.435	520.80	95.613
- studytime	1	7.605	514.97	96.142
- health	1	10.581	517.95	98.942
- Medu	1	10.818	518.19	99.165
- famrel	1	11.656	519.02	99.949
- absences	1	11.871	519.24	100.151
- sex	1	29.300	536.67	116.197
- goout	1	105.729	613.10	180.904

Step: AIC=88.99

Walc ~ sex + age + address + famsize + Pstatus + Medu + Fedu +
 Mjob + Fjob + reason + traveltime + studytime + schoolsup +
 famsup + paid + nursery + higher + internet + romantic +
 famrel + freetime + goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- age	1	0.096	507.54	87.080
- romantic	1	0.134	507.58	87.116

- schoolsup	1	0.146	507.59	87.128
- traveltime	1	0.269	507.72	87.245
- higher	1	0.429	507.88	87.398
- Pstatus	1	0.844	508.29	87.796
- paid	1	0.858	508.31	87.809
- G1	1	1.066	508.51	88.008
- address	1	1.129	508.58	88.068
- famsup	1	1.659	509.11	88.574
- internet	1	1.660	509.11	88.575
- reason	3	6.202	513.65	88.891
<none>			507.45	88.988
- Mjob	4	9.011	516.46	89.543
- famsize	1	3.585	511.03	90.409
- nursery	1	4.394	511.84	91.178
- freetime	1	4.425	511.87	91.208
- Fedu	1	6.512	513.96	93.185
- Fjob	4	13.785	521.23	94.015
- studytime	1	7.573	515.02	94.188
- health	1	10.808	518.26	97.231
- Medu	1	10.862	518.31	97.281
- absences	1	11.875	519.32	98.230
- famrel	1	12.133	519.58	98.471
- sex	1	29.629	537.08	114.567
- goout	1	106.917	614.36	179.909

Step: AIC=87.08

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + traveltime + studytime + schoolsup + famsup +
 paid + nursery + higher + internet + romantic + famrel +
 freetime + goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- romantic	1	0.109	507.65	85.184
- schoolsup	1	0.114	507.66	85.189
- traveltime	1	0.266	507.81	85.335
- higher	1	0.366	507.91	85.430
- paid	1	0.853	508.40	85.895
- Pstatus	1	0.864	508.41	85.906
- address	1	1.114	508.66	86.145
- G1	1	1.155	508.70	86.185
- internet	1	1.695	509.24	86.700
- famsup	1	1.746	509.29	86.748
- reason	3	6.242	513.79	87.020

<none>			507.54	87.080
- Mjob	4	9.011	516.55	87.633
- famsize	1	3.564	511.11	88.481
- nursery	1	4.435	511.98	89.308
- freetime	1	4.533	512.08	89.401
- Fedu	1	6.506	514.05	91.269
- studytime	1	7.478	515.02	92.188
- Fjob	4	13.927	521.47	92.235
- Medu	1	10.882	518.43	95.390
- health	1	10.963	518.51	95.465
- famrel	1	12.100	519.64	96.530
- absences	1	12.124	519.67	96.553
- sex	1	29.544	537.09	112.577
- goout	1	110.094	617.64	180.490

Step: AIC=85.18

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + traveltime + studytime + schoolsup + famsup +
 paid + nursery + higher + internet + famrel + freetime +
 goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- schoolsup	1	0.128	507.78	83.306
- traveltime	1	0.267	507.92	83.439
- higher	1	0.405	508.06	83.572
- paid	1	0.856	508.51	84.003
- Pstatus	1	0.883	508.54	84.028
- address	1	1.076	508.73	84.213
- G1	1	1.144	508.80	84.277
- internet	1	1.653	509.30	84.763
- famsup	1	1.719	509.37	84.826
- reason	3	6.221	513.87	85.103
<none>			507.65	85.184
- Mjob	4	8.995	516.65	85.719
- famsize	1	3.608	511.26	86.625
- nursery	1	4.384	512.04	87.363
- freetime	1	4.635	512.29	87.601
- Fedu	1	6.618	514.27	89.478
- Fjob	4	14.092	521.74	90.491
- studytime	1	7.706	515.36	90.506
- health	1	10.918	518.57	93.526
- Medu	1	10.931	518.58	93.537
- absences	1	12.016	519.67	94.553

- famrel	1	12.074	519.73	94.608
- sex	1	30.839	538.49	111.845
- goout	1	110.158	617.81	178.627

Step: AIC=83.31

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + traveltime + studytime + famsup + paid +
 nursery + higher + internet + famrel + freetime + goout +
 health + absences + G1

	Df	Sum of Sq	RSS	AIC
- traveltime	1	0.263	508.04	81.558
- higher	1	0.453	508.23	81.740
- paid	1	0.834	508.61	82.103
- Pstatus	1	0.887	508.67	82.154
- address	1	1.085	508.86	82.343
- G1	1	1.306	509.09	82.555
- famsup	1	1.664	509.44	82.896
- internet	1	1.677	509.46	82.908
- reason	3	6.290	514.07	83.289
<none>			507.78	83.306
- Mjob	4	8.872	516.65	83.724
- famsize	1	3.581	511.36	84.721
- nursery	1	4.394	512.17	85.494
- freetime	1	4.594	512.37	85.684
- Fedu	1	6.661	514.44	87.640
- Fjob	4	13.966	521.75	88.493
- studytime	1	7.584	515.36	88.512
- Medu	1	10.930	518.71	91.656
- health	1	11.028	518.81	91.748
- absences	1	11.891	519.67	92.556
- famrel	1	12.153	519.93	92.801
- sex	1	30.711	538.49	109.845
- goout	1	110.218	618.00	176.774

Step: AIC=81.56

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + studytime + famsup + paid + nursery + higher +
 internet + famrel + freetime + goout + health + absences +
 G1

	Df	Sum of Sq	RSS	AIC
- higher	1	0.487	508.53	80.023

- paid	1	0.790	508.83	80.313
- Pstatus	1	0.904	508.95	80.422
- G1	1	1.358	509.40	80.855
- internet	1	1.567	509.61	81.054
- address	1	1.587	509.63	81.074
- famsup	1	1.651	509.69	81.134
- reason	3	6.245	514.29	81.495
<none>			508.04	81.558
- Mjob	4	9.208	517.25	82.287
- famsize	1	3.649	511.69	83.036
- nursery	1	4.259	512.30	83.615
- freetime	1	4.692	512.73	84.025
- Fedu	1	6.536	514.58	85.770
- studytime	1	7.566	515.61	86.742
- Fjob	4	14.014	522.06	86.782
- health	1	10.812	518.86	89.793
- Medu	1	11.500	519.54	90.436
- absences	1	11.984	520.03	90.889
- famrel	1	12.216	520.26	91.105
- sex	1	31.410	539.45	108.713
- goout	1	111.041	619.08	175.628

Step: AIC=80.02

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + studytime + famsup + paid + nursery + internet +
 famrel + freetime + goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- paid	1	0.793	509.32	78.781
- Pstatus	1	0.965	509.50	78.945
- G1	1	1.043	509.57	79.019
- internet	1	1.498	510.03	79.453
- address	1	1.588	510.12	79.539
- famsup	1	1.613	510.14	79.563
- reason	3	6.147	514.68	79.863
<none>			508.53	80.023
- Mjob	4	9.253	517.78	80.787
- famsize	1	3.710	512.24	81.556
- nursery	1	4.264	512.79	82.081
- freetime	1	4.876	513.41	82.661
- Fedu	1	6.900	515.43	84.573
- studytime	1	7.238	515.77	84.892
- Fjob	4	14.447	522.98	85.638

- health	1	11.123	519.65	88.539
- Medu	1	11.338	519.87	88.740
- absences	1	11.747	520.28	89.123
- famrel	1	12.024	520.55	89.381
- sex	1	31.133	539.66	106.902
- goout	1	111.336	619.87	174.242

Step: AIC=78.78

Walc ~ sex + address + famsize + Pstatus + Medu + Fedu + Mjob +
 Fjob + reason + studytime + famsup + nursery + internet +
 famrel + freetime + goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- Pstatus	1	1.009	510.33	77.742
- G1	1	1.129	510.45	77.856
- famsup	1	1.466	510.79	78.177
- internet	1	1.571	510.89	78.277
- address	1	1.605	510.93	78.310
- reason	3	5.960	515.28	78.435
<none>			509.32	78.781
- Mjob	4	8.967	518.29	79.262
- famsize	1	3.566	512.89	80.171
- nursery	1	4.109	513.43	80.685
- freetime	1	5.024	514.35	81.551
- Fedu	1	7.005	516.33	83.419
- studytime	1	7.052	516.38	83.464
- Fjob	4	14.400	523.72	84.330
- Medu	1	10.908	520.23	87.079
- health	1	11.346	520.67	87.488
- absences	1	11.439	520.76	87.574
- famrel	1	12.240	521.56	88.322
- sex	1	32.576	541.90	106.911
- goout	1	111.577	620.90	173.051

Step: AIC=77.74

Walc ~ sex + address + famsize + Medu + Fedu + Mjob + Fjob +
 reason + studytime + famsup + nursery + internet + famrel +
 freetime + goout + health + absences + G1

	Df	Sum of Sq	RSS	AIC
- G1	1	1.015	511.35	76.707
- famsup	1	1.372	511.70	77.047
- reason	3	5.985	516.32	77.409

- address	1	1.887	512.22	77.536
- internet	1	2.041	512.37	77.682
<none>			510.33	77.742
- famsize	1	2.841	513.17	78.440
- Mjob	4	9.249	519.58	78.471
- nursery	1	4.219	514.55	79.743
- freetime	1	5.163	515.49	80.634
- studytime	1	6.928	517.26	82.296
- Fedu	1	7.288	517.62	82.633
- Fjob	4	14.993	525.32	83.814
- absences	1	10.799	521.13	85.919
- health	1	11.504	521.84	86.576
- Medu	1	11.608	521.94	86.673
- famrel	1	11.986	522.32	87.024
- sex	1	35.085	545.42	108.056
- goout	1	112.229	622.56	172.349

Step: AIC=76.71

Walc ~ sex + address + famsize + Medu + Fedu + Mjob + Fjob +
 reason + studytime + famsup + nursery + internet + famrel +
 freetime + goout + health + absences

	Df	Sum of Sq	RSS	AIC
- famsup	1	1.318	512.66	75.959
- reason	3	5.845	517.19	76.231
- internet	1	1.769	513.12	76.386
- address	1	2.070	513.42	76.671
<none>			511.35	76.707
- famsize	1	2.687	514.03	77.255
- Mjob	4	9.238	520.58	77.409
- nursery	1	4.082	515.43	78.571
- freetime	1	4.776	516.12	79.225
- Fedu	1	6.874	518.22	81.198
- studytime	1	8.223	519.57	82.461
- Fjob	4	15.698	527.04	83.403
- health	1	11.655	523.00	85.661
- Medu	1	11.906	523.25	85.893
- absences	1	12.135	523.48	86.106
- famrel	1	12.839	524.19	86.759
- sex	1	36.386	547.73	108.115
- goout	1	114.010	625.36	172.527

Step: AIC=75.96

Walc ~ sex + address + famsize + Medu + Fedu + Mjob + Fjob +
reason + studytime + nursery + internet + famrel + freetime +
goout + health + absences

	Df	Sum of Sq	RSS	AIC
- internet	1	1.661	514.33	75.531
- address	1	1.943	514.61	75.797
- reason	3	6.202	518.87	75.803
<none>			512.66	75.959
- Mjob	4	9.005	521.67	76.421
- famsize	1	2.887	515.55	76.688
- nursery	1	4.218	516.88	77.941
- freetime	1	4.849	517.51	78.534
- Fedu	1	6.488	519.15	80.070
- studytime	1	8.995	521.66	82.412
- Fjob	4	16.043	528.71	82.934
- health	1	11.195	523.86	84.458
- absences	1	11.819	524.48	85.036
- Medu	1	11.947	524.61	85.155
- famrel	1	13.023	525.69	86.150
- sex	1	37.514	550.18	108.281
- goout	1	113.725	626.39	171.330

Step: AIC=75.53

Walc ~ sex + address + famsize + Medu + Fedu + Mjob + Fjob +
reason + studytime + nursery + famrel + freetime + goout +
health + absences

	Df	Sum of Sq	RSS	AIC
- address	1	1.682	516.01	75.118
- reason	3	6.216	520.54	75.370
<none>			514.33	75.531
- famsize	1	2.879	517.21	76.244
- Mjob	4	9.675	524.00	76.589
- nursery	1	4.314	518.64	77.591
- freetime	1	4.423	518.75	77.693
- Fedu	1	6.772	521.10	79.889
- studytime	1	8.943	523.27	81.909
- Fjob	4	17.389	531.72	83.691
- health	1	10.872	525.20	83.698
- Medu	1	11.240	525.57	84.038
- famrel	1	12.336	526.66	85.050
- absences	1	12.386	526.71	85.097

```
- sex          1    37.787 552.11 107.986
- goout        1   115.079 629.41 171.664
```

Step: AIC=75.12

```
Walc ~ sex + famsize + Medu + Fedu + Mjob + Fjob + reason + studytime +
      nursery + famrel + freetime + goout + health + absences
```

	Df	Sum of Sq	RSS	AIC
<none>			516.01	75.118
- reason	3	6.526	522.53	75.226
- famsize	1	2.690	518.70	75.645
- Mjob	4	9.451	525.46	75.938
- nursery	1	4.004	520.01	76.874
- freetime	1	4.487	520.49	77.325
- Fedu	1	6.648	522.66	79.339
- studytime	1	9.349	525.36	81.844
- health	1	10.639	526.65	83.036
- Fjob	4	17.791	533.80	83.591
- absences	1	11.708	527.72	84.022
- famrel	1	12.094	528.10	84.377
- Medu	1	12.262	528.27	84.532
- sex	1	38.426	554.43	108.025
- goout	1	114.926	630.93	170.842

A tibble: 23 x 5

term	estimate	std.error	statistic	p.value
<chr>	<dbl>	<dbl>	<dbl>	<dbl>
1 (Intercept)	1.45	0.364	3.99	0.0000760
2 sexM	0.624	0.106	5.87	0.00000000823
3 famsizeLE3	0.169	0.109	1.55	0.121
4 Medu	-0.218	0.0658	-3.32	0.000981
5 Fedu	0.149	0.0610	2.44	0.0150
6 Mjobhealth	0.179	0.242	0.741	0.459
7 Mjobother	-0.147	0.136	-1.08	0.281
8 Mjobservices	0.0917	0.165	0.557	0.578
9 Mjobteacher	0.418	0.231	1.81	0.0706
10 Fjobhealth	-0.233	0.329	-0.709	0.479

i 13 more rows

Model 1

term	estimate	std.error	statistic	p.value
(Intercept)	2.153	0.249	8.653	0.000
studytime	-0.274	0.068	-4.040	0.000
absences	0.040	0.011	3.506	0.000
sex_M	0.688	0.114	6.061	0.000
Fjob_health	0.078	0.338	0.232	0.817
Fjob_other	0.287	0.211	1.356	0.176
Fjob_services	0.473	0.224	2.115	0.035
Fjob_teacher	-0.164	0.314	-0.520	0.603

A tibble: 7 x 2

	names	x
	<chr>	<dbl>
1	studytime	1.08
2	absences	1.02
3	sex_M	1.07
4	Fjob_health	1.48
5	Fjob_other	3.80
6	Fjob_services	3.49
7	Fjob_teacher	1.60

A tibble: 2 x 6

	.metric	.estimator	mean	n	std_err	.config
	<chr>	<chr>	<dbl>	<int>	<dbl>	<chr>
1	rmse	standard	1.20	5	0.0230	Preprocessor1_Model11
2	rsq	standard	0.146	5	0.0140	Preprocessor1_Model11

Model 2 with Interactions

term	estimate	std.error	statistic	p.value
(Intercept)	2.211	0.265	8.354	0.000
studytime	-0.307	0.085	-3.622	0.000
absences	0.022	0.030	0.732	0.464
sex_M	0.695	0.114	6.092	0.000
Fjob_health	0.066	0.339	0.194	0.847
Fjob_other	0.285	0.212	1.347	0.179
Fjob_services	0.468	0.224	2.089	0.037
Fjob_teacher	-0.153	0.315	-0.484	0.629
studytime_x_absences	0.011	0.017	0.649	0.517

```
# A tibble: 8 x 2
  names          x
  <chr>         <dbl>
1 studytime     1.69
2 absences      7.09
3 sex_M         1.08
4 Fjob_health   1.49
5 Fjob_other    3.80
6 Fjob_services 3.49
7 Fjob_teacher  1.60
8 studytime_x_absences 7.12

# A tibble: 2 x 6
  .metric .estimator mean      n std_err .config
  <chr>    <chr>      <dbl> <int>   <dbl> <chr>
1 rmse     standard    1.20     5  0.0232 Preprocessor1_Model11
2 rsq      standard    0.145     5  0.0140 Preprocessor1_Model11
```

! Important

Before you submit, make sure your code chunks are turned off with `echo: false` and there are no warnings or messages with `warning: false` and `message: false` in the YAML.