Alcohol Consumption in Schools

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Introduction and data

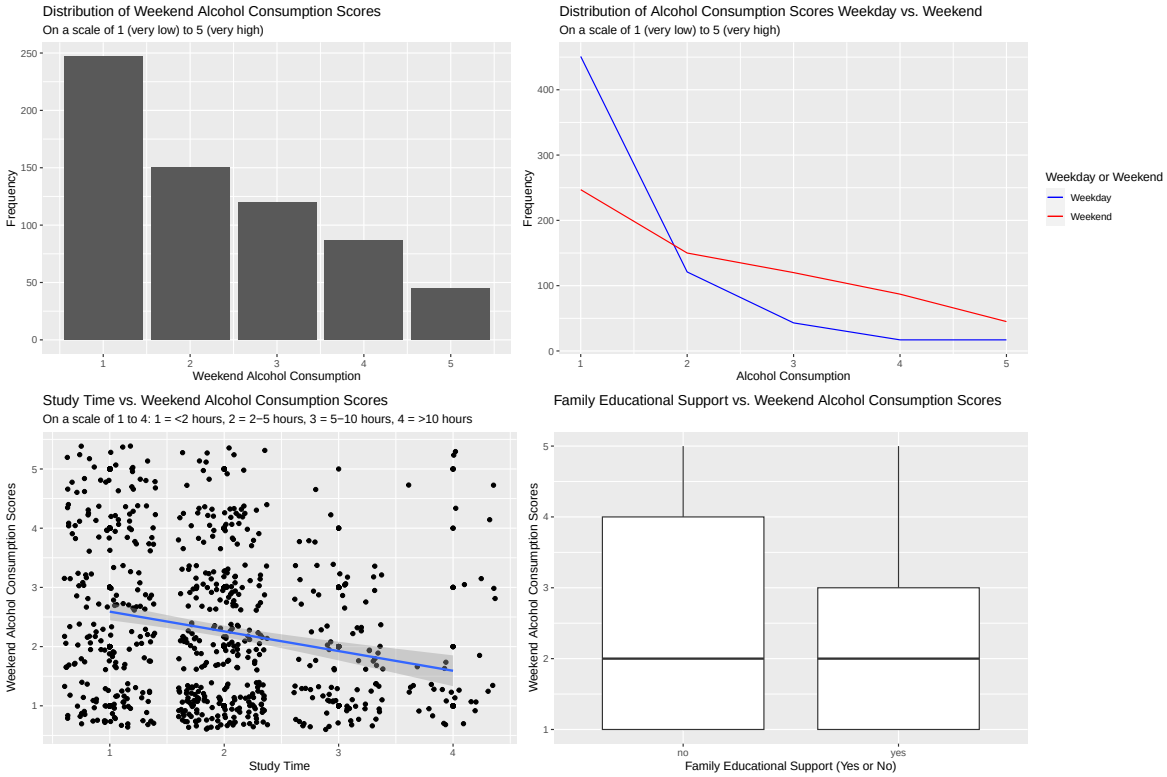
All around the world, underage drinking among students is a significant public health issue and takes a huge toll on the quality of students' lives and education. There is plenty of existing documentation on the effects of socioeconomic status on risky drinking behavior amongst college students. For 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

Split Data into Testing and Training Data and 5 Folds for Cross-Validation

StepAIC Model

term	estimate	std.error	statistic	p.value
(Intercept)	1.453	0.364	3.992	0.000
sexM	0.624	0.106	5.872	0.000
famsizeLE3	0.169	0.109	1.554	0.121
Medu	-0.218	0.066	-3.317	0.001
Fedu	0.149	0.061	2.442	0.015
Mjobhealth	0.179	0.242	0.741	0.459
Mjobother	-0.147	0.136	-1.079	0.281
Mjobservices	0.092	0.165	0.557	0.578
Mjobteacher	0.418	0.231	1.812	0.071
Fjobhealth	-0.233	0.329	-0.709	0.479
Fjobother	0.274	0.191	1.437	0.151
Fjobservices	0.419	0.205	2.046	0.041
Fjobteacher	-0.413	0.312	-1.323	0.186
reasonhome	0.011	0.127	0.085	0.932
reasonother	0.340	0.167	2.035	0.042
reasonreputation	0.202	0.133	1.519	0.130
studytime	-0.180	0.062	-2.896	0.004
nurseryyes	-0.234	0.123	-1.895	0.059
famrel	-0.172	0.052	-3.294	0.001
freetime	-0.100	0.050	-2.006	0.045
goout	0.458	0.045	10.155	0.000
health	0.108	0.035	3.090	0.002
absences	0.034	0.010	3.241	0.001

Model 1

Model Specification + Workflow 1

term	estimate	std.error	statistic	p.value
(Intercept)	1.876	0.350	5.365	0.000
studytime	-0.193	0.063	-3.080	0.002
absences	0.032	0.011	3.071	0.002
Medu	-0.240	0.066	-3.637	0.000
Fedu	0.161	0.061	2.625	0.009
famrel	-0.153	0.052	-2.922	0.004
freetime	-0.091	0.050	-1.804	0.072
goout	0.450	0.045	9.905	0.000
sex_M	0.661	0.107	6.196	0.000
Fjob_health	-0.143	0.331	-0.432	0.666
Fjob_other	0.305	0.193	1.587	0.113
Fjob_services	0.397	0.206	1.921	0.055
Fjob_teacher	-0.410	0.315	-1.303	0.193
Mjob_health	0.243	0.243	0.997	0.320
Mjob_other	-0.125	0.137	-0.909	0.364
Mjob_services	0.170	0.164	1.036	0.301
Mjob_teacher	0.485	0.232	2.091	0.037
famsize_LE3	0.156	0.110	1.420	0.156
reason_home	-0.020	0.128	-0.154	0.878
reason_other	0.301	0.168	1.793	0.074
reason_reputation	0.134	0.132	1.017	0.310
nursery_yes	-0.214	0.124	-1.719	0.086

VIF Multicollinearity Test 1

names	x
studytime	1.153
absences	1.088
Medu	2.392
Fedu	1.936
famrel	1.063
freetime	1.202
goout	1.176
sex_M	1.169
Fjob_health	1.763
Fjob_other	3.918
Fjob_services	3.695
Fjob_teacher	1.990
Mjob_health	1.695
Mjob_other	1.912
Mjob_services	1.982
Mjob_teacher	2.236
famsize_LE3	1.052
reason_home	1.232
reason_other	1.153
reason_reputation	1.269
nursery_yes	1.067

RMSE and R-Squared from 5-Fold Cross Validation 1

.metric	.estimator	mean	n	std_err	.config
rmse	standard	1.106	5	0.017	Preprocessor1_Model1
rsq	standard	0.280	5	0.015	Preprocessor1_Model1

Model 2 with Interactions

Model Specification + Workflow 2

term	estimate	std.error	statistic	p.value
(Intercept)	1.870	0.517	3.621	0.000
studytime	-0.209	0.078	-2.677	0.008
absences	0.023	0.027	0.861	0.389
Medu	-0.234	0.066	-3.525	0.000
Fedu	0.150	0.062	2.405	0.017
famrel	-0.187	0.065	-2.896	0.004
freetime	-0.049	0.130	-0.378	0.706
goout	0.500	0.133	3.769	0.000
sex_M	0.665	0.107	6.207	0.000
Fjob_health	-0.140	0.332	-0.423	0.673
Fjob_other	0.301	0.193	1.559	0.120
Fjob_services	0.392	0.207	1.893	0.059
Fjob_teacher	-0.402	0.316	-1.274	0.203
Mjob_health	0.229	0.245	0.933	0.351
Mjob_other	-0.129	0.138	-0.935	0.350
Mjob_services	0.175	0.165	1.061	0.289
Mjob_teacher	0.477	0.233	2.046	0.041
famsize_LE3	-0.265	0.450	-0.589	0.556
reason_home	-0.022	0.129	-0.171	0.865
reason_other	0.297	0.168	1.767	0.078
reason_reputation	0.131	0.133	0.985	0.325
nursery_yes	-0.211	0.125	-1.692	0.091
studytime_x_absences	0.005	0.015	0.357	0.721
freetime_x_goout	-0.014	0.038	-0.357	0.722
famsize_LE3_x_famrel	0.107	0.111	0.964	0.336

VIF Multicollinearity Test 2

names	x
studytime	1.784
absences	7.240
Medu	2.413
Fedu	1.990
famrel	1.611
freetime	7.944
goout	9.960
sex_M	1.175
Fjob_health	1.770
Fjob_other	3.931
Fjob_services	3.707
Fjob_teacher	1.996
Mjob_health	1.710
Mjob_other	1.914
Mjob_services	1.990
Mjob_teacher	2.253
famsize_LE3	17.545
reason_home	1.252
reason_other	1.155
reason_reputation	1.273
nursery_yes	1.073
studytime_x_absences	7.311
freetime_x_goout	21.846
famsize_LE3_x_famrel	18.071

RMSE and R-Squared from 5-Fold Cross Validation 2

.metric	.estimator	mean	n	std_err	.config
rmse	standard	1.106	5	0.017	Preprocessor1_Model1
rsq	standard	0.280	5	0.013	Preprocessor1_Model1

Applying Model 1 to Testing Data

.metric	.estimator	.estimate
rmse	standard	1.125

.metric	.estimator	.estimate
rsq	standard	0.211