

Analyzing Factors Influencing Student Performance at Gabriel Pereira High School

A Data Analytics Case Study

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Data: Student Performance via UCI ML Repository

Last Updated: 2008

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Defining the Problem

Goal:

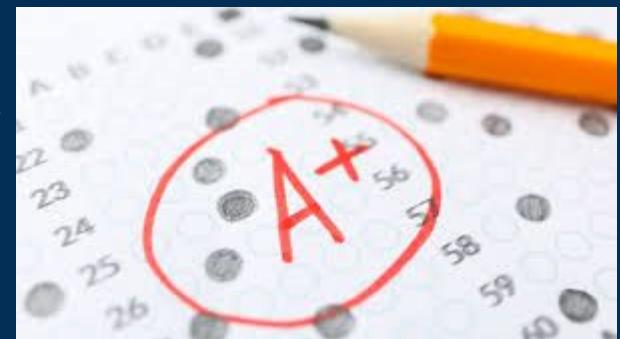
Understand and identify which factors most significantly influence final grades.

Key Questions:

- How does **Parental Education** affect final grades (G3)?
- How do **Absences** and student's **Study Habits** influence outcomes?
- Are **Lifestyle** or **Social Behaviors** correlated with grades?

Takeaway:

These insights can guide interventions to improve student outcomes.



Data Overview

Dataset Summary:

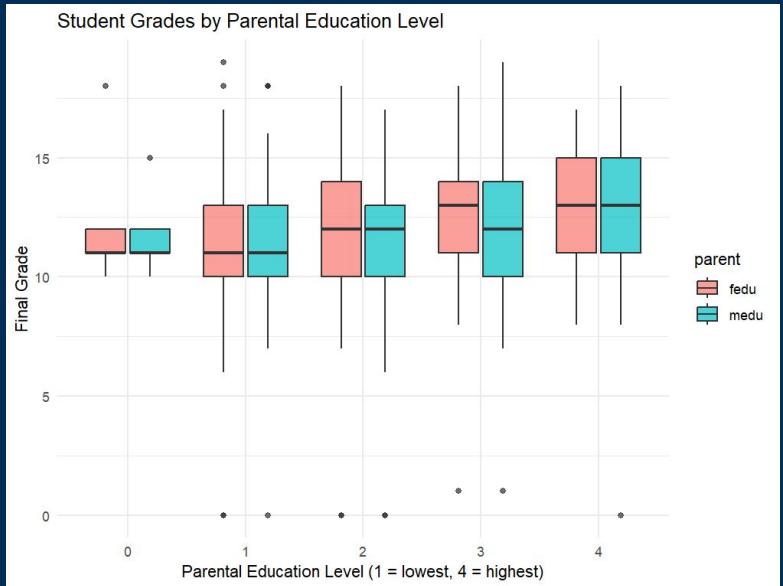
- 468 students from Gabriel Pereira High School in Lisbon, Portugal
- All students are <18 years old

Variables:

- Demographics
 - Age, Gender, Address
- Parental Education
 - Mother Education, Father Education
- Study Habits
 - Study Time, Failures
- Others

Parental Education and Final Grade

- Higher **Parental Education** = Higher Final Grades
- **Mother Education** shows a slightly higher correlation compared to **Father Education**
- Median grades rise from ~10 points for lower-educated parents to ~14-15 points for the highest level
- Suggests that **family background** and **home living environments** significantly influence achievement

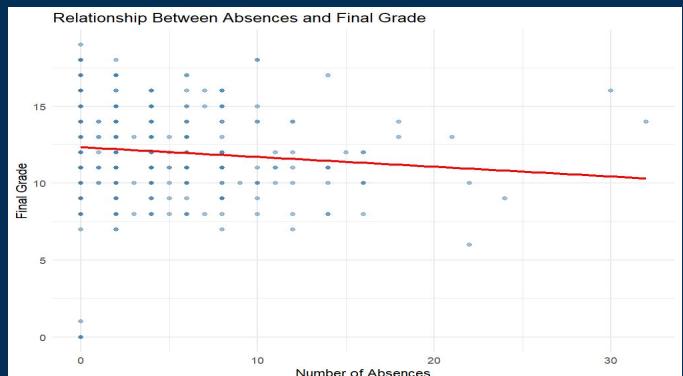
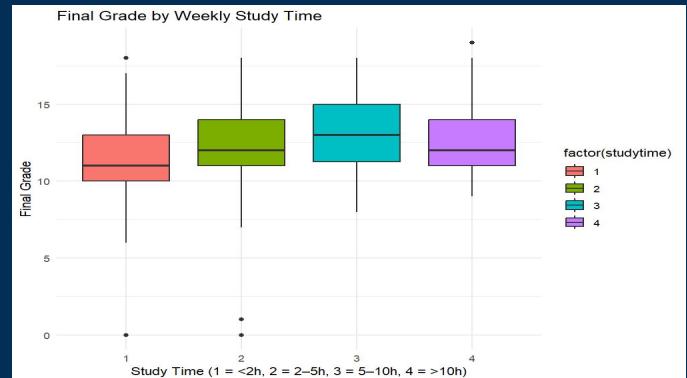


Mother Education Correlation: 0.24, significant

Father Education Correlation: 0.18, significant

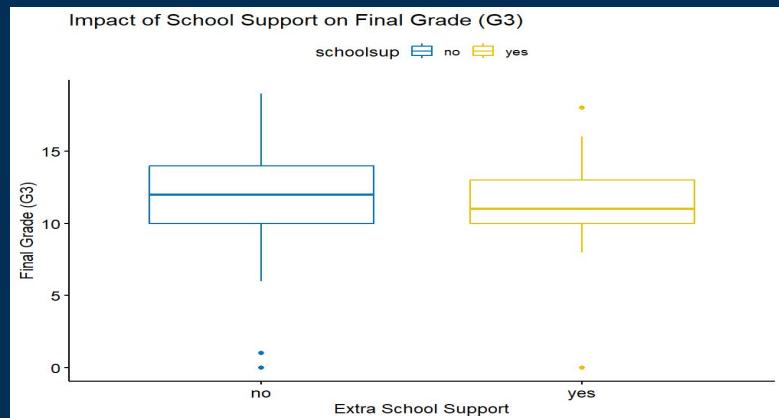
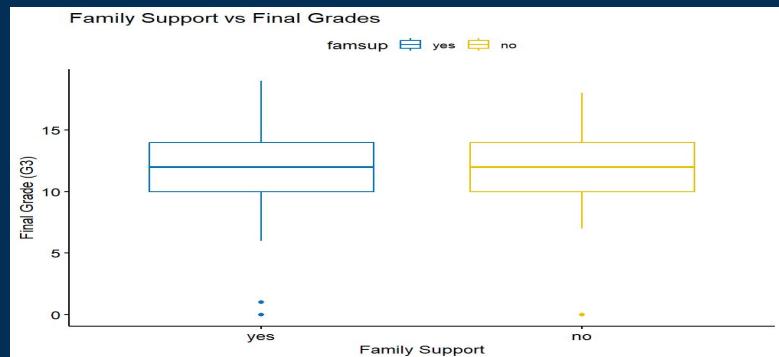
Study Habits and Absences

- Higher **Study Time** is most optimal at 5-10 hours
- After 10 hours, final grade performance falls off
- Limitation: Effective study strategies may matter more than sheer hours
 - More analysis needs to be done
- More **Absences** leads to lower final grades



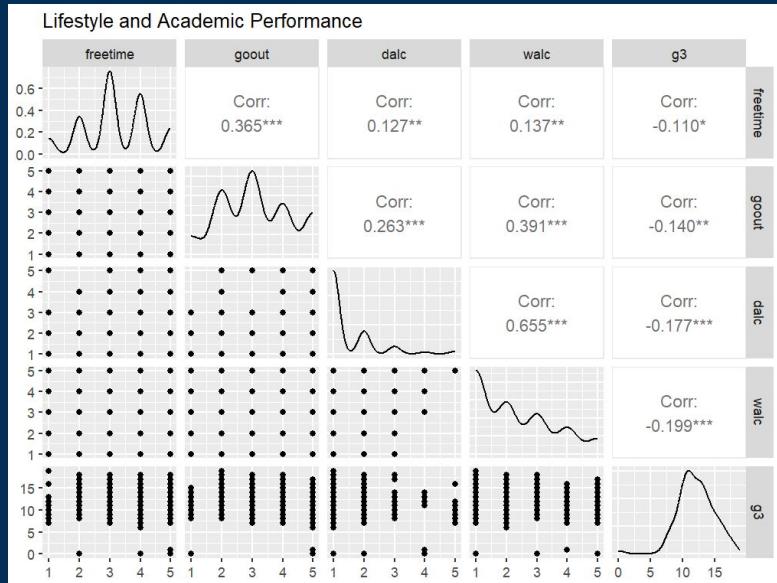
Support Systems

- There does not appear to be any correlation **Family Support** and **Final Grade**
- Those who do not receive **School Support** score higher than those who do
- Those who receive no **School Support** and do receive **Family Support** score the highest on average (~12.3)
- Indicates that **targeted academic support systems** can raise Final Grade performance



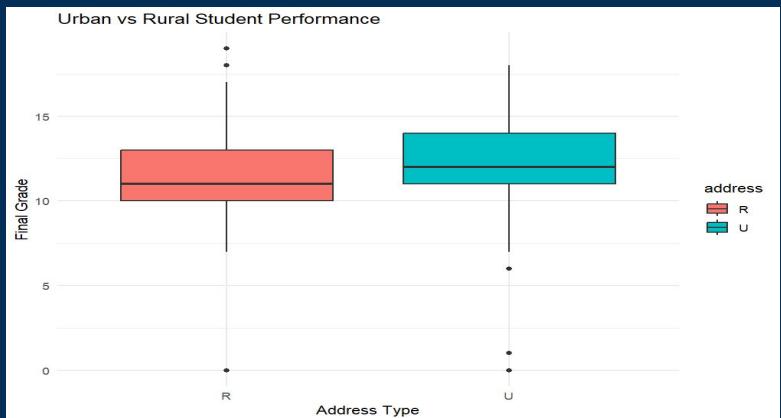
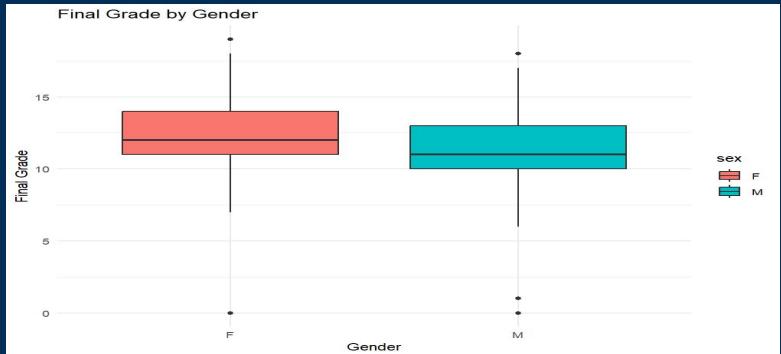
Lifestyle and Behaviors

- Higher **free time, social outings, and alcohol use** are linked to **lower final grades (G3)** .
- **Daily and weekend drinking** are strongly related, suggesting consistent lifestyle choices.
- The strongest negative impact comes from **weekend alcohol consumption ($r = -0.20$)** .
- Academic performance appears to benefit from **moderation and balance** in social habits.

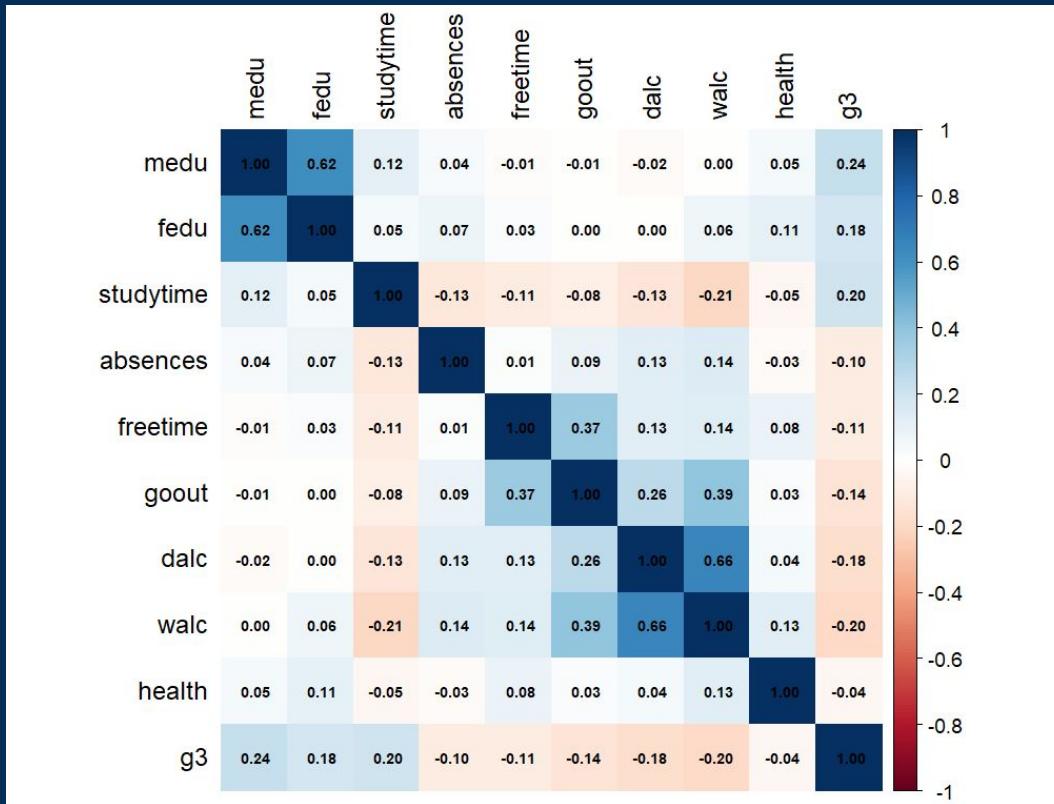


Demographics

- Females score ~12.5 points compared to ~11.6 for Males
- Students who have Urban addresses score ~12.4 points compared to ~11.6 points for Rural addresses, possibly due to resource allocation
- Urban Females perform the best on average, ~12.7, where Rural Males perform the worst, 10.7



Correlation Heatmap



Key Insights & Recommendations

Key Insights:

- Parental Education and Study Time are top predictors of academic success
- Alcohol Consumption, Social Outings, and Absences negatively impact academic performance
- Family Support and structured Study Habits improve performance

Recommendations:

Encourage parental involvement through engagement programs.

Monitor attendance closely, identify at-risk students early.

Promote balanced lifestyle, reward consistent study habits and health education.