

Feeding Minds: How Lunch Status and Parental Education Affect Student Performance

Food For Thought Research

Nayeli De Anda, Chelsea Jimenez, Chelsea Javier





Project Goal

This project investigates how lunch status such as free/reduced vs. standard correlates with student exam performance, exploring whether this relationship is influenced by parental education levels. By examining these socioeconomic factors, the study aims to examine potential disparities in academic outcomes and provide insights into how resources like school lunch programs may affect educational equity.

Question of Interest

How does **lunch status** (free/reduced vs. standard) correlate with **student performance** in exams, and does this relationship vary by **parental education level**?



Empirical Model

$$\text{ExamScore}_i = \beta_0 + \beta_1 \cdot \text{LunchStatus}_i + \beta_2 \cdot \text{ParentalEducation}_i + \beta_3 \cdot (\text{LunchStatus}_i \times \text{ParentalEducation}_i) + \beta_4 \cdot X_i + \epsilon_i$$



Null

There is no significant interaction between lunch status (free/reduced vs. standard) and parental education level on student exam performance.

Hypotheses



Alternative

There is a significant interaction between lunch status and parental education level on student exam performance.

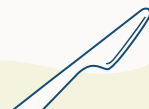


Data Description

The Student Performance dataset has 1,000 entries and the following variables:

- **Gender:** Categorical variable indicating the gender of each student (e.g., male, female).
- **Race/Ethnicity:** Categorical variable denoting racial or ethnic group (e.g., group A, group B), anonymized for privacy (not central to this specific analysis)
- **Parental Level of Education:** Categorical variable describing the highest education level attained by each student's parents (e.g., high school, some college, bachelor's degree).
- **Lunch Status:** Categorical variable indicating whether a student receives free/reduced lunch or has a standard lunch plan. This serves as a proxy for socioeconomic status.
- **Test Preparation Course:** Categorical variable reflecting whether the student completed a test preparation course (e.g., completed, none).
- **Math Score:** Numeric variable capturing each student's score in mathematics (0-100 scale).
- **Reading Score:** Numeric variable reflecting the student's reading comprehension score (0-100 scale).
- **Writing Score:** Numeric variable recording the student's writing proficiency score (0-100 scale).

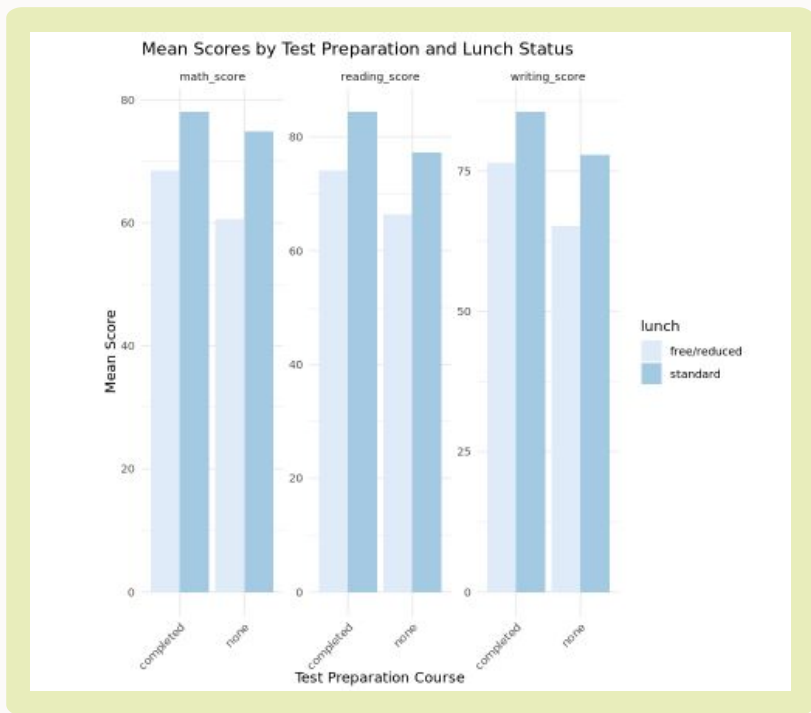
Variation Source: Variation primarily arises from differences in **lunch status** (free/reduced vs. standard) and **parental education levels**. This variation allows for the exploration of how these factors correlate with exam scores.



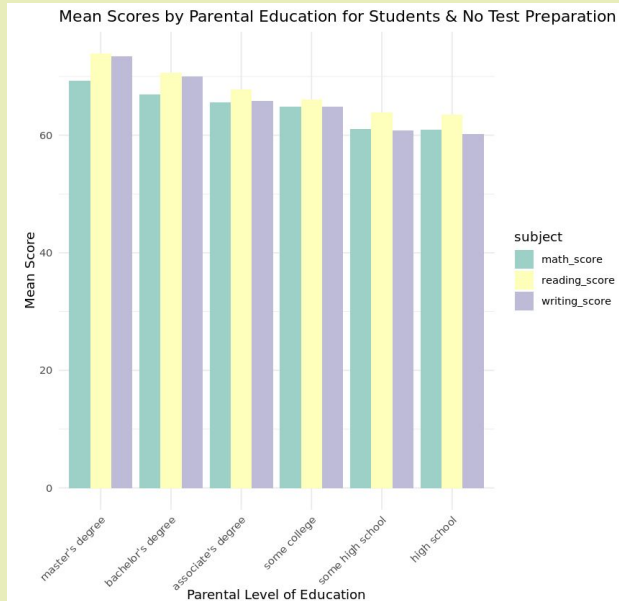
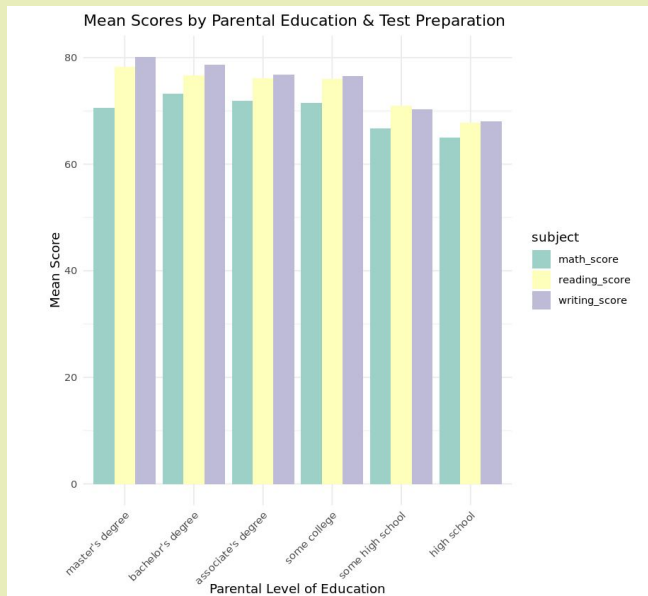
Mean Scores by Test Preparation & Lunch Status

The plot shown on the right compares the mean scores of students across three subjects: math, reading, and writing—based on their participation in a test preparation course and their lunch status.

- **Impact of Test Preparation:** Completing the test preparation course positively affects performance, as seen by the higher mean scores for the "completed" group.
- **Lunch Status and Performance:** The "standard" lunch group achieves better scores than the "free/reduced" lunch group, suggesting that socioeconomic factors may influence academic performance.

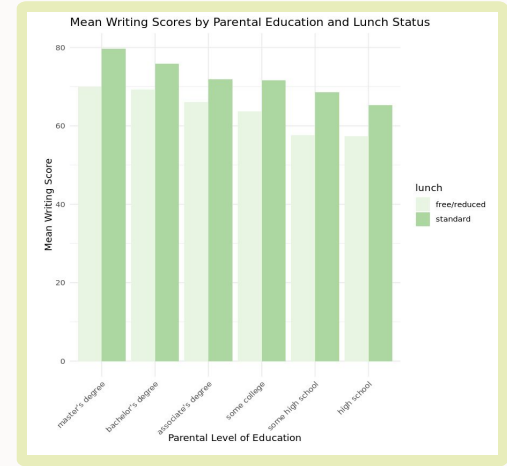
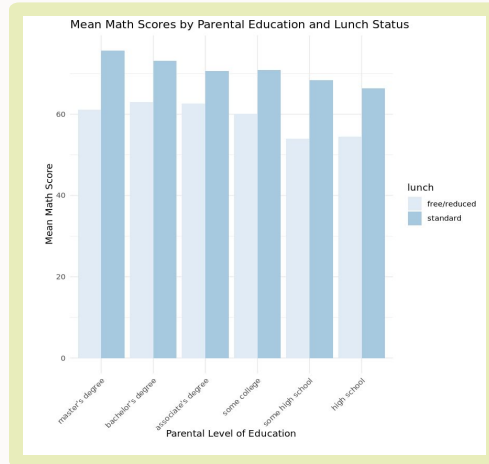
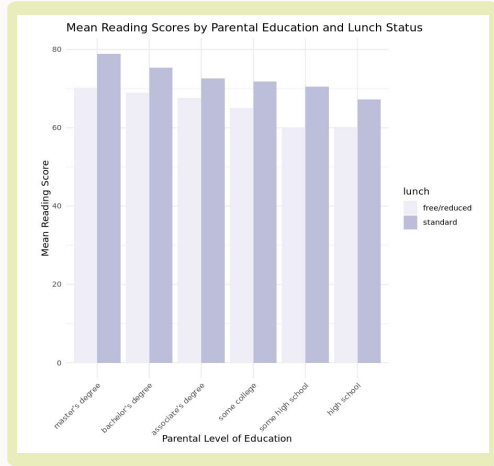


Mean Scores by Parental Education & Test Preparation



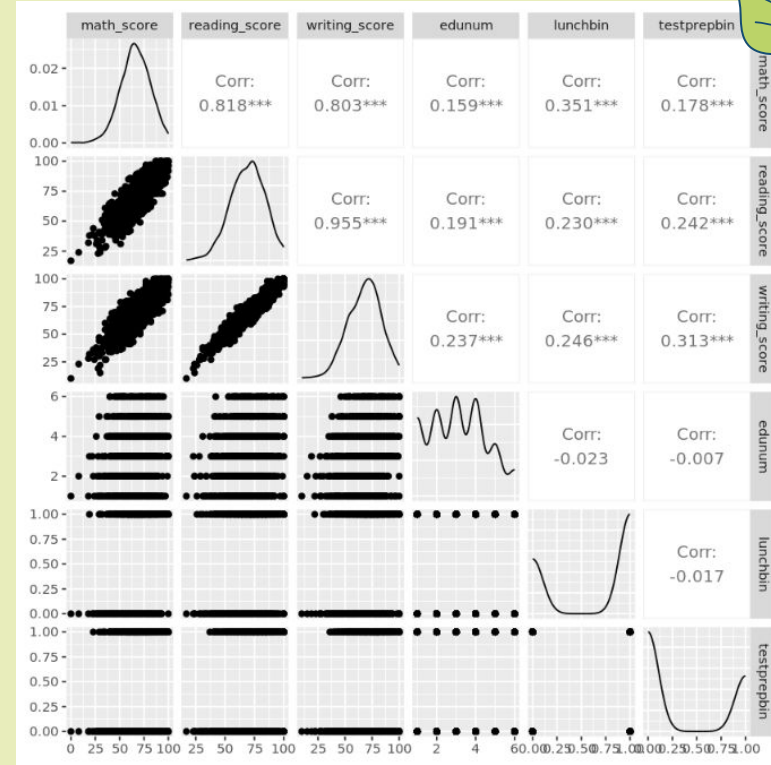


Mean Subject Scores by Parental Education and Lunch Status



Correlation Matrix

Based on the correlation matrix, academic performance across subjects is highly correlated. Socioeconomic status (proxied by lunch status) has a moderate impact on performance. Test preparation participation shows modest benefits, especially for reading and writing. Parental education has some positive influence but is not the strongest predictor of scores.




```
Call:
lm(formula = testcores ~ parental_level_of_education + lunch,
    data = students)
```

Residuals:

Min	1Q	Median	3Q	Max
-50.329	-9.120	0.525	9.110	33.824

Coefficients:

	Estimate	Std. Error	t value
(Intercept)	63.843	1.060	60.245
parental_level_of_educationbachelor's degree	2.583	1.513	1.707
parental_level_of_educationhigh school	-6.382	1.301	-4.904
parental_level_of_educationmaster's degree	4.555	1.946	2.341
parental_level_of_educationsome college	-1.069	1.255	-0.852
parental_level_of_educationsome high school	-4.514	1.334	-3.384
lunchstandard	8.767	0.878	9.986

	Pr(> t)
(Intercept)	< 2e-16 ***
parental_level_of_educationbachelor's degree	0.088081 .
parental_level_of_educationhigh school	1.1e-06 ***
parental_level_of_educationmaster's degree	0.019410 *
parental_level_of_educationsome college	0.394462
parental_level_of_educationsome high school	0.000741 ***
lunchstandard	< 2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 13.28 on 993 degrees of freedom
Multiple R-squared: 0.1379, Adjusted R-squared: 0.1327
F-statistic: 26.47 on 6 and 993 DF, p-value: < 2.2e-16

Multiple Linear Regression Model

The model shows students with parents holding a master's degree score 4.6 points higher, while those with high school (-6.4) or some high school education score lower. Standard lunch students score 8.8 points higher, linking socioeconomic status to performance. The model explains 13.8% of variation ($F = 26.47$, $RSE = 13.28$).

Conclusion

- Students on standard lunch outperform students on free/reduced lunch across all subjects (math, reading, and writing)
- The impact of lunch status on test performance varies by parental education level
 - For students whose parents have lower education levels, the performance gap is more pronounced
 - For students whose parents have higher education levels, the gap narrows which suggest that higher parental education levels mitigates disadvantages associated with free/reduced lunch
- Socioeconomic disparities remain a significant determinant of student performance, emphasizing the need for targeted support for free/reduced lunch students, particularly those with parents who have lower education levels
 - Therefore, we reject the Null Hypothesis

