

# **Analyzing the Impact of Socioeconomic Status on Academic Achievement in Kindergarten**

**Yifei Chu**  
**1010006832**

## **Introduction:**

This report investigates the relationship between socioeconomic status, as represented by income group, and academic achievement in kindergarten students. Utilizing a dataset from an early childhood longitudinal study, we focus on reading scores to examine how socioeconomic factors may influence educational outcomes.

## **Research Questions:**

RQ1: How does the income group of a student's family affect their spring reading scores, after controlling for their fall reading scores?

RQ2: What is the relationship between fall and spring reading scores across different income groups?

RQ3: How does the income group of a student's family affect their spring reading scores, after controlling for their fall reading scores?

RQ4: How do income group and age impact spring reading scores after controlling for initial reading proficiency as measured by fall reading scores?

## **Data Summary:**

The dataset comprises scores in reading, math, and general knowledge for both fall and spring semesters, along with a categorical variable for income group. Summary statistics and initial data exploration provide insights into the distribution of scores and the composition of income groups.

## **RQ1 Analyses:**

Analysis: To assess the effect of income group on spring reading scores after controlling for fall reading scores, an ANCOVA was performed.

	Source	SS	DF	F	p-unc	np2
0	incomegroup	5.131201e+02	2	4.055660	0.017348	0.00068
1	fallreadingscore	1.547042e+06	1	24455.397576	0.000000	0.67214
2	Residual	7.546256e+05	11929	NaN	NaN	NaN

Output:

Sum of Squares (SS) for income group: 5.131201e+02

Degrees of Freedom (DF) for income group: 2

F-value for income group: 4.056560

p-value for income group: 0.017348

Effect size (0.00068)

Interpretation: The p-value for income group (0.017348) is less than the standard alpha level of 0.05, indicating that there are statistically significant differences in spring reading scores among different income groups after controlling for fall reading scores. The effect size, however, is quite small, suggesting that while the differences are statistically significant, the practical impact of income group on spring reading scores may be limited.

## RQ2 Analyses:

Analysis: The relationship between fall and spring reading scores was assessed using correlation analysis.

```
correlation = df['fallreadingscore'].corr(df['springreadingscore'])
print("Correlation between fall and spring reading scores:", correlation)
```

Correlation between fall and spring reading scores: 1.0

Output:

The correlation between fall and spring reading scores: 1.0

Interpretation: The correlation coefficient is 1.0, indicating a perfect positive relationship between fall and spring reading scores. This suggests that students with higher reading scores in the fall continued to have higher scores in the spring, and those with lower scores remained lower, with no overlap or deviation.

## RQ3 Analyses:

Analysis: An ANCOVA was conducted to evaluate the effect of income group on spring

reading scores, controlling for fall reading scores.

	sum_sq	df	F	PR(>F)
C(incomegroup)	5.131201e+02	2.0	4.055660	0.017348
fallreadingscore	1.547042e+06	1.0	24455.397576	0.000000
Residual	7.546256e+05	11929.0	NaN	NaN

Output:

Sum of Squares (SS) for income group: 5.131201e+02

Degrees of Freedom (DF) for income group: 2

F-value for income group: 4.055660

p-value for income group: 0.017348

Effect size (Partial Eta Squared,  $\eta^2p$ ): 0.00068

Interpretation: The p-value for the income group (0.017348) is below the typical alpha level of 0.05, indicating a statistically significant effect of income group on spring reading scores when controlling for fall reading scores. However, the effect size is small ( $\eta^2p = 0.00068$ ), suggesting that while income group does have a statistically significant effect, its practical significance in explaining variance in spring reading scores is minimal.

#### RQ4 Analyses:

Analysis: An ANCOVA was conducted to examine the impact of income group and age on spring reading scores while controlling for fall reading scores. This model allows us to discern whether variations in spring reading scores can be attributed to differences in income group and age, above and beyond what is already explained by students' initial reading scores.

	sum_sq	df	F	PR(>F)
C(incomegroup)	6.488717e-26	1.0	5.598574e+00	0.019984
fallreadingscore	9.214767e+03	1.0	7.950657e+29	0.000000
age	1.411447e-27	1.0	1.217820e-01	0.727874
Residual	1.112635e-24	96.0	NaN	NaN

Output:

Income Group:

Sum of Squares (SS): 6.886717e-26

Degrees of Freedom (DF): 1

F-value: 5.598574e+00

p-value: 0.019984

Fall Reading Score:

SS: 9.214776e+03

DF: 1

F-value: 7.950657e+29

p-value: 0.000000

Age:

SS: 1.411447e-27

DF: 1

F-value: 1.217820e-01

p-value: 0.728774

Interpretation:

Income Group: The p-value for the income group (0.019984) suggests that there is a statistically significant effect of income group on spring reading scores, albeit this significance is marginal as it is close to the conventional alpha threshold of 0.05. This finding indicates that students' socioeconomic background plays a role in their reading development.

Fall Reading Score: The F-statistic and p-value for the fall reading score (practically 0) indicate an extremely strong, statistically significant relationship with spring reading scores. This outcome reaffirms the premise that initial reading ability is a potent predictor of future reading success.

Age: The age factor did not exhibit a statistically significant effect on spring reading scores (p-value = 0.728774), indicating that within the scope of this study, age does not appear to be a determining factor for spring reading outcomes when controlling for fall reading performance.

## **Conclusion:**

The comprehensive analyses conducted within this study have provided a multifaceted perspective on how socioeconomic status influences academic achievement in kindergarten, specifically in reading. Through the application of ANCOVA, we have observed that the income group of students' families exerts a statistically significant influence on spring reading scores, controlling for baseline performance in the fall. This suggests that socioeconomic background plays a notable role in educational outcomes, although the relatively small effect size indicates that additional factors also contribute to students' reading development.

The pronounced effect of income group on math scores, while not directly observed in this dataset, could be speculated to have a substantial influence, as evidenced by similar studies and the general understanding of socioeconomic impacts on education. Such

potential differences between subject areas underscore the complexity of learning and the need for diverse approaches to address educational inequities.

Moreover, the strong correlation between fall and spring reading scores signals a steadfast trajectory in literacy development over the course of the academic year. This consistency implies that early reading capabilities are likely to predict later performance, highlighting the importance of early interventions.

In synthesizing these insights, it becomes apparent that addressing socioeconomic disparities must be integral to crafting educational strategies. The variegated impact of socioeconomic status on educational trajectories demands targeted support structures within educational policy and programming. By acknowledging and addressing these disparities, educators and policymakers can create a foundation for all students to succeed, ensuring that the educational journey is not predetermined by economic background but enriched by equal opportunities for learning and growth.