ANALYSIS OF FACTORS INFLUENCING PERFORMANCE IN THE 2024 JAMB UTME EXAMINATION

SUMMARY

This report presents an analysis of factors influencing student performance in the 2024 Joint Admissions and Matriculation Board (JAMB) Unified Tertiary Matriculation Examination (UTME) in Nigeria.

Utilizing a dataset of 5,000 random student samples, the study aims to identify key determinants of JAMB scores to support targeted interventions for improving educational outcomes. The analysis, conducted entirely in **Microsoft Excel**, reveals significant correlations between JAMB scores and various student and environmental factors.

Key findings indicate that socioeconomic status, study hours, IT proficiency, and school type (private vs. public) are strong predictors of performance. Furthermore, high school attendance demonstrates a substantial positive impact, even potentially outweighing the benefit of extra tutorials when attendance is exceptionally high. While most advantageous factors correlate with higher scores, the analysis also highlights the critical, and sometimes underperforming, role of teacher quality, even in otherwise highly resourced environments. These insights provide a foundational understanding for stakeholders seeking to enhance access to quality tertiary education.

INTRODUCTION

The Joint Admissions and Matriculation Board (JAMB) is a Nigerian government agency established in 1978 to regulate and oversee the admission process into tertiary institutions, including universities, polytechnics, and colleges of education. JAMB is responsible for conducting entrance examinations, and coordinating admissions to ensure standardized and equitable access to higher education. The Unified Tertiary Matriculation Examination (UTME) is the specific entrance examination conducted by JAMB for candidates seeking admission into undergraduate programs in Nigeria.

This study leverages the "Students performance in 2024 JAMB UTME" dataset obtained from Kaggle This dataset was generated using statistics from the 2024 JAMB examination to predict student performance. The overarching objective of this analysis is to specifically identify modifiable factors and actionable strategies that students can employ to enhance their JAMB UTME performance, thereby empowering them with clear pathways for improvement and addressing common challenges leading to lower scores. The insights derived from this analysis are intended to directly inform students, educators, and parents about effective, student-driven approaches to boost scores, ultimately contributing to improved outcomes in this crucial examination.

PROBLEM STATEMENT & OBJECTIVES

Problem Statement

The core problem addressed by this analysis is not merely the prevalence of low JAMB UTME scores among candidates, but the lack of clear, actionable insights into which specific, modifiable student behaviors, habits, and environmental factors significantly contribute to higher scores.

Project Objective

The primary objective of this work is to analyze and explain the impact of various modifiable factors that correlate with higher JAMB UTME scores, thereby identifying practical avenues for student improvement. This involves a focused examination of:

- How individual student-controllable factors and responsive environmental influences relate to scores.
- The effectiveness and magnitude of these relationships, specifically highlighting areas where student effort or targeted interventions yield the greatest returns.
- How multiple modifiable factors might work in unison to create advantageous conditions, or, conversely, how their absence might act independently or even confound each other.

The ultimate deliverable will be an interactive dashboard showcasing these analytical findings, designed to empower students, educators, and parents with data-driven strategies for enhancing JAMB UTME outcomes.

Research Questions

1. What is the overall distribution of JAMB scores?
2. Do students in private schools consistently outperform those in public schools?
3. Does school location (urban vs. rural) impact performance independently of school type?
4. How does the number of study hours per week relate to scores?
5. What is the impact of attending extra tutorials, and is the benefit uniform across all students, suggesting when and for whom tutorials are most effective?
6. How do students with high attendance but no tutorials perform compared to those with lower attendance but multiple tutorials?
7. Does a higher parental education level correlate with higher scores?
8. How strong is the influence of socioeconomic status across different student demographics?
9. Do students with higher IT knowledge perform better, especially given the Computer-Based Test (CBT) format of JAMB, emphasizing the need for digital literacy?
10. To what extent does access to learning materials mitigate other disadvantages?

DATA DICTIONARY

Column Name	Description	Data Type	Range/Categories
JAMB_Score	The score obtained by the student in the JAMB exam	Integer	0-400 (inclusive)
Study_Hours_Per_Week	The number of hours the student dedicates to studying per week	Integer	0-40 hours (inclusive)
Attendance_Rate	The percentage of days the student attended school during the academic year	Integer	0-100% (inclusive)
Teacher_Quality	The quality of teaching in the school, rated on a scale of 1 to 5	Integer	1 to 5
Distance_To_School	The distance the student travels to get to school	Numerical	0-20 km
School_Type	The type of school the student attends	Categorical	'Public', 'Private'
School_Location	The location of the student's school	Categorical	'Urban', 'Rural'
Extra_Tutorials	Indicates whether the student received extra tutorials or coaching sessions	Categorical	'Yes', 'No'
Access_To_Learning_Materials	Indicates whether the student has access to learning materials like textbooks and internet resources	Categorical	'Yes', 'No'
Parent_Involvement	Participation and engagement rate of parents or guardians in the student's education	Categorical	Low, Medium, High
IT_Knowledge	Indicates the student's proficiency with using computers, critical for CBTs like JAMB	Categorical	Low, Medium, High
Student_ID	Unique identifier for each student	Text/ID	Primary Key
Age	The age of the student	Integer	15 to 22
Gender	The gender of the student	Categorical	'Male', 'Female'
Socioeconomic_Status	The socioeconomic standing of the student's family	Categorical	'Low', 'Medium', 'High'
Parent_Education_Level	The highest education level of the student's parents	Categorical	None, Primary, Secondary, Tertiary
Assignments_Completed	The assignments completion rate of the student	Numerical	1 to 5

METHODOLOGY

All data acquisition, cleaning, transformation, and analysis for this project were performed entirely within Microsoft Excel, leveraging PivotTables and Power Pivot (Data Model).

Data Acquisition and Preparation

The raw "Students performance in 2024 JAMB UTME" dataset, originally in CSV format, was acquired from Kaggle. The acquisition and subsequent preparation steps were meticulously executed to ensure a structured and analytical-ready dataset:

1. The CSV dataset was directly imported into a new Excel workbook.
2. To maintain data integrity and a structured workflow, the workbook was organized into distinct sheets:
    - **01_Raw_Data:** Contained the untouched, original imported CSV data to preserve the raw state.
    - **02_Working_Data:** A copy of the 01_Raw_Data was made and all subsequent data transformations, helper column creations, and preliminary cleaning operations were performed here. This ensured that the original dataset remained pristine.
3. The entire dataset within the 02_Working_Data worksheet was converted into an Excel Table (using Insert > Table) with headers.
4. To facilitate deeper analysis and cater to specific research questions, helper columns were created within the 02_Working_
5. The transformed data from 02_Working_Data was loaded into Excel's Data Model (Power Pivot). This step was important for:
    - Enabling the creation of sophisticated DAX (Data Analysis Expressions) measures.
    - Allowing for seamless connections between multiple PivotTables and PivotCharts via Slicers.

DATA CLEANING AND VALIDATION

Data Type and Range Constraints Verification:

- **JAMB_Score:** Verified as integers, ensuring all values fell within the expected range of 0 to 400.
- **Study_Hours_Per_Week:** Confirmed as integers, with values meticulously checked to be plausible within the 0 to 40 hours range. No outliers outside this defined logical range were identified.
- **Attendance_Rate:** Verified as integers, correctly representing percentages between 0 and 100.
- **Teacher_Quality:** Checked as integers, strictly conforming to the 1 to 5 rating scale.
- **Distance_To_School:** Confirmed as numerical values, lying within the defined range of 0 to 20 km.
- **Assignments_Completed:** Verified as numerical values representing a percentage or completion rate.
- **Categorical Field Validation:** All categorical columns (School_Type, School_Location, Extra_Tutorials, Access_To_Learning_Materials, Parent_Involvement, IT_Knowledge, Gender, Socioeconomic_Status, Parent_Education_Level) were systematically filtered and inspected. This ensured that all values strictly conformed only to their predefined categories, eliminating any typos or unexpected entries.
- **Duplicate Record Identification:** The native Excel feature for detecting duplicate values was utilized across the Student_ID column. No duplicate student records were found, confirming the uniqueness of each entry.

- **Missing Values Detection**: Each column was individually filtered to identify any blank cells or N/A values. The dataset was found to be complete, with no missing data points detected, ensuring that all analyses were based on comprehensive information.
- Upon completion of these comprehensive cleaning and validation steps, the data was confirmed to be clean, accurate, and fully prepared for analytical exploration.

Analytical Framework and Tools

The analysis was driven by the objective of identifying modifiable factors and actionable strategies for improving JAMB scores. This involved a multi-faceted approach leveraging various Excel features:

1. The Power Pivot Data Model served as the central analytical engine, enabling unified data access and dynamic filtering across all components of the dashboard.
2. PivotTables were extensively utilized to calculate average JAMB scores across various categorical groupings (e.g., School Type, IT Knowledge, Attendance Rate bins) and numerical groupings (e.g., Study Hours bins).
3. Power Pivot's DAX language was employed to create custom measures for complex calculations not available through standard PivotTables. Key measures included:
    - Overall Median JAMB Score: To provide a robust measure of central tendency, less susceptible to outliers than the mean.
    - Average Score for 90%+ Attendance (No Tutorials): A custom KPI specifically designed to highlight the impact of high attendance independent of extra coaching, calculating the average for students with Attendance_Rate >= 90% and Extra_Tutorials = "No".
4. Slicers were implemented and connected to all PivotTables and PivotCharts. This enabled dynamic filtering of the entire dashboard, allowing users to interactively explore score patterns across various combinations of demographic, habit, and environmental factors.
5. A range of dynamic PivotCharts were created to visually represent the analytical findings:
    - Histograms: To visualize the overall distribution of JAMB_Score.
    - Scatter Plots: To illustrate the correlation between continuous variables like Study_Hours_Per_Week and JAMB_Score, and Assignments_Completed and JAMB_Score.
    - Line Charts: To display trends and comparisons across ordered categories, such as Attendance_Rate bands, often with multiple lines to compare different groups (e.g., with/without tutorials).
    - Clustered Column Charts: To compare average scores across discrete categories (e.g., IT_Knowledge levels, School_Type vs. School_Location).
    - Combination Charts: To show relationships between multiple variables (e.g., average score overlaid with teacher quality ratings).
    - Descriptive Statistics: Fundamental descriptive statistics (mean, median, standard deviation, distribution skewness) were derived to provide an initial understanding of the JAMB_Score variable's characteristics.
    - Statistical Techniques: Linear correlation coefficients were calculated for continuous variables to quantify the strength and direction of relationships. Simple regression analysis was applied where appropriate to model the predictive power of key continuous factors.

KEY FINDINGS & ANALYSIS

This section details the primary findings from our analysis, structured around the research questions to provide clear insights into factors influencing JAMB UTME performance. The focus is on identifying modifiable factors and actionable strategies that can help students improve their scores.

Baseline Performance

Our initial analysis of the overall JAMB scores revealed an average of 174.07, with a median of 170. The score distribution is notably right-skewed, indicating that a larger proportion of students scored below the mean, with a spread extending towards higher scores. This suggests that while some students achieve high scores, the typical performance is closer to the lower end of the spectrum.

School Type and Environment

A significant finding emerged when comparing private and public school performance: private school students consistently achieved higher average JAMB scores across various socioeconomic statuses and geographical locations. For instance, in rural areas, private school students averaged 179.68, compared to 172.28 for public school students.

However, a compelling exception was observed: for students in the high socioeconomic status group with teachers rated '5' (the highest quality), public school students surprisingly outperformed private school students, achieving an average score of 234 compared to 219. This pivotal insight suggests that exceptional teacher quality in public institutions can not only close but potentially reverse the performance gap, underscoring its profound impact regardless of school type.

Beyond school type, school location also plays a significant role. Students attending schools in urban areas generally achieved higher average scores than their rural counterparts. This consistent trend was observed across both public and private schools, and held true for all socioeconomic categories, highlighting the potential advantages of urban educational environments.

Learning Support & Habits

We found a remarkably strong positive linear correlation between the average number of study hours per week and the average JAMB score. With a Pearson Correlation Coefficient of 0.9826 and an R^2 value of 0.9655, it's clear that approximately 96.55% of the variance in JAMB scores can be explained by study hours. This relationship can be approximated by the linear regression equation: $y = 2.0888x + 132$, unequivocally demonstrating that increased, dedicated study time is a powerful and direct predictor of higher scores.

The impact of extra tutorials also varied by socioeconomic status. While tutorials generally led to higher average scores across all groups, their benefit was more pronounced for students from lower and medium socioeconomic backgrounds. Specifically, extra tutorials resulted in an average score increase of approximately 7 points for low SES students and 8 points for medium SES students, compared to about a 3-point increase for high SES students. This suggests that tutorials may play a crucial compensatory role, potentially bridging educational gaps for disadvantaged students.

While extra tutorials consistently improved scores within each attendance band (e.g., 95% attendance with tutorials scored 200, compared to 190 without), very high school attendance (e.g., 95% or more) without extra tutorials (averaging 190) yielded better results than even lower to moderate attendance (e.g., 70%) with extra tutorials (averaging 178). This stark comparison underscores the profound importance of consistent school attendance as a fundamental, non-negotiable driver of performance, often more impactful than supplementary instruction alone.

Parental & Socio-Economic Influence

Socioeconomic Status (SES) emerged as a pervasive and strong underlying predictor of academic performance. A consistent trend indicated that students from higher socioeconomic backgrounds invariably achieved higher mean JAMB scores compared to those from medium or low SES categories, regardless of other filters. This highlights the systemic advantages that come with higher socioeconomic standing.

Similarly, a clear positive correlation was observed between parental education level and average JAMB scores, particularly for students in the low socioeconomic class. Higher parental education generally corresponded to higher scores across all school types and locations. Interestingly, for parents with tertiary education, the difference in average scores between urban and rural schools became minimal (only 1 point), suggesting that the benefits of highly educated parents might reach a ceiling effect, mitigating geographical disadvantages.

Parental involvement also showed positive trends, with higher parental engagement correlating with higher average scores. However, our analysis suggests that parental involvement might be correlated with socioeconomic status and parental education level, implying a need for nuanced understanding when attributing direct causal impact.

Technological & Resource Access

Proficiency in IT knowledge appears to be one of the most impactful factors on JAMB scores, especially given the Computer-Based Test (CBT) format of the examination. Students with higher IT knowledge consistently achieved significantly higher average scores. For instance, high IT knowledge students in public schools averaged 184.71, notably surpassing medium IT knowledge students in private schools who averaged 181.35. This powerfully emphasizes IT proficiency's critical role in exam success. Despite this, a 10-point score difference persisted between private and public schools (with private schools still scoring higher) even when analyzing only students with high IT knowledge, indicating that while IT boosts scores, other school-level factors continue to play a role.

For students in the low socioeconomic class, access to learning materials showed only a minimal difference (approximately one point) in average scores. While access to resources is inherently important, this finding suggests that for this specific group, its direct impact on scores might be less pronounced compared to other factors, or perhaps the quality and effective utilization of these materials warrant further investigation.

Intersections

- Students from rural areas who also belong to lower socioeconomic strata exhibited significantly lower average scores across both public and private school types. This demonstrates a powerful compounding negative effect when these two disadvantages combine.
- High teacher quality not only directly correlated with higher JAMB scores but also with increased average study hours. For example, students with teachers rated '1' studied an average of 17.48 hours per week and scored 152, while those with teachers rated '5' studied 22.30 hours per week and scored 217. This suggests that highly rated teachers may act as catalysts, not only providing better instruction but also motivating students to engage in more effective and consistent study habits.
- A particularly intriguing observation, involving a small group of just three students, highlighted a nuanced but critical point about teacher quality. These students seemingly possessed nearly every conceivable advantage: they attended private schools in urban locations, had tertiary-educated

and highly involved parents, received extra tutorials, demonstrated high IT knowledge, and came from high socioeconomic backgrounds. Despite this impressive array of beneficial factors, their average JAMB score reached 200.

The surprising element that transforms this high score into a paradox is their teacher quality ratings, which were notably only 2 and 3 out of 5. Their attendance rates were also moderate, ranging from 75% to 90%. This specific case, though limited in sample size, strongly suggests that even with numerous advantages, suboptimal teacher quality can be a critical limiting factor that prevents truly exceptional scores. It shows that a mere collection of advantages doesn't guarantee peak academic performance if key educational inputs are weak.

To put this into sharper relief, consider the broader impact of truly high teacher quality. Our analysis shows that when teacher quality is rated 4 or 5, the overall mean JAMB score across the dataset rises significantly to 198.1, with a median of 198. The fact that a group with virtually every advantage but average teachers (rated 2 or 3) only achieved an average of 200, while the general population with demonstrably high-quality teachers (rated 4 or 5) averaged nearly the same at 198.1, strongly underscores this point. This comparison powerfully reinforces that quality teaching is a non-negotiable element for maximizing academic outcomes, essential even for the most advantaged students to reach their full potential.

Conclusions

1. The most direct and actionable pathway to higher scores lies in student effort. Study hours per week emerged as an overwhelmingly strong predictor of success, explaining nearly 96.55% of the variance in JAMB scores. Furthermore, consistent school attendance is a fundamental driver; our analysis revealed that very high attendance (e.g., 95% or more) without extra tutorials can often yield better results than lower to moderate attendance even when paired with supplemental instruction. The proactive completion of assignments also stands out as a key indicator of engagement, reinforcing the importance of diligent, consistent work.
2. High teacher quality is a critical lever for improving academic outcomes. Our data shows it strongly correlates with both increased study hours and significantly higher JAMB scores, suggesting that effective teachers inspire greater student effort and deliver superior instruction. Intriguingly, even among students with almost every conceivable advantage, suboptimal teacher quality appeared to cap their potential, preventing truly exceptional scores. This underscores that while many factors contribute, optimal teacher quality is a necessary condition for maximizing student performance across all settings.
3. Students from higher socioeconomic backgrounds consistently outperform their peers. While high teacher quality can raise scores across the board, it acts more as a rising tide, lifting all boats, rather than a complete equalizer. Significant performance gaps related to socioeconomic status and school location persist even when students have highly-rated teachers, indicating that systemic disparities require broader interventions.
4. Given JAMB's Computer-Based Test (CBT) format, proficiency in IT emerged as one of the most impactful factors on scores. Students with higher IT knowledge consistently achieved significantly better results, highlighting its critical role in navigating the exam environment.
5. While private schools generally exhibit higher average scores, our analysis provided compelling evidence that exceptional teacher quality in public schools can lead to superior results, even surpassing private school performance in specific contexts. This suggests that the quality of

instruction can be a powerful equalizer, mitigating disadvantages associated with school type or location.

RECOMMENDATIONS

For Students:

- Make consistent school attendance your top priority. It's a foundational element for learning that often yields greater returns than supplementary efforts alone.
- Dedicate consistent and sufficient hours to studying each week. Leverage tools and strategies that maximize your study efficiency.
- Actively develop your IT literacy skills. Practice using computers for tests and research, as this proficiency is crucial for the CBT format of the JAMB exam.
- Consistently completing assignments reinforces learning and contributes directly to improved understanding and scores.

For Educators and Schools:

- Prioritize and continuously invest in professional development for teachers, especially in public and rural schools. High-quality instruction has a profound and cascading impact on student scores and intrinsic motivation to study.
- Implement robust programs and incentives to promote and maintain high attendance rates among students.
- Ensure adequate IT infrastructure and provide comprehensive computer literacy training for all students, preparing them effectively for the CBT exam format.

For Parents and Guardians:

- Instill the paramount importance of consistent school attendance in your children.
- Actively support and encourage adequate, consistent study hours by providing a suitable home environment for learning.
- Participate and engage actively in your children's education, as parental involvement consistently correlates with improved academic outcomes.
- Provide opportunities for your children to develop computer proficiency, recognizing its growing importance in education and examinations.

For Policymakers and Institutions:

- Develop and implement targeted programs and policies that address fundamental socioeconomic disparities. This includes ensuring equitable access to quality educational resources, technology, and support services across all regions and demographics.
- Design national and state-level initiatives to enhance teacher quality, particularly focusing on recruitment, training, and retention of highly-rated educators in public and rural areas.
- Invest in widespread programs aimed at improving IT literacy across all educational institutions, recognizing its vital role in modern examinations and future opportunities.