

PREDICTION OF ENROLLMENT IN STATISTICS NATIONAL DIPLOMA PROGRAM OF FEDERAL POLYTECHNIC OKO USING THE POISSON DISTRIBUTION

¹Ejiofor Chidimma Florence

²Ochuenwike Georgina Nwogo, Ph.D

³Chukwunenye Victor Chigozie

Department of Statistics, Federal Polytechnic, Oko

E-mail:chidimmaflorenceejiofor@gmail.com

Phone no: 07035074183

Department of Statistics, Federal Polytechnic, Oko

E-mail:gina4christ2010@gmail.com

Phone no: 07034925446

Statistics Department, NnamdiAzikiwe University, Awka

E-mail:vc.chukwunenye@unizik.edu.ng

Phone no: [07037860164](tel:07037860164)

Abstract

This study seeks to dig into the realm of statistics education by using the Poisson distribution to better understand students' enrollment. Data used for the analysis was obtained from the records of admissions office in the Polytechnic under study. It covers the number of students offered admission as well as the number that eventually accepted the offer into National Diploma program of the institution from 2018 to 2022 academic sessions. The result of the analysis revealed that the number that accepted the offer declined from 2020 to 2022 compared to the number admitted in previous years. More so, there exist 50% likelihood that enrollment into Statistics program will not get better if adequate measures are not put in place to attract a pool of potential students and in turn nurture the growth of this important academic discipline.

Keywords: enrollment, yield rate, statistics education, Poisson distribution, prediction.

Introduction

Statistics, with its powerful analytical tools and methodologies has distinguished itself amidst wide range of academic fields as an important ally in tackling real-world issues (Khan, 2013; Singh, 2019). With the increasing demand for statisticians across various industries, high enrollment of Statistics students who will take the lead in future in understanding complex

phenomena is being increasingly recognized by the public (Wild, 2017).

The Management of tertiary institutions are now concerned about the student enrollment situation having seen that enrollment is correlated with the expansion and long-term viability of the institution coupled with increase in institution's income (Ajilore & Suleiman, 2020). Numerous elements play a role in

students' decisions to enroll after receiving admission offers from several institutions. These range from tuition cost, the distance between the institution and their place of residence, availability of financial aid and many others (AbGhaniet al., 2019).

The percentage of admitted students who ultimately decide to enroll in a particular educational institution is measured by the admission yield rate, sometimes known as the "yield rate" (Crimson Education, 2023). This is an important indicator in higher education. It is a crucial sign of an institution's ability to draw students from its pool of admitted applicants and enroll them. A higher yield rate is frequently linked to an institution's increased competitiveness via promotional appeal and corporate image with evidence from two selected private universities in Nigeria (Akintola et al., 2021).

More so, academic administrators can use the invaluable information obtained to enhance program offerings, allocate school resources and create focused outreach initiatives for potential students.

In order to predict future yield rates for programs at academic institutions, several authors have created diverse statistical models that make use of previous enrollment data and a wide range of influencing factors. Ab Ghani et al. (2019) investigated those factors that predict students' decision to enroll into higher education programmes using three predictive models namely the logistic regression, decision tree and naïve Bayes. The anticipated major was the most significant predictor. Their findings

showed that there is a significant likelihood that an applicant will enroll in the institution if the program given to them is the same one for which they applied.

Suleiman et al. (2022) investigated the enrollment rate of undergraduate as well as postgraduate students across fifteen faculties in the University of Ilorin, Nigeria. The Faculty of Education recorded the highest enrollment of about 31% with female students taking the lead in the undergraduate program while the males had higher enrollment in the same faculty in postgraduate studies.

Aarkrog (2022) sought for reasons why after lower secondary education, hardly do enough young people enroll in Danish vocational education and training (VET), and only around half of those who do so finish their studies in the program. Their investigation revealed that learning environment played crucial role in students' decision to enroll as well as complete their vocational education training and therefore suggested that an attractive learning environment will solve the problem of low intake as well as high dropout of students.

Arora and Padroo (2023) conducted a thorough literature review of the factors impacting students' decision in choice of college selection. Their findings demonstrated that the key factors of students' decision are academic advantages and financial benefits, closely followed by the quality and reputation of the college.

It is therefore important for educational institutions that provide statistics programs, policymakers who are developing educational

initiatives, and the larger statistical community to understand the dynamics of students' enrollment behavior.

Statement of problem

The wide gap between the number of applicants awarded admission in recent years and those who ultimately accepted the offer, usually referred to as admissions yield rate is a key obstacle that weighs heavily on statistics program at Federal Polytechnic Oko. If nothing is done to boost the current yield rate, the institution's statistics program may be eliminated within the foreseeable future. This study therefore seeks to find out the statistics students yield rate and accordingly predict the likelihood of having a higher or lower enrollment going forward.

Significance of the study

Understanding the dynamics of students' enrollment behavior has significant practical implications. This study will guide the development of policies and plans for Statistics education in the Polytechnic which will nurture the growth of this important academic field. We hope to contribute to the developing field of educational planning through our investigation.

Objectives of the study

1. To determine the admission yield rate of Statistics students in Federal Polytechnic Oko from 2018 to 2023.
2. To predict the probability that a greater or smaller number of students will subsequently enroll in the statistics program.

Research questions

1. What is the admission yield rate of Statistics students in Federal Polytechnic Oko from 2018 to 2023?
2. What is the probability that greater or smaller number of students will subsequently enroll in Statistics program?

Research methodology

- Admission Yield Rate (AYR): This is defined as the proportion of admitted students who decide to enroll in a specific institution. It is calculated by

$$AYR = \frac{\text{Number of admitted students who enrolled}}{\text{Total number of admitted students}} \times 100$$

- The Poisson Distribution

A Poisson distribution is a discrete probability distribution which provides the likelihood that an event will occur a certain number of times (x) within a given interval of time. Being a discrete probability distribution implies that the number of events take on non-negative integer values (counts) like 0, 1, 2 and so on. When the average rate of an event is known, the likelihood of such events occurring can be predicted using the Poisson distribution. Its application is diverse such as in prediction of the probability of occurrence of natural disasters like earthquakes and floods, rise and fall in stock market prices, probability of accident occurring in a certain place and number of machine malfunctions in a year given that the average rate of occurrence of such event within a time frame is known.

The probability mass function (PMF) of a Poisson distribution is given by

$$P(X=x) = \frac{\lambda^x e^{-\lambda}}{X!}, x = 0, 1, 2, \dots$$

Where λ is the rate parameter (average number of times an event occurs). To obtain λ , we find the average number of students who enrolled in Statistics program from 2018 to 2023.

x is the number of times an event occurs during the period of time. That is, the number of

students who enrolled at a particular year such as 02, 13, 17, 26 or 22. $e = 2.71828$ is the Euler's constant and $x!$ is the factorial of x .

Its Cumulative Distribution Function (CDF) describes the probabilities of the random variable having values less than or equal to x . That is, $P(X \leq x)$. It is a cumulative function because it sums the total likelihood up to that point.

Results

Table 1: Summary of number of admitted students and enrolled (yield) percentages in Statistics Department

Admission Year	Admitted	Enrolled (% Yield)
2018	22	22 (100%)
2019	26	26 (100%)
2020	25	17 (68%)
2021	330	13 (3.9%)
2022	50	02 (4%)

For the Poisson Probability Mass Function, $\lambda = (22+26+17+13+2)/5 = 16$. That is, an average of 16 students were enrolled into National Diploma Statistics program. Next, we obtained the probability that exactly 16 students will enroll

next year. That is, $P(X=16)$ using the PMF. The probability that more than 16 students will enroll; $P(X > 16) = 1 - P(X \leq 16)$ and the probability that less than 16 students will enroll; $P(X < 16) = P(X=0) + P(X=1) + \dots + P(X=15)$ were obtained

some diagram is missing
here

some diagram is missing
here

Discussion of findings

Table 1 shows that in 2018 and 2019, the Yield rate was 100%. That is, same number of admitted students certainly enrolled in the program while from 2020 to 2022, the yield rate decreased.

From Figure 1, the probability that exactly 16 students will enroll next year is 0.10. That is, there is 10% chance that exactly 16 students will enroll next year (which is a very small probability). More so, the probability tends to zero as the number of students exceed 30. That is, the likelihood of having more than 30 students next year is zero. This implies that more than 30 students are not expected to be enrolled into the Statistics National Diploma program next year.

Figure 2 shows that the probability of less than 16 students enrolling in the program next year is about 0.5. That is, there is 50% chance that less than 16 students will enroll next year. More so, the upper tail of the distribution where probability is 1 (one) confirms with certainty that the number of students that are expected to enroll next year will not exceed 30.

Conclusion

This study therefore concludes that the admission yield rate into Statistics program in the Polytechnic is declining coupled with the likelihood that enrollment into Statistics program will not get better if adequate measures are not put in place to attract a pool of potential students and in turn nurture the growth of this important academic discipline.

Policy implication

- All stakeholders will work together to conduct additional research into the variables that, even after students have received the proper admission, influence their decision to enroll in the institution's Statistics program.
- Intervention strategies and policies that could entice potential students such as financial aid or scholarship should be considered.
- Functionalities like creating a more appealing environment or location for Statistics program could make the program more appealing to admitted students.

References

- Aarkrog, V. (2022). The significance of learning environment and decision-making forenrolment in and completion of VET: A Danish case. In S. Billett, B. E. Stalder, V. Aarkrog, S. Choy, S. Hodge, & A. H. Le (Eds.), *The standing of vocational education and the occupations it serves. Professional and practice-based learning*, vol 32. Springer, Cham. https://doi.org/10.1007/978-3-030-96237-1_13
- Ab Ghani, N. L., Che Cob, Z., MohdDrus, S., & Sulaiman, H. (2019). Student enrolment prediction model in higher education institution: A data mining approach. In: M. Othman, M. Abd Aziz, M. MdSaad, M. Misran (Eds.) *Proceedings of the 3rd International Symposium of Information and Internet Technology (SYMINTech 2018). Lecture notes in electrical engineering*, vol 565. Springer, Cham. https://doi.org/10.1007/978-3-030-20717-5_6
- Ajilore, K., & Suleiman, J. (2020). Corporate identity and students enrolment in Nigerian universities. *Ebonyi State University Journal of Mass Communication*, 7(1), 169-183.
- Akintola, O., Abosede, S., & Itiola, M. (2021). Students' enrolment in Nigerian private universities: The pull effect of corporate image and promotional appeal. *Interdisciplinary Journal of Education*. 4 (2) , 1 4 6 - 1 5 5 . <https://doi.org/10.53449/ije.v4i2.63>
- Arora, S., & Padroo, B. (2023). Factors affecting aspirants college selection decision: A systematic and bibliometric review. *Journal of Management & Entrepreneurship*, 16(4), 136-162.
- Crimson Education. (2023, May 16). *Understanding university yield rates: What they are and why they matter*. <https://www.crimsoneducation.org/us/blog/university-yield-rates/>
- Khan, S. (2013). Statistics in planning and development. *Pakistan Journal of Statistics*. 29(4), 513-524.
- Singh, A. (2019). Statistics, In Routine Life. *International Journal of Educational Science and Research*, 9, 7-14. <https://doi.org/10.24247/ijesraug20192>
- Suleiman, Y., Adeniyi, S. T., Kamal, O., Oluwaseun, L. S., & Abiodun, O. M. (2022). An assessment of students' enrolment rate in University of Ilorin, Nigeria from 2019-2021: Implications for management. *Journal of Educational Leadership in Action*, 8(2), Article 4. <https://digitalcommons.lindenwood.edu/ela/vol8/iss2/4>.
- Wild, C. J. (2017). Statistical literacy as the earth moves. *Statistics Education Research Journal*, 16(1), 31-37.