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A Retrospective Longitudinal and Predictive Analysis of the Number of Failed Examinees Among Radiologic Technology Schools in the Philippines

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ABSTRACT

The performance of educational institutions in licensure exams serves as an important measure of academic quality and the preparedness of graduates, especially in healthcare fields like radiologic technology. This research investigated the factors within institutions that predict the number of failed examinees in the Philippine Radiologic Technology Licensure Examination from 2014 to 2024. Employing a retrospective longitudinal design with predictive analysis, the study utilized Poisson and Negative Binomial Regression analyses to explore secondary data, concentrating on five institutions that consistently had high numbers of examinees. Key variables analyzed included the total number of examinees, the status of first-time takers versus repeaters, institutional passing rate, and the examination year. Findings indicated that the total number of examinees was the only variable that consistently served as a statistically significant predictor of failure across all five institutions, suggesting that a higher volume of examinees correlates with increased failure rates. In one of the models, the institutional passing rate also appeared as a significant negative predictor, underscoring the importance of academic effectiveness within institutions. Other factors, including examination year, whether the candidate was a first-time taker or a repeater, did not demonstrate significant predictive value. These results emphasize the importance for institutions to address the challenges linked to large student populations by enhancing academic support, optimizing resource allocation, and ensuring quality instruction. Future studies are encouraged to integrate qualitative data and additional institutional factors, such as faculty competence and student involvement, to deepen understanding of licensure examination results and support informed educational planning.

Keywords: *Radiologic Technology, Licensure Examination Performance, Retrospective Longitudinal Design, Predictive, Philippines*

Introduction

The effectiveness of educational institutions in licensure exams is a crucial measure of academic standards, teaching efficacy, and the preparedness of students for their professional careers. In the realm of radiologic technology education in the Philippines, ongoing differences in licensure exam outcomes necessitate an investigation into the reliable factors linked with institutional and academic elements that contribute to student failures. Research has shown that consistently low passing rates in the Philippine Radiologic Technology (RT) licensure exam raise alarms regarding the proficiency of graduates entering the healthcare sector (Alipio & Lantajo, 2024).

Several factors have been identified as important indicators of success in the RT licensure examination. The clinical internship grade and the college admission test significantly influenced the performance of RT graduates on the licensure exam (Talaroc et al., 2021). Additionally, the results indicate that both pre-admission assessments and performance during the internship were important predictors of the outcomes of the licensure examination.

In the other field of discipline, predictors of licensure examination are attributed to age, academic scores, and enrichment programs (Lai et al., 2023), admission test scores, high school and college GPAs, and academic performance (Callena et al., 2019; Ferrer, 2024); student-related, school-related, home-related, and teacher-related factors (Abdulmajid, 2024); curriculum quality, faculty competence, and institutional support (Gatpandan et al., 2023); and mock board examination results (Camacho et al., 2024; Camañero et al., 2024).

While current research provides important insights into the factors that affect licensure examination performance, limited research has examined the predictors of examinee failure. In particular, there is a notable scarcity of research exploring how trends in the number of failed examinees may serve as indicators of a school's future performance in licensure examinations—an aspect often overlooked in the literature. A majority of studies concentrate on specific academic indicators or characteristics of institutions without considering the wider consequences of failure patterns over time (Talaroc et al., 2021). This study sought to identify significant institutional factors, such as the number of examinees, the distinction between first-time takers and repeaters, and institutional performance ratings, that could impact failure rates among radiologic technology schools in the Philippines. The goal of its

findings was to assist educational institutions in formulating targeted strategies, improving curricula, and implementing support mechanisms to lower failure rates and boost the quality of radiologic technology education in the Philippines.

Methods

This study employed a retrospective longitudinal design with predictive analysis, analyzing secondary data from licensure examination results of radiologic technology in the Philippines from 2014 to 2024. The longitudinal component allowed the trends of examination in licensure outcomes over time (10 years), while the predictive analysis aimed to identify key institutional characteristics that could predict the number of failures among radiologic technology schools. Five RT schools were selected for this study based on their consistently high annual volume of licensure examinees, ensuring sufficient data for meaningful analysis."

This study employed Poisson regression and negative binomial regression analyses to predict the factors (year, total examinees, number of failed first takers, number of failed repeaters, and institutional passing rate) affecting the number of failed examinees among RT schools. Poisson Regression was used as it is the appropriate statistical method for modeling count data, particularly when the dependent variable represents the number of occurrences or events, such as the number of failed examinees. However, if the data exhibited overdispersion, that is, when the variance of the count data is greater than the mean, negative binomial regression analysis was used.

Results and Discussion

Table 1. Institutional Profile

Year	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2021**	**2022**	**2023**	**2024**
Institution A										
Total Failed Examinees	12	31	49	40	50	33	6	29	20	23
Failed First Takers	6	21	34	26	28	8	2	20	7	15
Failed Repeaters	6	10	15	14	22	19	4	9	13	6
Total Examinees	71	134	159	168	187	154	38	126	103	111
Institutional Passing Rate	83.1	76.87	69.18	76.33	73.26	77.92	84.1	76.19	79.61	79.28
Institution B										
Total Failed Examinees	0	6	9	4	4	2	4	9	9	7
Failed First Takers	0	6	7	4	3	2	3	5	8	2
Failed Repeaters	0	0	2	0	1	0	2	4	1	5
Total Examinees	43	52	84	97	81	79	24	98	124	162
Institutional Passing Rate	100	86.54	89.29	94.85	95.06	97.47	83.33	89.8	92.74	95.68
Institution C	83	16	12	11	12	10	7	39	54	58
Total Failed Examinees	2	13	7	2	8	9	2	33	51	28
Failed First Takers	1	2	5	9	4	9	5	6	3	30
Failed Repeaters	83	92	54	55	88	68	22	117	159	165
Total Examinees	96.39	82.61	81.82	83.33	87.13	85.29	68.18	66.67	66.04	64.85
Institutional Passing Rate										
Institution D										
Total Failed Examinees	55	96	119	123	85	71	26	58	45	46
Failed First Takers	32	57	66	60	28	27	2	39	9	28

Failed Repeaters	23	39	53	63	57	44	24	19	36	18
Total Examinees	169	233	265	252	238	188	40	187	92	145
Institutional Passing Rate	67.46	58.8	54.34	50.4	63.45	60.22	35	68.45	50	67.59
Institution E										
Total Failed Examinees	15	43	70	113	124	177	20	79	70	45
Failed First Takers	11	26	53	66	71	64	2	43	42	9
Failed Repeaters	4	17	17	47	57	53	18	36	28	36
Total Examinees	48	84	125	200	204	249	32	127	139	92
Institutional Passing Rate	66.75	48.81	23.4	43	37.25	51.81	37.5	37.8	48.2	50
National Passing Rate	58.51	43.54	42.76	46.36	47.2	51.9	36.1	40.3	55.57	57.55

**No licensure examination in 2020 due to the COVID-19 pandemic*

Table 1 presents the performance of five institutions in their licensure examinations from 2014 to 2024. Institution B consistently excelled compared to the others, maintaining a high passing rate (mostly exceeding 90%), with a peak of 100% in 2014. Institution A exhibited moderate yet stable performance, with passing rates typically above the national average. Institution C experienced a gradual decline in its passing rate, dropping from 96.39% in 2014 to 64.85% in 2024, accompanied by increased failures among repeat examinees. Institution D's performance was inconsistent, highlighted by a sharp decrease to 35% in 2021, but began to show signs of recovery by 2024 (67.59%). Institution E faced the greatest challenges, with the lowest passing rates, hitting a low of 23.4% in 2016 and gradually improving to 50% in 2024.

The national passing rate followed a similar trend—declining from 58.51% in 2014 to a low of 36.1% in 2021, before rebounding to 57.55% in 2024—suggesting a recent nationwide recovery in licensure outcomes.

Table 2. Predictors of Failed Examinees in Institution A

Parameter	**B**	**Std. Error**	**Hypothesis Test**			
			Wald Chi-Square	**df**	**Sig.**	**Interpretation**
(Intercept)	-8.18	40.22	0.04	1	0.84	Not Significant
Year	0.01	0.02	0.08	1	0.78	Not Significant
Total Examinees	0.01	0.01	5.03	1	0.03	Significant
Institutional Passing Rate	-0.02	0.01	1.61	1	0.2	Not Significant
First Takers	0.01	0.01	0.19	1	0.66	Not Significant
Repeaters	-0.01	0.03	0.15	1	0.7	Not Significant
(Scale)	1[a]					

Dependent Variable: Failed

Model: (Intercept), Year, Total Examinees, Institutional, First, Repeaters

Table 2 indicates that among the variables included in the model, only *total examinees* is a statistically significant predictor of examinee failure ($B = 0.01$, $p = 0.03$). This suggests that as the number of examinees increases, the number of failed examinees also tends to rise, possibly due to limitations in institutional capacity, resources, or instructional quality when managing larger groups."

"All other variables, including year, institutional passing rate, failed first takers, and failed repeaters, did not significantly predict failure, as indicated by their p-values being well above the 0.05 threshold. The non-significant intercept ($p = 0.84$) further indicates that the baseline level of failures, when all predictors are zero, is not meaningful in isolation. Overall, the findings highlight that the size of the examinee population plays a key role in predicting failure rates, while other institutional and demographic factors appear to have no independent effect within this model."

Table 3. Predictors of Failed Examinees in Institution B

Parameter	**B**	**Std. Error**	**95% Wald Confidence Interval**		**Hypothesis Test**			
			Lower	**Upper**	**Wald Chi-Square**	**df**	**Sig.**	**Interpretation**
(Intercept)	126.39	154.72	-176.85	429.64	0.67	1	0.41	Not Significant
Year	-0.054	0.07	-0.2	0.09	0.52	1	0.47	Not Significant
Total Examinees	0.027	0.02	-0.002	0.06	3.42	1	0.06	Not Significant
Institutional Passing Rate	-0.19	0.09	-0.36	-0.01	4.39	1	0.04	Significant
First takers	0.01	0.15	-0.29	0.3	0.03	1	0.96	Not Significant
Repeaters	-0.09	0.2	-0.49	0.31	0.19	1	0.66	Not Significant
(Scale)	1[a]							

Dependent Variable: Failed

Model: (Intercept), Year, Total Examinees, Institutional, First, Repeaters

"Table 3 presents the results of the Poisson regression analysis. Among the predictors, only the *institutional passing rate* variable (B = -0.187, p = .04) showed a statistically significant negative association with failure rates, suggesting that certain institutional characteristics may contribute to lower failure rates. This implies that institutions with supportive environments, effective teaching practices, and inclusive policies may foster better student outcomes. Moreover, the *number of examinees* (B = 0.027, p = .064) approached significance, indicating a possible positive effect."

"Other variables, including year, first-time takers, and repeaters, did not show significant effects, indicating limited influence on the outcome. These findings emphasize the role of institutional factors in the success of the examinees. By focusing on these areas, educational institutions can create environments that support student success and minimize the likelihood of academic failure. Overall, the results highlight the importance of institutional factors in understanding their role in the licensure examination success, while other predictors showed limited statistical significance."

Table 4. Predictors for Failed Examinees for Institution C

Parameter	**B**	**Std. Error**	**Hypothesis Test**			
			Wald Chi-Square	**df**	**Sig.**	**Interpretation**
(Intercept)	-149.47	318.4	0.22	1	0.63	Not Significant
Year	0.075	0.16	0.23	1	0.63	Not Significant
Total Examinees	0.046	0.02	3.39	1	0.05	Significant
Institutional Passing Rate	-0.02	0.09	0.05	1	0.83	Not Significant
First Takers	-0.091	0.09	1.14	1	0.28	Not Significant
Repeaters	-0.089	0.09	0.83	1	0.36	Not Significant
(Scale)	1[a]					
(Negative binomial)	1[a]					

Dependent Variable: Failure

Model: (Intercept), Year, Total Examinees, Institutional, First, Repeaters

"In Table 4, among the variables included, only the *total number of examinees* emerged as a statistically significant predictor (B = 0.046, *p* = 0.05), suggesting that as the number of examinees increases, the number of failures also tends to increase. This indicates a potential systemic or institutional challenge in accommodating larger cohorts."

"Other variables, including year, institutional passing rate, first-time examinees, and repeaters, did not significantly predict failure rates, as evidenced by their high p-values (all above 0.05). The intercept was also non-significant, implying that the base level of failure without the influence of other variables

is not distinguishable from zero in a statistically meaningful way. Overall, the model indicates that *examinee volume* is a crucial factor influencing failure rates, while other examined factors did not show a strong individual impact in this analysis."

Table 5. Predictors for Failed Examinees for Institution D

			95% Wald Confidence Interval		Hypothesis Test			
Parameter	B	Std. Error	Lower	Upper	Wald Chi-Square	df	Sig.	Interpretation
(Intercept)	22.403	43.7027	-63.253	108.058	.263	1	.608	Not Significant
Year	-.010	.0218	-.053	.033	.207	1	.649	Not Significant
Total Examinees	-.002	.0061	-.014	.010	.104	1	.747	Not Significant
Institutional Passing Rate	.017	.0204	-.023	.057	.701	1	.402	Not Significant
First	.015	.0101	-.004	.035	2.298	1	.130	Not Significant
Repeaters	.020	.0142	-.008	.048	2.037	1	.154	Not Significant
(Scale)	1[a]							

Dependent Variable: Failed

Model: (Intercept), Year, Total Examinees, Institutional, National, First, Repeaters

a. Fixed at the displayed value.

In Table 5, results revealed that none of the predictors had a statistically significant effect on the dependent variable ($p > 0.05$). While the coefficients for failed first-time takers ($B = 0.015$, $p = 0.130$) and failed repeaters ($B = 0.020$, $p = 0.154$) were positive and nearly reached significance, suggesting a potential relationship with failure counts, the overall model did not show strong predictive capability. Furthermore, the year variable had a negative but insignificant coefficient, indicating no clear trend over time.

The lack of significance in all predictors implies that the number of failed examinees cannot be reliably explained by the variables included in the model. This outcome suggests exploring additional factors or considering alternative modeling approaches that better account for overdispersion or excess zeros in the data.

Table 6. Predictors for Failed Examinees for Institution E

			95% Wald Confidence Interval		Hypothesis Test			
Parameter	B	Std. Error	Lower	Upper	Wald Chi-Square	df	Sig.	Interpretation
(Intercept)	-56.529	303.8386	-652.042	538.984	.035	1	.852	Not Significant
Year	.030	.1496	-.263	.323	.040	1	.842	Not Significant
Total Examinees	.012	.0321	-.051	.075	.131	1	.717	Not Significant
Institutional Passing Rate	-.018	.0796	-.174	.138	.053	1	.818	Not Significant
First	.001	.0683	-.132	.135	.000	1	.983	Not Significant
Repeaters	-.010	.0671	-.141	.122	.022	1	.883	Not Significant
(Scale)	1[a]							
(Negative binomial)	1[a]							

Dependent Variable: Failed

Model: (Intercept), Year, Total Examinees, Institutional, First, Repeaters

a. Fixed at the displayed value.

In Table 6, results showed that none of the predictor variables had a statistically significant effect on the number of failed examinees, as all p-values exceeded the 0.05 threshold. Specifically, the coefficients for year (B = 0.030, p = 0.842), total examinees (B = 0.012, p = 0.717), institutional passing rate (B = -0.018, p = 0.818), failed first takers (B = 0.001, p = 0.983), and failed repeaters (B = -0.010, p = 0.883) were not significant. The wide confidence intervals further indicate substantial uncertainty around the estimates. These findings suggest that, even after accounting for overdispersion through the negative binomial model, the selected independent variables did not meaningfully predict the number of failed examinees. This may indicate the presence of unmeasured factors influencing failure rates or limitations in the model's specification.

Conclusion

The findings across multiple regression models underscore the multifaceted nature of examinee failure in radiologic technology licensure examinations. In models (Tables 2 and 4), the total number of examinees repeatedly surfaced as a statistically significant factor among all the predictors examined, indicating that the number of failed examinees rises with cohort size. This trend likely reflects systemic limitations like overburdened institutional resources, lower-quality instruction, or weakened support networks when dealing with bigger student populations are probably the cause of this tendency.

Furthermore, the institutional passing rate revealed a notable negative correlation with failure (as shown in Table 3), indicating that strong performance at the institutional level may reflect practices and environments conducive to examinee success. Nonetheless, other factors—such as the year, the number of first-time takers who failed, and repeaters—did not significantly predict licensure failure across any of the models, underscoring their limited explanatory capacity within the present dataset. Additionally, findings from the Poisson and negative binomial regression analyses (refer to Tables 5 and 6) indicated an absence of significant predictors, which may suggest potential limitations of the models or the impact of unmeasured variables.

Recommendations

Based on the findings of this study, it is recommended that higher education institutions offering radiologic technology programs are advised to focus more on managing the number of examinees. Given that the total number of examinees consistently predicts failure rates, more students could strain available academic resources, which could lower the standard of education and student support. Particularly when dealing with growing student populations, institutions should consider implementing policies in place such as capping enrollment, maintaining ideal faculty-to-student ratios, and improving learning support systems.

In addition, the statistically significant association between institutional passing rate and lower failure counts highlights the importance of effective institutional practices. To promote greater levels of student readiness and competency, schools are urged to make investments in academic advising, curriculum improvement, faculty development, and licensure exam review programs.

Although factors like failed repeaters and first-time takers were not statistically significant, their possible influence should not be disregarded. According to these results, organizations must take a more comprehensive approach to determining and addressing potential factors that may contribute to failure. Over time, licensure outcomes may be enhanced by ongoing program evaluation, student performance tracking, and focused intervention techniques for at-risk students, particularly repeaters.

Future researchers should expand the scope of analysis by including additional variables that may influence licensure outcomes, such as accreditation status, socioeconomic status, past academic performance, access to review resources, faculty qualifications, and learning environment quality. Moreover, to account for overdispersion or unobserved heterogeneity in the data, researchers may also investigate alternative statistical methodologies, such as mixed-effects or zero-inflated models.

Qualitative approaches can also provide deeper insights into the experiences of students who struggle with academic performance, readiness, and access to support services. They can also be used to determine the instructional constraints that faculty face when managing large cohorts and ensuring the effectiveness of their instruction. By integrating these experiences and perspectives, they can complement the quantitative findings, provide richer explanations, and guide the development of more targeted interventions to reduce failure rates and improve educational quality. These expanded perspectives can help build a more comprehensive understanding of failure predictors and contribute to more effective policy and educational reforms in radiologic technology.

"Future researchers may also replicate this research across other professional disciplines to explore whether predicting the number of licensure examination failures can provide valuable trends or insights to improve institutional passing rates and academic outcomes."

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