Predictors of Licensure Exam Failure Among Radiologic Technology Programs in the Philippines

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Licensure exam performance serves as a critical metric in evaluating the academic quality, instructional efficacy, and career preparedness fostered by educational institutions. In the context of radiologic technology education in the Philippines, disparities in outcomes of the national Radiologic Technologist Licensure Examination continue to highlight the urgent need to examine institutional factors that influence exam failures. A study conducted at the University of Arkansas found that academic performance is a predictor of passing the radiography certification exam.[1] In the Philippines, predictors for radiologic technology licensure performance have been found to include clinical internship grades and college admission test scores.[2]

Comparable results have been found in other disciplines. For example, mock board exam performance was found to be a significant predictor of performance on the certified public accountants' licensure exam in South Florida.[3] The results of a study conducted in Malaysia found that grade point average, entrance exam scores, and mother's educational attainment were significant predictors of passing the licensure exam for teachers.[4] Moreover, predictors of licensure exam performance have been linked to age, academic achievement, and participation in enrichment programs[5]; admission test scores, high school and college grade point averages, and overall academic performance[6]; and student-, school-, home-, and teacher-related influences.[7] Additional determinants have been found to include the quality of the curriculum, faculty competence, and institutional support.[8]

Although existing studies offer insights into predictors of passing licensure exams, none have focused on predictors of failing these exams. Research is scarce on how trends in failed exams might indicate a school's future performance on licensure exams. This study was conducted to fill that gap with a longitudinal analysis designed to help determine institutional licensure exam performance using predictive institutional characteristics that are available online (eg, total number of exams, number of failed first attempts, number of failed retakes) for 5 high-volume radiologic technology programs. The aim is to provide programs with evidence-based results highlighting potential methods for reducing licensure exam failure rates, thereby increasing licensure exam pass rates.

Methods

A predictive, longitudinal design was employed using secondary data from the national Radiologic Technologist Licensure Examination given in the Philippines from 2012 to 2024. The Radiologic Technologist Licensure Examination is comprehensive, covering all imaging modalities. Longitudinal studies that span more than a decade enable the tracking of long-term trends and changes throughout an extended period.[9] A total of 5 institutions were selected based on having the highest volume of annual exams taken of

all institutions, ensuring sufficient data for analysis. A previous predictive, longitudinal design was employed by the author using secondary data from the national exam for a 10-year period (ie, 2014 to 2024).[10]

The statistical methods used consisted of Poisson regression and negative binomial regression, depending on the data dispersion patterns. Poisson regression initially was chosen because it is the appropriate statistical method for modeling count data, particularly when the dependent variable represents the number of occurrences or events (ie, number of failed exams). A key assumption of the Poisson regression model is the equidispersion of the data, meaning the mean and variance of the dependent variable are equal. However, when overdispersion is present (ie, when the variance exceeds the mean), the use of Poisson regression becomes inappropriate. In such cases, negative binomial regression is more suitable for analysis because this method accounts for overdispersion and is well suited for modeling count data with greater variability. Thus, if the analyzed data exhibited overdispersion, negative binomial regression was used. Results were considered significant at a P value of less than .05.

The statistical models evaluated 4 institutional-level variables: year, total number of exams taken, number of failed first attempts, and number of failed retakes. The current study was limited to using secondary data that are available online and thus did not account for other potential influencing factors that typically are not available in publicly accessible databases such as:

- academic performance
- clinical performance
- demographics (eg, sex, age)
- faculty competence
- learning environment
- motivation
- support from family
- support from the institution
- time management

Results

Trends were observed for each institution. Institution A exhibited moderate and stable pass rates for the Radiologic Technologist Licensure Examination, with manageable failure trends. Institution B consistently had the lowest number of failed licensure exams (ie, the highest pass rate). Institution C was the consistently top-performing program before 2013, but its passing rate declined from 2014 to 2024, with a growing number of failed exams. Institution D frequently had the largest cohorts but inconsistent pass rates. Institution E had the lowest licensure exam pass rates, despite maintaining a high volume of students taking the exam (see **Table 1**).

Regarding national passing rates for the Radiologic Technologist Licensure Examination, 3 trends were noted. Passing rates fluctuated substantially, from a low of 22% in November 2013 to a high of 58.5% in 2014. In 2021, the annual passing rate was the lowest at 36.1%. Passing rates demonstrated a recovery trend by 2024 (57.6%).

Regression Analyses

For Institution A, the total number of licensure exams was found to be a significant predictor of the number of failed licensure exams (unstandardized beta coefficient (B) = .01, $P < .001$); this outcome suggests that higher numbers of licensure exams led to higher failure rates, holding all other variables constant (see **Table 2**).

For Institution B, the regression analysis indicated that the number of failed retakes had a statistically significant and positive effect on the total number of failed licensure exams (B = .23, $P < .001$), suggesting that an increase in the number of failed retakes was strongly associated with a rise in the overall number of failed licensure exams (see **Table 3**). The Wald 95% confidence interval (0.12-0.35) supported the reliability of this estimate. Moreover, the total number of licensure exams (B = .002, $P = .04$) was found to have a positive association with the number of failed exams.

The regression analysis for Institution C showed that the total number of exams was a statistically significant predictor of the total number of failed licensure exams (B = .9, $P = .04$; see **Table 4**). This outcome suggests that as the number of licensure exams increased, the number of failed exams also tended to increase. However, the magnitude of the effect size was found to be small, and the lower confidence limit was found to be close to the 0 threshold, suggesting a weak yet significant association between the variables.

Table 1

Radiologic Technologist Licensure Examination Pass Rates From 2012 to 2024[a]

	2012		2013											
Variable	June	Nov	June	Nov	2014	2015	2016	2017	2018	2019	2021	2022	2023	2024
Institution A														
Total exams	71	30	79	40	71	134	159	168	187	154	38	126	103	111
Failed first attempts	2	3	7	3	6	21	34	26	28	8	2	20	7	15
Failed retakes	9	10	6	9	6	10	15	14	22	25	4	9	13	8
Total failed exams	11	13	13	12	12	31	49	40	50	33	6	29	20	23
Institution B														
Total exams	4	32	5	32	43	52	84	97	81	79	24	98	124	162
Failed first attempts	0	1	0	0	0	6	7	4	3	2	3	5	8	2
Failed retakes	0	0	0	0	0	0	2	0	1	0	2	4	1	5
Total failed exams	0	1	0	0	0	6	9	4	4	2	5	9	9	7
Institution C														
Total exams	50	16	36	14	83	92	54	55	88	68	22	117	159	165
Failed first attempts	5	0	0	2	2	13	7	2	8	9	2	33	51	28
Failed retakes	3	2	0	0	1	3	5	9	4	1	5	6	3	30
Total failed exams	8	2	0	2	3	16	12	11	12	10	7	39	54	58
Institution D														
Total exams	53	73	70	74	169	233	265	252	238	188	40	187	92	145
Failed first attempts	11	13	4	26	32	57	66	60	28	27	2	39	9	28
Failed retakes	18	18	13	17	23	39	53	63	57	44	24	19	36	18
Total failed exams	29	31	17	43	55	96	119	123	85	71	26	58	45	46
Institution E														
Total exams	18	24	31	10	48	84	125	200	204	249	32	127	139	92
Failed first attempts	5	7	14	5	11	26	53	66	71	64	2	43	42	9
Failed retakes	2	3	2	0	4	17	17	47	57	53	18	36	28	36
Total failed exams	7	10	16	5	15	43	70	113	128	117	20	79	70	45
National passing rate (%)	47.0	43.0	57.0	22.0	58.5	43.5	42.8	46.4	47.2	51.9	36.1	40.3	55.6	57.6

[a] *The licensure exam was conducted twice per year in 2012 and 2013; it was conducted once per year in all other years. No licensure exam was administered in 2020 due to the suspension of board exams after the onset of the COVID-19 pandemic.*

Regarding Institution D, the regression analysis revealed that the total number of exams (B = .03, $P < .001$), the number of failed first attempts (B = .01, $P < .001$), and the number of failed retakes (B = .01, $P < .001$) were statistically significant factors in predicting the total number of failed licensure exams (see **Table 5**). These positive coefficients indicated that as the number of exams in each category increased, the number of failed exams also increased. Overall, the model highlighted that the volume of licensure

Table 2

Predictors of Failed Exams at Institution A

Variable	B	SE	95% CI	χ^2	*df*	*P* value [a]
Year	.01	0.01	−0.01 - 0.02	0.58	1	.45
Total exams	.01	0.004	0.01 - 0.02	14.75	1	< .001
Failed first attempts	.01	0.01	−0.01 - 0.02	0.84	1	.36
Failed retakes	−.02	0.02	−0.05 - 0.02	0.69	1	.41

[a] *Significant at P < .05.*

Table 3

Predictors of Failed Exams at Institution B

Variable	B	SE	95% CI	χ^2	*df*	*P* value [a]
Year	.01	0.03	−0.05 - 0.07	0.12	1	.73
Total exams	.002	0.003	−0.003 - 0.01	0.67	1	.04
Failed first attempts	.27	0.03	0.20 - 0.33	68.44	1	.67
Failed retakes	.23	0.06	0.12 - 0.35	16.94	1	.001

[a] *Significant at P < .05.*

exams—including first attempts and retakes—was strongly associated with the number of failed exams.

The regression analysis for Institution E indicated that the total number of exams was a significant predictor of the total number of failed licensure exams ($B = .81$, $P < .001$; see **Table 6**). This direct, positive association showed that when the total number of licensure exams increased, the total number of failed exams also increased.

Discussion

This study examined institutional-level predictors of the total number of failed attempts on the Radiologic Technologist Licensure Examination at 5 institutions in the Philippines using regression analyses. Findings consistently point to the total number of exams as a key predictor of the number of failed licensure exams.

For all institutions, a statistically significant positive relationship was observed between the total number of licensure exams and the number of failed exams, suggesting that as the exam volume increased, the exam failure rate tended to increase.[10] A greater number of exams can indeed reflect resource strain, particularly in educational settings.[11] These findings suggest that increasing exam volume without expanding instructional resources and support infrastructure can compromise educational quality and elevate failure rates for licensure exams.

Furthermore, the results for Institution D showed that the number of first attempts and the number of failed retakes also significantly contributed to the total number of failed licensure exams; however, the results for Institutions A, C, and E showed no significant relationship between these variables for these institutions. The results for Institution B showed that the number of failed retakes had a significant influence on the overall number of failed licensure exams, indicating that the number of exam retakes largely contributed to overall exam performance outcomes at this institution. This suggests that top-performing programs must prioritize first-time pass rates and remediation for those retaking the exam.

For each of the 5 examined institutions, year was not found to be a significant predictor of exam failure, indicating that failure rates were more closely linked to institutional and student characteristics than to trends.

Table 4

Predictors of Failed Exams at Institution C

Variable	B	SE	95% CI	χ^2	*df*	*P* value [a]
Year	1.7	2.3	−2.9 - 6.2	0.5	1	.47
Total exams	.9	0.5	−0.1 - 1.9	3.1	1	.04
Failed first attempts	−1.6	1.6	−4.7 - 1.5	0.9	1	.32
Failed retakes	−1.5	1.5	−4.5 - 1.5	0.9	1	.33

[a] *Significant at P < .05.*

Table 5

Predictors of Failed Exams at Institution D

Variable	B	SE	95% CI	χ^2	*df*	*P* value [a]
Year	.01	0.01	−0.01 - 0.03	1.81	1	.18
Total exams	.03	0.001	0.002 - 0.004	25.17	1	< .001
Failed first attempts	.01	0.002	0.01 - 0.01	24.74	1	< .001
Failed retakes	.01	0.002	0.01 - 0.01	28.06	1	< .001

[a] *Significant at P < .05.*

Table 6

Predictors of Failed Examinations at Institution E

Variable	B	SE	95% CI	χ^2	*df*	*P* value [a]
Year	−.97	0.81	−2.56 - 0.61	1.46	1	.23
Total exams	.81	0.19	0.43 - 1.19	17.36	1	< .001
Failed first attempts	−.44	0.37	−1.17 - 0.29	1.36	1	.24
Failed retakes	.09	0.33	−0.57 - 0.74	0.07	1	.79

[a] *Significant at P < .05.*

However, passing rates were lowest in 2021, possibly due to COVID-19–related disruptions.

This study yielded important implications for educational policy and institutional management in radiologic technology education programs. The study revealed a consistent association between an increasing exam volume and elevated licensure examination failure rates at all institutions. This pattern underscores a critical vulnerability; expanding enrollment without commensurate investment in academic support structures (eg, faculty resources, dedicated review programs, and robust student mentoring) could jeopardize program quality and licensure outcomes. Thus, resource distribution should be consistent with enrollment trends to avert straining faculty, infrastructure, and learning spaces. Establishing monitoring systems that aim to track performance indicators is equally important, particularly during periods of increased exam volume.

Results of the current study suggest that exam failure rates are not a function of time or cohort size but are more influenced by how institutions prepare and support their students. To address this issue, institutions should implement more rigorous screening and

retention protocols to assess students' readiness for exam completion.

The significant contribution of the number of failed retakes and the number of first attempts to the total number of failed licensure exams at certain institutions highlighted the need for differentiated strategies, such as remedial programs for retakers and strengthened review programs to help new graduates be better prepared for the exam. The year variable was not a significant predictor of the total number of failed licensure exams, suggesting that exam failure trends are not cyclical or time-bound but are deeply rooted in institutional dynamics and learner preparedness. Therefore, institutional efforts aiming to improve student performance on licensure exams should extend beyond generic improvements in time and focus on targeted, data-driven interventions at the student and structural levels. The findings of the current study support a more strategic, resource-conscious approach to academic expansion and performance management in allied health education.

Moreover, government agencies should aim to implement policies that align institutional enrollment with available resources to prevent overenrollment and ensure academic quality. In addition, policies that provide institutions with incentives for high exam passing rates alongside responsible enrollment growth can help reduce the total number of failed exams and enhance the overall quality of radiologic technology education in the Philippines.

The results of the current study also highlighted the importance of data-driven approaches to institutional planning, in which patterns in exam volume are used to predict outcomes and shape interventions that aim to enhance student success and reduce the number of failed credentialing exams.

Recommendations for Future Research

Future research could expand the sample to include more institutions and integrate qualitative assessments to capture broader educational dimensions that affect licensure exam performance. First, future research might build on the findings of the current study by exploring additional variables that might influence licensure exam performance but were not analyzed in the current study. These variables could include individual-level factors like academic and clinical grades, study habits, motivation, and mental health, as well as sociodemographic characteristics like age, sex, and socioeconomic background. Institutional factors, such as faculty-student ratios, instructional quality, curriculum alignment, reviews of program effectiveness, and availability of academic support services, also might provide deeper insights if they were included in future studies.

Second, the inclusion of qualitative approaches into future studies can provide deeper insights into the experiences of students who struggle with academic readiness and engagement. These approaches can be used to determine the instructional constraints that faculty face when managing large cohorts, especially regarding maintaining the ideal faculty-student ratio and number of clinical hours. The integration of such experiences and perspectives into future studies through the addition of qualitative elements can complement the quantitative findings, provide richer explanations for outcomes, and guide the development of more targeted interventions that aim to reduce exam failure rates and improve the overall educational quality. These expanded perspectives can help build a more comprehensive understanding of predictors of failed licensure exam outcomes and contribute to more effective policy and educational reforms being implemented in radiologic technology education.

Conclusion

This longitudinal analysis identified institutional factors that predict the total number of failed licensure exams among several radiologic technology education programs in the Philippines from 2012 to 2024. The results provided targeted insights to inform interventions aimed at reducing unsuccessful licensure exam outcomes and strengthening institutional and student readiness. Specifically, educational institutions should aim to implement data-documented planning approaches, concentrate on managing exam volumes, improve student screening and retention mechanisms, and target academic interventions. Future studies should aim to examine additional variables, such as student-level academic performance, support systems, and motivation, using qualitative methods to better understand institutional challenges and student experiences more thoroughly.

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