

Staff-to-student ratios and student retention

This analysis explores the correlation between staff-to-student ratios and student retention rates across 390 US-based degree-granting 4-year non-profit institutions of higher education.

by Holly Adams

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Introduction to Statistics INFO-610 with Prof. John Lauermann, Fall 2024

Introduction

During the last 50 years, higher education institutions have seen extraordinary growth in the number of administrative staff and large increases in staff-to-student ratios (Delucchi et. al, 2021). Some of the reasons that institutions might see an increase in staff are the increased number of student accommodations, technological change and increased support needed in the aftermath of the Covid-19 pandemic, changes in Title IX mandates, and expansions of student success programs (GAO, 2024). Other reasons include bureaucratic and reporting pressures applied to non-profit institutions, as examined in the work of David Graeber.

These increased numbers of staff have come under scrutiny in a number of different ways, described often as ‘administrative bloat (Weinstein, 2023).’ Additionally, recent changes to laws surrounding Diversity, Equity, and Inclusion practices in institutions of higher education (Betts, 2024) have caused many DEI Offices, and the staff that serve these offices, to risk closure and layoff (Mangan, 2024).

With these factors in mind, this analysis was conducted to better understand the correlation between higher staff-to-student ratios and student retention rates.

Methodology

The data used in this study come from the Integrated Postsecondary Education Data System (IPEDS). The institutions included in this analysis are 390 US-based private non-profit 4-year degree-granting institutions. With this in mind, variations in student retention and staff-to-student ratios caused by the type of degree being pursued (there may be more research support staff at postdoc focused institutions, for example) and the funding model of the institution (public universities are subject to state funding laws and may have differences in staff, as evidenced by recent changes in DEI legislation) are controlled for.

The outcome variable is full time student retention rates for the 2022–2023 academic year. The primary predictor variable is ratio of staff-to-students, presented as a percentage of the student headcount. This ratio is calculated based on the average staff-to-student ratio between 2019 and 2023: the four year period up to and including the 2022–2023 academic year used for the retention rate variable.

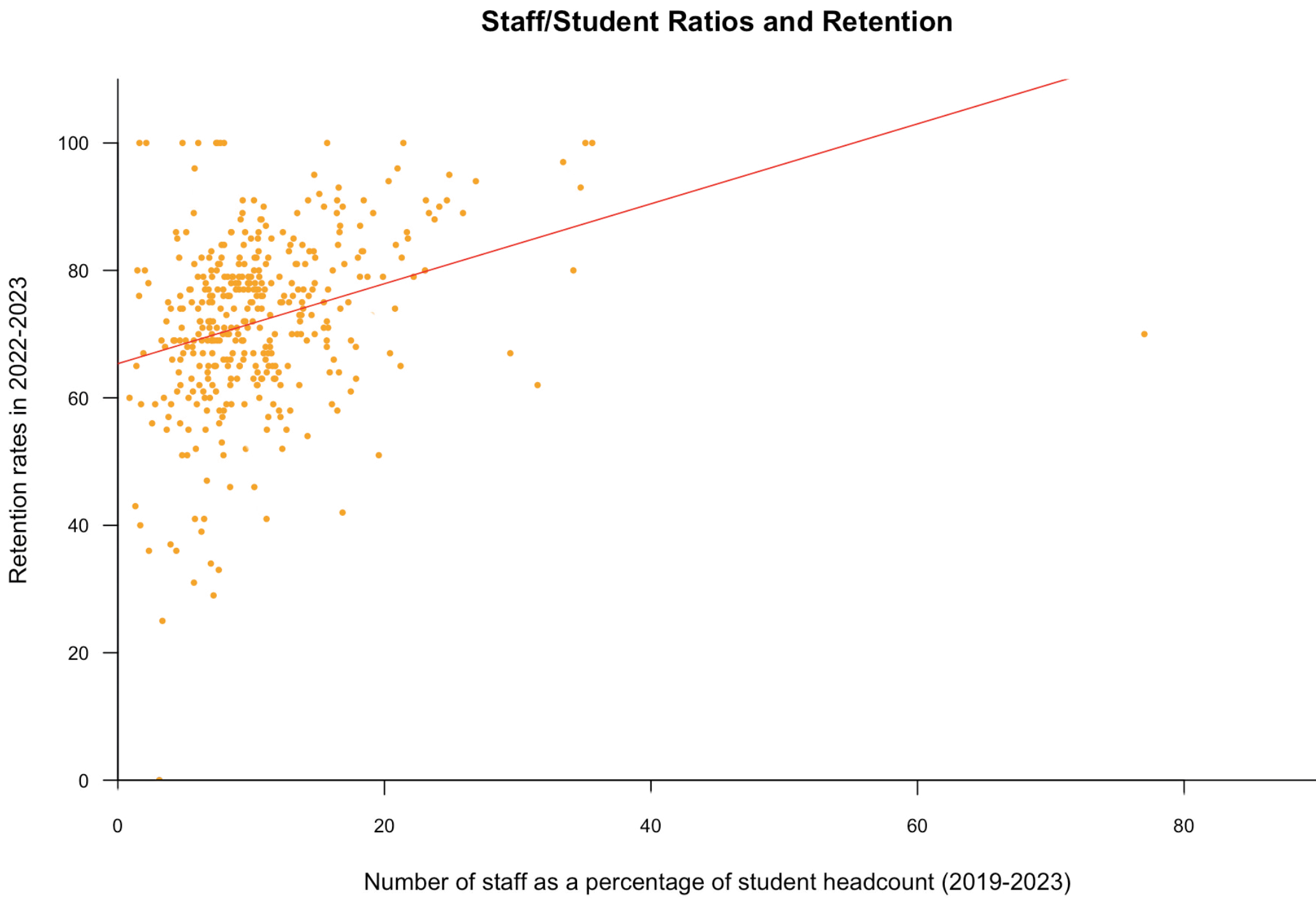
Additional variables considered within this analysis include the total expenditures of the institution, the percentage of institutional revenue from student tuition and fees, total revenue of the institution, and faculty-to-student ratios, also averaged over a four year period up to and including 2022.

To understand the relationships between these variables, correlation tests were performed between staff-to-student ratios and retention rates, a simple linear regression model was fit to the data with the initial outcome and predictor variables (Fig. 1 and 2), correlation tests were performed to understand the impact of additional predictor variables (Fig. 3) and a bi-directional stepwise regression model was fit to the data with the additional predictor variables included (Fig. 4).

Research Question and Hypotheses

Do higher staff-to-student ratios correlate with increased student retention?

H_0 = Increased staff-to-student ratios are not correlated with student retention.
 H_1 = Increased staff-to-student ratios are positively correlated with student retention.



Simple Linear Regression Model Summary

Call: lm(formula = data\$retention_22_23 ~ data\$NIS_Stu_avg)				
Residuals:				
Min	1Q	Median	3Q	Max
-67.319492	-7.190535	1.084821	8.213703	33.614440
Coefficients:				
	Estimate	Std. Error	t value	Pr(> t)
Intercept	65.36843577	1.25703656	52.00202	< 2.22e-16
NIS_Stu_avg	0.62720510	0.09934801	6.31321	7.4798e-10
RSE: 13.14743 on 388 degrees of freedom				
Multiple R-squared: 0.09315422				
Adjusted R-squared: 0.09081698				
F-statistic: 39.85665 on 1 and 388 DF, p-value: 7.479832e-10				

Figure 2

Correlation matrix for all potential variables

	retention_22_23	NIS_Stu_avg	fac_stu_avg	tut_p_avg	rev_avg	exp_avg
retention_22_23	1.00	0.31	0.12	-0.05	0.32	0.29
NIS_Stu_avg	0.31	1.00	0.44	-0.48	0.17	0.11
fac_stu_avg	0.12	0.44	1.00	-0.24	-0.08	-0.11
tut_p_avg	-0.05	-0.48	-0.24	1.00	0.11	0.17
rev_avg	0.32	0.17	-0.08	0.11	1.00	0.98
exp_avg	0.29	0.11	-0.11	0.17	0.98	1.00

Figure 5

Final Model Summary

Call:

lm(formula = retention_22_23 ~ ., data = dataSelected)

Residuals:

Min	1Q	Median	3Q	Max
-65.387	-6.383	1.495	7.091	35.164

Coefficients:

	Estimate	Std. Error	Std. Beta	t value	Pr(> t)
Intercept	63.67	1.243		51.215	< 2e-16
rev_avg	4.878e-08	8.470e-09	0.271	5.759	1.73e-08
NIS_Stu_avg	0.5335	9.685e-02	0.260	5.508	6.61e-08

RSE: 12.63 on 387 degrees of freedom

Multiple R-squared: 0.1647

Adjusted R-squared: 0.1604

F-statistic: 38.16 on 2 and 387 DF, p-value: 7.476e-16

Stepwise Summary

Step	Variable	AIC	SBC	SBIC	R2	Adj. R2
0	Base Model	3156.359	3164.291	2049.220	0.00000	0.00000
1	rev_avg (+)	3117.598	3129.496	2010.555	0.09924	0.09692
2	NIS_Stu_avg (+)	3090.159	3106.024	1983.434	0.16473	0.16041

Figure 4

Findings

An initial correlation test showed a moderate positive correlation between staff-to-student ratios and retention rates, with a correlation coefficient of 0.3052 (p-value = 7.48e-10, 95% CI: 0.2123-0.3926).

Simple linear regression (Fig. 1 and 2) showed that a one-percentage-point increase in staff-to-student ratios corresponded to a 0.62721 percentage point increase in retention rates. However, the model's low Multiple R-squared value of 0.09315 indicates that staff-to-student ratios explain only 9.3% of retention variance. The F-statistic is 39.86 with a p-value of 7.48e-10, so the model is statistically significant, but does not hold much explanatory power.

Additional variables were then tested for their correlations (Fig. 3) with retention rates: total institutional revenue, institutional expenses, the percentage of institutional revenue from student tuition and fees, and faculty-student ratios.

After bi-directional stepwise regression, the best-fitting multiple regression model incorporated two predictor variables: total institutional revenue and staff-to-student ratios.

$$\widehat{retention_22_23} = \hat{\alpha} + \hat{\beta}rev_avg_i + \hat{\beta}NIS_Stu_avg_i + \hat{\epsilon}_i$$

The final model (Fig. 4) has an intercept of 63.674. The standardized coefficients of the predictor variables demonstrate that, when scaled, increases in total institutional revenue (0.271) have a greater impact on student retention rates than staff-to-student ratios (0.260).

Detailed coefficients in the original scale indicating the following:

- Staff-to-student ratios: When institutional revenue is held constant, a one-percentage-point increase in staff-to-student ratio raises retention rates by 0.5335 percentage points
- Institutional revenue: When staff-to-student ratios are held constant, each \$10 million increase in revenue raises retention rates by 0.4878 percentage points

The model's multiple R-squared value is 0.1647, indicating that approximately 16.47% of the variance in the retention rate is explained by the model. The final F-statistic 38.16 (p-value = 7.476e-16) confirms statistical significance, with a residual squared error of 12.63.

Conclusions

I am choosing to reject the null hypothesis based on the analysis I have conducted.

The findings in this analysis emphasize the complexities of student retention, with about 84% of the retention rate variance unexplained by this model. These results suggest that staffing ratios do play a role in student retention, but are just one factor in retention. Further research should explore additional factors that may contribute to student retention.

References

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