REACHING HIGHER NH

The Whole Picture of Public Education in New Hampshire

Methodology

In partnership with Adam Gilbert, PhD, Associate Professor of Mathematics at Southern New Hampshire University, Reaching Higher NH gathered initial findings for *The Whole Picture of Public Education* by analyzing data from 178 school districts across the state of New Hampshire.

The analysis contained school district demographic data, socioeconomic markers, measures of educational attainment for residents, state funding, and student proficiency rates in math and reading at the fourth, eighth, and eleventh grade levels. The dataset contained information on each of 178 school districts in New Hampshire.

Training Models

In order to create general models of our data, we used a “validation set approach,” which entails splitting the data into two groups: a sample group, which we used to uncover relationships and build statistical models, and a validation group, which we used to test our statistical models for accuracy and without bias.

The 178 New Hampshire school districts were split into two groups: a training set of 114 districts, and a validation set of the remaining 64 districts. The training set was used in an initial analysis to uncover and identify relationships between variables, build models, and test hypotheses.

During this exploratory phase, the validation set was excluded from all analyses. It was opened on September 26, 2019, to further test hypotheses and validate claims, which would later evolve

into the “study findings,” made as a result of the initial analysis. Each district was assigned to either the training or validation set randomly by a computer.

The use of this validation set approach provides us with “unseen” data (meaning excluded from the initial analysis) that we can use to test hypotheses and validate the claims made as a result of the initial analysis. Secondly, because claims were developed and tested on separate sets of districts, we are able to generalize our findings beyond the dataset. **Because of this approach, we have confidence in applying these findings to years for which the data collected between 2008 and 2017 are representative.**

Appendices

Below, we include the statistical models associated with our findings.

Data legend

All_4M_L34: Students scoring proficient or above (3 or 4), on Grade 4 math assessment
All_4R_L34: Students scoring proficient or above (3 or 4), on Grade 4 reading assessment
All_8M_L34: Students scoring proficient or above (3 or 4), on Grade 8 math assessment
All_8R_L34: Students scoring proficient or above (3 or 4), on Grade 8 reading assessment
All_11M_L34: Students scoring proficient or above (3 or 4), on Grade 11 math assessment
All_11R_L34: Students scoring proficient or above (3 or 4), on Grade 11 reading assessment
Avg_Salary: District’s average teacher salary, scaled (1/1,000)
EconDis: Percentage of students who live in the school district who qualify for the federal Free and Reduced Lunch program
Educ_Bach: Percentage of adults over the age of 25 who live within the community and have earned a four-year college degree
Educ_Grad: Percentage of adults over the age of 25 who live within the community and have earned a graduate or professional degree
Educ_HS: Percentage of adults over the age of 25 who live within the community and have earned a high school diploma
Educ_ltHS: Percentage of adults over the age of 25 who live within the community and have not earned a high school diploma or equivalent
MedHHIncome_1K: Median household income, scaled (1/1,000)

For more information on our data sources and findings,
please visit the project’s web page: www.ReachingHigherNH.org/WholePic

Appendix 1: Proficiency rates, by family income and median household income

The regression models below show the statistically significant relationships at each grade level between proficiency rates and financial indicators “EconDis” (proportion of students qualifying for free or reduced lunch) and “MedHHIncome” (median household income).

Proficiency by Singnificant Financial Indicators

	Dependent variable:					
	All_4M_L34	All_4R_L34	All_8M_L34	All_8R_L34	All_11M_L34	All_11R_L34
	(1)	(2)	(3)	(4)	(5)	(6)
EconDis	-0.011***	-0.008***	-0.006***	-0.006***	-0.007***	-0.006***
	(-0.015, -0.007)	(-0.010, -0.007)	(-0.008, -0.004)	(-0.008, -0.004)	(-0.009, -0.005)	(-0.008, -0.005)
MedHHIncome_1k	-0.003**					
	(-0.006, -0.0003)					
Constant	1.018***	0.774***	0.611***	0.755***	0.614***	0.824***
	(0.736, 1.300)	(0.733, 0.815)	(0.556, 0.667)	(0.705, 0.805)	(0.554, 0.674)	(0.777, 0.871)
Observations	129	121	112	112	72	72
R^2	0.353	0.487	0.225	0.285	0.383	0.466
Adjusted R^2	0.343	0.483	0.218	0.279	0.374	0.458
Residual Std. Error	0.148 (df = 126)	0.119 (df = 119)	0.148 (df = 110)	0.133 (df = 110)	0.119 (df = 70)	0.093 (df = 70)
F Statistic	34.445*** (df = 2; 126)	112.920*** (df = 1; 119)	31.954*** (df = 1; 110)	43.855*** (df = 1; 110)	43.422*** (df = 1; 70)	61.031*** (df = 1; 70)
Note:						p<0.1; p<0.05; p<0.01

Free and reduced lunch along with median household income (in thousands) were only simultaneously significant in the case of fourth grade math proficiency rates. That being said, median household income is a significant predictor of proficiency rates in all cases if free and reduced lunch rates are not used. This is due to the fact that free and reduced lunch rates have a very strong association with median household income, so they are redundant predictors.

Appendix 2: Student proficiency rates by average teacher salary

We observed some moderate correlations between average teacher salary and proficiency rates. These correlations were similar in strength to the correlations between median household income and proficiency rates. Regression models for associations between average teacher salaries and proficiency rates follow.

Proficiency by Average Teacher Salary (in 1000s)

	Dependent variable:					
	All_4M_L34	All_4R_L34	All_8M_L34	All_8R_L34	All_11M_L34	All_11R_L34
	(1)	(2)	(3)	(4)	(5)	(6)
AvgSalary_1k	0.010***	0.012***	0.014***	0.010***	0.013***	0.011***
	(0.006, 0.014)	(0.009, 0.016)	(0.010, 0.018)	(0.006, 0.014)	(0.009, 0.017)	(0.008, 0.015)
Constant	0.019	-0.057	-0.258**	0.072	-0.255**	0.068
	(-0.199, 0.236)	(-0.245, 0.132)	(-0.463, -0.053)	(-0.135, 0.279)	(-0.471, -0.039)	(-0.112, 0.248)
Observations	129	121	112	112	72	72
R^2	0.150	0.275	0.311	0.193	0.362	0.375
Adjusted R^2	0.143	0.269	0.305	0.186	0.352	0.366
Residual Std. Error	0.170 (df = 127)	0.142 (df = 119)	0.139 (df = 110)	0.141 (df = 110)	0.121 (df = 70)	0.101 (df = 70)
F Statistic	22.360*** (df = 1; 127)	45.133*** (df = 1; 119)	49.665*** (df = 1; 110)	26.289*** (df = 1; 110)	39.646*** (df = 1; 70)	41.923*** (df = 1; 70)
Note:						p<0.1; p<0.05; p<0.01

While average teacher salary is a significant predictor of proficiency rates at all levels, it does not survive as a significant predictor when included in models alongside free and reduced lunch prevalence and median household income.

Appendix 3: Student proficiency rates by significant predictors

Level of educational attainment throughout a district is predictive of proficiency rates at all three grade levels.

Proficiency by Most Significant Predictors

	Dependent variable:					
	All_4M_L34 (1)	All_4R_L34 (2)	All_8M_L34 (3)	All_8R_L34 (4)	All_11M_L34 (5)	All_11R_L34 (6)
EconDis	-0.009*** (-0.013, -0.005)	-0.005*** (-0.007, -0.003)				-0.002** (-0.004, -0.0001)
MedHHIncome_1k	-0.004** (-0.006, -0.001)					
Educ_Bach	0.838*** (0.230, 1.446)		0.827*** (0.373, 1.282)			
AvgSalary_1k		0.005*** (0.002, 0.008)	0.009*** (0.005, 0.014)			
Educ_ltHS		-1.066** (-2.069, -0.063)		-1.682*** (-2.670, -0.695)		
Educ_Grad				0.613*** (0.200, 1.026)	1.426*** (1.120, 1.733)	
Educ_HS						-0.921*** (-1.273, -0.570)
Constant	0.812*** (0.499, 1.125)	0.508*** (0.306, 0.709)	-0.196* (-0.393, 0.001)	0.638*** (0.522, 0.755)	0.248*** (0.201, 0.294)	0.984*** (0.911, 1.057)
Observations	129	121	112	112	72	72
R^2	0.389	0.547	0.383	0.364	0.544	0.613
Adjusted R^2	0.374	0.535	0.372	0.352	0.537	0.602
Residual Std. Error	0.145 (df = 125)	0.113 (df = 117)	0.132 (df = 109)	0.126 (df = 109)	0.102 (df = 70)	0.080 (df = 69)
F Statistic	26.540*** (df = 3; 125)	47.015*** (df = 3; 117)	33.854*** (df = 2; 109)	31.141*** (df = 2; 109)	83.416*** (df = 1; 70)	54.755*** (df = 2; 69)
Note:						p<0.1; p<0.05; p<0.01

Appendix 4: School attendance and completion rates by average teacher salary

We observed some moderate correlations between average teacher salary and school attendance, and between average teacher salary and high school completion rates. Regression models for associations between the variables follow.

School Attendance and Completion Rates by Teacher Salary (in 1000s)

	Dependent variable:		
	GradPct	DropoutPct	Attendance
	(1)	(2)	(3)
AvgSalary_1k	0.465***	-0.046	0.0003***
	(0.292, 0.639)	(-0.131, 0.039)	(0.0001, 0.0005)
Educ_Bach		-14.338***	
		(-22.745, -5.931)	
Constant	64.533***	8.394***	0.937***
	(55.518, 73.547)	(4.966, 11.821)	(0.927, 0.947)
Observations	74	74	161
R^2	0.277	0.317	0.055
Adjusted R^2	0.267	0.298	0.049
Residual Std. Error	5.279 (df = 72)	1.865 (df = 71)	0.009 (df = 159)
F Statistic	27.575*** (df = 1; 72)	16.509*** (df = 2; 71)	9.184*** (df = 1; 159)