Running Head: Intra-district Demographic Impacts on Math Pass Rates

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Intra-district Demographic Impacts on Math Exam Percentage Pass Rates

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Introduction

The passing of the No Child Left Behind Act increased federal funding of public education and promoted standards based education for K-12 schools. Along with standards-based education came an increased demand for accountability and evidence of student learning. Most states implemented state-wide standardized tests as the primary method for tracking student learning (Thernstrom & Thernstrom, 2004). The bill received bi-partisan support and one of its primary goals was to close the so-called achievement gap, defined as the observed disparity in academic achievement among students based on socio-economic status and ethnicity. Researchers have not reached consensus about the *a priori* causes of the academic achievement gap; instead, there exists a wide range of studies that cite an array of factors that influence student performance in school that are both cultural and structural. Lareau (1987) suggested that students who are outside of the middle class and have limited parental involvement are likely to have lower academic achievement than their better middle class peers. Other researchers suggest that academic achievement is affected by being raised in a low-income family often means having fewer educational resources in addition to limited access to health care and nutrition. These shortfalls in areas of basic needs could contribute to lower academic performance (U.S. Department of Education, 2008).

In addition to socio economic status, researchers point to the role of language barriers in student achievement. Studies show that when students have assistance from a parent with homework, they do much better in school. This poses a problem for students who live in non-English speaking homes, as these students have difficulty getting help with their homework because there is not an English speaker at home to offer assistance (Orozco and Orozco, 1995).

In diagnosing the achievement gap, researchers typically examine national data, comparing vastly different schools and school districts against each other. This current study presents a unique opportunity by examining the achievement gap within a single school district that represents a wide swath of socio economic and English Speakers of Other Languages (ESOL) populations.In this particular district, many schools are represented that are located in zip codes that represent some of the highest median incomes in the United States. Other schools in this district are classified as Title 1 schools: schools that entitled to increase federal funding because at least forty percent (40%) of the student population comes from a low income household, as defined by the United States Census. The district also encompasses one of the most diverse metropolitan in the nation, with thousands of immigrants from East and Southwest Asia, Latin America, and Africa. Therefore, we are allowed to examine what disparities, if any, exit among students traditionally divided by the achievement gap when these students are part of the same school district and governed by a unified leadership, where students spending is roughly equal across the board (with Title 1 schools receiving slightly more funding due to federal sources). Thus we can see if after six years of No Child Left Behind, by examining a single district, we can see evidence that the achievement gap is indeed being closed.

Research Questions

Research Question 1 (RQ1): Is there an association between the population of ESOL students (low, medium, and high) and the Title 1 status of the school?

Research Question 2 (RQ2): Is there an association (dependency) between a school's population of ESOL students (low, medium, and high) and 5th grade math exam proficiency pass rates?

Research Question 2 (RQ2): Is there an association (dependency) between a school's population of ESOL students (low, medium, and high), Title 1 status, and 5th grade math exam proficiency pass rates?

Research Question 4 (RQ4): Can a school's total percent population of a ESOL students, Title 1 status, and 3rd grade math proficiency pass rates, predict 5th grade math exam proficiency pass rates?

Methods Section

Sample

The sample of the present study consisted on seventy (n=70) elementary schools that are all part of the same school district located in a highly populated, metropolitan area in the mid-Atlantic region of the United States that is very diverse in terms of race, ethnicity, and socio-economic status. Schools are classified as Title 1 or not non-Title 1 and as low population ESOL (14.99% of student body or less), medium population ESOL (between 15.00%-24.99% of student body), and high population ESOL (25.00% of student body or greater). The raw percentages of ESOL students were also used in some calculations.

Data

The data is submitted by each of the schools and made publically available on the district website. Schools report the total number of students eligible for free and reduced lunch. Title 1 status is based on that data. Schools also report the total number of students who qualify as ESOL in order to determine staffing needs. All schools are required to submit details regarding the schools' pass and fail rates for the annual state content exams. The math scores were used for students' first state exams (taken in third grade) and final elementary state exams (for most schools this is fifth grade).

Data collection

The data is in the form of Title 1 status, total percentage of ESOL students, a categorical classification of whether the school is a high, medium, or low ESOL population school, and total percentage of passing rates for students taking the state mathematics proficiency exams for third and fifth grade. The tests are given at the end of the year to tests students' knowledge and ability in mathematics.

Statistical data analysis

To address the research question one, about the association between Title 1 status and degree of ESOL population, a chi-square test for association was used. The cross tabs will determine the answer to the question: Is there a relationship between Title 1 status and degree of ESOL population?

To address the second research question, a one-way ANOVA test was run where the dependent variable will be total percentage of students who have passed the math proficiency exam in the fifth grade and the independent variables was the degree of ESOL student population.

To gain further insight and address the third research question, a two-way ANOVA test will be run where the dependent variable will be total percentage of students who have passed the math proficiency exam in the fifth grade and the independent variables will be degree of ESOL student population and Title 1 status.

To address the fourth research question, a multiple regression test will be conducted. The results will show the effects of independent variables on total population of students passing the fifth grade state math proficiency exams.

Results

Research Question 1

The results of the Pearson chi-square tests are (shown in Table 1) indicates that there is a statistically significant association between degree of ESOL population (high, medium, and low) and Title 1 status, χ^2 (2) = 17.466, p <.001. Further, the examination of the standardized residuals shows that major contribution to this association is provided by the fact that high degrees of ESOL population schools are over represented among Title 1 status schools.

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Insert Table 1 About Here

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Research Question 2

The Levene's Test of Equal Variances shows that we can assume equal variances within the populations (p = .483). However, the ANOVA test shows that there are no statistically significant differences among degree of ESOL population and percent passage rates for fifth graders on the state math proficiency exam, (p =.077).

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Insert Table 2 About Here

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Research Question3

The Levene's Test of Equal Variances shows that we can assume equal variances within the populations (p = .183). However, the two- way ANOVA test shows that there are no statistically significant differences to the model (p = .117). Further, the individual factors were not significant, specifically neither ESOL population (p = .155) nor Title 1 status (p=.369) where percentage of passage rates for fifth grade students on the math proficiency is concerned.

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Insert Table 3 About Here

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Insert Table 4 About Here

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Research Question 4

The results of multiple regression in table 4 show that the prediction of percent passage rates for fifth graders on the state math proficiency exam is statistically significant, $F(3,66)=5.65$, $p = .002$. Further, $R^2 = .202$ indicates that 20% of the variance in math proficiency pass rates can be explained by the variance in third grade proficiency pass rates, percentage of ESOL students, and Title 1 status. There is a statistically significant unique contribution to the prediction of math proficiency pass rates for the fifth grade exam from the math proficiency pass rates of that same schools' proficiency pass rates for the third grade exam ($p =.002$) but not from Title 1 status ($p = .341$) or total percentage of the ESOL population ($p = .114$). The regression equation is:

^Percentage Pass Rate of Math Exam for Fifth Grade = 3.072(Title 1 Status) + -.118(Total Percentage ESOL Students) + .399(Percentage Rate of Math Exam for Third Grade) +58.48.

Given the coding for Title 1 status, Title 1 schools get an extra three percentage points in the fifth grade math pass rates. The regression coefficient for total percentage ESOL students suggests that for each percentage point of ESOL students a school has, there is a negative contribution of -.118% in the fifth grade math pass rate. Given the regression coefficient for third grade math exam pass rates, each percentage point of pass rate in third grade increases the fifth grade math exam pass rate by .399%.

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Insert Table 5 About Here

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Discussion

The analysis shows significance in two areas: 1) High ESOL population schools are over represented among the Title 1 schools and 2) among ESOL population, Title 1 status, and third grade proficiency passing percentages, only the third grade proficiency passing percentages were a uniquely significant predictor of fifth grade proficiency pass rates, although along a very small confidence interval. The fact that high ESOL is over-represented in Title 1 schools is consistent with the literature on the achievement gap that indicates the co-occurrence of these two variables. However, diverging from the literature, we have found that despite the co-occurrence of high ESOL population and low socioeconomic status, the overall performance on math proficiency exams for fifth grade students are not different from non-Title 1 schools with low to medium ESOL populations. This result is further evidenced by the two ANOVA tests demonstrated that there is no significant difference among Title 1, high, low, and medium degree of ESOL population schools when it comes to proficiency passing percentages for fifth grade scores. Thus, within this school district, students have roughly equal opportunities of becoming proficient their grade-level math content, regardless of their socio-economic status or languages spoken in their home.

Limitations

Cell sizes for the study were relatively small, and while *p* values were not significant, they were close enough to the 5% error range that a larger cell size may demonstrate significant results. Furthermore, this study examined the percentage of passage rates rather than raw total scores. Some greater differences may be exposed if the study were conducted by examining the impact on Title 1 status, ESOL population, and raw total scores.

Recommendations

Our first recommendation would be to conduct the same analysis with an increased population of schools and examining the raw math scores, as opposed to the percentage passing with proficiency. Furthermore, because math is not as heavily dependent upon reading skills as language arts, we recommend additional analysis examining the difference among math proficient passing rates and language arts proficient passing rates.

References

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Appendix A

Table 1

Association between Degree of ESOL Population and Title 1 Status

Degree ESOL Population		Title 1	Not Title 1	Total
	Count	16	22	38
	Expected Count	8.7	29.3	38.0
High	Std. Residual	2.5	-1.4	
	Count	0	12	12
	Expected Count	2.7	9.3	12.0
Medium	Std. Residual	-1.7	.9	
	Count	0	20	20
	Expected Count	4.6	5.4	20.0
Low	Std. Residual	-2.1	12	
	Count	16	54	70
Total	Expected Count	16.0	54.0	70.0

Table 2

Means and Standard Deviation for Degree of ESOL population on Percentage Math Pass Rates for Fifth Grade Exam

Degree ESOL	N	M	SD
High	38	91.64	5.80
Medium	12	91.26	10.29
Low	20	95.70	6.07

Table 3

Means and Standard Deviation for Degree of ESOL Population, Title 1 Status, and Percentage Math Pass Rates for Fifth Grade Exam

ESOL Population	Title 1	Non-Title 1	Total

	N	M	SD	N	M	SD	N	M	SD
Low	0	0	0	20	95.70	6.07	20	95.7	6.07
Medium	0	0	0	12	91.30	10.30	12	91.30	10.30
High	22	90.47	3.64	16	92.50	6.92	38	91.64	5.80

Table 4

Analysis of Variance for Math Pass Rates for Fifth Grade Exams

Source	df	F	$p\eta^2$	*p*
Degree ESOL	2	1.917	.055	.155
Title 1 Status	1	.818	.012	.369
ESOL + Title 1	0		.000	
S within group error	66			

Table 5

Regression Analysis

Model	R	R Square	Adjusted Square	Std. Error of the Estimate
1	.449	.202	.166	6.36958

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	677.295	3	225.765	5.565	.002
	Residual	2677.723	66	40.572		
	Total	3355.018	69			

Appendix B

Output for Chi-square

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
1= yes, 0= no * 1=low, 2=middle, 3=high	70	100.0%	0	.0%	70	100.0%

1= yes, 0= no * 1=low, 2=middle, 3=high Crosstabulation

			1=low, 2=middle, 3=high			Total
			1	2	3	
1= yes, 0= no	0	Count	20	12	22	54
		Expected Count	15.4	9.3	29.3	54.0
		Std. Residual	1.2	.9	-1.4	
	1	Count	0	0	16	16
		Expected Count	4.6	2.7	8.7	16.0
		Std. Residual	-2.1	-1.7	2.5	
Total		Count	20	12	38	70
		Expected Count	20.0	12.0	38.0	70.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.466[a]	2	.000
Likelihood Ratio	23.528	2	.000
Linear-by-Linear Association	14.797	1	.000
N of Valid Cases	70		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 2.74.

Output for 1-way ANOVA

Between-Subjects Factors

		N
1=low, 2=middle, 3=high	1	20
	2	12
	3	38

Descriptive Statistics

Dependent Variable:mathSOL5

1=low, 2=middle, 3=high	Mean	Std. Deviation	N
1	95.6950	6.07102	20
2	91.2583	10.29205	12
3	91.6421	5.79551	38
Total	92.7343	6.97305	70

Levene's Test of Equality of Error Variances[a]

Dependent Variable:mathSOL5

F	df1	df2	Sig.
.735	2	67	.483

2. 1=low, 2=middle, 3=high

Dependent Variable:mathSOL5

1=low, 2=middle, 3=high	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	95.695	1.523	92.655	98.735
2	91.258	1.966	87.334	95.183
3	91.642	1.105	89.437	93.848

Noncent. Parameter	Observed Power[b]
5.320	.511

Post Hoc Tests

1=low, 2=middle, 3=high

Multiple Comparisons

mathSOL5
Tukey HSD

(I) 1=low, 2=middle, 3=high	(J) 1=low, 2=middle, 3=high	Mean Difference (I-J)	Std. Error
1	2	4.4367	2.48707
	3	4.0529	1.88160
2	1	-4.4367	2.48707
	3	-.3838	2.25539
3	1	-4.0529	1.88160
	2	.3838	2.25539

Based on observed means.
The error term is Mean Square(Error) = 46.392.

Homogeneous Subsets

mathSOL5

Tukey HSD[a,b,c]

1=low, 2=middle, 3=high	N	Subset
		1
2	12	91.2583
3	38	91.6421
1	20	95.6950
Sig.		.121

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 46.392.

a. Uses Harmonic Mean Sample Size = 18.791.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

Output for 2-way ANOVA

Univariate Analysis of Variance

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[DataSet1] C:\Documents and Settings\muchmiel\My Documents\Grad School Papers\Title1data.sav
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Between-Subjects Factors

		N
1=low, 2=middle, 3=high	1	20

Descriptive Statistics

Dependent Variable:mathSOL5

1=low, 2=middle, 3=high	1= yes, 0= no	Mean	Std. Deviation	N
1	0	95.6950	6.07102	20
	Total	95.6950	6.07102	20
2	0	91.2583	10.29205	12
	Total	91.2583	10.29205	12
3	0	92.4955	6.92260	22
	1	90.4688	3.63625	16
	Total	91.6421	5.79551	38
Total	0	93.4056	7.58627	54
	1	90.4688	3.63625	16
	Total	92.7343	6.97305	70

Levene's Test of Equality of Error Variances[a]

Dependent Variable:mathSOL5

F	df1	df2	Sig.
1.667	3	66	.183

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + ESOL + T1 + ESOL * T1

Tests of Between-Subjects Effects

Dependent Variable:mathSOL5

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	284.835[a]	3	94.945	2.041	.117	.085	6.123	.501
Intercept	459013.022	1	459013.022	9867.446	.000	.993	9867.446	1.000
ESOL	178.380	2	89.190	1.917	.155	.055	3.835	.384
T1	38.049	1	38.049	.818	.369	.012	.818	.145
ESOL * T1	.000	0	.	.	.	.000	.000	.
Error	3070.183	66	46.518					
Total	605330.360	70						
Corrected Total	3355.018	69						

a. R Squared = .085 (Adjusted R Squared = .043)

b. Computed using alpha = .05

Estimated Marginal Means

1. Grand Mean

Dependent Variable:mathSOL5

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
92.479[a]	.838	90.807	94.152

a. Based on modified population marginal mean.

2. 1=low, 2=middle, 3=high

Dependent Variable:mathSOL5

1=low, 2=middle, 3=high	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	95.695[a]	1.525	92.650	98.740
2	91.258[a]	1.969	87.327	95.189
3	91.482	1.120	89.245	93.719

a. Based on modified population marginal mean.

Post Hoc Tests

1=low, 2=middle, 3=high

Multiple Comparisons

mathSOL5
Tukey HSD

(I) 1=low, 2=middle, 3=high	(J) 1=low, 2=middle, 3=high	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	4.4367	2.49046	.184	-1.5347	10.4080
	3	4.0529	1.88416	.087	-.4648	8.5705
2	1	-4.4367	2.49046	.184	-10.4080	1.5347
	3	-.3838	2.25846	.984	-5.7989	5.0313
3	1	-4.0529	1.88416	.087	-8.5705	.4648
	2	.3838	2.25846	.984	-5.0313	5.7989

Based on observed means.
The error term is Mean Square(Error) = 46.518.

Homogeneous Subsets

mathSOL5

Tukey HSD[a,b,c]

1=low, 2=middle, 3=high	N	Subset
		1
2	12	91.2583
3	38	91.6421
1	20	95.6950
Sig.		.122

Means for groups in homogeneous subsets are displayed.
Based on observed means.
The error term is Mean Square(Error) = 46.518.

a. Uses Harmonic Mean Sample Size = 18.791.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

c. Alpha = .05.

Output for Multiple Regression

:le1data.sav

		Squares	df	Mean Square	F	Sig.
1	Regression	677.295	3	225.765	5.565	.002[a]
	Residual	2677.723	66	40.572		
	Total	3355.018	69			

a. Predictors: (Constant), mathSOL3, perESOL, 1= yes, 0= no

b. Dependent Variable: mathSOL5

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1	(Constant)	58.484	11.712		4.993	.000	35.100	81.869			
	1= yes, 0= no	3.072	3.204	.186	.959	.341	-3.325	9.470	-.178	.117	.105
	perESOL	-.118	.074	-.310	-1.600	.114	-.266	.029	-.261	-.193	-.176
	mathSOL3	.399	.122	.377	3.276	.002	.156	.642	.409	.374	.360

a. Dependent Variable: mathSOL5