2020 ILLINOIS EDUCATOR SHORTAGE SURVEY

Which District Characteristics Influence Educator Staffing? Analysis of Geographic Location and Urbanicity

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ABSTRACT

The Illinois Association of Regional Superintendents of Schools (IARSS) has conducted a series of educator shortage surveys over the past four years.[1] This white paper takes a closer look at which district characteristics affect educator staffing. A linear regression model was used to determine which characteristics of districts are indicators of more un-/underfilled positions. The model indicates that the racial composition of the student body is the largest predictor of teacher vacancies. The model also indicates that districts in the West Central region experience higher un-/underfilled positions when all other factors are controlled. Furthermore, teacher average salary and distance to the nearest teacher preparation program are significant predictors of un-/underfilled positions. Finally, the regression model indicated that student-teacher ratio, percent of low-income students or percent rural of the county were not significant indicators of un-/underfilled positions. The final paper of this series will discuss policy recommendations based on this analysis.
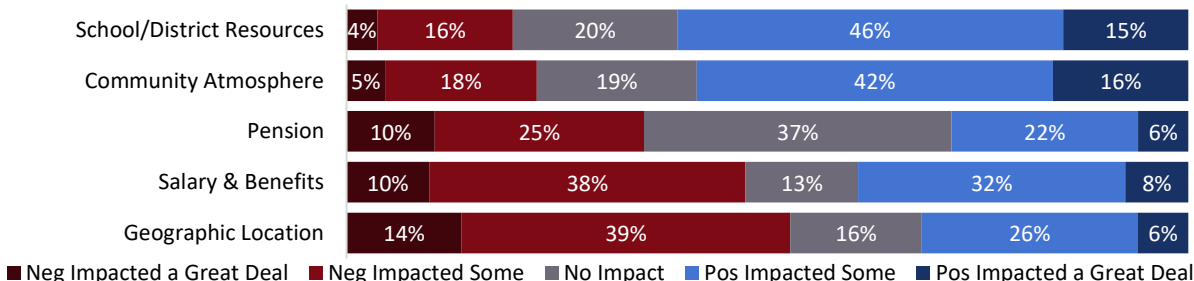
INTRODUCTION

What makes some districts more attractive places for teachers and administrators to work, and what makes some districts more difficult to staff? The previous white paper in this series discussed the positions that are the hardest to staff and of highest need. This report focuses on the types of districts where educator shortages are most likely to occur.

There are numerous district characteristics that might influence educator shortages, with some that might make districts more attractive places to work and others that might hinder recruitment. For example, very large districts may be more difficult to staff simply because they need to hire larger numbers of educators each year. On the other hand, very small districts may be less attractive places to work because they lack community resources that educators desire.

BACKGROUND

The 2020 IARSS survey asked superintendent to rate the extent to which various factors affected their abilities to recruit teachers to their districts. As shown in Figure 1 below, respondents believed that the factors that made the largest positive impacts included local resources and the community atmosphere, whereas geographic location and salary and benefits served as the biggest deterrents.

Figure 1: Factors That Impact Recruitment (IARSS 2020 Educator Shortage Survey)

	Neg Impacted a Great Deal	Neg Impacted Some	No Impact	Pos Impacted Some	Pos Impacted a Great Deal
School/District Resources	4%	16%	20%	46%	15%
Community Atmosphere	5%	18%	19%	42%	16%
Pension	10%	25%	37%	22%	6%
Salary & Benefits	10%	38%	13%	32%	8%
Geographic Location	14%	39%	16%	26%	6%

But what types of resources and what types of locations make a district harder or easier to staff? As shown in Figures 2 and 3, the survey revealed that all regions and locales reported somewhat serious issues with teacher shortages, but districts in the central and southern parts of Illinois, along with rural districts, reported the most serious problems with teacher shortages in recent years compared to their counterparts in the rest of the state. The most recent administrations of the IARSS survey, as well as ISBE data, suggest that the northeast region has fewer problems with educator shortage than the rest of the state.[2]

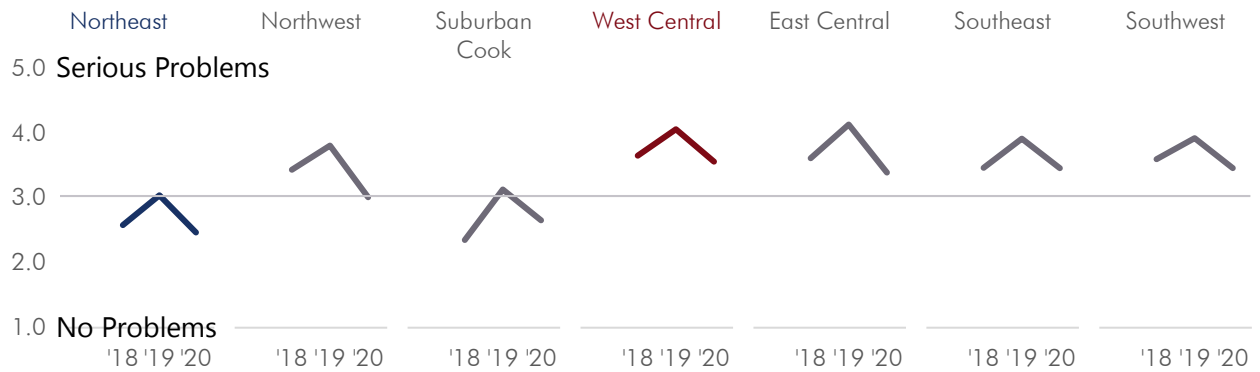***Figure 2: Severity of Teacher Shortage by Region***

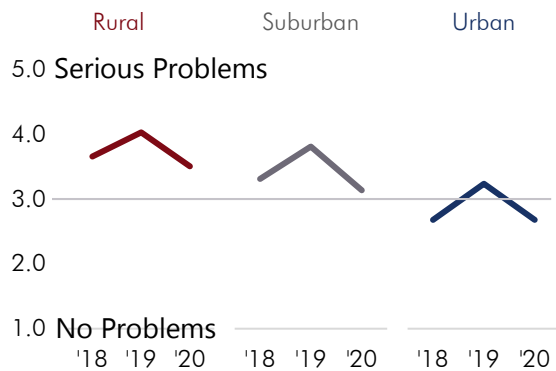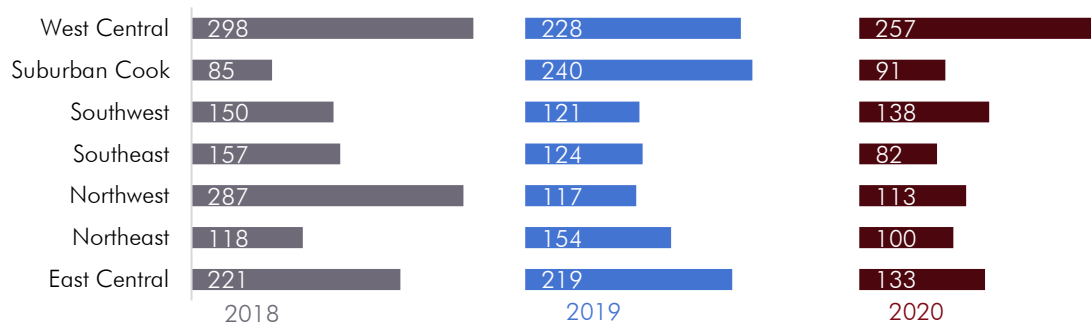***Figure 3: Severity of Teacher Shortage by Urbanicity***

Figure 4: Number of Un-/Underfilled Teacher Positions by Region

ANALYSIS

Geographic region and urbanicity are closely related in Illinois, as they are in most other states. In Illinois, urban districts are concentrated in the northern part of the state and rural districts are clustered in the southern regions of Illinois. These inter-relationships make it difficult to determine which factor – geographic location or urbanicity – makes districts more attractive places for educators to work. A linear regression model was used to help isolate the contributions of multiple variables simultaneously. This model disentangles the data to understand the influence of multiple district characteristics. That is, this model can control for urbanicity and other factors to help explain the impact of geographic region (and vice versa), across many variables associated with each district.

The outcome variable of interest for this regression analysis was the number of un-/underfilled positions reported in each district each year.[3] This outcome variable was chosen because it accounts for both "high need" and "hard-to-staff" educator roles, as discussed in the previous white paper.[4] The un-/underfilled positions is better suited for linear regression since it is a continuous variable that is more evenly distributed than the other categorical outcomes that could have been selected, such as perceived seriousness of educator shortage or percentage of positions remaining un-/underfilled. Even though the number of un-/underfilled positions is likely to be at least partially a factor of district size, this model is able to control for this by factoring in student, teacher, and school counts.

This analysis examined numerous district characteristics that might reasonably contribute to the number of un-/underfilled positions, including:[5]

- geographic region (seven regions identified by IARSS).
- percent rural (by county the district is in).
- district type (unit, elementary, or high school).
- district size (the number of schools, students, and teachers).
- student demographics (% white, % low-income, ELL, and students with IEPs).
- student-teacher ratio.
- average teacher salary.
- distance to the nearest teacher preparation program.

Ideally, this analysis would have included additional policy levers such as high-quality school leadership, which also influence districts' abilities to attract and retain teachers. Early attempts to include the 5Essentials data were unsuccessful because this analysis was done at the district level whereas the Illinois 5Essentials data are collected at the school level.

This regression model consists of 1724 observations from 777 districts across three years.[6] This model was able to explain 24% of the variance in un-/under-filled teaching positions, which is generally considered an adequate and moderately sized effect for research in the social sciences.

Table 1 shows the variables that were included in the regression model, along with their unstandardized and standardize coefficient values and significance levels. These variables were classified into 5 distinct categories: year; district size; geography; student factors; and policy factors.

Table 1. Regression Results

Category	Variable	Coefficient (B)	Standardized Coefficient (β)	Significance (p – value)
(Constant)		8.069		<.001
Year	Year = 2019 [A]	-.604	-.073	<.01
	Year = 2020[A]	-.955	-.114	<.001
District Size	Student Enrollment (in 1000s)	-1.223	-.860	<.001
	Number of Schools	.255	.269	<.001
	Total Teacher FTE	.019	.850	<.001
Geography	East Central Region [B]	.698	.061	.095
	Northwest Region [B]	.560	.052	.136
	Southeast Region [B]	.131	.012	.769
	Southwest Region [B]	.283	.023	.508
	Suburban Cook County [B]	-.202	-.017	.587
	West Central Region [B]	1.562	.144	<.001
	County Percent Rural [C]	-.003	-.023	.500
Student Factors	Elementary District [C]	-.870	-.108	<.001
	High School District [D]	-.193	-.014	.639
	% of Students who are White	-.061	-.386	<.001
	% of Student who are Low Income	.008	.044	.168
	% of Students who are ELLs	-.035	-.077	<.05
Policy Factors	Avg. Teacher Salary (in $1000s)	-.047	-.155	<.001
	Distance to nearest prep program	.025	.092	<.01

Highlighted factors are statistically significant with $p < 0.05$
[A] compared to 2018
[B] compared to Northeast region
[C] Percent Rural from the 2010 US Census
[D] compared to unit districts

HOW TO READ REGRESSION RESULTS

The eleven highlighted factors were found to have statistically significant associations with the number of un-/underfilled teaching positions in a district. For purposes of this report, the year and district size variables were used primarily as controls and so the discussion will focus on the remaining categories.

The "coefficient" column of Table 1 indicates the change in un-/underfilled positions associated with a one unit change of the given variable (while controlling for all other variables). Because the dependent variable (number of un-/under-filled vacancies) measures an undesirable outcome, positive coefficients can be considered "bad" because they are associated with an increase in un-/under-filled positions, while negative coefficients should be considered "good" because they are

associated with a decrease in un-/under-filled positions. For example, all else being equal, a district in the West Central region could be expected to have 1.562 more un-/under-filled positions than a school in the Northeast region (the reference category for region). However, this model predicts that an elementary district could expect to have 0.870 fewer un-/under-filled positions than a unit district (the reference category for district type).

The "standardized coefficient" column shows the change in un-/underfilled positions associated with a one standard deviation change in the given variable (while still controlling for other variables). These figures allow a comparison of the relative influence of variables to one another. For example, the effect of the being in the West Central region (0.100) is about the same size as the effect of distance from the nearest preparation program (also 0.100).

INTERPRETATION OF REGRESSION RESULTS

Looking at Table 1, factors that have a statistically significant and positive influence on teacher staffing (i.e., fewer un-/underfilled positions) include being an elementary (as opposed to unit) district, having larger proportions of white students and students who are English-language learners, and higher average teacher salaries. The factors that have a negative impact on staffing (i.e. more un-/underfilled positions) are being located in the West Central region (as opposed to Northeast region) and increased distance from a teacher preparation program. The most important factor in terms of predicting the numbers of un-/underfilled positions, aside from the controls for district size, is the racial composition of the district. Namely, the larger the proportion of white students in a district, the fewer un-/underfilled positions you would expect to find. **Further, these racial composition effects appear to exist above and beyond the impact of low income or ELL student concentrations or teacher salaries.**

Importantly, two policy-oriented factors emerged as important predictors of staffing success – teacher salaries and the distance to the nearest teacher preparation program. This is important because, unlike geography or student factors, these variables are subject to intervention, to some extent. Thus, these findings have implications for those considering reforms to teacher pay and to establishing new teacher preparation programs throughout the state.

Finally, this analysis is useful for identifying the factors that *do not* appear to be consequential in predicting staffing difficulties. Geographic effects exist mainly at the extremes – differentiating the West Central (hardest to staff) from the Northeast (easiest to staff). While the model provides coefficients to measure the influence of being situated in other regions, none of the other regions could be differentiated statistically. Similarly, the independent influence of "rurality" (the proportion of the population living in rural areas) was small and insignificant, and high school districts were statistically indistinguishable from unit districts. **Interestingly, once other factors were accounted for, the number of un-/under-filled vacancies also had no association with the proportion of low-income students.**

CONCLUSION

In considering the factors that make certain school districts more difficult to staff than others, it is important to distinguish between characteristics that are immutable and those that can be influenced by policy and practice. That is, although some locales may be intrinsically hard to staff, there are steps that can be taken to make them more attractive places to work. While districts may not be able to change their geography or student demographics, they do have some control over

teacher salaries, and institutions of higher education have some role to play in working to serve the state's "higher education deserts." The final white paper in this series on educator shortages in Illinois will reflect on the lessons learned from these analyses and explore some promising policies and practices to help the state address these issues.

BIBLIOGRAPHY

[1] The IARSS survey was developed in 2017 and included questions about superintendents' perceptions of the supply of teachers, substitute teachers, and administrators, factors that affect their ability to recruit educators, and the types of educators that were in short supply. The surveys were distributed to all superintendents in the state each fall from 2017 through 2020. Between 524 and 628 districts responded to the survey annually, for response rates ranging from 61% to 73%. Visit https://iarss.org/2020-educator-shortage/ to access the full reports.

[2] Although they did not participate in our survey, it is important to note here that other sources suggest that Chicago Public Schools (CPS) also has considerable difficulties with educator staffing. The Illinois State Board of Education reports that CPS accounts for about 40% of the state's unfilled educator positions, despite serving only about 16% of the state's students, primarily due to its low overall educator retention rates.

[3] The multiple linear regression model was also run with percent of teacher positions un-/underfilled instead of number of positions. The resulting model, run with percent un-/underfilled, had a much lower variance. Furthermore, using the number of positions retains the distinction of 30 out of 30 un-/underfilled compared to one out of one un-/underfilled.

[4] This series of white papers can be accessed at https://iarss.org/2020-educator-shortage.

[5] In starting this analysis, many variables were considered, including average teaching experience, percent local property taxes, instructional expenditure per pupil, number of colleges within 50 mi, percent of teachers with Master's degree, student-teacher ratio, percent of students who are low-income, student attendance rate, student mobility rate, 5 essentials leadership level. Some of these factors were discarded because they are too closely related to variables that were kept. Other factors were discarded because the data were incomplete or were collected at the school level instead of the district level. Finally, many of these factors were discarded as part of the multiple linear regression process. The process is an iterative process that adds and removes variables to find the "best fit", or the model that explains the most variance.

[6] Because the un-/underfilled positions data were collected differently in 2017, the analysis is limited to the three most recent years, 2018 through 2020.