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Introduction

There have long been anecdotal reports that some Maine districts have difficulty filling vacancies and retaining teachers. This is a common lament for schools in rural areas, and for schools across the state in hiring teachers for certain subject areas—namely math, science, special education, and foreign languages. Current policy initiatives in Maine such as the push for proficiency-based high school diplomas are raising the stakes for schools to employ high-quality teachers in all content areas. There is a concern that schools facing persistent teacher shortages may struggle to provide a comprehensive educational program, resulting in inequitable learning opportunities for their students. To further investigate the empirical evidence behind these anecdotal reports, the Joint Standing Committee on Education and Cultural Affairs commissioned this study of the Maine Education Policy Research Institute as part of its 2017-18 work plan.

Background

In a recent interview with NPR entitled "Revolving Door of Teachers Costs Schools Billions Every Year", Richard Ingersoll, a leading researcher on teacher turnover and retention, cautioned that school staffing problems are unlikely to be solved by teacher recruitment programs. Using national survey data from the U.S. Department of Education's National Center on Education Statistics (NCES), Ingersoll found that school staffing problems had less to do with teacher shortages and more to do with "excess demand" caused by teacher turnover, a significant amount of which is pre-retirement aged teachers due to reasons related to job dissatisfaction (Ingersoll, 2001). Instead, he advocated administrative initiatives to identify causes of teacher turnover and efforts to increase retention (Alliance for Excellent Education, 2005; National Public Radio, 2015). A recent report by the Learning Policy Institute shows that 95% of demand for teachers is caused by attrition and that pre-retirement attrition accounts for about two-thirds of overall turnover (Sutcher, Darling-Hammond, Carver-Thomas, 2016).

A 2012 an exit survey of teachers who left teaching found that only 13% said retirement was the most important reason why; 55% said they left teaching because of job dissatisfaction related to salaries and teaching conditions, quality of school leadership and administrative support, workload manageability, class sizes and time for collegial collaboration and planning, classroom autonomy and decision making input, professional development opportunities, and issues related to testing and accountability (Sutcher, Darling-Hammond, and Carver-Thomas, 2016). National and state research on the factors that influence recruitment and retention indicate that community and regional amenities as well as working conditions within a school matter, and that financial incentives can reduce teacher turnover (Carver-Thomas and Darling-Hammond, 2017; Ingersoll, 2001; Ladd, 2009; Goldring, Taie, Riddles, and Owens, 2014; Gray, Taie, and O'Rear 2015).

To assist the state in its planning and policymaking, this project investigated whether teacher age, experience and education profiles vary across the state and by school size, poverty level, and rurality. We also analyzed rates, patterns and correlates of teacher retention and turnover, both at the teacher and school levels, and changes in work and community conditions of teachers who move from one teaching job to another. Specifically, in this report we address the following questions:

- Teacher profiles: what are the age, experience and education profiles of Maine's teachers overall, and how do school-level teacher profiles vary by school size, poverty level, and rurality?
- What are Maine's statewide teacher retention and turnover rates? How has turnover changed over time?
- Do school retention and turnover rates vary by school characteristics (size, poverty level, locale, average salary and teacher demographic profile)?
- Who stays and who leaves: what factors (individual, job-related, or school) are associated with teacher retention and turnover?
- Who moves: what are the changes in salary and other work conditions (salary, school type, etc.) associated with job-to-job moves?

Findings are summarized with respect to implications for Maine policy and practice, with a particular emphasis on current policy questions in the 128th Legislative Session.

Methods

Teacher turnover and retention were examined at both the individual teacher level and at the school level. Staff data files obtained from the Maine Department of Education (MDOE) were used to track individual teachers in and out of teaching positions. The data include an individual record for each position held by a staff member. For example, a classroom teacher who is also a Department Head and a coach will have three records in the data system. Unique position codes and staff and school IDs enable the tracking of individual teachers over time, across schools, and in and out of positions. Each staff record also includes information on the teacher's gender, approximate age, education level, and years of teaching experience in Maine, as well as the full-time equivalent (FTE) and salary for each position held. The FTE indicates whether the position is full-time or part-time, with 1.0 indicating a full-time position, 0.5 indicating a half-time position, etc.

Information describing schools was obtained from MDOE's Data Warehouse including school size (enrollment) and the percentage of students eligible for free and reduced price lunch (FRPL) in the most recently reported year (2015-16).[1] Data from National Center for Education Statistics was used to categorize school "locale codes" in terms of rurality,[2] with schools grouped as city, suburban, town, or rural. Information about the school characteristics (poverty level, size, rurality) was linked to individual teachers using School IDs.

Schools were grouped according to school size, poverty level, and urban-to-rural locale. Small schools are defined as those with less than 100 attending students, small-medium sized schools as those with 100 to 250 attending students, medium sized schools as those with 250 to 500 attending students, and large schools as those with 500 or more attending students. We also categorized schools according to three levels of poverty: low poverty schools (%FRPL is less than one standard deviation below the statewide average of 49%), average poverty districts (%FRPL within one standard deviation from the statewide mean), and high poverty districts (%FRPL is greater than one standard deviation above the

[1] http://dw.education.maine.gov/DirectoryManager/Web/Maine_report/MaineLanding.aspx

[2] https://nces.ed.gov/ccd/schoolsearch/

mean). Locale codes were used to categorize schools according to their city, suburb, town, or rural location.

Teacher age, experience and education were obtained from staff records. Highest educational degree was recoded into six categories: 1) Other, which usually means an Associate's degree or less (some college/no degree), 2) Bachelor's degree only, 3) Bachelor's degree plus 15 or 30 hours of additional training, 4) Master's degree or Master's degree plus 15 hours of additional training, 5) Master's degree plus 30 hours of additional training, including Certificates of Advanced Study, or 6) an Advanced Degree or a Doctorate. Information from staff files on teachers' years of experience was used to determine the average number of years of experience and the percent of teachers with 0 to 3 years, 4 to 6 years, 7 to 10 years, 11 to 20, 21 to 30, or 31 or more years of experience. Birth year was used to calculate the teacher's approximate age.

Samples used in the analysis include only regular public schools (i.e., no private schools, CTEs, magnet schools, charter schools, or state operated schools). Teachers include classroom teachers, literacy specialists, and special education teachers. Classroom teachers included Title I, ELL, and Gifted and Talented Teachers; in years 2015-16 and 2016-17 these categories of teachers were distinctly labeled, and in prior years they were included in the classroom teacher position type.

Teachers were tracked from year 1 to year 2 across three different time periods (2006-07 to 2007-08, 2011-12 to 2012-13, and 2015-16 to 2016-17) using position codes and staff and school IDs. A teacher working in year 1 (e.g., 2006-07) who remained teaching in the same school in year 2 (e.g., 2007-08) was classified as a **stayer**. Year 1 teachers who appear in the year 2 staff data as a teacher at a different public school were designated as **movers**. Teachers who left their year 1 teaching position and did not move to another public school teaching position were counted as **leavers**. Leavers include teachers who: left their year 1 teaching position but transferred to some other type of position (principal, coach, ed tech, etc.); took a teaching position at a private school or charter, etc.; went on leave or sabbatical and returned in year 3 (e.g., 2008-09)[3]; and teachers who

[3] Longitudinal analysis of the 2005-06 staff data finds that approximately 3% of leavers returned to teaching at some point after time 3. Teachers who return some time after time 3 are nonetheless counted as leavers for the time period in question.

appear to have left the Maine education profession altogether. It should be noted we cannot determine if the last category of teachers left voluntarily or because they were terminated, downsized, or simply not rehired. Additionally, a small percentage of teachers (1.4%) were both stayers and movers: they worked in two or more schools in year 1 and in year 2 they continued working in at least one of their year 1 teaching positions, but not all of them. These teachers were excluded from the teacher-level analysis.

In order to reduce confounding of typical teacher mobility with that caused by school consolidations and closings, only those teachers working in schools open and running across all three time periods were included in the sample. Also excluded were eleven schools that appear to have undergone downsizing or restructuring.

Teacher-level data files were used to describe teacher retention and turnover and to explore the correlates of teacher-level transitions. Teacher-level records were also aggregated to the school level to produce data files used to calculate school-level retention and turnover rates, and to examine whether there were significant differences across school type (poverty level, size, locale, teacher profile, etc.). We analyzed overall turnover and the different types of turnover separately to investigate commonalities and differences.

Basic statistics were calculated to describe schools and rates of retention and turnover overall, over time, and across types of schools and teachers. Multivariate regression was used to determine which factors have an independent effect on staying versus leaving (i.e., continued to be significantly correlated with staying versus leaving once all other factors were held constant). Regression identifies the relative strength and direction of the relationship between predictor (teacher demographics, school type, salary level, etc.) and outcome (stay vs. leave) variables and whether the relationship is statistically significant. Statistical significance indicates the degree to which we can confidently report that there is, in fact, a real and independent association between a variable and a teacher's stay vs. leave decision (i.e., the observed correlation is unlikely to be a random fluke of the sample). Regression techniques that accommodate the "nested" nature of the data (i.e., that teachers working within the same school will experience similar conditions which cannot be observed in the data) and the fact that the data include

repeated measures (i.e., we observe the same school or teacher up to three times over the course of the 10-year observation period 2006-2007 to 2016-2017) were used to ensure robust results.

Findings

SECTION 1. TEACHER PROFILES ACROSS SCHOOL TYPES

We begin by exploring how teacher age, experience and education profiles vary across the state and by school size, poverty level, and rurality in order to address the question of whether some schools employ more teachers with higher levels of education and more experience. Staff data from the 2016-17 school year were used to describe the statewide teacher profile.

Teacher-level information on approximate age, education level, and years of experience was aggregated to the school level to create school demographic profiles. Statistical analysis was used to determine whether school profiles vary significantly across school enrollment size, poverty level, and locale (rurality). The analysis sample excluded schools with less than 5 teachers as well as those with no information on student enrollment or FRPL. The sample includes 533 regular public schools.

Statewide Teacher Profiles

Teacher Age (Approximate)

The average age of teachers in Maine is 45. However, it is not a normal bell-shaped distribution. Teachers are fairly evenly distributed between the ages of 25 and 60, as can be observed in Table 1 and in the teacher-level histogram in Figure 1 below.

Table 1. Age Distribution of Maine Teachers

Age	% of Teachers
Average age	*45.1*
25 or younger	4.7%
26 to 50	57.1%
51 to 62	31.9%
63 or older	6.2%

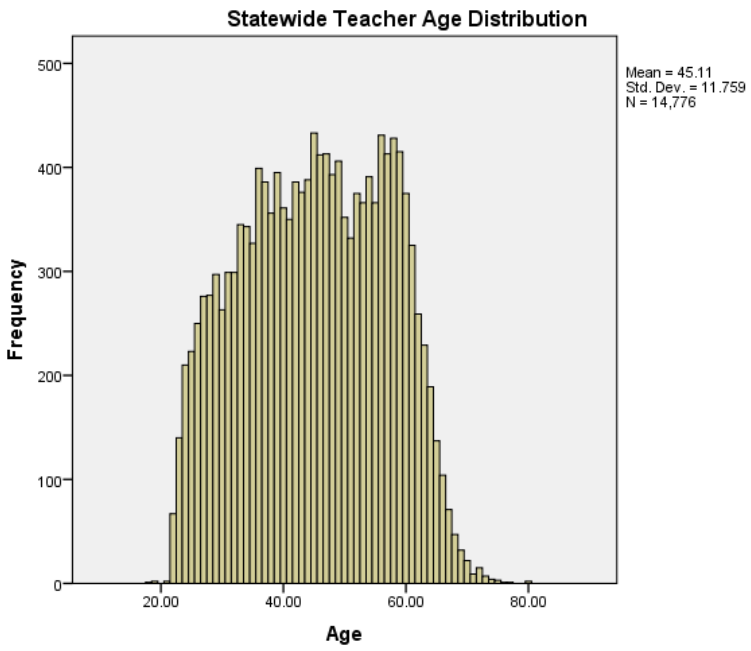

Figure 1

Next, we analyzed the average teacher age at each Maine public school. Across all 533 schools, the average school had teachers that were 45 years old on average, the same as the overall statewide teacher profile. But as shown in Figure 2, the school-level average ages are more normally distributed, with most schools having an average teacher age between 40 and 50.

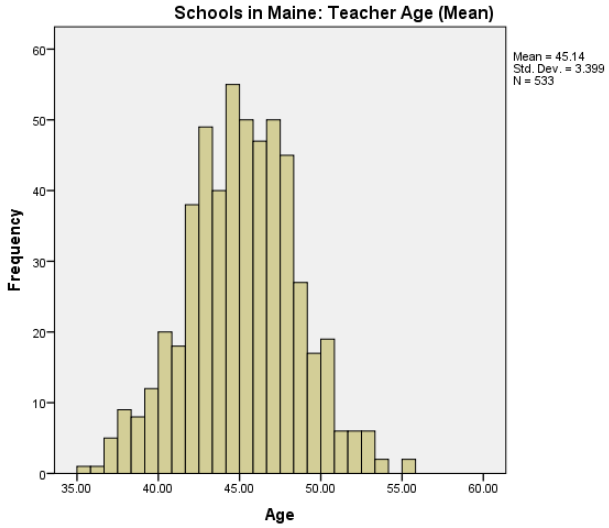

Figure 2

Five outlier schools with average ages above 55, which can be seen in the right tail of the histogram, are all small, remote and distant rural schools. They include two elementary schools and a K-8 school with 8 teachers each, and a middle school and a K-8 school with 11 teachers each.

Years of Teaching Experience

Overall, Maine teachers have an average of 15 years of teaching experience (Table 2). When examined at the teacher level, a spike in new teachers is observable, as seen in Figure 3.

Table 2. Experience Distribution of Maine Teachers

Experience	% of Teachers
Average years experience	*15.3*
0-3 years	19.2%
4 to 8 years	15.7%
9 or more years	65.1%

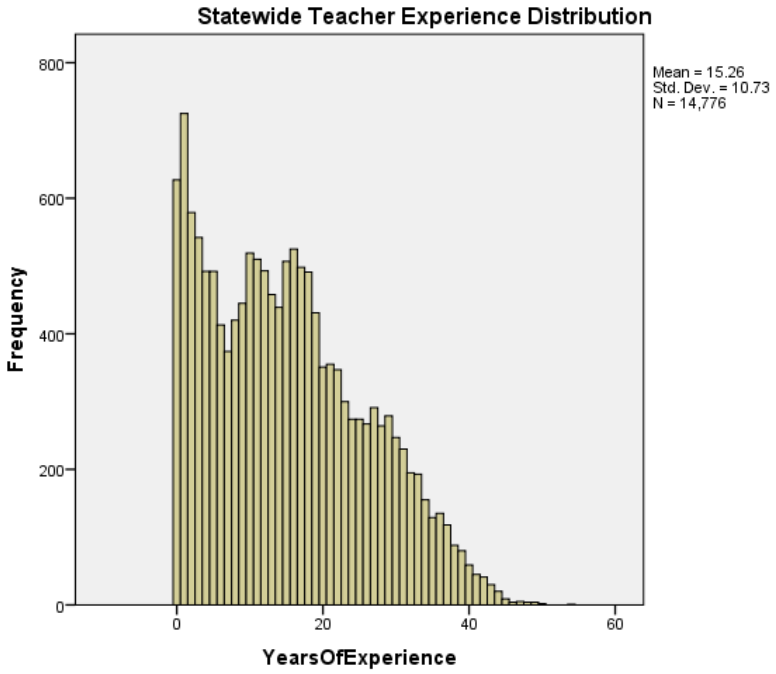

Figure 3

The school-level average years of experience is 14.6, meaning that the average school had a teacher profile that was just slightly younger than the overall state pattern (Figure 4). As with age, school profiles were more normally distributed than the teacher-level data.

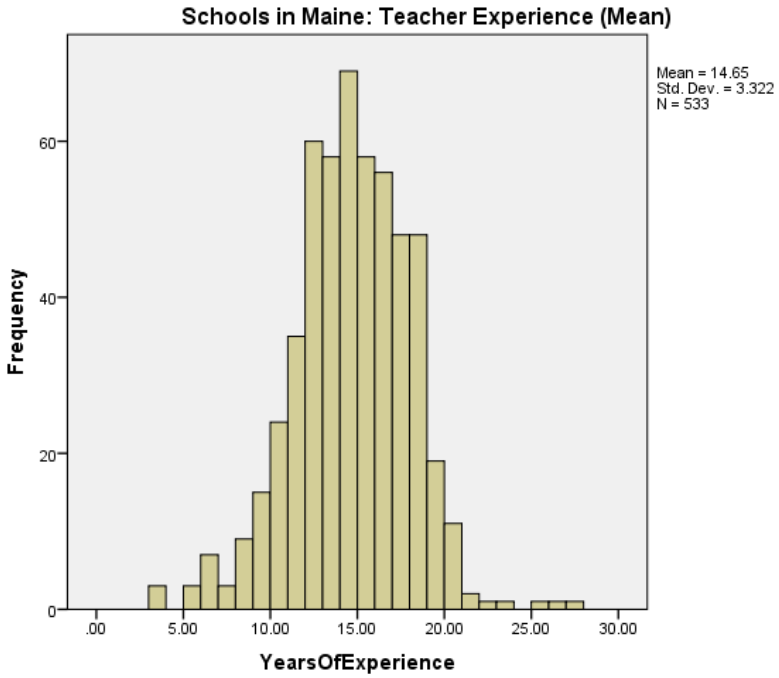

Figure 4

The outlier schools with very low average years of experience (observable in the left tail of the histogram) are small and rural schools, including a K-8 school with 9 teachers, an elementary school with 10 teachers, and an elementary school with 12 teachers. The teachers in these three schools had, on average, less than 4 years of experience. An island school with 25 teachers serving grades K-12 and an elementary school with 15 teachers had average teacher experience of 5.7 years and 5.9 years, respectively.

Level of Education

Most Maine teachers (55%) have a Bachelor's degree, and nearly all of the remainder have a Master's degree or Certificate of Advanced Study (44%), as shown in Table 3 and Figure 5. A small number have a doctorate or less than a bachelor's degree.

Table 3. Education Level of Maine Teachers	
Degree Attained	% of Teachers
Other	0.7%
Bachelor's degree or Bachelor's plus 15 hours	51.6%
Bachelor's plus 30 hours	6.1%
Master's degree or Master's plus 15 hours	35.0%
Master's plus 30 hours or Cert. of Advanced Study	6.2%
Doctorate	0.4%

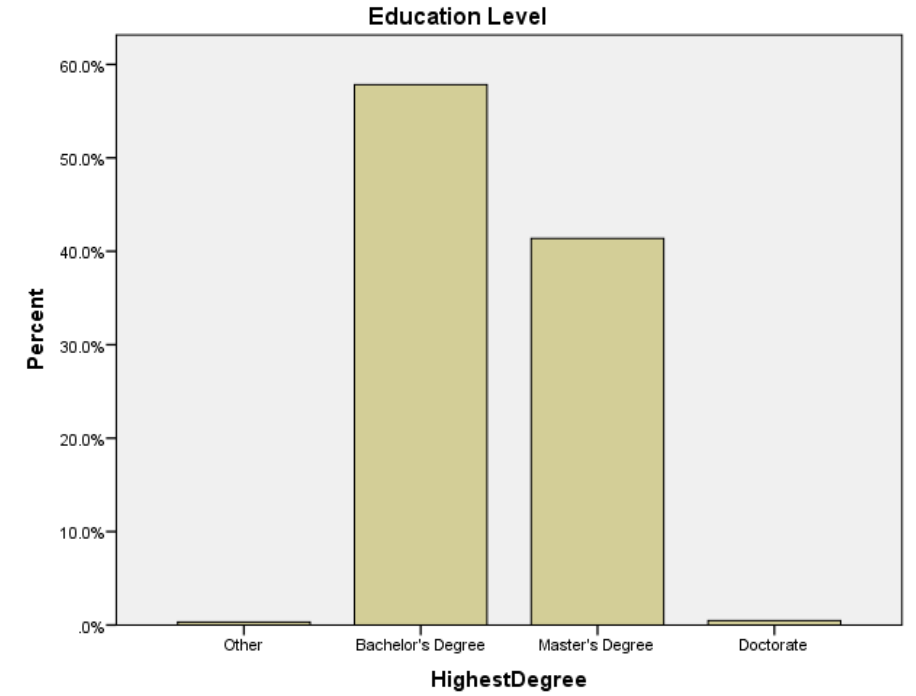

Figure 5

Teacher Profiles by School Type

Next we examine teacher demographic profiles by school size, poverty level and urban-rural locale. Regression techniques were used to determine whether observed differences are statistically significant and if the relationship persists holding other school factors constant. Level of significance is indicated by the p value, with smaller values indicated stronger statistical significance: $p<0.10$, marginally significant, $p<0.05$ moderately significant, $p<0.01$ strongly significant and $p<0.001$ very strongly significant.

By School Size

From Table 4 we can see that teachers at small schools (100 or fewer students) are slightly older (about 1.5 to 2 years older, on average) and that small schools have higher percentages of teachers who are retirement age (63 plus) or near retirement age (51 to 62): small schools have on average 44% of their teachers aged 51 or older, compared to 38% at schools with 100-250 students, 37% at schools with 250-500 and 36% at schools with 500 or more. The correlation between school size and teacher age was strongly statistically significant even after controlling for poverty level and rural-urban category ($p < 0.001$).

Table 4. School-level Teacher Profiles by School Size

	Very Small (100 or less students) (N=54)	Small (100 to 250 students) (N=174)	Medium (250 to 500 students) (N=215)	Large (500 or more) (N=90)
Age				
Average age	46.8	45.1	44.7	45.2
25 or younger	5.3%	5.0%	4.9%	3.5%
26 to 50	50.9%	56.6%	57.9%	60.1%
51 to 62	35.5%	32.3%	31.4%	30.0%
63 or older	8.4%	6.1%	5.8%	5.9%
Experience				
Average years experience	13.9	14.5	14.5	15.5
0-3 years	22.6%	19.4%	19.7%	15.5%
4 to 8 years	16.6%	16.2%	15.9%	13.6%
9 or more years	60.8%	64.4%	64.4%	70.9%
Education				
Other	0.5%	0.9%	0.7%	0.4%
Bachelor's degree, or Bachelor's plus 15 hours	54.6%	56.1%	51.8%	40.5%
Bachelor's plus 30 hours	6.9%	5.6%	6.0%	7.1%
Master's degree, or Master's plus 15 hours	31.8%	33.3%	34.8%	40.6%
Master's plus 30 or Cert. of Advanced Study	5.9%	3.9%	6.4%	10.5%
Doctorate	0.3%	0.3%	0.2%	0.8%

Given the strong correlation between age and years of experience ($r = 0.77$, $p < 0.001$) it is not surprising that small schools also have higher percentages of less experienced teachers, compared to larger schools. The average years of experience is about

two years longer for large compared to small schools, and almost 24% of teachers at small schools are beginner teachers (0 to 3 years of experience) compared to 15% to 20% among larger schools. This difference in experience profiles by school size, albeit relatively small, is statistically significant ($p < 0.05$) even after controlling for both NCES locale and %FRPL.

There are also significant differences in the education profiles of teachers across school size, with larger schools having higher percentages of teachers with more advanced education (Master's degrees, Master's degrees plus 30 hours, Advanced Certificates, Doctorates). Large schools (more than 500 students) have on average 52% of their teachers with advanced degrees compared to 38% among small schools (less than 100), 37% of small-medium (100-250) schools and 41% of medium-large schools (250-500). The correlation between school size and teacher education profile remains strongly statistically significant even after controlling for %FRPL and locale ($p < 0.01$).

By School Poverty level

Next we examined teacher demographic profiles by school poverty level. Schools were categorized according to three levels of poverty. Among low poverty schools, the average percentage of students eligible for free or reduce priced lunch (FRPL) is 17%, with a range of 2% to 27%. Among average poverty schools, the average rate of FRPL is 49%, with a range of 28% to 65%. The typical high poverty school has a FRPL rate of 73%, with a range of 66% to 100%.

Table 5. School-level Teacher Profiles by School Poverty Level

	Lower poverty (n=74)	Average poverty (n=341)	Higher poverty (n=118)
Age			
Average age	45.5	45.0	45.3
25 or younger	2.9%	4.4%	6.5%
26 to 50	58.9%	58.2%	53.1%
51 to 62	32.6%	31.1%	34.0%
63 or older	5.7%	6.4%	6.3%
Experience			
Average years experience	16.1	14.4	14.1
0-3 years	14.6%	19.6%	22.2%
4 to 8 years	13.3%	16.1%	16.1%
9 or more years	72.1%	64.3%	61.7%
Education			
Other	0.3%	0.7%	1.3%
Bachelor's degree or Bachelor's plus 15 hours	36.9%	52.9%	57.2%
Bachelor's plus 30 hours	6.7%	6.2%	6.3%
Master's degree or Master's plus 15 hours	43.6%	34.4%	30.5%
Master's plus 30 hours or Cert. of Advanced Study	12.2%	5.3%	4.6%
Doctorate	0.3%	0.4%	0.2%

While there was virtually no difference in average teacher age across school poverty levels, lower-poverty schools tend to have slightly fewer younger teachers (less than 25 years) and more "middle-aged" teachers (26 to 50), especially when compared to high poverty schools. Among high poverty schools 7% of teachers are 25 or younger compared to 3% among low poverty schools. High poverty schools have on average 53% of their teachers 26 to 50 compared to 59% among low poverty schools. The differences are small but remain statistically significant even after controlling for school size and urban-rural locale. However, there is no statistically significant difference in the percent of teachers near or at retirement age (51 and older) once school size and rurality are controlled for.

As school poverty level increases, so does the percentage of beginner (0 to 3 years of experience) teachers. For example, high poverty schools have on average 22% of teachers with less the 4 years of experience compared to 20% in average poverty schools and 15%

in low poverty schools. These differences in teacher experience profiles across poverty levels are small but statistically significant even after controlling for both NCES locale and school size ($p < 0.001$).

Low poverty schools also tend to have more teachers with more advanced education compared to other schools. On average 56% of teachers in low poverty schools have advanced degrees compared to 40% of teachers in average poverty schools and 35% of teachers in high poverty schools. The relationship between education profiles of teachers and the school's poverty level is strongly significant ($p < 0.001$) even after controlling for school size and locale.

By NCES Rural-Urban Locale Category

In this section we examine teacher profiles according to school locale: city, suburb, town, or rural. The majority (63%) of Maine schools are based in rural areas; less than 9% are categorized as urban (i.e., city) schools.

Table 6. School-level Teacher Profiles by School Locale

	City (n=47)	**Suburb** (n=74)	**Town** (n=80)	**Rural** (n=332)
Age				
Average age	44.2	44.8	45.1	45.3
25 or younger	3.8%	3.6%	5.6%	4.8%
26 to 50	61.6%	60.5%	56.5%	56.0%
51 to 62	29.9%	31.4%	31.7%	32.4%
63 or older	4.7%	4.5%	6.2%	6.8%
Experience				
Average years of experience	14.3	15.2	15.6	14.3
0-3 years	21.5%	16.4%	16.4%	20.6%
4 to 8 years	15.4%	13.4%	14.5%	16.5%
9 or more years	63.1%	70.2%	69.1%	62.9%
Education				
Other	0.3%	0.5%	0.6%	0.9%
Bachelor's degree or Bachelor's plus 15 hours	42.2%	42.2%	50.1%	55.3%
Bachelor's plus 30 hours	8.1%	5.9%	5.6%	6.3%
Master's degree or Master's plus 15 hours	40.0%	39.5%	36.7%	32.7%
Master's plus 30 hours or Cert. Advanced Study	9.1%	11.3%	6.5%	4.5%
Doctorate	0.3%	0.6%	0.4%	0.3%

The typical profiles in city and suburban schools contained more middle-aged teachers (51 to 62) and fewer younger (25 and under) and retirement aged (63 or more) teachers compared to schools in towns and rural areas, although the differences are small. On average, 62% of the teachers in city-based schools and 60% in suburban schools were aged 26 to 50; this is compared to an average of 57% of teachers among town-based schools and 56% among rural schools. More remote schools also tend to have slightly higher rates of retirement aged teachers: on average just under 5% of city-based and suburban school teachers are 63 or older compared to almost 7% in rural schools. These differences were, however, very small and not as statistically strong as differences by school size and poverty. The higher rate of teachers aged 26 to 50 in city and suburban schools compared to rural schools was statistically significant after controlling for school size and poverty level ($p < 0.05$). The lower percent of retirement-aged teachers was only marginally significant for city schools ($p=0.09$) but strongly significant for suburban schools ($p = 0.02$).

When it comes to experience profiles, urban and rural schools tend to look alike, as do suburban and town-based schools. The differences were, again, very small, with the suburban and town-based school teachers having on average about one year more experience compared to the 14.3 years typical of city and rural schools. City-based schools and rural schools had about the same average percent of relatively new teachers (those with 3 or less years of experience) - 21% compared to 16% among suburban and town-based schools. City-based and rural schools also tend to have similar profiles when it comes to brand new teachers (0 years of experience); on average, 6% of teachers in city schools and 5% in rural schools are beginner teachers, compared to about 4% of teachers in both suburban and town-based schools. The differences in experience profiles between city and other schools loses statistical significance, however, once school size and poverty level are held constant; the difference between rural and other schools maintains only marginal significance ($p = 0.08$) after school size and poverty level are controlled.

The differences in education profiles of teachers by locale were larger than the differences in age and experience profiles. Schools in cities and suburbs tended to have teacher profiles with higher levels of education compared to the more remotely located schools. On average schools in cities and suburbs have more teachers with Master's

degrees and Advanced Certificates - 49% and 51%, respectively - while the typical education profile for a rural school contains only 37% of teachers with advanced degrees; schools located in towns had on average 44% of teachers with advanced degrees. The relationship between education profiles of teachers and locale was strongly statistically significant ($p < 0.001$) even after controlling for school size and poverty level.

Teacher Profiles Summary

The differences in teacher education, experience and age profiles across school size, locale and poverty level are subtle but generally statistically significant. Small schools and high poverty schools tended to have teacher profiles that were less experienced and less likely to hold advanced degrees. They also had teacher profiles that were bimodal with higher percentages of both younger and retirement aged teachers. Teacher profiles in rural schools tended to be older and more experienced but less likely to hold advanced degrees. To the extent that teacher age, experience, and education impact retention and turnover decisions, these small differences in school profiles could impact education policy and planning.

SECTION 2. SCHOOL RETENTION AND TURNOVER RATES

In this section we examine school-level retention and turnover rates over time and by school characteristics. We report rates for each of the three time periods (2006-07 to 2007-08, 2011-12 to 2012-13, and 2015-16 to 2016-17) and overall using a pooled sample. Because the loss of only one or two teachers from small schools can create very large rates of turnover which skews results, schools with fewer than 20 teachers are excluded from this part of the analysis. In order to exclude closed, downsized and consolidated schools from the analysis, only schools open in all three time periods and with retention rates within three standard deviations of average (i.e. 62% to 100%) are included in the analysis. The sample includes 319 schools and 905 school-level observations; not all of the 319 schools had at least 20 teachers during all three time periods.

As before, schools are grouped according to poverty level, size, and NCES locale. Because we excluded schools with fewer than 20 teachers from this part of the analysis, there are no small schools included in the analytic sample. Schools are also grouped

according to salary level, based on the average of their teachers' salaries. The lowest level includes schools whose average teacher salary places them in the lowest 25% ($28,078 to $41,457), average schools are those whose average teacher salary places them in the middle 50% of schools ($41,458-$50,012), and the highest level are those schools whose average teacher pay places them in the top 25% ($50,018-$73,165).

For school level analysis we focused on retention (percent of teachers staying) and overall turnover (percent of teachers who left their job for any reason), as well as the percent of teachers who moved (from one public school teaching job to another) and the percent who exited teaching and did not take another position or return the following year (leavers). The percent of teachers who left a year 1 teaching job for another type of job in year 2, or went on temporary leave, was small (1.8%) and will be examined in more depth below using teacher-level analysis. Table 7 shows fairly consistent retention and turnover rates over the three periods.

Table 7: Statewide School Average Retention and Turnover Rates (and Ranges)

	2006-07 to 2007-08 (n=322)	2011-12 to 2012-13 (n=299)	2015-16 to 2016-17 (n=284)	Overall (n=905 school observations)
Retention Rate	88.2% (67-100%)	90.8% (70-100%)	87.2% (66-100%)	88.8% (66-100%)
Move Rate	3.5% (0-22%)	3.2% (0-29%)	4.6% (0-27%)	3.7% (0-29%)
Leave Rate	6.6% (0-28%)	4.6% (0-23%)	5.9% (0-31%)	5.7% (0-31%)

Overall, retention across the three periods is 88.8%, which was higher than the national public school teacher retention rate of 84% reported by the National Center for Education Statistics (2014).[4] The average move rate (the rate at which schools lose teachers to other public schools) across the three time periods was 3.7%. The average leave rate (the percentage of teachers leaving who appear to have left the profession altogether) across the three time periods was 5.7%, somewhat lower than the national move (8%) and leave (8%) rates reported by NCES.

[4] https://files.eric.ed.gov/fulltext/ED546773.pdf

Interestingly, the specific schools experiencing higher or lower turnover rates were not consistent across the three time periods studied. There was no correlation between schools' teacher retention rates in any of the three years investigated.

Table 8 displays school-level retention (staying) and turnover (moving and leaving) rates – averaged over the 3 periods – by school size, poverty level, locale and salary level. Regression analysis was used to determine if observed differences in retention and turnover rates across school type are statistically significant. The differences in retention and turnover rates across school size, poverty level, locale, and salary level were small.

Table 8: School Retention and Turnover Rates by School Type and Locale

	N of schools	Stay	Move	Leave
Size				
100 to 250	97	87.0%	4.7%	6.3%
250 to 500	549	88.7%	4.1%	5.5%
More than 500	257	89.6%	2.7%	5.9%
Poverty level				
Lower	233	89.8%	2.6%	6.0%
Average	565	88.5%	4.0%	5.7%
Higher	103	88.1%	5.3%	4.7%
Average salary Level				
Lowest Quartile	167	87.1%	4.3%	6.7%
Middle Quartlies	460	88.5%	3.9%	5.7%
Highest Quartile	278	90.1%	3.2%	5.1%
Locale				
City	116	88.4%	4.5%	5.3%
Suburb	180	89.9%	3.1%	5.3%
Town	173	88.8%	3.7%	5.8%
Rural	436	88.4%	3.9%	6.0%

*Note: Rates do not sum to 100% because they exclude those leaving for non-teaching jobs or on temporary leave/sabbatical.

By school size: There is a positive correlation between retention and school size, with retention rates increasing with school size. The retention rate is 87.0% for small schools (100-250 students), 88.7% for medium schools (250-500 students), and 89.6% for large schools (more than 500 students). This difference is statistically significant ($p < 0.02$) even after controlling for the school's salary level, urban-rural locale, and %FRPL. Large

schools also have lower average move rates than do other schools: on average 2.7% compared to 4.1 to 4.7% among other schools. The lower move rate among large schools remains statistically significant ($p < 0.001$) even after the school's locale, poverty level and salary level are held constant. There is no statistically significant correlation between school size and leave rate.

By poverty level: There is a negative correlation between retention and a school's poverty level. Average retention rates decline slightly, from 89.8% to 88.5% to 88.1%, as school poverty level increases. This pattern, albeit subtle, is statistically significant ($p < 0.04$) until the school's salary level is controlled. A school's poverty and salary levels are negatively correlated ($r= 0.28$, $p < 0.001$), with low poverty schools able to pay higher salaries and vice versa.

The school's %FRPL does appear to play a more consistent role in move and leave rates. The rate at which a school loses teachers to other schools (movers) increases as the school's poverty level increases: from 2.6% among low poverty schools to 4.0% among average poverty schools and to 5.3% among high poverty schools. The correlation between move rate and poverty remains strongly significant ($p < 0.001$) even once salary level, size, and locale are controlled, indicating that schools with more disadvantaged students are losing teachers to other schools compared to low poverty schools.

Interestingly, the leave rate is slightly lower among high poverty schools - 4.7% compared to 6.0% for low poverty schools - and the difference remains statistically significant even after other school characteristics are held constant. This finding could have to do with the differences in teacher profiles across high and low poverty schools. As shown above, high poverty schools tend to have more beginner teachers and low poverty schools tend to have more experienced and higher educated teachers. We examine this further below.

By salary level: Retention rates and salary level are positively correlated, with average retention rates increasing from 87.1% among schools paying the lowest salaries to 90.1% among those paying the highest average salaries. Salary level remains strongly correlated to school retention rate ($p < 0.001$) even after school size, poverty level, and locale are held constant.

Schools that pay higher average salaries also tend to have lower move rates and leave rates compared to other schools. In fact, salary appears to play a stronger role in reducing leave rates compared to reducing the loss of teachers to other schools (moving). Once school size, poverty level, and locale are held constant, whether a school pays low or high salaries is no longer correlated to its move rate while in the leave model, a school's salary level remains strongly significant ($p < 0.001$) even after other school characteristics are controlled.

By NCES locale: Suburban schools have slightly higher average retention rates (89.9% compared to 88.4%-88.8% for schools in other locales) and city schools have slightly higher average move rates, especially compared to towns and suburbs (4.5% compared to 3.1 and 3.4%). However, because of relatively strong correlation between locale and other school variables, especially salary and poverty levels, locale plays very little independent role in influencing school-level retention and turnover rates. For example, higher average move rates among city schools is no longer significant once school size and salary level are held constant. The leave rate does increase ever so slightly with increased rurality but again, this pattern is no longer statistically significant once other school-level variables are entered into the model.

In Section 1 we showed that there were significant differences in teacher profiles across school type and locale. Some of the observed differences in school retention and turnover rates across school type and locale may actually be caused by these differences in teacher profiles and not school size, poverty level, or locale. Regression was used to determine if differences in school retention and turnover rates by school size, poverty level, locale and salary level persist once the schools' teacher demographic profiles (age, experience, and education) are controlled. The results are displayed below in Table 9.

We report regression results in terms of the direction of influence of the factor on school retention and turnover rates. A negative sign (-) indicates the variable is negatively correlated with the outcome (retention or turnover), meaning it reduces the rate, and a positive sign (+) means the variable is linked to an increased rate. We also report the level of statistical significance and the relative strength of each factor's impact (influence) on retention and turnover rates.

Table 9: Multivariate Analysis of Correlates to School-level Turnover and Retention						
	Retention Rate		Move Rate		Leave Rate	
Predictor Variables ↓	Correlat. and Sig	Order of influence	Correlat. and Sig	Order of influence	Correlat. and Sig	Order of influence
Teacher profile variables						
% Female	NS		NS		NS	
% Age 33 to 50	NS		-*	4th	NS	
% Age 51-62	NS		NS		+*	7th
% Age 63+	-*	5th	NS		+****	1st
% 1-3 Yrs Exp	-****	1st	+****	1st	+****	2nd
% 4-8 Yrs Exp	-***	2nd	NS		NS	
% 9-14 Yrs Exp	NS		NS		-*	6th
% 15-20 Yrs Exp	NS		NS		NS	
% Adv. Degree (MA, CAS, Doc)	-*	8th	NS		NS	
School level variables						
Lower Poverty	NS		-**	3rd	NS	
Higher Poverty	+*	7th	NS		-***	3rd
Large School	+***	4th	-****	2nd	NS	
Locale - rural	NS		NS		NS	
Locale - city	-*	9th	NS		NS	
Lower Avg salary	-*	6th	NS		+**	4th
Higher Avg salary	+**	3rd	NS		-**	5th

Sample includes regular publics schools with at least 20 teachers. All models control for repeated measures. Asterisks indicate level of significance: * (p<0.10, marginal), ** (p<0.05), *** (p<0.01), **** (p<0.001, very strong) and NS=not statistically significant.

Retention rate: Teacher experience and age (%s of beginner and new teachers, % of teachers 63 and over), school size and its average salary relative to other schools across the state have the most influence relative to the other factors. A school's teacher experience profile is negatively correlated to its retention rate, meaning schools with higher percentages of new teachers have lower retention rates. The fact that the % of new teachers (0-3 years of experience) and relatively new (4-8 years) teachers are more influential (ranked 1st and 2nd) than the % of teachers aged 63 and over (5th in influence) in predicting a school's retention rate suggests pre-retirement attrition is as much if not more of an issue as retirement.

The school's salary level remains statistically powerful (3rd and 6th in influence) even after the school's teacher demographic profile is controlled, despite the fact that a school's average salary is correlated with teacher experience, age, and education. Schools

that pay high salaries relative to other schools across the state have higher retention rates and schools that pay low salaries have lower retention rates.

School size remains an important predictor of retention even once the school's teacher profile is held constant, with large schools having higher retention rates compared to smaller schools. Larger schools may offer teachers greater opportunities for professional development and instructional leadership roles, factors researchers have found to positively impact job satisfaction and reduce teacher turnover (Sutcher, Darling-Hammond, Carver-Thomas, 2016).

Interestingly, the percentage of teachers with more advanced degrees has a negative correlation with a school's retention rate, albeit relatively weak. That this variable is not significant in either of the turnover models (move, leave) indicates that the loss of these teachers is probably through their higher rate of transition into administrative positions (which are not captured in the move or leave rates) compared to other teachers. This will be explored further below.

Move rate: Regression results indicate that higher percentages of new teachers (0-3 years) are linked to higher move rates, even after controlling for other teacher demographics and school size, salary level, locale and poverty rate. The percentage of new teachers is the most influential variable in the model. This lends support to the theory that beginner teachers may be starting their careers in schools that have lower standards (in order to fill vacancies) and then moving to other schools once they accrue experience.

The negative correlation between school size and move rate also remains statistically significant. Large schools lose fewer teachers to other schools, compared to smaller schools, even after controlling for teacher education, experience, and age profile. The variable is the second most influential variable in the model. That the school size variable is both strongly correlated with increased retention (see above) as well as a reduced rate of loss of teachers moving to other schools but has no statistically significant correlation to a school's leave rate (see below) indicates that school size reduces retention through reducing the move rate, not the leave rate.

The school's poverty also remains statistically significant after controlling for teacher profile: low poverty schools lose fewer teachers to other schools. The research on

teacher turnover consistently shows higher turnover at schools with higher concentrations of economic disadvantaged students (Ingersoll, 2001; Simon, Johnson, and Moore, 2015).

Note that the school's salary level relative to other schools has no independent impact on the school's move rate. The salary variables were only weakly correlated with move rate when we held school size, poverty level and locale constant; they lose all statistical significance once the school's teacher age, experience, and education profile is controlled.

Leave rate: The retirement effect is strong and clear: even after controlling for school level factors (size, locale, poverty level, salary level) and the full teacher demographic profile, the % of teachers aged 63 and older has the strongest relative impact on a school's leave rate. Comparatively, the early retirement effect appears to be fairly weak: while the % of teachers aged 51 to 62 is positively correlated with a school's leave rate, its only marginally significant ($p = 0.08$) and ranked 7th in terms of relative influence.

That the two most powerful variables in the model are the percent of teachers 63 and the percent of new teachers (0-3 years of experience) has potentially important implications for policy and planning. Losing older teachers to retirement is inevitable but figuring out why younger, less experienced teachers appear to be leaving teaching altogether will be important to reducing turnover and addressing teacher shortages.

Even after controlling for a school's teacher demographic profile, the school's salary level remains statistically correlated with its leave rate: schools that pay low salaries have higher leave rates while those that pay high salaries have lower leave rates.

That the school's salary level remains strongly correlated to both the leave rate and retention rate after controlling for school size, locale and its teacher profile but has no statistically significant correlation to a school's move rate indicates that the role of higher salaries in reducing retention is through reducing the leave rate, not the move rate. This is consistent with other studies that indicate low wages are causing teachers to give up on teaching altogether (Sutcher, Darling-Hammond, Carver-Thomas, 2016).

Other studies pretty consistently show higher turnover rates among schools with higher percentages of poor students. Yet our analysis indicates the leave rate is actually lower among high poverty schools, even after controlling for teacher age, education and experience profile. In fact, the variable indicating a school is high poverty is the third most

influential variable in the model. This suggests that it may not be school level differences in teacher profiles that are driving this result, as speculated above. Further study is needed to explore the reasons behind this finding.

School-Level Turnover Rate Summary

A school's retention and turnover rates are strongly correlated to its teacher demographic profile. The variable measuring the percentage of new teachers (0-3 years of experience) is consistently among the most powerful predictors in all three models: stay, move, and leave. Schools with higher proportions of beginner teachers lose more teachers to other schools. High percentages of beginner teachers are almost as strongly correlated to higher leave rates as the percent of teachers 63 and older, confirming pre-retirement attrition is an important component of turnover in Maine. While not as influential as the percent of teachers 63 and older, a school's percent of near-retirement aged teachers (51 to 62) is also linked to higher leave rates, indicating the "early-retirement" effect is also an important component of attrition. Salary also matters. After controlling for a school's teacher demographic profile, the school's salary level remains statistically correlated with its leave rate: schools that pay low salaries have higher leave rates while those that pay high salaries have lower leave rates. Retention rates tend to be slightly higher in larger schools primarily due to the fact that they lose fewer of their teachers to other schools (i.e., not due to leave rates). The move rate among higher-poverty schools is more than twice that among lower- poverty schools but the leave rate among higher-poverty schools is slightly lower than that of lower-poverty schools. Differences in teacher turnover and retention rates across school urban-rural locale are primarily attributable to locational differences in salary.

SECTION 3. TEACHER LEVEL RETENTION AND TURNOVER

In this section we examine retention and turnover dynamics at the individual teacher level. The results of the teacher-level analysis mirror those of the school-level analysis, thereby serving as a test of validity. Additional insights can also be gleaned because we can track different aspects of teacher turnover and look more closely at who

stays and who leaves, and the results of job-to-job moves in terms of salary and other job conditions.

As we did in the prior analyses, we excluded teachers from schools that closed at some point during our observation period (2006-07 to 2016-17) or appeared to have undergone some downsizing or consolidation (i.e., had zero or exceptionally low retention rates). We also excluded teachers from schools with fewer than five teachers.

As with the school level analysis, we began by examining retention and turnover at the teacher level for each time period separately and in pooled samples. The merged sample pools stay-leave outcomes for 21,216 teachers for all 3 time periods and includes 40,507 teacher observations, many of which were repeated observations of the same teacher (i.e., teachers who remain working from period 1 to period 2 will have two records in the data and those who work throughout 2006-2017 will have 3 records in the data).

From Table 10 we can see that teacher level retention and turnover closely track school-level rates (even though small schools were excluded from the school level analysis).

Table 10: Teacher-level Retention and Turnover

	Period 1: 2006-07 to 2007-08 (n=14,331)	Period 2: 2011-12 to 2012-13 (n=13,002)	Period 3: 2015-16 to 2016-17 (n=13,174)	Overall Pooled Sample (n=21,216)*
Stay	88.1%	90.7%	86.6%	88.4%
Move	3.6%	3.2%	5.1%	3.9%
Sabbatical/temp leave	0.6%	0.4%	0.4%[5]	0.5%
Other job	1.3%	0.9%	1.8%	1.4%
Leave	6.1%	4.7%	6.1%	5.8%

* *Ns refer to individual teachers; there were 40,507 total teacher-observations*

The overall retention rate was 88.4%. About 4% of the teachers moved from one public school teaching position to another. The remaining 7.7% were leavers, the majority (75%) of which appear to have left the field, meaning they did not continue in another non-teaching position (ed tech, principal, etc.), did not take a job in a private school, charter, etc., and were not on temporary leave.

[5] Note: in periods 1 and 2, staff data are available to track leavers who return to teaching in time 3. Period 3 (2015-16 to 2016-17) "temp leave" %s includes only those recorded in time 2 data as being on leave or sabbatical.

About 18% of the leavers transitioned into a non-teaching job (or continued working in the non-teaching position they held in addition to their teaching position). The most common positions were: Ed Tech, administration (e.g., Assistant Principal or Principal, Dean/Department Head/Director/Coordinator of some sort including Athletic Director, Director of Adult Education, Director of Spec Education or ELL, Director of Technology, Drop Out Prevent Coordinator, Attendance Coordinator, Computer/Tech Coordinator, Coach/Athletic Trainer), or a classroom teacher in private school or CTE. About half of the teachers who left their regular public school teaching job were already in these other positions at year 1 (along with their teaching position); the other half actually moved into a new position. About a third of the teachers who left their year 1 teaching job for another position in year 2 remained in same school, and about half remained in same district.

To get a sense of the characteristics of the stayers and leavers, Table 11 describes the demographics and job characteristics of stayers, movers, job changers, and leavers. Movers tended to be younger and leavers tended to be older. Movers were on average almost 5 years younger than stayers, while leavers were on average 4 years older.

Table 11: Stayers, Movers, Job Changers, and Leavers - Who are they?

	Stayers	Movers	Job changers	Leavers	All
N of observations	35,823	1,600	551	2,349	40,507
Female	75.6%	79.3%	65.0%	74.9%	75.6%
Average age	45.2	40.2	44.2	49.0	45.2
25 or younger	3.5%	9.3%	3.4%	5.2%	3.8%
26 to 50	58.7%	68.7%	64.3%	38.4%	58.0%
51 to 62	34.4%	19.9%	26.8%	41.4%	34.1%
63 or older	3.4%	2.1%	5.5%	14.9%	4.1%
Average years of experience	16.6	11.1	14.7	18.9	16.5
0 years	2.6%	6.6%	5.0%	4.2%	2.9%
1-3 years	8.0%	17.9%	10.9%	11.6%	8.7%
0-3 years	10.6%	24.5%	15.9%	15.8%	11.6%
4-8 years	15.9%	24.9%	18.7%	16.1%	16.4%
9-14 years	20.1%	19.9%	23.6%	11.8%	19.7%
15-20 years	18.0%	13.1%	13.8%	10.2%	17.2%
21-30 years	23.6%	12.6%	15.5%	19.5%	22.8%
31+ years	11.8%	3.9%	12.4%	26.6%	12.3%
Other	0.3%	0.7%	1.4%	0.5%	0.3%
Bachelor's degree	58.1%	60.9%	49.5%	57.0%	58.0%
Master's degree or CAS	41.2%	38.1%	48.4%	41.6%	41.2%
Doctorate	0.5%	0.2%	0.7%	0.9%	0.5%

The effect of retirement is clear with nearly 15% of leavers being 63 years or older, compared to only 3.4% of stayers. The early retirement effect observed above using school-level analysis is also visible here at the teacher level: 41.4% of leavers are aged 51 to 62 compared to 34.4% of stayers.

The bimodal distribution of age among leavers can be observed more easily in the histogram below. Leavers tended to be younger or older teachers, and the pre-retirement and retirement effects were more pronounced.

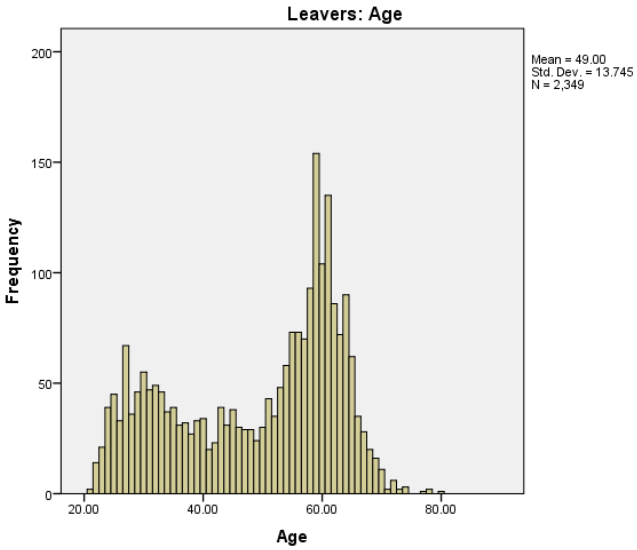

Figure 6

Because of the correlation between age and experience, years of experience is also bimodal, with both beginner teachers and highly experienced teachers more likely to leave teaching compared to mid-career teachers. The correlation between age and experience is not a perfect correlation, however. While older teachers leave at higher rates than younger teachers, the leave rate among teachers with less experience is somewhat more pronounced than it is among teachers with more experience, as can be seen in the histogram below.

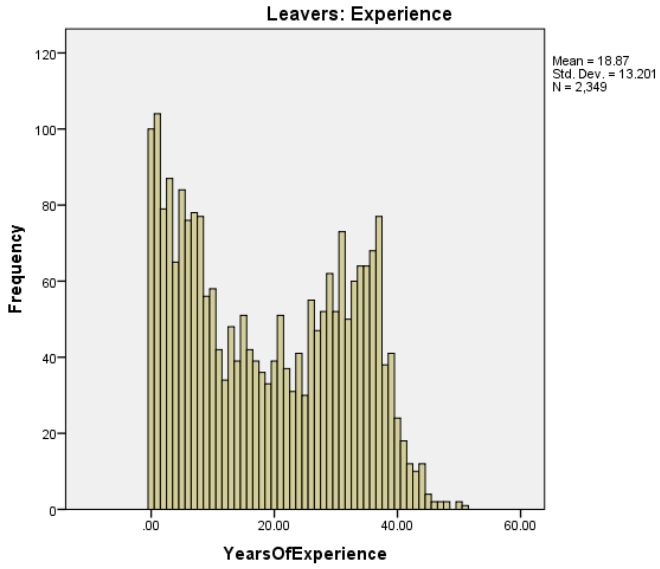

Figure 7

As can be observed in the histogram below, new teachers make up the bulk of movers, with moving from one teaching job to another teaching job declining with years of experience.

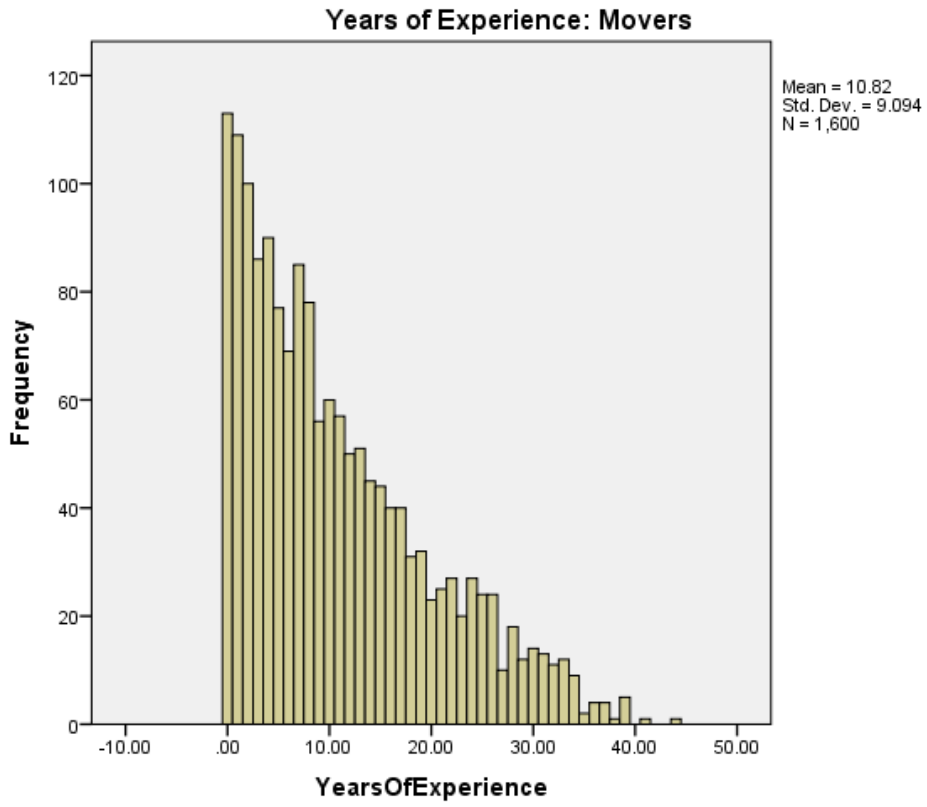

Figure 8

Another piece of information to be gleaned from Table 11 is that teachers who leave a teaching position for a non-teaching job are more likely to have advanced degrees (Master's degree, Advanced Certificate, Doctorate): 49.1% of those who leave for other types of positions have advanced degrees compared to 41.7% of stayers, 38.5% of movers, and 43.0% of leavers. This makes sense since many leave teaching for administrative positions. Teachers who leave teaching for another type of position are also more likely to be male: overall 76% of teachers are women compared to only 65% of teacher who leave teaching for some other type of education position. Since most are leaving for administrative positions or teaching positions in CTEs, this may reflect gendered labor market dynamics.

Table 12 describes the year 1 job characteristics of teachers who stay versus leave. Salary includes wages earned from all positions (i.e., salary figures include additional salary or stipends paid to teachers who hold other, non-teaching positions).

Table 12. Stayers, Movers, Job Changers, and Leavers –Year 1 Job Characteristics

	Stayers	Movers	Job changers	Leavers	All
N of observations	35,814	1,600	550	2,347	40,311
Full-time (0.90 FTE +)	97.0%	95.0%	93.6%	91.2%	96.5%
Salary: Average and (Range)	$47,754 ($1,076-$134,200)	$41,892 ($4,995-$142,612)	$46,343 ($9,303-$100,724)	$45,741 ($1,680-$182,160)	$47,381 ($1,076-$182,160)
Salary – lowest quartile	23.7%	42.0%	28.5%	32.3%	24.9%
Salary – highest quartile	25.6%	11.6%	30.2%	25.6%	25.2%
Special Education	12.9%	22.4%	22.0%	14.3%	13.2%
Teaches in > 1 school	2.8%	4.6%	4.4%	4.7%	3.0%
Holds > 1 position in same school	18.1%	9.7%	24.9%	13.7%	17.7%

Special education teachers are more likely than other teachers to move from one teaching job to another. Special education teachers make up 22% of movers compared to only 13% of stayers. Special education teachers are not significantly more likely to leave the profession altogether.

Teachers who teach in more than one school also make up slightly higher percentages of both movers and leavers: 4.7% of those who leave were teaching in more than one school compared to 2.8% of stayers. Only 3% of the overall sample of teachers were teaching in more than one school and the difference in leaving versus staying is small but it reflects higher levels of job stress (a heavier workload or more commuting) among part-time teachers, which in turn leads these teachers to leave the profession, this could be an important finding for education policy and planning. On the other hand, it may reflect teachers who are not competitive for full-time jobs deciding to leave the profession altogether. Movers (4.4%) are also slightly more likely to be working in more than one school compared to stayers (2.8%); in this case it may be that working in another school creates connections and job opportunities.

The fact that job changers are the most likely (24.9%) to hold another position in addition to teaching in year 1 makes sense: they stop teaching but remain working in that

other position in year 2. More interesting is the fact that stayers are almost twice as likely as movers to hold another position (e.g., coach, department head, curriculum coordinator, teacher support team member, etc.) in addition to their teaching position - 18.2% compared to 9.7%. Multiple roles may enhance a teacher's commitment to the school and reduce their incentive to leave. Whether this has an independent effect from the higher salary that those holding other positions earn will be explored below using multivariate regression analysis.

From Table 12 we can also see that stayers and leavers also differ in terms of salary and hours, with stayers both earning higher salaries and more likely to be working full-time. On average, stayers earned $47,754 in their year 1 job compared to $41,892 earned by movers, a $5,862 difference. Overall, 23.6% of stayers are earning salaries that place them at the bottom percentile across the state, compared to 42.0% of movers; and stayers are more than twice (25.7%) as likely movers (11.6%) to be earning salaries that place them in the top 25% statewide. These differences are not likely to be the result of differences in the hours: 97.0% of stayers and 95.0% of movers were working full-time in year 1, a very small and only marginally significant difference. In fact, if we restrict the sample to only full-time teachers the salary difference between stayers ($48,433) and movers ($42,917) is still sizeable at $5,516.

The smaller difference between the average salaries of stayers and leavers ($2,013) reflects the fact that the salary distribution of leavers is impacted by higher-paid older teachers who retired and lower paid younger teachers who left education altogether. If we restrict the sample to middle-aged teachers (26 to 50) working full-time (see Table 13) the relationship between salaries and retention and turnover is clearer: stayers earn on average $4,660 more than leavers, and 47.2% of leavers earn salaries placing them in the bottom statewide percentile compared to 27.5% of stayers.

Table 13: Salary Differences Among Full-time Teachers Aged 26 to 50

	Stayers	Movers	Leavers
Average salary	$45,512	$42,235	$40,852
Salary – lowest quartile	27.5%	37.8%	47.2%
Salary – highest quartile	16.8%	7.9%	6.5%

Some of the teacher and job conditions described above could be correlated, masking or amplifying differences between stayers and leavers. For example, the above bivariate analysis indicates that younger teachers are more likely to leave; they are also less experienced. The bivariate analysis also showed that stayers are more likely to hold another, non-teaching position within the same school; is this a factor that retains them from one year to the next or is it that they are also earning higher average salaries compared to other teachers (i.e., they earn their teacher salary plus an additional salary or stipend for the other position)? Moreover, school-level factors such as size, poverty level, and urban-rural locale were shown above to have small but generally significant impacts on school-level teacher turnover and retention rates. To determine which of the factors (teacher demographics, job conditions, and school size, poverty, and locale) has an independent effect (i.e., is predictive of staying or leaving even when all other factors, at both the teacher and school level are controlled) on teacher transitions we ran a series of regression analyses.

Table 14 provides an overview of the results from teacher-level regression analyses indicating for each variable the direction of correlation with the retention or turnover outcome, whether it is statistically significant, and the order of influence on the leave/stay outcome relative to the other variables in the model. A negative sign means the variable is negatively correlated with the outcome, meaning it reduces the likelihood a teacher will stay, move or leave. A positive sign means the variable increases the likelihood that the teacher will stay, move, or leave.

After establishing that teachers aged 63 and over are significantly more likely to leave, we have excluded them from the following regression analysis in order to focus on the more policy-relevant transitions outside of retirement. For the most part, regression results confirm the bivariate analysis results displayed in Tables 9 and 10, but there are some important differences which may provide additional insight into which teachers are more likely to stay, leave, or move.

Table 14: Multivariate Analysis of Correlates to Teacher-level Turnover

	Stay		Move		Leave	
Predictor Variables ↓	Correlation and Sig	Order of influence	Correlation and Sig	Order of influence	Correlation and Sig	Order of influence
Teacher level variables						
Female	+ ***	9th	NS		NS	
Age 33 to 50	+ **	13th	-*	13th	-**	12th
Age 51 to 62	-***	12th	-****	7th	+****	2nd
0-3 years exp.	-****	1st	+****	1st	+****	8th
4-8 years exp.	-****	4th	+****	3rd	NS	
9-14 years exp.	-**	11th	+****	5th	-****	7th
15-20 years exp.	+**	10th	+**	12th	-****	3rd
Advanced Degree (MA, CAS, Doc)	-****	5th	+***	9th	+***	9th
Special Education	-****	3rd	+****	2nd	NS	
Teaches in > 1 school	-****	6th	NS		+****	6th
Holds other non-teaching position	+***	8th	-****	6th	-***	10th
Full-time	+****	2nd	-***	10th	-****	1st
Salary-lowest quartile	-****	7th	NS		+****	4th
Salary-highest quartile	+***	15th	NS		-****	5th
School level variables						
Lower Poverty	NS		-***	8th	NS	
Higher Poverty	NS		+**	11th	NS	
Large School	+***	14th	-****	4th	+**	11th
Locale - rural	NS		NS		NS	
Locale - city	NS		NS		NS	

Sample includes teachers at regular publics schools with at least 20 teachers aged 62 and under. Asteriks indicate level of significance: * ($p<0.10$, marginal), ** ($p<0.05$), *** ($p<0.01$), **** ($p<0.001$, very strong).

Age: The bivariate analysis above showed a strongly bimodal age distribution with leaving more likely among both younger teachers and older teachers, both retirement aged (63 plus) and near-retirement aged (51 to 62). National research cited above (Sutcher, Darling-Hammond, Carver-Thomas, 2016) indicates that leaving by retirement aged teachers plays a relatively small part in the turnover problem. Regression results from the "leave" model (Table 14, column 4) indicate that "early retirement" may be an issue here in Maine as well. The variable indicating the teacher is aged 51 to 62 is positively correlated

with the likelihood of leaving and is the second most influential variable in the model. This mirrors the results found at the school level (Table 9).

Experience: The descriptive statistics displayed in Table 11 show that both movers and leavers tended to be less experienced, compared to stayers. Regression results suggests that having less experience plays a larger role in teacher's decision to move to another school than it does decisions to leave teaching altogether. The variable identifying new teachers (0 to 3 years) is positively correlated to both leaving and moving but it has a larger relative influence in the move model (1st) than it does in the leave model (8th). This mirrors school level regression analysis results and provides further support for the idea that beginner teachers are starting their careers in schools that may have lower standards (in order to fill vacancies) and then moving to other schools once they accrue experience.

While not as influential as it is in the move model, the variable identifying beginner teachers (0 to 3 years of experience) is still strongly significant and linked to a higher likelihood of leaving. Beginner teachers in Maine appear to be at higher risk of failing and leaving the profession altogether. Whether this is a problem requiring increased mentoring support for new teachers (Smith and Ingersoll, 2004; Ingersoll and Strong, 2014) or reflects efficient turnover of less qualified teachers requires additional study.

Education: The variable identifying teachers with more advanced education (Master's degree, Advanced Certificate, Doctorate) is negatively correlated with staying and positively correlated with leaving and moving, even after controlling for their higher salary (education and salary are positively correlated). That teachers with higher education are more likely to leave the profession may reflect that fact that they have more job opportunities outside of the education profession, compared to teachers with only Bachelor's degrees. Note that the variable identifying teachers with more advanced education plays a relatively stronger role in the stay model (5th most influential) than it does in the move and leave models (9th). This makes sense since they are more likely to leave teaching for administrative positions (a transition which is captured in the stay outcome but not the move or leave outcome).

Special education teachers: Regression confirms the higher move rate among special education teachers, compared to other teachers: special education status is the third most powerful variable in the retention model – and its negative sign indicates these teachers

are less likely to stay - and the second most influential in the move model – where its positive sign indicates they are more likely than other teachers to move to another teaching position. Special education teachers are not more likely to leave; the variable is not statistically correlated with leaving.

Full-time: Not surprisingly, full-time teachers are significantly more likely to remain in their jobs – the variable is positively correlated to staying and the second most powerful variable in the model. Retention related to full-time status appears to operate primarily through reducing the incentive to leave the profession. While significant and negatively correlated to both the likelihood of moving and leaving, the variable is the most powerful variable in the leave model and only the 10th most powerful in the move model.

Salary: Regression results show that earning a high salary increases the likelihood a teacher remains in her job while earning a low salary reduces the likelihood she will stay, even after age, experience, hours and whether they hold another position - factors correlated with salary - are held constant. Retention related to salary appears to operate by reducing the incentive to leave teaching altogether rather than reducing the incentive to move to another school. The salary variables are the 4th and 5th most powerful variables in the leave model but have no statistical significance in the move model. This is consistent with the school-level results reported above that show that a school's average salary relative to other schools across the state had no significant correlation with the rate at which school's lose teachers to other schools but that a school's salary level was correlated to leave rates.

This is not to say that salary does not matter to the teacher's decision to move: as we show in tables 12 and 13, both leavers and movers earn on average more than $5,000 less than stayers. And as we will show below, the majority of movers do see a sizeable increase in their salary over what they were earning in their time 1 job. However, the regression results do indicate that once other factors are held constant, salary is not as influential as other variables in her move decision compared to its role in her decision to leave the profession. This is consistent research indicating that working conditions matter as much if not more than compensation (Ingersoll, 2001; Ladd, 2009).

Note also that the salary effects in the "stay" model earning a low salary is more influential (7th) than earning a high salary (15th), suggesting that while salary matters,

other factors matter more when it comes to staying, unless the teacher is earning a wage that places her at the bottom 25% of teachers statewide. This makes sense in that jobs are "sticky" and changing jobs can be a hassle so salary plays a less influential role in the decision to stay vs leave, unless she is earning very low wages.

Teaching in more than one school: The bivariate analysis presented in Table 11 showed that both leave and move rates were slightly higher among teachers who are teaching in more than one school. Regression results in Table 14 show that the effect of this job arrangement is still significantly and positively correlated with leaving after controlling for other factors, including full-time status and salary, but is no longer significantly linked to moving. This result lends support to speculation that these are teachers who are not competitive for full-time jobs deciding to leave the profession altogether rather than qualified teachers stressed by working across more than one school looking for full-time positions.

Other positions: Teachers who hold a non-teaching position in addition to their teaching job are significantly less likely to move or leave, even when their salary level is held constant. This suggests that there is something beyond the higher salary keeping them in their jobs. These positions, many of which are leadership and decision-making roles (e.g., department head, teacher support team member and curriculum coordinator), appear to enhance a teacher's commitment to the school and to the profession in general. This is consistent with surveys of teachers reporting that instructional leadership opportunities and teacher input in school level decision-making increase job satisfaction and reduce turnover (Ingersoll, 2001; Ladd, 2009; Sutcher, Darling-Hammond, Carver-Thomas, 2016).

School-level factors: For the most part, school-level factors appear to have more relevance to teacher level decisions to move to another school and less relevance to decisions to leave. The likelihood of moving is lower for teachers in lower poverty schools and higher for those working in higher poverty schools. This is consistent with school-level results above as well as other teacher turnover studies, which see significantly higher turnover among schools with higher percentages of low-income students. Existing research suggests that teachers tend to move away from higher poverty schools because of a lack of resources and supports, and not because of the students themselves (Ingersoll, 2001; Simon and Johnson, 2015).

Regression results also show a relatively strong influence of school size, especially on the likelihood of moving to another school even after controlling for other teacher and school factors. The variable identifying teachers who work in large schools (500 plus) is negatively correlated with moving and the 4th strongest variable in the model. We speculated above that the lower move rate might be because large schools offer teachers more professional development and leadership opportunities, educational resources and other amenities, factors that researchers find correlate to teacher turnover (Ingersoll, 2001; Sutcher, Darling-Hammond, and Carver-Thomas, 2016).

Summary of Teacher Turnover Categories & Teacher-Level Regression Models

Teachers who remain in their original year 1 teaching position (stayers) are more likely to be "middle-aged" (26 to 50) and more experienced. The effect of retirement is clear with nearly 15% of leavers being 63 years or older, compared to only 3.4% of stayers. The early retirement effect observed above using school-level analysis is also visible here at the teacher level: 41.4% of leavers are aged 51 to 62 leave compared to 34.4% of stayers. Movers tend to be younger, on average 5 years younger than stayers, and less experienced. Beginner teachers and older, highly experienced teachers are both more likely to exit the field altogether (leave) but the leave rate among beginner teachers is somewhat more pronounced. Teachers who leave a teaching position for a non-teaching job are more likely to have advanced degrees, which makes sense since many leave teaching for administrative positions. Teachers who leave teaching for another type of position are also more likely to be male. Since most are leaving for administrative positions, this may reflect gendered labor market dynamics.

Overall, teachers who remain in their original year 1 teaching position (stayers) are more likely to hold another position within their school in addition to their teaching position and earn higher salaries. Movers – teachers who leave one teaching job for another – and leavers – those who appear to have left the profession altogether - are both earning significantly lower wages at their year 1 job. Leavers are also less likely to be working full-time and were more likely to be teaching in more than one school. Special education teachers are more likely than other teachers to move but they are not more likely to leave.

Regression results confirm much of the teacher bivariate analysis results displayed in Tables 11, 12 and 13 and also provide additional insight into which teachers are more likely to stay, leave, or move and why. Regression results confirm that new teachers (0 to 3 years) are both more likely to move to another teaching job and to leave the profession altogether. Regression also indicates that despite their higher salaries and seniority, teachers at pre-retirement age (51 to 62) are more likely than younger teachers to leave, suggesting that "early retirement" may be having an important impact on teacher turnover. Teachers who hold a non-teaching position in addition to their teaching job are significantly less likely to move or leave, even when their salary level is held constant. This suggests that there is something beyond the higher salary keeping them in their jobs. These positions, which are frequently leadership and decision-making roles (e.g., department head, teacher support team member and curriculum coordinator), appear to enhance a teacher's commitment to the school and to the profession in general. Regression results salary plays a significant role in the decision to leave the profession but has less influence in the decision to move from one teaching job to another. This makes sense in that moving involves comparing working conditions at both schools as well as compensation and is consistent with research showing that while salary matters job satisfaction matters more. Finally, regression shows that even after controlling for teacher demographics, salary and other job factors, schools size and poverty are linked to turnover, primarily through moves to other schools: teachers are less likely to move from large schools and low poverty schools. Low poverty schools and large schools may offer teachers more professional development and leadership opportunities, educational resources and other amenities, factors that researcher finds correlate to teacher turnover.

SECTION 4. MOVERS: JOB-TO-JOB CHANGES in SALARY AND JOB CHARACTERISTICS

In this final section we examine the changes in salary and other work conditions (salary, hours, etc.) and school type (poverty level, locale, size) resulting from job-to-job moves. The sample of movers includes 1,472 teachers and 1,596 moves (i.e., 61 teachers were observed to move twice and 2 teachers moved during all three observed periods).

In Table 15 we examine the changes in job conditions and school types resulting from these moves. While most movers (95%) were already working full-time in their year 1 teaching job, among the 5% who were not, most (74%) moved into a full-time job.

Table 15: Movers - Changes in Job Conditions

Salary changes			
% with salary increase	79%		
% with salary decrease	17%		
Average change in salary	$3,111 (-$59,171 to $78,222)		
Change with salary increase	$5,346 ($4-$78,222)		
Hours changes			
Full-time job 1, part-time job 2	3%		
Full-time job 1, full-time job 2	97%		
Part-time job 1, full-time job 2	74%		
Part-time job 1, part-time job 2	26%		
School type changes			
High poverty school → Low poverty school	1%		
Change in avg %FRPL	47% to 43%		
Small school → larger school	3%		
change in avg enrollment	390 to 438		
School locale changes			
City → not city	4% (avg salary change: $2,954)		
Suburb → not suburb	7% (avg salary change: $3,509)		
Town → not town	9% (avg salary change: $3,743)		
Rural → not rural	19% (avg salary change: $4,339)		
Among rural movers:	Destination job 2	Avg $ change	Avg $ salary increase
• rural→city	16%	$7,186	$8,955
• rural→suburb	38%	$4,720	$6,109
• rural→town	46%	$3,053	$5,962

Despite the fact that a teacher's job 1 salary did not appear to be an influential factor in predicting whether he or she stayed or moved to another school, the majority (79.0%) of teachers who move do experience a salary increase. Among those who do increase their

salary, the average increase is $5,346 with a range of $4 up to $78,222. However, the range of salary changes is very wide - as can be seen in the histogram below - with most increasing their salary by very little and some even taking a pay cut. This suggests that while salary matters, it was not the main driver.

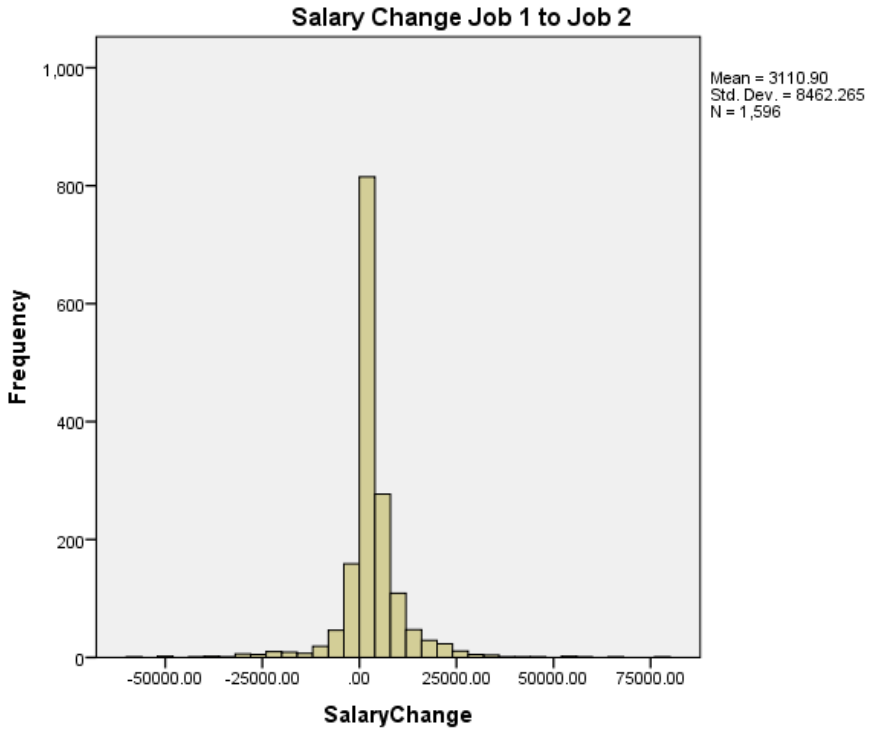

Figure 9

The regression results presented above in Table 15 show that even after controlling for teacher demographics, salary and other job factors, large schools and low poverty schools are losing fewer teachers to other schools, compared to high poverty and smaller schools. We speculated that low poverty schools and large schools may offer teachers more professional development and leadership opportunities, educational resources and other amenities, increasing job satisfaction. These schools may be more desirable places to work but they also may have fewer job openings: only 1% of movers moved all the way from a high poverty to a low poverty school (the change in average %FRPL from job 1 to job 2 is 47% to 43%) and only 3% of movers moved from a small school (fewer than 100 students) to a larger school.

There also do not appear to be a lot of teachers leaving city-based schools – only 4% of movers went from teaching at a city school to a school in the suburbs, a town, or a more rural locale. There are somewhat higher rates of moving from schools based in the suburbs (7%) and towns (9%) but the rate of moving from rural schools is considerably higher: 19% of teachers who work in rural schools at year 1 leave for a non-rural based school in year 2. While the rural variable did not have an independent relationship to moving – once salary was controlled - at the teacher or the school level (i.e., it was not significantly correlated to higher rates of moving) when teachers move, they are leaving rural schools at a significantly higher rate than other locales.

Not surprisingly, given cost of living salary adjustments, teachers who leave rural schools are significantly more likely to see a salary increase ($p < 0.002$), compared to teachers who move from other locales. Teachers who leave schools in rural areas saw an average salary change of $4,339 compared to $3,743 among those who left town-based schools, $3,509 among those leaving suburban schools and $2,954 among those leaving city-based schools.

Teachers leaving rural schools earn significantly higher salaries, particularly if they move to schools located in less remote areas: among those who moved to a school based in a town, the average change in salary was $3,053 compared to $4,720 for those who moved to a suburban school, and $7,186 among those who moved to a school based in a city.

Using regression analysis, we are able to determine that moving from a rural to a non-rural school and from a high poverty to a low poverty school are both positively and significantly correlated to salary increases, even after controlling for teacher experience and education, gender and changes in hours. Low poverty schools and non-rural schools pay higher salaries. Moving from a small to a larger school does not significantly increase a teacher's salary once these other factors are controlled for.

Finally, we find some evidence to support the idea that beginner teachers are starting off in schools that have lower standards in order to fill vacancies and then moving on to schools with better working conditions. In Table 16 we compare job changes experienced by beginner teacher movers (0 to 3 years of experience) and all other movers. Beginner teachers are more likely to move away from poor schools compared to other movers: 12.2% of beginner teachers move from a high poverty school to an average or low

poverty school compared to 8.7% of other movers. Beginner teachers are also more likely to leave rural schools for non-rural schools: 21.9% of beginner teachers move away from rural schools compared to 17.3% of other movers. Beginner teachers are not more likely to move from a small school to a larger school.

Table 16. Movers - Changes in Job Conditions Between Beginner Teachers and Other Movers

Salary changes		
	Beginner teachers (0 to 3 years exp.) n= 411	Other teachers n=1,185
% with salary increase	78.6%	80.3%
% with salary decrease	16.5%	16.9%
Average change in salary	$3,316	$3,040
Change among those with salary increase	$4,921	$5,498
Hours changes		
Full-time job 1, part-time job 2	5.3%	3.2%
School type changes		
High poverty school → low poverty school	0.97%	0.80%
High poverty school → low or average poverty school	12.2%	8.7%
Small school → larger school	3.4%	3.0%
School locale changes		
Rural to non-rural	21.9%	17.3%
Town to not town	9.0%	8.6%

Beginner teachers are also slightly more likely to move from a part-time position to a full-time position: 5.3% compared to 3.2% of other movers, and to see a salary increase: 80.3% compared to 78.6% of other movers.

Summary Description of Movers

Both the school-level and teacher-level turnover analysis indicated that salary levels plays little role in teachers deciding to leave one teaching job for another. However, the majority of teachers who move do experience a sizeable salary increase. However, the range of salary changes is very wide with most increasing their salary by very little and some even taking a pay cut. This suggests that while salary matters, it was not the main driver. Moving from a part-time position to a full-time position explains a significant

portion of the salary increase. School locale and poverty level also explain salary changes. Rural schools in particular appear to be losing teachers to higher paying schools in other locales. We also find some evidence to support the idea that beginner teachers are starting off in schools that have lower standards in order to fill vacancies and then moving on to schools with better working conditions. Beginner teachers are more likely than other teachers to move from a high poverty school to a low or average poverty school. They are also more likely than other movers to move from a rural school to a non-rural school.

LIMITATIONS AND CAVEATS

As with all teacher turnover research, there are limitations to the analysis and some cautions regarding interpretation of results. First, as we mention above, the data do not permit us to discern voluntary versus involuntary school departures. We called teachers who left their year 1 teaching job and do not appear in the year 2 data in a non-teaching position or return to their teaching job at some point after year 3 "leavers". However, we cannot actually determine if leavers left of their own choice or if they left the profession because they were laid off, terminated, or simply not rehired. This makes it less clear why, for example, there is an increased risk of leaving among beginner teachers: are they well-prepared by their teacher training programs and merely in need of more mentoring and support, or is it that they are not well prepared and are not being rehired?

Second, despite the fact that we took considerable care to separate teacher-initiated turnover from transitions resulting from school downsizings, closings and consolidations there may be some confounding of these effects. We used the statistical rule of thumb and excluded schools with turnover rates 3 standard deviations above the mean. Even with the exclusion of schools with atypically high turnover rates, there is still a lot of variability across schools, with some schools reporting unusually high turnover. Some of the variability may reflect data recording errors or school size changes unrelated to teacher-motivated moves and transitions. As a validity check, we re-ran analyses excluding even more high turnover schools. The results did not change significantly.

Third, the information available in staff and other administrative data explain only about 2-12% of the observed variation in teacher transitions. Regression analysis is used here only to determine which factors have an independent correlation to teacher retention

and turnover and the relative strength of those correlations. In other words, these models cannot be used to forecast turnover rates year-to-year and they leave a lot of reasons why teachers leave jobs unanswered.

Reliable forecasts of retention and turnover require a much more detailed set of data than are available in MDOE staff records. At the teacher level, there are myriad factors related to the decision to stay or leave a job. While salary and hours may be important factors, there are many other job-related factors that play into a decision to stay or leave. Moreover, employment decisions of teachers, like other workers, are strongly influenced by family and personal relationships, community connections and local amenities, work-family dynamics, etc.

The other limitation of administrative data is that there are few specific and precise measures of school characteristics and job conditions. School size and poverty level are rough proxies for what a teacher's day-to-day work life is like. In addition to the statistical "noise" that is created by the use of proxies to measure job and school conditions, use of proxies confounds interpretation. For example, in these models we rely on the percentage of children eligible for free and reduced price lunch as a measure of the number of poor students. Not only is this a rough estimate of the actual number of economically disadvantaged students, %FRPL it is likely capturing both workload dynamics as well as amount and quality of resources available to teachers.

To produce models that could accurately forecast retention and turnover, we would need much more specific and precise information on teachers, their jobs and schools, and the communities in which they live or might live if they were to change jobs. That said, even if we had more precise and detailed information on job and work conditions, personal and family dynamics, local community conditions, our models would still have relatively low forecasting reliability. After all, we are trying to explain human behavior, which is notoriously difficult to predict.

Despite these limitations, the results reported here are generally consistent with the body of research on teacher turnover using national samples and larger data sets. These studies combine administrative data with survey data and can include variables in their models that capture more aspects of a teacher's job more precisely. They are also able to collect directly from teachers their opinions about different aspects of their work-life

including the level of administrative support, quality of collegial collaboration, workload manageability, and overall job satisfaction and use these as controls in their models. The consistency of our results with these larger studies provides a strong validity check on the analysis reported here and increases the confidence with which we draw conclusions and make recommendations.

CONCLUSIONS

In this section, we first synthesize the findings presented above based on the research questions posed at the outset of the study. Then we draw conclusions about potential consequences of these findings, and thus the policy implications for Maine's educational stakeholders. Some options are presented for supporting Maine schools in hiring and retaining high-quality teachers; strategies and policies may involve higher education institutions and their teacher preparation programs, the Maine Department of Education and its educator certification division, or legislative interventions.

Question 1. Teacher profiles: what are the age, experience and education profiles of Maine's teachers overall, and how do school-level teacher profiles vary by school size, poverty level, and rurality?

The average Maine teacher is a woman about 45 years old who has taught for 15 years and has a bachelor's degree plus some graduate credits. Overall, half of Maine's teachers are between the ages of 25 to 50, and about a third are in the pre-retirement years of 51 to 62. Six percent are at retirement age (63 or more years old). About one in five teachers is new and has less than three years of experience teaching in the state.

The differences in teacher education, experience and age profiles across schools by size, locale and poverty level are subtle but generally statistically significant. Small schools and higher poverty schools tend to have teacher profiles that are less experienced and less likely to hold advanced degrees. They also have teacher profiles that are more bimodal, with higher percentages of both younger and retirement-aged teachers. Teacher profiles in rural schools tend to be older and more experienced but less likely to hold advanced degrees.

Question 2. What are Maine's teacher retention and turnover rates statewide? How has turnover changed over time?

Retention and turnover rates changed very little over the 10-year observation period. Overall teacher retention across the three periods was 88.8%, with a retention rate of 88.2% from 2006-07 to 2007-08, 90.8% from 2011-12 to 2012-13, and 87.2% from 2015-16 to 2016-17. These rates is higher than the 2012-13 national public school teacher retention rate of 84% reported by the National Center for Education Statistics (Goldring, Taie, Riddles, and Owens, 2014). The average annual move rate (the rate at which schools lose teachers to other public schools) across the three time periods was 3.7%, about half that reported by NCES (8%). The average leave rate (the percentage of teachers leaving who appear to have left the profession altogether) across the three time periods was 7.5%, including the 1.8% of who returned in a subsequent year, just slightly lower than the 8% leave rate reported by NCES.

Question 3. Do school retention and turnover rates vary by school characteristics (size, poverty level, locale, average salary and teacher demographic profile)?

A school's teacher demographic profile was strongly correlated to its retention and turnover rates. The variable measuring the percentage of new teachers (those with 0-3 years of teaching experience) was consistently among the most powerful predictors of a school's retention, move, and leave rates. Having a high percentage of beginner teachers was almost as strongly correlated to higher leave rates as the percentage of teachers 63 and older, suggesting pre-retirement attrition is an important component of turnover. While not as influential as the percentage of teachers 63 and older, the school's percentage of near-retirement aged teachers (51 to 62) was also linked to higher leave rates, indicating the "early-retirement" effect is also an important component of attrition.

After controlling for a school's teacher demographic profile, several school characteristics remained statistically correlated with leave rates. First, the school's average salary level matters. Schools that paid lower salaries had higher leave rates and vice versa. Retention rates also tended to be slightly higher in larger schools, primarily due to the fact that fewer of their teachers moved to other schools (i.e., not due to a difference in leave rates). When comparing schools of different student poverty levels, the *move* rate among

higher-poverty schools (5.3%) was more than twice that among lower poverty schools (2.6%), but the *leave* rate among higher-poverty schools (4.7%) was slightly lower than that of lower-poverty schools (6.0%). Because higher-poverty schools had a higher percent of beginning teachers than lower-poverty schools (22.2% vs. 14.6%)—a key predictor of attrition—it is inferred that their leave rates are driven more by pre-retirement attrition than in lower-poverty schools.

Differences in teacher turnover and retention rates across school urban-rural locales were primarily attributable to local differences in salary; rurality alone was not a significant driver of overall retention. However, subsequent analyses indicate that rurality may be a factor in move patterns for beginning teachers.

Question 4. Who stays and who leaves: what factors (individual, job-related, or school) are associated with individual teacher retention and turnover?

Teachers who remain in their original (year 1) teaching position—i.e. the "stayers—are more likely to be "middle-aged" (26 to 50) and more experienced. The effect of retirement is clear with nearly 15% of leavers being 63 years or older, compared to only 3.4% of stayers. The early retirement effect observed in school-level analysis is also visible at the teacher level: 41.4% of leavers were aged 51 to 62, compared to 34.4% of stayers. Movers tended to be younger, on average five years younger than stayers, and less experienced. Beginner teachers and older, highly experienced teachers were both more likely to exit the field altogether (leave) but the leave rate among beginner teachers is somewhat more pronounced. Teachers who leave a teaching position for a non-teaching job are more likely to have advanced degrees, which makes sense since many leave teaching for administrative positions. Teachers who leave teaching for another type of position are also more likely to be male. Since most are leaving for administrative positions or teaching positions in CTEs, this may reflect gendered labor market dynamics.

Regression results of the factors predicting retention confirmed much of the findings suggested by teacher and school descriptive profiles. Regression models also provided additional insight into which teachers are more likely to stay, leave, or move. Findings confirmed that new teachers (0 to 3 years) were both more likely to move to another teaching job and to leave the profession altogether. The models also indicated that

despite their higher salaries and seniority, teachers at pre-retirement age (51 to 62) are more likely than younger teachers (aged 25 to 50) to leave, suggesting that "early retirement" may be having an important impact on teacher turnover.

Teachers who hold a non-teaching position in addition to their teaching job are significantly less likely to move or leave, even when their salary level is held constant. This suggests that there is something beyond the higher salary keeping them in their jobs. These positions, which are frequently leadership and decision-making roles (e.g., department head, teacher support team member and curriculum coordinator), appear to enhance a teacher's commitment to the school and to the profession in general.

Regression results indicate that salary played a significant role in the decision to leave the profession, but had less influence in the decision to move from one teaching job to another. This may at first seem counter-intuitive, given the descriptive finding that about 80% of movers experienced a pay increase. But the lack of significance of having a lower salary school could mean that salary differences were also explained by other variables in the model, including age and experience. It is also consistent with research showing that while salary matters to teachers, job satisfaction matters more. Teachers may be motivated to move for improved working conditions as well as for better compensation. Finally, regression shows that even after controlling for teacher demographics, salary and other job factors, schools size and poverty are linked to turnover, primarily through moves to other schools: teachers are less likely to move from large schools and lower poverty schools. Lower poverty schools and larger schools may offer teachers more professional development, peer collaboration, leadership opportunities, educational resources, and other amenities, factors that research had found correlate to teacher turnover.

Question 5. Who moves: what are the changes in salary and other work conditions (salary, school type, etc.) associated with job-to-job moves?

Both the school-level and teacher-level turnover analysis indicated that individual salary levels played little role in teachers deciding to leave one teaching job for another. While the majority of teachers who moved did experience a salary increase, the range of salary changes was very wide with most increasing their salary by relatively little. Some (about 20%) even took a pay cut. Moving from a part-time position to a full-time position

also explained a significant portion of the average salary increase. This suggests that while salary mattered, it was not the main driver for changing schools. School locale and poverty level also explained salary changes. Rural schools in particular appeared to be losing teachers to higher paying schools in other locales.

We also found some evidence to support the conventional wisdom that beginner teachers may start off in less-desirable schools and then move on to more competitive school—presumably those with better working conditions or locations—after gaining some experience. Beginner teachers are more likely than other teachers to move from a higher poverty school to a lower or average poverty school. They are also more likely than other movers to move from a rural school to a non-rural school.

POLICY IMPLICATIONS & NEXT STEPS

While Maine's overall turnover rates were lower than the national average, they nonetheless present an ongoing challenge for schools. Several of the report conclusions lead to areas for potential policy interventions, as well as questions for possible further exploration.

Findings pointed to more than one driving force behind teacher turnover, and thus the need for multiple approaches for reducing it. Policy implications are categorized below according to their area of challenge.

Teacher recruitment

Because a certain amount of teacher turnover is to be expected (and even desirable), the standard reaction is to call for expanded recruitment efforts. This is not a novel or surprising recommendation, yet it remains worthy. Recruitment options are well-documented and include advertising, job-shadowing programs, scholarships, and loan forgiveness programs. Such efforts are often in concert with teacher preparation offerings, described in more detail below.

In addition to recruiting new pre-service teachers, schools may find value in creating jobs that would be attractive to retired veteran teachers, such as part-time or part-year positions. Part-time positions have the potential to save schools money, and hiring retirement-aged teachers can save on benefit costs. Recruiting from the retired teacher

pool would be prohibitively difficult if policies were enacted to prevent them from continuing to receive pension payments.

Lastly, a unified statewide job application system could serve to streamline the application process for candidates and increase awareness of openings in smaller districts. Districts could expand their applicant base by advertising amenities such as housing supports or community features that may attract candidates from other parts of Maine (or outside the state).

Beginning teacher retention

This group of the teacher workforce was more likely to move from and to leave a school, and thus turnover among new teachers is a strong factor in the overall teacher turnover picture. At a time when Maine is facing an historically low unemployment rate and an aging workforce, it is imperative to improve retention among this segment; recruitment alone will not solve the problem. Myriad options could be explored, including:

- Improving teacher induction supports, including but not limited to coaching, mentoring, co-teaching with experienced teachers, and professional development opportunities. These supports could be provided by school districts, higher education institutions, professional organizations, consultant groups specializing in induction such as the New Teacher Center, and/or the Maine Department of Education;
- Reducing workload for new teachers;
- Exploring financial incentives for teachers to stay through their initial years of teaching, such as ramped loan forgiveness rates, retention bonuses, or salary supplements.

Resources for teacher induction exist in federal Title II formula grants; certain programs may also be eligible for other types federal funds, at either the district and/or state level.

Changes in teacher preparation

There are two basic ways that teacher preparation can have an impact in this area: 1) high-quality preparation can help ensure that beginning teachers are job-ready and more likely to feel successful, and 2) expanded program options, including more flexible offerings, can help with recruitment and teacher supply. In a prior MEPRI study (2017), a

literature review summarized the evidence base for high-quality preparation and cited strong content knowledge, strong clinical preparation, and performance-based candidate assessment as key elements of preparing teachers. Compared to other parts of the country, Maine currently has limited options for non-traditional and post-baccalaureate students to pursue the training for initial teacher certification in a rigorous, well-mentored and supervised model including extended clinical preparation and performance assessment. Alternative pathways built upon a residency model, in which schools invest their own resources in supporting teacher candidates, show promise. While most residency programs have been developed in urban settings, rural models are emerging and could serve as exemplars.

Other

The finding that school turnover rates were not consistent over time was unexpected. This suggests that the specific schools experiencing high turnover rates in one year may or may not have a similar challenge in the next year. From a policy perspective, this creates a challenge for developing strategies that would target certain schools based on their historical turnover patterns. Such approaches typically use a prior year of data to determine schools eligible for supports in a future year; however, this research suggests that past results may not predict future need for teachers in a given year. Interventions may need to be targeted at regions or at the individual teacher level rather than at the school level. However, the research did provide guidance on the *types* of schools that consistently encounter staffing challenges. This information should be used to inform any interventions by targeting the needs of smaller, higher-poverty and under-resourced schools. Namely, supports (such as professional development or mentoring) should be provided at low-cost and with flexible scheduling (i.e. low travel) to allow teachers in these schools to participate.

From a research perspective, this also raises questions about the life-cycle of teacher turnover. If retention rates vary from year-to-year, it is possible they could ebb and flow on some other periodic basis (e.g. biannually) based on patterns of teacher hiring and retention. Additional research using complete longitudinal datasets would be necessary to investigate this question.

In addition, additional research would be valuable to investigate the geographic and subject-area differences in teacher supply across the state. The staffing data used in the current study only include employed teachers; linking these data to certification records would provide a more robust depiction of the available pool of teachers and their preparation pathways. Such a study is currently under consideration for inclusion in the FY2019 MEPRI workplan for the legislature.

In summary, the challenge of teacher turnover is multi-faceted. It affects all schools to at least some extent, and has large impacts on some schools in some years. There is no single solution that will address the various problems that contribute to staffing shortages. Ensuring that Maine students have opportunities for learn from well-qualified educators will require ongoing and sustained efforts and innovations on multiple fronts.

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