Monitoring Cost Pressures on Teacher Salaries in Wyoming

Final report to the

Joint Appropriations Interim Committee and

the Joint Education Interim Committee

Dr. Christiana Stoddard

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Executive Summary

Between 2001 and 2010, average Wyoming teaching salaries rose by 64 percent to existing levels of about $57,000. This rapid increase was more than three times the average national rate of increase, outpacing the next highest state by more than 15 percentage points. In the 2010-11 school year, average salaries exceed those of adjacent states by 25 percent. Last year, the state maintained the level of salaries used in the school funding model, although salaries still increased for individual teachers with changes in experience and education.

This report compiles a set of indicators related to potential cost pressures that may signal when there is a need for future policy responses. If cost pressures increase but salaries do not change, districts in Wyoming could experience greater difficulty recruiting and retaining high quality teachers in the future. This report identifies two potential **sources** of pressure on salaries. First, labor market changes in other professions or in the teaching market in other states could potentially affect the number of individuals interested in teaching in Wyoming. Second, demographic patterns could increase the number of positions that need to be filled.

If these factors change substantially, they might influence districts' ability to recruit and retain high quality teachers. As a result, measures of the recruitment and retention capacity of districts are also key indicators of whether compensation in Wyoming is set at appropriate levels. There are three classes of **outcome** indicators: those related to retention, those related to recruitment, and those related to the pool of individuals training to become teachers.

This report summarizes these five sets of indicators (labor market indicators, demographic indicators, recruitment, retention, and training indicators), their current levels and historical ranges, and the values that would represent a large deviation from historical patterns and might signal the need for policymakers to monitor salaries more closely. However, it should be noted that all indicators exhibit some year to year variation: a change in a single measure warrants less concern than broad based changes across several metrics.

This report focuses on indicators chosen from rapidly available data sources to track current conditions. The indicators were also constructed to be easily computed from existing data. In several cases, these metrics were compared to more complex indicators to identify whether the more simple measure tracks the overall broad patterns of cost pressures. However, because each measure is individually simple, using the collection of indicators is most useful for documenting general conditions.

The results indicate that present labor market and demographic trends do not predict increased cost pressure on salaries within the next five years. Current outcomes measures also reveal little difficulty in recruiting or retaining teachers, although existing teacher quality measures are indirect and should continue to be monitored, particularly as new sources of information become available.

Section I. Why Monitor Costs?
The Relationship Between Salary and Teacher Quality

Wyoming teaching salaries rose by 64 percent between 2001 and 2010 to existing levels of about $57,000. This rapid increase was more than three times the national rate of increase and more than 15 percentage points faster than in any other state. Salaries in the 2010-11 school year were 25 percent higher than the average salary in adjacent states. For the last year, the state decided to maintain the level of salaries used in the school funding model, although salaries still increased for individual teachers with changes in experience and education.

This report presents several metrics for monitoring changes in cost pressures on teaching salaries. It is important to note at the outset, however, that there is not a single "right" level of compensation because compensation does not uniformly affect districts' ability to recruit and retain quality teachers.

To understand how to interpret these metrics, it is useful to begin with a potential teacher's perspective. Individuals decide to teach based on how well teaching matches their skills and interests as well as their other potential employment options. High teaching salaries and benefits are competitive with more employment options, attracting a larger pool of individuals who might consider teaching. However, the relationship between salary and teacher quality is complex.

The best measure of teacher quality is teacher effectiveness—that is, the impact a teacher has on student outcomes. Research has shown that the most effective teachers also earn more in other professions. If teaching compensation in Wyoming were low compared to other professions or compared to teaching in other states, teaching would be unattractive for many high ability individuals. In this case, raising salaries could lead to rapid improvements in teacher quality by drawing more effective individuals into the teaching pool.

However, if compensation is comparable with other states or occupations, many high quality teachers may have already chosen to teach in Wyoming. Increases in salary may still be associated with a higher quality pool, but the number of new applicants brought in through higher salaries is smaller. Some individuals with more employment options (for example, individuals with strong math or science skills) may still be attracted through higher salaries, but fewer individuals are sensitive to salary changes at these higher levels. Changing salaries in this range may have a more moderate effect on quality.

When teaching salaries are very high relative to other states and occupations, nearly all of the individuals most interested in teaching in Wyoming have already entered the profession. Due to the high salaries, existing teachers are less likely to leave, even if they discover that their skills are not a strong match for teaching. Relatively few individuals remain to be attracted through salary. In that case, raising salaries even further might have only minimal effects on teacher quality.

Similarly, changes in a "cost pressure"—for example, changes in the number of new positions or changes in labor market conditions—may have strong effects or only minimal effects on the ability of districts to recruit and retain high quality teachers, depending on the existing relationship between quality and compensation. In addition, these external factors may move in different directions, leading to muted net effects. For example, when there are few openings, districts can be more selective in their hires and cost pressures are therefore lower even if outside wages are rising.

As a result, this report presents two different classes of cost pressure indicators: those related to its **sources** and those related to its **outcomes**. While a source indicator may be changing (e.g., rising number of teachers of retirement age), if outcomes do not respond much (e.g., the quality of teachers being hired is constant), then this indicates less of a need for salaries to be adjusted.

Wyoming is currently developing an accountability system to better capture teacher effectiveness, but currently most existing data relates to numbers of teachers with some proxy indicators of quality. This report will present what is known about existing outcomes, but as better measures of teacher effectiveness are developed, these should be incorporated in future indicators that help to monitor the need for salary adjustments.

Section II presents five indicators that would signal changes in **sources** of cost pressures related to labor market and demographic patterns:

1. Changes in the ratio of teaching wages relative to wages of comparable professionals
2. Changes in the ratio of teaching wages in Wyoming to teaching wages in other states
3. The trends in student enrollment
4. The trends in teacher retirement
5. The fraction of new hires

Section II discusses a number of other more data intensive measures of cost pressure sources, but finds that the above metrics are sufficient for capturing the general patterns of labor market and demographic dynamics.

Section III presents four indicators most likely to signal the changes in **outcomes** of cost pressure:

6. Retention rates of current teachers
7. Number of applicants per full time position
8. Percent of districts hiring first choice applicant
9. Percent of districts reporting "very easy" or "somewhat easy" to hire high quality applicants

Section III discusses a number of other teacher recruitment or retention outcomes that could potentially be affected, but finds that most of these are so stable over time that they are likely to respond very slowly to changing salary stressors.

Section II: Sources of Cost Pressure
Labor Market and Demographic Indicators

There are two main potential sources of stress on the teacher salary-quality relationship. The first is when external markets change so that fewer individuals are attracted to teaching in Wyoming. Although a variety of factors influence the attractiveness of teaching, many of these are permanent or slow changing and, therefore, cause minimal fluctuations in the available teaching pool. However, abrupt changes in economic conditions may influence compensation levels relative to other occupations or other states. For example, the current fiscal situation in many states has resulting in stagnating teacher salaries, slower hiring, and layoffs in some areas. This increases the number of individuals interested in teaching in Wyoming. As economic conditions change, it is important to monitor these external markets.

The second major source of pressure for salaries is the demand for teachers. Clearly, policy changes (like mandated class sizes) might change the number of teachers needed in schools. Additionally, demographic patterns influence the number of available positions. Rising enrollment or rising numbers of retiring teachers will lead to more openings. Counterbalancing this is the number of new college graduates: if many teachers are retiring but the number of college graduates is also rising, salaries are less likely to need to be adjusted than if the number of college graduates interested in teaching is stagnant.

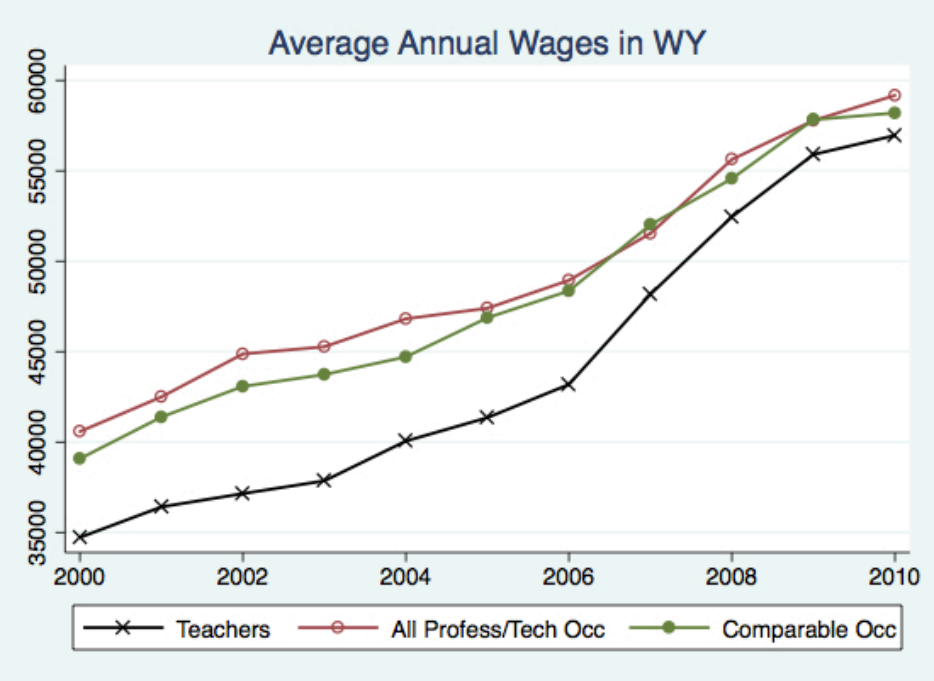
Indicator 1: Ratio of Teaching Wages to Wages of Comparable Professionals

Wages in other occupations affect both the pool of individuals who are interested in becoming teachers as well as the alternative opportunities for exisiting teachers. The first indicator is changes in the ratio of teaching salaries to non-teaching salaries in professional and technical occupations.

The Department of Labor reports salaries by occupation each quarter in the Occupational Employment Statistics (OES) survey. These statistics can easily be used to compare teaching salaries to other salaries. The disadvantages of the OES data is that it is a survey of employers only, and so it does not include personal characteristics of workers. As a result, the data cannot be used to adjust for workers' characteristics (e.g., work experience, education, gender, hours of work). However, this is the most rapidly available source of employment information, making it useful for monitoring current external markets.

Figure 1 shows the trend in teaching salaries in Wyoming, compared to the salaries of other workers in the state. This figure shows trends for two different comparison groups. The first group is all other professional and technical workers, a class of workers defined by OES. The second is a select group of occupations based on the Economic Policy Institute's (EPI) list of occupations that have skills and attributes most like teaching. These occupations are listed in Appendix C. Figure 1 shows that both comparison groups have similar average salaries and similar trends for Wyoming professionals. As a result, the simpler comparison to all professional and tehcnical occupations is sufficient for this indicator.

Figure 1: Average Annual Wages for Teachers and Comparable Workers in Wyoming, 2000-2010

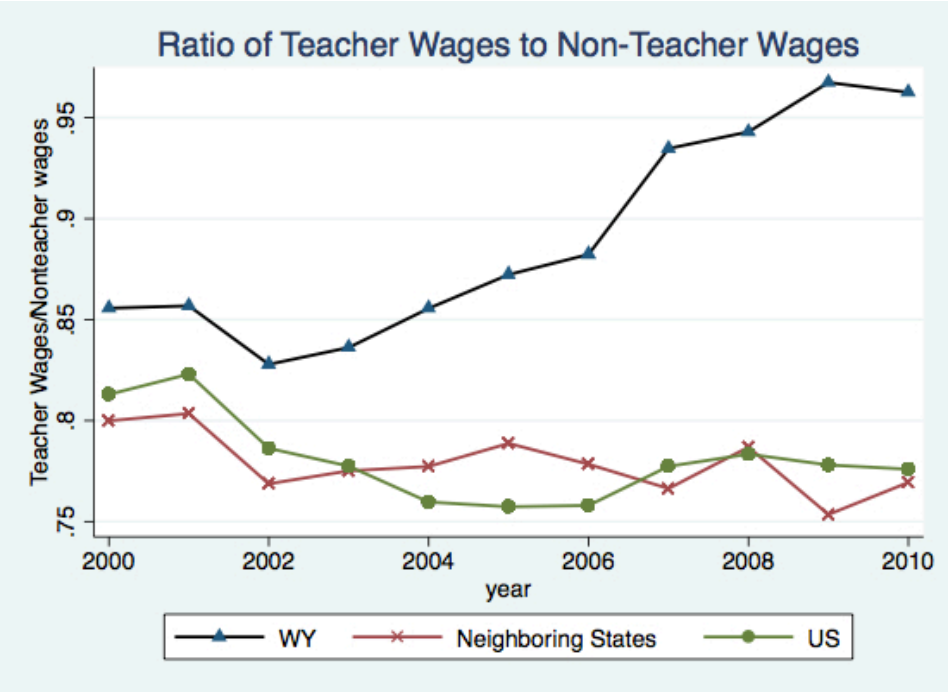


Source: Occupational Employment Statistics (OES)

Figure 1 shows that annual salaries in teaching are slightly lower than those in other professional occupations (although hours and weeks of work are lower and benefits are higher). However, this gap shrank considerably over this period. Teaching salaries are currently more than 95% of the salaries of other professional and technical occupations.

Figure 2 reports the ratio of teaching wages to the wages of other professionals in neighboring states and in the US as a whole. This indicates that in the typical states, teaching wages are less than 80 percent of the wages of other professionals. Economists have noted that this is in part due to the high levels of benefits and low hours and weeks of work in teaching.[i] This implies that teaching in Wyoming is highly competitive in relation to other professions.

Figure 2: Ratio of Teacher Wages and Non-Teacher Wages in Wyoming and Other States

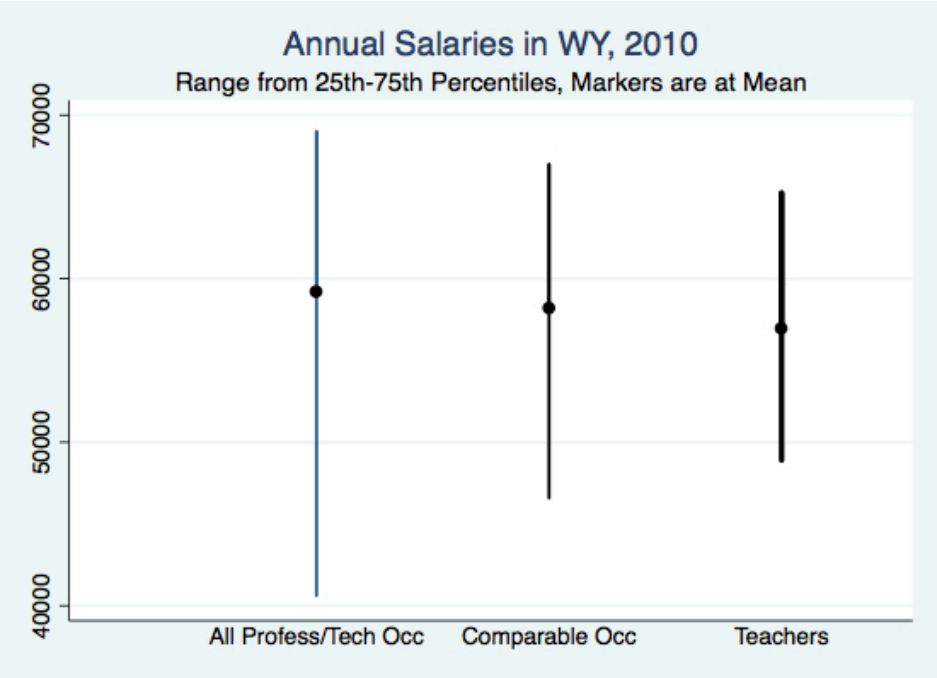


Source: Occupational Employment Statistics (OES)

As noted earlier, one key issue in monitoring the effect of salary changes is identifying the proportion of additional workers whose occupation decisions might be affected by changing teaching salaries. When teaching salaries are low relative to other occupations, many workers may reconsider their choice as salaries rise. However, when salaries are already high, relatively fewer individuals remain to be drawn into teaching.

In addition to mean wages, the OES reports wages at the 25th and 75th percentile. Half of all workers will earn wages within this range, and wages outside this range are likely to be especially low or high for more idiosyncratic reasons. Figure 3 shows the range of wages in teaching, in all other professional and technical occupations, and in the EPI list of comparable professions. The lines in the graph represent this range; the markers indicate mean wages for that set of occupations. This figure indicates that even though average wages are similar for the three groups, there are many fewer teachers at low wage levels than in other occupations. Consequently, teaching is very competitive with a large proportion of other occupations, even without adjusting for the lower hours of work and generally high benefits.

Figure 3: Range of Teacher Wages and Non-Teacher Wages in Wyoming



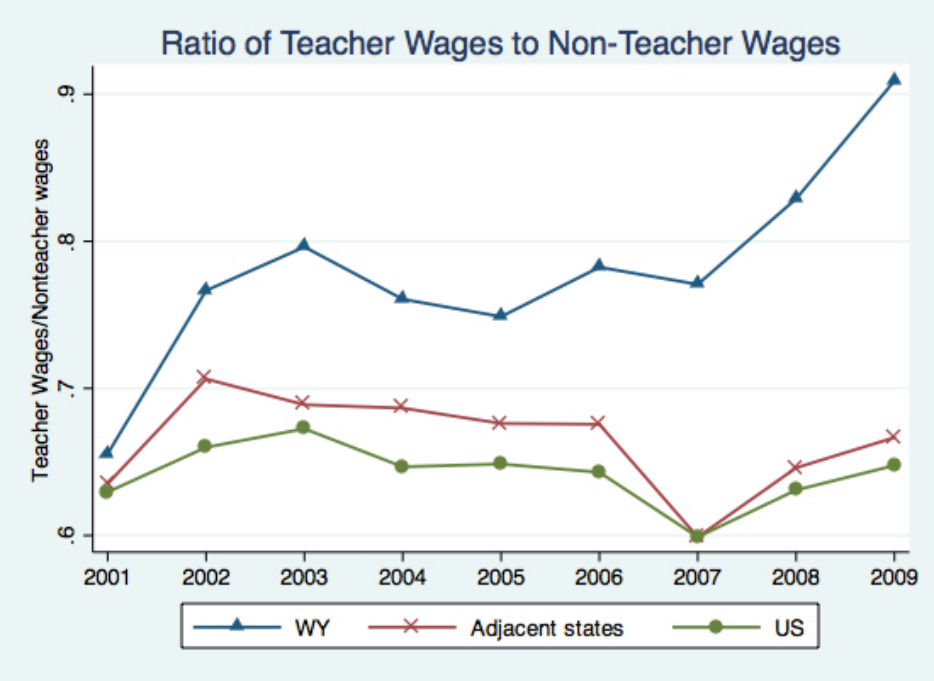
Source: Occupational Employment Statistics (OES)

Clearly, salaries differ across individuals for many reasons other than their occupation. One potential concern with simply using the OES averages is that the averages do not account for these differences. For example, suppose teachers are older than other workers. Their salaries will reflect this additional work experience, and comparing average salaries conflates the differences in characteristics and the differences in pay. This is one reason why it is useful to track the ratio of teaching and non-teaching wages over time: the composition of worker characteristics usually changes more slowly than labor market conditions. As a result, changes in the ratio will mostly pick up changing labor market conditions.

However, to further verify that compositional changes in the characteristics of workers do not unduly influence this trend, an additional data source can be used. The American Community Survey samples individuals in each year in each state and can be used to adjust wages for individual characteristics. However, this data has two disadvantages. First, the sample sizes are much smaller than in the OES. Second, the data are not released as rapidly as the OES, and individuals are asked about their past annual salary rather than current salary levels, further delaying this information.

Figure 4 presents the relative salary trends for teachers and non-teachers who are college graduates, adjusting for age, education, race, sex, and hours of work so that characteristics match those of teachers in Wyoming. This is again presented for Wyoming, adjacent states, and the US as a whole. Like in the OES data, Wyoming experienced a rapid rise in the relative salary of teachers, in contrast to the stable and much more similar ratio in the US and in adjacent states.

Figure 4: Ratio of Teacher Wages and Non-Teacher Wages in Wyoming and other States, Adjusted for Personal Characteristics and Hours of Work



Source: American Community Survey (ACS)

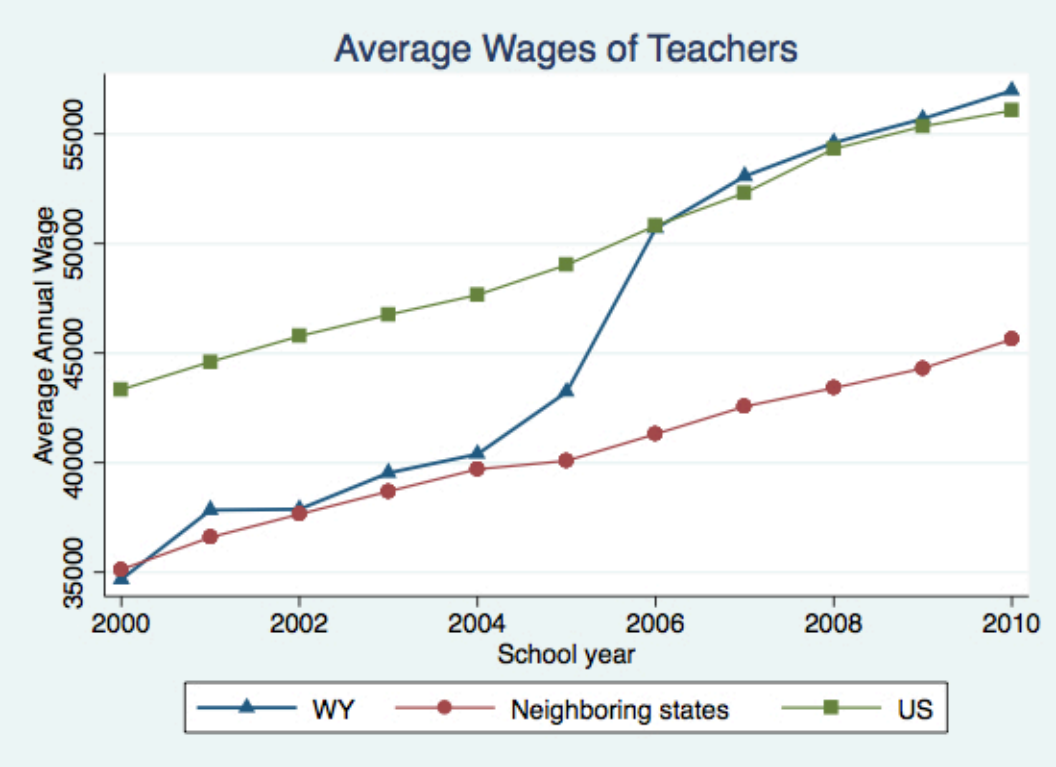
The implication is that if Wyoming policymakers need a metric that is rapidly available, using trends in the ratio based simply on the unadjusted OES data will not be misleading in spite of the fact that personal characteristics cannot be controlled for in this source. This timely source is useful if labor market conditions change as the economy improves in the future.

Indicator 2: Teaching Salary Trends in Other States

State and local governments in many areas have experienced difficult fiscal conditions in recent years, affecting teaching salaries and benefits across the country. As discussed more below, two thirds of new hires in Wyoming attended school in a different state, indicating the interconnected nature of the regional teaching labor market. As a result, changes in the compensation and working conditions in the region also could potentially affect salaries in Wyoming, particularly if salaries in other states begin rising more rapidly in the future.

While other reports will present an analysis of salaries in comparable districts, one useful indicator of the general conditions is the average salary of teachers in other states. This data is reported in the Digest of Education Statistics, and projections for current annual salaries are reported by the National Education Association each spring. This represents the most current source of teaching salary information from other states. Figure 5 reports the average teaching wages in Wyoming, in adjacent states, and in the US as a whole from the 2000-01 school year through 2010-11.

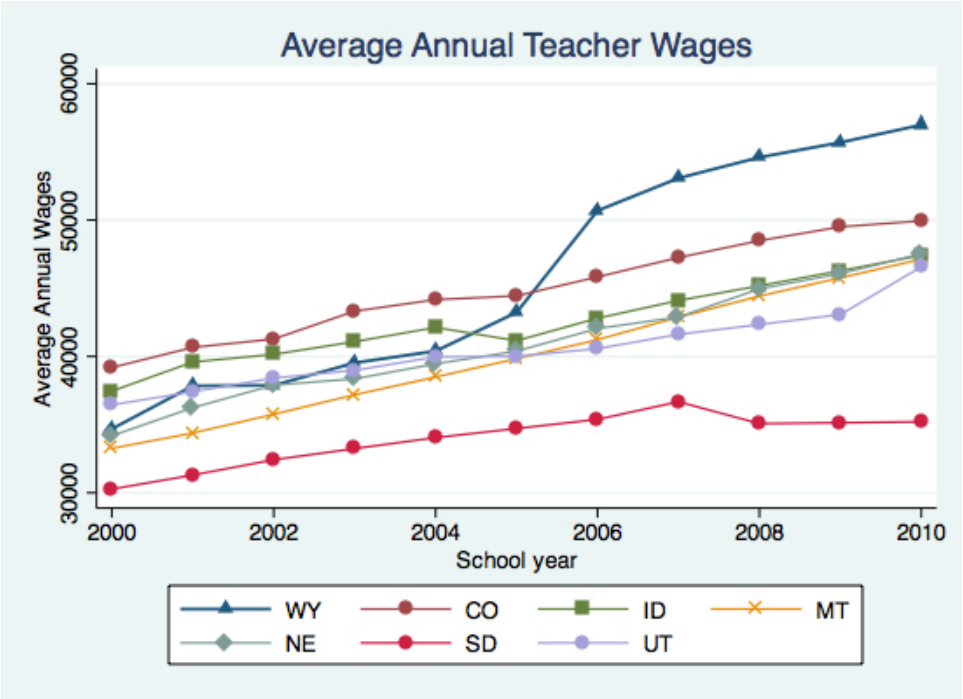
Figure 5: Trend in Teacher Wages in Wyoming and other States



Source: Digest of Education Statistics, 2010; National Education Association, Estimates of School Statistics, 1959-60 through 2010-11

Figure 6 shows the trend in salaries for each of the individual adjacent states and Wyoming. Both figures show the same abrupt increase in salaries in Wyoming. They also show the recent slight leveling off of salaries in the US and in some adjacent states like South Dakota and Colorado. However, in a few states, most notably Utah, teaching salaries increased in the last year.

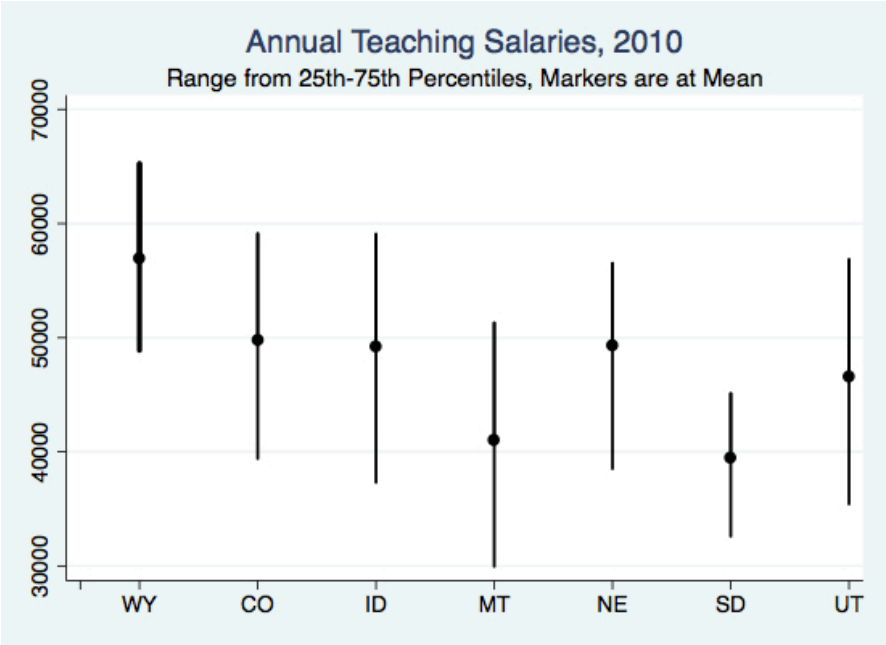
Figure 6: Trend in Teacher Wages in Wyoming and Adjacent States



Source: Digest of Education Statistics, 2010; National Education Association, Estimates of School Statistics, 1959-60 through 2010-11

Again, averages do not capture the proportion of individuals who are affected by the high relative salaries in Wyoming. Figure 7 again uses the OES data to present the range of teaching salaries in Wyoming and in other states between the 25th and 75th percentiles in each state.

Figure 7: Range of Teacher Wages in Wyoming and Adjacent States



Source: Occupational Employment Statistics

What is most striking about this graph is not only that Wyoming salaries are substantially higher on average, but also that the 25th percentile of wages is at or above average salaries in all adjacent states. In other words, 3 out of every 4 teachers in Wyoming earns more than the average teacher in all neighboring states, even without adjusting for experience or education levels.

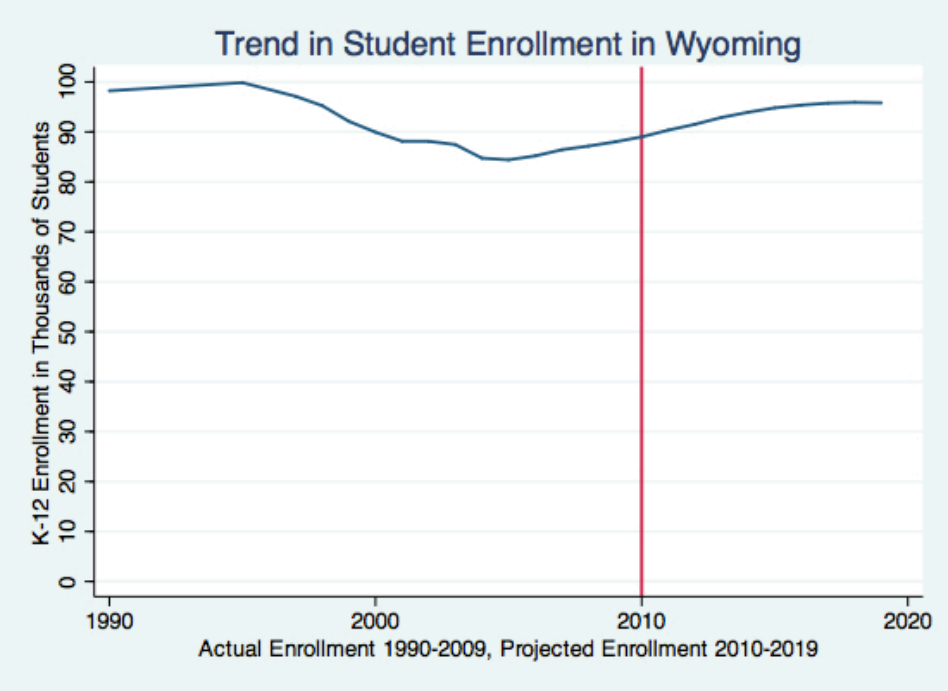
Again, a more comprehensive analysis of relative teaching salaries would adjust for differences in teacher characteristics, benefit levels, and working conditions across states. The best source for this kind of adjustment is the Schools and Staffing Survey. However, this is only conducted every three years, and data are released after a substantial lag. However, if differences in state teacher characteristics remain roughly the same over time or change slowly, changes in relative state salaries over time will largely be related to state economic or policy changes.

Indicator 3: Trend in Student Enrollment

Stress on salary is generated through a combination of how many people are interested in teaching and how many teachers districts need to hire. With few openings and many applicants, districts can be more selective in hiring, and as a result cost pressures are lower. In addition to the supply of individuals interested in teaching, changes in demand for new teachers could lead to recruitment and retention difficulties if salaries are too low to attract enough applicants.

One source of new positions is rising student enrollment. Student enrollment in Wyoming peaked in 1995, and then fell, followed by a subsequent rise of about 1 percent per year beginning in 2006. Based on Department of Education projections, student enrollment is predicted to continue to rise at about 1 percent per year through 2015 and then will plateau. Figure 8 shows this pattern. The red line in the graph indicates the years after which the enrollment figures are projections. The rise in student enrollment has fueled the rise in the number of teachers in Wyoming in recent years.

Figure 8: **Trend in Student Enrollment in Wyoming, Actual and Projected Enrollment 1990-2019**



Source: Digest of Education Statistics, 2010

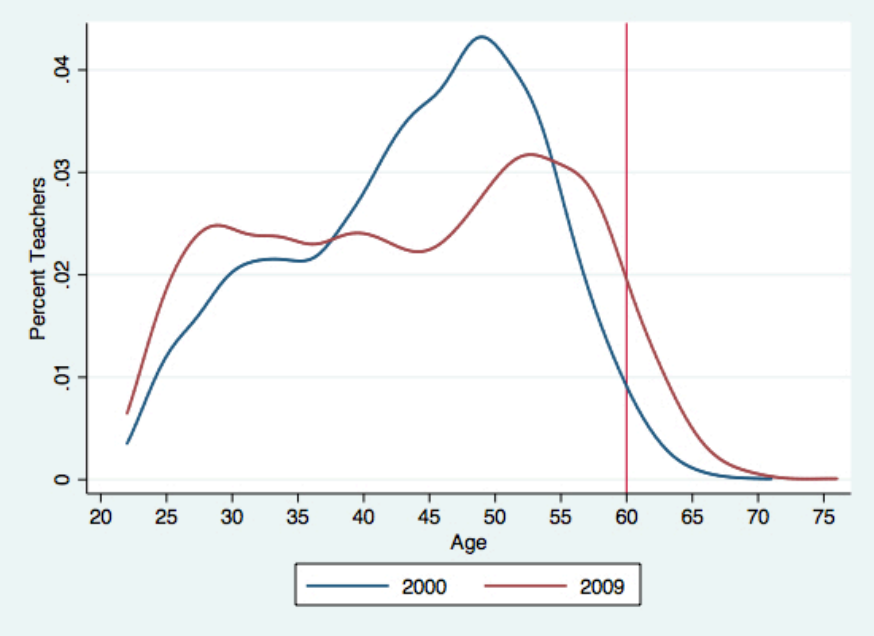
Indicator 4: Trend in Teacher Retirements

As is well known, the retirement of the baby-boomer generation will influence the labor market across the United States. The teaching profession in Wyoming, like in other states, has a relatively large proportion of individuals close to retirement age who will be replaced over the next period.

Teachers begin retiring at somewhat younger ages than in many other occupations. Based on calculations from the Department of Education Staffing files, in any given year about 25 percent of teachers age 60 and older retire the next year. This rate has remained relatively constant, with a slight drift down. However, this exit rate would be important to monitor if Wyoming were to consider changes to pensions or other policies that might influence retirement behavior.

Although the exit rate for retirement aged teachers has remained relatively constant, the number of individuals of retirement age is growing. To illustrate this, Figure 9 shows the age profile of teachers in the 2000-01 school year in blue and in the 2009-10 school year in red. The large "hump" represents the baby-boomer aged teachers. As can be seen in the figure, this group is now moving in to the post-age-60 bracket, where many will begin retiring. Teachers are somewhat more likely to retire at both younger and older ages than in other professions. As a result, the height of the baby-boomer "bubble" in 2000 is much steeper than in 2009 because retirements have been "smoothed out" across more ages.

Figure 9: Percent of Teachers of Each Age, 2000 and 2009

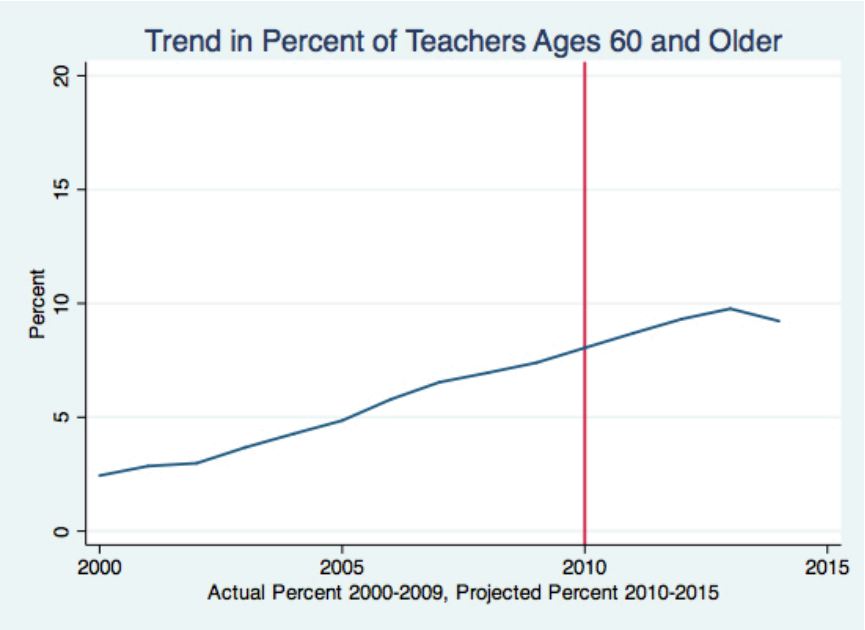


Source: WY Department of Education Staffing files

The implication of Figure 9 is that because teachers retire at a wide range of ages, there is unlikely to be a large or abrupt change in the proportion of teachers retiring.

This is confirmed in Figure 10, which presents the trend in the percentage of teachers age 60 and older through 2010, as well as the projected percentage for the next five years. The projections were calculated using the past exit patterns of teachers of each age and the age structure of current teachers. Figure 10 shows a uniform rate of increase in the proportion of teachers of retirement age over time--about half a percent more are of retirement age each year. This is predicted to continue through 2013, and then the rate of increase is projected to taper off—retirements will still be rising, but at a somewhat slower rate. In other words, based on this indicator, the rate at which cost pressures on salaries from retirement have changed is likely to be roughly the same for the next 5 years as it has been over the past 10 years.

Figure 10: Percent of Teachers Ages 60 and Older, Actual and Predicted, 2000-2015



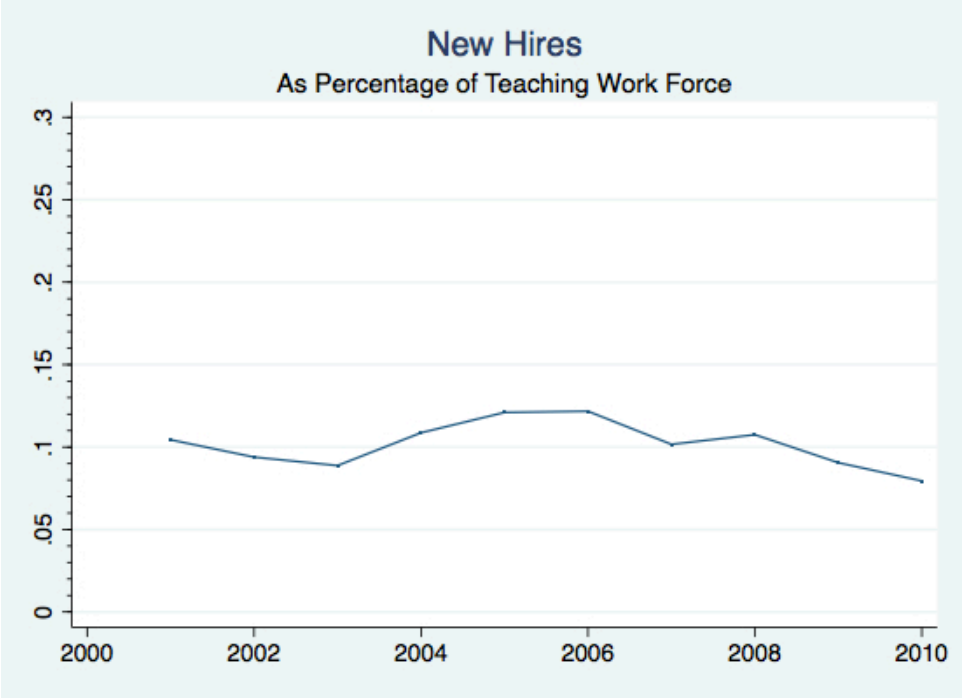
Source: WY Department of Education Staffing files, author forecasts

Indicator 5: Percent of New Hires

The net combination of student enrollment, teacher retirements, and teacher exits for other reasons results in the percentage of new hires. Policy changes, like class size reductions, would also influence this percentage. An abrupt increase in the percent of new hires may therefore warrant more monitoring of salaries to ensure that salaries are sufficient to recruit these additional teachers.

Figure 11 reports the past pattern of new hires. Note that in spite of rising enrollments and retirements, this percentage has remained remarkably stable at about 10 percent over the last 10 years, with a slight decline in recent years. This speaks to the falling turnover rates of teachers in Wyoming for other reasons than retirement. This may be partly attributable to the very high salaries in Wyoming.

Figure 11: Percent of Teachers who are New Hires, Wyoming 2000-2010



Source: WY Department of Education Staffing files

One additional demographic trend is worth mentioning. Even if the number of new positions rises in the future more than is predicted, this would only lead to substantial pressure on salaries if the pool of individuals training to be teachers remained constant or fell. Although it is impossible given existing data to determine the trend in "prospective teachers," it is clear that the number of college graduates in Wyoming and other states has been increasing. Based on data on college graduates reported by the National Center for Education Statistics, college enrollment rates in Wyoming have been rising on average at about 2.5 percent per year over the last 10 years.

Summary of Indicators of Cost Pressure Sources

Table 1 summarizes these key labor market and demographic factors. This table reports the most recent levels, the historical range and average over the last decade, and what levels would need to be to represent a statistically significant deviation from the historical average in a direction that would indicate potential stress for Wyoming salary levels.

Table 1: Summary of Labor Market Indicators

	Status in 2010	Typical Range 2000-2010	Historical Average	Outside 99% Confidence Interval
Ratio of teaching wages to other professional and technical occupation wages in WY	.96	.83-.97	.89	Below .85 (Or above .93)
Ratio of WY average salaries to average salaries in region	1.25	.99-1.25	1.13	Below 1.03 (Or above 1.23)
Student Enrollment growth	1%	-3% to 1.5% per year	0	Above 1%
Growth in Percent Teachers 60 and older	.65%	.12% to .93% per year	.56% per year	Above .74%
Percent New Hires	8%	8%-12%	10%	Above 12%
Growth in number of college graduates	2%	-2% to 4%* per year	2.5% per year	Above 3.5%

* 2000-2008

Section III: Outcomes of Cost Pressure
Teacher Recruitment, Retention, and Training

Labor market and demographic changes do not necessarily have immediate effects on schools. As noted, the relationship between salary changes and quality varies. Furthermore, demographic and labor market changes take time to affect the teaching market. Rising salaries in other occupations, for example, might affect students currently in college considering career options, but current teachers are unlikely to make an immediate career change. Factors might also move in different directions or be offset by other forces. As a result, it is important to also monitor the potential outcomes of changing labor market or demographic dynamics.

There are a number of caveats associated with these outcome metrics. First, Wyoming has good data on *quantities* of teachers, but more limited and imperfect data on their effectiveness and quality. Second, there is no single "right" number of applicants, or turnover rate, or ACT score. However, these data can be used to establish baseline levels. Deviation from historical patterns would signal potential changes that warrant further investigation. Third, quality is best measured as teacher effectiveness in improving student achievement—for example, as a value added measure or growth measure of teacher effects on student outcomes. Wyoming currently only collects proxy measures of teacher quality (e.g., selectiveness of undergraduate institution, education, GPA). While this report will present some of that data, as better measures of teacher quality become available, these are important to monitor over time.

Indicator 6: Retention Rates of Current Teachers

The first outcome indicative of cost pressures would be if districts begin having trouble retaining high quality teachers. While there is imperfect data on the quality of teachers exiting, Wyoming data can be used to track exit rates of teachers. Some turnover is inevitable, and even desirable, as it takes some experience in the classroom to determine if teaching is a good fit, and retaining less effective teachers is not an optimal outcome. It is worth noting that overall levels of turnover are similar in comparable occupations like social work (Mor Barak, Levin, Nissly, & Lane, 2006), nursing (Hayes et al., 2006) and accounting (Harris and Adams 2007), with the exception that teachers tend to retire earlier than other workers (Harris and Adams 2007). Nevertheless, a sizable increase in turnover rates could indicate changing labor market conditions for teachers.

Table 2 reports detailed information from districts about vacancies. This data was collected for the 2009-10 and 2010-11 school years. Overall, about a fourth of vacancies were due to retirements. Another 20 percent were due to transfers to another district, largely within Wyoming. Only 6 percent were due to former teachers who left the profession altogether: few of the vacancies were due to reasons that might be affected by teacher compensation rates for the state as a whole.

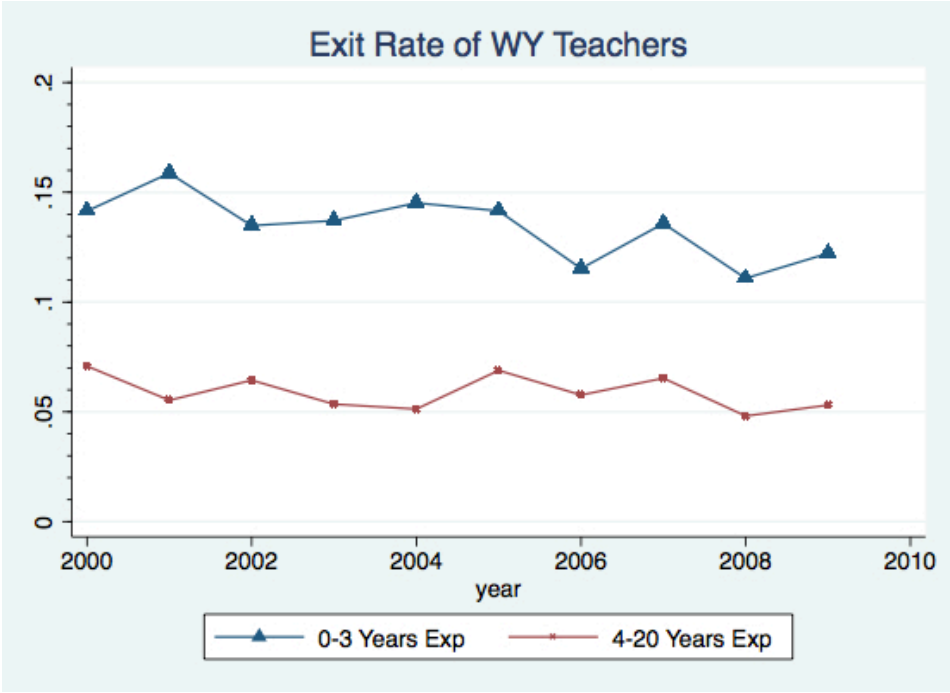
Table 2: District Reported Causes of Wyoming Teacher Vacancies

	2009-10	2010-2011
Number of vacancies	1058	1083
Number of full time vacancies	848	700
Reason for Vacancy—Full Time Positions		
Former teacher retired	177 (21%)	161 (23%)
New position or new course	182 (21%)	105 (15%)
Former teacher transferred within district or promoted	231 (27%)	185 (26%)
Former teacher transferred out of district	177 (21%)	135 (19%)
Former teacher left profession	53 (6%)	41 (6%)

Source: WY Department of Education Vacancy files

Figure 12 presents turnover rates for new teachers (those with three years of experience or less) and mid-career teachers (those with 4 to 20 years experience). The graph shows that exit rates for mid-career teachers are remarkably low and stable, with only about 6 percent leaving in any given year. Exit rates for new teachers are currently around 12 percent and have fallen from around 15 percent in 2000. This fall is potentially related to the dramatic rise in teacher salaries.

Figure 12: Annual Exit Rate of Teacher by Experience Level



Source: WY Department of Education Staffing files

Much less data is available on the quality of teachers who left teaching and how this compares to the quality of those choosing to remain in teaching. Although Wyoming is beginning to collect data on the universities, ACT scores, and GPAs of new hires, this data is less systematically available for the entire pool of current teachers, making comparisons over time difficult. However, as quality measures are tracked over time, an analysis of the characteristics of individuals remaining in teaching compared to those exiting would shed further light on the potential impact of compensation changes.

Indicator 7: Recruitment and Training Indicators

The second outcome indicator relates to the ability of districts to recruit high quality teachers. Again, quality measures are somewhat more limited. However, during the most recent school year, school districts collected information on numbers of applicants for positions, whether they were able to hire their first choice candidate, and the district's perception of how hard it is to hire qualified candidates.[ii] Table 3 reports the results from the 2010-11 school year.

On average, there were about 24 applicants for each full time position.[iii] Of these, an overwhelming 94 percent were filled with the district's top candidate. Furthermore, 78 percent of districts report that it is "somewhat" or "very easy" to attract high quality applicants. Currently, there is not historical data to put these figures into context, but as they are monitored into the

future, if the number of applicants drops sharply or if districts report increased difficulties in recruiting applicants, this might signal the need to revisit compensation levels.

Table 3: Wyoming District Vacancy Data, 2010-2011 Positions

	2010-2011
Average number applicants, all positions	19.6
Average number applicants, full time	23.9
Hired first choice, full time positions	94%
Very difficult to attract high quality applicants, full time positions	8%
Somewhat difficult, full time	13%
Somewhat easy, full time	30%
Very easy, full time	48%

Source: WY Department of Education Vacancy files

There is some limited proxy information on the overall quality of new hires in Wyoming. This data mostly consists of the undergraduate institution that a teacher attended and their undergraduate GPA. The selectivity of a teacher's undergraduate institution and a teacher's own achievement test scores (SAT or ACT) have been associated with higher student performance.[iv]

Wyoming now pulls students from a broad range of universities. Table A in Appendix A lists the undergraduate institutions with the largest proportions of new hires. The striking change in Wyoming is that new hires are now much more likely to come from outside Wyoming than in the past: while half of all new teachers had degrees from the University of Wyoming in 2000-03, today only a third do.

However, although hires now come from a broader range of institutions, there has been very little change in the overall GPAs of new hires or in the selectivity of the institutions that they attended. Appendix Figure A shows the trends in the average GPAs of new hires; Appendix Figure B reports the average 25th and 75th percentile of ACT scores for the institutions where Wyoming teachers attended. These two graphs show such little variation that they are unlikely to be responsive to salary change and are therefore of limited use as indicators.

A final outcome metric is the ability level of students training to become teachers. Again, data on this is somewhat fragmentary. However, the University of Wyoming has provided information on the characteristics of students with elementary and secondary education majors as well as other university students. Similar data have also been collected from Montana State University, Bozeman, as a comparison university with similar overall ACT scores located in a state with much lower teaching salaries. Table 4 reports that elementary education majors have lower ACT scores than other students, while secondary education majors' scores are very similar to the university average. This pattern is nearly identical in both state universities and exhibits little change over the past 6 years.

Table 4: Average Composite ACT Score of All Graduating Students and Teaching Majors, University of Wyoming and Montana State University, Bozeman 2005-2010 Graduates

	University of Wyoming			Montana State University-Bozeman		
Graduation Year	All Graduates	Elementary Ed Majors	Secondary Ed Majors	All Graduates	Elementary Ed Majors	Secondary Ed Majors
2004	23.4	20.7	22.8	24.0	21.4	24.3
2005	23.4	21.3	22.7	23.6	21.3	22.1
2006	23.2	21.3	23.5	23.5	22.4	23.2
2007	23.3	21.8	23.8	23.5	21.3	22.6
2008	23.2	21.2	23.9	23.4	21.1	23.1
2009	23.4	20.8	22.9	23.8	21.9	22.1
2010	-	-	-	23.6	21.9	23.6

Summary of Outcome Indicators

The following table summarizes these key labor market and demographic factors. This table reports the most recent levels, the historical range and average over the last decade, and what levels would need to be to represent a statistically significant deviation from the historical average in a direction that would indicate potential stress for Wyoming salary levels.

Table 5: Summary of Indicators of Teacher Recruitment, Retention and Training

	2010 Level	Typical Range 2000-2010	Historical Average	Above 99% Confidence Interval
Exit Rate New Teachers	12.2%	11% - 16%	13%	Above 15%
Exit Rate Mid Career Teachers	5.3%	5% - 7%	6%	Above 7%
Number of Applicants per Full Time Position	23.9	Not enough years to calculate		
Hired First Choice, Full Time Position	94%	Not enough years to calculate		
Percent vacancies where report "very" or "somewhat" easy to hire high quality	78%	Not enough years to calculate		

Section IV: Conclusion
Status of Current Indicators and Tracking Future Cost Pressures

This report identifies two classes of cost pressure indicators—those related to its sources (labor market conditions or demographic patterns) and those related to its outcomes (difficulties in teacher recruitment, retention, or training). Currently, neither class indicates pressure on teacher salaries.

Labor market indicators show that the current average and range of teaching salaries is very high relative to neighboring states; additionally, the ratio of teaching wages to non-teaching wages is very high by historical standards. However, if economic or fiscal conditions improve, this could potentially change in the future. Meanwhile, demographic trends indicate that the rise in enrollment over the next five years is likely to be similar to the past four years, and the retirement trend for the next three years is predicted to be similar to the past ten years. The fraction of new hires has been very consistent over time, and it is currently at its lowest historical level this decade. Demographics are unlikely to be a new source of salary stress.

Outcome metrics are remarkably stable, even with the recent large salary increases. Exit rates for new and mid-career teachers have been relatively constant, although the relative quality of teachers exiting and remaining in teaching is harder to track. Recruitment measures indicate that the number of applicants is high and that districts usually hire their first choice. The quality of new hires as measured by undergraduate GPA and institution quality is highly stable over time. Average ACT scores in the education program at University of Wyoming are also unchanged over time and are roughly consistent with other comparable institutions.

If model salaries remain unchanged, it is important to monitor labor market changes and recruitment and retention outcomes. Other policy initiatives may also influence salary dynamics—for example, mandates for smaller classes could mean more positions to fill; changes in pensions in other states could raise attractiveness of teaching in Wyoming. As a result, if other policies in Wyoming change, these indicators should be monitored closely.

While there is no single level of these indicators that needs to be rigidly targeted (i.e., no ideal level of turnover, applicants, or salary ratios), these measures can effectively be used to track when future dynamics deviate from historical patterns. Because most metrics exhibit year-to-year fluctuations, a single year change may not imply the need for a broad policy response. However, large deviations should be investigated to ensure that they are not indicative of new patterns.

Wyoming's existing data is most complete for measuring sources of cost pressure and for monitoring quantity based outcomes. Changes in teacher quality outcomes are the most important to track, but this data is less complete, especially for teacher effectiveness. However, if multiple outcome indicators change, it is more likely that teacher quality may be affected.

Appendix A: Undergraduate Institutional Quality

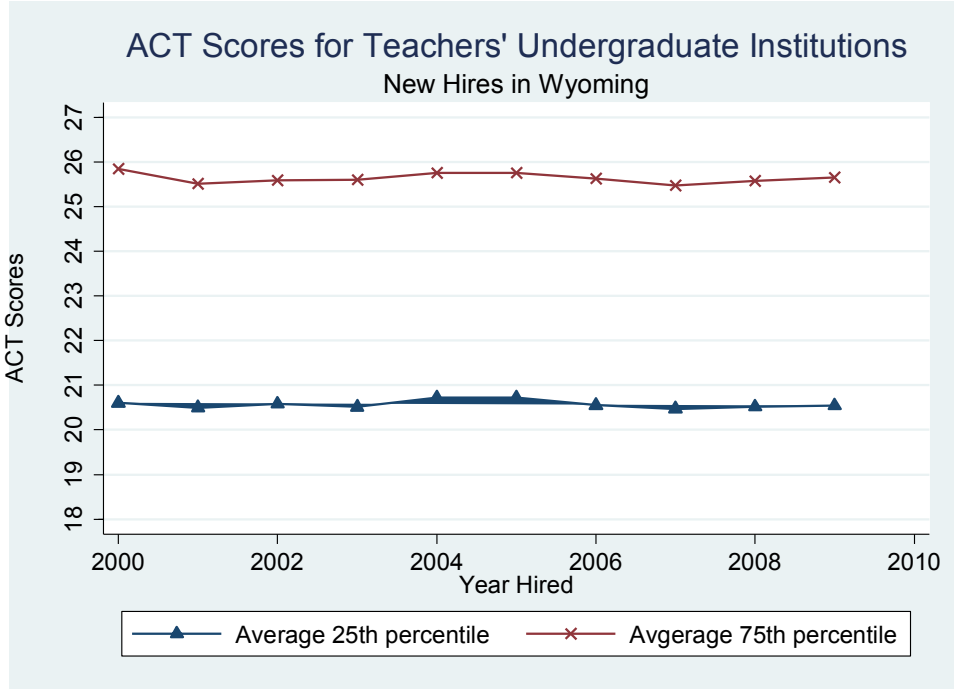
Appendix Table A: Percentage of New Hires by Undergraduate Institution (Universities with at least 2 Percent of New Hires in 2007-2010 in Wyoming)

	2000-01 – 2002-03	2007-08 – 2009-10
University of Wyoming	50.2%	32.7%
Black Hill State University	6.7%	6.7%
MSU Billings	4.0%	4.6%
Chadron State University	7.1%	4.6%
Utah State University	1.7%	3.1%
University of Northern Colorado	<1%	2.5%
Brigham Young University	<1%	2%
MSU Bozeman	<1%	2%
Other institutions	30%	42%

One measure of the selectivity of a university is the ACT scores for its student body. The IPEDS is a survey of all institutions of higher education in the United States. It reports ACT scores for incoming freshman at the 25th percentile and at the 75th percentile for each institution. By matching each new hire with the ACT scores for his or her institution, Figure B reports the trends in college selectivity over time.

Appendix Figure A: Average GPA of New Hires

Appendix Figure B: ACT Scores of New Hire's Undergraduate Institutions



Appendix B: Data Sources

- The Wyoming Department of Education Staffing files report salaries for all teachers in Wyoming, along with details about their experience level, assignment type, and FTE. The files now contain the Wyoming Professional Teaching Standards Board (PTSB) data on licensed teachers in Wyoming. This data includes the date and type of license, education degrees, institutions attended, and undergraduate GPA. Information about PRAXIS scores is available for some teachers, but this data does not appear to be consistently collected over time.
- The Wyoming Department of Education Vacancy files are district reports of information for each vacancy. These data were collected in 2009-10 retrospectively, and in 2010-11. Because the 2009 data was retrospective and because it was the first year of collection, there are a number of inconsistencies in the way districts reported. This year of data is therefore not used in the analysis.
- The Digest of Education Statistics (DES) reports average teaching salaries for all states over time. The National Education Association reports preliminary projections of average teaching salaries for the current year.
- The American Community Survey (ACS) is conducted by the US Census Bureau. It is essentially a mini-census conducted in each year between 2000 and 2010. This is a survey of individuals, and reports an individual's occupation, salary from employment, age, education, race, gender, hours and weeks of work. This survey is used to adjust salaries of non-teachers and teachers in other states to match the characteristics of teachers in Wyoming.
- The Occupational Employment Statistics survey (OES) This is a quarterly survey conducted by the Bureau of Labor Statistics of employers who are paid wage or salary income. Self employed individuals, owners and partners in unincorporated firms, and household workers are not included in this survey. This survey reports the number of individuals in each occupation in each state and the average salary.
- The Integrated Postsecondary Education Data System (IPEDS) is an annual survey of all institutions of higher education in the United States conducted by the National Center for Education Statistics. This survey contains information about the type of institution. The IPEDS also report the ACT and SAT scores for students scoring at the 25th percentile for the institution and at the 75th percentile. The SAT scores can be converted to ACT scores using the College Board conversion tables.

Appendix C: Comparable Professional and Technical Occupations

Teacher salaries reported in the Occupational Employment Statistics are compared to the salaries of other professional and technical occupations. These include occupation in the following categories:

- Management Occupations
- Business and Financial Operations Occupations
- Computer and Mathematical Science Occupations
- Architecture and Engineering Occupations
- Life, Physical, and Social Science Occupations
- Community and Social Services Occupations
- Legal Occupations
- Education, Training and Library Occupations
- Arts, Design, Entertainment, Sports, and Media Occupations
- Healthcare Practitioner and Technical Occupations

Teachers are not compared to employees in other occupations. The excluded occupational categories are

- Personal Care and Service Occupations Healthcare Support Occupations
- Protective Service Occupations
- Food Preparation and Serving Related Occupations
- Building and Grounds Cleaning and Maintenance Occupations
- Sales and Related Occupations
- Office and Administrative Support Occupations
- Farming, Fishing, and Forestry Occupations
- Construction and Extraction Occupations
- Installation, Maintenance, and Repair Occupations
- Production Occupations
- Transportation and Material Moving Occupations
- Military Specific Occupations (not surveyed in OES)

The Economic Policy Institute (EPI) identified 16 professional and managerial occupations that it determined to be similar to teaching based on Bureau of Labor Statistic skill ratings. These occupations are

- Accountants and auditors
- Underwriters
- Personnel training and labor relations specialists
- Inspectors and compliance officers, except construction
- Architects
- Forestry and conservation scientists
- Registered nurses
- Occupational therapists
- Physical therapists

- Trade and industrial teachers
- Vocational and educational counselors
- Archivists and curators
- Clergy
- Technical writers
- Editors and reporters
- Computer programmers

Appendix D: Estimating Comparable Non-Teaching Wages

Teaching wages are compared to the wages of non-teachers using the American Community Survey. To make this comparison, the analysis used ACS data from 2001 through 2009. The sample was restricted to all employed individuals with a bachelor's degree between the ages of 22 and 65 who were employed at least 27 weeks in the year and usually worked at least 35 hours a week. Individuals living in group quarters were dropped. Self employed individuals were also dropped. Teachers were defined as those working in the public sector. Individuals in each survey year reported their income from salary and wages for the previous year.

Separate regressions were run for teachers and non-teachers. These regression included age, age squared, an indicator variable for female, an indicator variables for race, an indicator for whether or not the individual was enrolled in school, an indicator variable for whether or not the individual held an advanced degree, and usual hours worked, and indicators for categories of hours of work. These categories were for working 35 to 48 hours, 49-59 hours, or 60 or more hours a week.

The analysis then calculated the average characteristics of teachers in Wyoming in each year. The comparable non-teaching wage was then calculated by predicting wages using the average characteristics of Wyoming teachers. Teaching wages in other states were similarly adjusted.

NOTES

[i] See Podgursky (2003) for an overview of this issue.

[ii] Data for the 2009-10 school year was collected retrospectively, and appeared to contain a number of inconsistencies like multiple entries for the same position. As a result, it is not used in this report.

[iii] Some districts appear to have reported the total number of applicants for several positions of the same type: these totals were divided by the number of positions in creating the overall average. For comparison, Jacob (2007) reports about 10 applicants for every position in the Chicago school district.

[iv] For example, see Ballou (1996), Clotfelter, Vigdor and Ladd (2006), Ehrenberg and Brewer (1994), Ferguson and Ladd (1996).