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Trends in California teacher demand: a county and regional perspective

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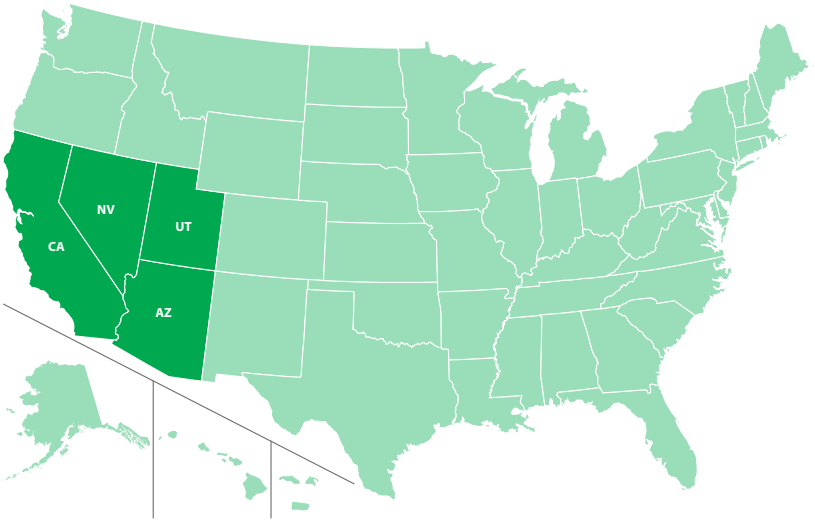

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July 2008

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Summary

REL 2008–No. 057

Trends in California teacher demand: a county and regional perspective

The report highlights the differences among California's counties and regions in their use of underprepared teachers and their needs for new teachers in the coming decade as driven by projected student enrollment changes and teacher retirements. The findings show county and regional variations in key factors that influence teacher labor markets.

If every California K–12 classroom is to have a fully credentialed teacher, state policymakers and other education decisionmakers must monitor the teacher labor market and take action when possible to ensure an adequate supply of teachers. Previous analyses of California's teacher supply and demand have contributed substantially to the understanding of the overall dynamics of the teacher labor force at a statewide level (for example, Guha et al. 2006; Esch et al. 2005).

However, finer grained analyses of labor market variables could provide valuable information for addressing the teacher supply issue, especially considering research that suggests the local nature of teacher labor markets (Martin 2003; Boyd et al. 2005) and the regional variation in certain key labor market variables (Guha et al. 2006). This report highlights the differences among California's counties and regions (clusters of contiguous counties) in their use of underprepared teachers (defined as teachers who have not completed a teacher preparation program and attained a preliminary or professional clear credential[1]) and their need for new teachers in the coming decade, as driven by projected student enrollment and teacher retirement. Although this report does not analyze projected county-level attrition or new teacher supply, its findings highlight county and regional variations in key factors that influence teacher labor markets.

Using data from state agencies, researchers examined three variables: current use of underprepared teachers, projected enrollment-generated demand for teachers, and projected teacher retirement-generated demand. The findings reveal differences in how these variables play out across California counties and regions. For example, while the use of underprepared teachers averaged 6 percent statewide in 2005/06, in 2 counties underprepared teachers accounted for more than 10 percent of the teacher workforce and in 16 for less than 2 percent. Likewise, while 21 of California's 58 counties will likely experience double-digit enrollment growth as a percentage of current enrollment over the next decade, 22 counties are expected to see declining student numbers. Finally, more than 40 percentage points divide counties with the highest projected

teacher retirement rates from those with the lowest. When the two sets of projections were combined to show the net effect of retirement growth and student enrollment growth, there was a spread of 64 percentage points between the county facing the highest projected demand (68 percent) and the county facing the lowest demand (4 percent). Because this analysis was unable to account for nonretirement attrition, these estimates may not reflect the total number of teachers needed over the decade.

The analyses, based on expected teacher retirements and student enrollment growth, suggest that California's Central Valley (North and South San Joaquin Valley and Upper and Sacramento Metropolitan Valley) and Inland Empire (Riverside and San Bernardino Counties) will face some of the highest demand for new teachers in the coming decade. This demand will come on top of other challenges facing most of these regions, including high poverty rates, low educational attainment, and diverse student populations. It is not possible to predict any resulting teacher supply-demand imbalances, however, without a complete analysis of all the teacher labor market variables in these and other regions, which this report does not provide.

As local decisionmakers consider the implications of the information provided in this report, they may want to seek out additional county- or district-level data for a fuller picture of regional teacher labor markets. Further investigation at the state level, such as research into the degree to which new teacher supply in California is localized rather than uniform across the state, could help state policymakers as they consider what interventions might effectively address the anticipated differential demand for new teachers across counties and regions. When the state's new longitudinal teacher database becomes available in a few years, it could facilitate a more complete analysis of the regional teacher labor market issues that this report highlights.

July 2008

Note

1. California grants preliminary teaching credentials to candidates who have successfully completed either a traditional fifth year or a blended teacher preparation program that includes student teaching and have passed various examinations; teachers must progress to a clear credential within five years (Loeb and Miller 2006).

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The report highlights the differences among California's counties and regions in their use of underprepared teachers and their needs for new teachers in the coming decade as driven by projected student enrollment changes and teacher retirements. The findings show county and regional variations in key factors that influence teacher labor markets.

WHY THIS STUDY?

A substantial body of research shows that effective teachers are a critical classroom resource (see, for instance, Nye, Konstantopoulos, and Hedges 2004; Rivkin, Hanushek, and Kain 2005). Considerable attention at both the state and federal levels has been focused on ensuring that every student has access to high quality teachers. The No Child Left Behind Act of 2001, for example, requires that all teachers of core academic subjects be "highly qualified."

If every California K–12 classroom is to have a qualified teacher, the state's education decision-makers need to monitor the teacher labor market to ensure an adequate number of teachers. Multiple factors contribute to teacher supply and demand. New teacher supply consists primarily of newly credentialed teachers, though credentialed teachers who re-enter the field after a break and those who come from other states can also add to supply. On the demand side, changes in student enrollment, teacher attrition, and teacher retirement all play a role, as can policy changes, such as class-size reduction. All these factors contribute to a dynamic labor market in which a substantial change in any one variable can result in an imbalance.

California began to see such an imbalance in the late 1990s, as districts implemented the state's ambitious class-size-reduction policy, which led to rapid growth in the demand for new teachers. Unable to turn away students, many districts tried to meet the demand by hiring educators who were not fully credentialed. According to the Center for the Future of Teaching and Learning (CFTL), which has tracked California's teacher labor market in annual reports to the state since 1997, by 2000/01, 42,000 California teachers (14 percent) were working without being fully credentialed (Guha et al. 2006).

As of 2005/06 California still employed close to 18,000 underprepared teachers—almost 6 percent of the workforce (Guha et al. 2006). As the state

works to reduce the number of underprepared teachers and to reduce future supply-demand imbalances, it is essential to anticipate changes in demand for teachers and respond accordingly. For the last several years CFTL's annual reports have provided information for this type of planning at a statewide level. However, other than CFTL's brief highlighting of certain county-level underprepared-teacher and teacher-demand trends in its 2006 report (Guha et al. 2006), no recent policy reports analyze teacher labor market trends within California at the county or regional levels. This report aims to fill that void.

Geographic variations in the teacher labor market are likely to be important for a variety of reasons. Research shows that labor markets tend to be local (Martin 2003). For instance, recent research in New York finds that teachers prefer to teach close to where they grew up and, controlling for proximity, they prefer areas with characteristics similar to those in their hometown (Boyd et al. 2005). In New York City, for instance, between 1998 and 2001, 90 percent of all teachers took their first jobs within 40 miles of their hometown.

Such findings suggest that state-level planning to expand the state's overall teacher supply may not be adequate for dealing with the localized nature of the teacher labor market. For example, turning out more teachers in one part of the state would not necessarily help meet demand in another part. County- or regional-level planning thus appears to be equally important.[1] Teacher labor market information at the county level can serve two purposes. It can improve the state's ability to react to county and regional differences in labor market conditions. And it can inform the staffing efforts of districts and of county offices of education, which support districts' teacher staffing efforts and have recently received state funding to broaden their efforts in teacher recruitment.

State-level planning to expand the state's overall teacher supply may not be adequate for dealing with the localized nature of the teacher labor market

Data constraints preclude a full analysis of all current and future teacher supply and demand factors influencing California's K–12 education picture by county and region (clusters of contiguous counties; see next section). For instance, while teacher attrition affects teacher demand, there is no system for tracking teachers longitudinally.[2] However, the national Schools and Staffing Survey (SASS), which collects information on teacher attrition in schools by locale (rural, urban, or suburban) found only modest differences in attrition across schools for locale for the 1999/2000 SASS (Ingersoll 2003). Analysis of new teacher supply from California institutions of higher education is similarly constrained, in this case by a lack of information about where graduates from each California institution end up teaching. Finally, the full impact of policy changes is difficult to estimate because different districts respond by reallocating teachers and responsibilities differently.

While this report does not provide a complete picture of California's teacher supply and demand, it does offer some key pieces, starting with an analysis of the current use of underprepared teachers by county and region (for a discussion of how the report defines *teacher*, see box 1). Then, looking to the future, it focuses—also by county and, as applicable, by region—on two demographic trends that will influence teacher demand: student enrollment and teacher retirements. However, because this analysis was unable to account for nonretirement attrition, these demand estimates represent an unknown portion of the total number of teachers that will be needed over the next decade.

Two questions guided the research:

- How do existing patterns in the use of underprepared teachers vary at the county level?
- How will projected teacher retirements and projected changes in student enrollment intersect in particular counties to produce differential demand for teachers over the next decade?

BOX 1

Study definitions, data sources, and projection assumptions

The study uses longitudinal analysis to examine two major demand factors that vary at the county level: changes in student enrollment and in teacher retirement. The study also highlights county-level differences and patterns in the use of underprepared teachers as of 2005/06. Data limitations precluded analyzing county-level teacher attrition.

Defining *teacher*

For analyzing the teacher labor market, the term *teacher* can be defined in various ways. For example, teachers could be defined as those who meet the "highly qualified" criteria of the No Child Left Behind Act, which in California means being fully credentialed or enrolled in a state-approved teacher internship program and demonstrating competence in the subject area being taught. The Center for the Future of Teaching and Learning (CFTL), in its annual inventory of the state's teacher workforce, defines a teacher in the negative—identifying as "underprepared" any teacher who has not completed a teacher preparation program and attained a preliminary or professional clear credential.[1] This group includes teachers with waivers, emergency-permit holders, and interns (Guha et al. 2006, pp. 11–12).

While it might be preferable to define a teacher by effectiveness, possession of teaching credentials has been widely used in the absence of data systems that allow direct measurement of teacher effectiveness. For addressing the first research question, *teachers* are defined as CFTL does, referring to teachers who are not fully credentialed as underprepared. One reason is to make the analysis more useful to California decisionmakers who have been tracking this issue through CFTL's reports.

Data sources

Data for the study came from three state databases (for details, see appendixes A and B). Data on the use of underprepared teachers are from the California Department of Education's (2005) October 2005 data collection for the Personnel Assignment Information Form (PAIF), which reports the credential status of all K–12 teachers in the state's public schools at the school, district, and county levels. Underprepared teachers are those who are authorized to teach through a district or university internship, emergency permit, pre-internship, or waiver.

Data on student enrollment are from the California Department of Finance (2006) annual county-level student enrollment data (for 1994/95–2005/06) and enrollment projections for the following 10 years (2006/07–2015/16). Enrollments as of 2005/06 are from the California Department of Education (2006a).

Data on teacher retirement are from the California State Teachers' Retirement System (CalSTRS), which serves most teachers in California and maintains data on their retirement patterns (California State Teachers' Retirement System 2006). Data for 1994/95–2005/06, including county-level data, show members' ages and retirement year. Because the CalSTRS data system does not distinguish between teaching and nonteaching staff, researchers used teachers' age data from the PAIF for 2001/02–2005/06 to adjust the CalSTRS retirement data to represent the retirement patterns of teachers only.[2] Previous studies have not made such adjustments.

Key assumptions of the projections

Several assumptions were made for the projections of student enrollment- and teacher retirement-driven demand based on current school conditions and the historical behavior of teachers (for details, see appendix A). If these assumptions are incorrect, the projections could under- or overstate demand.

- For teacher demand based on student enrollment growth, it is assumed that counties will maintain their current pupil–teacher ratios.

- For teacher demand based on retirement, it is assumed that CalSTRS members and K–12 teachers of the same age in a given county retire at the same rate and enter the workforce at the same rate and that all other factors not directly controlled in these analyses remain constant.

Notes

1. California grants a preliminary teaching credential to candidates who have successfully completed either a traditional fifth year or a blended teacher preparation program that includes student teaching and have passed various examinations. Teachers must progress to a professional clear credential within five years (Loeb and Miller 2006).
2. These data included the number of teachers within each county for a given age and were obtained independently from the California Department of Education.

WHAT WE LEARNED

To explore how existing patterns in the use of underprepared teachers vary at the county level, analyses were conducted of data from the California Department of Education's Personnel Assignment Information Form (PAIF), which reports the credential status of all K–12 teachers in the state's public schools, as well as their age. To project county-level teacher retirements for the next decade California State Teachers' Retirement System (CalSTRS; 2006) data on county-level retirement rates over several years were combined with PAIF data from the California Department of Education (2005) showing the age distribution of the current K–12 teacher force in each county. To show how projected changes in enrollment in specific counties would translate into demand for new teachers, student enrollment projections from California's Department of Finance (2006) were combined with county-level pupil–teacher ratios. These two demand factors were then combined to examine how projected teacher retirements and projected changes in student enrollment could intersect in particular counties to produce differential demand for teachers over the next decade and to catalog projected needs for new teachers in the 58 California counties. The projected need for new teachers is based on the current mix of teaching staff, irrespective of teachers' credential status. (Box 1 and appendix A discuss key assumptions underlying the projections and the data and analyses in more detail.)

The next sections detail the county-level variation in the current use of underprepared teachers, future enrollment-driven demand, and future retirement-driven demand. The following sections then discuss how future retirement and enrollment trends will intersect in particular counties and regions. The findings are generally presented first in percentages and then in numeric counts to provide additional context (box 2 on metrics explains how the two measures complement one another). Appendix C provides the detailed county by county results for each of this study's primary analyses and is the basis for much of the discussion throughout the findings section. Map 1 depicts the regional delineations referred to throughout the report.

Use of underprepared teachers by county

The statewide average for the use of underprepared teachers in California was 6 percent in 2005/06. Of the approximately 18,000 underprepared teachers statewide, about half held university or district intern credentials, while the rest held waivers, permits, or pre-intern credentials.[3]

At the county level the percentage of underprepared teachers ranged from a high of 12.5 percent in Imperial County to a low of zero in Sierra County (table C1 in appendix C). While the counties with the highest percentages of underprepared teachers do not seem to fit a clear geographic pattern, those with the lowest percentages are in the Upper Sacramento Valley, North Coast, Northeast Inland, and East Inland regions (see map 2).

As of 2005/06 more than 80 percent of the state's 17,839 underprepared teachers were located in 11 of California's 58 counties (table 1; see table C2 for the entire list of counties). These counties, which are in the top 20 percent for number of underprepared teachers, are also among the 13 largest counties in current student enrollment.

Student enrollment projections by county

At the state level historical and projected student enrollment data suggest that after a period of steep increases during the past decade, statewide enrollment growth is leveling off (figure 1). Annual enrollment growth has slowed steadily from a rate of almost 3 percent in 1996/97 to less than 0.5 percent in 2006/07. Cumulative enrollment growth over the next decade (2005/06–2015/16) is projected to be just over 2 percent, with differential growth patterns for elementary and high schools. Elementary enrollments began declining in 2004 and are expected to continue declining until 2008/09 and then start growing again. High school enrollments are expected to grow slightly until

BOX 2

Reporting results in numeric counts and percentages

This study reports results in both numeric counts and percentages. Each provides a slightly different perspective.

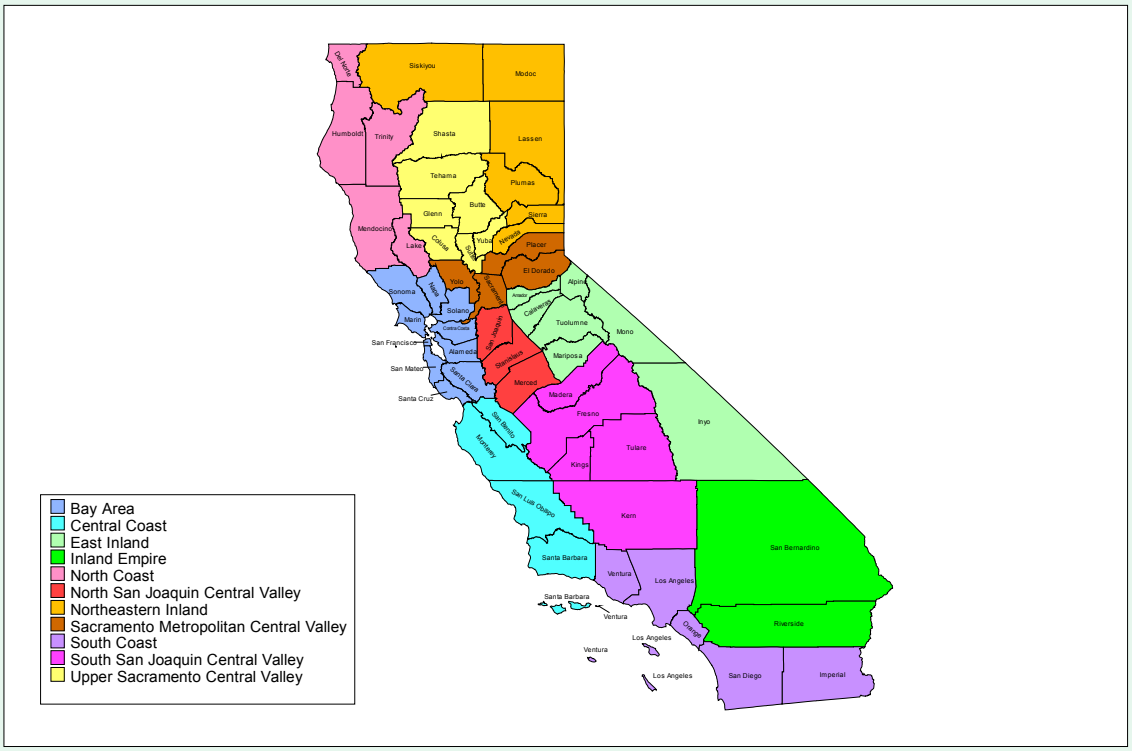
With numeric counts alone, this report would be a story largely of California's 10 biggest counties. For current use of underprepared teachers, projected retirements, and projected retirement- plus enrollment-related demand, in numeric counts the top 20 percent of counties is dominated by the 10 counties with the largest student enrollments. (Projected enrollment-related demand is the only exception.)

Including percentages broadens the story. In addition to making it easier to consider future demand relative to current workforce size in a given area, percentages help convey the relative impact of changes in demand across counties or regions that might differ in their capacity to address future demand. For example, the need to hire 60 teachers over the next decade will pose a greater challenge for a county currently employing 100 teachers than for one employing 1,000 teachers; the first county will need to replace 60 percent of its current teachers, while the second will need to replace 6 percent.

But reporting percentages alone would make it difficult to judge the differences in absolute need for teachers or to aggregate teacher demand. In a state where 10 counties educate more than 70 percent of students, and one county (Los Angeles) educates close to a third, differences in absolute numbers are important. Consider that Los Angeles ranks last (58th) among California counties in the percentage of its current workforce that will need to be replaced to meet retirement- and enrollment-related demand over the next decade. But with a projected demand for close to 3,300 teachers, Los Angeles ranks 10th in numeric need.

MAP 1

Regional categories of California counties

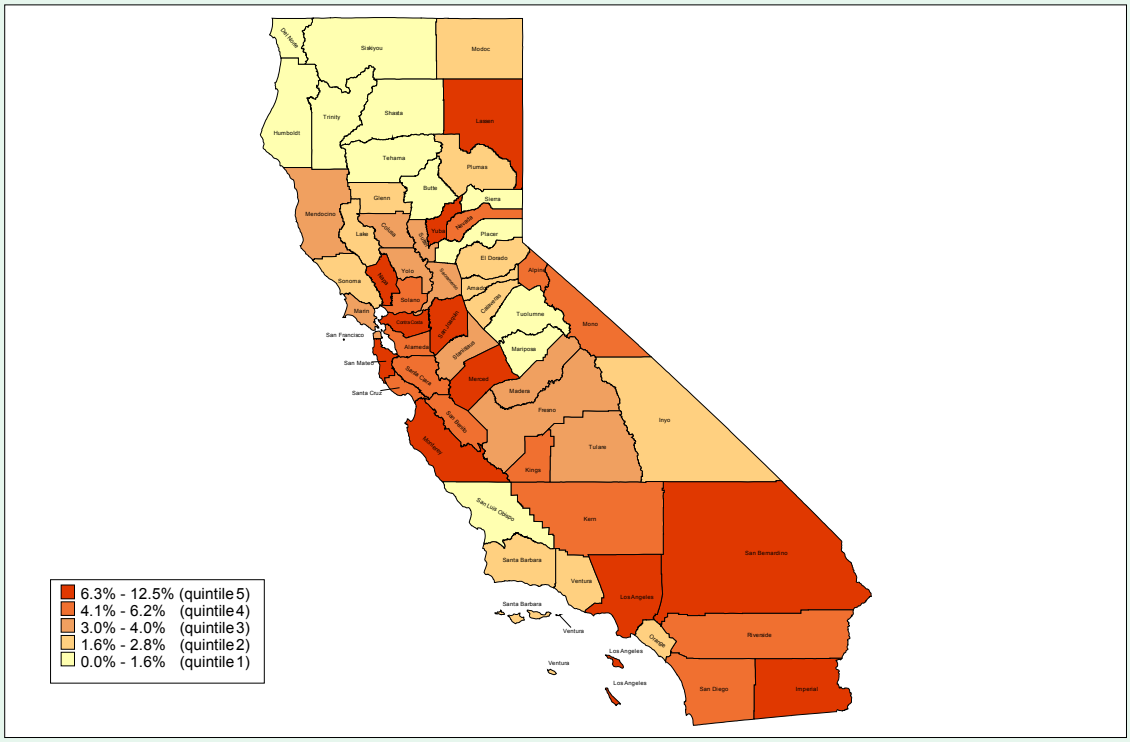


Note: These regions were developed for this report.

Source: The Central Valley regions are based on Johnson and Hayes (2004) and Public Policy Institute of California (2004); the Inland Empire region is based on Downs (2005).

MAP 2

Percentage of underprepared K–12 teachers in California by county, 2005/06



Source: Authors' analysis based on data from California Department of Education (2005). Table C1 in appendix C reports the underlying data, which are based on tabulations of the percentages of underprepared teachers by county; see box 1 and appendix A for details.

2007/08 and then begin declining until 2012/13 (California Department of Finance 2006).

These modest projections for enrollment growth statewide mask considerable regional variation. For more than 30 years California's inland areas have experienced faster population growth rates than coastal areas have, and these trends are expected to continue. The Inland Empire (Riverside and San Bernardino Counties) has been one of the fastest growing metropolitan areas in the country for decades (Johnson 2003). The Central Valley (North and South San Joaquin Valley and the Upper and Sacramento Metropolitan Valley) also has experienced growth in recent decades, with its population more than doubling in the last 30 years and expected to double again between 2000 and 2040 (Johnson and Hayes 2004). These general population trends are reflected in the region's student enrollment growth.

The data used in this study show that between 2005/06 and 2015/16, 21 counties are expected to experience double-digit enrollment growth (as a percentage of current enrollment), while 22 counties are expected to experience declining enrollment (table C9 in appendix C). Among the 10 counties with the largest enrollment as of 2005/06, half are expected to have increasing enrollments (all but one in double digits) and half are expected to have declining enrollments.

Using current student–teacher ratios to translate projected student enrollment growth into projected teacher demand shows that most of the counties with the fastest growing enrollment-driven projected demand are in the Central Valley and Inland Empire (map 3).

Generally speaking, the coastal and northern counties, and a few eastern counties (Amador, Tuolumne, Mariposa, and Inyo), are expected to

TABLE 1
Number and percentage of underprepared K–12 teachers in California, 2005/06 (top 20 percent of counties based on number of underprepared teachers)

County	Number	Percentage
Los Angeles	6,891	8.5
San Bernardino	1,332	6.9
Riverside	1,074	5.9
San Diego	1,042	4.1
Santa Clara	743	5.8
San Joaquin	698	10.1
Alameda	692	6.2
Orange	611	2.7
Contra Costa	596	7.1
Kern	498	6.0
Sacramento	409	3.4
Total	14,586	81.8

Source: Authors' analysis based on data from California Department of Education (2005); see box 1 and appendix A for details. Tables C1 and C2 in appendix C report these data for all counties.

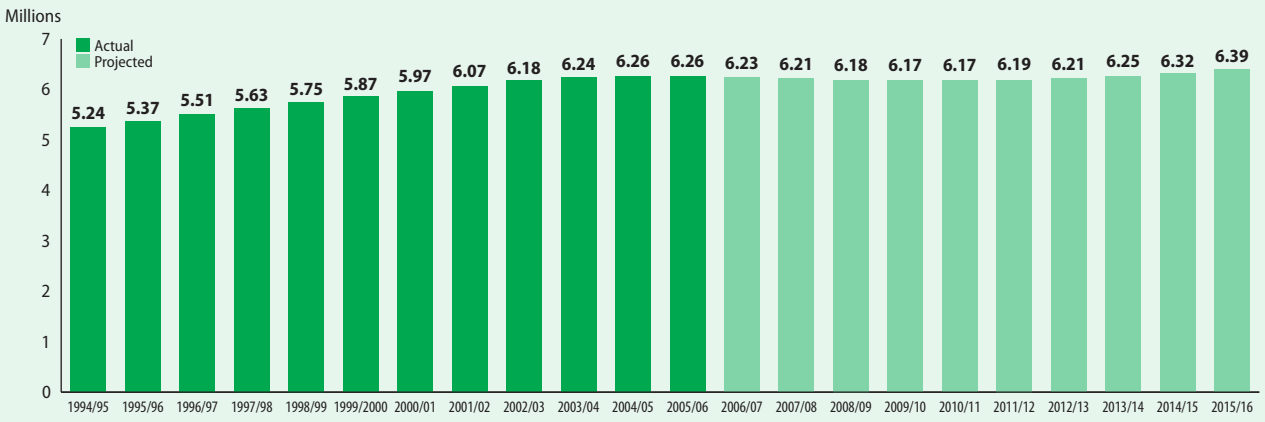
experience declining teacher demand based on student enrollment (the bottom two quintiles) over the next decade. All the counties registering losses of more than 1,000 students over the coming decade are coastal counties (table C9 in appendix C). That may in part be because most of the state's population is concentrated along the coast (Johnson 2003) and because migration from coastal to inland communities has been occurring over the last three decades (Johnson and Hayes 2004). Map 4 shows how county-level changes in projected student enrollment could translate into county by county teacher demand over the next decade.

Retirement projections by county

The aging of the baby boom generation (people born between 1946 and 1964) is expected to lead to the number of seniors in California doubling between 2000 and 2025 (Lee, Miller, and Edwards 2003). These mid-century boomers make up a large portion of the state's current K–12 teaching force, and as they begin to reach retirement age, their departures are likely to have a strong impact on school staffing. For those born in the first year of the baby boom, 2006 marked their 60th birthday and the beginning of the coming retirement wave.

A graph of the age distribution of California teachers as of 2005/06 shows that close to 84,000 teachers, or 27 percent of the teaching workforce, were between the ages of 51 and 60 (figure 2). That indicates that the wave of teacher retirements will continue over the next decade as teachers now in their 50s reach the peak retirement ages of 60–62.

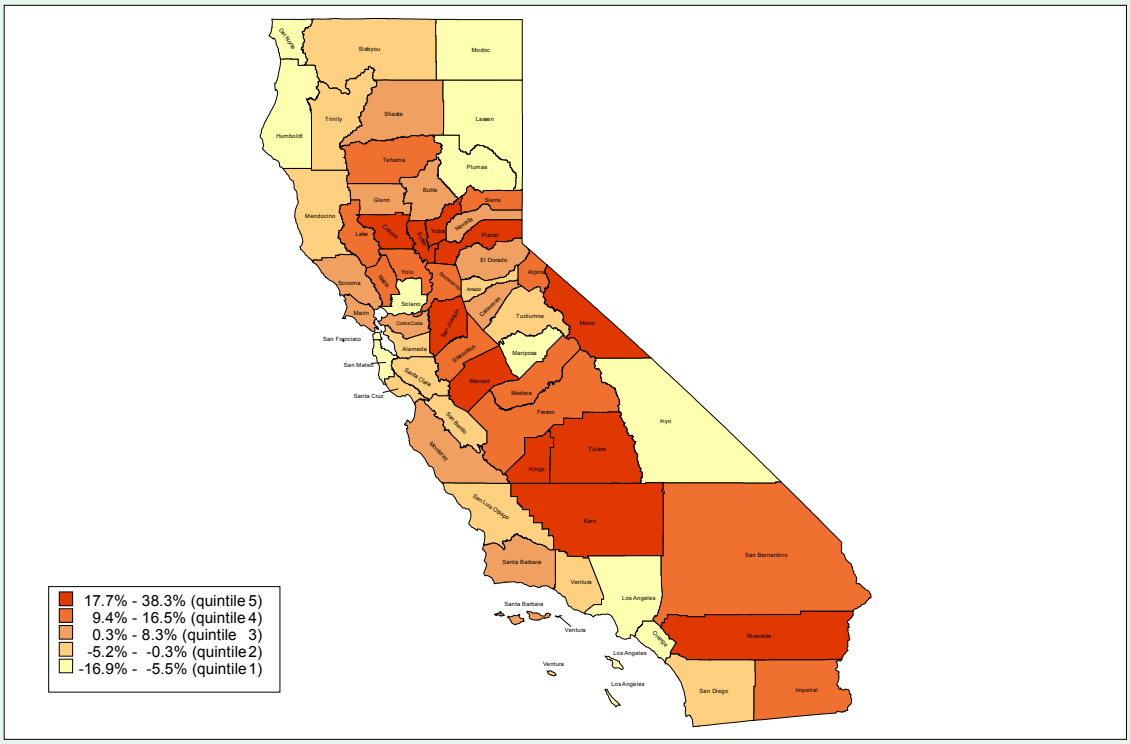
FIGURE 1
Historical and projected California K–12 student enrollment statewide, 1994/95–2015/16



Source: Authors' analysis based on data from California Department of Finance (2006).

MAP 3

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on student enrollment projections, by county



Note: Workforce needs were computed by applying county-level pupil–teacher ratios in 2005/06 to projected enrollments, as described in appendix A. Table C5 in appendix C reports the data underlying the map.

Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a).

Analysis of CalSTRS retirement rates, adjusted to focus on K–12 teachers, shows that over the last five years statewide teacher retirements have hovered around 2 percent annually. Retirements will increase over the rest of this decade, peaking in 2009/10. Retirements are predicted to reach more than 8,000 annually in 2008/09, 2009/10, and 2010/11 before beginning to decline (figure 3).[4]

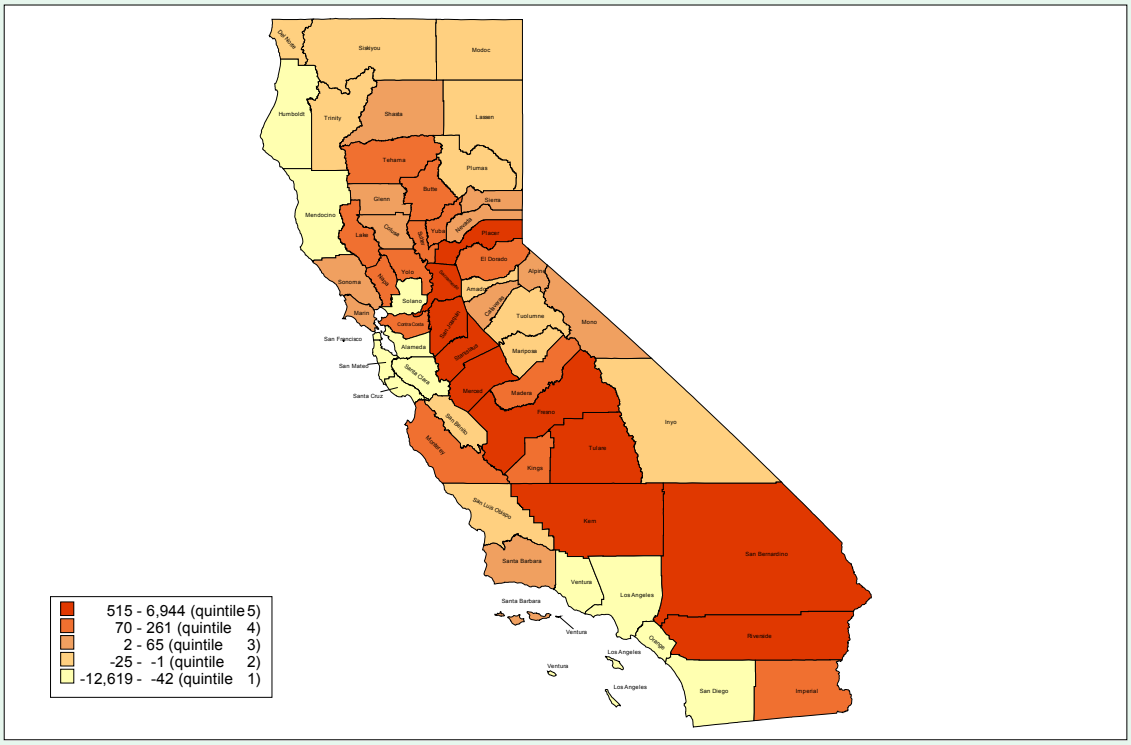
As do the trends in enrollment, the retirement projections show county-level variation in the proportion of the workforce that will retire by 2015/16. The lowest rate in the state is in Alpine County, with 18 percent of its teachers projected to retire over the next decade (see table C3 in appendix C). At the other extreme is Plumas County, with 59 percent of its teachers projected to retire. Most of the top 10 counties for student enrollment are expected to lose 20–30 percent of their teacher workforce over the coming decade to retirements. Sacramento County, at 45 percent, is projected to lose a larger share of its teachers than others in the top 10 percent enrollment counties.

The counties in the top 20 percent of retirements are projected to lose 41–59 percent of their teachers. These high-retirement areas form a band around the Central Valley in the top half of the state. Sacramento—also an outlier among the 10 largest counties in student enrollment—is the only Central Valley county that falls into this high-retirement group (map 5).

Several of the counties registering the lowest projected retirement rates are in the Central Valley and Inland Empire. These counties have been experiencing rapid enrollment growth for years, and previous research suggests that they are likely to

MAP 4

Estimated change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on student enrollment projections, by county

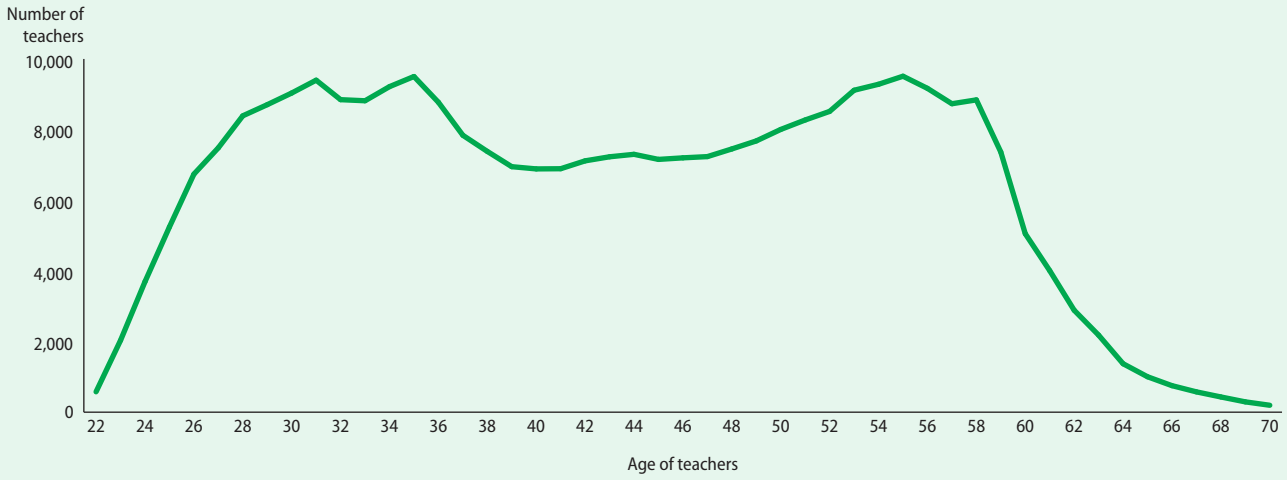


Note: Workforce needs were computed by applying county-level pupil–teacher ratios in 2005/06 to projected enrollments, as described in appendix A. Table C6 in appendix C reports the data underlying the map.

Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a).

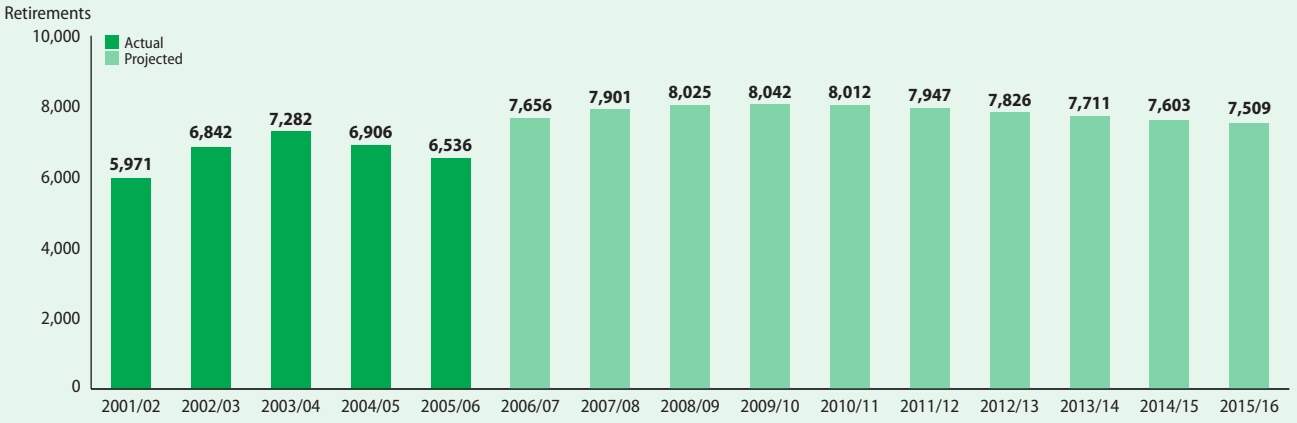
FIGURE 2

Age distribution of California teachers in 2005/06



Source: Authors' analysis based on data from California Department of Education (2005).

FIGURE 3
Actual and projected K–12 teacher retirements statewide in California, 2001/02 to 2015/16



Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request; see box 1 and appendix A for details of the analysis.

have younger teaching populations (Rose and Sengupta 2007). Also, several low-retirement counties are in coastal areas in or around urban centers. Mono, Alpine, and San Benito are the only counties in the lowest projected retirement quintile that are not located in the Central Valley, the Inland Empire, or on the coast.

The counties that are projected to experience the highest number of teacher retirements are in the Bay Area, Sacramento Metropolitan Region, San Joaquin Valley, Inland Empire, and South Coast regions. Most of the counties with the lowest number of projected retirements are in the Northeastern and East Inland regions, and they have some of the smallest student populations in the state; all had under 5,000 students in 2005/06 (map 6).

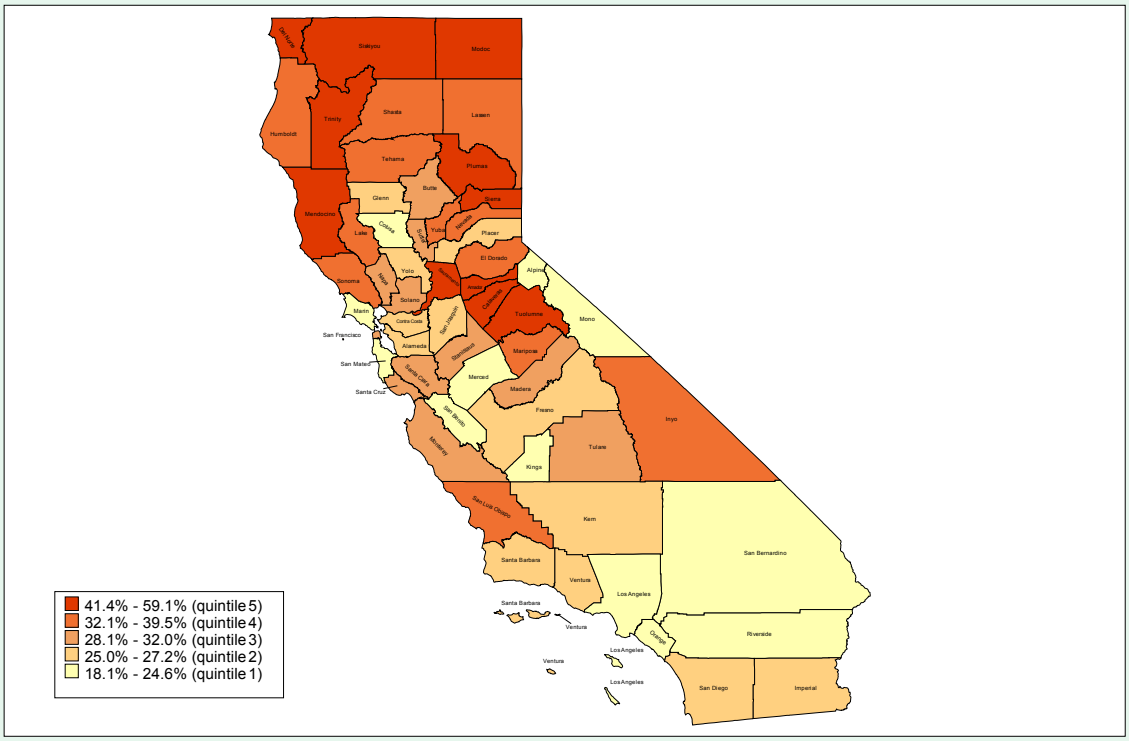
Combining projected teacher retirements and change in student enrollment

To examine the net effect of these projected teacher retirement and student enrollment trends, the two sets of projections for the next decade were combined on a county by county basis. A large gap of 64 percentage points separates the two counties facing the highest projected demand (68 percent) and lowest demand (4 percent) for teachers (table C7 in appendix C). Many counties with the highest expected need relative to their current workforce are in the upper parts of the Central Valley or immediately adjacent to that region. Riverside is the only county in the southern end of the state that is in the top 20 percent of the distribution for these combined demand projections (map 7).

Most counties in the bottom 20 percent of the distribution for combined projected enrollment growth and retirement-related demand relative to the current workforce are along the California coast. The exceptions—Mariposa, Inyo, and San Benito—all have small student populations that are expected to contract over the next decade (table C9 in appendix C). Los Angeles, with a projected demand of 4 percent of its current workforce, has the lowest projected demand for new teachers over the next decade (see table C7 in appendix C). This relatively low projected demand results from the combined effect of low retirement rates and a projected decline in student enrollment over the next decade (see tables C3 and C5). The second lowest demand county, San Francisco, is a full 10 percentage points higher. Riverside and Sacramento Counties are predicted to need to hire both large numbers and high percentages of new teachers over the next decade as a result of teacher retirements and student enrollment growth (box 3).

MAP 5

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on projected teacher retirements, by county



Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request; see box 1 and appendix A for details on the analysis. Underlying data are reported in table C3 in appendix C.

Relative contribution of teacher retirements and enrollment growth

For counties in the top 20 percent of the distribution of net demand for new teachers, the relative contributions of projected teacher retirements and student enrollment growth look different for demand as a percentage of the current workforce and as number of teachers. For the 20 percent of counties with the highest projected net demand as a proportion of the current workforce due to projected teacher retirements and student enrollment growth, the analysis reveals that the contribution of the two demand variables is almost equal: 52 percent of teachers are needed because of teacher retirements and 48 percent because of student enrollment growth (figure 4).

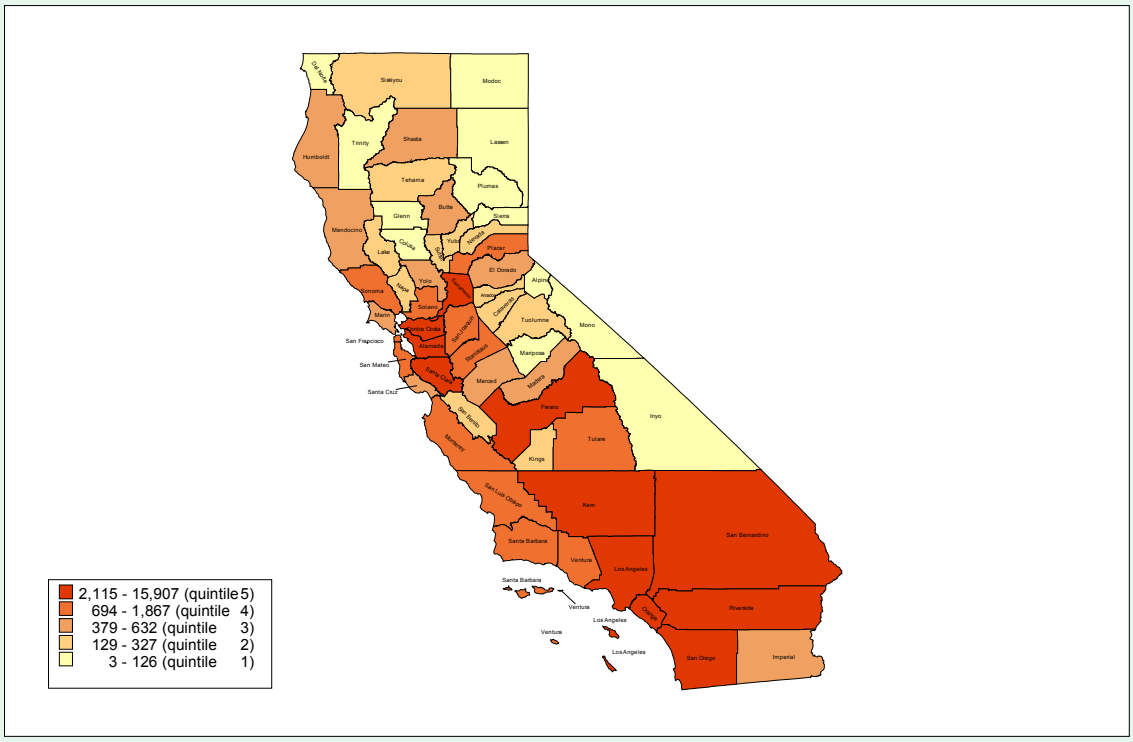
For the top 20 percent of counties in total teachers needed due to both factors the analysis reveals that more than 54,000 teachers are needed because of retirements, but fewer than 350 because of student enrollment growth (figure 5). The large discrepancy is due to negative enrollment growth in several large counties (such as Los Angeles, San Diego, and Orange). Only three counties (Riverside, Placer, and Colusa) register higher demand for new teachers because of student enrollment growth rather than teacher retirements.

CONCLUSIONS AND IMPLICATIONS

Previous analyses of teacher supply and demand have contributed to an understanding of the dynamics of the teacher labor force at a statewide level (Guha et al. 2006). This analysis adds to that body of knowledge by expanding on the county-level analysis of the use of underprepared teachers, initially highlighted by the Center for the Future

MAP 6

Estimated change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on teacher retirement projections, by region



Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request; see box 1 and appendix A for details on the analysis. Underlying data are reported in table C3 in appendix C.

of Teaching and Learning (Guha et al. 2006) and by shedding new light on two key trends—teacher retirements and student enrollment growth—that are likely to affect regional variation in demand for new teachers in the coming decade.

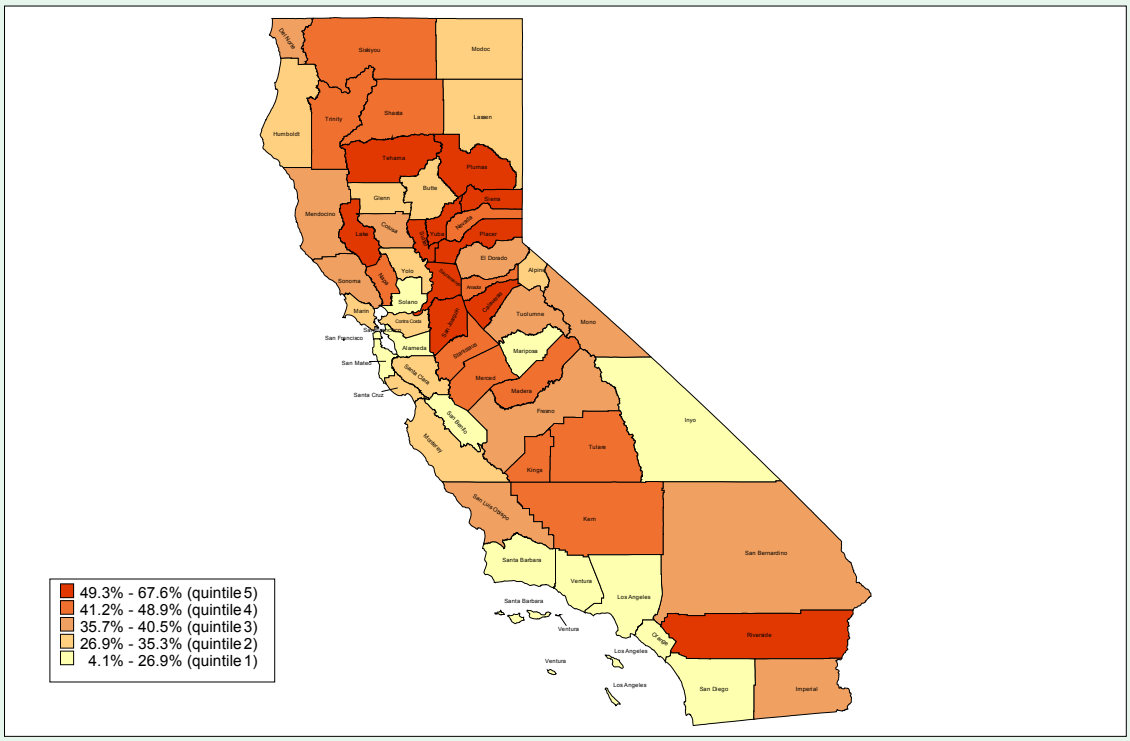
While this report does not consider county-level attrition or teacher supply, the demand projections highlight the impact that teacher retirements and student enrollment growth will have on the demand for new teachers across different counties. Even without teacher attrition, the results suggest that many counties will need to hire a large proportion of new teachers—in some cases, large numbers of teachers—over the next decade because of teacher retirements and student enrollment growth. The issues highlighted here may spur further analysis and discussion of the regional teacher workforce that could help state policymakers and teacher preparation institutions target resources to the highest need areas of the state and inform district and county education offices as they plan for future hiring needs.

County-level variation in the use of underprepared teachers and future demand for teachers

This analysis of the use of underprepared teachers reveals that state-level analyses can mask variation at the county level. It shows that most of the state's underprepared teachers are concentrated in several large counties. While the state average for use of underprepared teachers has dropped considerably since peaking at 14 percent in 2000/01 (Guha et al. 2006), certain counties (particularly Imperial and San Joaquin) have percentages of underprepared teachers closer to the state average in 2000/01 than in 2005/06. At the same time,

MAP 7

Estimated percentage change in the number of K–12 teachers in California needed from 2005/06 to 2015/16 based on projected teacher retirements and student enrollment, by county



Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request, for retirement projections; California Department of Finance (2006), for enrollment projections; and California Department of Education (2006a), for county-level pupil–teacher ratios. See box 1 and appendix A for details of the analysis. Underlying data are reported in table C7 in appendix C.

16 counties had less than 2 percent underprepared teachers in 2005/06.

The results of the analysis of future demand for teachers suggest that certain counties (notably, Riverside and Sacramento) are expected to need to hire both large numbers and high percentages of new teachers over the next decade because of teacher retirements and student enrollment growth. In such counties there is evidence of an aging teacher workforce and a projected influx of new students.

Challenges and implications for the Central Valley and Inland Empire regions

The Central Valley regions and the counties immediately bordering it are projected to face some of the most formidable challenges with respect to enrollment- and retirement-related demand for new teachers as a percentage of their current workforce in the coming decade. Most of the top 20 percent of counties facing the highest projected demand due to these two variables are in or immediately adjacent to the northern part of the Central Valley. And only 6 of the region's 19 counties are not in the top 40 percent of counties for projected demand (Butte, Glenn, Yolo, Colusa, El Dorado, and Fresno).

In the Central Valley regions the high projected demand for new teachers will arrive with other challenges. The Central Valley counties (the area around the Sacramento and San Joaquin Valleys; see map 1) tend to have higher poverty rates and lower education attainment than the rest of the state. Excluding the Sacramento Metropolitan Central Valley region (which, at 8 percent, has relatively

BOX 3

Teacher demand in the top 10 enrollment counties

Ten counties in California account for more than 70 percent of the state's student enrollment and will drive much of the state's enrollment- and retirement-related teacher demand over the coming decade: Los Angeles, Orange, San Diego, San Bernardino, Riverside, Santa Clara, Sacramento, Alameda, Fresno, and Kern.

As shown in the table, within this group, Riverside and Sacramento face the greatest teacher demand over the next decade due to teacher retirement and student enrollment growth. Both counties are in the top 20 percent of the distribution for projected demand relative to their current workforce—in percentage terms.

Based on these two factors alone, each county will have to hire enough new teachers to replace close to 60 percent of its current workforce by 2015/16: Sacramento largely because of high teacher retirements and Riverside largely because of high student enrollment growth. This means that Sacramento will need to hire close to 7,000 teachers over the next decade, and Riverside close to 11,000 (see table C8 in appendix C). At the other end of the spectrum is Los Angeles County, which will need to hire approximately 4 percent of its current workforce (or close to 3,300 teachers). Overall, in percentage terms, the majority of the top 10 enrollment counties have projected enrollment- and retirement-driven demand that is below the median level of demand across all 58 counties.

Estimated percentage change in the number of K–12 teachers needed based on projected teacher retirements and student enrollment from 2005/05 to 2015/16 in the top 10 student enrollment counties in California

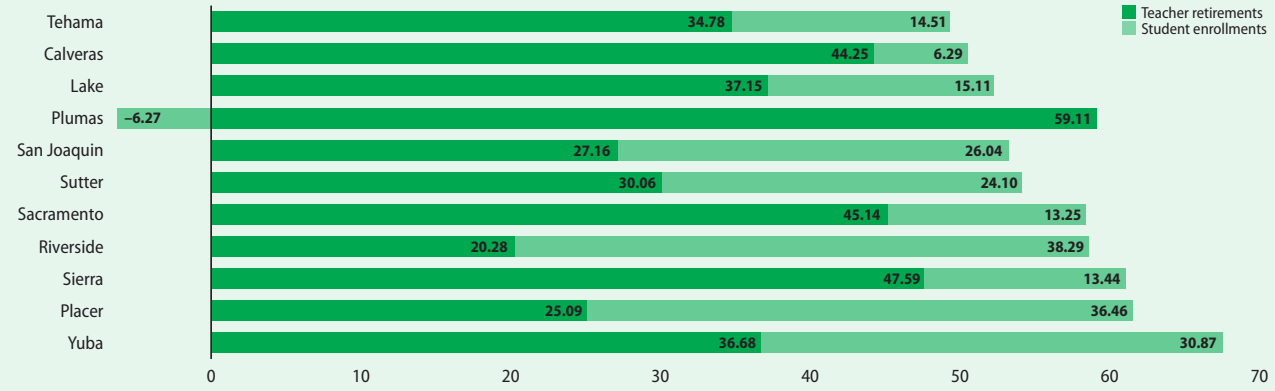
County	Rank by enrollment, 2006	Student enrollment (percent growth)	Percent of current workforce to retire	Percent of current workforce needed to hire due to retirement plus enrollment	Rank for percent of current workforce needed to hire due to retirement plus enrollment
Riverside	5	38	20	59	4
Sacramento	7	13	45	58	5
Kern	10	20	26	46	14
Fresno	9	9	26	36	33
San Bernardino	4	13	23	36	34
Santa Clara	6	–2	29	28	45
Alameda	8	–2	26	24	50
San Diego	3	–3	25	22	53
Orange	2	–8	24	17	56
Los Angeles	1	–16	20	4	58

Source: Authors' analysis based on data from California Department of Finance (2006); California Department of Education (2006a); California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request; and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request; see box 1 and appendix A for details of the analysis; see table C7 in appendix C for parallel information for all counties.

low levels of poverty and close to the same proportion of college graduates as the rest of the state), about 20 percent of Central Valley residents live in poverty, compared with 13 percent for the rest of the state (Public Policy Institute of California 2006). Also, migration trends have resulted in a net loss of college graduates in the area. In 2000 only 14 percent of San Joaquin Valley residents and 17 percent of Upper Sacramento Valley residents were college graduates, compared with 28 percent in the rest of the state (excluding the Central Valley; Johnson and Hayes 2004). In addition, the San Joaquin Valley has a diverse population, with no dominant ethnic group. Growth in the Hispanic and Asian populations in the Central Valley has been substantial; between 1970 and 2000 the Hispanic population

FIGURE 4

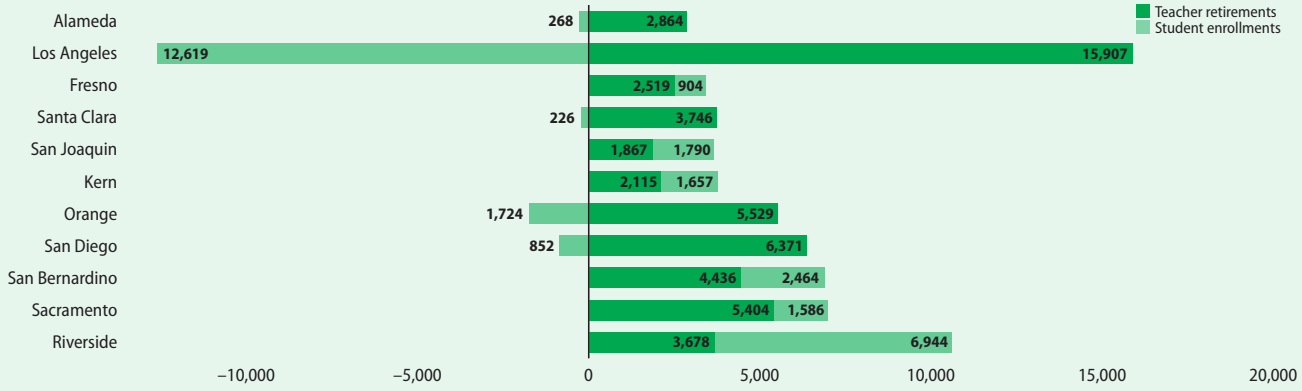
Estimated percentage change in the number of K–12 teachers needed in California from 2005/05 to 2015/16 due to teacher retirements and changes in student enrollment (top 20 percent of counties)



Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a), for enrollment projections; California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request, for retirement projections; see box 1 and appendix A for details of the analysis. See table C7 in appendix C for parallel information for all counties.

FIGURE 5

Number of new teachers needed from 2005/06 to 2015/16 due to teacher retirements and changes in student enrollment (top 20 percent of counties)



Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a), for enrollment projections; California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request, for retirement projections; see box 1 and appendix A for details of the analysis. See table C8 in appendix C for parallel information for all counties.

increased fivefold and the Asian population fourfold (Johnson and Hayes 2004).

In the Inland Empire Riverside County is also expected to face high demand for new teachers in the coming decade due to student enrollment growth and teacher retirements. And, like many counties in the Central Valley, Riverside also has high poverty rates and low educational attainment.[5] It, too, faces the challenges of educating a diverse student population—in 2004/05, 52 percent of the county's students were Hispanic and 33 percent were White (Downs 2005).

Taken together, these economic and sociodemographic trends and indicators suggest that efforts

Economic and sociodemographic trends and indicators suggest that efforts to retain teachers and to hire new teachers in the Central Valley and Riverside County could face several impediments

to retain teachers and to hire new teachers in the Central Valley and Riverside County could face several impediments. From a supply perspective the relatively low proportions of college-educated adults in most parts of the Valley and in Riverside County (and the Inland Empire, in general) may translate into fewer potential teacher candidates, especially in light of the research highlighting the local nature of teacher supply. Efforts to recruit teachers from other parts of the country or state may fail because of teachers' preferences to work close to their hometowns. It is important to remember, however, that without a complete analysis of all the labor market variables in these regions, it is not possible to predict whether there will in fact be supply-demand mismatches in coming years.

Current efforts to address teacher workforce challenges

The dynamics of current use of underprepared teachers, projected student enrollment growth, and projected teacher retirements occur against the backdrop of state teacher recruitment and retention efforts. Some of the state's funded programs could help address supply-demand mismatches emerging in certain counties. For example, several programs target low-performing schools or teachers who intend to work in these schools (Low Performing School Enrichment Block Grant, Assumption Program of Loans for Education, National Board incentives, Certificated Staff Mentoring Program). To the extent that low-performing schools are concentrated in the Central Valley and Inland Empire, as the analysis here shows, these specialized programs may help with recruitment and retention efforts in these regions.[6]

In addition, two county-level recruitment initiatives were recently funded with one-time monies. The first, funded in the 2005/06 Budget Act, provided $3 million to the Tulare County Office of Education for the California Teacher Recruitment Program to recruit teachers to low-performing schools in three areas, including the Central Valley and Inland Empire. The other, funded in 2006/07, creates teacher recruitment personnel teams run by six county offices to provide technical assistance to school districts to establish and maintain effective personnel management, recruitment, and hiring processes. However, both these county programs are of limited duration.

Possible next steps for additional explorations of local labor market dynamics in California

As noted throughout, this report offers some key local and regional pieces of the overall teacher labor market puzzle, but not a complete description of county-level supply and demand. Additional research could help fill out the picture of local teacher labor markets drawn in this report and inform appropriate policy interventions to balance supply and demand within local teacher labor markets.

The possibilities for conducting further research and analysis related to local teacher labor markets are likely to expand once the California Longitudinal Teacher Integrated Data Education System (CalTIDES), currently being developed, becomes operational, some time around the end of the decade. It is expected to facilitate teacher workforce analyses, including investigation of mobility, retention, and attrition (Senate Bill 1614; Chapter 840, Statutes of 2006). Until then, the following sections propose several directions for further explorations of local teacher labor market issues. These analyses would rely primarily on district and county resources. Once CalTIDES is operational, the proposed investigations could be conducted using the new state-level data. The discussion is organized mainly by demand- and supply-side issues.

Demand-side investigations and research

Exploring the impact of pre-retirement attrition on future demand. As noted, pre-retirement attrition, in addition to changes in student enrollment and teacher retirement, contributes to the ongoing

need for new teachers. Analysis of county-level attrition is inhibited by lack of the necessary data system at the state level. However, any counties or districts that maintain their own longitudinal teacher data systems could explore the impact of pre-retirement attrition on future demand. This information would round out the demand estimates based on teacher retirements and enrollment growth reported here.

Assessing the differential needs of elementary and secondary school teachers. Statewide student enrollment projections show growth at the elementary level during the projection period. Because of data limitations, this study did not investigate the projected needs for new teachers by school level. However, the distinction between needs for elementary and secondary school teachers is important, since elementary and secondary school teachers are not generally interchangeable.

Supply-side investigations and research

Determining whether supply will meet future demand and maximizing the supply of fully credentialed teachers as needed. County offices of education and school districts could identify which teacher preparation programs are their primary sources of new teachers and then collaborate with those programs to determine whether the supply of teachers to the region is likely to meet demand in the coming years. (Appendix D shows data on recent trends in the number of credentials issued by individual institute of higher education-based teacher preparation programs.) The district and county offices could also consider which programs provide teachers who are best prepared to work in the unique contexts of local schools. Such an effort could help turn the challenge of meeting the demand for new teachers into an opportunity to shape the new teaching pool to address the unique needs of different counties.

Further exploring the nature of county- and regional-level use of underprepared teachers. As local and state decisionmakers work to ensure that all students have access to fully credentialed teachers, geographic variation may be an important lens for viewing the distribution of teachers. However, further analysis of geographic distributions may be important. For example, the analysis here does not show the extent to which the patterns in the county- and regional-level use of underprepared teachers as of 2005/06 might vary over time in response to changes in labor market conditions. Future research could use historical data from the California Department of Education to examine volatility in the use of underprepared teachers at the county and regional levels.

Counties or districts that maintain their own longitudinal teacher data systems could explore the impact of pre-retirement attrition on future demand to round out the demand estimates based on teacher retirements and enrollment growth reported here

Conducting further state-level research on geographic patterns of the teacher pipeline. Further research could build on the findings of Boyd et al. (2005) regarding the local nature of teacher labor markets to explore the geographic aspects of the teacher pipeline in California. For example, do schools in a given region attract primarily new teachers who grew up in the region? Under what circumstances do teachers migrate to other regions for jobs? Which teacher preparation programs are the major suppliers to various regions in California? Such information would help state policymakers as they consider interventions for addressing the differential demand for new teachers in different parts of the state. In addition, it would add to the knowledge base on teacher labor markets.

Investigating the reserve pool of teachers. Many teachers do not take a teaching job within three years of receiving their credentials (Esch et al. 2005). Increasing the effective yield from teacher preparation programs by increasing the number of credential holders who take teaching jobs could reduce the number of underprepared teachers and mitigate any future supply-demand imbalances. Research about this reserve pool of teachers could improve understanding of their potential to play such roles and might inform efforts to entice more credential holders into the teaching profession.

APPENDIX A
DATA AND ANALYSES

This appendix provides additional information about the data sources and the analysis used in this study.

Data sources

This study uses longitudinal analysis to examine two major demand factors that vary at the county level: changes in student enrollment and in teacher retirements. In addition, the study highlights county-level differences and patterns in the use of underprepared teachers in 2005/06. Due to data limitations, the study does not analyze projected county-level teacher attrition. Analysis of county-level teacher attrition would require having individual teacher identification numbers that could be tracked longitudinally to identify when a teacher leaves the profession. Research on teacher attrition has found relationships between attrition and school-level working conditions, district conditions, and certain teacher characteristics (Ingersoll 2003; Reed, Reuben, and Barbour 2006; Loeb, Darling-Hammond, and Luczak 2005). The authors are not aware of research that establishes links between geographic conditions (by county or region) and teacher attrition, though the national Schools and Staffing Survey (SASS) does collect information on attrition in schools by locale (rural, urban, and suburban). Data from the 1999/2000 SASS show only modest differences in attrition across rural, suburban, and urban schools (Ingersoll 2003).

As described in the following sections, the study drew from three primary data sources to produce a descriptive analysis, first, of California counties' current use of underprepared teachers and, then, of their differential needs for additional teachers over the next decade based on projections over 2006/07–2015/16 of teacher retirements and student growth.

Underprepared teachers. Following the lead of the Center for the Future of Teaching and Learning, this report considers as underprepared any teachers who were authorized to teach through a district or university internship, emergency permit, pre-internship, or waiver.

The California Department of Education annually collects extensive data on the K–12 teaching force and makes many of these data publicly available on its web site. Data on underprepared teachers came from the California Department of Education's Personnel Assignment Information Form (PAIF), from the October 2005 data collection, which reports the credential status of all K–12 teachers in the state's public schools at school, district, and county levels (California Department of Education 2005).

The data showed that 4,289 teachers said that they held both a full credential and some type of underprepared authorization. These teachers were counted as fully credentialed. Unless they were reporting incorrectly, these fully credentialed teachers also held one or more of the other underprepared authorizations for a variety of other reasons, most having to do with needing further training in other instructional areas (such as special education or instruction of English language learner students) that the original credential did not authorize them to teach. For example, a fully credentialed teacher with a single-subject teaching authorization might obtain a "limited assignment teaching permit" to teach a new subject area or to teach in a self-contained classroom or might hold an emergency resource specialist or education specialist teaching permit, emergency library services permit, or an internship credential for education specialist training.

The analysis of underprepared teachers includes both full- and part-time teachers. Part-time teachers accounted for about 6 percent of the California teacher workforce as of 2005/06. Among full-time teachers 5.8 percent were underprepared; among part-time teachers 5.5 percent were underprepared. Excluding part-time teachers from the analysis generally changes the results at the county level by less than 1 percent of the total county's workforce.

Student enrollment growth. The California Department of Finance (2006) annually publishes county-level student enrollment data and student enrollment projections for the next 10 years. The analysis for this report used the Department of Finance's 2006 enrollment series, which include historical enrollment data (1994/95–2005/06) and annual projections (2006/07–2015/16). For the student enrollment projections, the Department of Finance uses a cohort survival projection technique that draws on historical trends, migration trends, and demographic data for each county and survey results from selected school districts. Birth data are used to predict entering cohorts of kindergarteners and first-graders.

For student enrollment as of 2005/06, data were taken from the Dataquest (California Department of Education 2006a). Enrollment projections are based on the Department of Finance (2006) enrollment series, which projects enrollment for 2006/07–2016/17. The 2006 series is no longer available online, but the 2007 series is.

To calculate the number of teachers needed to meet enrollment growth-related demand, county-level pupil–teacher ratios were applied to projected enrollments. Pupil–teacher ratios were derived by dividing the total student enrollment by the total number of teachers reported in the California Department of Education's Dataquest for 2005/06 (California Department of Education 2005, 2006a), full- and part-time for each county.[7]

Teacher retirement data. CalSTRS, the state's teacher retirement fund, serves most teachers in California and maintains a historical database that includes data about their retirement patterns. The Defined Benefit Program is the main retirement program in which teachers and other certificated staff in California public schools and community colleges participate. Most full-time certificated employees (including teachers, administrators, and pupil services staff, among others) employed by a school district or county office of education are required to participate in the Defined Benefit Program (California Education Code section 22501). As stated in an annual publication from CalSTRS, "all certificated, charter school, and community college employees of public schools (K–14), whose basis of employment is 50 percent or more" are required to participate in the program (California State Teachers' Retirement System 2007). Charter school teachers whose basis of employment is 50 percent or more are required to participate only if the school in which they are employed has opted into the system.[8] Part-time certificated staff and substitutes do not have to participate initially, but it is the default retirement plan for them, and they must participate after accumulating a certain number of work hours in a given school district (California Education Code sections 22501–22504).

Members of the Defined Benefit Program are employed in 1,350 public school districts, community college districts, county offices of education, and regional occupational programs in California. Normal retirement eligibility is at least age 60 with at least five years of credited service. Members can retire early, at age 55 with a minimum of five years of service or at age 50 with 30 years of service, though there are certain financial disincentives. Members who retire after age 60 receive certain financial premiums. There are also longevity bonuses for service beyond 30 years, with a maximum bonus of $400 per month for 32 years of service (California State Teachers' Retirement System 2006). In 2006 the average age of retirement was 61.2, and the average service credit at retirement was 26 years (California State Teachers' Retirement System 2006).

For this study researchers obtained 12 years of historical data from CalSTRS (1994/95–2005/06), including county-level data showing members' ages and retirement year. These data include the most current county-level data showing counts of members, retirees, and new entrants for each age level and for every county in California. The data also include certain nonteachers employed by school districts, county offices, and regional occupational centers—such as administrators, pupil services staff, preschool teachers, adult

education staff, and possibly regional occupational program staff employed by school districts, county offices, and regional occupational offices.

Because the CalSTRS data system does not distinguish between types of staff, researchers also obtained data from the California Department of Education's Professional Assignment Information Form (PAIF) for 2001/02–2005/06 on the number of teachers within each county for a given age. The data are not provided on the California Department of Education web site but were obtained through a special request to the California Department of Education.

Using an estimating technique, researchers were able to adjust the CalSTRS retirement data with the PAIF data to represent the retirement patterns of teachers rather than all CalSTRS members. For example, if the PAIF data showed eight teachers at a given age within a given county and the CalSTRS data showed 10 members at the same age, the researchers reduced the age counts in the CalSTRS active members, retired members, and new members data by 20 percent. The key assumptions in using this approach are that the CalSTRS members and K–12 teachers of the same age retire at the same rate and that the CalSTRS members and K–12 teachers of the same age enter the workforce at the same rate (see next section). Previous reports on teacher retirements using CalSTRS data did not make such adjustments and thus may have provided less refined estimates of teacher retirements.

Teacher retirement projections formula used in analysis

Key assumptions of the projections. Several assumptions were made in projecting student enrollment- and teacher retirement-driven demand based on current school conditions and on the historical behavior of teachers. If these assumptions are incorrect, the projections could either under- or overstate actual demand related to these two factors, though it is difficult to predict in advance the overall direction of the biases that may be embedded in the assumptions.[9]

Teacher demand based on student enrollment growth. Counties will maintain their current pupil–teacher ratios. To calculate the number of teachers needed to meet student enrollment growth, county-level pupil–teacher ratios were applied to the California Department of Finance's (2006) projected changes in student enrollment. Even though the rules of California's K–3 class size reduction program, as well as local collective bargaining agreements, may constrain the maximum number of students per class, class size (and therefore pupil–teacher ratios) could be modified in the context of shifting conditions, such as changes in school funding levels. While it is plausible that districts facing high demand for teachers may increase their ratios, districts facing low demand for teachers may pursue the reverse strategy, decreasing their ratios.

Teacher demand based on retirement. CalSTRS members and K–12 teachers of the same age within a given county will retire at the same rate. Because the data obtained from CalSTRS do not distinguish between teachers and nonteacher school employees (such as K–12 administrators and pupil services staff), teacher-age data at the county level from the California Department of Education's 2001/02–2005/06 PAIF (obtained by special request) were used to adjust the five years of data from CalSTRS in the projections formula. This adjustment was made to more precisely reflect the count of K–12 teacher retirees only. The technique could not be used to compute the teacher-only retirement rate by age but only the retirement rate of the whole CalSTRS population of a given age within a given county in the projections. That means that if K–12 teachers of a given age retire at a lower rate than all CalSTRS members of the same age, then actual teacher retirements in the future would be lower than projected retirements. And if K–12 teachers of a given age retire at a higher rate than do all CalSTRS members of the same age, then actual teacher retirements in the future would be higher than projected retirements.

CalSTRS members and K–12 teachers of the same age within a given county enter the workforce at the same rate. The adjustment technique described

in the previous assumption also precluded computation of the rate at which only new teachers enter the workforce. As a result, the new entrant rate of the whole CalSTRS population of a given age within a given county was used in the projections. The projections account for the retirement behavior of teachers currently in the workforce who will retire over the next decade and so focus on teachers who are generally ages 48 or older in 2006. The rate at which people enter the teaching workforce at these ages is very low. In 2006, for instance, 80 percent of counties had one or no new 60-year-old teachers. Because there are few new entrants among teachers expected to reach retirement age within the decade, this assumption is likely to have a minimal impact on projections.

All other factors not directly controlled in the analyses will remain constant. Several aspects of the retirement projections are based on the historical behavior of teachers from 2001/02 to 2005/06 in California counties. These factors include estimates of future retirement rates, number of teachers who remain in the profession from one year to the next, number of teachers who re-enter the workforce after a break, and number of new teachers entering a given county. While the model accounts for the age of teachers and the county in which they are employed, it does not account for the potential effect of changes in other conditions that might affect teacher retirement, such as teacher salaries, the retirement or health benefits that active and retired teachers receive, school-level working conditions, school budgets, or even broader economic conditions.

Projections formula. The following formula was used to project teacher retirements in each county:

$$R_{a,t} = (r_a)\,(N_{a,t})$$

$$r_a = R_{a,\,t-1}/N_{a,\,t-1}$$

$$N_{a,t} = [N_{a-1,\,t-1} - N_{a-1,\,t-1}\,(r_{a-1})]^{*}\ \text{Stay rate}_{\,a-1} + F_a$$

where $R_{a,\,t}$ is the number of retirements for age a in year t, r_a is the retirement rate for teachers of age a, $N_{a,\,t}$ is the number of active teachers age a in year t, F_a is the number of first-time teachers of age a, and Stay rate$_{a-1}$ is (the sum of the actual active teachers observed for each year 2001/02 through 2004/05 in age group a) divided by (the sum of expected active teachers for each year 2001/02 through 2004/05, based on the formula: $N_{a,t} = N_{a-1,\,t-1} - N_{a-1,\,t-1}\,(r_a) + F_a$).

To calculate the number of active members in a projected year at a given age, the number of active members the year before (at the given age minus one) is calculated first, and then the members who retired the previous year are subtracted from the total. This number is then adjusted by the "stay rate," the proportion of teachers who stay in the profession, which is calculated for each age group for each county (see following section). Finally, the new teachers expected to enter the teaching profession for that year and age group are added to the total.

Variation in retirement rates by age within each county over different periods was examined to determine the best approach for deriving a historical retirement rate (r_a) to apply to future retirements. Candidates were the county-level retirement rates for each member age category for 2005/06 only, a 5-year average, and a 12-year average (for a listing of each of these retirement rates for individual counties, see table A1).[10] The average retirement rate over the past five years (2001/02–2005/06) within each age level and county[11] was chosen because it provided a large enough window to account for time trends without using data that may have become obsolete, as using the 12-year average might have done.[12]

To project the number of first-time teachers of age a (F_a), the total number of new teachers of a given age (and county) were calculated for the period 2001/02–2005/06[13] and then divided by total student enrollment over the same period. This figure represents the five-year average of new teachers per student enrolled for a given age and county. This average was then multiplied by the projected student enrollment for a given year to yield the expected number of new teachers of a given age. The assumption is that new members will enter the

TABLE A1

1-, 5-, and 12-year retirement rates at the county level as of 2005/06 (percent)

County	1-year rate	5-year rate	12-year rate
Alameda	3.2	3.0	2.5
Alpine	3.8	0.6	1.5
Amador	5.3	2.8	2.3
Butte	2.0	2.4	2.0
Calaveras	3.9	3.1	2.4
Colusa	1.6	1.7	1.7
Contra Costa	2.5	2.7	2.4
Del Norte	1.2	2.7	2.1
El Dorado	2.7	2.5	1.9
Fresno	1.9	2.0	1.6
Glenn	0.9	2.5	2.1
Humboldt	2.6	3.3	2.5
Imperial	2.0	1.8	1.7
Inyo	4.8	3.2	2.8
Kern	2.2	2.1	1.9
Kings	2.4	2.3	1.9
Lake	2.0	2.6	2.1
Lassen	2.9	2.6	2.1
Los Angeles	2.3	2.3	2.0
Madera	2.0	2.2	1.8
Marin	2.8	2.7	3.0
Mariposa	1.5	3.2	2.2
Mendocino	4.4	3.8	2.7
Merced	1.3	2.1	1.9
Modoc	3.1	3.2	2.5
Mono	5.4	3.1	2.1
Monterey	3.2	3.0	2.3
Napa	2.7	2.8	2.4
Nevada	3.4	2.8	2.0
Orange	2.3	2.5	2.2
Placer	2.0	1.9	1.7
Plumas	2.1	3.7	2.6
Riverside	1.5	1.6	1.3
Sacramento	2.1	2.5	2.2
San Benito	3.5	2.0	1.7
San Bernardino	1.9	1.7	1.5
San Diego	2.1	2.4	2.0
San Francisco	3.2	3.2	2.6
San Joaquin	2.3	2.2	1.9
San Luis Obispo	2.3	2.0	1.7
San Mateo	2.5	2.9	2.7
Santa Barbara	2.2	2.4	2.3
Santa Clara	3.1	3.4	2.9
Santa Cruz	2.8	2.8	2.2
Shasta	3.4	2.9	2.4
Sierra	7.7	5.0	2.9
Siskiyou	6.2	4.6	3.2
Solano	2.8	2.9	2.1
Sonoma	2.9	3.1	2.5
Stanislaus	2.4	2.1	1.8
Sutter	3.1	2.3	2.2
Tehama	2.8	3.0	2.4
Trinity	3.0	5.2	3.4
Tulare	3.1	2.3	1.9
Tuolumne	4.4	3.8	2.8
Ventura	2.7	2.6	2.2
Yolo	2.4	2.3	1.8
Yuba	3.4	3.7	2.8

Note: The 5- and 12-year retirement rates are averaged rates.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request.

system in the future based on the same proportion of total student enrollment as they have in the past.

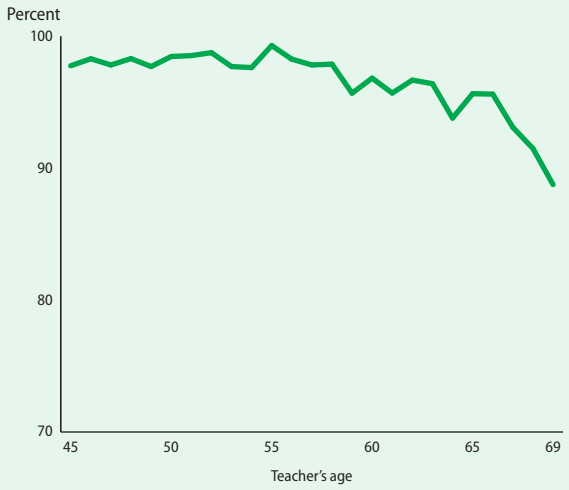
Additional information about the stay rate. The stay rate adjustment prevents overestimating the number of teachers who advance from one year to the next, which would inflate the number of teachers retiring in a given future year. It was calculated as the average proportion of teachers who persisted in a given county from one year to the next during 2001/02 through 2004/05.[14] The number of teachers expected in a given age in a given historical year is based on the number of teachers in the previous year, the number of teachers who retired in the previous year, and the number of new teachers who entered in the given historical year.

The ratio between the actual number of teachers observed in the data and the expected number of teachers represents the stay rate.

While the stay rate is influenced by teacher attrition, it also is influenced by differences that may arise when the CalSTRS retirement counts are converted to teacher retirement counts (as discussed previously). For example, suppose the CalSTRS member retirement counts (from the CalSTRS dataset) for 60-year-olds were reduced by 50 percent in a given county to arrive at a teacher retirement count based on the ratio of CalSTRS members to teachers. Now assume that 60-year-old teachers in this county systematically retire at lower rates than CalSTRS members (possibly because they retire later), and so the CalSTRS member retirement count should be reduced by a proportion less than 50 percent when calculating the number of teachers who retired. Using the stay rate adjustment would correct for this type of problem, since it observes the actual number of 61-year-old teachers the following year and so accounts for more than simply teacher attrition in the study's formula. Figure A1 presents the stay rates for teachers ages 45–69.

FIGURE A1

California average stay rates for teachers ages 45–69, 2001/02–2004/05



Note: The stay rate is the ratio between the actual number of teachers observed in the data and the expected number of teachers.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/01–2005/06 Personnel Assignment Information Form data obtained by special request.

Combining enrollment and retirement projections

To determine the net effect of the enrollment and retirement projections by county on the number of new teachers needed by 2015/16, the findings from the two analyses were combined. The percentage of the total workforce needed based on these combined projections uses the total teacher count for 2005/06. The two datasets with teacher counts from the California Department of Education had slightly different totals. The dataset obtained by special request, which included age data on all teachers in California as of October 2005, had data on 307,017 teachers. These were the data used for adjusting the retirement analyses because they underlie the bulk of the technical analysis for this report—the retirement projections.

The second dataset, downloaded from the California Department of Education (2005, 2006a) web site, provided data on the credential status of teachers as of October 2005. It included data on 307,864 teachers. These data were used in analyses of underprepared teachers and in the pupil–teacher ratios used in the student enrollment growth analyses. The difference between the two teacher counts is small (0.28 percent).

Limitations of the analyses

The accuracy of the analyses and projections depends on the quality of the data and the accuracy of the assumptions used in the projections. The assumptions depend on several current conditions remaining the same in the future. If these assumed conditions were to change, the projections would either under- or overstate demand for teachers.

APPENDIX B
REPORT ESTIMATES COMPARED WITH OTHER RECENT ESTIMATES OF TEACHER RETIREMENT

The authors are aware of three other sources of information about teacher retirement in California: the California State Teachers' Retirement System (CalSTRS) *2006 comprehensive annual financial report* (California State Teachers' Retirement System 2006), the Center for the Future of Teaching and Learning report *California's teaching force 2006: key issues and trends* (Guha et al. 2006), and the Legislative Analyst's Office (2006) *Cal Facts 2006: California's economy and budget in perspective.* The retirement figures cited in this report differ from those reported in these other publications because these other sources report on the retirement of all CalSTRS Defined Benefit Program members, whereas this study adjusts estimates to account only for California K–12 public school teachers. (Appendix A describes the adjustment in more detail.)

The differences in the numbers of retirements among these three reports and this report are due primarily to differences in the dataset used, although some differences are also due to differences in projection methods and assumptions. Even though K–12 teachers constitute the majority of CalSTRS Defined Benefit Program members, several nonteaching staff are included in the CalSTRS dataset that are not included in the California Department of Education's Personnel Assignment Information Form (PAIF) dataset of K–12 teachers (see appendix A for details). Table B1 illustrates the difference between the CalSTRS data and the PAIF data for the five-year period ending 2005/06, showing that K–12 teachers constitute just under 70 percent of the total active membership of the CalSTRS Defined Benefit Program.

Table B2 shows the differences between the number of retirements of CalSTRS Defined Benefit Program members and retirements of K–12 teachers only. Teacher retirements accounted for approximately 60 percent of the retirements in the CalSTRS program over the past five years. Thus, K–12 teacher retirements are disproportionately low relative to the proportion of K–12 teachers in the CalSTRS Defined Benefit Program. For example, in 2006 teachers represented 67.7 percent of all CalSTRS members, but only 60.1 percent of the retirements of CalSTRS members.[15]

Correspondingly, the K–12 teacher retirement rate is lower than the CalSTRS retirement rate over the five-year period (see figure B1).

Thus, because of different underlying data and assumptions, the estimates for teacher retirements do not match those in the three reports referenced above. For example, in Guha et al. (2006) the number of teacher retirements reported annually from 1995/96 through 2004/05 is

TABLE B1
Total California State Teachers' Retirement System Defined Benefit Program members and total number of teachers from the California Basic Educational Data System

Year	Total Defined Benefit Program members	Total teachers	Teachers as percentage of Defined Benefit Program members
2002	442,208	303,067	68.5
2003	448,478	308,818	68.9
2004	444,680	305,131	68.6
2005	450,282	305,766	67.9
2006	453,365	307,017	67.7
Total	2,239,013	1,529,799	68.3

Source: Authors' analysis based on California State Teachers' Retirement System (2006) data and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request; see appendix A for more details.

TABLE B2

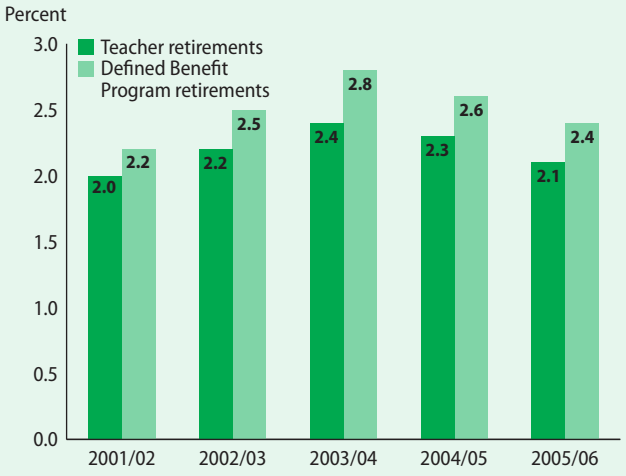
California State Teachers' Retirement System Defined Benefit Program retirements and K–12 teacher retirements

Year	Defined Benefit Program retirements	Teacher retirements	Teacher retirements as percentage of Defined Benefit Program retirements
2002	9,762	5,971	61.2
2003	11,189	6,842	61.2
2004	12,301	7,282	59.2
2005	11,624	6,906	59.4
2006	10,877	6,536	60.1
Total	55,753	33,537	60.2

Source: Authors' analysis based on data from California State Teachers' Retirement System (2006) and California State Teachers' Retirement System data for 2001/02–2005/06 obtained by special request adjusted to account for K–12 teachers only using data from the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form obtained by special request; see appendix A for details of the analysis.

FIGURE B1

Retirement rates for California State Teachers' Retirement System members and K–12 teachers, 2001/02–2005/06



Source: Authors' analysis based on California State Teachers' Retirement System (2006) data and California State Teachers' Retirement System 2001/02–2005/06 data obtained by special request and adjusted to account for K–12 teachers only using data from the California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request. See appendix A for details of the analysis.

based on total CalSTRS Defined Benefit Program membership. For the four years that overlap with the retirement data here, those figures are more than 1.5 times larger than the estimates of K–12 teacher retirements. Also, Guha et al. project that up to 98,000 teachers, or 32 percent of the teaching workforce, could retire between 2005/06 and 2015/16. By contrast, the projections in this report suggest that 78,000 teachers, or 25 percent of the current teaching workforce, will retire between 2006/07 and 2015/16. This estimate from Guha et al. is based on age data for K–12 teachers only, but they assume that all teachers older than 50 will retire within the next 10 years, which is unlikely to be the case because some teachers continue to teach after age 60. For instance, for 2005/06, the latest year available, the data for this report show that there were more than 14,000 teachers in the workforce who were at least 61 years of age.

The Legislative Analyst's Office's (2006) *Cal Facts 2006* publication projects retirements to be 3.2 percent annually between 2004/05 and 2013/14. While this report does not project the total number of teachers into future years (that would require making assumptions about factors such as economic conditions), the Legislative Analyst's Office's projections are based on total CalSTRS membership, not K–12 teachers only.

APPENDIX C
SUPPLEMENTARY DATA TABLES

TABLE C1

Percentage of underprepared K–12 teachers in California by county and quintile, 2005/06

Rank	County	Percent	Quintile
1	Imperial	12.5	5
2	San Joaquin	10.1	5
3	Merced	9.5	5
4	Los Angeles	8.5	5
5	Lassen	8.3	5
6	Napa	7.6	5
7	Yuba	7.3	5
8	Contra Costa	7.1	5
9	San Bernardino	6.9	5
10	San Mateo	6.4	5
11	Monterey	6.3	5
12	Alameda	6.2	4
13	San Benito	6.1	4
14	Kern	6.0	4
15	Solano	6.0	4
16	Riverside	5.9	4
17	Santa Clara	5.8	4
18	Alpine	5.6	4
19	Mono	5.5	4
20	Santa Cruz	5.3	4
21	Kings	5.1	4
22	Nevada	4.6	4
23	San Diego	4.1	4
24	Fresno	4.0	3
25	Tulare	3.8	3
26	Stanislaus	3.6	3
27	San Francisco	3.5	3
28	Madera	3.4	3
29	Sacramento	3.4	3
30	Colusa	3.3	3
31	Yolo	3.3	3
32	Sutter	3.2	3
33	Mendocino	3.2	3
34	Marin	3.0	3
35	Ventura	2.8	2
36	Orange	2.7	2
37	Inyo	2.6	2
38	Modoc	2.6	2
39	Glenn	2.4	2
40	Sonoma	2.0	2
41	El Dorado	1.9	2
42	Lake	1.9	2
43	Amador	1.7	2
44	Plumas	1.7	2
45	Santa Barbara	1.7	2
46	Calaveras	1.6	2
47	Tuolumne	1.6	1
48	Shasta	1.5	1
49	Butte	1.4	1
50	Trinity	1.4	1
51	Placer	1.4	1
52	Mariposa	1.4	1
53	Siskiyou	0.9	1
54	Humboldt	0.9	1
55	Tehama	0.9	1
56	Del Norte	0.8	1
57	San Luis Obispo	0.7	1
58	Sierra	0.0	1

Source: Authors' analysis based on data from California Department of Education (2005).

TABLE C2

Number of underprepared K–12 teachers in California by county and quintile, 2005/06

Rank	County	Underprepared teachers	Quintile
1	Los Angeles	6,891	5
2	San Bernardino	1,332	5
3	Riverside	1,074	5
4	San Diego	1,042	5
5	Santa Clara	743	5
6	San Joaquin	698	5
7	Alameda	692	5
8	Orange	611	5
9	Contra Costa	596	5
10	Kern	498	5
11	Sacramento	409	5
12	Fresno	382	4
13	San Mateo	303	4
14	Merced	264	4
15	Imperial	222	4
16	Monterey	218	4
17	Solano	208	4
18	Ventura	192	4
19	Stanislaus	188	4
20	Tulare	171	4
21	San Francisco	117	4
22	Santa Cruz	104	4
23	Napa	84	4
24	Sonoma	77	3
25	Kings	71	3
26	Yuba	60	3
27	Santa Barbara	57	3
28	Yolo	52	3
29	Madera	50	3
30	Marin	50	3
31	Placer	45	3
32	Nevada	35	3
33	San Benito	34	3
34	Sutter	30	3
35	El Dorado	29	2
36	Mendocino	28	2
37	Lassen	27	2
38	Butte	26	2
39	Shasta	23	2
40	San Luis Obispo	14	2
41	Humboldt	10	2
42	Lake	10	2
43	Colusa	9	2
44	Mono	9	2
45	Glenn	8	2
46	Tuolumne	7	2
47	Calaveras	6	1
48	Amador	5	1
49	Inyo	5	1
50	Tehama	5	1
51	Modoc	4	1
52	Siskiyou	4	1
53	Plumas	3	1
54	Del Norte	2	1
55	Mariposa	2	1
56	Trinity	2	1
57	Alpine	1	1
58	Sierra	0	1
	Total	17,839	

Source: Authors' analysis based on data from California Department of Education (2005).

TABLE C3

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on projected teacher retirements, by county and quintile

Rank	County	Percentage change	Quintile
1	Plumas	59.1	5
2	Siskiyou	48.2	5
3	Sierra	47.6	5
4	Trinity	47.2	5
5	Sacramento	45.1	5
6	Amador	45.0	5
7	Del Norte	44.9	5
8	Modoc	44.5	5
9	Calaveras	44.3	5
10	Mendocino	43.9	5
11	Tuolumne	41.4	5
12	Nevada	39.5	4
13	Lassen	38.9	4
14	Shasta	38.8	4
15	Mariposa	38.7	4
16	Inyo	37.2	4
17	Lake	37.2	4
18	Yuba	36.7	4
19	Sonoma	36.5	4
20	San Luis Obispo	36.3	4
21	Tehama	34.8	4
22	Humboldt	34.3	4
23	El Dorado	32.1	4
24	Santa Cruz	32.0	3
25	Solano	31.8	3
26	Butte	31.4	3
27	Monterey	31.0	3
28	Sutter	30.1	3
29	Tulare	30.0	3
30	Stanislaus	29.7	3
31	Santa Clara	29.3	3
32	Madera	28.6	3
33	San Francisco	28.1	3
34	Napa	28.1	3
35	San Joaquin	27.2	2
36	Contra Costa	27.2	2
37	Glenn	26.5	2
38	Alameda	26.3	2
39	Fresno	26.3	2
40	Ventura	25.9	2
41	Kern	25.6	2
42	San Diego	25.3	2
43	Placer	25.1	2
44	Santa Barbara	25.0	2
45	Imperial	25.0	2
46	Yolo	25.0	2
47	Marin	24.6	1
48	Orange	24.2	1
49	San Mateo	24.2	1
50	San Benito	23.9	1
51	Kings	23.7	1
52	San Bernardino	22.9	1
53	Merced	22.8	1
54	Mono	21.8	1
55	Riverside	20.3	1
56	Los Angeles	19.8	1
57	Colusa	18.3	1
58	Alpine	18.1	1

Note: The two datasets were used to estimate retirements for K–12 teachers only; see appendix A for details.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request.

TABLE C4

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on teacher retirement projections, by county and quintile

Rank	County	Number of teachers	Quintile
1	Los Angeles	15,907	5
2	San Diego	6,371	5
3	Orange	5,529	5
4	Sacramento	5,404	5
5	San Bernardino	4,436	5
6	Santa Clara	3,746	5
7	Riverside	3,678	5
8	Alameda	2,864	5
9	Fresno	2,519	5
10	Contra Costa	2,259	5
11	Kern	2,115	5
12	San Joaquin	1,867	4
13	Ventura	1,745	4
14	Stanislaus	1,553	4
15	Sonoma	1,398	4
16	Tulare	1,358	4
17	San Mateo	1,150	4
18	Solano	1,094	4
19	Monterey	1,069	4
20	San Francisco	938	4
21	Santa Barbara	851	4
22	Placer	810	4
23	San Luis Obispo	694	4
24	Merced	632	3
25	Santa Cruz	631	3
26	Shasta	587	3
27	Butte	566	3
28	El Dorado	481	3
29	Imperial	444	3
30	Madera	415	3
31	Marin	415	3
32	Humboldt	395	3
33	Yolo	389	3
34	Mendocino	379	3
35	Kings	327	2
36	Napa	309	2
37	Nevada	303	2
38	Yuba	300	2
39	Sutter	280	2
40	Siskiyou	209	2
41	Tehama	203	2
42	Lake	195	2
43	Tuolumne	180	2
44	Calaveras	161	2
45	San Benito	134	2
46	Amador	129	2
47	Lassen	126	1
48	Del Norte	120	1
49	Plumas	105	1
50	Glenn	90	1
51	Inyo	72	1
52	Modoc	69	1
53	Trinity	67	1
54	Mariposa	56	1
55	Colusa	49	1
56	Mono	36	1
57	Sierra	20	1
58	Alpine	3	1
	Total	78,232	

Note: The two datasets were used to estimate retirements for K–12 teachers only; see appendix A for details.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request.

TABLE C5

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on student enrollment projections, by county and quintile

Rank	County	Percentage change	Quintile
1	Riverside	38.3	5
2	Placer	36.5	5
3	Yuba	30.9	5
4	San Joaquin	26.0	5
5	Sutter	24.1	5
6	Kern	20.1	5
7	Colusa	19.2	5
8	Kings	19.0	5
9	Tulare	18.9	5
10	Merced	18.6	5
11	Mono	17.7	5
12	Madera	16.5	4
13	Stanislaus	15.6	4
14	Lake	15.1	4
15	Napa	15.1	4
16	Imperial	14.7	4
17	Tehama	14.5	4
18	Sierra	13.4	4
19	Sacramento	13.3	4
20	San Bernardino	12.7	4
21	Alpine	11.3	4
22	Yolo	9.5	4
23	Fresno	9.4	4
24	El Dorado	8.3	3
25	Calaveras	6.3	3
26	Nevada	4.0	3
27	Glenn	4.0	3
28	Butte	3.9	3
29	Shasta	3.7	3
30	Marin	3.0	3
31	Monterey	2.9	3
32	Santa Barbara	1.9	3
33	Contra Costa	1.5	3
34	Sonoma	0.3	3
35	San Luis Obispo	–0.3	2
36	Trinity	–0.6	2
37	San Benito	–1.1	2
38	Santa Clara	–1.8	2
39	Alameda	–2.5	2
40	Santa Cruz	–2.8	2
41	Ventura	–3.0	2
42	San Diego	–3.4	2
43	Tuolumne	–3.5	2
44	Amador	–3.8	2
45	Mendocino	–4.9	2
46	Siskiyou	–5.2	2
47	San Mateo	–5.5	1
48	Plumas	–6.3	1
49	Solano	–6.7	1
50	Humboldt	–7.4	1
51	Orange	–7.6	1
52	Lassen	–7.7	1
53	Del Norte	–8.0	1
54	Inyo	–10.5	1
55	San Francisco	–13.7	1
56	Modoc	–15.3	1
57	Los Angeles	–15.7	1
58	Mariposa	–16.9	1

Note: Workforce needs were computed by applying county-level pupil–teacher ratios, as reported in California Department of Education (2006a), to projected enrollments.

Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a).

TABLE C6

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on student enrollment projections, by county and quintile

Rank	County	Number of teachers	Quintile
1	Riverside	6,944	5
2	San Bernardino	2,464	5
3	San Joaquin	1,790	5
4	Kern	1,657	5
5	Sacramento	1,586	5
6	Placer	1,178	5
7	Fresno	904	5
8	Tulare	858	5
9	Stanislaus	817	5
10	Merced	515	5
11	Imperial	261	4
12	Kings	261	4
13	Yuba	252	4
14	Madera	239	4
15	Sutter	224	4
16	Napa	166	4
17	Yolo	148	4
18	El Dorado	125	4
19	Contra Costa	123	4
20	Monterey	100	4
21	Tehama	85	4
22	Lake	79	4
23	Butte	70	4
24	Santa Barbara	65	3
25	Shasta	55	3
26	Colusa	52	3
27	Marin	51	3
28	Nevada	31	3
29	Mono	29	3
30	Calaveras	23	3
31	Glenn	14	3
32	Sonoma	10	3
33	Sierra	6	3
34	Alpine	2	3
35	Trinity	–1	2
36	San Luis Obispo	–6	2
37	San Benito	–6	2
38	Plumas	–11	2
39	Amador	–11	2
40	Tuolumne	–15	2
41	Inyo	–20	2
42	Del Norte	–21	2
43	Siskiyou	–22	2
44	Modoc	–24	2
45	Mariposa	–24	2
46	Lassen	–25	2
47	Mendocino	–42	1
48	Santa Cruz	–56	1
49	Humboldt	–85	1
50	Ventura	–204	1
51	Santa Clara	–226	1
52	Solano	–231	1
53	San Mateo	–261	1
54	Alameda	–268	1
55	San Francisco	–458	1
56	San Diego	–852	1
57	Orange	–1,724	1
58	Los Angeles	–12,619	1
	Total	3,972	

Note: Workforce needs were computed by applying county-level pupil–teacher ratios, as reported in California Department of Education (2006a), to projected enrollments.

Source: Authors' analysis based on data from California Department of Finance (2006) and California Department of Education (2006a).

TABLE C7

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on projected teacher retirements and student enrollment, by county and quintile

Rank	County	Percentage change	Quintile
1	Yuba	67.6	5
2	Placer	61.5	5
3	Sierra	61.0	5
4	Riverside	58.6	5
5	Sacramento	58.4	5
6	Sutter	54.2	5
7	San Joaquin	53.2	5
8	Plumas	52.8	5
9	Lake	52.3	5
10	Calaveras	50.5	5
11	Tehama	49.3	5
12	Tulare	48.9	4
13	Trinity	46.7	4
14	Kern	45.7	4
15	Stanislaus	45.3	4
16	Madera	45.0	4
17	Nevada	43.5	4
18	Napa	43.1	4
19	Siskiyou	43.1	4
20	Kings	42.7	4
21	Shasta	42.5	4
22	Merced	41.3	4
23	Amador	41.2	4
24	El Dorado	40.5	3
25	Imperial	39.6	3
26	Mono	39.5	3
27	Mendocino	39.0	3
28	Tuolumne	38.0	3
29	Colusa	37.5	3
30	Del Norte	36.9	3
31	Sonoma	36.8	3
32	San Luis Obispo	35.9	3
33	Fresno	35.7	3
34	San Bernardino	35.7	3
35	Butte	35.3	2
36	Yolo	34.4	2
37	Monterey	33.9	2
38	Lassen	31.3	2
39	Glenn	30.5	2
40	Alpine	29.3	2
41	Modoc	29.2	2
42	Santa Cruz	29.2	2
43	Contra Costa	28.6	2
44	Marin	27.7	2
45	Santa Clara	27.6	2
46	Humboldt	26.9	2
47	Santa Barbara	26.9	1
48	Inyo	26.7	1
49	Solano	25.1	1
50	Alameda	23.9	1
51	San Benito	22.9	1
52	Ventura	22.8	1
53	San Diego	21.9	1
54	Mariposa	21.8	1
55	San Mateo	18.7	1
56	Orange	16.7	1
57	San Francisco	14.4	1
58	Los Angeles	4.1	1

Note: The datasets were used to estimate retirements for K–12 teachers only. Workforce needs were computed by applying county-level pupil–teacher ratios, as reported in California Department of Education (2006a), to projected enrollments.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request, for the retirement projections; California Department of Finance (2006), for enrollment projections.

TABLE C8

Estimated percentage change in the number of K–12 teachers needed in California from 2005/06 to 2015/16 based on projected teacher retirements and student enrollment, by county and quintile

Rank	County	Number of teachers	Quintile
1	Riverside	10,622	5
2	Sacramento	6,990	5
3	San Bernardino	6,901	5
4	San Diego	5,519	5
5	Orange	3,805	5
6	Kern	3,772	5
7	San Joaquin	3,657	5
8	Santa Clara	3,520	5
9	Fresno	3,423	5
10	Los Angeles	3,288	5
11	Alameda	2,596	5
12	Contra Costa	2,381	4
13	Stanislaus	2,370	4
14	Tulare	2,216	4
15	Placer	1,988	4
16	Ventura	1,541	4
17	Sonoma	1,408	4
18	Monterey	1,169	4
19	Merced	1,148	4
20	Santa Barbara	916	4
21	San Mateo	889	4
22	Solano	863	4
23	Imperial	705	4
24	San Luis Obispo	688	3
25	Madera	654	3
26	Shasta	642	3
27	Butte	637	3
28	El Dorado	606	3
29	Kings	588	3
30	Santa Cruz	575	3
31	Yuba	553	3
32	Yolo	537	3
33	Sutter	504	3
34	San Francisco	480	3
35	Napa	475	2
36	Marin	466	2
37	Mendocino	337	2
38	Nevada	334	2
39	Humboldt	310	2
40	Tehama	288	2
41	Lake	275	2
42	Siskiyou	187	2
43	Calaveras	184	2
44	Tuolumne	165	2
45	San Benito	128	2
46	Amador	119	2
47	Glenn	104	1
48	Colusa	101	1
49	Lassen	101	1
50	Del Norte	99	1
51	Plumas	94	1
52	Trinity	66	1
53	Mono	64	1
54	Inyo	52	1
55	Modoc	46	1
56	Mariposa	31	1
57	Sierra	26	1
58	Alpine	5	1
	Total	82,208	

Note: The datasets were used to estimate retirements for K–12 teachers only. Workforce needs were computed by applying county-level pupil–teacher ratios, as reported in California Department of Education (2006a), to projected enrollments.

Source: Authors' analysis based on California State Teachers' Retirement System data for 1994/95–2005/06 obtained by special request and California Department of Education's 2001/02–2005/06 Personnel Assignment Information Form data obtained by special request, for the retirement projections; California Department of Finance (2006), for enrollment projections.

TABLE C9

Student enrollment in California for selected years, by county

				Percentage change	
County	1996/97	2005/06	2015/16	1996/97–2005/06	2005/06–2015/16
Alameda	202,752	213,127	209,106	5.1	–1.9
Alpine	164	133	148	–18.9	11.3
Amador	4,837	4,858	5,107	0.4	5.1
Butte	34,443	33,145	34,488	–3.8	4.1
Calaveras	6,709	6,830	7,290	1.8	6.7
Colusa	4,264	4,497	5,366	5.5	19.3
Contra Costa	142,733	164,180	168,252	15.0	2.5
Del Norte	5,307	5,019	4,640	–5.4	–7.6
El Dorado	28,435	29,153	31,777	2.5	9.0
Fresno	172,180	192,244	210,627	11.7	9.6
Glenn	6,150	5,945	6,182	–3.3	4.0
Humboldt	21,506	19,190	17,830	–10.8	–7.1
Imperial	31,724	36,046	41,337	13.6	14.7
Inyo	3,500	3,112	2,786	–11.1	–10.5
Kern	136,028	170,025	204,537	25.0	20.3
Kings	24,005	27,281	32,502	13.6	19.1
Lake	10,013	10,181	11,743	1.7	15.3
Lassen	5,618	5,690	5,254	1.3	–7.7
Los Angeles	1,511,670	1,673,255	1,440,915	10.7	–13.9
Madera	23,856	28,228	32,877	18.3	16.5
Marin	27,104	28,669	29,635	5.8	3.4
Mariposa	2,768	2,417	2,012	–12.7	–16.8
Mendocino	15,819	13,973	13,385	–11.7	–4.2
Merced	47,617	56,319	66,971	18.3	18.9
Modoc	2,324	2,140	1,819	–7.9	–15.0
Mono	1,936	2,310	2,721	19.3	17.8
Monterey	65,435	69,574	72,412	6.3	4.1
Napa	18,411	19,884	22,899	8.0	15.2
Nevada	13,549	14,685	15,281	8.4	4.1
Orange	436,687	507,635	471,618	16.2	–7.1
Placer	46,395	63,691	86,917	37.3	36.5
Plumas	3,695	2,905	2,723	–21.4	–6.3
Riverside	272,498	393,563	546,267	44.4	38.8
Sacramento	198,632	238,470	270,619	20.1	13.5
San Benito	9,883	11,576	11,483	17.1	–0.8
San Bernardino	340,382	426,080	482,059	25.2	13.1
San Diego	442,121	492,911	478,514	11.5	–2.9
San Francisco	62,115	57,689	49,780	–7.1	–13.7
San Joaquin	107,198	134,665	171,693	25.6	27.5

(CONTINUED)

TABLE C9 (CONTINUED)

Student enrollment in California for selected years, by county

				Percentage change	
County	1996/97	2005/06	2015/16	1996/97–2005/06	2005/06–2015/16
San Luis Obispo	35,609	35,736	35,854	0.4	0.3
San Mateo	91,225	87,924	83,514	–3.6	–5.0
Santa Barbara	61,485	67,225	68,506	9.3	1.9
Santa Clara	243,748	252,733	250,123	3.7	–1.0
Santa Cruz	38,888	38,527	37,465	–0.9	–2.8
Shasta	30,224	29,242	30,417	–3.2	4.0
Sierra	861	558	633	–35.2	13.4
Siskiyou	8,572	6,466	6,145	–24.6	–5.0
Solano	67,286	70,301	65,735	4.5	–6.5
Sonoma	69,231	71,751	72,054	3.6	0.4
Stanislaus	89,560	105,733	123,410	18.1	16.7
Sutter	15,241	17,770	22,048	16.6	24.1
Tehama	11,079	11,149	12,758	0.6	14.4
Trinity	2,454	2,007	1,996	–18.2	–0.5
Tulare	82,371	93,038	111,058	12.9	19.4
Tuolumne	8,030	7,715	7,467	–3.9	–3.2
Ventura	126,921	142,957	139,203	12.6	–2.6
Yolo	25,834	29,444	32,232	14.0	9.5
Yuba	13,073	15,332	20,065	17.3	30.9

Source: Authors' analysis based on data from California Department of Finance (2006).

APPENDIX D
INSTITUTIONS OF HIGHER EDUCATION TRENDS IN ISSUING CREDENTIALS

Each year the California Commission on Teacher Credentialing issues a report to the Legislature on recent trends in the preparation of new teachers. These reports show the number of full credentials (preliminary and professional credentials) issued to teachers who have been prepared through both traditional and intern delivery models run by institutions of higher education. The numbers include individuals who received their initial certification (first time) and individuals who previously held another type of certification, such as an emergency permit (new type). Table D1 shows the number of credentials issued for the past three years by each California institution of higher education.

TABLE D1
Credentials issued by California institutions of higher education, 2003/04–2005/06

Institution	2003/04	2004/05	2005/06	Percentage change 2003/04–2005/06
Alliant International University	73	64	56	–23
Antioch University	34	31	31	–9
Argosy University	34	31	39	15
Azusa Pacific University	821	736	680	–17
Bethany College of Assemblies of God	23	17	14	–39
Biola University	82	87	92	12
California Baptist University	166	173	124	–25
California Lutheran University	140	126	150	7
California State University, Bakersfield	610	498	536	–12
California State University, Channel Islands	64	96	102	59
California State University, Chico	420	309	358	–15
California State University, Dominguez Hills	1,202	1,120	650	–46
California State University, Fresno	712	813	654	–8
California State University, Fullerton	1,030	995	852	–17
California State University, Hayward/East Bay	521	345	453	–13
California State University, Humboldt	174	96	155	–11
California State University, Long Beach	1,176	1,089	1,049	–11
California State University, Los Angeles	1,393	1,156	945	–32
California State University, Monterey Bay	268	253	183	–32
California State University, Northridge	1,303	1,355	1,121	–14
California State University, Pomona	466	382	363	–22
California State University, Sacramento	756	682	666	–12
California State University, San Bernardino	1,021	839	743	–27
California State University, San Diego	705	612	665	–6
California State University, San Francisco	974	739	584	–40
California State University, San Jose	597	684	477	–20
California State University, San Luis Obispo	198	152	207	5
California State University, San Marcos	528	557	461	–13
California State University, Sonoma	341	297	343	1
California State University, Stanislaus	553	515	469	–15

(CONTINUED)

TABLE D1 (CONTINUED)

Credentials issued by California institutions of higher education, 2003/04–2005/06

Institution	2003/04	2004/05	2005/06	Percentage change 2003/04–2005/06
Loyola Marymount University	217	310	236	9
Mills College	59	50	53	–10
Mount St. Mary's College	67	55	57	–15
National Hispanic University	74	70	57	–23
National University	3,629	2,851	2,699	–26
New College of California	22	31	27	23
Notre Dame de Namur University	153	105	116	–24
Nova Southeastern University	10	13	10	0
Occidental College	26	6	21	–19
Pacific Oaks College	47	39	51	9
Pacific Union College	28	42	20	–29
Patten University	25	12	17	–32
Pepperdine University - Los Angeles	280	278	231	–18
Pepperdine University - Malibu	34	19	29	–15
Point Loma Nazarene University	200	248	260	30
Santa Clara University	98	116	75	–23
Simpson College	77	87	86	12
St. Mary's College of California	183	138	139	–24
Stanford University	64	68	89	39
The Master's College	38	25	14	–63
University of California, Berkeley	88	92	58	–34
University of California, Davis	167	194	143	–14
University of California, Irvine	195	187	190	–3
University of California, Los Angeles	267	293	255	–4
University of California, Riverside	178	147	149	–16
University of California, San Diego	80	62	105	31
University of California, Santa Barbara	122	94	88	–28
University of California, Santa Cruz	130	108	111	–15
University of La Verne	406	359	345	–15
University of Phoenix	493	436	834	69
University of Redlands	189	191	200	6
University of San Diego	98	90	94	–4
University of San Francisco	200	184	183	–9
University of Southern California	77	32	66	–14
University of the Pacific	83	80	78	–6
Vanguard University	56	59	49	–13
Westmont College	11	13	17	55
Whittier College	77	70	62	–19

Note: Six institutions of higher education are excluded because of missing credential data from one or more years.

Source: California Commission on Teacher Credentialing (2005, 2006, 2007).

NOTES

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1. County and regional delineations do not necessarily correspond to the boundaries of local teacher labor markets. However, since information about actual boundaries was lacking, county and regional delineations were used as the unit of analysis to investigate variation in key labor market variables. There may also be substantial variation within counties that the analysis does not capture.

2. Analysis of county-level teacher attrition would require having individual teacher identification numbers that could be tracked longitudinally to identify when a teacher leaves the profession.

3. When interns are excluded from the definition, approximately 9,000 teachers, or 3 percent of the current workforce, are underprepared.

4. The increase in retirements between the actual 2005/06 figure and the projected 2006/07 figure, comparable to other estimates (see, for instance, Legislative Analyst's Office 2006), reflects the large number of teachers approaching retirement age in 2006/07, as the first wave of baby boomers reach 60.

5. Of the 375 schools in Riverside County with complete data on Academic Performance Index (API) values for 2005/06, 91 were classified in the bottom two deciles on the API (California Department of Education 2006b) A binomial test shows that this number is statistically different at the 5 percent level from the expected number based on chance alone (75), suggesting that schools in Riverside County are lower performing compared with schools in the state as a whole.

6. Of the 1,878 schools in the Central Valley with complete data on API values for 2005/06, 467 were classified in the bottom two deciles on the API (California Department of Education, 2006b). This is different from the number of schools that would be expected to be in the bottom two deciles based on chance alone (20 percent of 1,878 would be 375.6 schools). A binomial test shows that this is statistically different at the 1 percent level from the expected number based on chance alone (375.6), suggesting that schools in the Central Valley are lower performing compared with schools in the state as a whole.

7. Part-time teachers accounted for 6 percent of the California teacher workforce as of 2005/06. To assess the impact of including part-time teachers, a sensitivity analysis was performed by excluding part-time teachers in the calculation of pupil-teacher ratios and comparing the results to results of the analysis that included part-time teachers. The percentage of workforce needed due to changes in student enrollment (table C5) remains exactly the same, since the number of teachers in 2006 cancels out of the equation (in other

words, the reported percentage in table C5 is equal to the number increase/decrease in student enrollment over the 10-year period divided by the number of students in 2006). The number of new teachers needed (table C6) changes, but these changes as a percentage of the workforce in 2006 (using the original workforce numbers, which include full-time and part-time teachers) are all less than 4 percent.

8. J. Dickerson, personal communication with author, July 18, 2007; E. Derman, personal communication with author, February 4, 2008.

9. To illustrate the difficulty in knowing the overall biases embedded in the projections, consider the following cases. If teachers' overall retirement benefits were to improve during the projection period, teachers might choose to retire earlier than they otherwise would have. Furgeson, Strauss, and Vogt (2006), for example, show that changes in defined benefit pension incentives have statistically significant impacts on the retirement behavior of teachers in Pennsylvania. Such changes in benefits might mean that actual retirements would be greater than projected retirements. Other conditions could result in actual retirements being lower than projected retirements. For example, if school-level working conditions were to improve, retirement-age teachers might choose to stay in the profession longer than they otherwise would have. If this were the case, the projected retirements would overstate actual retirements.

10. For this sensitivity analysis researchers used the dataset obtained from CalSTRS that includes all members (not just teachers) because the CalSTRS data go back to 1995/96, whereas the California Department of Education dataset only goes back to 2001/02. The retirement rates calculated for one and five years would be the same regardless of whether the California Department of Education data or the CalSTRS data were used, because the researchers assume that the same proportion of teachers retire as total CalSTRS members do.

11. At the state level the three retirement rates are similar: 2.34 percent for the 1-year rate, 2.40 percent for the 5-year rate, and 2.07 percent for the 12-year rate.

12. At the state level, using a 3-year, 5-year, or 12-year retirement rate made little difference (a 1-year rate could not be used to project future retirements because certain districts had age categories in which no members retired in 2005/06, which made it impossible to project how many members at that age would retire in future years). The total projected number of members retiring was 111,353 using a 3-year average rate, 111,769 using a 5-year rate, and 110,734 using a 12-year rate. The difference between the lowest and highest estimate is less than 1 percent. Small differences when using the 3-, 5-, and 12-year retirement rates were also observed for individual counties. Results are available from the West Regional Educational Laboratory on request.

13. Historical data from this dataset show that there are commonly a positive number of new teachers over age 60 joining the teaching profession in any given year, but the numbers are small.

14. Sensitivity analyses, on using different stay rates (2004/05 and the average stay rate for 2003/04 and 2004/05) found that differences in projections of the total number of teachers retiring over the 10-year period in California were less than 2 percent.

15. While tables B1 and B2 show that across all ages teachers tend to retire at a lower rate than the CalSTRS Defined Benefit Program members, this does not contradict the assumption in appendix A that all certificated members of the same age retire at the same rate as teachers. That assumption is conditional on age, whereas the data presented in tables B1 and B2 are not.

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