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Segregated by Teacher Experience in California

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# Segregated by Teacher Experience in California



A Policy Brief

by Ryan Pflieger and Gary Orfield

May 2024

The Civil Rights Project  
*Proyecto Derechos Civiles*



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# Segregated by Teacher Experience in California

## A Policy Brief

by Ryan Pflieger and Gary Orfield

### Introduction

Among the many inequalities associated with racial segregation in schools, one notable disparity is the unequal access to experienced teachers. Students benefit in several ways from more experienced teachers. For example, a developing body of research finds teachers with more years of teaching experience increase student growth on achievement tests more than novice teachers (Kini & Podolsky, 2016; Ladd & Sorensen, 2017). New teachers can educate children, mere experience does not produce excellence, and teaching is just one of many factors influencing school outcomes, but, on average, researchers find a positive relationship between years of experience and multiple student outcomes. A concerning trend is apparent when analyzing teacher experience in schools with different racial compositions of students. Schools with high proportions of Black or Latinx students have a disproportionate share of inexperienced teachers, both throughout the nation and in California specifically (Clotfelter, Ladd, & Clifton, 2023; Darling-Hammond, 2004; Goldhaber, Lavery, & Theobald, 2015; Knight, 2019; Learning Policy Institute, 2023; Shields et al., 1999).

Several policies and initiatives have attempted to address the inequitable distribution of experience, including the *Every Student Succeeds Act* (2015), and other influential federal policies in recent years (Knight, 2019). State-level policies and analyses in California have addressed the racial distribution of teacher experience, including the State's release of three annual reports in 2015, [2016](#), and [2017](#) titled, *California State Plan to Ensure Equitable Access to Excellent Educators*. Public pressure and court challenges may also have influenced the distribution of teacher experience. Given the importance of teacher experience and possible changes to the racial distribution of experience in

recent years, this policy brief examines the distribution of teacher experience across segregated schools in California.

We analyzed 7 years of the most recent publicly available data from California’s public schools, focusing on the relationship between student race and teacher experience. We categorized teacher experience in various ways: identifying teachers as “novices” based on 1, 2, or 3 years of teaching experience, and calculating the average and median years of experience at each school. Segregation was assessed from multiple angles by grouping schools based on their racial composition in six different ways, including categories such as “majority non-white” and “90% or more underrepresented minorities” that measure varying degrees of racial concentration (see the appendix for details on the data, measures, and definitions used in this report). We also present a regression model to investigate whether the relationship between teacher experience and racial composition holds when taking into account other variables, such as poverty status. The multiple ways of assessing the relationship all point to a discouraging conclusion: California continues to maintain a system of segregated schools that are separate and unequal in terms of teacher experience.

### **Key Findings for Policymakers and School Stakeholders:**

- **Unequal Distribution of Teacher Experience:** Schools with the highest proportions of underrepresented students of color had the highest proportions of novice teachers. Schools with majority white student enrollment, on average, had teachers with more years of teaching experience than schools with greater proportions of underrepresented students. In short, racially segregated schools were associated with a sizable gap in teacher experience.

- **Growing Disparities Over Time:** Between academic years 2012-13 and 2018-19, the gap in teacher experience across segregated schools widened for teachers with 1, 2 and 3 or fewer years of experience.
- **Intense Segregation and Intense Inequality:** Of the five categories of segregated schools studied, the most intensely segregated schools – with 90-100% underrepresented minorities – had the least experienced teachers. In the most recent school year examined, the teacher experience gap was clearly evident. Intensely segregated schools had approximately 33% more novice teachers than schools with a majority white and Asian enrollment (12.7% vs. 9.6% novice teachers, respectively).
- **Black and White Inequality:** Predominantly white schools, defined as the top quintile by proportion white, had teachers with an average of 1.4 more years of experience than schools in the top quintile of Black students.
- **Consistent Correlations:** The mean number of years of teaching experience had a negative correlation with Black student enrollment and a positive correlation with Asian student enrollment in each year and with each measure analyzed.
- **Gaps Robust to Different Measures of Experience:** Teacher experience gaps across student race, and the increases in those gaps over time, were identified across several different measures of teacher experience, including the proportion of teachers with 1, 2, 3 or fewer years of experience; mean years of experience; median years of experience; and schools with a majority novice faculty.
- **Inequalities Beyond Simple Correlation:** Employing a first-differences statistical model (see Appendix) that controls for multiple alternative explanations, we found that increases in the proportion of Black and Latinx students were both independently associated with a decrease in teaching experience.

The remainder of this report details and provides context for these findings. We conclude with a discussion of several possible ways to address the inequitable distribution of teacher experience in California.

## **Novice Teachers In California Schools**

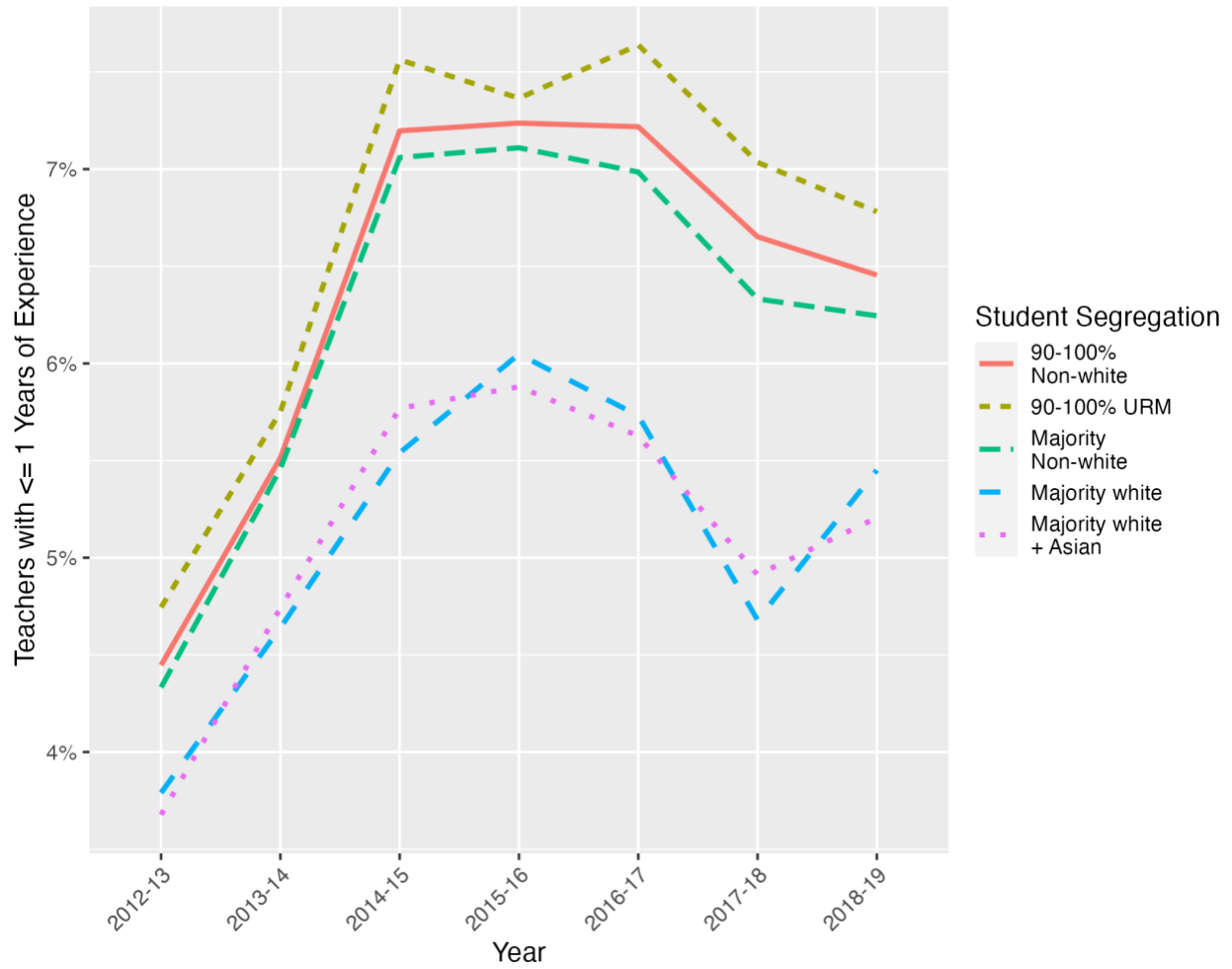
There are multiple possible mechanisms through which teacher experience may improve schooling, which is why the distribution of teacher experience across schools matters. On-the-job experience may enhance teachers' pedagogical and curricular knowledge, deepen learning goals, and improve classroom practices. Faculties with greater experience may also have positive school-wide effects through improved teacher support networks and mentoring among teachers.

Our analysis found that teaching experience varied with student segregation in California's schools (Figures 1a-c). In each of the 7 years analyzed, majority white schools had fewer novice teachers than schools with higher proportions of racially marginalized students. In particular, schools with a student composition that was 90% or greater underrepresented minorities had a higher proportion of novice teachers than schools that were majority white or majority white and Asian. That teacher experience gap doubled from approximately 1.5 percentage points to 3 percentage points between 2012-13 and 2018-19 (for 2 or fewer years of experience). In 2018-19, intensely segregated schools with greater than 90% underrepresented minorities had approx. one-third more novice teachers than majority-white schools.

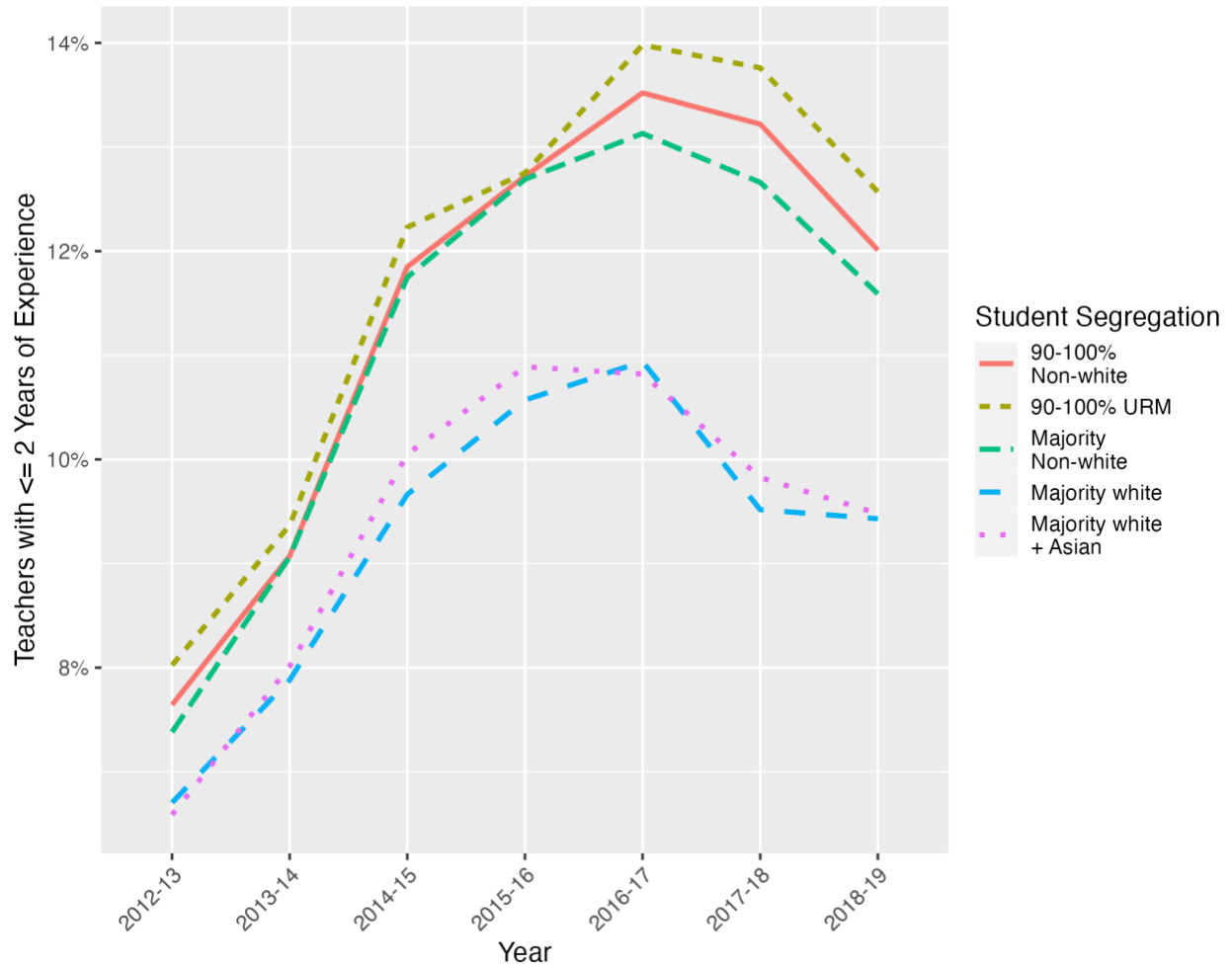
The proportion of teachers with 2 or fewer years of experience increased in all categories of segregated schools studied from 2012-13 to around 2016-17. The next two years, however, saw a reversal of that trend (future analyses can explore why). Meanwhile, the gaps across types of segregated schools, which likely benefit white and Asian students, remained wide and clearly identifiable.



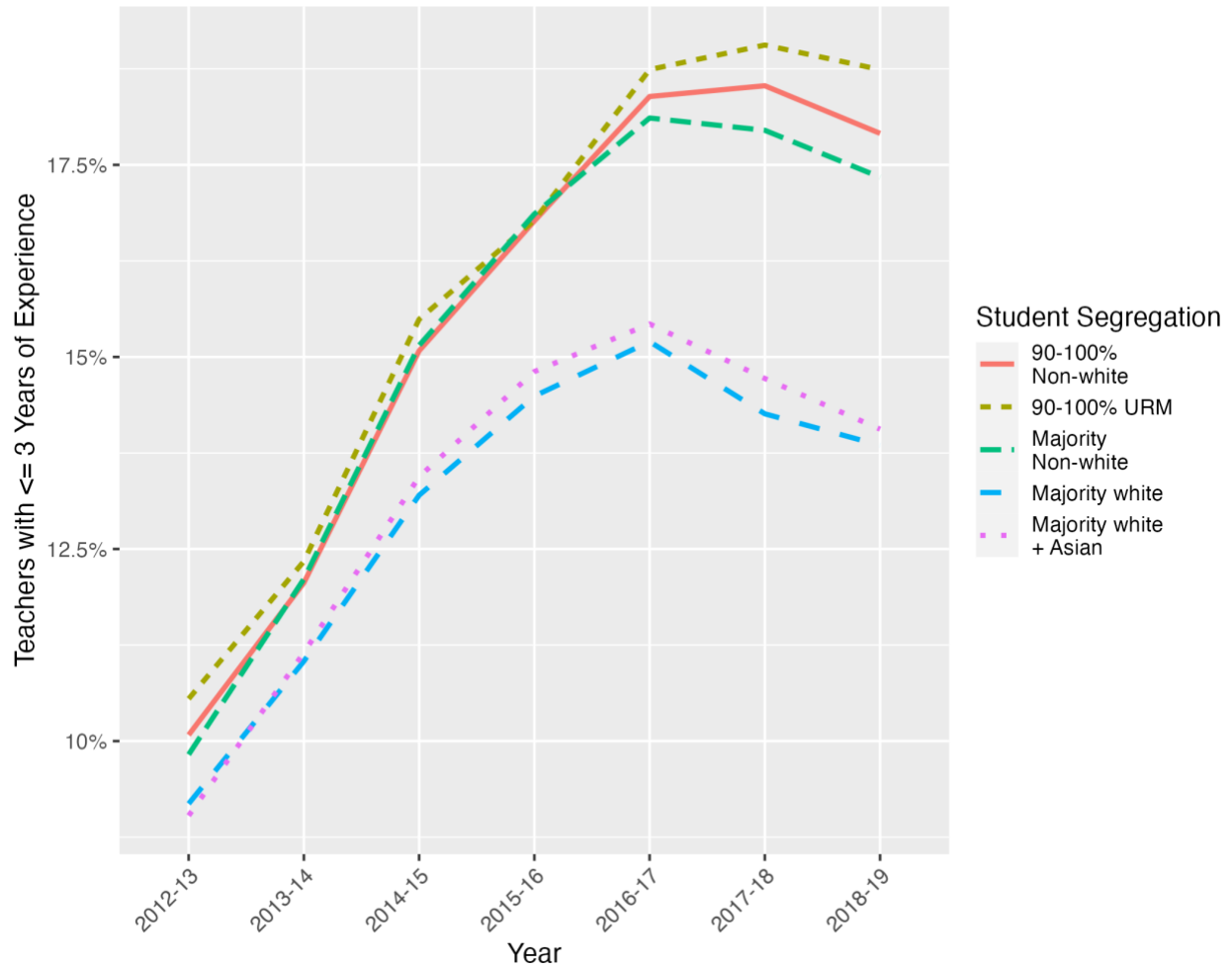
**Figure 1a: Percent of Novice Teachers, by Student Segregation, 2012-13 to 2018-19, One Year Experience**



**Figure 1b: Percent of Novice Teachers, by Student Segregation, 2012-13 to 2018-19, Two or Fewer Years of Experience**



**Figure 1c: Percent of Novice Teachers, by Student Segregation, 2012-13 to 2018-19, Three or Fewer Years of Experience**



Note. See the [online appendix](#) for data and interactive figure.

As illustrated in the separate panels in Figures 1a-c, we examined the proportion of teachers with 1, 2 and 3 years of experience or fewer. The results for all three definitions of *novice* were similar: majority white and majority white plus Asian schools had lower proportions of novice teachers than majority non-white, 90-100% non-white, and 90-100% underrepresented minority schools. The gap began to widen in approx. 2014-15 for teachers with 2 and 3 or fewer years of experience. When defining *novice* as the proportion of teachers with 3 or fewer years of experience, the experience gap between majority white and majority non-white was approximately 4 percentage

points in 2018-19, noticeably higher than just a few years before. There were 119 schools in 2018-19 where the majority of teachers had 2 or fewer years of teaching experience (see the [online appendix](#) for the data). The schools were spread out across the state, in 54 school districts and 23 counties. These schools varied in terms of student segregation, with some schools reporting no white students to one school that was 73% white. Approximately 80% of schools with a majority novice faculty were disproportionately non-white (higher than the white enrollment in the state of approximately 24%). In other words, there was a high concentration of inexperienced teachers in schools with a high concentration of students of color.

The schools with majority novice teachers had noteworthy racial and social class patterns. More than one-quarter (33 of 119) of these schools had more than 90% of their students qualifying for free or reduced priced meals (a measure of poverty). Four of these schools reported that *all* of their students were underrepresented minorities. And there was greater than 95% Latinx enrollment in 17 of these schools. Our finding that schools with the highest proportions of racially marginalized students have the least experienced teachers could be an artifact of how teacher experience was measured. However, several robustness checks in which we used different definitions of *novice* suggest this was not the case.

## **Unyielding Disparities: Inequalities in Teacher Experience Across Various Metrics**

The educational returns of additional years of experience are likely greatest in the first few years of teaching (Kini & Podolsky, 2016), so a measure that focuses on the share of teachers with just a few years under their belts is salient. Indeed, part of the analysis presented above used the proportion of teachers with 2 or fewer years of experience. However, because some recent reviews of research find that additional teaching experience is associated with student gains into teachers' second and even third decade (e.g., Kini & Podolsky, 2016), just examining the proportion of new

teachers may not comprehensively describe potentially important elements of teacher experience gaps. We created several alternative measures to check if the central finding was robust to alternative measures of teaching experience. These alternative measures included the proportion of teachers with 1 and 3 years of experience (see Figures 1a-c), average teacher experience (see Figures 2a-g), and median teacher experience. Regardless of the type of measurement, similar teacher experience gaps were identified across racially identifiable schools.

**Figure 2a: Mean Years of Teaching Experience and Student Racial Composition, 2012-13**

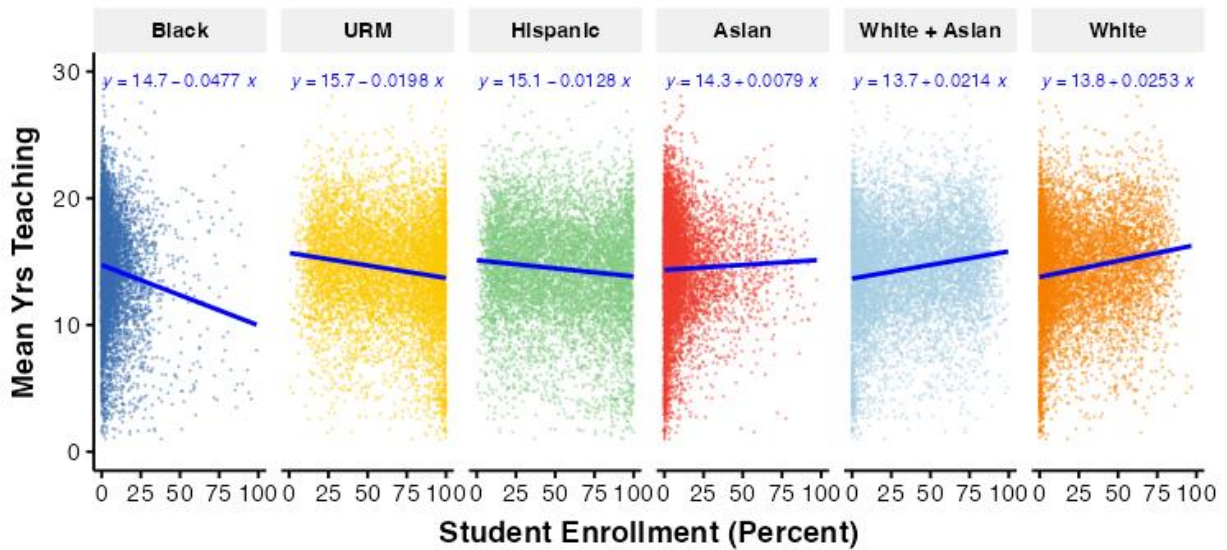


Figure 2b: Mean Years of Teaching Experience and Student Racial Composition, 2013-14

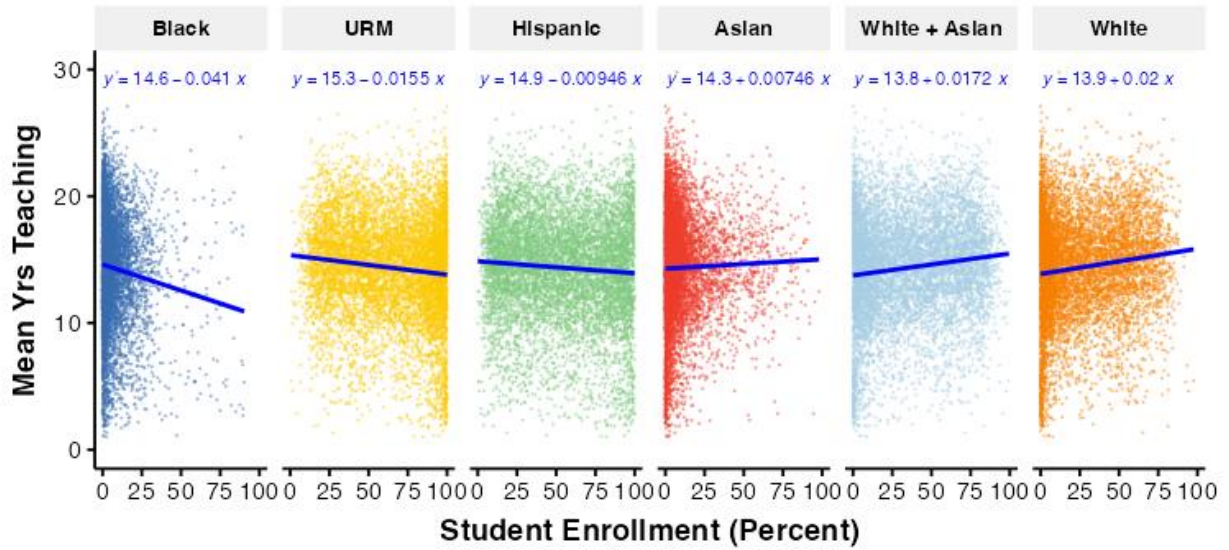


Figure 2c: Mean Years of Teaching Experience and Student Racial Composition, 2014-15

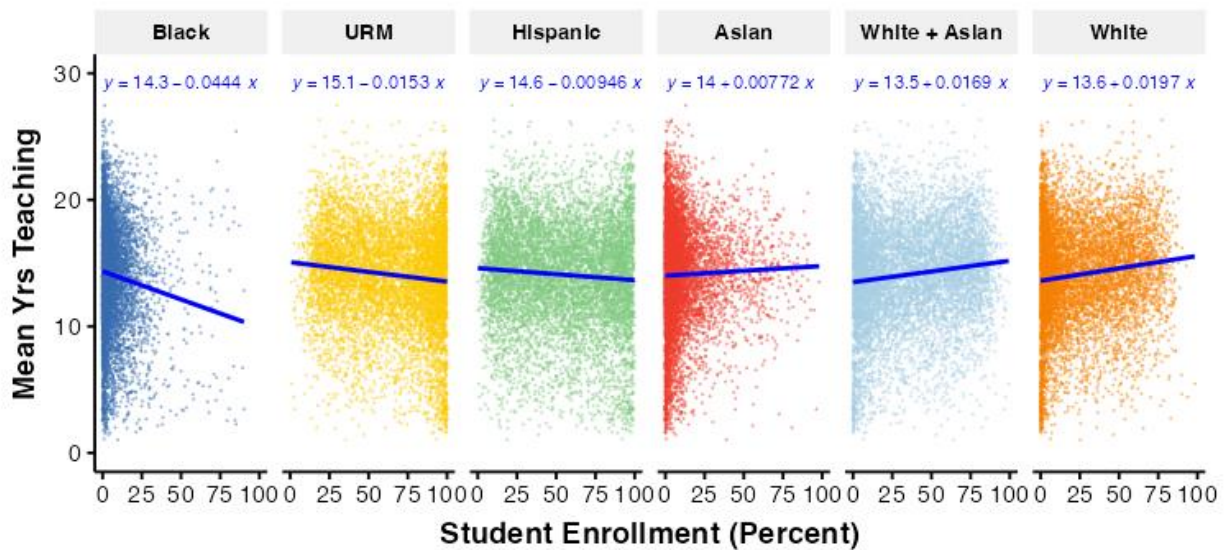


Figure 2d: Mean Years of Teaching Experience and Student Racial Composition, 2015-16

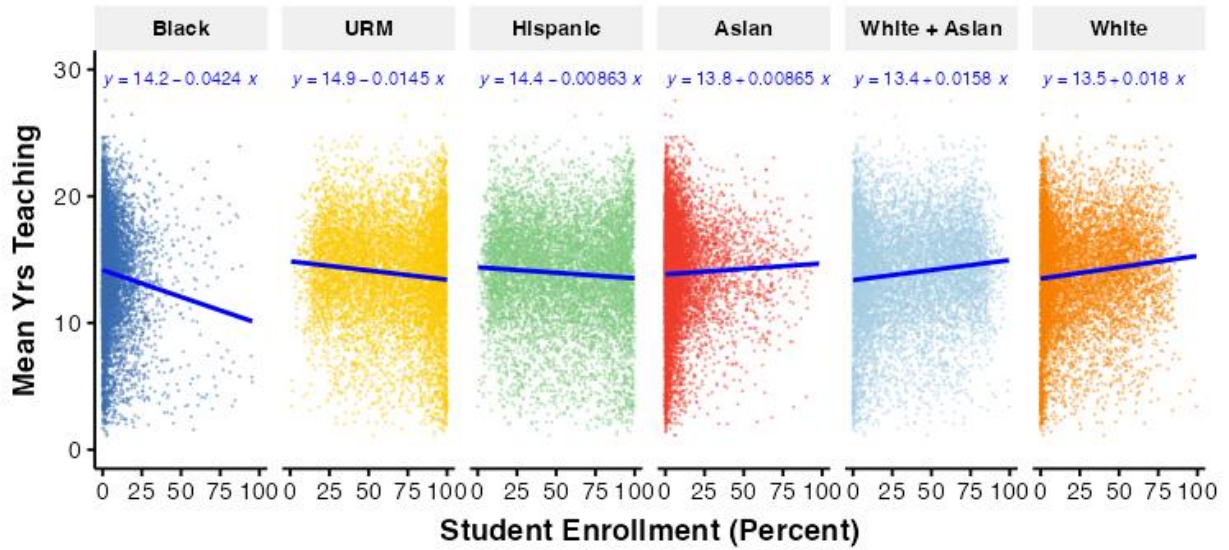


Figure 2e: Mean Years of Teaching Experience and Student Racial Composition, 2016-17

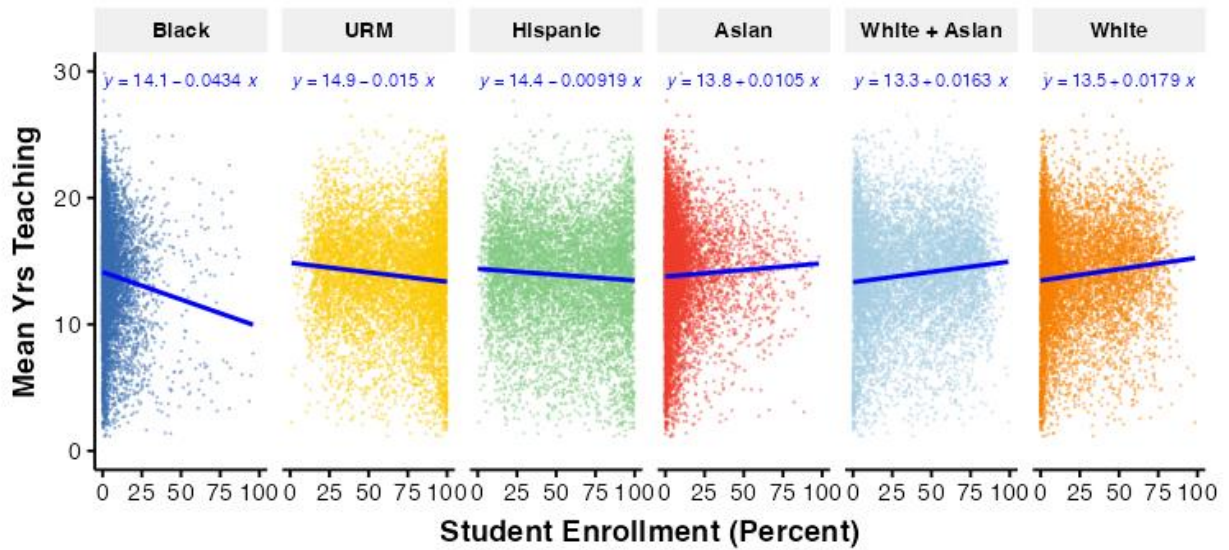


Figure 2f: Mean Years of Teaching Experience and Student Racial Composition, 2017-18

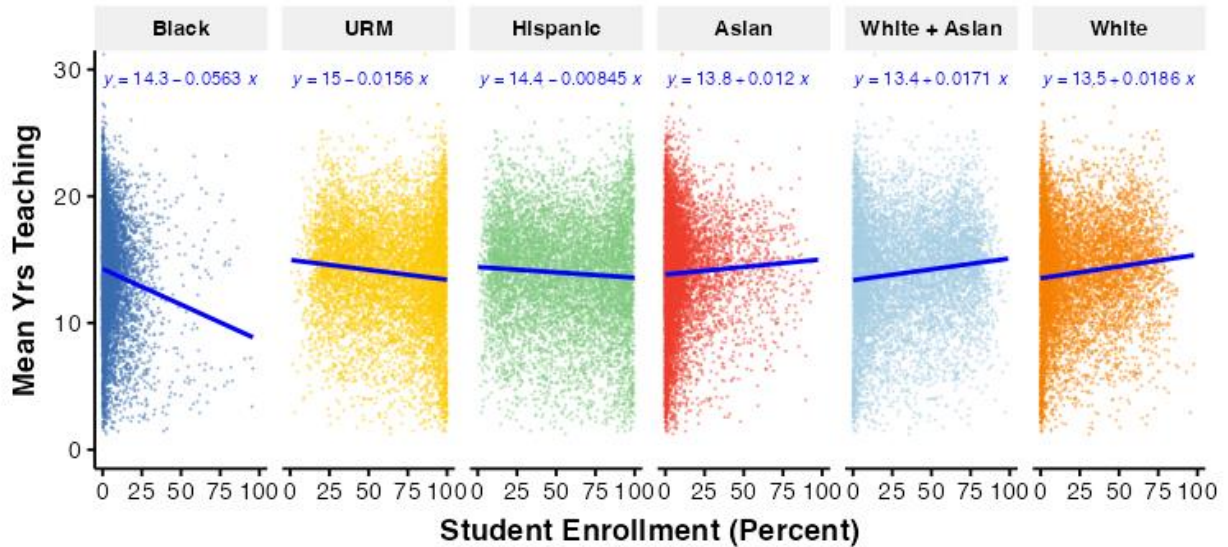
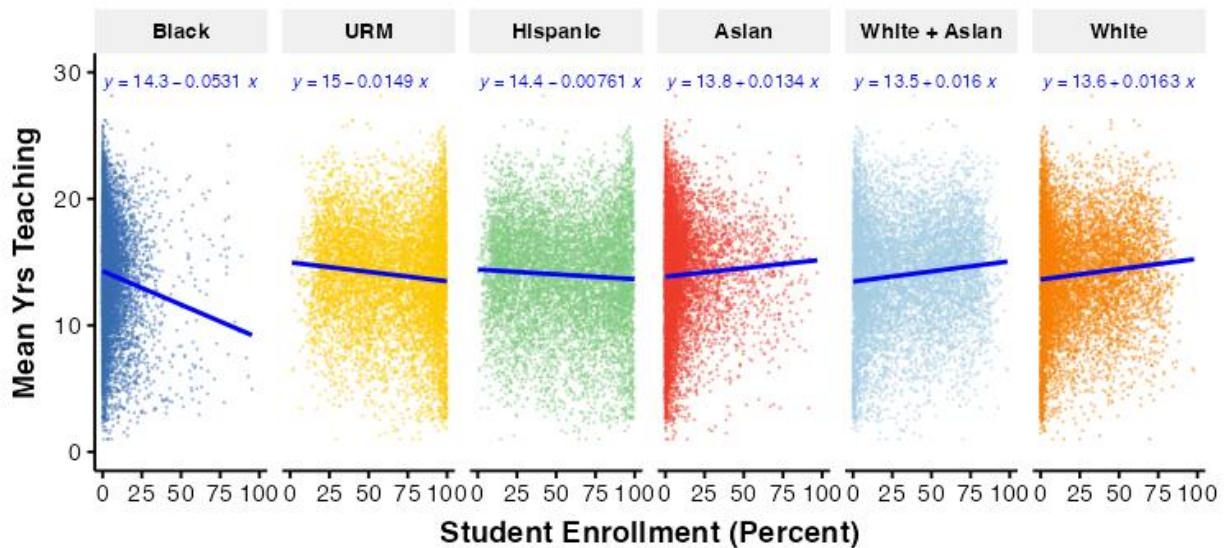


Figure 2g: Mean Years of Teaching Experience and Student Racial Composition, 2018-19



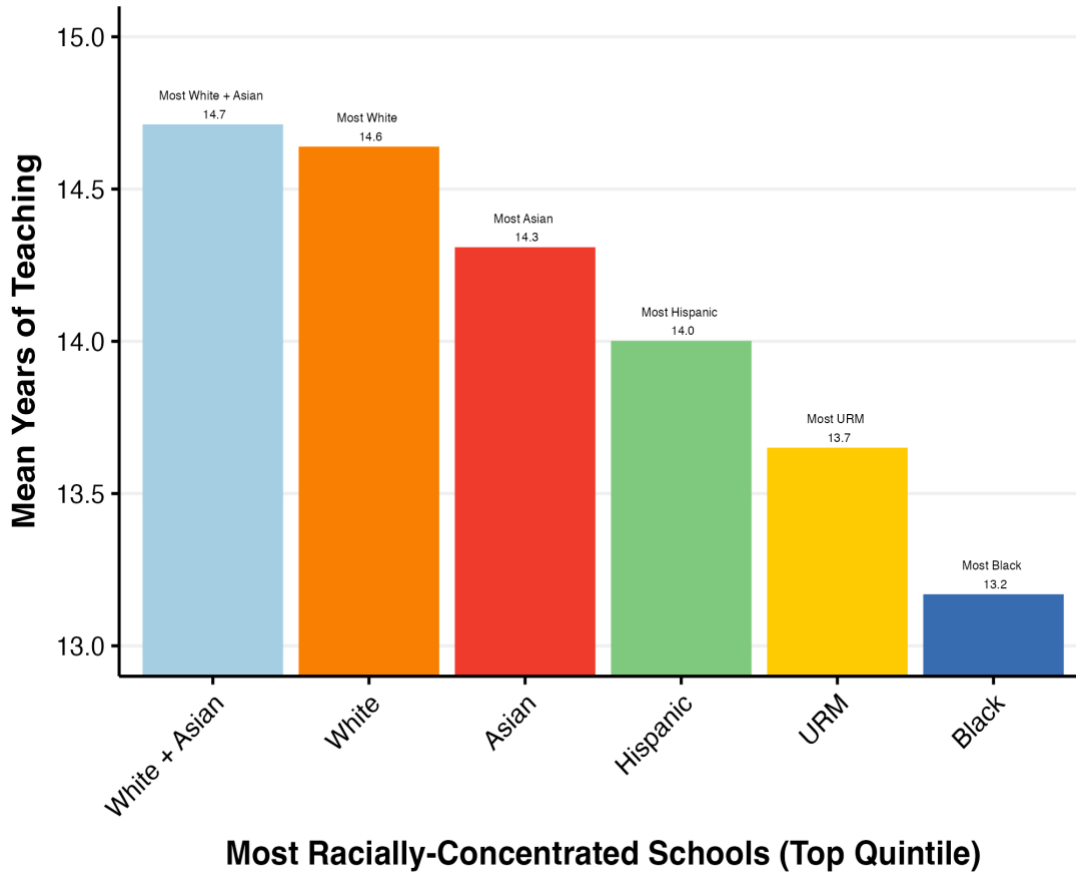
The scatterplots in Figures 2a-g depict relationships between average years of teaching and the percent of the six focal racial groupings. Each dot represents a California school with mean years of experience on the y-axis and the share of each racial grouping on the x-axis. We observed consistent trends from 2012 to 2018. The average years of teaching experience was negatively



correlated with Black, underrepresented minority, and Latinx enrollments and positively correlated with white and Asian enrollments in each year. The relationship was strongest with Black enrollment and somewhat weak for the other groups (see the angles of the blue best fit lines – a horizontal line would represent an absence of a relationship). The most positive relationship with mean years of teaching experience was for white and Asian student groups. Pooling the data from 2012-13 to 2018-19 created similar results, as did each year computed separately. The same analysis conducted with median years of experience, instead of mean years of experience, produced similar trends, with slightly larger gaps across racial groups. The same analysis using 2 or fewer years of experience also produced similar racial gaps.

Note that the observed relationships could be characterized as somewhat weak. In 2018-19, the Pearson correlations with teacher experience were just -0.11 and 0.09, for Black and white respectively (0.0 would represent no correlation). However, the effect of teacher experience on students could accumulate year after year. The negative correlation between the proportion of Black students and teachers' years of experience can also be usefully contrasted with the positive correlation between proportion white and years of experience. Viewed this way, the gap between -0.11 and 0.09 could be consequential, especially given the consistency in the correlations over all of the years examined.

Figure 3: Mean Teacher Experience in the Most Racially Concentrated Schools, 2018-19



Note: Figure includes the top quintile or 20% of schools (approx.1,647) for each racial category.

This part of the analysis focuses on the subset of schools with rather significant racial segregation. A comparison of teacher experience in the schools with the highest racial concentrations, the top quintile or 20%, is presented in Figure 3. Schools were designated in the highest quintile if they were in the top one-fifth of schools by racial concentration. For example, schools with enrollment greater than 44.1% white students constituted the top 20% whitest schools. The mean years of experience for those schools was 14.6. This was 1.4 years more teacher experience than in the schools with the highest enrollment of Black students, where mean years of

teacher experience was 13.2. Schools with the highest concentrations of white and Asian students had the highest mean teacher experience, at 14.7 years.

The gap was fairly consistent across the time period studied, ranging from a white advantage of approximately 1.3 years in 2013-14 to 1.5 years in 2017-18. From 2012-13 to 2018-19 the Black-white teacher experience gap did not improve. In each year studied, schools with the highest concentrations of white, white plus Asian, and Asian students employed more experienced teachers than schools with the highest concentrations of Latinx, underrepresented minority, and black students.

**Figure 4: Mean Teacher Experience by Student Segregation, 2018-19**

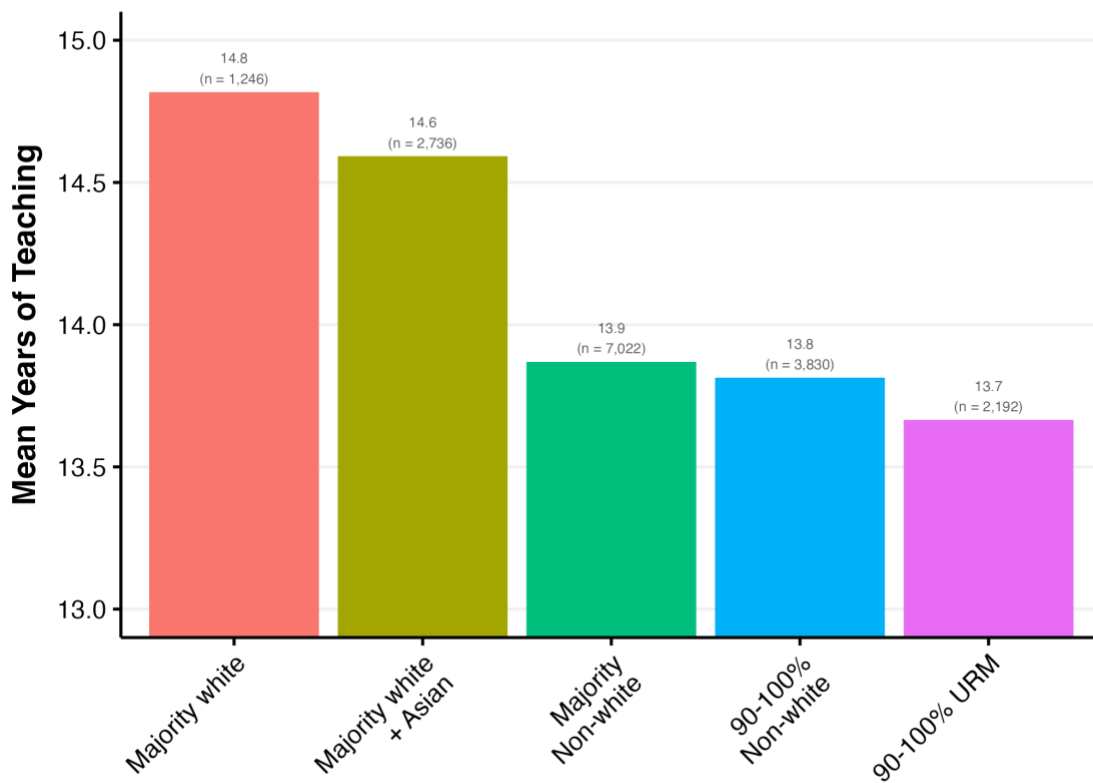


Figure 4 employs different measures (than presented in figure 3) of segregation to examine variations in teacher experience. Majority-white schools had slightly more than 1 year of additional mean experience than schools that enrolled over 90% underrepresented students.

## Racial Composition and Teacher Experience: Beyond Correlation

The results described above depict a clear relationship between teacher experience and the racial composition of schools. Two competing perspectives are relevant to this observation. One suggests that policy reforms can improve teacher experience in racially segregated schools and segregation itself is not a barrier to equal educational opportunity. Another posits that desegregation is essential for achieving lasting equity in teacher experience. Initial evidence leans towards the latter, with segregated schools consistently employing less experienced teachers. However, this might be a correlation influenced by other variables, with segregation not necessarily a fundamental cause.

To delve deeper into these two competing perspectives and control for potential confounding factors, we conducted a preliminary analysis of change in teacher experience and racial composition over a 7-year span using a first-differences regression approach (see the appendix for a detailed description of the approach and findings). This method allowed us to account for observed variables like student poverty, school size, and the number of teachers. Crucially, it also controls for unobserved, consistent-over-time factors, which could encompass otherwise confounding factors like neighborhood characteristics, urbanicity, and various policies that might sway the distribution of teacher experience across school districts.

The regression results reveal that schools with an increase in Black or Latinx student populations were, on average, linked to a decline in teacher experience, even after accounting for other influences. This aligns with other research that finds segregated schooling is causally associated with fewer resources and poorer outcomes for students of color (Johnson, 2015). Thus, reducing racial segregation in schools might be a pivotal step towards a more equitable distribution of teacher experience.

## Limitations

Effective and thorough policy remedies for the teacher experience gap would need to account for variation in teacher experience across schools, in ways that the present analysis only partly measured. For example, schools with equal mean years of experience are not necessarily equal in important types of experience. Take two schools, both with 10 years of mean teacher experience. One school employs all the teachers from the prior year, and the other has 10 teachers *new to that school*, which represents a form of churn between schools. The school with greater teacher turnover has higher instability that may pose problems. Disruption to and lack of continuity in the relationships teachers build with their particular school communities, including students, parents, and each other, is associated with an array of issues (Simon & Johnson, 2015). Schools with greater teacher turnover incur higher financial costs as they must find and hire new teachers more often. Furthermore, churn *within* schools, and across grades or subjects, may be significant and associated with student demographics (Atteberry et al., 2017; Huang & Moon, 2009).

Schools with similar mean teacher experience may also have many new *and* veteran teachers, or all teachers may have experience very close to the mean. The multiple measures of teacher experience we examined in this report – including mean years of experience and percent of novice teachers — helps address limitations with any single measure, but effective policy solutions may need to include additional ways of measuring teacher experience. Also, schools with small enrollments and numbers of teachers can produce measures of novice teachers and racial segregation that vary somewhat noisily. Finally, pandemic disruptions may have changed the distribution of teacher experience since the available data was analyzed.

## Conclusion and Policy Remedies

This analysis identified persistent gaps in teacher experience across segregated schools. Schools with higher proportions of marginalized racial groups had a higher proportion of novice teachers and the trends worsened over time. The identified findings constitute opportunity gaps – unequal opportunities to learn from more experienced teachers – that may cause achievement gaps. The size of these teacher experience gaps, which, depending on the measure, could appear small to some readers, may become practically significant when considering that the effects of teacher (in)experience can accumulate over 12 or more years of schooling.

Regardless of the specific mechanisms by which teacher experience may benefit students, of which there are multitudes, research consistently finds that more experienced teachers are associated with improved student outcomes (e.g., Kini & Podolsky, 2016). It's a common aspiration among many education reformers to structure schools in a way that addresses pervasive achievement gaps rooted in racist systems of unequal opportunity. Achieving higher teacher experience in schools with the most marginalized racial groups is feasible. However, data from California paints a picture of a goal not yet achieved and suggests the structure of schooling may contribute to achievement gaps.

The inequitable distribution of teacher experience in California mirrors national trends. Research across the country finds that the most inexperienced teachers are clustered in schools with the most marginalized students, with racialized minority students more likely to employ “green” teachers (Cardichon et al., 2020; Knight, 2019). This disparity is not just limited to teacher experience; opportunity gaps based on race permeate many types of school resources (Carter & Welner, 2013). One interpretation of equitable distribution of school resources suggests that the most marginalized students would receive the most resources. However, the reality highlighted in our analysis is quite different. The presence of higher concentrations of less experienced teachers in schools with racially marginalized students directly contradicts this ideal of equal opportunity.

With a growing body of research concluding that teacher experience improves school success, teacher experience gaps across segregated schools constitutes part of an ongoing opportunity gap in California. Efforts to address the distribution of teacher experience have been made in recent decades, yet the trends observed in this analysis suggest different approaches are required. It is also worth noting that one study (reardon et al., 2019) was unable to explain variation or growth in racial achievement gaps by measures of teacher experience in the context of schools segregated by race and class. So, although teacher experience may be associated with higher achievement, differences in teacher experience may not cause racial achievement gaps in the context of segregation. More research is needed to understand the specific contexts under which teacher experience is connected to educational outcomes. Relatedly, we used measures of racial composition (e.g., share of a schools' racial groups, see Appendix) instead of a full battery of segregation measures. Future research could explore the relationships between exposure and other measures of segregation.

Teacher experience gaps may be decreased by reforming several types of policies. Changing teacher tenure, seniority preference, transfer, and dismissal practices may help slightly (Goldhaber, Lavery, & Theobald, 2016), yet at least two empirical studies suggest other directions may be required (Knight, 2019; Koski & Horng, 2007) and another study recommends against changes to teacher tenure as a solution (Clotfelter, Lavery, & Theobald, 2023). One of those studies (Knight, 2019) concluded that additional funding was associated with lower teacher experience gaps across high- and low-poverty schools, although the effect across racially segregated schools was not clear. Another study found “no persuasive evidence that the seniority preference rules... exacerbate the negative relationship between higher minority schools and uncredentialed and low-experience teachers” (Koski & Horng, 2007, p. 262).

Due to rather inconclusive evidence on how district-level human capital management and collective bargaining affect teacher experience gaps, alternative policy changes may be necessary. One such approach involves offsetting the negative effects of inexperienced teachers through other school reforms, such as lowering class sizes in segregated schools. Other possibilities that could tackle the teacher experience distribution itself include: changing the distribution of school funding; reforming economic conditions that affect labor market competition among high minority schools and other sectors of the economy; and increasing the prestige, economic reward, and well-being that comes with teaching in schools with high proportions of underrepresented children of color. Based on a North Carolina study of racial disparities in teacher experience, researchers suggested money would likely be an essential part of the solution, including investments in teacher preparation programs, mentoring supports, financial incentives, fellowships and salary supplements (Clotfelter, Ladd, & Clifton, 2023).

Reducing segregation is also a change that could fundamentally reduce racial disparities in access to teachers. “The most obvious way to reduce racial differences in access to high-quality teachers across individual local schools, but one that has often proven difficult to implement,” write Clotfelter, Ladd and Clifton, “would be for policy makers to reduce the extent to which schools are racially segregated” (2023, p. 9). This recommendation is consistent with the results of our regression analysis, which found that racial composition was independently associated with teacher experience. Many reforms will also likely interact with each other. California’s most significant and recent school funding reform, enacted in 2013-14, is associated with smaller class sizes in high-need schools but more inexperienced teachers (Lafortune, 2023). Recruiting new teachers of color and retaining those teachers may produce educational benefits, but that could reduce, at least temporarily, average teacher experience (any *new* teacher, regardless of teacher race, reduces the experience level). Taking into account the eco-system of school and social reform would be a wise



approach to addressing the distribution of teacher inexperience and balancing other equity-related goals (e.g., see DeBray et al., 2022).

Regardless of which reforms may best improve the unequal distribution of teacher experience, the best approach is likely to pay particular attention to racial segregation. The evidence presented in this report adds to a significant body of research concluding that equal educational opportunity is thwarted by school segregation. Addressing racial segregation and the distribution of teacher experience simultaneously may produce the most substantial benefits.

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## **Appendix A: Racial Composition and Teacher Experience beyond Simple Correlation**

Some readers may believe that with sufficient policy reform, the distribution of teacher experience can be addressed without changing segregation. A different set may believe that while reforms can result in some improvements for segregated schools, desegregation is a necessary prerequisite for a substantial and durable equitable distribution of teacher experience. This latter belief has correlational evidence on its side: the analysis in this report and other research conclude that segregated schools consistently have less experienced teachers. Segregated schools are indeed different in a number of ways that may make it more difficult for them to employ experienced teachers. This section presents a preliminary investigation into whether there is a link between segregated schools and teacher inexperience, beyond mere correlation. First, an illustrative example is provided to gain some clarity about how teacher experience and racial composition may change over time. Then, an analytic approach is described followed by preliminary results.

**Figure 5: Illustrative Example of a School that Became Whiter Each Year, Accompanied by an Increase in Teaching Experience**

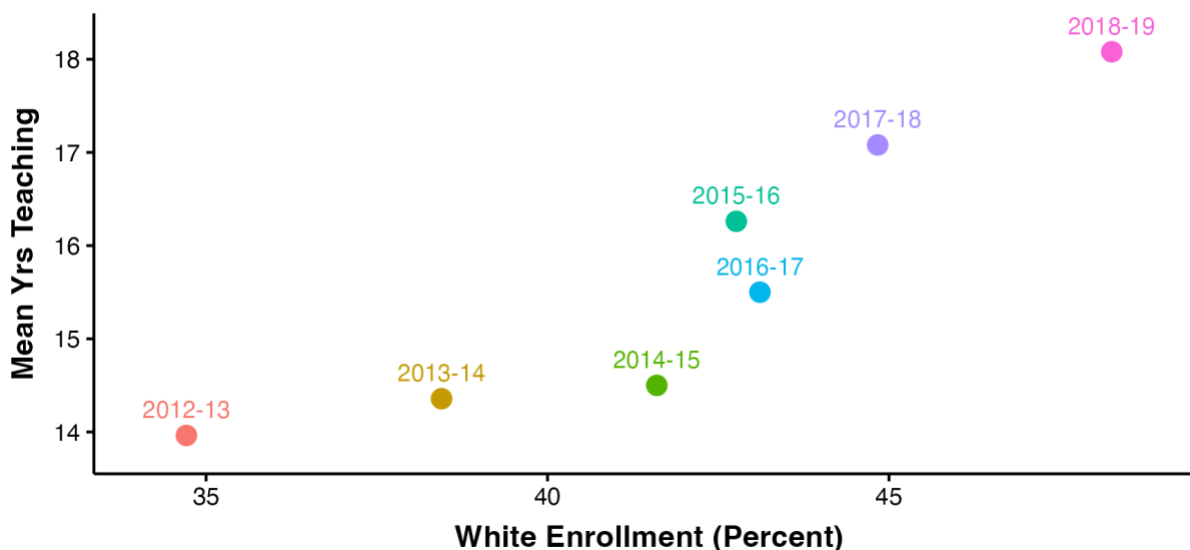


Figure 5 shows an example of a school that increased in proportion white each year and increased in mean teacher experience in 4 out of 5 years. This kind of association, if systematic and if the relationship remained static or flowed in a different direction for other racial groups, would be evidence that segregation may significantly pressure and limit teacher experience. There are, of course, other schools that exhibit the opposite association (i.e., increases in proportion white were associated with decreases in mean teacher experience). But the focus, from a policy perspective, can usefully derive from an understanding of systemic trends. This analysis investigates whether there are systematic trends that are consistent with this illustrative school.

We found a positive correlation between share white and teacher experience. In schools that became whiter during the 7-year period with available data, teacher experience systematically increased. However, this observed correlation might be influenced by other factors associated with the proportion of white students. For instance, the rise in teacher experience might be linked to an increase in average family income or other variables related to the demographic of white students.

Or schools with large shares of white students may be located in areas that attract older, more

experienced teachers. The possibility of these kinds of confounding factors make the observed correlation between share white and teacher experience somewhat limited in terms of policy value: what can be changed to address the unequal distribution of teacher experience remains unclear. Without more specific evidence, it could be that changing the socioeconomic composition of schools, for example, could resolve the problem of teacher experience and race. To test whether changes in racial composition in California schools is systematically associated with teacher experience, independent of other variables, we conducted a regression analysis.

The following question is difficult to answer, yet important for policymaking. Does student racial composition *cause* lower teacher experience? This question addresses whether reforms can make segregated schools more equal in terms of teacher experience or whether the racial composition of schools limits what is possible.

This section tests the following two hypotheses:

H1. An increase in proportion Black student enrollment is independently associated with a decrease in mean teacher experience.

H2. An increase in proportion Latinx student enrollment is independently associated with a decrease in mean teacher experience.

We can begin to address the issue of whether racial composition itself is related to teacher experience by holding many other possible influences on the distribution of teacher experience equal. To do this, we control for observed characteristics of schools where data are available, but perhaps more importantly, we control for some *unobserved* characteristics by employing a linear mixed model coupled with first-differences.

The first-differences approach controls for unobserved time-invariant factors, which reasonably may include neighborhood characteristics, urbanicity, district transfer policies, labor union policies, and many other factors which may influence the distribution of teacher experience.

For example, districts’ transfer policies may influence where teachers work, but because we only model experience changes within schools, this district influence is “held constant,” as long as it does not co-vary across time in a systematic fashion with racial composition. School architecture and the physical condition of schools is another example of a (presumably) unobserved time-invariant factor that our first-differences approaches controls. Old buildings in disrepair may disincentivize teachers and we may find levels of disrepair connected to racial composition (e.g., because of chronic underinvestment in communities of color and reliance on local property taxes for school funding; Sosina & Weathers, 2019). As long as schools do not change architecture over time in ways that *systematically* vary with teacher experience and racial composition, then school architecture changes should not bias the results (even though we do not include specific data on school architecture). The first-differences approach subtracts each variable from its lagged value, leaving us with differences. For example, imagine a school went from 20% to 30% White and 3 to 4 years of mean teacher experience. After differencing, we have a 10-percentage point increase in share white and a 1-year mean increase in teacher experience. The same process of differencing is applied to all variables before regressing them. In sum, omitted variable bias would only occur if unobserved factors systematically vary with mean teacher experience and racial composition.<sup>1</sup>

We modeled longitudinal data with observations of schools across 7 years (2012-13 to 2018-19). The longitudinal data allowed leveraging temporal ordering, as well as the use of a within-school estimator, to reduce the likelihood of omitted variable bias, and produce rigorous estimates of the relationships between racial composition and teacher experience.

We regressed year-over-year changes in mean teacher experience ( $\overline{\Delta Experience_{it}}$ ) by changes in school racial composition. Equation 1 describes the model,

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<sup>1</sup> A first-difference approach is similar to the commonly used fixed-effects model and shares its primary attraction: controlling for unobserved, time-invariant school characteristics which could contribute to omitted variable bias (Cameron & Trivedi, 2005).

$$\begin{aligned}
\Delta Experience_{it} = & \beta_0 \\
& + \beta_1 \Delta \%Black_{it} \\
& + \beta_2 \Delta \%Latinx_{it} \\
& + \beta_3 \Delta \%Asian_{it} \\
& + \beta_4 \Delta \%MultiRacial\ and\ Other_{it} \\
& + \beta_5 \Delta Enrollment_{it} \\
& + \beta_6 \Delta Poverty\ Rate_{it} \\
& + \beta_7 \Delta Teacher\ Num_{it} \\
& + \mu_t \\
& + \lambda_i \\
& + \epsilon_{it}
\end{aligned}$$

where  $\Delta \%Black_{it}$  represents the change in proportion of Black students,  $\Delta \%Latinx_{it}$  represents the change in proportion of Latinx students,  $\Delta \%Asian_{it}$  represents the change in proportion of Asian students,  $\Delta \%MultiRacial\ and\ Other_{it}$  represents the change in proportion of Multi-Racial and other students. Percent white (omitted) is the reference category.<sup>2</sup>

Because omitted variable bias was an important threat to identifying a causal relationship, we included several control variables which were plausibly related to teacher experience and racial composition.  $\Delta Enrollment_{it}$  represents the change in total student enrollment. Perhaps as schools grow in size, they put pressure on local teacher labor supply.  $Poverty_{it}$  represents the change in the share of students who qualified for free or reduced priced meals. There may be an association between teacher experience and poorer students.  $\Delta TeacherNum_{it}$  represents the change in the total number of teachers. Perhaps the number of teachers employed influences the mean experience of teachers.

Year fixed effects,  $\mu_t$ , control for unmeasured year-over-year effects, invariant across schools. The goal of the model is to determine the reaction of teacher experience to changes in racial

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<sup>2</sup> Note that the racial composition predictors used in this section (e.g., proportion Black and Latinx) are not typical measures of segregation, *per se*. Typical measures of segregation, such as isolation, exposure and an H-index, could be included in future analyses.



composition, without the influence of changes related to any specific year (e.g., a policy that might have changed racialized teacher experience in, say, 2017), which is addressed by the inclusion of  $\mu_t$ .

There was variation between schools in teacher experience. For example, some schools had more than 20 years mean experience and others less than 2 years. We are not primarily interested in that variation between schools. Rather, we are interested in the variation between student race and teacher experience after accounting for the variation between schools in teacher experience. Thus, we use random effects for the school id factor, which is represented by  $\lambda_i$  in Eq. 1 (and represented as CDS\_CODE in the results).  $\epsilon_{it}$  is the error term.

The main coefficients of interest are the average changes in the proportion of each racial group associated with a 1-year change in mean teacher experience (compared to White students). If there were no time-varying omitted variables which are correlated with both change in racial composition and change in mean teacher experience, these would be closer to unbiased estimates (Liker, Augestyniak, and Duncan 1985).

## Results

The regression results below show that, on average, schools with an increase in the shares of Black or Latinx students were negatively associated with mean teacher experience, controlling for several other possible influences.

First, we checked whether the percent black was predictive of teacher experience. Does Model 1 fit the data better than a null model without percent Black? We can address this question by checking whether the focal model is statistically different from a “null” model. The results of an ANOVA comparing the null model with the focal model generated a p-value of 0.0001, which suggests that adding the percent black covariate contributes significantly to the prediction of teacher experience.

**Table 1: First Differences Regression Results**

	$\Delta$ Mean Years of Experience	
Predictors	<i>Estimates</i>	<i>p</i>
(Intercept)	0.023	0.193
$\Delta$ % Black	-0.024	<b>&lt;0.001</b>
$\Delta$ % Latinx	-0.012	<b>&lt;0.001</b>
$\Delta$ % Asian	0.001	0.886
$\Delta$ % Multi-Racial and Other	0.017	<b>0.007</b>
$\Delta$ Enrollment	-0.001	<b>&lt;0.001</b>
$\Delta$ Poverty Rate	0.001	0.392
$\Delta$ Teacher Num	-0.024	<b>&lt;0.001</b>
factor(YEAR)2014-15	-0.241	<b>&lt;0.001</b>
factor(YEAR)2015-16	-0.124	<b>&lt;0.001</b>
factor(YEAR)2016-17	-0.002	0.944
factor(YEAR)2017-18	0.043	0.075
factor(YEAR)2018-19	0.089	<b>&lt;0.001</b>
N CDS_CODE	8,143	
Observations	46,091	
Marginal R <sup>2</sup>	0.017	

Model 1 in Table 1 presents the results of the model specified by Eq. 1. The results are consistent with the two main hypotheses. An increase in 1 percentage point Black was associated with a mean teacher experience decrease of 0.024 years. In possibly more accessible terms: this suggests that an increase in 42 percentage points Black was associated with teachers less experienced by one year. Change in proportion Latinx was also a statistically significant predictor of teacher experience, yet with a weaker association.

One policy-relevant interpretation consistent with our results is that schools with high proportions of Black or Latinx students may benefit from an increasing white enrollment, because this may increase teacher experience in those schools. In short, decreasing segregation in schools

with high proportions of Black and Latinx students may more equitably distribute teacher experience.

### **Model Assumptions and Limitations**

There are several assumptions that are needed to believe that the model provides unbiased estimates of the relationship between teacher experience and racial composition. We included several available time-varying variables, but omitted variables that co-vary across time in a systematic fashion with racial composition remain a threat to unbiased estimates. Also, the model assumes there is a linear relationship between experience and racial composition. Perhaps an increase from 0% to 5% Black does not affect teacher experience in the same way as an increase from 50% to 55%. The results also assume there are no omitted variables that co-vary with time, within schools, along with racial composition and teacher experience. For example, perhaps the observed decrease in teacher experience associated with the shares of Black and Latinx students is a function of changes in school funding that drives both teacher experience and racial composition. Note that the random effects for schools had a near-zero variance component and did not add explanatory value beyond the fixed effects, but this finding requires more exploration. A linear model without random effects had similar results and may be preferred by virtue of parsimony. Finally, because of some obviously dirty data, a small subset of schools changed radically in terms of racial composition or mean teacher experience from one year to the next (although removing them didn't change the basic observed relationships, the data quality is concerning).

## Appendix B: Data and Measures

Data analyzed in this report came from publicly available student and staff files provided online by the California Department of Education (CDE). Free or reduced priced meal data come from the Common Core of Data provided by the National Center for Education Statistics. The analysis covers the most recent school years of teacher data made available by the CDE: 2012-13 to 2018-19.

The following rules were applied to prepare the data for analysis:

- Removed schools with:
  - the name “District Office”
  - the name “Nonpublic, Nonsectarian Schools” (there were no teacher data for these schools)
- Included schools with:
  - greater than 100 students
  - greater than 10 teachers
- Included teachers with greater than 80% full-time equivalency in a school.

The final analytic data set included an average of 8,126 schools per year.

### *Measures of Experience*

The basic measure available in the data was teacher experience as measured by duration of employment. For example, one measure of teacher experience used was the proportion in each school of teachers with 2 or fewer years of teaching experience. That is, the proportion of schools’ teachers in their first or second year of teaching. Experience, as [measured by the CDE](#), includes prior teaching experience in any school, including outside of California. Experience for substitute

teaching or classified staff service is not included, according to definitions provided by CDE. A teacher in their first year of employment is categorized by CDE as having 1 year of experience.

### *Measures of Student Segregation*

To examine teacher experience gaps across different types of segregated schools, schools were grouped into one or more of the following categories: majority white (50% or greater), majority white and Asian, majority non-white, 90-100% non-white, and 90-100% Underrepresented Minority (URM). “Majority white and Asian” included Filipino. Non-white was defined as a sum of all the racial groups provided by CDE other than white (i.e., Latinx, Black, Asian, American Indian, Filipino, Pacific Islander, and Two or More races). Underrepresented minority was defined as the sum of students classified as Latinx, Black, American Indian, Pacific Islander, two or more races and “not reported.” The “not reported” racial category is associated with less than 1% of records. Including “not reported” or leaving it out altogether could both pose comparability problems if “not reported” is not measured at random across segregated schools. However, analyses conducted with and without including this category in URM didn’t meaningfully change teacher experience gaps across segregated schools.