



## DO LOW-INCOME STUDENTS HAVE EQUAL ACCESS TO THE HIGHEST-PERFORMING TEACHERS?

*This brief describes the prevalence of highest-performing teachers in ten purposely selected districts across seven states. The overall patterns indicate that low-income students have unequal access, on average, to the district's highest-performing teachers at the middle school level but not at the elementary level. However, there is evidence of variation in the distribution of highest-performing teachers within and among the ten districts studied. Some have an under-representation of the highest-performing teachers in high-poverty elementary and middle schools. Others have such under-representation only at the middle school level, and one district has a disproportionate share of the district's highest-performing teachers in its high-poverty elementary schools.*

There is growing concern that students from low-income and minority backgrounds have relatively less access to teacher quality.<sup>1</sup> It is well documented that schools with more disadvantaged students tend to have teachers with weaker qualifications in terms of experience, teacher test scores, post-baccalaureate coursework, and certification.<sup>2</sup> However, with the exception of experience in the first few years of teaching, the teacher qualifications that have been shown to be inequitably distributed are only weakly if at all associated with teacher performance in the classroom.<sup>3</sup>

The strongest predictor of a teacher's on-the-job performance in a given year is that teacher's past performance in the classroom.<sup>4</sup> Thus those who want to assure that economically disadvantaged students have access to teachers who are at least as good as those available to students in more advantaged circumstances need to attend to the distribution of teacher effectiveness, measured in terms of classroom performance, rather than to the distribution of teacher credentials.<sup>5</sup> However, there is currently little information available on how the distribution of teacher effectiveness across schools is associated with the demographics of the students served by those schools.

There are structural reasons to expect teachers to be unevenly distributed across schools based on credentials. Within districts, teachers with more seniority receive preference in teaching assignments, and across districts teachers with experience and favored credentials have advantages when competing for openings. Thus teachers tend to migrate from more to less challenging schools as they accumulate seniority and advanced course credits. However, since few school districts systematically collect or use data on teacher effectiveness and effectiveness is not strongly correlated with observable teacher credentials, the mechanisms that would result in the most effective teachers being in the most advantaged schools are not clear. As the education policy landscape shifts from a focus on assuring equitable access to teacher quality measured by credentials to equitable access to teacher quality measured by performance, it will be important to know whether there are predictable patterns of sorting by teacher effectiveness based on school demographics. For example, policymakers might respond differently if we found that the most effective teachers were disproportionately represented in lower-poverty schools than if there were no systematic relationship between teacher effectiveness and school demographics. This brief adds to our knowledge of how teacher performance is distributed across schools by describing the prevalence of highest-performing teachers across schools of higher and lower poverty levels in ten school districts across seven states. Analyses in this memo pertain to these ten districts.

## Defining “Highest-Performing” Teachers

We identified the highest-performing teachers within each district by using valued-added analysis. “Value-added” is defined in ideal terms as the contribution of the teacher to student achievement growth, holding constant the factors outside the teacher’s control. There is active debate about the interpretation and use of value-added measures of teacher performance for high stakes decisions,<sup>6</sup> but they are increasingly used as a policymaking tool.

We estimate valued-added as the average growth in test scores for each teacher in our study relative to the average for the district in which the teacher taught, using statistical controls to account for the students’ background characteristics and their achievement level when they first enter the teacher’s classroom. By using several school years of data for each teacher – up to three years – we obtain a more precise estimate of their performance than with one year of data. An appendix to this memo provides a technical description of the value-added methods we used in our analysis.

For each district, we used value-added estimates of performance that were calculated separately for elementary school teachers, middle school mathematics teachers, and middle school English language arts teachers. We labeled the top 20 percent of teachers within each subject and grade span as highest performing. This is an arbitrary cut point but it identifies a limited proportion of teachers. The students in these teachers’ classes averaged greater gains on achievement tests from one year to the next across multiple years on tests of achievement than similar students taking similar courses in the district from other teachers. Depending on the district, subject, and grade level in our data, the average highest-performing teacher would move his or her students up by an average of 4 to 14 percentile points in a school year compared to the average teacher in the district.<sup>7</sup> The contrast between these highest-performing teachers and below-average teachers is even greater.

Our value-added measures are similar to the indicators that school district leaders are using around the country for policymaking. Examples of their use include the programs proposed under Race to the Top and the Teacher Incentive Fund, as well as local initiatives such as the IMPACT system of teacher evaluation in the DC Public Schools and Educator Value Added Assessment System (EVAAS) used for school and teacher accountability in Texas, Tennessee, North Carolina, and Ohio.<sup>8</sup>

## Data and Methods

Data used in this brief are based on 11,115 teachers in 723 schools in 10 school districts: eight of the districts are participating in an evaluation sponsored by the U.S. Department of Education’s Institute of Education Sciences (IES) and two districts were part of other studies conducted by Mathematica Policy Research. These ten districts are large—at least 40 elementary schools in each district—and economically diverse—with schools ranging from less than 40 percent to 100 percent of students eligible for free or reduced price lunch (FRL). The findings here are specific to the ten districts purposefully selected for this brief and should not be generalized to other districts across the country. A more representative sample would be needed to understand how the distribution of teacher effectiveness varies within districts nationally.

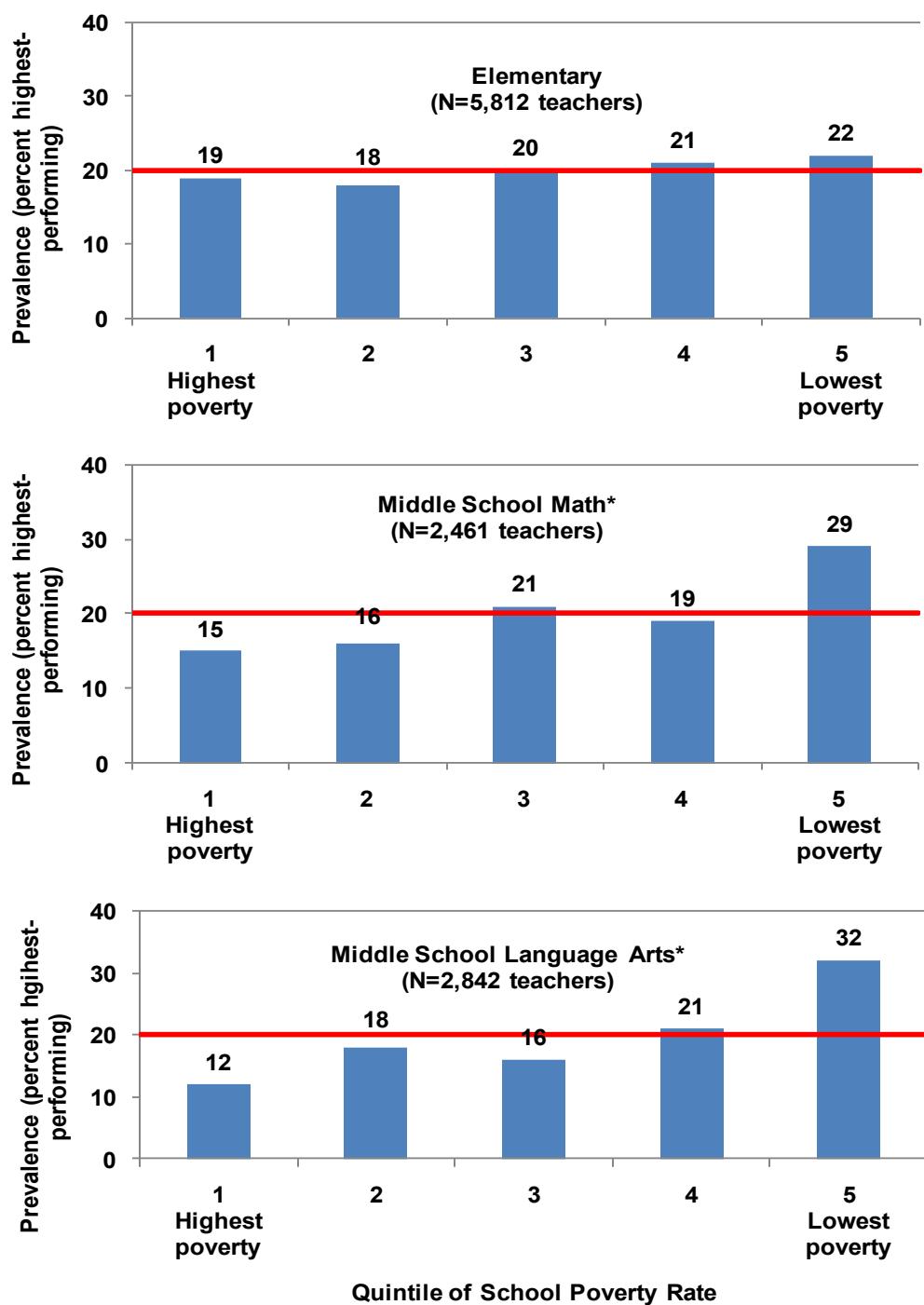
Our analysis examined the distribution of highest-performing teachers across high- and low-poverty schools in each district. We ranked schools within grade span (elementary separate from middle school) within each district by the percentage of their students eligible for FRL, an indicator of poverty. After ranking schools, we divided them into five equal-sized groups, or quintiles, with the first quintile representing the highest-poverty schools and the fifth quintile the lowest-poverty schools. For our sample of districts, the average elementary school had 33 percent FRL in the first quintile and 92 percent FRL in the fifth quintile. For middle schools it was 37 and 91 percent FRL. The districts themselves varied considerably. For example, one district had 58 percent FRL in the poorest quintile, while another district had 99 percent FRL in its poorest quintile. This breakdown of schools into quintiles provides one way to contrast schools with different levels of student disadvantage, but we also examined other breakdowns, such as four equal-sized groups (quartiles) and two groups based on absolute FRL percentages.<sup>9</sup> See the appendix for more detailed information about the variation in district characteristics and individual district distributions.

Within each quintile of schools we calculated the prevalence of teachers who were calculated to be highest performing, based on the value-added estimates and the definition above (top 20 percent for their district). We calculated prevalence separately for elementary schools, middle schools for math, and middle schools for English language arts. In two of the districts, the data were limited to middle school teachers so elementary results pertain to just 8 districts while the middle school results include all 10 districts.<sup>10</sup>

### The Prevalence of Highest-Performing Teachers

Taking together all the districts in our analysis, we found that highest-performing teachers were under-represented in the most disadvantaged middle schools. Such under-representation was not found for elementary schools when all districts were considered collectively. However it was present in 4 of the 8 districts considered individually.<sup>11</sup> We provide examples below that demonstrate the distributions of highest-performing teachers across higher and lower poverty schools.

The relationships for all districts combined are illustrated in Figure 1. Each panel shows the percentage of teachers in each school quintile who are highest performing in the whole district for elementary, middle school math, and middle school English language arts teachers, respectively. Since we defined highest-performing teachers as the top 20 percent in terms of valued-added, then for students to have “equal access” to these teachers, schools within each quintile would be expected to have 20 percent of teachers in this top 20 percent category, which is represented by the horizontal red line at 20 percent in each of the three panels in Figure 1. The height of the bar represents the actual prevalence in each quintile of schools. Figure 1 illustrates the point made previously: In the elementary grades, the distribution of highest-performing teachers does not statistically differ from an equitable distribution, but in the middle grades, the distribution difference is statistically significant -- schools serving disadvantaged students tend to get less than their fair share of highest-performing teachers compared to schools serving more advantaged students. Appendix Table A.5 provides estimates of the average of the value added estimates for all teachers within each of the five poverty groups.

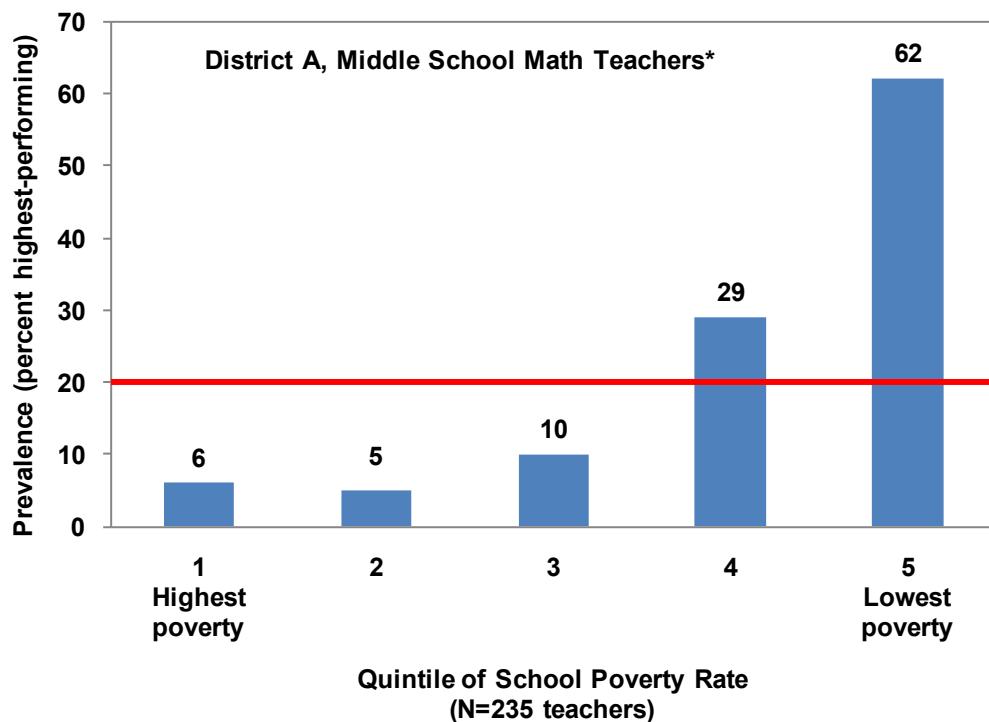
**Figure 1. Prevalence of Highest-Performing Teachers by School Poverty Quintile**

\* Chi-square test of no relationship between quintile and percent highest-performing is rejected at the 0.05 level.

When we looked at individual school districts, we found a variety of patterns, including districts with access to highest-performing teachers disproportionately in the lowest-poverty schools, districts with access disproportionately in the higher-poverty schools, and districts with no statistically significant relationship between the poverty quintile and the prevalence of highest-performing teachers.

Figure 2 shows the distribution of teachers in the district and subject which was the most extreme in terms of the disparity in highest-performing teachers between the schools with the most and fewest low-income students. About 1 in 20 teachers in the first two high-poverty quintiles were highest-performing, whereas about 12 in 20 teachers in the top quintile schools were highest-performing. Under perfectly equal access, all quintiles would have 4 of 20 teachers who were from this highest-performing group.

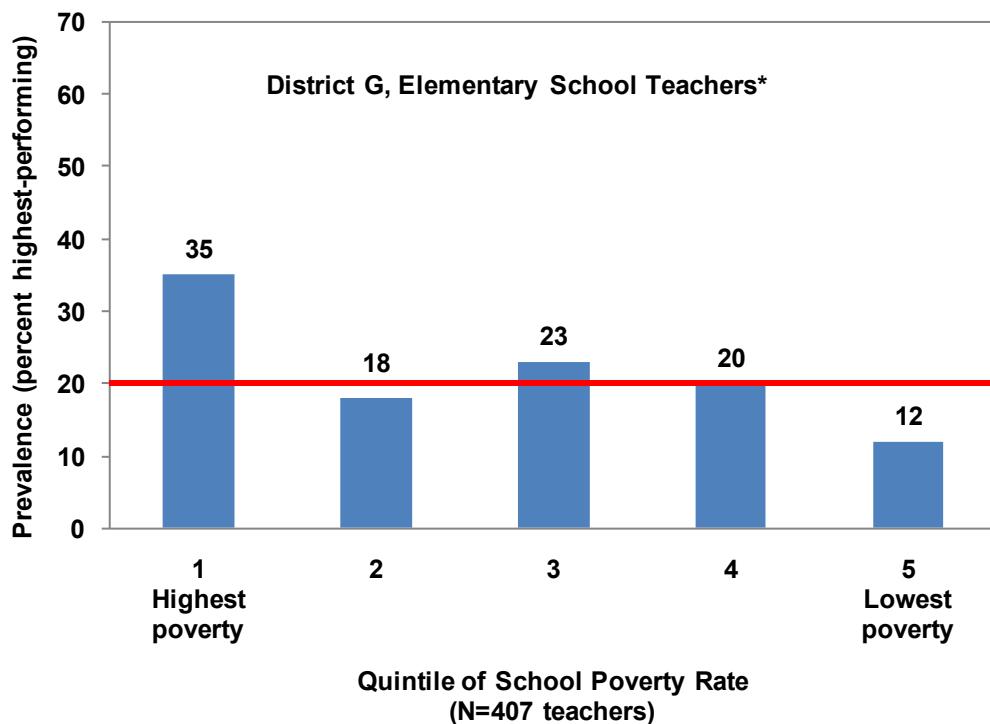
**Figure 2. Relationship Between Poverty Quintile and Prevalence of Highest-Performing Middle School Math Teachers for District A**



\* Chi-square test of no relationship between quintile and percent highest-performing is rejected at the 0.05 level.

Figure 3 shows the most extreme example of a relationship that goes in the opposite direction, where the students most likely to have a highest-performing teacher were those in the highest poverty schools. The divergence from “equal access” in which 20 percent of teachers in all quintiles are highest-performing is statistically significant for the middle school distributions in both Figures 2 and 3.

**Figure 3. Relationship Between Poverty Quintile and Prevalence of Highest-Performing Elementary Teachers for District G**



\* Chi-square test of no relationship between quintile and percent highest-performing is rejected at the 0.05 level.

## Summary

We examined the prevalence of highest-performing teachers in 10 districts and found overall trends that indicate that low-income students have unequal access, on average, to the district's highest-performing teachers at the middle school level but not at the elementary level. However, there was variation in the distribution of highest-performing teachers within and among the 10 districts we studied. High-poverty schools in some districts at both the elementary and middle school levels had fewer highest-performing teachers, other districts had an uneven distribution favoring lower-poverty schools only at the middle school level, and one district favored high-poverty schools at the elementary school level in its distribution of highest-performing teachers. These findings pertain to this purposefully selected set of ten large districts and are not necessarily applicable to other districts.

To the extent that policymakers at the federal, state, and local levels shift away from credential-based measures of teacher quality towards measures based on classroom performance, information on the distribution of high-performing teachers is potentially useful information to assuring that the best teachers are deployed where they are most needed. The data suggest that any given district may have more or less equitable distribution of its highest-performing teachers and it could differ by grade span or subject.

## ENDNOTES

<sup>1</sup> Goldhaber 2008; Peske and Haycock 2006. (Full citations provided in the technical appendix).

<sup>2</sup> Presley et al. 2005; Lankford et al. 2002; Education Trust 2008; Clotfelter et al. 2006; Carroll et al. 2000.

<sup>3</sup> Rivkin et al. 2005; Gordon et al. 2006; Rockoff et al. 2008; Buddin and Zamarro 2008.

<sup>4</sup> Gordon et al. 2006.

<sup>5</sup> A few studies report that high value-added teachers are disproportionately teaching in low-poverty or low-minority schools (Sanders and Rivers 1996; Tennessee Department of Education 2007; Jordan et al. 1997). Others have begun to document the role of teacher mobility on equity (Hanushek and Rivkin 2010) or the role that teacher preferences play in determining their distribution (Jackson 2009). However, only one recent study directly estimates teacher performance and tabulates teacher performance in low-versus high-poverty schools (Sass et al. 2010).

<sup>6</sup> General critiques of value-added methods can be found in Rothstein 2010 and Baker et al. 2010. Further discussion of the limitations can be found in Harris 2011.

<sup>7</sup> These values are derived by noting the average valued-added scores of teachers above the 80th percentile cutoff and converting them into student-level standard deviation units. We then translate the student level standard deviations into percentiles assuming that student test scores are normally distributed. The range is from 4 percentile points in the district and pool with the smallest contrast to 14 percentile points in the district and pool with the highest contrast.

<sup>8</sup> See <http://www2.ed.gov/programs/racetothetop/awards.html> for states awarded Race to the Top awardees. See <http://www2.ed.gov/programs/teacherincentive/awards.html> for Teacher Incentive Fund awardees. For other examples, see <http://dcps.dc.gov/DCPS/In+the+Classroom/Ensuring+Teacher+Success/IMPACT+%28Performance+Assessment%29> and <http://www.sas.com/govedu/edu/k12/evaas/index.html>.

<sup>9</sup> We repeated the entire analysis using four equal sized groups of schools in each district (quartiles instead of quintiles). The resulting patterns were similar to those shown in Figure 1 – at the elementary school level, there were similar proportions of highest-performing teachers in each of the quartiles; at the middle school level in both reading and math, there were significantly higher proportions of highest-performing teachers in the fourth quartile than in the first quartile. Hence, these patterns across the 10 districts do not appear to be dependent on how we group the high and low poverty schools within each district.

<sup>10</sup> Test scores within each district were standardized by grade and subject before averaging across grade levels and subject areas. Elementary school findings were based on grades two or three to five, grades four to five, or grades three to six. Middle school findings pertain to grades six to eight.

<sup>11</sup> The test was a chi-square test of the independence of rows (school quintiles) and columns (prevalence of highest-performing teachers).

**For more information on the full study, please visit:**

[http://ies.ed.gov/ncee/projects/evaluation/tq\\_recruitment.asp](http://ies.ed.gov/ncee/projects/evaluation/tq_recruitment.asp)

**To read the technical appendix, please visit:**

[http://ies.ed.gov/ncee/pubs/20114016/pdf/20114016\\_app.pdf](http://ies.ed.gov/ncee/pubs/20114016/pdf/20114016_app.pdf)



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