



Technical Appendix



Their FAIR Share

How Texas-Sized Gaps In Teacher Quality Shortchange Low-Income and Minority Students

The Education Trust's series of *Their Fair Share* reports reveals the inequitable distribution of teacher talent to low-income and minority students within both the 10 largest school districts (June 2007) and the 50 largest school districts in Texas (January 2008). All of the data in these reports—teacher salaries, school demographics, teacher experience, credentials, and teacher turnover—is publicly available through the Texas Education Agency (TEA). Ed Fuller, Ph.D., from the University of Texas at Austin conducted the analyses presented in these reports.

Data Sources

We relied on two data sources for our analyses of teacher distribution: the Teacher Employment Records (TER) and the Academic Excellence Indicator System (AEIS) data.

The 2005-2006 Teacher Employment Records are a part of the Public Education Information Management System (PEIMS) created and maintained by the Texas Education Agency. Publicly available for purchase through TEA, TER data include every teacher in Texas's public schools, the school or schools that employ each teacher, the percentage of the day each teacher is employed in each school (Full-Time Equivalent, or FTE), and the base pay, supplemental pay, and the total pay associated with each teacher and his or her assignment(s). For cases in which a teacher was assigned to two schools, we identified the salary corresponding to each of the two assignments.

We used AEIS¹ to identify the 50 school districts in Texas with the largest student enrollment² and to obtain school demographic information, specifically the percentages of students considered low-income (based on the percentages of students who are eligible for the federal free and reduced-price lunch program) and the percentages of students who are African-American, Hispanic and Native American.

Data from TER and AEIS were merged to create a file that linked teacher information to the data for each school that employed her or him during the 2005-2006 academic year. We then narrowed the data set to include only teachers in the 50 districts in Texas that enrolled the largest number of students and only teachers in schools with a standard accountability rating (low-performing, acceptable, recognized, or exemplary). These data selection criteria ensured the inclusion of districts from which reliable estimates of differences in teacher distribution could be derived and excluded schools serving special populations such as profoundly disabled students or schools serving students removed from their home school for disciplinary reasons. All teachers of record within these districts were included in the analyses, including regular classroom teachers, special-duty teachers, and permanent substitutes.

Thus, the final data set included information about almost 149,000 teachers.

Methodology for Analyzing Teacher Credentials

Our report also includes Fuller's analysis of 2006 teacher certification data for all K-12 public schools in Texas. Fuller used the 2006 Teacher Employment Records from the Public Education Information Management System to conduct the analysis that includes schools both with an accountability rating and schools without an accountability rating (e.g., charter schools, alternative schools).

We calculated the percentage of teacher FTEs assigned in-field and out-of-field for each major course with the four core course areas (English/language arts, mathematics, science and social studies) for all of Texas's public high schools.

In Field

Teachers teaching "in field" are those who hold certification in the subject area of the course(s) they were teaching. In Texas, this means that they were certified both for the course and for the particular grade level to which they were assigned.

Out-of-Field

Teachers who are "out-of-field" include two groups: first, those teachers who hold a full state teaching certificate but *not* in the subject(s) they were assigned to teach (e.g., a teacher certified in English who is currently teaching an Algebra I class); and second, those teachers who are not fully certified by the state of Texas. This latter group mostly includes teachers on probationary or out-of-state certificates.

Probationary certificates are given to those teachers enrolled in a Texas alternative certification program accredited by TEA. State

regulations designate teachers on both of these certificates as being not fully certified. Thus, they are considered out-of-field.³

The data indicate that between 30 and 40 percent of teachers who do not have full state certification never obtain it. An analysis by Alexander and Fuller (2003) concluded that about 40 percent of teachers on probationary certificates never obtained full state certification.⁴ Further, Fuller (2007) reported that 30 percent of secondary mathematics and science teachers holding out-of-state certificates and 40 percent of secondary mathematics and science teachers holding probationary certificates never obtained full state certification.⁵

We calculated the percentage of teachers assigned in field and out-of-field for each school in every school district in Texas. Next, we divided the schools into subgroups by percentage of low-income students and percentage of minority students enrolled in the district. For each of these subpopulations, we created four groups of schools: those with 0-25 percentage enrollment of the particular demographic, those with 25.1-50.0 percentage enrollment, 50.1-75.00 percentage enrollment and 75.1-100 percentage enrollment. For schools within each of these subgroups, we calculated the average percentages of teacher FTEs assigned in field and out-of-field. Further, because the data set identifies the FTEs for each course taught, we were able to calculate these percentages by course (e.g., the percentage of in-field Algebra I teachers at schools with Hispanic student populations of 0-25.0 percent).

Methodology for Calculating Teacher Turnover

We looked at both average and cumulative teacher turnover in our analyses of teacher turnover in Texas's 50 largest school districts. These analyses were based on the teacher employment records as submitted by school districts to TEA. If a teacher

was employed by School A in Year 1 and in Year 2, that teacher was considered to have stayed at School A. If a teacher employed by School A in Year 1 was employed by a different school (School B) in Texas in Year 2, then that teacher was considered to have moved to another school. This was true regardless of whether School B was located in the same district as School A.

If a teacher employed by School A in Year 1 was no longer employed in any Texas public school in Year 2, then that teacher was considered to have quit teaching.

We used the teacher-level file to calculate the total teacher FTEs for each school, the total teacher FTEs who stayed at each school, who moved to a different school, and who quit teaching. We established the total teacher turnover FTEs for each school by adding the total teacher FTEs that moved from that school and that quit teaching. To calculate the percentages of teachers staying, moving and quitting, we divided the total number of teacher FTEs staying, moving and quitting that school by the total number of teacher FTEs in the school, then multiplied that number by 100.

Similarly, the teacher turnover rate was calculated by dividing the total FTEs moving from or quitting a school by the total number of teacher FTEs at the school, then multiplying that number by 100. A one-year turnover analysis represents the percentage of teacher FTEs in Year 1 who were no longer at the school in Year 2. We calculated average teacher turnover for one-, three- and five-year spans, going backward from the 2005-2006 school year. For example, the three-year average teacher turnover was established by calculating the average one-year teacher turnover rates for three years in a row—the 2003-2004, 2004-2005 and 2005-2006 school years. We calculated *cumulative* teacher turnover for one-, three- and five-year spans, going backward from the 2005-2006 school year. For example, the three-year *cumulative* teacher turnover shows the

percentage of teachers who were employed in the school during the 2002-2003 year who did not return to teaching in that school in the 2005-2006 school year.

Methodology for Calculating Teacher Salary Gaps

Before conducting the analyses, we reviewed the data for possible inaccuracies in the reporting of salaries for all teachers in the sample. Given the sheer number of salaries reported—often entered by hand by school personnel—checking for accuracy of the data is essential to an accurate analysis.

To begin the review, we first ensured that the salary data for each teacher reflected the teacher’s FTE at each school. For example, if a person was assigned to teach only 0.50 FTE and was scheduled to make \$20,000 for the 2005-2006 academic year, the data reflected a \$40,000 base salary. To determine the accuracy of salary data, the minimum salary schedule for 2005-2006 as published by TEA was used to establish a lower bound of \$24,800 for the salaries of all teachers.⁶ An arbitrary upper-bound of \$100,000 was also used.

Overall, 600 teachers (0.4 percent) had salaries outside the acceptable salary range, with 572 of the salaries *lower* than the minimum. Approximately 50 percent of these low salaries were for special-duty teachers and permanent substitutes. Indeed, 99.8 percent of the regular-duty teachers had salaries within these lower and upper bounds. Any teachers with a 2005-2006 total salary outside of this range were flagged for identification purposes.⁷

To check the accuracy of the salary reporting, we merged the salary data from the 2003-2004 and 2004-2005 academic years to analyze the salary trends for teachers with salaries outside the lower and upper boundaries. If the 2005-2006 salary was consistent with the previous years’ salaries, then

the reported 2005-2006 salary was maintained in the database. If the 2005-2006 salary data were outside the acceptable range, and the salary data for the 2003-2004 and 2004-2005 academic years suggested a 2005-2006 salary within the lower and upper bounds, then a new salary was calculated by increasing the 2004-2005 salary by three percent, which represents the average increase in teacher salaries from 2004-2005 to 2005-2006 for all teachers in Texas.

We also compared the average base salary for each school to the average base salary for each school published by TEA on the AEIS website. The vast majority of schools had average base salaries that were within \$100 of the AEIS base salaries. Less than 20 of the schools had differences of over \$1,000. These schools typically had a larger proportion of teachers with adjusted salaries. TEA does not adjust the salaries, but accepts district reports when calculating their averages.

To determine gaps in average teacher salaries between highest-poverty and lowest-poverty schools within the same district, as well as between highest-minority and lowest-minority schools within the same district, we conducted the following series of calculations. Please note that when we refer to *teachers*, we are talking about *teachers of record*, including regular teachers, special-duty teachers and permanent substitutes. Teacher salary is total individual teacher compensation, including base salary for teaching duties as well as money for any additional duties such as coaching, writing curriculum, extra duties, etc.

1. Calculate the Average Teacher Salary in Each School

We first aggregated the individual teacher salary data and the teacher FTE positions at the school level for every school in the 50 largest districts. We then divided the aggregate salary by the aggregate FTE to calculate an average teacher salary for each school.

2. Calculate the Percent of Low-Income Students and Minority Students in Each School

The percentage of low-income students was calculated as the sum of the students coded as eligible for free or reduced-price lunch or eligible for other public assistance, as reported in the AEIS, divided by the total number of students, multiplied by 100. The percentage of minority students includes the total percentage of the students at the school who are African-American, Hispanic or Native American.

3. Identify Quartiles Based on Percentage of Poverty or Minority Enrollment

In order to compare the average teacher salaries in the highest-poverty and lowest-poverty schools within each district (and highest-minority and lowest-minority schools), we ranked the schools within each district and within each level (elementary, middle, high school) according to the enrollment of low-income (or minority) children, and created quartiles so that each school-level quartile for each district had approximately the same number of children. Then, starting with the school with the greatest percentage of low-income students and continuing in descending order, we designated schools as being in the highest quartile until the sum of the total enrollment of the designated schools was approximately equal to one-fourth of the total enrollment of schools

within that school level and district. The student count in each quartile is not precisely the same because each quartile group consists of whole schools. When a quartile break fell within a single school's enrollment total, we decided to include or exclude that school in the quartile based on whether inclusion or exclusion would bring the overall enrollment total in the quartile closer to the desired quartile size.⁸

4. Find the Teacher Salary Gap by the Percentage of Low-Income or Minority Students

We aggregated the total salaries and total FTEs for each quartile of schools and then divided the aggregate salary by the aggregate of FTEs to arrive at the average teacher salary for each quartile. So, for example, to find the average teacher salary in the highest-poverty elementary schools in the district, we divided the aggregate salary by the aggregate FTEs in Quartile 1 of elementary schools ranked by the enrollment percentage of low-income students.

Finally, to determine the total gap between the lowest- and highest-poverty (or minority) schools, we compared the average teacher salaries between the lowest- and highest-poverty (or minority) schools at each level in each district. The salary gap is the difference in average teacher salary between the lowest- and highest-poverty (or minority) schools at each level, or Quartile 1 and Quartile 4 schools, respectively.

Example of Quartile Designation

School	Percent Minority	Student Enrollment	Cumulative Enrollment	Reverse Cumulative	Lowest Quartile	Highest Quartile
A	10	400	400	8120	I	
B	15	800	1200	7720	I	
C	25	350	1550	6920	I	
D	35	600	2150	6570	I	
E	50	550	2700	5970		
F	53	1200	3900	5420		
G	64	700	4600	4220		
H	68	710	5310	3520		
I	70	850	6160	2810		
J	82	900	7060	1960		4
K	88	660	7720	1060		4
L	90	400	8120	400		4
		8120				

	Total Salary	FTE	Average Salary
Lowest Quartile	\$4,299,085	120.4	\$35,706.69
Highest Quartile	\$3,644,860	118.8	\$30,680.64
Difference	\$654,225	1.6	\$5,026.05

Endnotes

¹ Academic Excellence Indicator System (AEIS) data on schools is available at no cost from TEA at: <http://www.tea.state.tx.us/perfreport/aeis/2005/DownloadData.html>

² The 50 districts included in our final data set educate over one-half (52%) of the 4.3 million students in Texas' public schools.

³ See the following link for certification requirements in Texas: <http://www.sbec.state.tx.us/SBECOnline/certinfo/becometeacher.asp?width=800&height=600#basicreq>

⁴ Celeste Alexander and Ed Fuller. (2003). *Teacher Supply and Demand in Texas*. Presented to the Joint Committee on Education, Texas State Legislature, November, 2003. Austin, TX; State Board for Educator Certification.

⁵ Fuller, Edward J. (2007). Solving the Shortage of Mathematics Teachers in Texas. Invited Address at the Texas Public Policy Forum. Austin, TX.

⁶ Special-duty teachers and permanent substitutes, however, are not subject to the minimum salary schedule. In this analysis, 715 individuals (0.5 percent) were either special-duty teachers or permanent substitutes. These teachers were included in the analysis because they were reported as teachers of record by the school districts, meaning they were responsible for instructing students.

⁷ Because special-duty teachers and permanent substitutes are not subject to the minimum salary schedule, the salaries for these teachers were allowed to stray outside of the boundaries. Fewer than 30 teachers had salaries below an FTE-adjusted \$10,000 per year. All salaries below this level were adjusted upwards to \$10,000.

⁸ In two instances, ninth-grade centers were excluded when they were the only school in a quartile. We made this decision for several reasons. First, we wanted to make sure that quartile size was as close as possible to the desired quartile size (i.e., one-fourth of the total enrollment of schools within that school level and district). Second, ninth-grade grade schools typically have a greater concentration of novice teachers and higher turnover rates—and thus far lower average teacher salaries—than traditional high schools. Since ninth-grade grade centers and traditional high schools are so different in terms of the types of teachers they employ, comparing them would not be fair to the district.