

**Reference:** Krueger, A. & Whitmore, D. (2002). Would smaller classes help close the black-white achievement gap? In J. Chubb and T. Loveless (Eds.), Bridging the achievement gap. Washington, DC: Brookings Institute Press.

## STRUCTURED ABSTRACT

**Background:** The gap between black students and white students in student achievement scores remains sizable. For example, the average 17-year-old black student scored at the 13<sup>th</sup> percentile of the distribution of white students on the math exam and the 22<sup>nd</sup> percentile on the reading exam of the 1999 National Assessment of Educational Progress. An important task before the community of educational researchers, practitioners, and policymakers is to identify and implement school practices that help to close this black-white achievement gap.

One school practice to consider in this context is small class size in the early grades. Project STAR was a major randomized-controlled field trial in Tennessee where students were randomly assigned to small class sizes of about 13-17 students or regular class size of about 22-25 students in kindergarten through third grade. Teachers were likewise randomly assigned to small size or regular size classes. The study took place between 1985 and 1989 and involved more than 11,600 students; approximately one-third of the participating students were black. As one of the very few examples of a large-scale experiment in education in the United States, Project STAR is the best-designed study to evaluate the long-term impact of small classes in the early elementary grades on student achievement, including the effect of small classes on the black-white achievement gap.

**Purpose:** To examine the effect of being assigned to a small class in the early elementary grades on student achievement, with special attention given to disaggregating the results by race. Student achievement measures include standardized test scores through the eighth grade and performance on college-entrance exams. An additional question for consideration is the long-term effect of small classes in the early grades on teen birth rates and criminal conviction rates.

**Population:** Students who participated in Project STAR, consisting of about 6,200 students per year in kindergarten through third grade (when the randomized-controlled field trial was taking place), and 7,700 students per year in 4<sup>th</sup> grade through 8<sup>th</sup> grade (after the experiment had ended).

**Research Design:** Quantitative comparison (long-term follow-up of participants in the Project STAR, the Tennessee randomized-controlled field trial on class size).

**Data Collection and Analysis:** In grades K-3, achievement test data for participants in Project STAR came from both a nationally-normed standardized test (i.e., the Stanford Achievement Test) administered in the spring of each school year and a state-specific curriculum-based test (i.e., the Tennessee Basic Skills First test). In 4<sup>th</sup> grade and beyond, students each year took another nationally-normed standardized test (i.e., the Comprehensive Tests of Basic Skills) as well as the Tennessee Basic Skills First tests in reading and math.

The statistical analysis of standardized test data employed a “balanced-sample estimator” procedure to control for school effects when examining the differences between being assigned to a small or regular size class. The analysis separated out the effect of class size on student achievement from other possible school-wide influences on student achievement (e.g., a new principal). The analysis of student achievement data was also based only on the students’ initial class size assignment during the first year of participation in the Project STAR experiment. This is a conservative procedure - known as an “intent to treat” estimator – because students initially enrolled in small classes actually ended up in regular size classes, and vice versa. As a result, the findings likely underestimate the effect of small classes by 10 to 15 percent.

ACT, Inc. and the Educational Testing Service provided ACT and SAT college entrance exam data for former participants in Project STAR, most of whom had graduated from high school as the Class of 1998. SAT and ACT records were searched nationwide; 9% of former Project STAR participants were found to take either the ACT or SAT outside of Tennessee.

The Tennessee State Department of Corrections data were matched to the Social Security Numbers of former Project STAR participants to provide criminal conviction data. Since boys represented 88% of those convicted in the sample, the analysis was restricted to males.

Birth records in the state of Tennessee were matched to the Social Security Numbers of former Project STAR participants to provide teen birth rate data.

**Findings:** During the Project STAR experiment, black students randomly assigned to small classes outperformed black students assigned to regular size classes on average by 7-10 percentile points on standardized tests in kindergarten through third grade. In the same experiment, white students in small classes outperformed white students in regular size classes on average by 3-4 percentile points on standardized tests in kindergarten through third grade. The effect size of being assigned to a small class in grades K-3 was about 0.26 for black students and about 0.13 for white students. Based on these figures, the impact of assigning all students to small classes of 15 students in the early grades instead of regular size classes of 22 students would be to reduce the black-white gap in achievement test scores by 38 percent in kindergarten through 3rd grade.

In 4<sup>th</sup> grade, after the Project STAR experiment ended and all students had been returned to regular size classrooms, the effect of being in a small class in grades K-3 persisted, though the effect size dropped by about half. Black students formerly assigned to small classes in the early grades continued to outperform their counterparts who had been previously assigned to regular size classes by 5 percentile points on standardized tests in grades 4-8; for white students, the difference was 1.5 percentile points. These figures indicate that assigning all students to small classes in grades K-3 would continue to reduce the black-white gap in achievement test scores by 15 percent in 4<sup>th</sup> grade and beyond.

In high school, the long-term effect of being assigned to a small class in grades K-3 likewise persisted for black students. Black students who had been randomly assigned to small class size in the early grades were more likely than black students who had been assigned to regular class size to take the ACT or SAT college entrance exams: 41.3% of black high school seniors who

had been assigned to small classes took the ACT or SAT exam, compared to 31.8% of black students assigned to regular size classes. Based on these figures, the estimated impact of assigning all students to small classes of 15 students in the early grades would be to reduce the black-white gap in taking a college entrance exam by 60 percent.

In terms of ACT and SAT test scores, the “adjusted” effect size of being assigned to small classes in the early grades was about 0.15-0.20 for black students. Statistical adjustment was necessary to account for the fact that substantially more students took the ACT and SAT exams from the group of students who had been assigned to small classes; when larger numbers of students take a college entrance exam, average test scores tend to fall. The adjusted analysis looked at two comparable cohorts from the groups of students who had been assigned to small and regular size classes in the early grades, and then compared their college admission test results.

White students previously assigned to small classes in the early grades had slightly higher test-taking rates than white students assigned to regular size classes (46.4% vs. 44.7%) and slightly higher college admission test scores (effect size = .04), but these differences were not statistically significant.

Class size in the early grades did not have a significant effect on criminal conviction rates for either white males or black males.

The teen birth rate was considerably lower for white females who had been assigned to small classes in the early grades compared to white females who had been assigned to regular size classes (3.2% vs. 4.8%). The teen fatherhood rate was likewise substantially lower for black males who had been assigned to small classes in the early grades compared to their counterparts in regular size classes (1.5% vs. 2.5%). Class size in the early grades did not have a significant effect on teen parenthood rates for either white males or black females.

**Conclusions:** Students assigned to a small class in kindergarten through third grade had higher scores on standardized achievement tests in grades K-3 than their counterparts in regular size classes. These gains persisted in grades 4-8 after the experiment ended and all students had been returned to regular size classes, though the effect size in 4<sup>th</sup> grade and beyond was diminished by about half. Average gains for black students on achievement tests in grades K-8 were about twice the size of gains for white students.

Black students who had been assigned to small classes in the early grades were more likely to take the ACT or SAT college entrance exam by the end of high school and to get higher test scores on these exams, increasing their prospects of attending college.

This study indicates that small class size in the early grades can be an important equity measure. Based on this analysis, the estimated impact of assigning all students to small classes of 15 students in the early grades instead of regular size classes of 22 students would be to reduce the black-white gap in achievement test scores by 38 percent in kindergarten through 3rd grade; by 15 percent in achievement test scores in grades 4-8; and by 60 percent in test-taking rates for a college entrance exam like the SAT or ACT in high school.