



The development of racial/ethnic and socioeconomic achievement gaps during the school years



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ABSTRACT

Although a large body of research has documented racial/ethnic gaps in academic achievement at school entry, less is known about the interaction between race and poverty as achievement gaps develop. This study examined developmental trends in academic achievement gaps between poverty and race/ethnicity groups from school entry to middle school using two large longitudinal data sets. We used time-varying effect modeling (TVEM) to estimate how the associations among race/ethnicity, poverty status, and math and reading achievement vary across continuous age from age 5 to age 15. Poor White students consistently outperformed poor Black and poor Hispanic students, with gaps widening around ages 7–8. Furthermore, we found that within-group variation increased across time, which indicated that a standardized difference in later grades translates to a larger difference in knowledge in later grades. The results highlight the importance of studying race and poverty in interaction when measuring achievement gaps.

Introduction

Disparities in educational opportunities and the resulting gaps in academic achievement by race/ethnicity are a widely-recognized problem in American public education. National studies have consistently found sizeable Black-White gaps in both reading and math that are present at school entry (e.g., Fryer Jr & Levitt, 2004; Reardon & Portilla, 2015) and grow across the elementary school years (Fryer & Levitt, 2005; Murnane et al., 2006; Reardon, 2008). While less studied than the Black-White gap, researchers have found a similar gap at school entry between Hispanic and non-Hispanic White students (Reardon & Galindo, 2009).

A key question in the study of achievement gaps has been whether gaps by race/ethnicity are in fact gaps by income. The primary way this question has been tested is by measuring the extent to which the racial test score gap is reduced when measures of family socioeconomic status (SES) are included in regression analyses. One such study (Fryer & Levitt, 2005) used data from the Early Childhood Longitudinal Study-Kindergarten Cohort of 1998–1999 (ECLS-K-1998) and found that SES explained the majority (85%) of the Black-White math gap and all of the reading gap at school entry. Other studies have found that SES explains smaller portions of the race or ethnic gaps—between 25% and 50%—in the later elementary school years (Clotfelter, Ladd, & Vigdor, 2006; Murnane et al., 2006; Phillips, Crouse, & Ralph, 1998).

Despite a number of studies that have sought to use SES to explain away racial and ethnic achievement gaps, surprisingly little research has examined the interaction between race/ethnicity and family income or poverty status in explaining the development of academic ability from school entry to the teenage years. There is reason to think that achievement gaps might be associated with a combination of race/ethnicity and income. For example, using data from National Educational Longitudinal Study of 1988 (NELS), Gánarda (2005) demonstrated that SES was less associated with achieving at high levels for Latino students than for White students. This could be due to the fact that race and ethnic groups vary in their likelihood of experiencing low income or poverty (Proctor, Semega, & Kollar, 2016). Additionally, Black and Hispanic groups are more likely to experience multiple aspects of poverty (e.g., low household income, lack of health insurance, unemployment) than their White counterparts (Reeves, Rodrigue, & Kneebone, 2016). Furthermore, median White wealth is twelve times higher than median black wealth (Thompson & Suarez, 2015). More than one in four Black households have zero or negative net worth, while only 9% of White households do. It is likely that while SES explains some of the racial/ethnic achievement gaps, Black and Hispanic students in poverty still face additional barriers than do White students in poverty.

Given that the relation between race/ethnicity and SES in the United States is complex, racial/ethnic differences in achievement

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outcomes may look different if one focuses separately on populations in poverty or not in poverty (Lin & Harris, 2009). Furthermore, almost all of the research on achievement gaps has focused on mean gaps in achievement by group, with little examination of racial/ethnic disparities across the full distribution of test scores. Test score distributions across racial/ethnic and poverty groups may differ in their spread (e.g., Hispanic students who are not in poverty may show more within-group score variation than Black students who are not in poverty due to population heterogeneity) as well as the percentage in certain ranges of the distribution (e.g., Black and Hispanic students are underrepresented in the upper end of the achievement distribution).

In the present study, we investigated the development of racial/ethnic and poverty gaps in three academic skills—math, reading, and vocabulary—from school entry to age 15. Instead of using SES components such as parents' education and household income to account for racial/ethnic achievement gaps at specific time periods, we estimated trajectories of academic development separately for groups defined both by race/ethnicity and poverty status. By using a combination of non-parametric spline regression models and descriptive distributional analyses, we provide insight on when achievement gaps develop and how race/ethnicity and poverty are associated with score distributions across elementary and middle school. Although the presence of racial/ethnic and poverty gaps has been documented for particular grades in previous research, our descriptive analyses highlight at what chronological ages these gaps appear and expand. In doing so, our analyses can target key ages on which to potentially focus for interventions or further research.

Achievement gaps in reading and math at school entry

A large body of research has demonstrated that there is a Black-White achievement gap at the start of elementary school (e.g., Fryer Jr & Levitt, 2004; Neal, 2006; Reardon & Portilla, 2015). Studies using the ECLS-K-1998 have found that the Black-White gap at the start of kindergarten is about three-quarters of a standard deviation in math and one-half of a standard deviation in reading (Fryer Jr & Levitt, 2004). However, there is a considerable amount of variation in the magnitude of the gap at school entry across different studies as well as in the degree to which the gap is explained by SES (Reardon, Robinson, & Weathers, 2015; Rock & Stenner, 2005). Prior research using the Children of the National Longitudinal Survey of Youth (CNLSY; Baker, Keck, Mott, & Quinlan, 1993) has found smaller school-entry gaps than the ECLS-K-1998, with a Black-White reading gap of 0.20 standard deviations and Black-White vocabulary gap as measured by Peabody Picture Vocabulary Test scores (PPVT; Dunn & Dunn, 1997) of 0.98 standard deviations (Phillips et al., 1998).

The achievement gap between White and Hispanic children has received less attention. Reardon and Portilla (2015) used the recent ECLS-K-2011 and found the White-Hispanic gap at school entry was 0.56 standard deviations in reading and 0.67 standard deviations in math. These authors also highlight the considerable heterogeneity in the development and magnitude of achievement gaps across various Hispanic subgroups depending on national origin and immigrant generational status.

While a great deal of research has focused on gaps between low and high SES families in terms of school readiness (Duncan & Magnuson, 2005; Janus & Duku, 2007), one difficulty in interpreting the research on SES achievement gaps is the multiple ways of defining SES. Magnuson and Duncan (2006) defined four key components of family SES that are particularly relevant for children's well-being: income, education, family structure and neighborhood conditions. Most of the achievement gap research to date have focused on income and parent education. Reardon and Portilla (2015) estimated the income achievement gap (which they defined as the average test score gap between children from families at the 90th percentile of the family income distribution and children from families at the 10th percentile)

at school entry using the ECLS-K-2011 sample and found large gaps (1.17 standard deviations in math and 1.06 standard deviations in reading). To identify gaps by parent education, Reardon et al. (2015) used data from the National Assessment of Educational Progress Long-Term Trends study and found that at both ages 13 and 17, students whose parents had only a high school diploma performed three quarters of a standard deviation worse in math and reading than students whose parents had at least a college degree.

Modeling the development of the achievement gap across schooling

There is broad consensus that the Black-White achievement gap in reading and math gaps either grow or are maintained across elementary school (see Reardon et al. (2015) for an overview of the literature). Less is known about the development of Hispanic-White gaps. One study using the ECLS-K-1998 found that the gaps between White and Hispanic students narrow by roughly a third in the first 2 years of schooling but then remain relatively stable for the subsequent 4 years (Reardon & Galindo, 2009). The gap by income has also been found to be relatively stable across elementary school. Reardon (2011) estimated the 90/10 income achievement gap across six longitudinal studies and found that the income achievement gap changed little as children progressed from school entry to high school. Thus, research to date suggests that the Black-White gaps grow across elementary school, while the Hispanic-White gaps and income gaps remain stable across the school years.

The majority of the research to date on achievement gaps has calculated these gaps from group averages at single points in time. While this approach gives us a sense of the absolute size of the gaps at particular time points, it does not characterize the average growth of these groups, which prevents a clear understanding of how these gaps arise and are maintained. Gaps could expand because the advantaged group is accelerating more quickly (a difference in rate of change only) or because the disadvantaged group is starting out behind and is learning less once they enter school (differences in both intercept and rate of change). By only focusing on gaps in point-in-time averages and not focusing on group trajectories, past studies have lost nuanced information about how the gaps are formed and maintained across the school years. One exception is a study that compared the shape of achievement trajectories in mathematics and reading across racial/ethnic and socioeconomic groups using nonlinear “S-shaped” Gompertz growth curves to model individual changes from kindergarten to the end of middle school using the ECLS-K-1998 (Cameron, Grimm, Steele, Castro-Schilo, & Grissmer, 2015). Across all children, the fastest growth in achievement occurred before 3rd grade, but among Black and Hispanic students, there was slower growth in achievement generally and Hispanic students showed accelerated change later in elementary school than White students.

Research on the development of the race, ethnic, and income achievement gaps after children enter school comes from a combination of longitudinal panel studies and meta-analyses of multiple studies. Many of the highly-cited studies use the ECLS-K-1998 longitudinal samples to examine the developmental trends within specific cohorts of children (e.g., Fryer Jr & Levitt, 2004; Fryer & Levitt, 2005). This repeated-assessment longitudinal design allows for the estimation of individual growth patterns across fixed intervals of time. A combination of linear and nonlinear growth models have been used to examine academic trajectories (e.g., Cameron et al., 2015; Chen, Hughes, & Kwok, 2014; Shin, Davison, Long, Chan, & Heistad, 2013). However, most longitudinal studies do not have sufficient coverage of the age range of interest to pinpoint when groups converge and diverge. Growth models fit lines or curves to the data collected in intervals of one to multiple years between assessments by extrapolating between assessment points. This type of longitudinal design is useful for estimating the overall shape of individuals' academic trajectories, but less useful in identifying narrow periods of time where growth is occurring most rapidly.

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