

Teacher Diversity in Alabama

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## I. Introduction

Over the past two decades, researchers have generated a large and growing literature on the importance of teachers in influencing a variety of student outcomes from test scores to labor market outcomes. One attribute of teachers that has received attention over the past decade has been that of the race of the teacher. Beginning as early as 1992 (Hanushek, 1992), there has been evidence suggesting that a student's assignment to a teacher of his or her own race resulted in higher test scores. More recent work on the own-race teacher looks not only at test scores but at longer run outcomes such as dropout rates and making efforts to enroll in college (Gershenson et al., 2017). Perhaps due to these findings, policymakers in most states have adopted laws that aim to increase the diversity of the teacher workforce by preparing more teachers of color.

While the policy argument is growing for student-teacher matches by race, there has been much less work highlighting where these matches are or are not occurring. According to a U.S. Department of Education report in 2016<sup>1</sup>, the teacher workforce has become more diverse across the U.S., though the proportion of teachers who identified as African American has decreased. Although diversity has increased, nonwhite teachers are concentrated not only by state but by geographic regions within the states. In inner cities, for example, 12 percent of teachers are black whereas only 6 percent are black in rural areas (Department of Education, 2016, p. 26). As well, the Education Department report (2016) illustrates that the teacher numbers contrast starkly with student numbers where 51 percent of public school students are students of color (NCES data SY 2015).

While the aggregate statistics are illuminating, we know little more about the distribution of teachers of color in relationship to the students of color at a micro level. This paper begins to fill that gap by looking at administrative data on teachers in a single state, Alabama, over a 3-

year period, school years 2010 – 2012. Alabama is a particularly interesting state for study because its 33 percent of black population and black students is significantly higher than the national average of 15 percent. According to the U.S. Department of Education (2016), it is also one of the states that has a higher than national average of black teachers in the preparation pipeline.

Specifically, we examine the diversity of teachers in Alabama and observe the distribution of teachers across districts and schools within the state. While there has been much attention given to student segregation by schools with federal court orders mandating against such segregation, scholars and policymakers have failed to consider whether teachers are segregated in similar fashion to the students. Beyond looking at the average distribution of teachers across schools and locales in Alabama, we also empirically assess what teacher and school-level factors are associated with “own-race matches” in the classroom. In this state with above average numbers of black teachers, we specifically ask whether they are distributed across the entire state so that students are equally likely to experience a teacher of his or her own race regardless of locale?

The results of this paper suggest that segregation of students and teachers closely align and that this segregation is geographic in nature. Black teachers are more likely to be located in the Black Belt region and either in mid-size cities or rural areas, not suburbs or small cities and towns, which is where the majority of black students are also located. As well, black teachers taught in schools with a higher percentage of students of their own race. The rest of the paper is structured as follows. Section II highlights the literature relating to own race teachers. Section III provides information about Alabama education system. Section IV includes a description of our data, the empirical estimation and ensuring results. Section V offers concluding comments.

## II. Importance of own race teachers

Scholars across many social science disciplines have hypothesized that placing students in a classroom with a teacher of his or her own race would be beneficial for the students. While the exact mechanism through which the benefits are generated was initially speculative, most studies assumed some form of role model effects. Villegas and Irvine (2010) provide an excellent summary of the literature covering the conceptual arguments for teacher diversity. They argue that the role model argument was the impetus behind federal government support of teacher diversification as early as 1998. In the role model studies, benefits have been found not only for black students who are taught by black teachers but also for white students being taught by black students (Waters, 1989). Perceptions of students are positively affected when they see successful black teachers as role models regardless of student race.

It is not only through the role model effect that teachers are expected to influence students. As early as 1992, researchers began examining the effects of teacher's race on student achievement (Hanushek, 1992) and finding evidence suggesting that a teacher's race affected student performance on measured test scores. The early studies did not uniformly find test score effects, but found other effects that have led to continuing research in the area. For example, Ehrenberg, Goldhaber, and Brewer (1995) used data from the 1988 National Educational Longitudinal Study (NELS) and were among the first to show that teachers' expectations differ depending on their own and student characteristics. They found that teachers of color evaluated students of color more highly than did white male students. That expectations or perceptions of students by teachers is now a robust finding in the literature (Villegas and Irvine, 2010).

Dee (2005) found similar findings about subjective evaluations of teachers when using the NELS data but he also used the Tennessee Star Data to look at randomized effects of matching students to teachers. There he found that poorer students were less likely to have their own race teacher but like others, he found that assignment to one's own race teacher increased a student's test scores. Most recently, Gershenson et. al. (2017) have extended these earlier findings of the effects of own-race teachers to look at longer run effects on students including high school dropout rates and aspirations to attend college as evidenced in self-reported data and in sitting for the SAT or ACT. They used North Carolina data as well as the Tennessee STAR data. With both data sets, they find the own-race teachers result in better long run outcomes for the students. Because they observe students and teachers in a longitudinal context in North Carolina, they find that exposing a child to her own race teacher even once in her schooling leads to significantly higher long run educational outcomes.

As strong as the mounting evidence appears regarding the positive effects of own-race teachers, there remains a dearth of literature on the characteristics of schools that are more and less successful in achieving the desirable matches. The U.S. Department of Education issued a report in 2016<sup>1</sup> comparing teacher diversity in 2016 with that in 2010. Data from a nationally representative survey of teachers and principals -- the U.S. Department of Education's Schools and Staffing Survey (SASS) -- revealed that that 84 percent of teachers identified as white in 2010 and 82 percent identified as white in the latest survey. This represents an increase in minority teachers compared to a survey in 1987-88 in which 87 percent of teachers identified as white. While teachers of color have increased slightly over a 30-year period, teachers who were black decreased.

Looking at teacher preparation programs as a means of forecasting future changes in the teacher workforce, the study finds that black enrollees in current programs are concentrated in Arizona (home of an online teacher prep program) as well as the southeast and mid-Atlantic and there is more diversity in the teacher pipeline than in the current teacher workforce. Also of interest, the data show that nonwhite teachers currently are concentrated not only by state but by geographic region within the states whether looking at new hires or the current teacher supply. In inner cities, for example, 12 percent of teachers are black whereas only 6 percent are black in rural areas (Department of Education, p. 26). They also find that retention for white teachers was higher (85 percent) at the same school than for blacks (78 percent).

The remainder of this paper focuses on the state of Alabama and uses teacher administrative data over a three-year period to determine whether a state with relatively high percentages of black students and black teachers tend to be located in the same areas.

### III. The Alabama context

Though evidence points to the importance of diversity in the classroom, we do not know where these student-teacher matches are occurring, and previous studies have not yet considered a state where a significant portion of the population is African American. Alabama proves an important setting given its diverse demographics and poor education outcomes.

As of 2017, Alabama had a population of 4.8 million people with 22.6 percent of the population under 18 years old. The state is similar in size to other southern states, including Kentucky (4.5 million), Louisiana (4.7 million), and South Carolina (5.0 million). Statewide, 26.8 percent of the population is African American, which is double the national average but similar to other areas of the southeast. As well, Alabama's population is poorer and has lower

educational attainment. The median household income is approximately \$10,000 less than the national median income (Alabama = \$44,758; U.S. = \$55,322), and 17.1 percent of the population is in poverty (U.S. = 12.1 percent). Only 24 percent of Alabama's population holds a bachelor's degree or higher, compared to thirty percent in the U.S.

Within Alabama, race, income, and education attainment vary widely by region and county. Measured at the county-level, rural areas<sup>1</sup> of Alabama have lower median incomes (rural = \$33,925; non-rural= \$43,385)<sup>2</sup>, greater percentages of individuals in poverty (rural = 25 percent; non-rural= 19 percent), and lower education attainment (measured by percent of population with a bachelor's degree, rural = 12 percent; non-rural= 19 percent).

However, unlike other states where African Americans have primarily located in more urban areas, rural counties in Alabama have higher percentages of African Americans than non-rural counties, a function of African Americans migrating back to the south since the 1970s (Falk et al. 2004). Of note, rural counties with higher percentages of African Americans are located in what is known as the Black Belt region of Alabama. Outside of Alabama, the Black Belt stretches west into Texas and east through Georgia to North Carolina and Virginia. The region became known as the Black Belt in the 19<sup>th</sup> century because of rich soil, which had made it the epicenter for southern agriculture and slavery (Webster and Bowman 2008; Harris and Hyden 2017). In fact, counties in the Black Belt were among the highest in terms of slave populations in 1860 (Acharya 2016).

The Black Belt title remained and has been more commonly associated with the region's demographic and economic attributes, including its large African-American population and lack of economic opportunity (Webster and Samson 1992; Webster and Bowman 2008). Figure 1

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<sup>1</sup> County rural designations <https://www.hrsa.gov/sites/default/files/ruralhealth/resources/forhpeligibleareas.pdf>

<sup>2</sup> Measured in 2015 dollars

depicts the percentage of black students within each school district across ten southern states, and the darker shaded regions overlap what is considered the Black Belt region in most of these states.

Figure 2 shows where the 18 Alabama Black Belt counties are located. In Alabama, 55 percent of individuals who live in Black Belt counties are African American, compared to 22 percent in non-Black Belt counties. Thirty percent of Black Belt county residents are in poverty, compared to only 20 percent of non-Black Belt county residents, and the disparity increases for children in poverty, where 43 percent of children in Black Belt counties are in poverty, compared to 29 percent in non-Black Belt counties.

### Education

Alabama ranked 50<sup>th</sup> among states on overall National Assessment of Educational Progress (NAEP) scores in 2015 (only Washington, D.C. had lower scores). For black students, Alabama ranked last, and while white students scored considerably better, they still lagged nearly all other states. In terms of K-12 per-pupil funding, Alabama has not returned to pre-recession per-pupil revenue levels and ranked 10<sup>th</sup> among all states, spending \$9,913 per student in the most recently available NCES data. As well, the average school district in Alabama relies more heavily on state and federal funding than an average school district in the U.S. Again, within Alabama, disparities exist for schools in Black Belt areas. Though black students make up one-third of all Alabama K-12 students, they comprise 76 percent of all students in the Black Belt. And though Black Belt school districts receive \$400 more in total per-pupil revenue, they receive less in state and local support and nearly \$800 more in federal per-pupil funding, on average<sup>3</sup>

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<sup>3</sup> Though such a contrast exists, few researchers have considered the impact of these racial and economic disparities prevalent in the Black Belt on education outcomes. Instead, the breadth of research has focused on health outcomes

#### IV. Data and empirics

##### a. Data description

Like most states, Alabama maintains a longitudinal administrative data base for teachers.<sup>4</sup> Data regarding teacher-level characteristics come from the Alabama State Department of Education through the Public Affairs Research Council of Alabama. Data were collected for school years (SY) 2010-2011 through 2012-2013. For each teacher, data include the gender, race, age, employment date, salary, highest degree earned, and the school and school district of employment.

We match the Alabama data to school- and district-level data from the National Center for Education Statistics. For each school, data include the demographic makeup of the student body (race, gender, and free or reduced- price lunch eligibility), the grade levels included at each school, and the pupil-to-teacher ratio. For each district, data include per-pupil revenues, the urbanicity of the district and whether the district was located in one of the Black Belt counties in Alabama. Table 1, Columns A - C illustrate these data.

In Table 1, Column A represents descriptive statistics for our sample of teachers in Alabama. Columns B and C represent descriptive statistics for the sub-samples of teachers in the Black Belt (Column B) and non-Black Belt (Column C) regions. Across the state, 20.5 percent of teachers were Black, though in the Black Belt region, the proportion of teachers who are Black was over half (53 percent). The average teacher is 43 years of age with 11.5 years of experience. Forty percent of teachers have a bachelor's degree, and 53 percent have a master's degree. With respect to age, experience, and education attainment, there are no substantive differences

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like childhood obesity (Robinson et al. 2014; Li et al. 2014), HIV/AIDS (Lichtenstein 2007), heart disease and smoking (Kuhajda 2006; Shuaib 2011), and cancer (Powell et al. 2005; Gyawu 2016).

<sup>4</sup> For this paper, we construct a 3-year data panel but that will be extended in future analyses.

between teachers inside the Black Belt region and those outside. Salaries differed, though. While the average teacher earned \$53,362 (in 2018 dollars), teachers in the Black Belt (\$52,049) earned \$1,495 less than teachers outside of the Black Belt (\$53,545).

Table 1 also displays descriptive statistics for schools, districts, and counties in Alabama. Again, Column A displays descriptive statistics for all of Alabama, whereas Columns B and C allow for comparison between the Black Belt region (Column B) and non-Black Belt region (Column C). The average school faculty in our sample reflects the overall teacher labor force in Alabama, as 21.85 percent of teachers were black and 78.15 of teachers were white. Faculty demographics varied between the Black Belt region (55.04 percent of teachers were black) and the non-Black Belt region (16.80 percent of teachers were black), however. Student demographics followed a similar pattern. In the state of Alabama, 36.83 percent of students were black, though in the Black Belt region, 76.33 percent of an average school's student body was black (30.56 of students in the average non-Black Belt school were black). Table 1 also includes standard deviations, and we note the high degree of variation across schools within and outside of the Black Belt region.

The average school has a pupil-to-teacher ratio of 15.6, and classrooms in the Black Belt region (16.4) were typically larger than classrooms outside of the region (15.5). Schools in the Black Belt region had a higher proportion of students who were eligible for free or reduced-price lunch. The state average was 57.7 percent, whereas the average school in the Black Belt had 76.4 percent (average non-Black Belt had 55 percent).

A reflection of higher poverty, more schools in the Black Belt were eligible for Title I status. Schools can operate one of two Title I programs. With "targeted assistance" programs, Title I funds must be used for Title I students. Districts eligible for school-wide Title I programs

can use funds for programs that affect all students, though the poverty rate within these schools must be higher.<sup>5</sup> Compared to the non-Black Belt region, a greater proportion of schools in the Black Belt region were eligible (and elected) to use school-wide Title I funds.

School district locations reflect Alabama's rural geography. Only 15 percent of school districts were located in a mid-size city. Nearly 25 percent were located in a small city or suburb, and the remaining 60 percent were located in towns and rural areas. While both regions are rural, 20 percent of school districts in the Black Belt were in remote rural areas (only 5 percent in non-Black Belt), and the Black Belt region had very few school districts located in the suburbs (none in small cities). The average school district in Alabama receives \$11,184 in per-pupil revenues, though school districts in the Black Belt receive nearly \$500 more than school districts outside of the Black Belt region. The \$500 difference can be attributed to more state and federal funding, which more than offsets the lack of local funding from Black Belt school districts (\$1,000 less than non-Black Belt districts).

As noted previously, residents in the Black Belt region have less income and are more likely to be in poverty. Across the years in our sample, the median household income in Alabama was \$40,996 (in 2018 dollars), but the difference between the Black Belt (\$33,293) and non-Black (\$43,826) regions was \$10,533. As well, the average county in the Black Belt had 28.7 percent of residents in poverty, whereas the average county outside of the Black Belt had only 19.7 percent of residents in poverty.

While the above Tables illustrate average characteristics, the racial and economic distribution of the population is better illustrated by Figures 3 – 5. Figure 3 displays the percentage of African Americans living in each Alabama Census Tract. As noted, African

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<sup>5</sup> <https://www2.ed.gov/policy/elsec/leg/essa/essaswpguidance9192016.pdf>

Americans have primarily located in Black Belt counties, reflecting racial segregation within the state. Even within the four most populous cities, Birmingham, Huntsville, Montgomery (the state’s capital), and Mobile, census tracts are racially segregated. More specifically, Figure 4 shows a similar pattern for students and teachers and their concentrations within school districts. Students and teachers do not appear to be randomly distributed across the districts. Combined, Figure 4 and the descriptive statistics previously discussed indicate racial segregation appears to occur both across schools and districts.

b. Empirical estimation

First, we explore where black teachers are more likely to locate. While our descriptive statistics would suggest that black teachers located in schools that were in the Black Belt region, we are also interested in what school, district, and county attributes were associated with a black teacher’s school location. We observe each teacher in a specific school, district, and county, so we can predict a teacher’s race based on school, district, and county attributes. In other words, how do these factors influence the likelihood of a teacher’s location? As such, we empirically estimate the following equation:

$$(1) \quad \text{Race}_i = \alpha_1 \mathbf{School}_j + \alpha_2 \mathbf{District}_k + \alpha_3 \mathbf{County}_m + \varepsilon_i$$

where the dependent variable, *Race*, represents teacher *i*’s race, coded as a 1 for black teachers and 0 for white teachers. In Equation 1, the  $\alpha$ ’s are estimated coefficients; **School** is a vector of coefficients that represent school *j*’s pupil-to-teacher ratio, percent of students eligible for free and reduced-price lunch, and the percent of black students. **District** is a vector of coefficients that represent the per-pupil general revenues received by the district *k* and the locale (as defined by the U.S. Census Bureau). Finally, **County** is a vector of coefficients county *m* that represent the median income and percentage of the population living in poverty. We observe teacher *i*,

school  $j$ , district  $k$ , and county  $m$  in year  $t$  for school year's 2010-2012. We estimated Equation 1 with and without year fixed effects; however, given the short time span of our sample and lack of year-to-year variation across our measures, year fixed effects did not substantively affect results, so we present estimates from the model without year fixed effects.

Second, we want to see if black teachers are more likely to match with black students. While the raw data suggest that similar patterns of segregation exist across students and teachers, they do not allow us to assess the probabilities of own-race matches of students to teachers across the state. To more precisely address what school and socioeconomic characteristics are associated with a higher percentage of own-race teacher-student matches and especially a higher percentage of black student-black teacher matches, we ideally would match individual teachers and individual students. To date, the state of Alabama has not granted access to researchers of student level data allowing such matches.

Econometrically, however, with some straightforward assumptions, we can address the question of probabilities of matches by race. We assume at the outset that individual classrooms have the same racial allocation as the school. This assumption requires only that intra-school racial assignments (profiling) does not occur. In other words, while it seems reasonable to assume that characteristics of schools will drive differences in the extent of diversity of teacher hiring (and indeed this is our question), we assume teachers and students are randomly matched by race within a school.<sup>6</sup> This implies that the racial allocation of the school of any teacher,  $i$ , is the same as the racial allocation of the classroom of teacher  $i$ , other than for random, zero-mean variation in teacher assignments.

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<sup>6</sup> There are laws that would prohibit such profiling within schools (cite).

Our data set consists of 52,328 teachers in 1,392 schools, of which 20.26 percent of teachers were black and 78.59 percent of teachers were white.<sup>7</sup> As noted in the descriptive statistics, there were varying numbers of black and white teachers and varying proportions of black and white students for each school in our sample. For the construction of our own race teacher-student pairings or concordance measures, we assign each black teacher in school,  $S$ , a value that equals the proportion of black students in her school. Again, this only requires that the probability of a black teacher for a classroom is randomly distributed across the school. The same construction, of course, holds for white teachers.

Empirically, this allows us to estimate the following model:

$$(2) \quad \text{RaceMatch}_{it} = \alpha_1 \mathbf{Teacher}_i + \alpha_2 \mathbf{School}_j + \alpha_3 \mathbf{District}_k + \alpha_4 \mathbf{County}_m + \varepsilon_i$$

where the dependent variable, *RaceMatch*, represents the percentage of students in teacher  $i$ 's school that match his or her race. In Equation 2, the  $\alpha$ 's are estimated coefficients; **Teacher** is a vector of coefficients that represent the race, gender, experience, and education for teacher  $i$  in year  $t$ . **School** is a vector of coefficients that represent school  $j$ 's pupil-to-teacher ratio and percent of students eligible for free and reduced-price lunch in year  $t$ . **District** is a vector of coefficients that represent the per-pupil general revenues received by the district  $k$  and the locale (as defined by the U.S. Census Bureau). Finally, **County** is a vector of coefficients for county  $m$  that represent the median income and percentage of the population living in poverty.<sup>8</sup>

### c. Results

Table 2 presents results from the estimation of Equation 1. We estimate Equation 1 with a linear probability model. As we noted before, the dependent variable is coded as 1 for black

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<sup>7</sup> The remaining 1.15 percent on teachers outside these two categories is too small to analyze without violating confidentiality laws.

<sup>8</sup> Again, we estimated Equation 2 with and without year fixed effects, which would be represented by  $\gamma$  in Equation 2. The same data constraints applied, so we present estimates from the model without year fixed effects.

teachers and 0 for white teachers, so results for each coefficient reflect the increase or decrease in the likelihood a teacher was black.

Considering school-level attributes, the pupil-to-teacher ratio, percentage of students eligible for free or reduced-price lunch, and the percentage of black students were all positively related to the likelihood a teacher was black. Though statistically significant, none of the school-level attributes were economically significant. Compared to an elementary school, a teacher in a middle school was 2.2 percent more likely to be black, and a teacher in an alternative school was 1.1 percent more likely to be black.

Again, we also included district attributes. Per-pupil revenues were positively associated with a teacher's likelihood to be black, though the effect sizes were not practically relevant. Location did matter, however. Compared to a school in the suburbs, a teacher in a mid-size city was 11 percent more likely to be black. A teacher in a small city (1 percent) or town (4.5 percent) was less likely to be black when compared to a teacher in the suburbs. And teachers in rural areas were more likely to be black (rural-other = 1 percent; rural-remote = 2.2 percent). County poverty rates and median household incomes were both positively associated with the likelihood a teacher was black, though these effect sizes were not practically relevant. In line with the descriptive statistics we presented, a teacher in the Black Belt region was 8 percent more likely to be black, *ceteris paribus*.

Table 3 presents results from the estimation of Equation 2. As indicated previously, the dependent variable is the percentage of students in a teacher's school that match his or her race, so results for each coefficient reflect the increase or decrease in the percentage of students of a teacher's own race. At times, we will refer to this as the "race match."

We estimated Equation 2 for both races and then separately. First, we will address the estimation that included both races. Compared to white teachers, black teachers were located in schools where 16 percent more students match their race, on average. Gender was not statistically relevant. Compared to be bachelor-prepared, teachers with sixth-year and master's degrees were more likely to be in schools with students who matched their race. Those with doctorates were in schools with 2.6 percent fewer students of their own race, on average. An additional year of experience was positively related to a teacher's race match. A teacher with 10 years of experience is in a school with 1.3 percent more students that matched his or her race. While salary was statistically significant, the effect size was not practically relevant.

Considering attributes of the school, pupil-to-teacher ratio was statistically significant but not practically relevant. As the percentage of students who were eligible for free or reduced-price lunch increase, the percentage of students who matched that teacher's race decrease. Compared to elementary schools, teachers in middle schools had 0.8 percent more students of their own race, and teachers in high schools had 0.8 percent fewer students of their own race, on average. Teachers in alternative schools had nearly 6 percent more students of their own race, on average. We also considered the school district. Though per-pupil revenues were statistically significant, their effect on the race match in a teacher's school was not economically relevant. In estimating the effect of a school district's location, we compare school districts in suburbs to all other locales. Teachers in schools located in small cities had 14 percent fewer students of their own race. In rural areas, teachers located in schools with 8 percent (other) and 8.5 percent (remote) more students of their own race.

Finally, we controlled for attributes of the county where the teacher has located. As the poverty rate increased by 1 percent, a teacher located in a school with 0.8 percent fewer students

of his or her own race, *ceteris paribus*, and for every \$1,000 the median household income increase, the teacher's school comprised of 0.7 fewer students of his or her own race. Most economically significant, teachers in the Black Belt region had a 10.4 percent lower race match than teachers outside of the Black Belt region.

Also presented in Table 3 are estimations of Equation 2 for black and white teachers, separately. Compared to males, black female teachers were in schools with 0.9 percent more black students. For white teachers, gender had the opposite effect on matching on their own race, though the effect size is smaller. Considering education, as a black teacher earned more education, he or she located in schools with fewer students. Compared to a bachelor's degree, a black teacher with a sixth-year (2.6 percent) or master's degree (1.5 percent) located in a school with fewer black students. A doctorate-prepared black teacher located in a school with 4.1 percent fewer black students, on average. The opposite was true for white teachers who earned a sixth-year or master's degree. A white teacher with a sixth-year degree located in a school with 4.6 percent more white students than a white teacher with a bachelor's degree, and the same held for a white teacher with a master's degree (1.8 percent).

An additional year of experience was negatively related to a black teacher's race match but positively related to a white teacher's race match. In other words, as black and white teachers earned more experience, they located in schools with more white students, though the effect size for white teacher was nearly double of that for a black teacher. While salary was statistically significant, the effect size was not practically relevant, though we would note that salary was positively associated for black teachers and negatively associated for white teachers, indicating that as a teacher's salary increase, he or she located in schools with a higher percentage of black students, *ceteris paribus*.

When comparing a black teacher's school to a white teacher's school, we also observe opposite relationships between covariates and our dependent variable. For black teachers, increasing the pupil-to-teacher ratio was associated with a positive increase in black students, though the effect size was not economically significant. The opposite held for white teachers, as an increase in the pupil-to-teacher ratio was associated with a decrease in the percentage of white students. For black teachers, a one percent increase in the percentage of students who were eligible for free or reduced-price lunch was associated with a one percent increase in a school's black student population. Again, the opposite held for white teachers, as the percentage of white students in their schools decreased with an increase in free or reduced-price lunch students.

Compared to a black teacher in an elementary school, a black teacher in a high school had 7.8 percent more black students, on average. For white teachers, teaching in a high school was associated with 4.7 percent fewer white students than teaching in an elementary school, and teaching in an alternative school was associated with 5.4 percent more white students than teaching in an elementary school. Collectively, these results would indicate that black and white teachers taught a higher percentage of black students than elementary school teachers.

Again, we considered district attributes, too. For black teachers, a \$1,000 increase in the district's per-pupil revenues was associated with a 3 percent increase in the percentage of black students in their school. The opposite held for white teachers, as a \$1,000 increase in the district's per-pupil revenues was associated with a 2 percent decrease in the percentage of white students in their school. Black teachers who taught in schools located in mid-size cities had 8.5 percent more black students than those black teachers who taught in schools located in the suburbs. For all other school locations, black teachers had lower percentages of black students, compared to suburbs. The opposite held for white teachers, who had lower percentages of black

students (i.e. higher percentages of white students) in towns and rural areas when compared to suburbs.

Considering county attributes, for black teachers a 1 percent increase in the county's poverty rate was associated with a 1.7 percent increase in the percentage of black students at their school, and for white teachers, a 1 percent increase in the county's poverty rate was associated with a 1.9 percent decrease in the percentage of white students at their school. Counties with higher median incomes were positively associated with a black teacher's race match and negatively associated with a white teacher's race match, *ceteris paribus*.

Finally, for black teachers, teaching at a school in the Black Belt was associated with a 10.2 percent increase in the percentage of black students at their school, when compared to black teachers outside of the Black Belt region. The opposite held for white teachers, as those who taught in the Black Belt had 26 percent fewer white students than white teachers outside of the Black Belt. Combined, the effect sizes for the Black Belt comparison reflect the region's proportionately higher black population.

## V. Concluding comments

This paper was motivated by growing evidence suggesting that a student's assignment to a teacher of his or her own race resulted in better student outcomes in both short-term test scores and long-term college aspiration (Gershenson et al, 2017; Villegas et al., 2010; Dee, 2005). This paper is one of few (if any) to try to understand where these same race matches have occurred and what factors influence the match. Using teacher level administrative data from the state of Alabama, this study has provided some insights that should be of interest to academics and policymakers alike.

Alabama is a particularly interesting state to study because it has an above average proportion of black students and of black teachers when compared to the rest of the U.S. Even within this state with its relatively large population of black teachers, their distribution is not dispersed across the state in such a way as to maximize the probability of racial matches between students and teachers. Rather, black teachers are concentrated in the poorest region of the state known as the Black Belt region. Black students are also concentrated in the poorest region of the state. While students in these poorest schools were subsequently more likely to experience a student of their own race, the probability of these matches decreases significantly in other parts of the state.

The significance of the findings of this paper fit directly within recent economic literature on the importance of “place” (Chetty, et. al., 2014). While there has been much literature examining the segregation of housing, of schools, and students in urban areas, this is one of the few that looks at the segregation of teachers in rural areas. The findings of this paper suggest that increasing the number of black teachers in the teacher preparation pipeline will not, by itself, solve the racial matching of students and teachers in the U.S. Policymakers continue to face the challenge of how to encourage diversity in such a way to reap the benefits of mixed peer groups both among students and teachers. Research in other locales and states is valuable. But the findings of this paper alone should be sufficient to encourage further discussion among policymakers in Alabama and other states with higher than average poverty and higher than average concentrations of black teachers.

Table 1 Descriptive statistics for teachers, schools, districts, and counties

	<b>Alabama</b>	<b>Black Belt</b>	<b>Non-Black Belt</b>
<b>Teacher characteristics</b>			
Black (%)	20.50%	53.07%	15.96%
Female (%)	82.45%	80.64%	82.70%
Education			
Bachelors	40.47%	41.42%	40.32%
Sixth year	4.68%	5.50%	4.57%
Masters	53.39%	51.37%	53.67%
Doctorate	0.69%	0.61%	0.71%
Other	0.77%	1.10%	0.72%
Experience	11.53 (8.36)	11.61 (8.66)	11.51 (8.32)
Salary (2018 \$)	\$53,362.03 (\$7,762.70)	\$52,049.76 (\$6,705.50)	\$53,545.38 (\$7,881.80)
<b>School characteristics</b>			
Black students (%)	36.83% (34.44%)	76.33% (25.66%)	30.56% (31.36%)
White students (%)	55.87% (33.26%)	19.50% (23.40%)	61.65% (30.86%)
PT Ratio	15.62 (5.60)	16.39 (5.56)	15.52 (5.60)
FRL (%)	57.67% (23.05%)	76.37% (19.87%)	55.04% (22.23%)
School level			
Elementary	48.25%	49.53%	48.07%
Middle	16.74%	15.76%	16.88%
High	24.24%	25.33%	24.09%
Other	10.77%	9.38%	10.96%
<b>District characteristics</b>			
Urban-centric locale			
1:City_midsize	15.25%	25.94%	13.48%
2:City_small	8.83%	0.00%	10.29%
3:Suburb	14.92%	5.65%	16.46%
4:Town	14.33%	16.09%	14.04%
5:Rural_other	39.36%	31.59%	40.64%
6:Rural_remote	7.31%	20.72%	5.09%

<b>Revenues (2018 \$)</b>			
Total (pp)	\$11,183.87 (\$1,689.74)	\$11,589.07 (\$1,752.40)	\$11,091.54 (\$1,664.22)
Local (pp)	\$3,299.54 (\$1,572.27)	\$2,474.87 (\$706.75)	\$3,483.36 (\$1,651.87)
State (pp)	\$6,262.76 (\$935.18)	\$6,708.02 (\$643.15)	\$6,163.51 (\$961.61)
Federal (pp)	\$1,621.54 (\$788.73)	\$2,415.17 (\$1,235.64)	\$1,444.63 (\$502.30)
<b>County characteristics</b>			
Poverty - all ages (%)	22.11% (6.13%)	28.75% (5.83%)	19.68% (4.10%)
Median HH income (2018 \$)	\$40,996.38 (\$8,793.84)	\$33,292.59 (\$5,394.48)	\$43,826.34 (\$8,084.28)

Table 2 – Factors Influencing Teacher Location

	Likelihood teacher was black (Std. Error)
<b>School characteristics</b>	
Pupil to teacher ratio	<0.001 (<0.001)
FRL (%)	0.001*** (<0.001)
Black students (%)	0.006*** (0.000)
<u>School level</u>	
<i>Compare to elementary</i>	
Middle	0.022*** (0.003)
High	-0.004 (0.002)
Other	0.011*** (0.003)
<b>District characteristics</b>	
Revenue (pp) (\$1,000s)	0.003*** (<0.001)
<u>Locale</u>	
<i>Compare to suburb</i>	
Midsize city	0.112*** (0.004)
Small city	-0.045*** (0.004)
Town	-0.007** (0.003)
Rural (other)	0.010*** (0.003)
Rural (remote)	0.022*** (0.005)
<b>County characteristics</b>	
Poverty rate (%)	0.005*** (0.001)
Median HH income (\$1,000s)	0.000*** (0.000)
Black Belt region	0.084*** (0.005)
Constant	-0.357*** (0.023)
Observations	122,447
R-squared	0.333

Table 3 – Probability of Student -Teacher Racial Match

	Both races (Std. error)	Black (Std. error)	White (Std. error)
<b>Teacher characteristics</b>			
Race <i>Black compared to white</i>	16.129*** (0.351)		
Female	-0.322 (0.202)	0.845*** (0.279)	-0.334** (0.154)
<u>Education</u>			
<i>Compare to bachelors only</i>			
Sixth year	1.772*** (0.431)	-2.672*** (0.549)	4.598*** (0.327)
Masters	1.017*** (0.191)	-1.542*** (0.302)	1.782*** (0.155)
Doctorate	-2.615*** (0.948)	-4.137*** (1.401)	-1.381* (0.750)
Other	-1.702* (0.881)	-1.844* (1.038)	-2.752*** (0.762)
Experience	0.128*** (0.011)	-0.133*** (0.016)	0.232*** (0.008)
Total salary (\$1,000s)	-0.115*** (0.015)	0.185** (0.025)	-0.270*** (0.013)
<b>School characteristics</b>			
Pupil to teacher ratio	-0.024** (0.010)	0.151*** (0.029)	-0.122*** (0.014)
FRL (%)	-0.329*** (0.005)	0.968*** (0.008)	-0.718*** (0.004)
<u>School level</u>			
<i>Compare to elementary</i>			
Middle	0.831*** (0.206)	-0.179 (0.290)	-0.405*** (0.150)
High	-0.827*** (0.192)	7.808*** (0.280)	-4.772*** (0.148)
Other	5.959*** (0.239)	-1.043** (0.445)	5.380*** (0.181)
<b>District characteristics</b>			
Revenue (pp) (\$1,000s)	-0.140** (0.058)	2.949*** (0.102)	-1.957*** (0.000)
<u>Locale</u>			
<i>Compare to suburb</i>			
Midsize city	0.451 (0.335)	8.556*** (0.381)	-11.551*** (0.319)
Small city	-14.081*** (0.266)	-5.646*** (0.513)	-13.479*** (0.199)
Town	0.428* (0.266)	-11.775*** (0.513)	2.350*** (0.199)

Rural (other)	(0.237) 7.973***	(0.442) -12.724***	(0.183) 9.881***
Rural (remote)	(0.204) 8.548***	(0.414) -17.272***	(0.168) 13.436***
	(0.418)	(0.521)	(0.308)
<b>County characteristics</b>			
Poverty rate (%)	-0.732*** (0.038)	1.693*** (0.048)	-1.879*** (0.027)
Median HH income (\$1,000s)	-0.706*** (0.017)	0.736*** (0.032)	-1.273*** (0.012)
Black Belt region	-10.392*** (0.318)	10.182*** (0.348)	-26.030*** (0.244)
Constant	134.523*** (1.797)	-114.702*** (2.858)	233.283*** (1.335)
Observations	122,447	24,942	97,505
R-squared	0.139	0.689	0.555

Figure 1  
Percentage of Black Students by School District

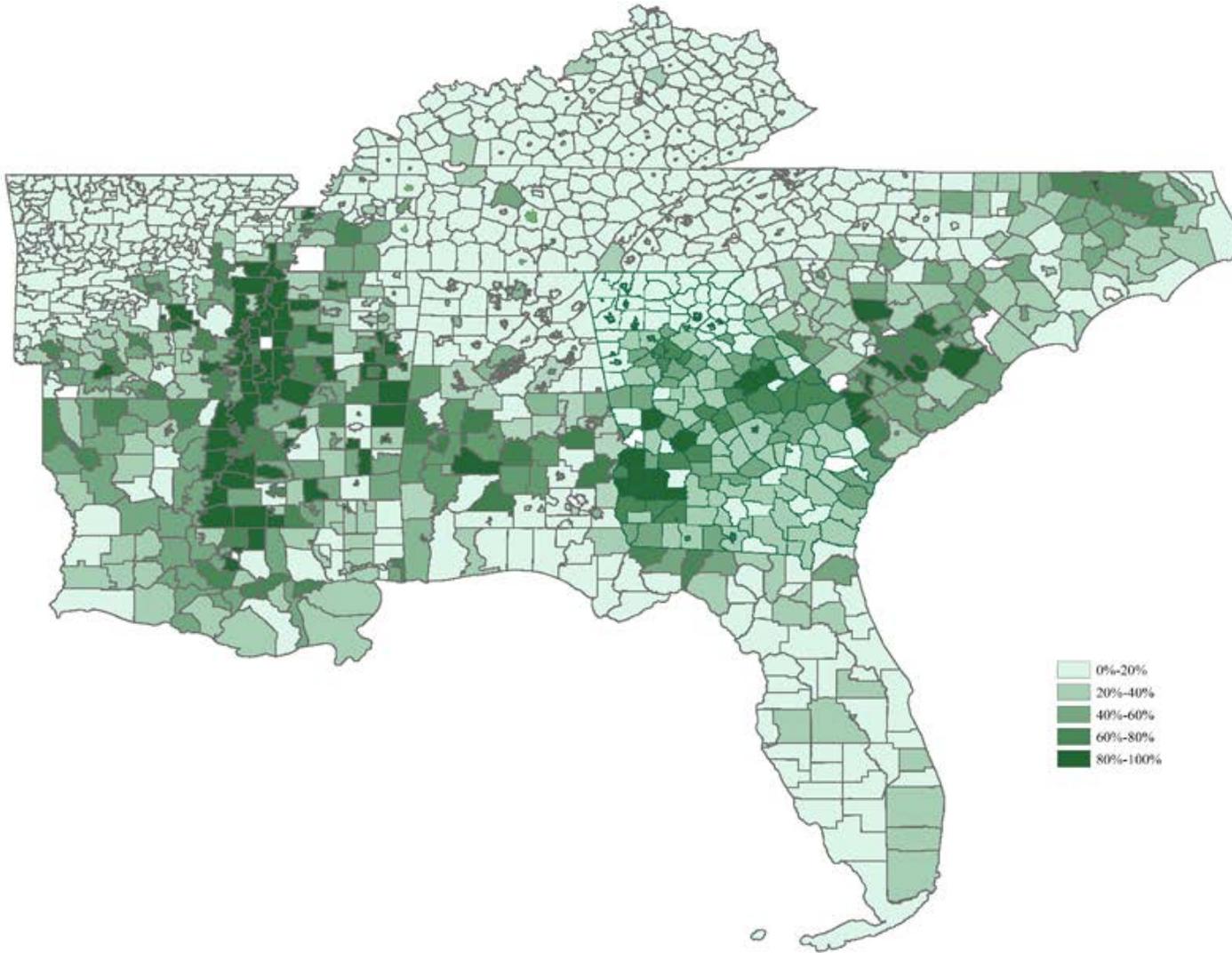


Figure 2  
Black Belt Counties in Alabama

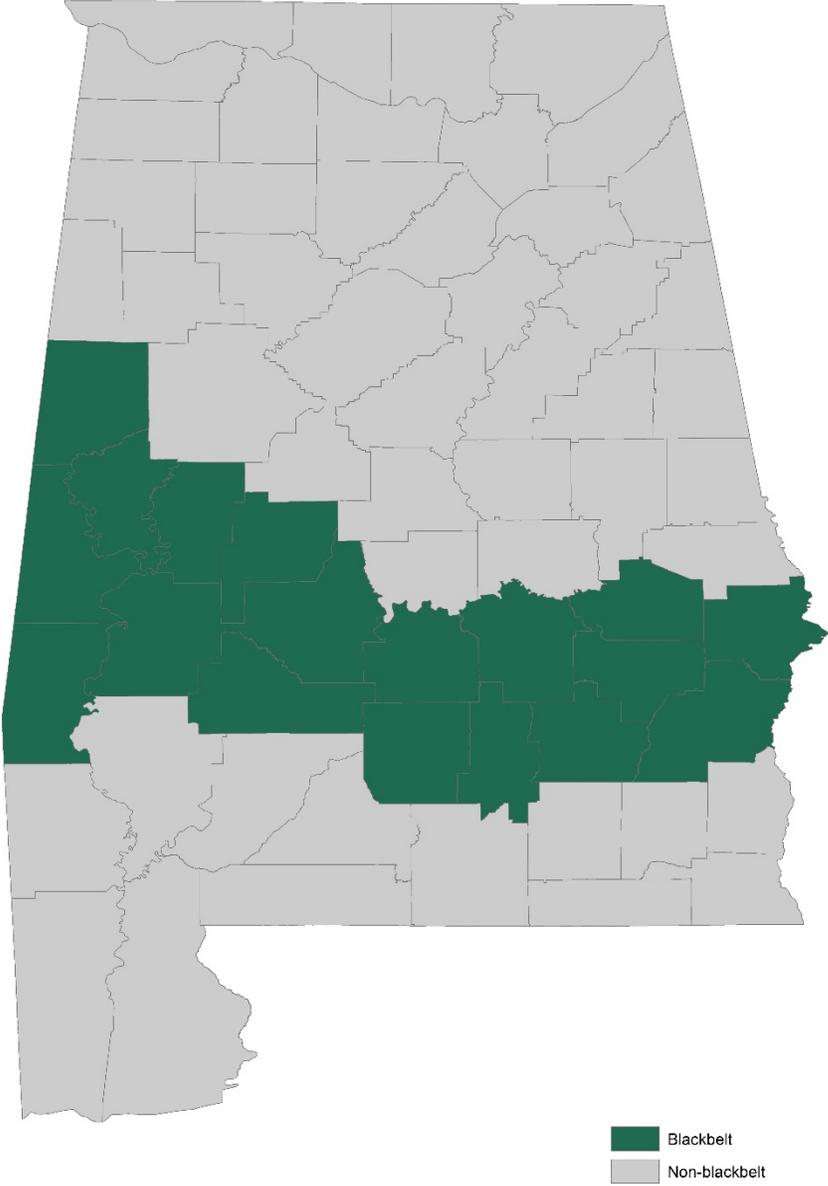
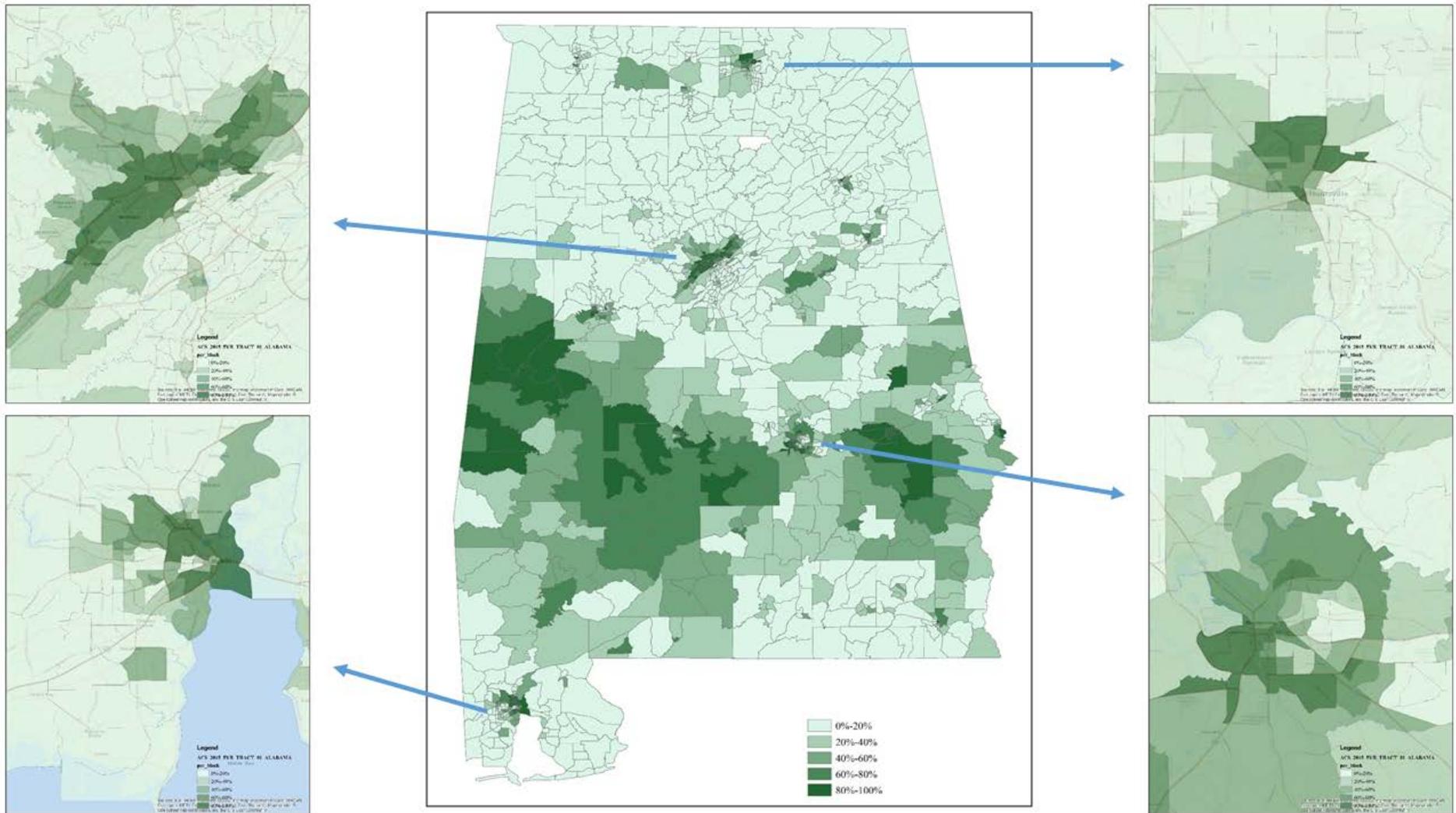
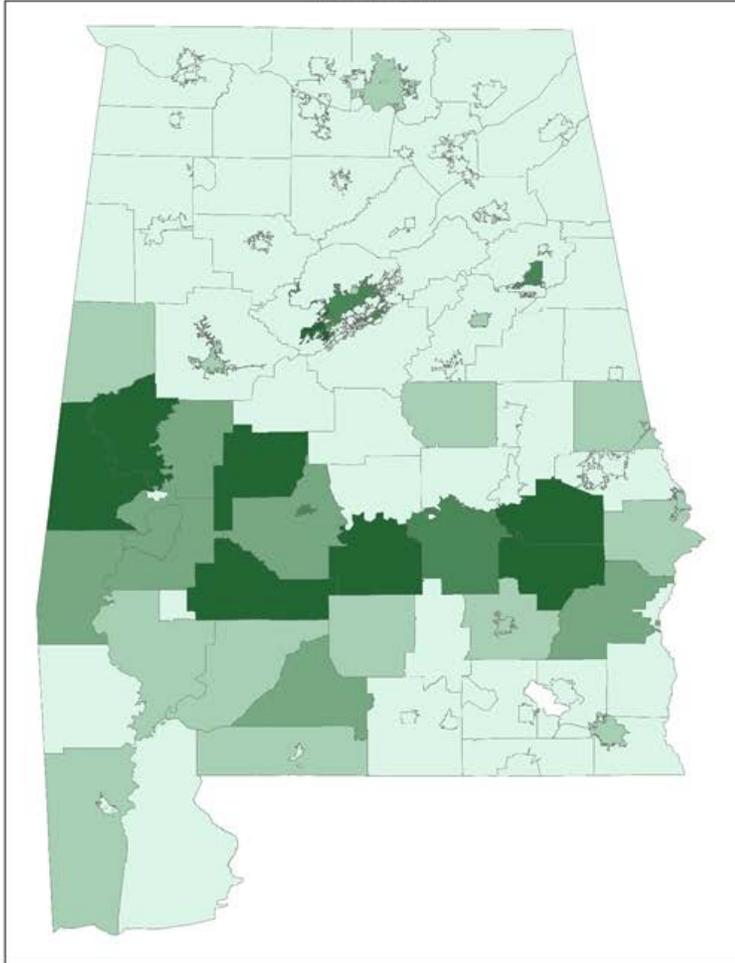


Figure 3 Percentage Blacks by Census Tract

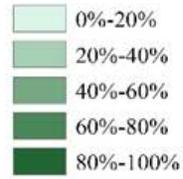
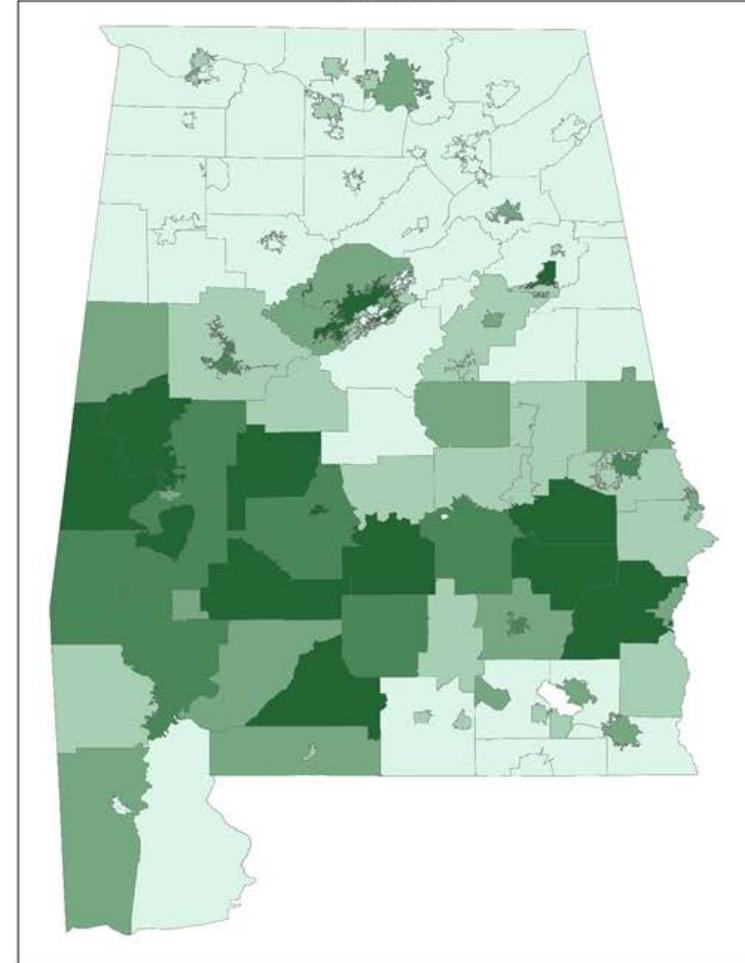


Figures 4 Teachers and Students by School District

Percent African American  
**Teachers**



Percent African American  
**Students**



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