

## Appendix 5.b

### CALCULATING BETWEEN-SCHOOL AND WITHIN-SCHOOL IMBALANCE MEASURES

To examine these classroom assignments, we used detailed unpublished administrative data from the North Carolina Department of Public Instruction, made available to us under strict conditions to insure confidentiality of information on individual students and teachers. For each school in the state, the department collected information on the racial composition of each “activity” throughout the school week, with figures broken down further by grade level. Our strategy was to place every student in each of our four grade levels in exactly one classroom – designed to be the primary instructional class in grades 1 and 4, and the student’s English class in grades 7 and 10.

In elementary schools, activities included subjects taught by a special teacher or instruction outside of the regular classroom, such as physical education or music, as well as academic subjects taught by a regular teacher, such as math or language arts. Reflecting the practice of assigning a single teacher to lead instruction in most academic subjects for the same group of children, the most common activity definition in elementary grades was “self-contained.” For the 1st and 4th grades in most schools, therefore, we could use this “self-contained” activity to indicate classroom assignment. In implementing this approach, however, we found that the set of activities offered in schools was not uniform across the state, reflecting either inconsistency in applying activity definitions or actual variation in the way districts organized instruction in their schools. For example, while the data indicated that most elementary schools offered self-contained classes, the category was missing altogether for some schools.

To account for differences across schools, we allowed the particular combination of activities used to differ across schools, and chose that combination whose total enrollment in the grade of interest came closest to the actual number of students enrolled in that grade in the school.<sup>1</sup> For 1st graders, self-contained was the activity that yielded the best fit to total 1st grade enrollment in 83 percent of the state’s schools. In the remaining schools, another subject, such as general music, visual arts, or physical education provided the best fit. In using these other subjects, we are assuming that students who are grouped together for, say, general music, are also grouped together for the bulk of their academic subjects. For 4th graders, the self-contained designation yielded the best fit for 73 percent of the elementary schools, with general music, reading, math, and language arts combining to give the best fit in another 13 percent of schools.

In middle schools and high schools, the activities designated on the school reports generally corresponded to classes. For a particular high school, for example, information was available on the number of students, by race, in each section of Algebra I taught in the school, and within each of those sections the racial breakdown of tenth grade students and, if students from other grades were enrolled in the class, the racial breakdown of the students from each of those grade levels as well. Similar information was provided for all courses. We focused on

classes in English, or language arts. Some high schools offered only four levels of English (denoted by levels I-IV), while others offered those four plus English as a second language, occupational English, or courses combining language arts with other subjects. However, since every student in theory was required to take one of them every year, we counted 7<sup>th</sup> or 10<sup>th</sup> grade students in whatever English course they were enrolled. Among schools containing a 7th grade, the best fit was attained in 42 percent of schools by counting all English courses, including reading courses and courses combining language arts with other subjects; but in another 27 percent of schools the best fit meant excluding reading and combined courses. For high schools, the best grouping at the 10th grade level was to combine all English-related courses, a combination that worked best in 83 percent of schools.

Once each student in each of the four grade levels was assigned to a classroom, exposure rates could be calculated by following the logic of the conventional measure described above. Instead of measuring the nonwhite percentage in the typical white student's school, our more exact measure of exposure gives the nonwhite percentage in the typical white student's *classroom*. We performed these calculations for classes that contained any students in grades 1, 4, 7, or 10. Unless the classrooms in each school are racially balanced at that school's racial composition, this exposure rate will be lower than the school-level exposure rate, and this difference can be attributed entirely to imbalance within the school. By virtue of the additional level of detail provided by classroom-level data, therefore, imbalance in a district can be decomposed into two components: (1) the portion due to racial disparities at the classroom level, within schools and (2) the portion due to racial disparities between schools, within a district. This second portion is equivalent to  $S_k^B$ , the imbalance index based on school-level data. Since this conventional imbalance index is based on school-level data, it systematically understates actual imbalance. Just how serious this understatement is will depend on the relative magnitude of the within-school component.<sup>2</sup> In summary, we decompose a district's imbalance into two pieces: that which is attributable to between-school imbalance in the district and that which is attributable to within-school imbalance in the district. As defined up to this point, these measures have been based on disparities in enrollment patterns defined in terms of white and nonwhite students, but they can easily be modified to assess imbalance between any two racial groups.

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<sup>1</sup> Enrollment based on activity reports might not exactly match enrollment figures from so-called membership reports because these surveys were undertaken on different dates in the fall.

<sup>2</sup> By similar logic, it is possible to decompose segregation within a county into a third part, that due to disparities between districts in a way parallel to the approach we use for metropolitan areas. Because the vast majority of counties had only one district, we do not use this decomposition.