Making Individual School Enrollment Projections Using "Micro-Geographies"

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ABSTRACT

The Los Angeles Unified Schools District (LAUSD) makes enrollment projections for over 600 schools annually. A key challenge is that that schools' projections are keyed to their attendance boundaries, but the data needed to support those projections are registered to geographies that aren't consistent with attendance boundaries. A second challenge is that school choice is made available at some LAUSD schools through option areas, which are geographical areas where the attendance boundaries of multiple schools overlap. In this paper we discuss a method that addresses both geographical scale and student choice by using a set of micro-geographies that are created when the discrete geographies of the data sets are consolidated, and their respective data are distributed across each of the micro-geographies using a spectrum of allocation methods that respond to the parameters of each of the geographies.

Each year, the Los Angeles Unified Schools District (LAUSD)—the nation's second largest K-12 public school system, serving almost 700,000 students—makes enrollment projections not only for the District as a whole, but individually for over 600 of its elementary, middle and high schools. The stakes are high. In an environment of declining enrollment, accurate individual school projections are needed by the LAUSD's Budget Office to determine, in the short-term, whether any of its approximately 45,000 teachers and school-based staff must be displaced, and, in the longer-term, by the District's Facilities Division to make course corrections for its $11.2 billion, long-range facilities capital master plan. LAUSD's Master Planning and Demographics Unit (MPD) is the group charged with making the District's enrollment projections.

One of the main challenges in making school-level enrollment projections is that that each school's projection must be keyed to its own small-area attendance boundary, but the data needed to support those projections are registered to geographies that are inconsistent with those schools' attendance boundaries. A second difficulty is that, while most of LAUSD's student assignments are made in accordance with its neighborhood school policy, the District does make choice available at some schools through option areas, which are geographical areas where the attendance boundaries of multiple schools overlap. The number of students in these areas who are likely to choose one option over another must be established before projections can be made for those schools.

In this paper we discuss a method that the Master Planning and Demographics Unit (MPD) is in the process of developing to address both the issues of geographical scale and student choice by using a set of "micro-geographies" that are created when the discrete geographies of the data sets being utilized are consolidated, and their respective data are distributed across each of the micro-geographies using a spectrum of allocation methods that respond to the parameters of each of the geographies.

To make school-level projections, MPD relies on historical births by zipcode, forecast births by County, historical LAUSD student records by address point, LAUSD's elementary, middle and high school attendance boundaries, individual school grade configurations by Keycode number (an administrative boundary planning mechanism), and historical population data for ages 5 – 17 by census block and block group.

MPD's new projection process began by creating "micro-geographies" that the data sets of interest are registered to. We combined LAUSD's elementary, middle and high school attendance boundary sets with zipcodes to create the micro-geographical areas that would allow us to 'standardize' the data scales for student data (registered to attendance boundaries) with births (registered to zipcode).

To establish each school area's resident population as its historical base, we defined the area of residence of each student directly by their home address, using GIS (Geographic Information System) to geocode each student's historical records to a master street base map for the Los Angeles metropolitan area. Geocoded student point data were then spatially joined to the micro-geographies, which attached a tally of historical student data points to each of the micro-geographies.

Because the birth data were available only as the total number of births per zipcode, and because that total was registered to the centroid of each zipcode, we needed to devise a method of distributing the births across each micro-geography for each historical year. For our proxy we used the distribution of LAUSD's K-12 students for each birth year, coupled with the distribution of 5-17 year-old children from census data for each birth year, across each micro-geography. By computing the proportion of students per micro-geography inside LAUSD's boundaries, and the approximate proportion of 5-17 year-old children per zipcode outside of LAUSD's boundaries, we were able to establish the number of births per micro-geography. When the birth data were re-aggregated up to the attendance boundary level, we had our measure of births per school attendance area, a necessary component for forecasting incoming classes of kindergarten and first grade students for that school.

To solve the problem of option areas, MPD calculated historical choice patterns by micro-geography based on students who attended their resident school in the past and applied those proportions to the students who attended non-resident schools in order to simulate a complete K-12 Profile for each school's attendance area. For each option area, all the possible choice 'pathways' a student could take during their K-12 career were defined using a combinatorial mathematics algorithm. The students residing in the micro-geographies within each option area were then 'forced' through these pathways based on the proportions developed from the historical choice patterns. These student counts were then added back in to complete the simulated K-12 profile counts for each micro-geography.

Student counts by micro-geography were then re-aggregated up to the attendance boundary level. We now had the complete K-12 profile, as well as births, for each school's attendance boundary, and were able to proceed with forecasting for each school using a cohort-survival method. The sum of all schools' projections was compared to the forecast for the LAUSD District as a whole, and any variance between them was spread proportionally across all the individual schools to bring the schools' sum in line with the District-level projection.

MPD will assess the results of this new method of forecasting for SY2007-08 when actual SY2007-08 data become available in the fall of 2007. MPD anticipates including a discussion of the results in the extended version of this paper which is planned for spring, 2008.