A Pitch for School Geo-Demography

Robert Lycan
Portland State University

Charles Rynerson
Portland State University

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The Population Research Center at Portland State University provides demographic services to most of the mid to large sized school districts in Oregon. My co-author is the school demographer for our center. I am an emeritus faculty member and mainly work with Charles on background demographic studies related to school enrollment.
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Who we are

- The Population Research Center (PRC) is a community service organization in the College of Urban and Public Affairs at Portland State University.
- PRC has some legislatively mandated functions, city and county estimates, and liaison with the U.S. Bureau of the Census.
- PRC has a staff of 6 full time professionals and support staff and employs graduate student assistants, mainly from Urban Studies and Planning and Geography. About half our income is from contract research.
  - Most is for public agencies and non-profits.
  - School demography is our largest source of contract income and employs about 1.5 FTE staff. Charles Rynerson does our school demography work.
  - We have provided demographic services for school districts for nearly 40 years.
  - For the last 20 years the school support has made use of GIS providing geographically detailed forecasts.
The types of services to school districts

- The most commonly requested projects are enrollment forecasts for school districts, or districts and their attendance areas.
- Other services for school districts include:
  - Attendance area boundary changes and boundary change scenarios
  - School board member district reapportionment
  - Estimates of student generation from new housing
  - Field surveys to determine household composition
- The studies typically include a written report and a presentation to a school board committee and/or the general public.
- We have provided service to most of the mid to large school districts in Oregon and have a continuing agreement with a few.
Where do school districts get demographic services?

- **In house staff** – Many large school districts have a staff, usually affiliated with facilities planning, that provide demographic services. The staff have skills in demography, GIS, planning, and database management. In a small district sometimes an assistant superintendent who deals with facilities does the forecasting.

- **Turnkey Software** – There are several firms that sell software tools to provide enrollment forecasts. Often they are an appendage to school bus routing software. Examples are Edulog in Montana and Davis Demographics in California.

- **Private Consultants** – There are several consulting firms that provide demographic services to school districts nationally. Examples are Gobalet and Lapkoff in California and McKibben Demographics in South Carolina, as well as some who work at a more local level. A&E firms sometimes provide forecasts as part of a capital plan.

- **Universities** – Several university population research centers provide this type of service. Examples include our center in Oregon and the Applied Demography Lab at the University of Wisconsin.
The data environment

- Student record is central to building forecasts.
  - We need historical data in order to calibrate enrollment forecasts.
  - The student record data is carefully geo-coded to the students' residential locations.
- Birth records also are geo-coded to mother's residence and identify potential enrollees some five years later.
- Tax-lot data from the assessor's office provides the information about the housing units and neighborhoods where students live. We link birth records and student records to their tax-lot.
- We make use of data from the decennial census and the American Community Survey.
- Our forecasts are informed by advice from various other organizations such as:
  - Local planning departments
  - The regional economists with the Oregon Employment Department
Enrollment forecasts

- Long versus mid-range enrollment forecasts
  - Long range forecasts - typically required for facilities planning and usually are for about ten years, but may extend as far as 15 or 20 years into the future.
  - Mid range forecasts – typically required for budget planning, staffing, transportation planning, and use of existing facilities usually include extent five years into the future.

- Three types of forecasting models typically used
  - The grade-progression model – driven by student enrollment trends for short term forecasts and for smaller geographies, such as elementary school attendance areas.
  - The cohort cohort-component model – driven by births, deaths, and migration and used for larger geographies, such as school districts, and longer term forecasts.
  - The housing based model – driven by housing types and numbers and neighborhood turnover.
  - We use combinations of the three types.
Three types of enrollment forecasting models utilized

- Cohort-component
- Grade progression
- Housing based
- Combined models used for most of our forecasts
The cohort approach follows the progression of an individual through time, noting the events in the life course of the person as shown in the Lexis diagram. Or, one can follow the progress of a group of persons through time as they age.
Here is another example, looking at the kindergarten class entering in 1994. This group grew consistently over the time period observed, but we cannot track it beyond the 9th grade.
### Grade Progression Ratio for Tigard School District

<table>
<thead>
<tr>
<th>Year2/Year1</th>
<th>01/00</th>
<th>02/01</th>
<th>03/02</th>
<th>04/03</th>
<th>05/04</th>
<th>06/05</th>
<th>07/06</th>
<th>08/07</th>
<th>09/08</th>
<th>10/09</th>
<th>11/10</th>
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<tbody>
<tr>
<td>2008/2007</td>
<td>1.07</td>
<td>1.03</td>
<td>1.00</td>
<td>1.02</td>
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<td>1.03</td>
<td>0.99</td>
<td>0.97</td>
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<tr>
<td>2009/2008</td>
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<td>1.01</td>
<td>1.00</td>
<td>0.96</td>
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<td>0.98</td>
<td>0.99</td>
<td>1.01</td>
<td>1.01</td>
<td>1.00</td>
<td>0.96</td>
<td>0.96</td>
</tr>
<tr>
<td>2010/2009</td>
<td>1.07</td>
<td>1.00</td>
<td>1.01</td>
<td>1.02</td>
<td>1.04</td>
<td>1.01</td>
<td>1.01</td>
<td>0.99</td>
<td>1.04</td>
<td>1.01</td>
<td>1.02</td>
<td>1.04</td>
</tr>
</tbody>
</table>

![Graph showing grade progression ratio for Tigard School District](chart.png)
The grade progression ratio all can be computed spatially

- The dots show the location of students enrolled in Tigard Schools in Fall 2010.
- The color shades show the ratio of the Fall 2010 enrollment to the same cohort one year earlier.
- Green shaded areas show that the cohort declined
- Blue shaded areas show growth in the cohort.
The cohort component model

- Enrollment is determined as a share of the forecast school age population.
- The school age population is determined by earlier births and net migration of families with school age children.
- The model is recursive, the forecast for each time period building on that 5 or 10 years previous.
- Provides age detail, but best used for larger geographies.

Diagram:
- Births
- Population
  - 00-04
  - 05-09
  - 10-14
  - 15-17
  - 15-44
  - 75-79
  - 80-84
  - 85+
- Migration
- Deaths
- Enrollment
  - KG
  - 01
  - 11
  - 12
Data that inform the cohort-component model

- Fertility rates – by age, race and Hispanic status. Shift from births from younger to older mothers.
- Net migration rates by age and sex, perhaps the most difficult to estimate.
- Public school capture rates – the share of the school age population enrolled.
Capture rate for Portland Public Schools

• Computed from grid mapping of student record and census block data.

• In 2000, lower values tend to be in high income areas where more students are enrolled in private schools.

• In 2010, high values tend to be in low income and minority areas where most students are enrolled in the public school system.

• The change from 2000 to 2010.
The housing based model

- We look first at birth mothers who’s children will appear in school in about 5 years.
- From work for Portland Public Schools we show what type of housing is most common for highly educated age 30+ mothers. OMA is a gentrifying neighborhood and Remainder is a lower income area with large Hispanic population.
- And for less educated mothers under age 30.
- From work for Tigard School district we show the loading of students into single family housing by age of the structure. Note how the loading of KG-5 students declines as the housing ages.
Enrollment forecasting leads raises interesting issues worth of further exploration

- **Example One** – The Hillsboro School District in suburban Portland has a large and increasing Hispanic population as well as the families of employees of Intel. It has experienced rapid population, and school enrollment, growth but recently the enrollment growth peaked.

- **Example Two** – In some areas of older but substantial housing in Portland enrollment has been declining and schools have been closed. However in 2006 some of the schools in these neighborhoods began to show enrollment growth in kindergarten and the lower grades. A gentrification process was at work involving older, highly educated, and affluent mothers.
Example One: An enrollment forecast for Hillsboro School District focused on student generation rates

- Hillsboro SD has a large Hispanic population many of whom reside in multi-family housing.
- Student generation rates are relatively high in Hispanic neighborhoods but also in new suburban areas.
- Most areas of newly built housing show high student generation ratios.
- Areas where seniors out-migrate result in turnover and in-migration of younger households.
- As new housing ages the students advance in age and eventually leave home.
The District’ enrollment peaked at nearly 90,000 during the Post WWII baby boom, again 25 years later with the “echo of the baby boom” and has declined since.
The setting for the Portland School District

- The Portland District is largely built out and surrounded by growing suburban areas.
- There has been some infill and replacement single family housing in the District, but most of the construction has been multi-family and does not generate much student enrollment.
- Only about 50 students come from the 20,000 units in the trendy Pearl District (A) but high value new housing (such as at B) has contributed some growth.
- The recent up-tick in enrollment is due more to turn-over than to new construction.
Looking at the five years after 1996 and the five years after 2002 the decline in births to younger mothers has been approximately equal to the increase in births to younger mothers.

The total number of births changed little.
There was growth in the number of births to older mothers across the District, but that on the east side was mainly after 2000. Of particular interest was the “East Older Mothers area (East OMA).”
The four combinations of mother's age and education

- Here is a map showing the births per acre for older moms (age 30+) who have a baccalaureate degree of higher (42% of the District's births from 2007-2009).
- The counterpoint map shows mothers under age 30 with less than a baccalaureate level of education. This area includes the areas with large Hispanic populations (31%).
- Mothers under age 30 with a baccalaureate level of education. This may be a younger group of gentrifying households, but perhaps many of them are childless (10%).
- The group of older mothers age 30 plus with less than a baccalaureate education (16%).
- And finally, a combined map of older more educated and younger less educated mothers (combined 73% of births).
Gentrification based on Percent College Educated and Employed in MTP Occupations – following Ley, 1996

- From 1990 to 2000 the average change in proportion with college degree and employed in MTP occupations rose around the edge of the East OMA.
- From 2000 to 2008 the measure of gentrification spread out beyond the East OMA.
- Ley depicts gentrifying areas as being in the top 20% of tracts with respect to change in the composite education and MTP employment index.
Yes, the shift in births from younger to older mothers and gentrification of some of Portland’s 100 year old housing did help turn around the decline in the district, and likely saved some schools from closing.

Our school demography work has been successful with many districts returning for new or updated forecasts. PRC has a reputation for unbiased and well thought out forecasts, although we have not always been right.

We support about 1.5 researchers doing enrollment forecasts. The individual projects bring in from $3,000 for a simple update to $60,000 for a metropolitan district.

A large part of the cost of a school forecast is in the database development. This provides employment for students with GIS skills. Repeat business with districts lowers the cost for this part of the work.

Should you take on this type of work?

- **Good** – Learn about the social geography of communities, provide employment for students, satisfaction with providing a valuable service, discover puzzles to be solved.
- **No so good** – Need long term commitment, patience in working with school administrators and committees, may be hard to manage time commitments if teaching.
Sources of information

- The website for the Population Research Center.
  - Examples of forecasts:
    - http://www.pdx.edu/prc/school-enrollment
  - Papers and presentations on school demography:
    - http://www.pdx.edu/prc/publications

- Books

- Conferences to learn, present
  - AAG, Population Specialty Group
  - Population Association of American, Applied Demography Specialty Group
  - Applied Demography biannual conference
  - ESRI Education Conference
  - Southern Demographic Association

Richard Lycan – lycan@pdx.edu
Charles Rynerson – rynerson@pdx.edu

Portland State University
Fee Schedule

- .016d(02) - Population Research Center – Fee Schedule
  - District-wide forecast by grade level $6,000 & up
  - Update district-wide school enrollment forecast by grade level. $3,000 & up
  - District-wide forecast and individual schools or attendance areas forecast $8,000 & up
  - Update district-wide school enrollment forecast and individual schools or attendance area forecast. $4,000 & up
The figures on this graph reiterate how the impact of declining numbers of non-Euro students coupled with increasing losses of Euro students after 2001 combined to produce the major loss of students from 2002 to 2003. While examining the changing number of students by race sheds some light on the losses, it does not fully account for the declines. Why did more minority families decide to leave the District? Why did the loss of non-Euro students increase?
A Major reason for the decline was the movement of Portland's Black population from its historical core area.

- Animation shows students per acre.
- In 1996 52% of the Black students in the District resided in the "core area", shown in red.
- By 2006 the value had fallen to 31%.
- Analysis of the student record data provided us with timely and geographically detailed information.