Linking Tax-lot and Student Record Data: Applications in School Planning

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Presentation for the 2005 ESRI User Group Meeting,
San Diego, July 2005

Abstract

The Population Research Center at Portland State University provides demographic services for a number of school districts. One approach that we have found useful is to link student records to the tax-lot where the student resides, allowing us to join student characteristics and those of the property where the student lives. This is helpful to us in better understanding enrollment trends. For example we can find out what types of housing by age, type, value, and size most frequently house younger children. This can allow us to find comparables for a proposed housing development. Or we can look at characteristics of the children who have moved from one type of housing setting to another. Using this approach also helps build better bridges to community planners who work in the world of housing and land use but who would like to better relate their work to children and schools.

Purpose of Paper

- Show how using tax-lot data can improve K-12 school planning
- Demonstrate the mutual benefits to planners and school officials of linking planning for land, housing, and students
- Argue for extending the content of tax-lot databases to include additional data such as housing counts and tenure
- Let you see a GIS application in a different setting – a demography program

PRC - Who we are

- The Population Research Center (PRC) is an applied research program in the College of Urban and Public Affairs at PSU
- Our staff include a mix of faculty and graduate students with backgrounds in demography, geography, and planning with varying levels of expertise in GIS.
- We provide demographic services for a variety of organizations. School Districts are an important client.
- We provide enrollment forecasts, support for facility planning, and a variety of other services for school districts.

Two propositions:

- By using linked tax-lot (structure type, tenure, value, etc.) and student record data (age, race, school attending) PRC should be able to improve the quality of K-12 school planning.

- Student record data provides some of the most current information on how our communities are changing. Cooperation between community planners and school administrators provides benefits to both parties.

Outline of presentation

- The mechanics of linking student record and tax-lot data
- Examples in school planning:
  - Housing tenure and turnover of students in the classroom
  - Students per single family housing unit by housing tenure
  - Housing construction and enrollment declines during the 1990's
  - Bedrooms, ethnicity, and tenure impact student yield per housing unit
  - Improving enrollment forecasts for Bend, Oregon
- Conclusions

The Mechanics of Linking the Data

- All but a few small parts of the District are located in Multnomah County. Assessor's data from the County were obtained from the County GIS coordinator.

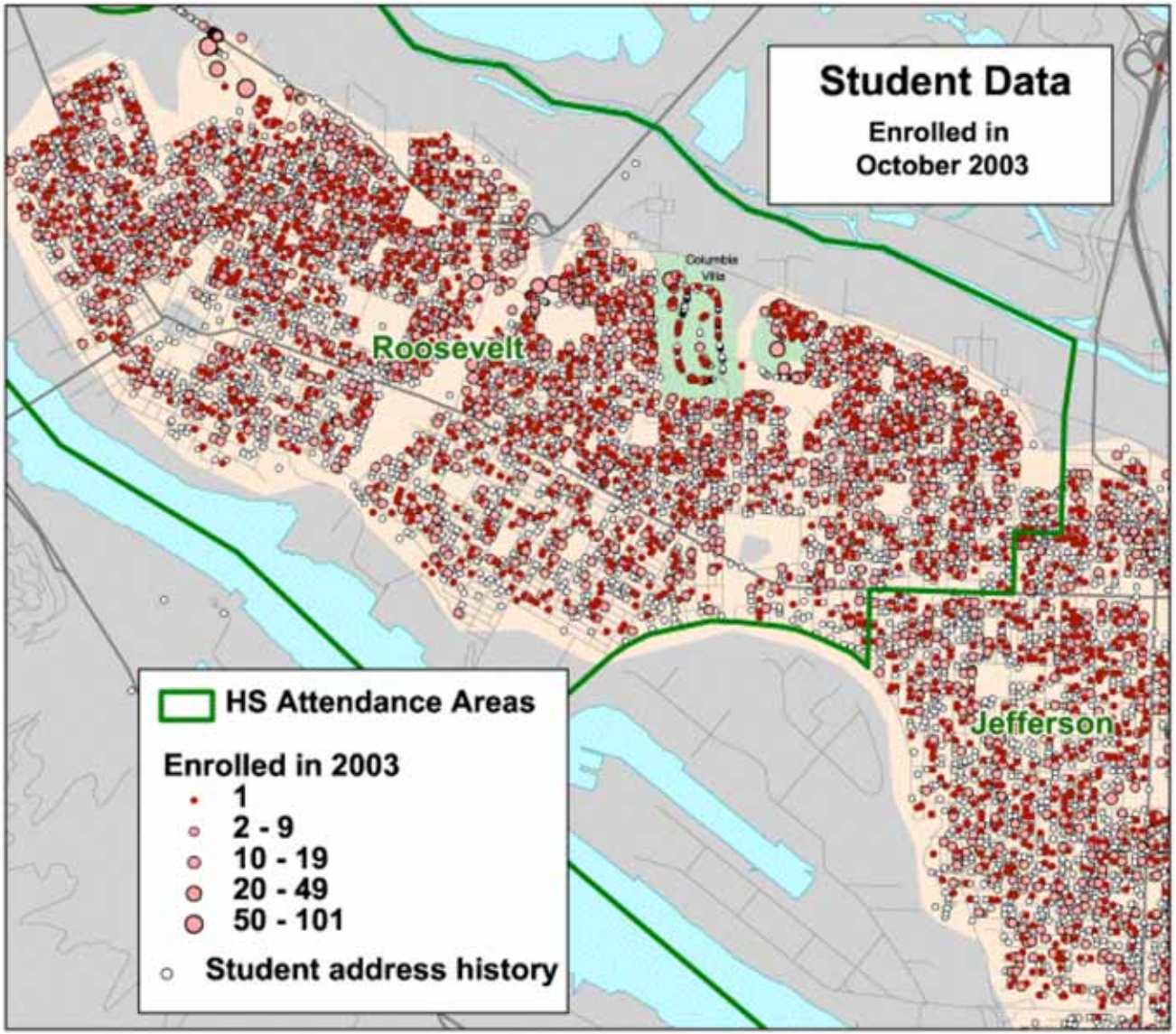
- PRC has maintained a geo-coded student record data base for the District dating back to 1996. 85% of the addresses are geo-coded to tax-lot addresses, the remainder to street addresses.

- These two files are joined by a near function.

Student Record Data

PRC has maintained a geo-coded student record database for the District since 1996.

The open white circles are the inventory of student addresses. The red and pink dots are where the student lived in Oct. 2003.



Sample data for the Roosevelt and Jefferson HS Attendance areas

Tax-Lot Data

The tax-lot data are from the Multnomah Co. Assessor's data. The data fields utilized include housing values, year built, units in structure, number of bedrooms, and tenure.

The map example shows the number of units in structure and housing tenure

Sample data for the Roosevelt and Jefferson HS Attendance areas

Sample Data from the Linked Files

This table shows three sample records from the linked student record – tax-lot files.

The students by residence are linked to the tax-lot centroid by a near function.

Since about 85% of the student records are geo-coded to tax-lot, centroids most records link with a zero distance.

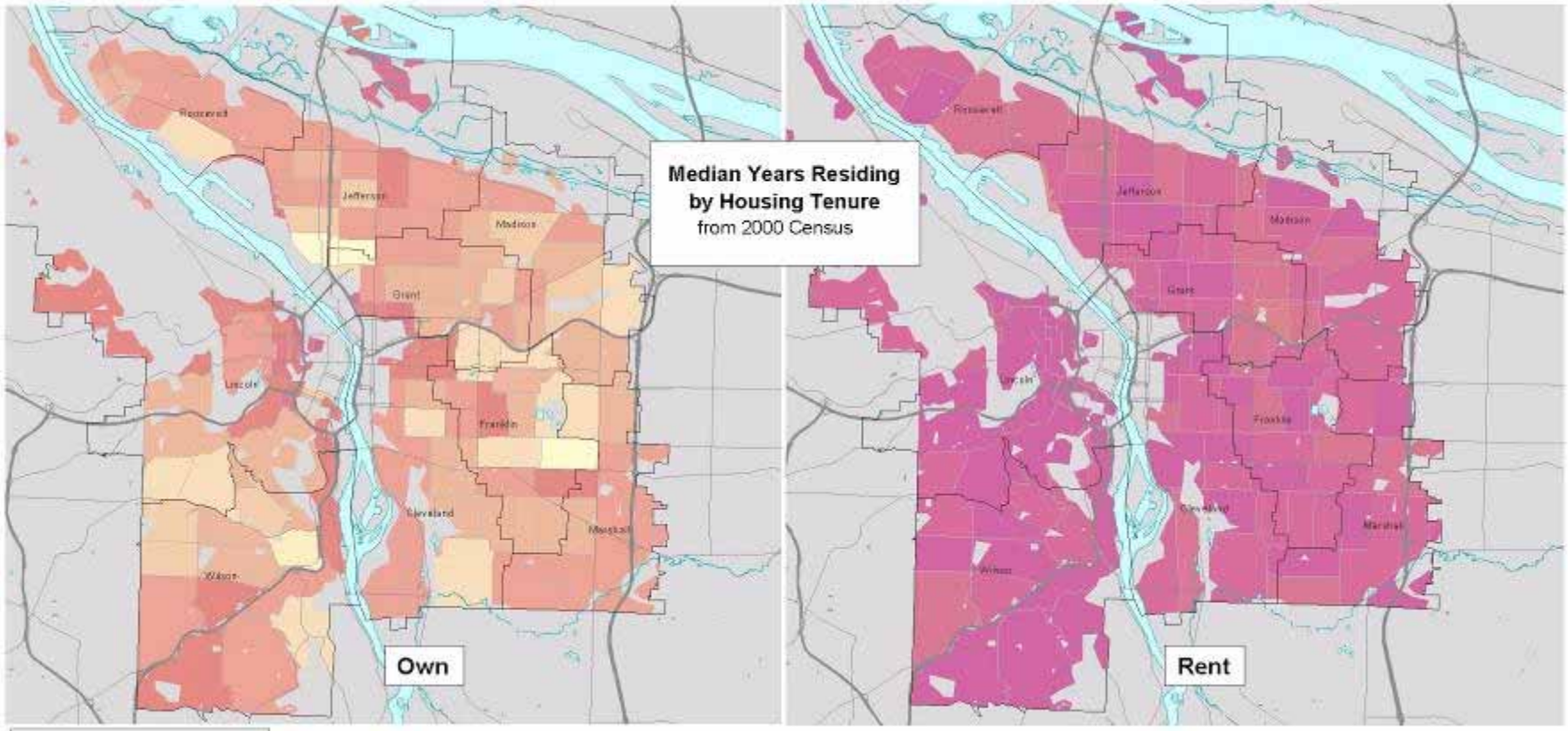
Student Record Data	**Student ID**	860902	127863	949295
	School Atending	290	258	264
	School Name	Whitman	Kelly	Lee
	DOB	11/12/1996	5/8/1997	4/1/1997
	Age	6	5	5
	Grade	01	01	01
	Gender	M	M	M
	Race	B	W	A
	X Coord	7664928	7666899	7666717
	Y Coord	662792	688831	669818
	Geocoded from	TAX	PRE	PRE
	Elem Sch Att Area	290	258	264
	Middle Sch Att Area	263	263	254
	High Sch Att Area	220	220	218
Linked by Nearest	**Distance - Student to lot (feet)**	0	0	57
Tax Lot Data	**Taxlot ID**	BQR8753	NTZ0593	XYZ0011
	Land Value	36,500	40,670	47,500
	Bldg Value	95,580	107,230	139,190
	Total Value	132,080	147,900	186,690
	Bldg Sq Ft	1,371	1,768	2,050
	Acres	0.04	0.12	0.13
	Year Built	2002	1956	1942
	County	M	M	M
	Units in structure	1	1	1
	Bedrooms	3	6	4
	Landuse	SFR	SFR	SFR
	Tenure	RNT	OWN	OWN

Example #1: Tenure and Classroom Turnover

- Established research on the moving habits of households have shown that renters move more often than do home owners. Moving is a simpler process for renters. Many renters are young and changing job and family circumstances dictate their need to move.

- When households with school age children move, the children may need to move to a new school. This can be disruptive to the individual child. Where there is high turnover in classrooms it can be disruptive to the learning process.

Housing Turnover from the 2000 Census

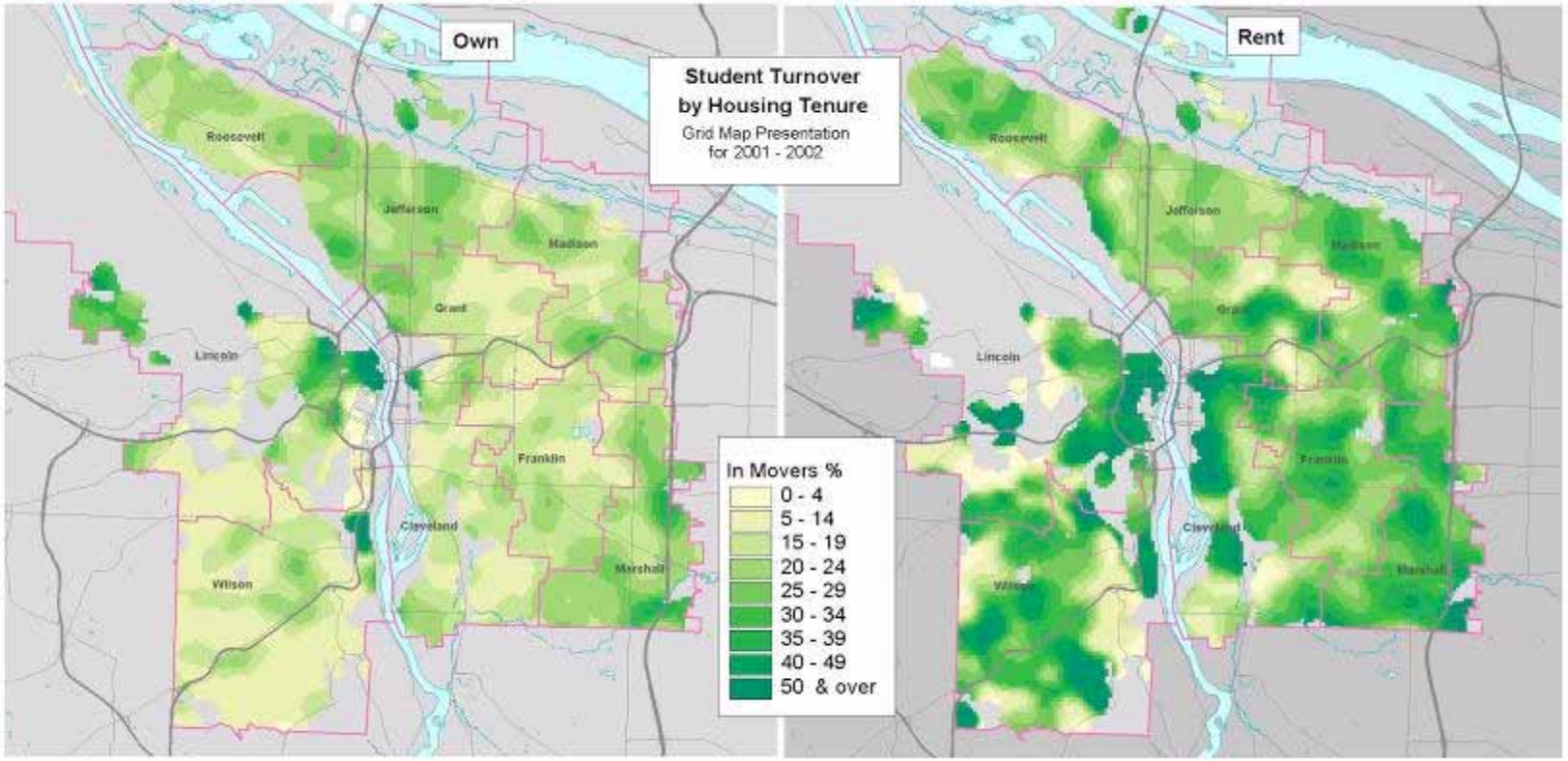


Median Years Residing
- 18-19
- 16-17
- 14-15
- 12-13
- 10-11
- 8-9
- 6-7
- 4- 5
- 3
- 2
- 1

Data from the 2000 Census shows that for most census tracts the median length of residence for renters is less than 4 years.

By contrast for most census tracts the median length of residence for home owners is from 4 to over 19 years. Tenure clearly impacts turnover of households in housing units.

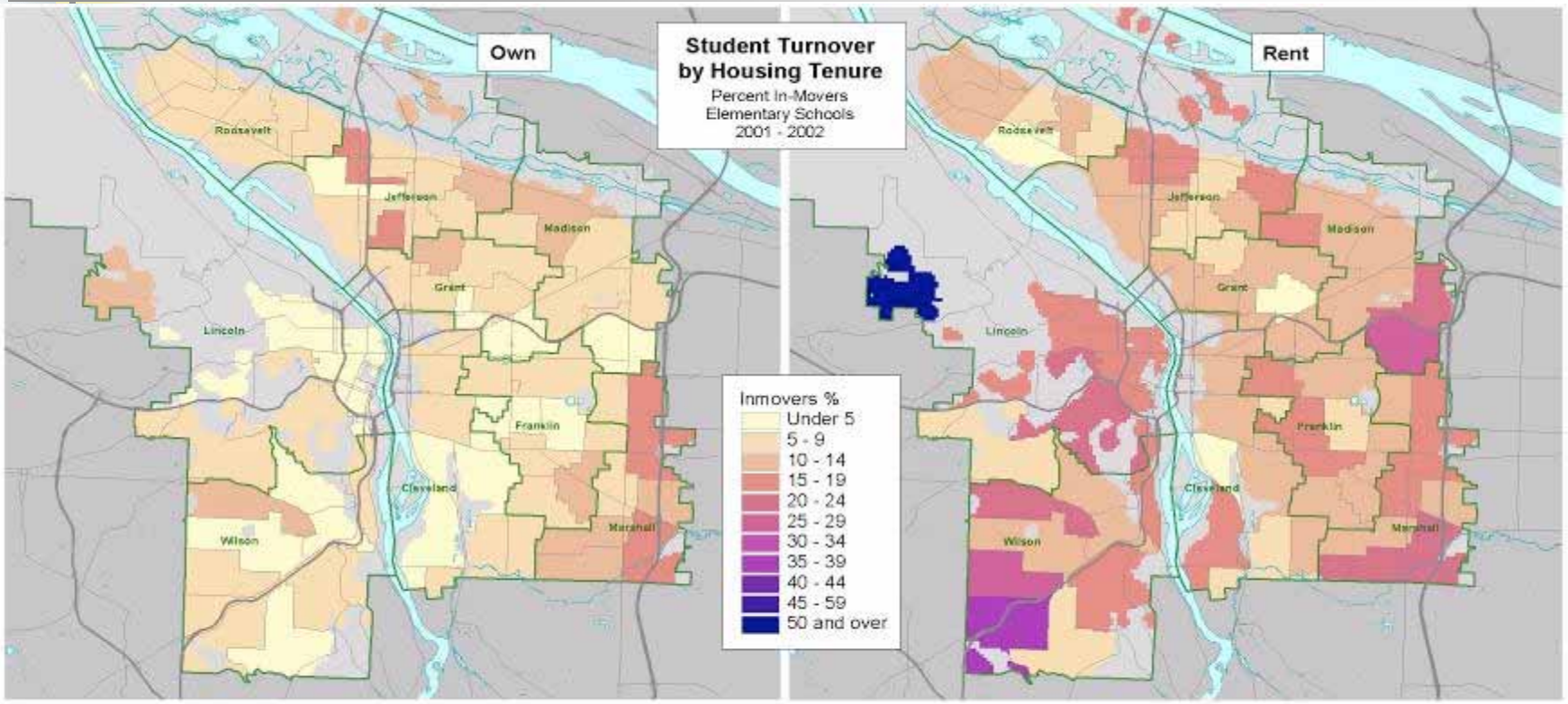
Generalized Student Turnover from Student Record and Tax-lot Data



The number of students moving to a new elementary school attendance area are shown as a percent of the number already residing using a grid map technique.

The rate of turnover is much greater for nearly all of the District for students living in rental versus owner occupied housing. A number of areas show 50% or higher turnover of students in rental housing.

Student Turnover by School from Student Record and Tax-lot Data



These maps show the percent of the grade 3- 6 students newly arriving in October. For students living in owner occupied housing most schools show turnover below 10%.

However for students living in rental housing most schools show turnover over 10% and in some schools turnover is as high as 50%.

Example #2: Yield of Students per Household

- One method of forecasting student enrollment is to use the ratio of the number of students per household and housing unit counts.
- We commonly use this to assess the impacts of a new housing development on school enrollments
- The 2000 Census provides data by school district on this topic but these data are not tabulated for small geographical areas

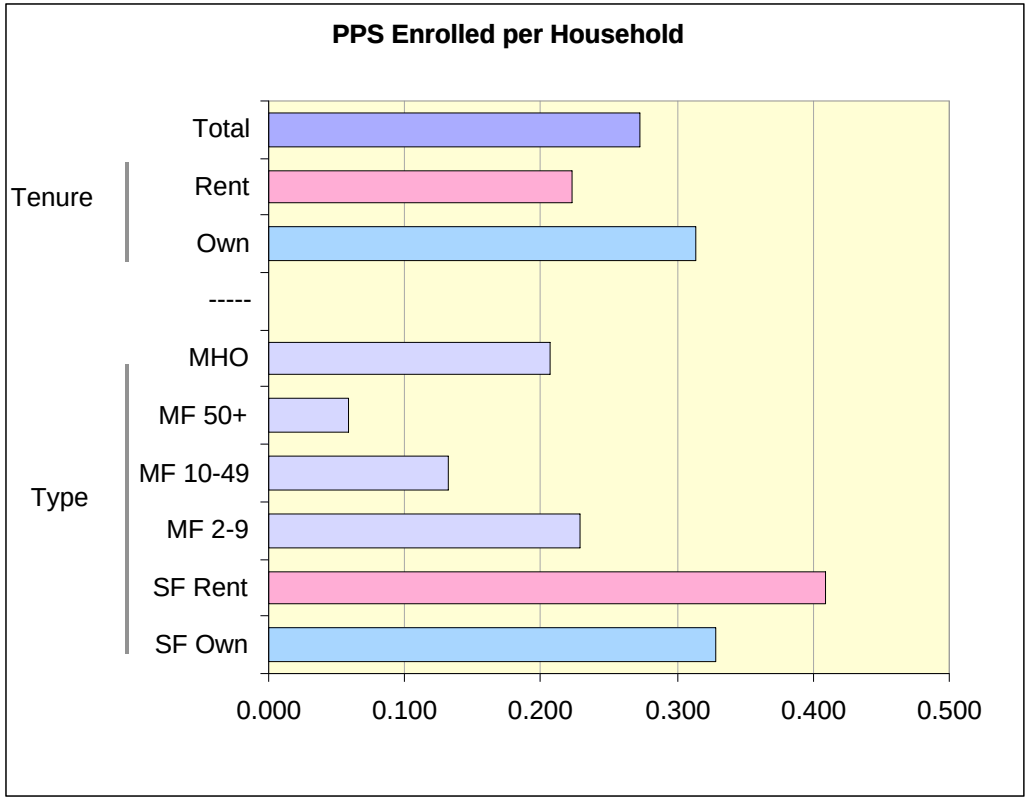
From The 2000 Census

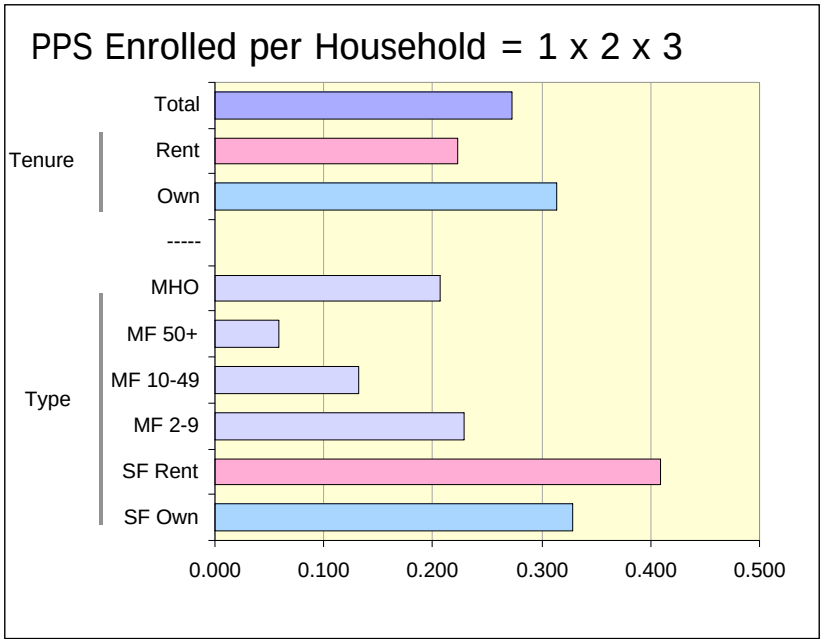
	Single Family		Multi Family (mainly renter occ.)				By Tenure		
	Own	Rent	2-9	10-49	50+	MHO	Owner	Renter	Total
Households	95,505	22,725	26,195	22,765	16,760	1,835	101,760	84,025	185,790
Households with kids	30,100	7,820	5,975	3,290	1,275	379	30,740	18,110	48,845
All Children	54,460	15,470	10,235	5,475	1,975	824	55,555	32,890	88,440
Kids In Public School	31,370	9,300	5,975	3,000	980	379	32,000	18,760	50,760
Prop HH with kids	0.315	0.344	0.228	0.145	0.076	0.207	0.302	0.216	0.263
Kids per HH w kids	1.809	1.978	1.713	1.664	1.549	2.174	1.807	1.816	1.811
PPS as prop kids	0.576	0.601	0.584	0.548	0.496	0.460	0.576	0.570	0.574
PPS Kids per HH	0.328	0.409	0.228	0.132	0.058	0.207	0.314	0.223	0.273

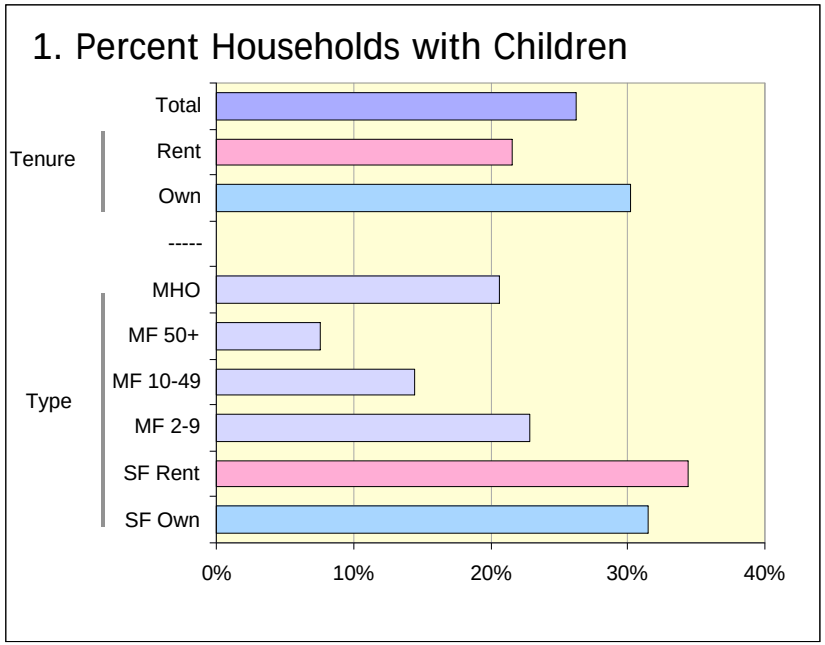
Data shown are for Portland Public Schools and are from a special school district tabulation of the 2000 census published by NCES.

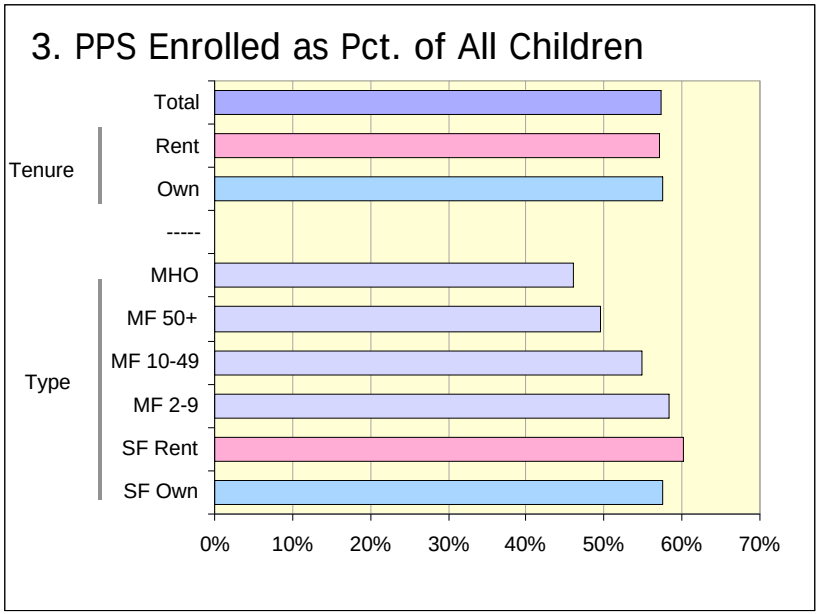
They show the yield of Portland Public School Students per household by housing type and tenure.

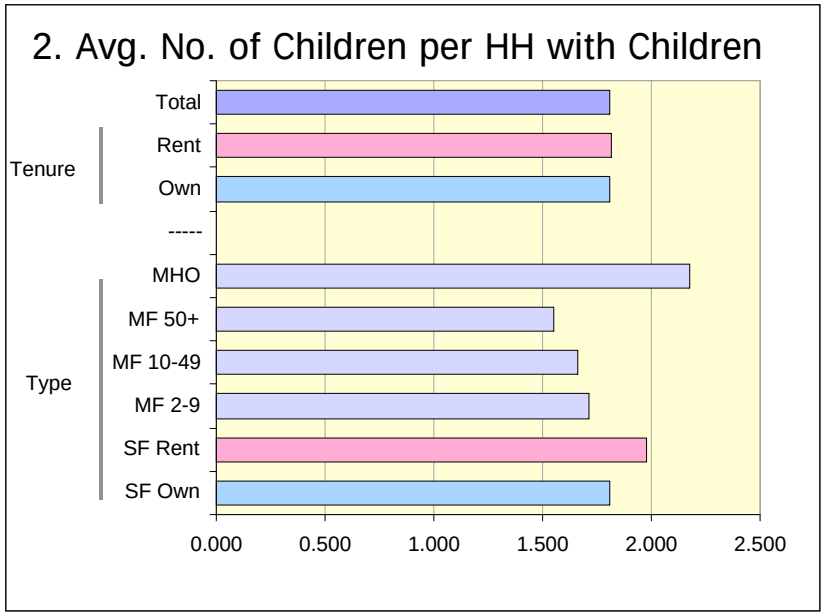
We will show how the last series of values (in green) can be derived from linked student and tax-lot data sets, tabulated, and mapped.





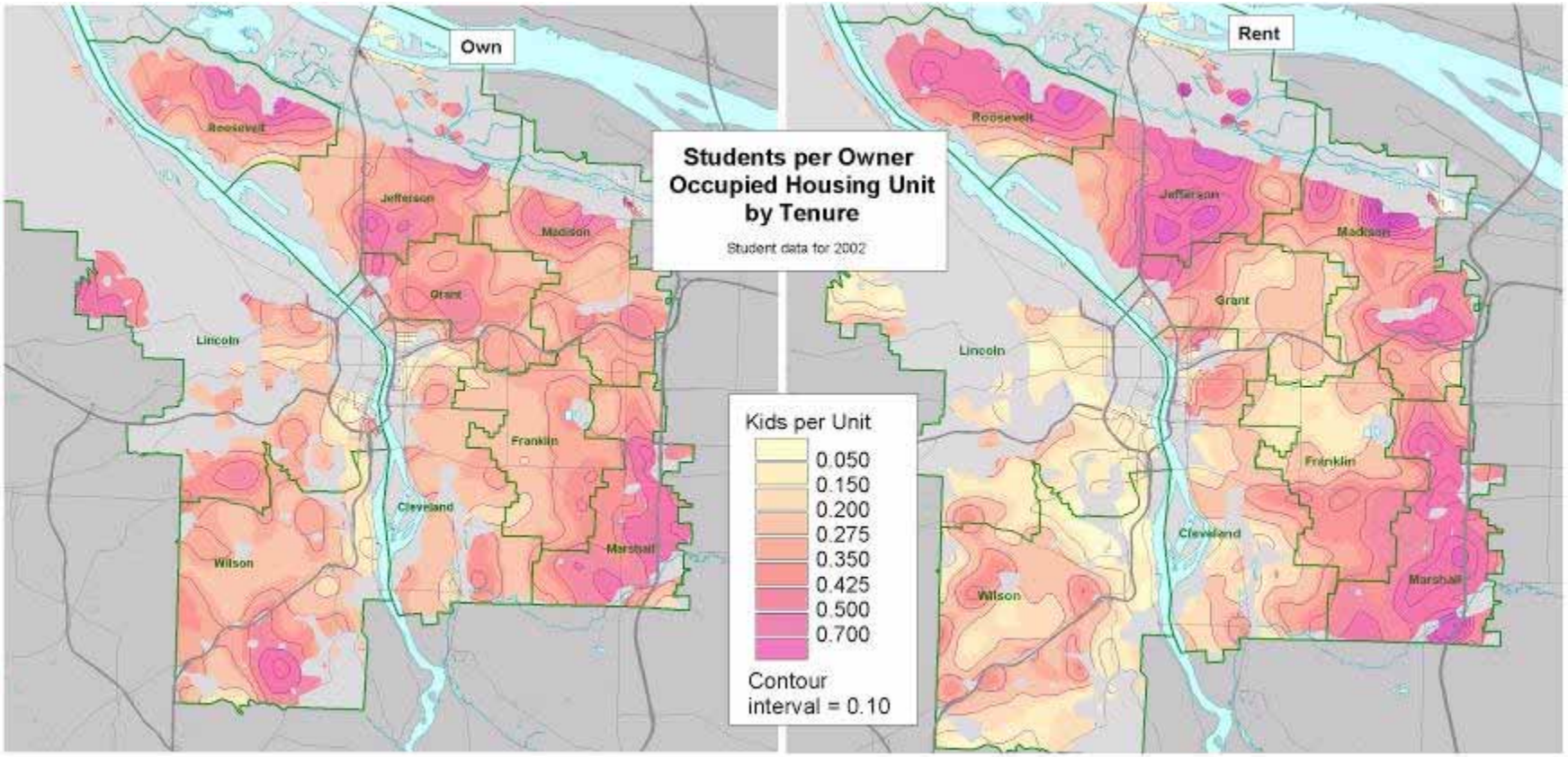






Note that the greatest variation is in “1: Percent Households with Children”

Students per Owner Occupied Housing Unit by Tenure Grid Map Based on Student and Tax-lot Data



Census data shown previously indicated that owner occupied housing has a yield of 3.28 students per household. The yield varies around this amount with highest values in lower income and minority neighborhoods.

The yield of students from rental housing is slightly higher but much more geographically variable. West side neighborhoods show a much lower yield of students from rental housing

Example #3: 1990's Housing Construction in the District Did Little to Sustain Enrollment

- About 20,000 housing units were built in the Portland Public Schools District during the 1990's but enrollment only grew by a negligible amount. Most of the growth occurred before 1995 and was erased by declines after 1995.

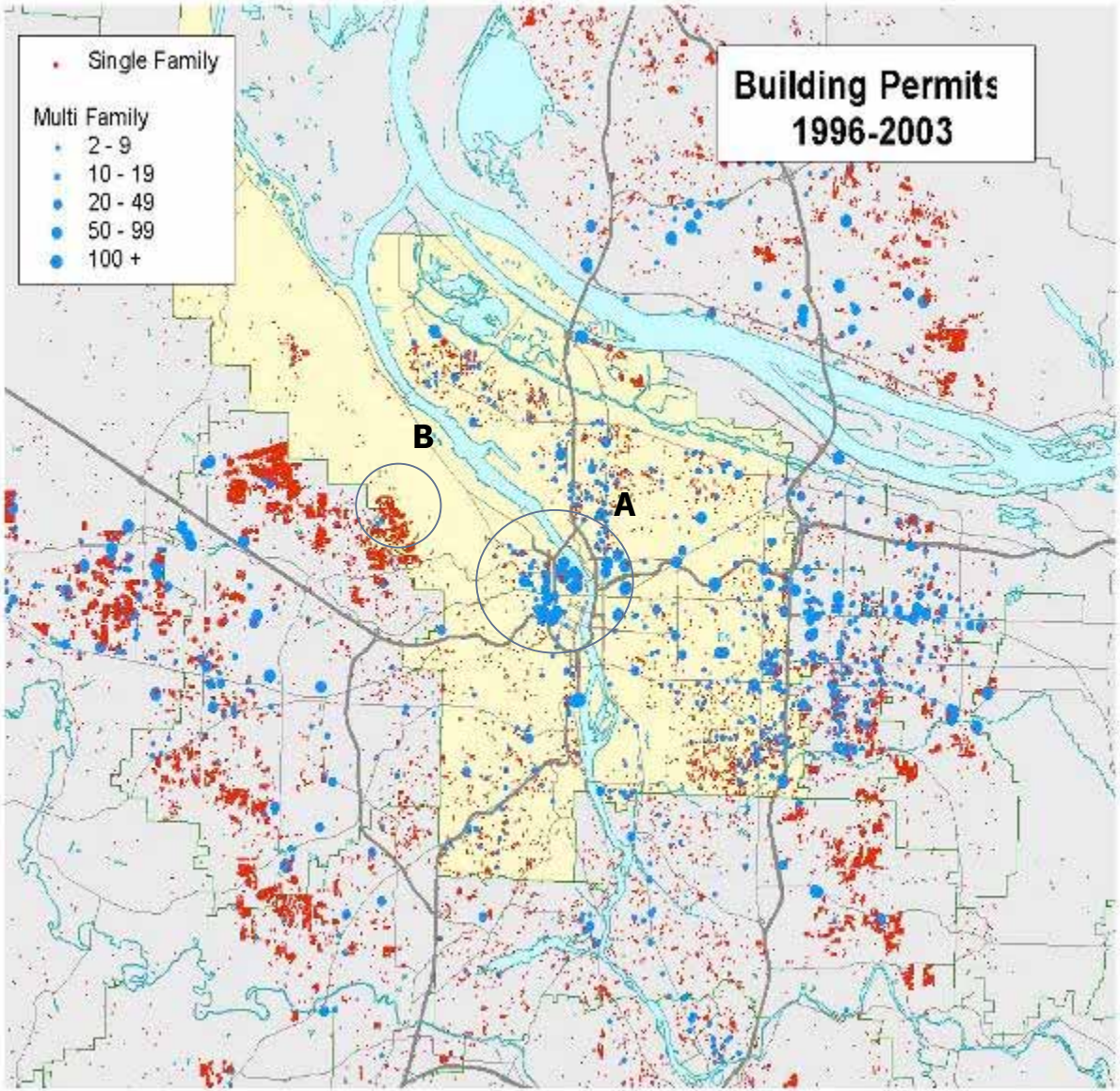
- An earlier analysis of the relationships between housing, households, and school enrollment suggested that the upward effects of housing construction on enrollment were overcome by declining numbers of children per household in the large inventory of existing housing.

- The following example examines the numbers of PPS students living in single family housing built during the 1990's.

Housing Construction in the Portland Public Schools Area

Most of the single family housing construction in the Portland Metro area was outside of the Portland Public Schools District. The only major concentration in the District was at “B” in the Forest Park area.

While there was a substantial amount of multifamily housing built in the District most of it did not provide housing that attracted families with school age children. The housing in the core at “A” yielded about one PPS student per 200 housing units.

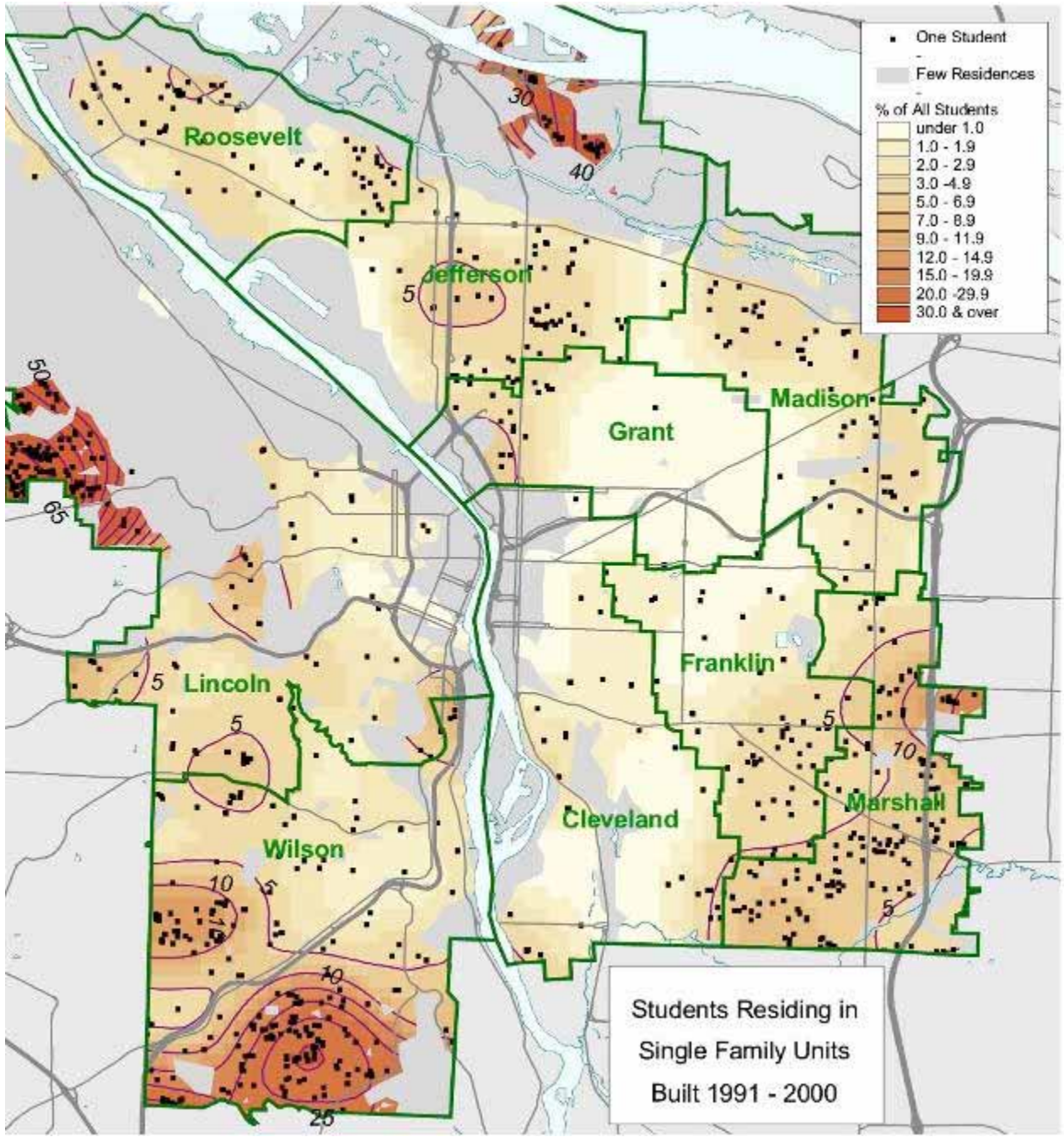


PPS Students in 1990's Single Family Housing

The map is based on PPS students in 2000 living in single family housing.

In only a few areas of the District does the proportion of PPS students living in housing built in the 1990's exceed 10%

In most of the District less than 5% live in such recently built housing.



Example #4: Bedrooms, Tenure, and Race and Yield of PPS Students

- One of the reasons for the decline of enrollment in the PPS District is the scarcity of affordable housing with 3 or more bedrooms. Many of the housing units with 3+ bedrooms are occupied by more affluent families.

- PRC was asked by the PPS District to assess the numbers of children who might move into a large public housing development in the Roosevelt HS attendance area. We looked for some comparables in the area based on numbers of bedrooms, tenure, assessed values, and year of construction.

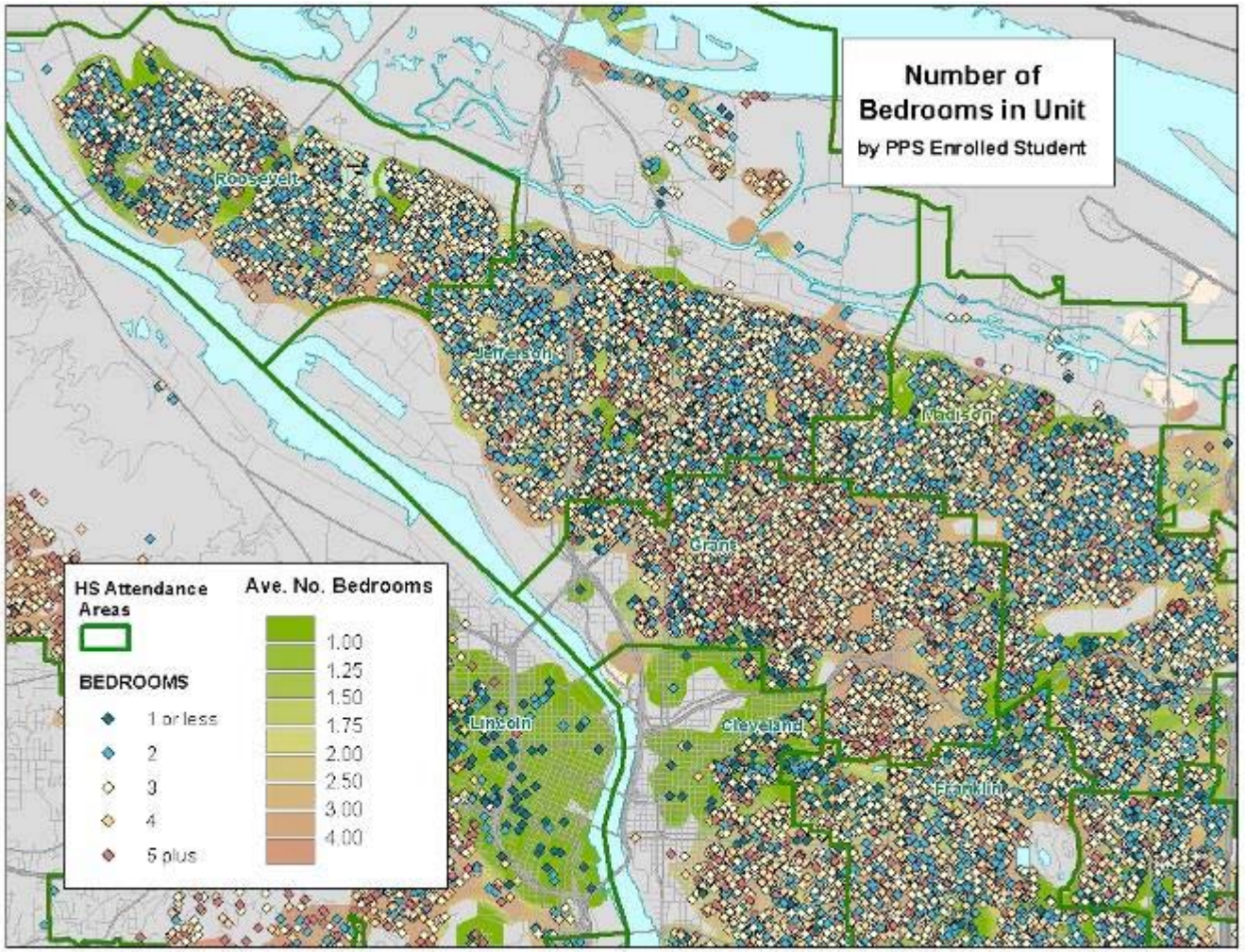
- We do not present that full analysis here but instead some more general insights into how housing (tenure and number of bedrooms) affects the yield of students (by race) per housing unit.

Bedrooms in Unit by PPS Student

This map shows the number of bedrooms in residences housing a PPS student.

Note the number of “blue” units (2 or less bedrooms) in the Roosevelt HS area and the large number of “brown” units (5 or more bedrooms) in the Grant HS area.

The variations reflect income and ethnic differences and the housing mix in the two areas



Finding “Comparables” for Market Housing in the New Columbia Development

Rent

White non-Hispanic

	Bedrooms					
Grade	0,1	2	3	4+	N/A	Total
KG-02	55	49	50	31	0	185
03-05	33	42	58	34	0	167
06-08	48	49	69	28	0	194
09-12	47	46	62	23	0	178
UN	17	8	13	10	0	48
Total	200	194	252	126	0	772

Non-White or Hispanic

	Bedrooms					
Grade	0,1	2	3	4+	N/A	Total
KG-02	209	41	102	53	0	405
03-05	167	45	98	57	0	367
06-08	188	45	80	41	0	354
09-12	129	34	76	42	0	281
UN	25	9	19	17	0	70
Total	718	174	375	210	0	1,477

Own

	Bedrooms					
Grade	0,1	2	3	4+	N/A	Total
KG-02	6	84	113	60	0	263
03-05	9	71	154	81	0	315
06-08	16	112	194	79	2	403
09-12	9	64	136	73	0	282
UN	1	23	24	16	1	65
Total	41	354	621	309	3	1,328

	Bedrooms					
Grade	0,1	2	3	4+	N/A	Total
KG-02	12	58	198	71	1	340
03-05	12	53	154	55	1	275
06-08	14	62	190	45	1	312
09-12	7	45	159	40	1	252
UN	1	8	25	6	1	41
Total	46	226	726	217	5	1,220

The most striking number in this table may be the 718 non-white or Hispanic students residing in units with 0 or 1 bedrooms. Nearly half the minority students living in rental housing live in such crowded accommodations.

By contrast students in owner occupied housing are more likely to live in units with 3+ bedrooms regardless of ethnicity. Analyses of student yield of housing must take into account race and tenure as well as bedroom counts.

Example 5: The Bend-LaPine School District

- The Bend-LaPine District is in Central Oregon, Deschutes County, one of the most rapidly growing areas in Oregon

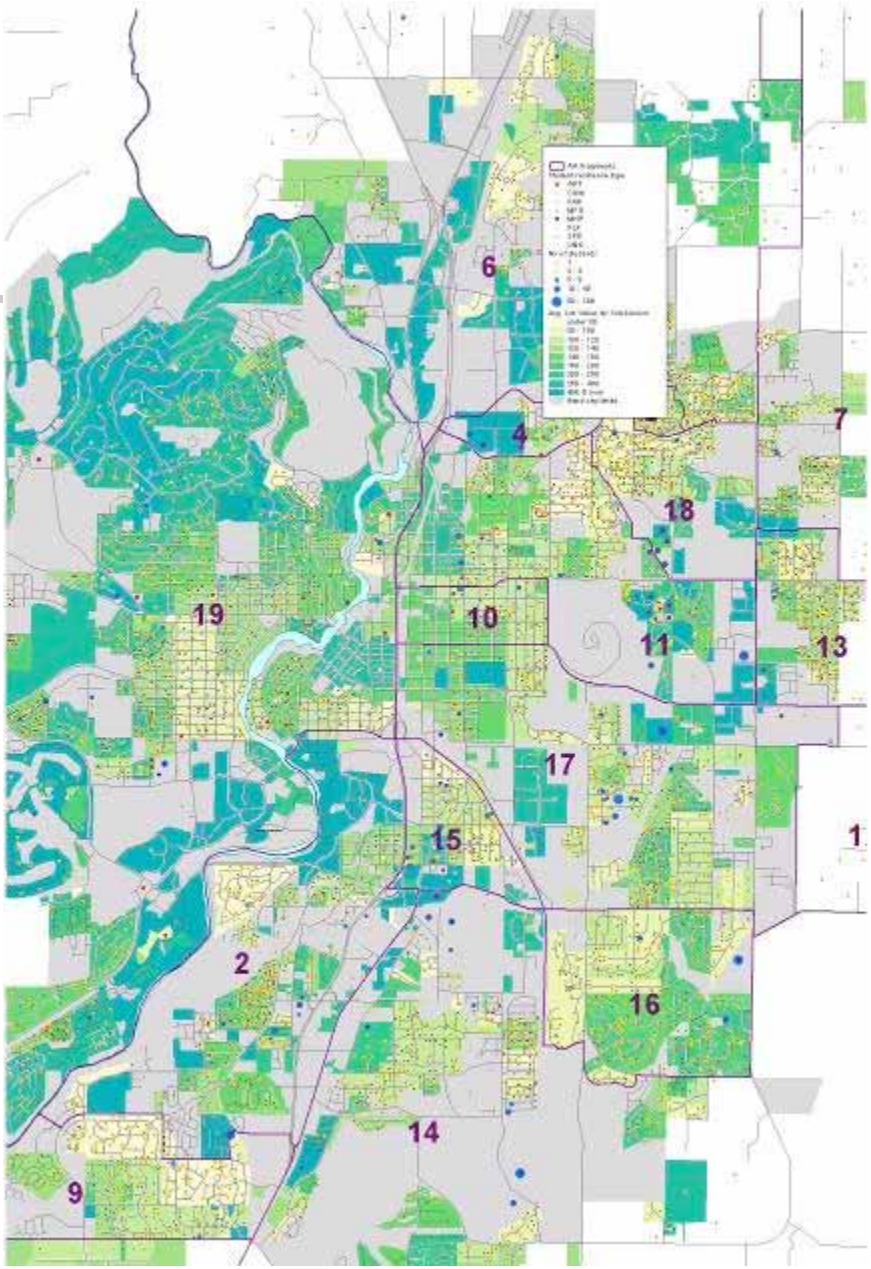
- The City of Bend (with 2/3 of the District's students) is currently completing a very detailed buildable lands study which provides support for the enrollment forecasting effort

  - Includes detailed tax-lot data on housing showing number of housing units, type of housing, year built, and assessed value

  - The build-out data will show the numbers of remaining vacant and buildable lots suited for residential development. Most of this land will be developed in the next ten years necessitating expansion of the urban growth boundary

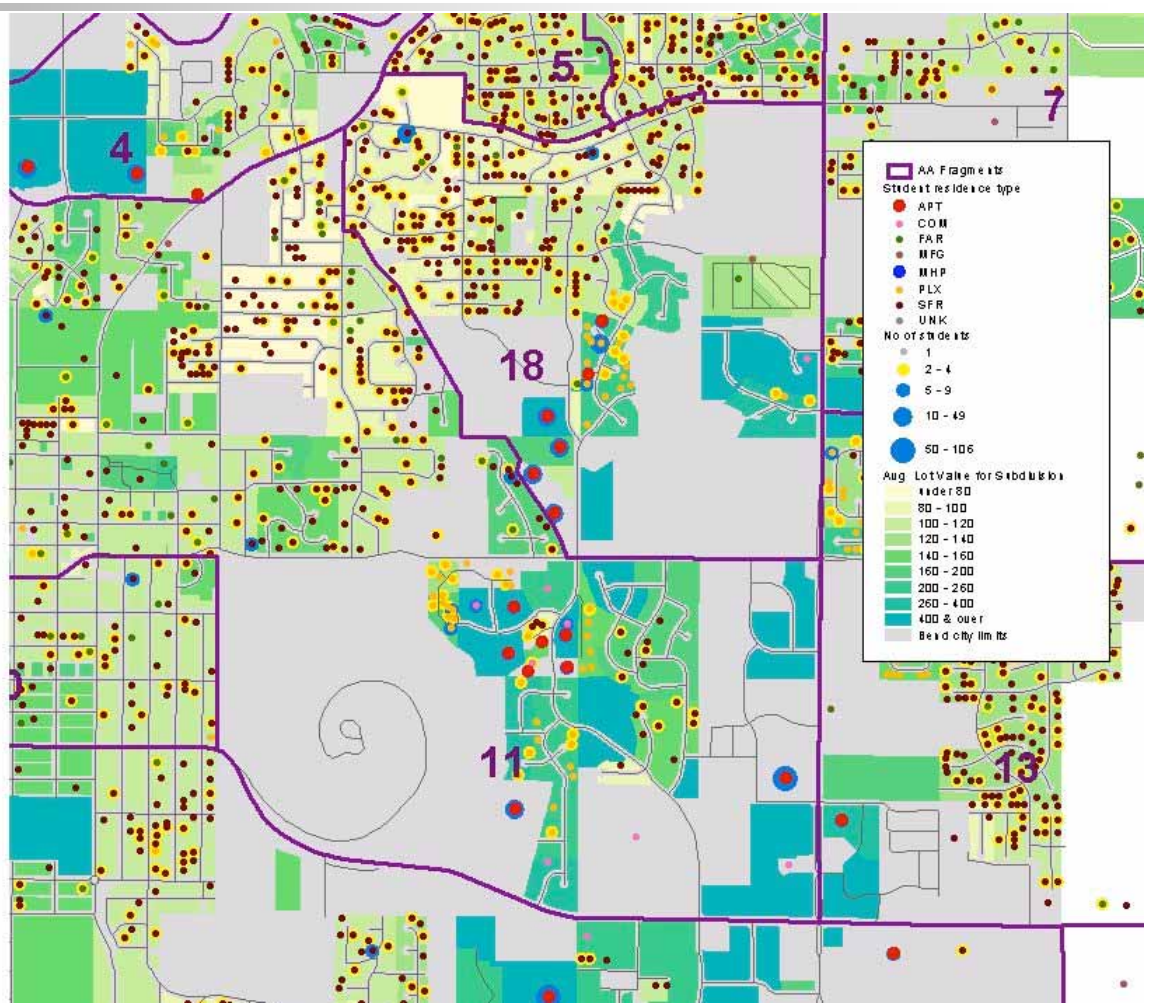
Overview of the Bend Portion of Study Area

- The purple lines and numbers are the sub areas for enrollment forecasting
- The green shades show average housing values by subdivision
- The dots are the students



Zoomed in on a small area of the previous map

- For each student address we show the type of housing in which the student resides and the number of students residing at that address.
- Thus we can compare numbers of students to housing by type, age, value, and other measures.

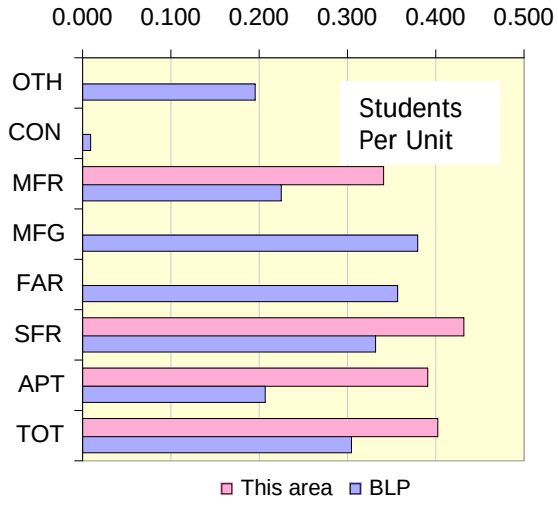


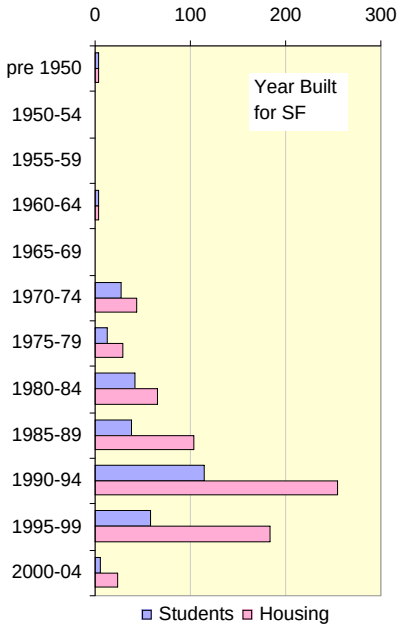
Cross Tabulation of Student and Tax-Lot Data for Area 18 on Previous Slide

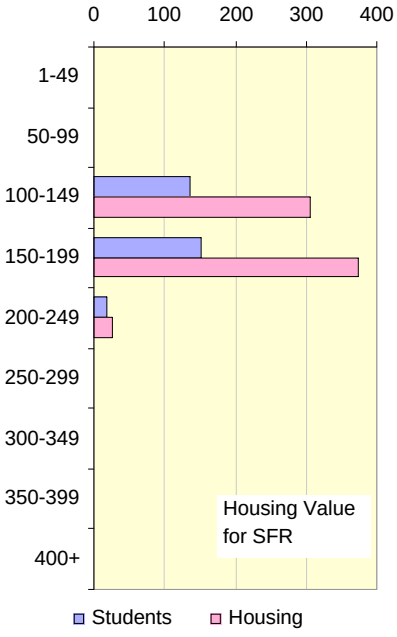
- Here we show in tabular and graph form the relationships between student and housing counts by housing type, value, and year built.
- This area yields more students per unit than does the District as a whole.

Children and Housing

Units	OTH	CON	MFR	MFG	FAR	SFR	APT	TOT
Pre 1950	0	0	0	0	0	3	0	3
1950-79	0	1	48	0	0	77	79	205
1980-89	0	0	16	0	0	168	5	189
1990-99	0	22	84	0	0	438	116	660
2000-94	0	0	2	0	0	24	0	26
Total	0	23	150	0	0	710	200	1,083
Enrolled	OTH	CON	MFR	MFG	FAR	SFR	APT	TOT
Pre 1950	0	0	0	0	0	4	0	4
1950-79	0	0	22	0	0	44	30	96
1980-89	0	0	4	0	0	79	1	84
1990-99	0	0	25	0	0	173	47	245
2000-94	1	0	0	0	0	6	0	7
Total	0	0	0	0	0	0	0	0
Enr/Unit	OTH	CON	MFR	MFG	FAR	SFR	APT	TOT
Pre 1950								
1950-79			0.458			0.571	0.380	0.468
1980-89						0.470		0.444
1990-99		0.000	0.298			0.395	0.405	0.371
2000-94						0.250		0.269
This area		0.000	0.340			0.431	0.390	0.403
BLP	0.196	0.008	0.225	0.381	0.356	0.332	0.206	0.306







Conclusions -1

- During the past year the ability to relate tax-lot data to student record information has been very helpful to PRC in providing demographic and planning support to Portland Public Schools. Some examples are:
  - Determining the numbers of students by grade that could be expected to reside in the large New Columbia community that is being developed by the Housing Authority of Portland
  - Assessing the potential impacts on enrollment of proposed housing in the Portland Development Commission's South Macadam developments
  - Better understanding the interactions between housing type, tenure, and ethnicity of students as they have affected the sharp enrollment drop experienced from 2002 to 2003.

Conclusions - 2

- Student record data provide some of the most current information bearing on the changing social demography of the city and region.
  - The changing age and ethnic mix of students is indicative of changes in the overall population
  - The historic record of geo-coded student data provides an opportunity to study the dynamics of the movement of student households. A common student record system may allow tracing movements over a larger region.
  - We currently use annual snapshots of the student record data, with data back to 1996 and a data point at 1990.
  - There are issues of confidentiality of student records, cost, and software incompatibility.

Conclusions -3

- With respect to the work on Bend Oregon, we are still working on enrollment forecasts and learning how to use the highly detailed information linking students and housing.
  - The highly detailed planning information available from the City of Bend and Deschutes County are very helpful in shaping the forecasts
  - Still there is great uncertainty about the timing and location of growth. The where and when of growth boundary expansion is particularly uncertain.
  - Having this highly detailed data on property, housing, and students has not made the forecasting effort easier. Working at this level of detail is very costly and time consuming.

Conclusions -4

- The shrinking quantity of small area census data will require that local governments make an effort to develop housing unit and household level data

- In the 2000 census we lost key block level census data.The 2010 census will not have a long form questionnaire. Instead, we will need to rely on the American Community Survey with a much lower sampling density.

- Some planning organizations have recognized this problem and are attempting to develop accurate and current housing unit based data.

Acknowledgements

- PRC's demographic work for Portland Public Schools is a team effort on the part of our staff and graduate students.
  - Risa Proehl has assisted in developing some of the data for the paper and has provided valuable advice. George Hough and Irina Sharkova have made valuable suggestions and criticisms. Barry Edmonston, PRC Director, although currently on leave, has provided me with valuable insights.
- At Portland Public Schools Pam Brown, Kerry Hampton, and Theresa White have provided valuable advice and support. The District has funded our research.
- At Multnomah County Andrea Westersund has provide assessor's data and enhanced map files.
- For the work on Bend-LaPine we thank Damian Syrnk and Colleen Miller with the City of Bend, Bob Haas and the GIS staff for Deschutes Co., and Brian Rankin, planning consultant to the Bend-LaPine School District and John Rexford Assistant Superintendent of the Bend-LaPine District.
- Metro in Portland has assisted our work by publishing the RLIS Lite database on which most of our maps depend.
- While others have made valuable suggestions and helpful criticisms the views expressed in this paper are ultimately the author's.

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