



PROJECTING SCHOOL ENROLLMENT

Cohort Survival
Student Yield Models

A brief description of the Cohort Survival Method of Projecting Enrollment, and the Use of Student Yield Models to Predict Enrollment Growth of New and Existing Residential Properties.

William T. Rebore, Ph.D.
Professor Emeritus – Saint Louis University
LDR Administrative Services
reborewt@ldr-services.com

ENROLLMENT PROJECTIONS

A multiple year projection of enrollment allows the district to modify revenue and expenditure projections to account for student increases or decreases. Even districts with stable enrollments over a number of years could experience shifting patterns of student growth. While declining or increasing birth rates may not impact school enrollment for several years, planning is a continual process of preparing for future changes. The most common reasons to maintain a continuing enrollment projection is to provide time to prepare for the following issues:

1. Redistricting
2. New school openings
3. Changes/additions in program offerings
4. Preschool programs
5. Change in grade level configuration.
6. Reacting to Economic issues (Interest rates/unemployment shifts)
7. Magnet/Charter/Private school opening or closure
8. Zoning changes
9. Unplanned new housing activity
10. Planned, but not built, housing.
11. School funding changes. (FN)

The most common method of projecting enrollment is the “Cohort Survival” Method

Cohort Survival Method of Projecting Enrollment

The Cohort Survival Methods is most effective when the school experiences a gradual increase or decrease in students over a number of years. During periods of significant growth or decline the use of prior year enrollments needs to be modified to include student yield data. (Discussed Later). For example, when a district’s enrollment significantly increases or decreases over the previous 3 to five years, using 10 years of data may not be practical. In those cases, the District may find using survival rates of 3 to 5 years to be more appropriate to accurately project enrollment.

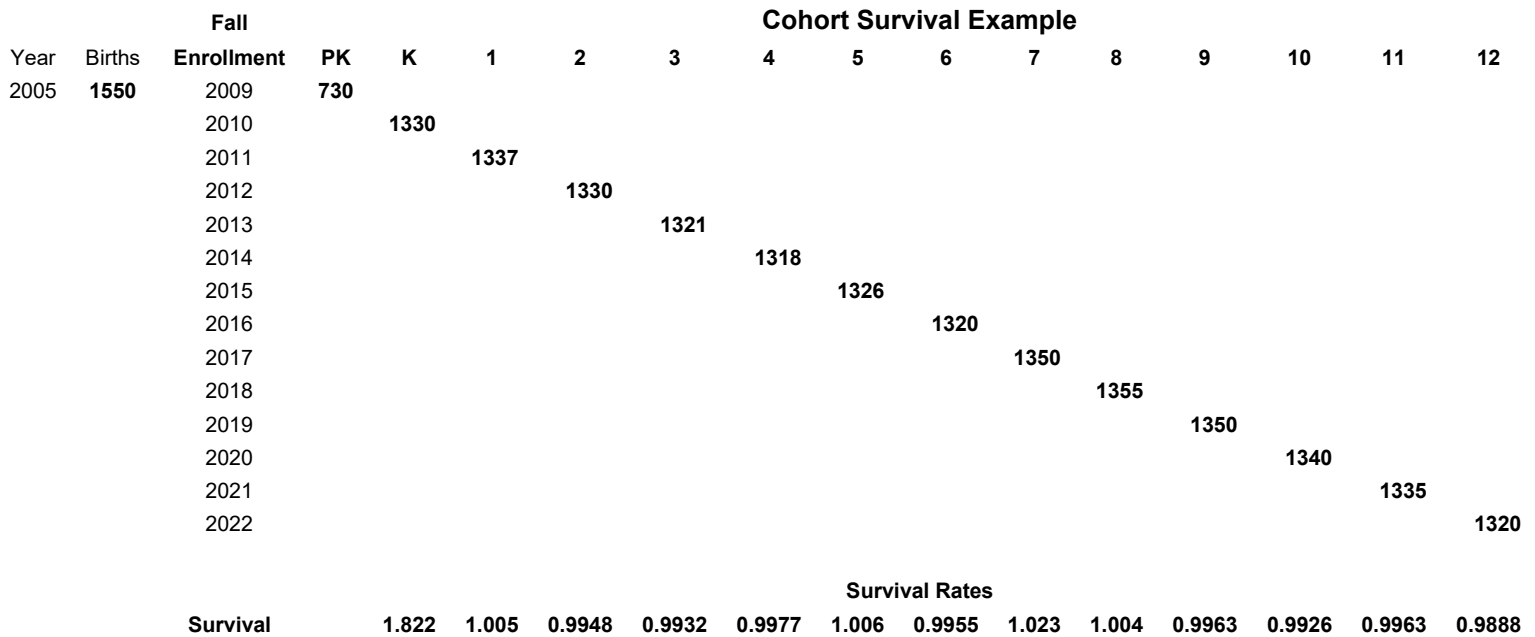
Methodology

The cohort survival enrollment projection methodology uses historic live birth data and historic student enrollment to “age” a known population or cohort throughout the school grades. For instance, a cohort begins when a student enrolls in grade PK and moves to Kindergarten the following year, first grade the next year, and so on. A “survival ratio” is developed to track how this group of students increases or decreases in number as they moved through the grade levels. By developing survival ratios for each grade transition [i.e. 2nd to 3rd grade] over a ten year period of time, patterns emerge and can be folded into projections by using the survival ratio as a multiplier. For example, if student enrollment has consistently increased from the 8th to the 9th grade over the past ten years, the survival ratio would be greater than 100% and could be

multiplied by the current 8th grade to develop a projection for next year’s 9th grade. This methodology can be carried through to develop ten years of projection figures. Because there is not a grade cohort to follow for students coming into kindergarten, live birth counts are used to develop a survival ratio. Babies born five years previous to the kindergarten class or 4 years prior to a four year old PK program are compared in number, and a ratio can be developed to project future kindergarten enrollments. The cohort survival method is useful in areas where population is stable [relatively flat, growing steadily, or declining steadily], and where there have been no significant fluctuations in enrollment, births, and housing patterns from year to year. The projections presented in this report are meant to serve as a planning tool for the future, and represent the most likely direction of the District. Enrollment projections were developed by analyzing the following data:

The following Graph depicts the progression of a cohort of students

Exhibit 6.1



Cohort Example

1. In 2005, there were 1550 births in the district.
2. Four years later (2009), 730 students were enrolled in the 4-year-old PK Program
3. In 2010, 1330 students were enrolled in Kindergarten.
4. From 2010, the annual enrollment of the Cohort is listed as they progress to 12th Grade.

Survival Rates

As the Cohort moves from grade to grade, a survival rate is calculated. Ex. K to 1st. grade was calculated by dividing 1337/1330 which equals a survival rate of 1.005. Growth is noted by a

survival rate of 1.0 or greater. Decline in enrollment is represented by a less than 1.0 survival rate. Ex. Grade 2 to Grade 3 $1321/1330 = .994$ A small decline

Common Question About the Cohort Survival Method.

How do I know if the births listed in 2005 are the same students that entered the PK Program.

Answer:

You do not know. Obviously, some parents will move out of the districts and others will move in. However, you can only analyze the numbers available to you. Grade levels change are inevitable base on mobility.

To Complete a Cohort Survival Enrollment Projection the following components are necessary:

- Live birth data
- Historical enrollment by school, by grade
- Calculate Survival Rates
- Project Enrollment based on current birth data and survival rates.
- Building permits

Live Birth Data

Live Birth Data is available on the Missouri Health and Human Services website by Zip Code. Birth data by district is also available on a fee basis.

Historical Enrollment Data by District.

Historical Enrollment data is available through the Data Portal (Demographics) on the Missouri Department of Elementary and Secondary Education.

Survival Rates

By developing survival ratios for each grade transition [i.e., 2nd to 3rd grade] over a ten year period of time, patterns emerge and can be folded into projections by using the average survival ratio as a multiplier.

Enrollment Projection

The Enrollment Projection is calculated use the live birth data and the average survival ratios over the past 10 years.

Exhibit 6.2 is an example of a completed Enrollment Projection using the Cohort Survival Method.

Cohort Survival Example (Exhibit 6.2)																						
Year	Births	Fall Enrollment	PK	K	1	2	3	4	5	6	7	8	9	10	11	12	PK-12	PK	K-5	6-8	9-12	K-12
2009	329	2013	94	280	259	253	231	278	249	241	214	188	282	187	156	198	3110	94	1550	643	823	3016
2010	306	2014	116	225	272	271	236	238	275	237	243	207	199	251	210	163	3143	116	1517	687	823	3027
2011	329	2015	117	220	255	252	265	219	218	260	207	222	193	197	230	205	3060	117	1429	689	825	2943
2012	305	2016	112	209	218	235	243	259	219	209	230	198	210	204	202	225	2973	112	1383	637	841	2861
2013	295	2017	119	210	210	222	228	241	235	189	198	213	188	197	196	205	2851	119	1346	600	786	2732
2014	327	2018	123	222	236	208	218	229	217	212	187	193	199	191	190	195	2820	123	1330	592	775	2697
2015	301	2019	115	171	221	217	221	205	228	193	205	179	178	201	177	192	2703	115	1263	577	748	2588
2016	260	2020	130	176	174	214	210	206	207	201	197	192	173	190	182	186	2638	130	1187	590	731	2508
2017	264	2021	112	200	162	173	213	196	201	181	207	193	190	172	181	180	2561	112	1145	581	723	2449
2018	287	2022	118	171	207	175	175	211	185	185	189	186	189	175	159	187	2512	118	1124	560	710	2394
+ (-)	-42															+ (-)	-598	24	-426	-83	-113	-622
%	-13%															%	-19%	26%	-27%	-13%	-14%	-21%
Cohort Survival Ratios																						
		Cohort Survival	B-PK	PK-K	K-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12						
		2013	0.286																			
		2014	0.379	2.394	0.971	1.046	0.933	1.030	0.989	0.952	1.008	0.967	1.059	0.890	1.123	1.045						
		2015	0.356	1.897	1.133	0.926	0.978	0.928	0.916	0.945	0.873	0.914	0.932	0.990	0.916	0.976						
		2016	0.367	1.786	0.991	0.922	0.964	0.977	1.000	0.959	0.885	0.957	0.946	1.057	1.025	0.978						
		2017	0.403	1.875	1.005	1.018	0.970	0.992	0.907	0.863	0.947	0.926	0.949	0.938	0.961	1.015						
		2018	0.376	1.866	1.124	0.990	0.982	1.004	0.900	0.902	0.989	0.975	0.934	1.016	0.964	0.995						
		2019	0.382	1.390	0.995	0.919	1.063	0.940	0.996	0.889	0.967	0.957	0.922	1.010	0.927	1.011						
		2020	0.500	1.530	1.018	0.968	0.968	0.932	1.010	0.882	1.021	0.937	0.966	1.067	0.905	1.051						
		2021	0.424	1.538	0.920	0.994	0.995	0.933	0.976	0.874	1.030	0.980	0.990	0.994	0.953	0.989						
		2022	0.411	1.527	1.035	1.080	1.012	0.991	0.944	0.920	1.044	0.899	0.979	0.921	0.924	1.033						
		Average	0.388	1.756	1.021	0.985	0.985	0.970	0.960	0.910	0.974	0.946	0.964	0.987	0.967	1.010						
Projection																						
Year	Births	Year	B-PK	K	1	2	3	4	5	6	7	8	9	10	11	12	PK-12	PK	K-5	6-8	9-12	K-12
2019	264	2023	103	207	175	204	172	170	203	168	180	179	179	187	169	161	2456	103	1,130	527	696	2353
2020	289	2024	112	180	212	172	201	167	163	184	164	170	172	177	180	171	2426	112	1,095	518	701	2314
2021	250	2025	97	197	184	208	169	195	160	148	179	155	164	170	171	174	2374	97	1,114	483	680	2277
2022	250	2026	97	171	201	181	205	164	187	146	144	170	149	162	164	165	2308	97	1,110	460	641	2211
2023	250	2027	97	171	174	198	178	199	158	170	142	136	164	148	157	159	2251	97	1,078	449	627	2154
+ (-)	-14															+ (-)	-205	-5	-52	-79	-69	-200

Exhibit 6.2 Analysis

Analysis of the Enrollment Projection example presented in Exhibit 6.3 would include the following observations:

Observation 1. Birth Rate

The birth rate declined from 329 to 287 (13%) from 2009 to 2018. Additional decline occurred from 2018 to 2021 (12%). The birth rates for 2022 and 2023 are projected to remain the same. The decline in the birth rate will impact future enrollment as a smaller number of students enter the PK or K grades.

Observation 2. Pre-K Program

The District's 4-year-old Pre-K Program grew from 94 students from 2013 to 2018 by approximately 23.5%. This increase may be the result of a planned expansion of the program to provide a services to the community. Beginning with the 2015 school years, districts were allowed to claim State Aid for students who qualify for free and reduced lunch. The number of pre-school students receiving State Aid may not exceed 4% of the total number of pupils who are eligible free and reduced price lunch between the ages of five and eighteen who are included in the district's calculation of average daily attendance. (163.018.1 RSMo)
District's Average Daily Attendance (ADA) for the year

Observation 3. Enrollment by Grade Level

K-5 Enrollment decreased from 1550 to 1124 (27%) from 2013 to 2022. Decreases in the birth rate would impact K-5.

6-8 Enrollment decreased from 643 to 560 (13%).

9-12 Enrollment decreased 823 to 710 (14%)

K-12 Enrollment decreased from 3016 to 2449 (19%)

Observation 4. Five Year Enrollment Projection

The District continued to decrease in enrollment from 2023 to 2027

PK Slight decrease from 108 to 97 (5%)

K-5 Projected decrease from 1130 to 1078 (-5%)

6-8 Projected decrease from 527 to 449 (-15%)

9-12 Projected decrease from 696 to 627 (-10%)

K-12 Projected decrease from 2353-2154 (-8%)

Observation 5. Normal Break Points.

When analyzing enrollment projections, it is important to look at normal break points to determine enrollment increases and decreases.

PK to K. The Survival Rate may increase (above 1.0) because parents choose or unable to participate in the PK Program.

Grade 5 to 6 This is a normal break point from elementary to middle school. Parents may wait to move from the District at the conclusion of the elementary school or choose to enroll their children in a private middle school.

Grade 8 to 9 Similar to the reasons articulated above regarding middle school. Parent are reluctant to move their children during the high school years. Therefore, a change of residence may be appropriate at the conclusion of middle school.

Observation 6. Impact on Revenue and Expenditures.

Decreases in enrollment will directly impact Average Daily Attendance (ADA) resulting in lower revenue from specific local, state and federal resources. Revenue reductions will impact personnel costs, class size, transportation, and student curricular and co-curricular activities.

Other Enrollment Factors

Housing Data. Obviously, certain factors can be estimated and planned better than others. For instance, it may be relatively straightforward to gather housing data from local builders regarding the total number of lots in a planned subdivision and calculate the potential student yield. For example, if 100 new residential properties built the previous yielded 50 additional students, the yield per unit would be .50.

Enrollment by Housing Types. Over the past several years, several studies have been conducted to predict student yields by housing types. The studies predicted the yield by three housing types: single family homes, multi-family housing (apartments and condominiums) and manufactured (mobile) homes. As noted in Exhibit 6.5, student yields for multi-family and manufactured home are smaller than single family home. For example the American Association of Planning Officials study in 1966 found the following yield:

Single Family – 1.08 student per unit.

Multi-Family - .45 student unit, and

Manufactured Home - .21 student per unit.

However, the density per acre is much greater for multi-family and manufactured homes. Exhibit 6.5 summarizes the following three studies conducted over the past several years: American Association of Planning Officials in 1966, National Association of Home Builders in 2015 and an enrollment study for the Platt County School District in 2018. (FN)

Exhibit 6.3

Average Student Yields by Housing Type Per Student.

Report	Single Family	Multi-Family	Manufactured	Total
American Association of Planning Officials (1966)	1.08	.37	.21	1.66
Housing Economics National Association of Home Builders (Missouri 2015)	.451	.168	.36	.829
Platt County School District Missouri (2018)	.69	.35	NA	1.04

It should be noted that every school district has the capability to develop its own data based on prior and current enrollment. School records contain the grade level and addresses of all students. This allows the district to calculate the student yields by grade level and housing type. This is particularly helpful if the district is growing with new single family and multi-family developments.

Impact of Student Enrollment on District Revenues and Expenditures.

Student enrollment is directly related to several types of revenue received by the district each year. However, the method of using enrollment differs based on the type of revenue received. Table 6-5 summarizes the difference revenue objects and the base of enrollment used.

Definitions of the how enrollment impacts revenue.

Membership:

Count of resident students in grades PK-12 taken the last Wednesday in September, or the last Wednesday in January, who are enrolled on the count day and in attendance at least one of the 10 previous school days, by grade at each attendance center. PK students included in membership are only the PK students being claimed for state aid.

Average Daily Attendance:

Total regular term hours of attendance (including remedial hours) divided by calendar hours in session PLUS the summer school ADA (total number of hours attended in an approved summer school divided by 1,044 hours).

Weighted Average Daily Attendance

Total regular term hours of attendance (including remedial hours) divided by calendar hours in session PLUS the summer school ADA (total number of hours attended in an approved summer school divided by 1,044 hours) plus weights of students populations: weighted by taking 25% multiplied by the Free and Reduced Lunch pupil count that exceeds the threshold of regular term ADA plus summer school ADA, plus 75% multiplied by the number of Special Education Pupil count that exceeds the threshold of regular term ADA plus summer school ADA, plus 60% multiplied by the Limited English Proficiency count that exceeds the threshold of regular term ADA plus summer school ADA. (Glossary – DESE Accounting Manual)

Exhibit 6-4

Distribution Methods by Source of Revenue

<u>Source of Revenue</u>	<u>Distribution Method</u>
Local Revenue	
Proposition C	Prior Year Average Daily Attendance)
County Revenue	
Fines/Forfeitures	Membership
State Assessed Utilities (School Purposes)	Membership
State Revenue	
Foundation Formula	Weighted Average Daily Attendance
Community Trust Fund	Prior Year Average Daily Attendance

