

Student Yields in Selected Rockville Housing

Roald Schrack 5 July 2011

In response to a request from the Adequate Public Facilities Advisory (APFO) Committee the Montgomery County Public Schools (MCPS) made a survey of students coming from a varied set of 16 housing sites. This request arose because of doubts about the accuracy of averages used by MCPS to calculate expected student yields from projected new housing. So few cases are being tested that one cannot test the precision of the MCPS estimates but only that the chosen examples are in statistical agreement with the estimates. The MCPS yield estimates are shown below.

MCPS Student Generation Rates for New Housing by Type

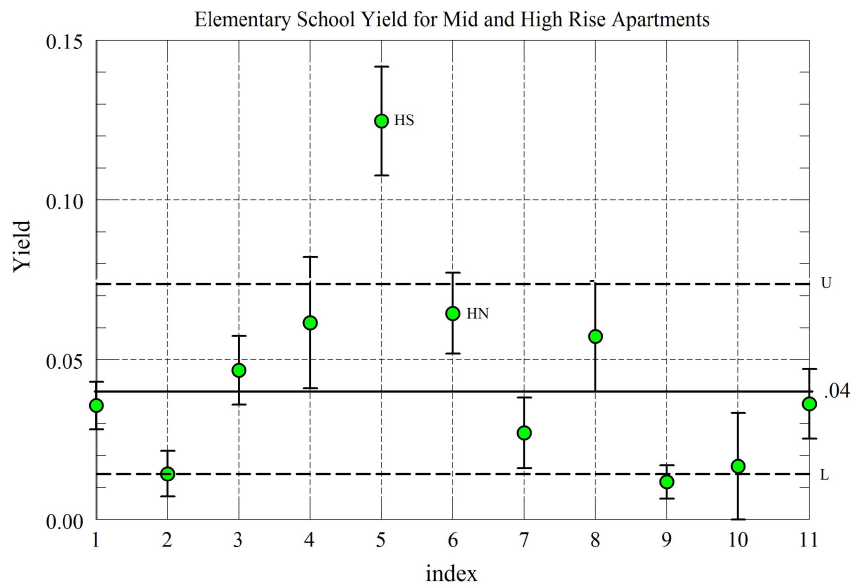
	2008-2010		
	K - 5	Gr 6 - 8	Gr 9 - 12
Single-family	0.34	0.14	0.10
Townhouse	0.25	0.11	0.13
Garden Apts	0.12	0.03	0.04
High/Mid Rise	0.04	0.04	0.03

A majority of the housing units chosen by the committee were high and mid rise apartments because any new residential construction in Rockville will be predominantly of these types. The results of the survey are shown on page 3. Uncertainties associated with the student yields are based on the statistics appropriate for the counting of random uncorrelated events.

Since the major interest is in the yield of elementary school students from apartments, a separate analysis is dedicated to that category. The yield results for the eleven cases of mid-rise and high-rise apartments are shown in the graph on the right for elementary school (K-5) students. The index value represents the order of the data given on page 3.

The uncertainties (UY) are shown by the vertical bars associated with data value (Y). The MCPS expected value of .04 is shown as the solid line.

The mean of the data is 0.045 and the standard deviation of the set, (a measure of the scatter of the data) is 0.03. The upper (U) and lower (L) levels of the standard deviation are shown on the graph as dashed lines. The data point marked HS lies well outside the limits of the standard deviation suggesting that there is something unusual affecting that data value.

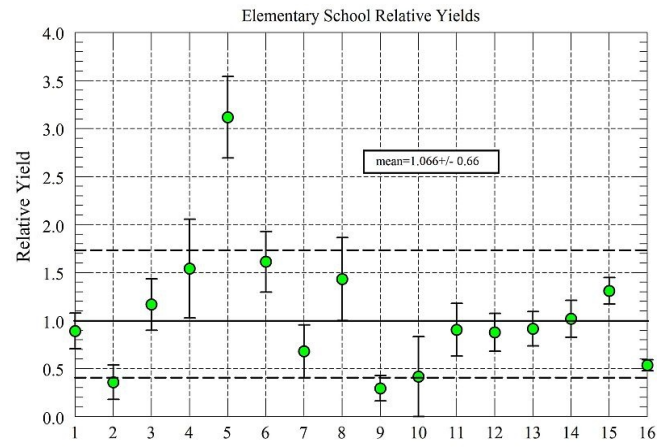


The data point HS stands for the data associated with the 433 Huntington Apartments at King Farm, south of Redland Blvd. The data point marked HN shows the results for the 403 apartments north of Redland Blvd. Children living in the southern part of the apartments go to College Gardens elementary in Rockville. The children living in the northern part go to Rosemont elementary in Gaithersburg. The apartments are the same, but the schools are different. The yield for the College Garden students is twice the yield for the Rosemont students, clearly showing the effect of the Redland Blvd boundary and the strong preference for College Gardens Elementary. There is anecdotal evidence that families moved from the apartments north of Redland Blvd. to the apartments south of Redland Blvd. so that their children could

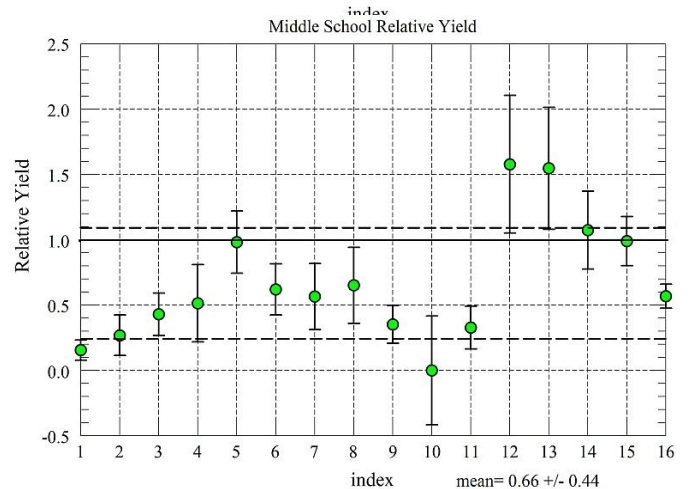
attend College Gardens Elementary school. It is striking that parents would move from an area serviced by a school that was not overcrowded to an area serviced by a school that was quite overcrowded. This clearly indicates that school overcrowding is not a primary consideration in the choice of a school. Aside from the special case of HS, the data for the 11 apartments looks normal with 6 of the eleven cases below the MCPS expected value.

While considering only the case of apartments, it was appropriate to plot the yield values directly. In making comparisons for all the housing types together it is more appropriate to consider the yields relative to the MCPS expected average values because the expected yields vary by housing type. The relative yields (RY) used for comparison in the graphs are the yield (Y) divided by the expected yield (AY). Thus the values plotted are the relative yield (RY) together with the appropriate uncertainty (URY). In all, there were 16 different tests of student yield with samples of the four different types of housing.

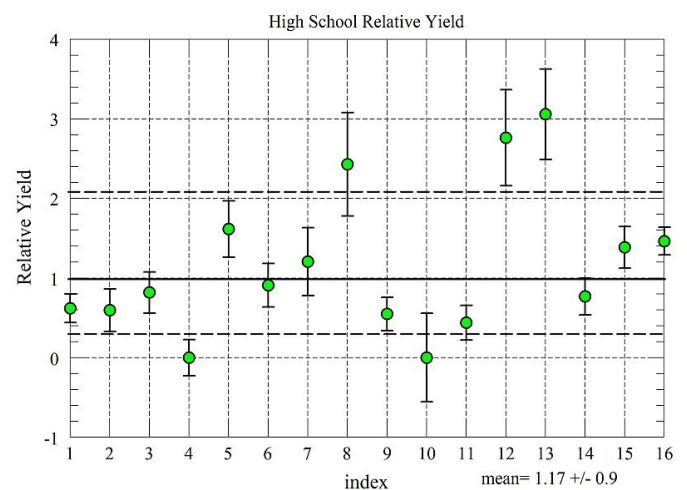
The first graph on the right shows the relative yields for elementary school students. The first 11 index values are just a replication of the information shown in the previous graph. The data at 12 and 13 are for garden apartments, the value at 14 is for a townhouse and the values at 15 and 16 are for single family dwellings. The table on page 3 gives the complete identification. The mean of the distribution of the 16 cases is 1.066 and the standard deviation of the set is 0.66. Note that there are 9 values below and 7 values above the MCPS averages expected for elementary school student yields.



The second graph to the right shows the relative yields for middle school students. The mean of the 16 cases is 0.66 and the standard deviation of the set is 0.44. Note that only 3 of the cases are higher than the MCPS averages expected for middle school student yields, and all of the apartment yields are at or below the MCPS expected yields.



The final graph shows the relative yields for high school students. The mean of the 16 cases is 1.17 and the standard deviation of the set is 0.9. Note again that for apartments, eight of the eleven values are below the MCPS averages expected for high school students.



A larger number of cases for garden apartments, townhouses and single family dwellings would be required to make any conclusions about validity of the expected yield values or the uncertainties associated with them separately. Statistically speaking, the 16 values as a whole, used to test the validity of MCPS expected yields support the values given by MCPS. A person unfamiliar with random events might find the scatter of values unsettling but a lack of scattering of the data would be very abnormal. In fact a lack of appropriate scatter in the data has been used to uncover faked data in medical and scientific reports

Student Yields - June 23, 2011

index	zone	type	u	n	Y	AY	RY	URY	UY	n2	Y2	AY2	RY2	URY2	UY2	n3	Y3	AY3	UY3	RY3	URY3
1	2	MHR	645	23	0.0357	0.04	0.891	0.186	0.007	4	0.006	0.04	0.155	0.078	0.003	12	0.019	0.03	0.005	0.620	0.179
2	4	MHR	279	4	0.0143	0.04	0.358	0.179	0.007	3	0.011	0.04	0.269	0.155	0.006	5	0.018	0.03	0.008	0.597	0.267
3	5	MHR	407	19	0.0467	0.04	1.167	0.268	0.011	7	0.017	0.04	0.430	0.163	0.007	10	0.025	0.03	0.008	0.819	0.259
4	6	MHR	146	9	0.0616	0.04	1.541	0.514	0.021	3	0.021	0.04	0.514	0.297	0.012	0	0.000	0.03	0.000	0.000	0.228
5	7a	MHR	433	54	0.1247	0.04	3.118	0.424	0.017	17	0.039	0.04	0.982	0.238	0.010	21	0.048	0.03	0.011	1.617	0.353
6	7b	MHR	403	26	0.0645	0.04	1.613	0.316	0.013	10	0.025	0.04	0.620	0.196	0.008	11	0.027	0.03	0.008	0.910	0.274
7	9	MHR	221	6	0.0271	0.04	0.679	0.277	0.011	5	0.023	0.04	0.566	0.253	0.010	8	0.036	0.03	0.013	1.207	0.427
8	10	MHR	192	11	0.0573	0.04	1.432	0.432	0.017	5	0.026	0.04	0.651	0.291	0.012	14	0.073	0.03	0.019	2.431	0.650
9	11	MHR	425	5	0.0118	0.04	0.294	0.132	0.005	6	0.014	0.04	0.353	0.144	0.006	7	0.016	0.03	0.006	0.549	0.208
10	12	MHR	60	1	0.0167	0.04	0.417	0.417	0.017	0	0.000	0.04	0.000	0.417	0.000	0	0.000	0.03	0.000	0.000	0.556
11	14	MHR	304	11	0.0362	0.04	0.905	0.273	0.011	4	0.013	0.04	0.329	0.164	0.007	4	0.013	0.03	0.007	0.439	0.219
12	1	G	190	20	0.1053	0.12	0.877	0.196	0.024	9	0.047	0.03	1.579	0.526	0.016	21	0.111	0.04	0.024	2.763	0.603
13	8	G	237	26	0.1097	0.12	0.914	0.179	0.022	11	0.046	0.03	1.547	0.466	0.014	29	0.122	0.04	0.023	3.059	0.568
14	3	T	110	28	0.2545	0.25	1.018	0.192	0.048	13	0.118	0.11	1.074	0.298	0.033	11	0.100	0.13	0.030	0.769	0.232
15	13	SFD	202	90	0.4455	0.34	1.310	0.138	0.047	28	0.139	0.14	0.990	0.187	0.026	28	0.139	0.10	0.026	1.386	0.262
16	15	SFD	478	87	0.1820	0.34	0.535	0.057	0.020	38	0.079	0.14	0.568	0.092	0.013	70	0.146	0.10	0.018	1.464	0.175

Zone	
1	Monroe St
2	Town Center
3	Redland Blvd
4	The Allaire
5	Congressional South
6	The Chase
7a	Huntington Apts - S. of Redland
7b	Huntington Apts - N. of Redland
8	Fireside Apts
9	The Fitz
10	The Westchester
11	The Americana
12	King Farm @ King Farm Blvd.
13	King Farm - n. of Gude Dr
14	Park Potomac
15	West End Park

The data for elementary schools (K5), Middle Schools (G6-8), and High Schools (G9-12) are presented.

Index - my sequence numbers. 1 to 11 are all mid and high rise apartments grouped consecutively to show on a graph.

Zone - sequence numbers used in city data. Use this number to identify the unit, see table

Type - mid and high rise (MHR), Garden Apts (G),

Townhouses (T), Single Family Detached (SFD)

u - number of units in group

n - number of students from the group, elementary, middle (2), high (3)

Y - yield = n/u

AY - average yield given in MCPS table

RY - Relative yield = Y/AY

URY - uncertainty associated with relative yield

UY- uncertainty in yield value