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DEVELOPING A PREDICTIVE METRIC TO ASSESS SCHOOL VIABILITY

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This article examines a wide range of parish school indicators that can be used to predict long-term viability.

Catholic elementary school enrollment peaked in 1965, when 4.491 million students were educated in over 10,000 Catholic schools across the country (United States Catholic Conference, 1976). Since then, Catholic elementary school enrollment and the number of schools have dropped back to 1920 levels (see Table 1). Numerous reasons for this decline have been offered. McLellan (2000) identified the lack of leadership on the part of the Church hierarchy and their unwillingness to make critical changes in governance and administration, the diminished value and utility placed on Catholic schools by Catholic parents who had entered the American economic and cultural mainstream after World War II, theological shifts regarding the purpose and effectiveness of Catholic education in the period immediately following Vatican II, organizational changes, such as the declining number of vowed women religious and the hiring of lay teachers, and demographic shifts as reasons for the decline.

CHANGING DEMOGRAPHY

During the later part of the 20th century, Catholics participated in the mass migration of the White middle class from the city to the suburbs (Convey, 1992; Greeley, 1959; McGreevy, 1996). As the White middle class moved out, African Americans, who are proportionately far less likely to be Catholic, moved into the urban areas.

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Catholics had abandoned the inner-city parish-school infrastructure, moving to the suburbs en masse, thereby greatly expanding the population in areas lacking parish schools. The Diocese of Cleveland provides a vivid example of what has happened in many urban centers. The City of Cleveland lost 409,192 residents between 1950 and 1990, while Cuyohoga County grew by 432,000 (Harris, 1996). In 1950, average parish membership in the city and in the suburbs was 2,668 and 2,488 respectively; by 1990, the city parishes had dropped in membership to an average of 1,666, while the suburban parish average membership had more than doubled to 5,617 (Harris, 1996).

Table 1

Catholic Elementary School Enrollment (in Millions) and Number of Schools 1920-2005

Year	Enrollment	Schools
1920	1.796	6,551
1930	2.223	7,923
1940	2.035	7,944
1950	2.561	8,589
1960	4.373	10,501
1970	3.359	9,366
1980	2.293	8,100
1990	1.983	7,395
2000	2.013	6,923
2005	1.780	6,574

Note. Source: McDonald (2005).

More recent quantitative research supports the contention that changing demography has contributed to the closure of Catholic schools. McLellan (2000) found that the 20 dioceses with the largest Catholic school enrollment (the Top 20) accounted for 62% of the national Catholic elementary school population in 1940, but only 42% of the national Catholic elementary population in 1990. Furthermore, Top 20 enrollment declines from 1960 to 1990 were related to White population declines in their central cities. Interestingly enough, McLellan (2000) found that the more urban dioceses seemed to be more successful in stemming the decline in the proportion of parishes with schools. This paradoxical finding is reconciled when consideration is given to the Herculean efforts made by large urban dioceses to keep urban parish schools open even while the White Catholic population vacated the parish boundaries.

A recent study by the Center for Applied Research in the Apostolate (CARA; 2006) found that "some schools reached critical tipping points during this period [2000-2005] as the demographic changes that had been taking place for more than five decades caught up with the most vulnerable campuses" (p. 1). The study found that in 2005, 22% of Catholic elementary schools were located in counties that had a loss in Catholic population or very low growth since the 1950s: "The current and emerging geographic

centers for potential Catholic elementary students in the 21st century no longer closely overlap as well with the Catholic elementary school system that was primarily designed and built in the early 20th century" (p. 2).

FINANCIAL ISSUES

The number of vowed religious serving in Catholic schools dropped precipitously during the 1960s. By 2005, religious teachers in Catholic schools comprised 5% of the total teaching staff, down from the slightly greater than 90% common prior to 1950 (see Table 2).

Table 2

Number of Religious in Catholic Schools and their Percentages in Schools (1920-2005)

Year	Number	Percentage
1920	45,563	92.0
1930	65,601	90.4
1940	73,960	91.2
1950	84,925	90.1
1960	112,029	73.8
1970	80,615	48.4
1980	42,732	29.0
1990	20,020	14.6
2000	11,011	7.0
2005	7,990	5.0

Note. Source: McDonald (2005).

Consequently, parish schools had to replace the religious with lay faculty at considerably higher cost, since the religious were often paid very meager stipends far below market value.

Unfortunately, the capacity for the parish to accommodate these financial demands diminished during this same time period. Harris (1996) notes that "Catholic giving as a proportion of household income declined sharply between 1965 and 1984" (p. 2). Parishes responded by cutting back on increases to the subsidy given to the parish school. The percentage of parish school income from the parish dropped from 63% in 1969 (Bredeweg, 1980) to less than 25% at present, while tuition grew to account for over 60% of parish school income (Bimonte, 2004). The large increases in tuition, the diminished value and utility placed on Catholic schools by Catholic parents, and the changing demographics, led to smaller enrollments, further exacerbating the precarious financial position of many Catholic elementary schools. Commenting on these trends Harris (2000) rightly concludes, "Catholic schools have evolved from a Church-funded endeavor managed by professed religious to a system of largely parent-funded programs for a diminishing portion of the Catholic school population" (p. 56).

Lundy (1999) attempted to identify differences between "survivor" and "non-survivor" parish elementary schools from the Archdiocese of Chicago for the period spanning 1991-1994. "Survivor" schools were those Catholic elementary schools that were sponsored by a single parish as of June 1994, and were not scheduled for closure or consolidation the following fall. "Non-survivor" schools were defined as those that had been closed or consolidated between 1991 and 1994. Tests for correlations were performed between survivor status and a number of financial variables, and the best independent predictors were then used in a discriminant function analysis to predict survivor status.

Lundy (1999) found that the sum of two ratios, one indicating the financial solvency of the parish and the other indicating the financial solvency of the parish school, was the single best predictor of survivor status, correctly classifying 85.9% of the schools. The sum of the two ratios was termed the "keyratio" and defined as the sum of parish compensation expenditures divided by parish-collection income and school compensation expenditures divided by tuition-and-fees revenue (see Figure 1).

$$\text{Keyratio} = \frac{\text{Parish compensation expenditures}}{\text{Parish collection income}} + \frac{\text{School compensation expenditures}}{\text{School tuition and fees revenue}}$$

Figure 1. Definition of keyratio

Lundy (1999) found that most parishes with a keyratio of 1.75 or below had balanced budgets, while most above that level were in deficit spending. Other strong independent predictors of survivor status included the percentage of school income spent on compensation (80.2% correct classification), school compensation costs divided by tuition and fee revenue (79.7% correct classification), and parish total balance (76.7% correct classification). Two demographic variables also served as strong predictors of survivor status: K-8 enrollment (62.6%) and Catholic enrollment (65.6%).

STUDY

This study explored the relationship between demographic variables, financial variables, and parish grade school closures in the Archdiocese of Saint Louis. Specifically, this study investigated whether statistically significant and substantively meaningful differences exist between open and closed schools on selected demographic and financial variables. Discriminant function analysis was utilized to create a model for predicting parish school viability. The final portion of this study describes the translation of this discriminant function analysis into a diagnostic tool that could be used as an early warning system to assess school viability on an ongoing basis.

METHODOLOGICAL CONSIDERATIONS

This study was limited to the quantitative analysis of select demographic and financial variables. It does not investigate the other qualitative reasons for school closure cited by McLellan (2000), namely, the influence of the Church hierarchy, the attitudes of Catholic parents toward Catholic schools, or theological shifts.

The first part of the study provided a general profile of both open and closed parish schools through a comparison of means of 21 demographic and financial variables using independent *t* tests. Due to the large number of *t* tests conducted, the alpha required for significance was lowered to .002 to control for type 1 errors (.002 * 21 = .042, below the standard threshold of .05). The study then utilized discriminant function analysis to create a model for predicting parish school viability. Discriminant function analysis was selected for use in this study because of its ability to classify each case (school) into a dichotomous category (open or closed).

Twenty-one variables thought to potentially capture aspects of the demographic changes and financial issues were selected for inclusion. While a more sophisticated methodology (such as factor analysis) would uncover latent characteristics behind these variables (e.g., the factor "demographic decline" characterized by small parish populations, low baptismal rates, etc.), this study employed only readily accessible variables with the explicit intent of creating a diagnostic tool that could be used as an early warning system to assess school viability on an ongoing basis.

Parish boundaries were coded into a geographic information system (GIS) that enabled United States census data to be linked directly to the parish boundaries. The demographic and financial variables were entered into an Excel spreadsheet and then transferred into SPSS for statistical analysis.

Using census data disaggregated by parish boundaries assumes that parishioners and school parents have the same demographic and financial characteristics as the general population that resides within the parish boundaries. However, Catholics routinely cross parish boundaries in selecting their parish. Therefore, a threshold for including a parish in the study needed to be created that would maximize the inclusion of parish schools while ensuring the integrity of data attributed to parishes. The Annual Catholic Appeal provided the best available record of the addresses of every household within the archdiocese. These addresses were coded into GIS and provided data for every parish on the percentage of parishioners who actually reside within the parish boundaries. The mean for the archdiocese was determined to be 67%, and a threshold of 50% within-parish residency of parishioners was established for the inclusion of a parish school in this study. This criterion eliminated only a handful of parish schools and none of the closed parish schools.

The years spanning 2000-2005 were examined as a group in order to generate a sufficient number of closed schools to make possible a quantitative statistical analysis. Doing so created the need for a sound methodology for making comparisons among schools with data from different years. Comparison year (CY) refers to the most recent year of operation of a particular school; that is the 2004-2005 school year for the open schools and the last year of operation for the closed schools. Fiscal year (FY) refers to the fiscal year for the Archdiocese of St. Louis which runs from July 1 of the prior calendar year to June 30 of the year represented. Adjusted median household income and the variables using adjusted income were calculated using the urban consumer price index (CPI-U) for St. Louis (Bureau of Labor Statistics, 2007). In constructing this variable, the CPI-U from the spring prior to the academic year was used. The logic for this choice was that parents are often informed of tuition and are required to pay a pre-registration fee in the spring of the year preceding the school year. Thus the calculation of affordability on the part of the parents is most likely based on income in the spring preceding the academic year. Only schools that closed after the 1999-2000 school year used the actual median adjusted income from the 2000 United States census (1999 annual; United States Census Bureau, 2007) without any adjustment. Other variables were not adjusted unless otherwise noted in their definitions in Table 3.

SAMPLE

Open schools were defined as Catholic elementary schools sponsored by a single parish in the Archdiocese of St. Louis that were not scheduled for closure for the 2005-2006 school year. Closed schools were defined as Catholic elementary schools that had closed in the spring of 2000 through the spring of 2004 or were not scheduled to re-open in the fall of 2005. Parishes without parish schools, parishes that sponsored consolidated schools, and parish schools that did not meet the threshold level of parishioners living within parish boundaries were not included in this study. Ultimately 138 schools were used in the analysis (99 open schools and 39 closed schools).

DATA

Financial and demographic data for parish schools and their parishes were obtained from the Archdiocese of St. Louis for the period of 2000 through 2005. Data were obtained from the Archdiocesan Finance Office, the *Status Animarum*, and the school data form. The *Status Animarum* is an annual report completed each year by pastors that contains data on both the school and the parish. The school data form is an instrument that is sent out every summer to every school to be completed by the administrator. The school data

form requests data on enrollment, finances, staffing, programs, and resources. The financial data from the school data form were cross referenced against financial data obtained from the Archdiocesan Finance Office for accuracy.

Additional financial data such as median household income were collected from the 2000 Census (United States Census Bureau, 2007). Parish membership data were obtained from the records of the Archdiocesan Annual Catholic Appeal. All data are for the comparison year (CY) unless otherwise stipulated. Ultimately 21 variables were used that are described below in Table 3.

Table 3

Variables Used in the Analysis

Parish Demographics	
nhshlds	The number of households within the parish in 2004.
npar	The number of parishioners in the parish in 2004.
totbapt	The total number of baptisms in the parish performed in the 3 years prior to the comparison year.
School Demographics	
nsch-1	The number of students in the parish school 1 year prior to the CY.
nsch-2	The number of students in the parish school 2 years prior to the CY.
nsch-3	The number of students in the parish school 3 years prior to the CY.
nsch-5	The number of students in the parish school 5 years prior to the CY.
pchgsch1	The percent change in enrollment for the parish school between 2 years prior to the CY and 1 year prior to the CY.
pchgsch3	The percent change in enrollment for the parish school between 3 years prior to the CY and 1 year prior to the CY.
pchgsch5	The percent change in enrollment for the parish school between 5 years prior to the CY and 1 year prior to the CY.
Parish Finances	
ptotinc04	The parish total income for FY 2004.
givpctinc	The giving per household in the parish as a percentage of median household income defined as total parish income divided by the number of households in the parish, then divided by the median household income for the parish.
hseinc00	The median household income for the parish derived from the 2000 United States census data.
adjhseinc	The median household income within the parish boundaries adjusted to the CY using the CPI-U (St. Louis).
School Finances	
tuition	The tuition charged for one child in the school for the CY.
schttlinc	The parish school's total income.
schttlexp	The parish school's total operating expense.
schtuitinc	The parish school's total income from tuition.
perpupilcost	The total operating expenses divided by the enrollment for one year prior to the CY.
Parish and School Finances	
keyratio	The sum of two ratios: the ratio of school salary and benefit expenses to school income from tuition plus the ratio of the parish's total income minus the parish's subsidy given to the school to the parish's total income.
Parent Finances	
tuitpctadjinc	The tuition charged for one child in the school for the comparison year divided by the median household income adjusted to the comparison year using the CPI-U (St. Louis).

RESULTS: INDEPENDENT *T* TESTS

A series of independent *t* tests comparing open and closed schools were run. Eighteen of the 21 comparisons of means between open and closed schools were statistically significant at the .002 level (see Table 4).

Table 4

A Comparison of Means of Open and Closed Catholic Grade Schools

Variable		*n*	*M*	*SD*	*SE*	*p*	*d*
pchgsch-1	open	92	-.0002	.08674	.00904	.000	1.61
	closed	32	-.1526	.10173	.01798		
pchgsch-3	open	92	-.024	.1472	.0153	.000	1.60
	closed	37	-.244	.1273	.0209		
pchgsch-5	open	92	-.020	.2643	.0276	.000	1.36
	closed	37	-.306	.1350	.0222		
ptotinc04	open	99	722028	485984	48843	.000	1.19
	closed	33	295602	141189	24578		
adjhseinc	open	98	56825	17928	1811	.000	1.18
	closed	39	40082	8915	1428		
nsch-1	open	97	284.4	176.7	17.95	.000	1.15
	closed	39	134.4	53.3	8.54		
hseinc00	open	98	51647	16294	1646	.000	1.12
	closed	39	37300	8026	1285		
npar	open	92	3802	2771	288.9	.000	1.05
	closed	37	1665	799	131.5		
totbapt	open	92	160.1	131.9	13.75	.000	1.03
	closed	37	60.1	37.2	6.12		
schttlexp	open	98	998032	496030	50107	.000	0.98
	closed	32	617634	233230	41230		
schttlinc	open	94	998244	495913	51150	.000	0.96
	closed	31	625145	233437	41926		
nhshlds	open	92	1301	853.6	88.99	.000	0.96
	closed	37	688	300.3	49.37		
tuitpctadjinc	open	97	.0499	.02408	.00244	.000	0.95
	closed	31	.0705	.01921	.00345		
nsch-2	open	99	287.4	176.4	17.73	.000	0.93
	closed	34	163.8	64.3	11.03		
perpupilcost	open	88	3794	905	96.49	.000	0.88
	closed	29	4714	1172	217.6		
nsch-3	open	97	292.5	177.1	17.98	.000	0.84
	closed	39	178.7	73.3	11.74		
schtuitinc	open	94	563751	378715	39061	.000	0.84
	closed	31	320527	157209	28236		
nsch-5	open	97	292.8	173.0	17.57	.000	0.74
	closed	39	194.4	74.7	11.96		
givpctinc	open	92	.01219	.004981	5.19 E-4	.471	-
	closed	31	.01294	.004888	8.78 E-4		
tuition	open	99	2591	1000	100.5	.210	-
	closed	34	2740	359	61.6		
keyratio	open	93	2.4487	1.96998	.20428	.390	-
	closed	25	2.1605	1.24126	.24825		

Among the variables that had means with no statistically significant difference were tuition ($2,591 for open and $2,740 for closed schools), and

giving as a percentage of median household income (1.22% for open and 1.29% for closed schools). The means for giving as a percentage of median household income were remarkably similar to the 1.2% giving percentage of Catholics reported in a recent national study (Zech, 2000). The most surprising finding was that there was no statistically significant difference in the keyratio between open and closed schools, and that the open schools actually had a higher average keyratio. While Lundy (1999) found parishes with non-survivor schools spent 77.4% of their income on compensation and parishes with survivor schools spent only 53.2% of theirs on compensation, the present study found that parishes with closed schools spent 48% of their income on compensation and the open ones spent 57% of their income on compensation. Clearly, the keyratio variable that captured the dynamic operative in Chicago in the early 1990s was not correlated with school closures in St. Louis in the early 2000s.

The effect size (d) displayed in Table 4 was calculated using Cohen's (1988) d, defined as the difference between means divided by the pooled standard deviation: $d = (M_1\text{-}M_2)/\sqrt{([(SD_1)^2 + (SD_2)^2]/2)}$. Nearly all the effect size differences were large (.8 and above), with only a few that could be classified as medium (.5) and none that could be classified as small (.2).

The most substantively meaningful differences between open and closed schools as measured by the effect size involved changes in enrollment and total enrollment (pchgsch-1, pchgsch-3, pchgsch-5, and nsch-1), parish finances (ptotinc04, adjhseinc, hseinc00), and parish demographics (npar, totbapt, nhshlds). A line graph comparison of open and closed schools' average enrollment for the 5 years prior to the comparison year can be found in Figure 2.

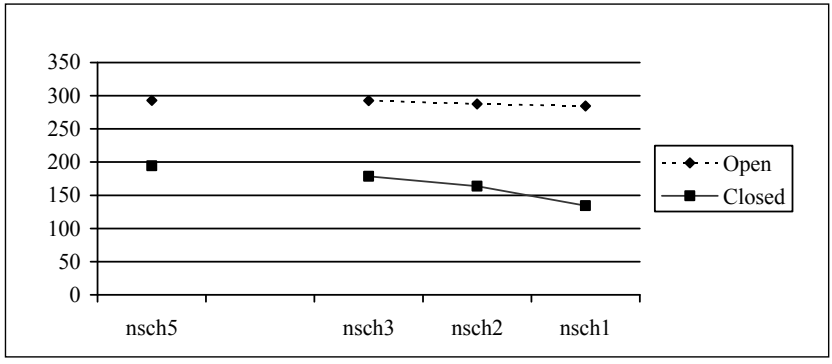

Figure 2. Average enrollment of open and closed schools 5 years prior to comparison year

TIPPING POINTS

The CARA study (2006) suggests that the recent school closures were the result of schools reaching "critical tipping points that quickened between 2000 and 2005" (p. 1). Large effect size differences between open and closed schools in the areas of enrollment (in years 1, 2, 3, and 5 prior to CY), as well as the precipitous decline in the mean enrollment of closed schools in the 3 years prior to closure led the investigators to think in terms of a tipping point.

Lundy (1999) found that the average enrollment of survivor schools (345) was nearly twice as large as non-survivor schools (175). The present study found that open schools had an average enrollment one year prior to CY of 284, while closed schools had an average enrollment of 134.

Could there be a tipping point, a threshold enrollment, where once broken, changes in enrollment become very significant for reasons of efficiency, capacity, and per pupil cost, not to mention marketability? In order to investigate this possibility, the variable "above200" was created, a dichotomous variable that distinguished the schools based upon this threshold enrollment of being either above 200 students or not. The rationale for 200 as the threshold is suggested from the data illustrated in Table 4. The number also approximates school enrollment with a kindergarten through eighth grade school with one class per grade and 25 students per class.

RESULTS: DISCRIMINANT FUNCTION ANALYSES

The 18 variables with significant differences between open and closed schools and the newly created "above200" variable were included in a discriminant function analysis predicting status. Variables that were highly correlated with one another were removed from the analysis. The discriminant function analysis took the remaining variables (x_0, x_1, x_2, …) that were reliably correlated with another variable (status) and created an equation. The analysis generated coefficients (a_0, a_1, a_2,…) for the variables (x_0, x_1, x_2, …) and a constant (C) that maximized the difference between the quotients of open and closed parish schools: $DF = a_0x_0 + a_1x_1 + a_2x_2\ldots..+ C$. When the variables are entered into this equation, a viability score is produced that can then be compared to the average scores for the open and closed parish schools. The discriminant function analysis then calculated the probabilities of a particular quotient being a member of either the open group or the closed group. It assigned the parish school to either the open group or the closed group, and then checked the accuracy of its prediction based upon the known outcome.

The analysis included 124 of the 138 cases; 14 cases were not included due to missing variables (7 open and 7 closed). Three variables generated a

93% overall correct classification (see Tables 5 and 6), and an 87.5% correct classification of closed schools, a very important attribute for an early warning system. The mean discriminant function score for open schools was .597, while the mean discriminant function score for the closed schools was -1.716.

Table 5

Canonical Discriminant Function Unstandardized Coefficients

	Function 1
above200	1.241
pchgsch1	8.106
tuitpctadjinc	-17.290
(Constant)	.686

Table 6

Discriminant Function Analysis Classification Results

		Status	Predicted group membership		Total
			Open	Closed	
Original	Count	Open	87	5	92
		Closed	4	28	32
	Percentage	Open	94.6	5.4	100.0
		Closed	12.5	87.5	100.0
Cross-validated[a]	Count	Open	87	5	92
		Closed	4	28	32
	Percentage	Open	94.6	5.4	100.0
		Closed	12.5	87.5	100.0

[a] Cross validation is done only for those cases in the analysis. In cross validation, each case is classified by the functions derived from all cases other than that case.
[b] 92.7% of original grouped cases correctly classified.
[c] 92.7% of cross-validated grouped cases correctly classified.

APPLICATIONS

This study employed only readily accessible variables with the explicit intent of creating a diagnostic tool that could be used as an early warning system to assess school viability on an ongoing basis. The discriminant function analysis produced an equation (see Figure 3) that demonstrated a 93% overall correct classification of open and closed schools based upon three variables (see Tables 5 and 6).

Viability Score = .686 + 1.241(above200) + 8.106(pchgsch1) – 17.290(tuitpctadjinc)

Figure 3. Equation produced by discriminant function analysis

The viability score for an individual school can be calculated by entering the appropriate values into the equation and performing the calculation. If a school has an enrollment of above 200, a 1 is placed in the parentheses "above200," if not, a zero is placed in the parentheses. The percentage change in enrollment from the previous year (either positive or negative) is placed in the parentheses designated "pchgsch1," and the tuition as a percentage of adjusted median household income is placed in the parentheses designated "tuitpctadjinc."

The tuition as a percentage of median adjusted household income is the tuition charged for one child in the school divided by the adjusted median household income. This adjustment is done by multiplying the median household income from the 2000 United States Census (1999 annual; United States Census Bureau, 2007) for a particular parish boundary by a ratio of numbers obtained from the CPI-U St. Louis, a statistic produced by the Bureau of Labor Statistics (see Table 7). An income of $50,000 for the year 1999, adjusted forward to the spring of 2006, would be $59,898 ($50,000 * [188.8 / 157.6] = $59,898).

Table 7

Consumer Price Index – All Urban Consumers – All Items – St. Louis, Missouri

Year	Annual	First half	Second half
1999	157.6	156.4	158.8
2000	163. 1	162.1	164.0
2001	167.3	167.5	167.1
2002	169.1	167.8	170.3
2003	173.4	172.3	174.5
2004	180.3	179.1	181.6
2005	186.2	185.0	187.4
2006	189.5	188.8	190.3

Note. Source: Bureau of Labor Statistics (2007).

The tuition as a function of adjusted median household income is then calculated by dividing the tuition charged for one child in the school ($4,275) by the adjusted median household income ($59,898). The value, .07137, is then placed in the parentheses designated "tuitpctadjinc" completing the equation.

AN EARLY WARNING SYSTEM FOR THE ARCHDIOCESE

A frequency analysis of the viability scores for all the parish schools included in this study were run (see Figure 4). Basic descriptive statistics were also run on the distribution of these viability scores. The standard deviation for open schools was found to be approximately 1 (see Table 8).

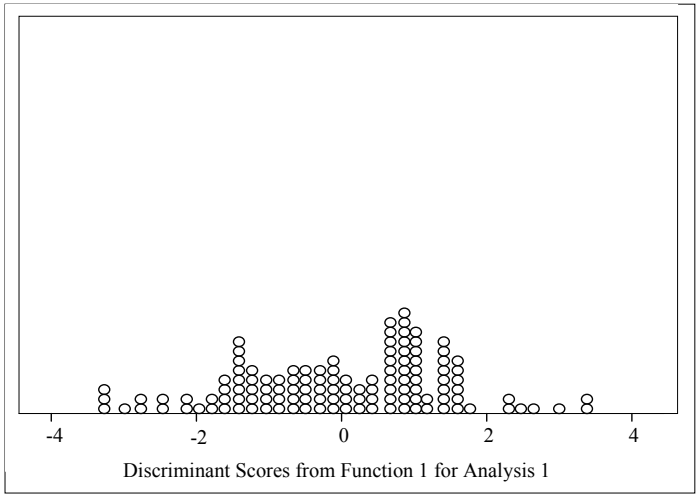

Figure 4. Distribution of viability scores

Table 8

Descriptive Statistics on Viability Scores for Parish Schools Included in the Study

Status	*N*	*M*	*SD*	*SE*
Open	92	.5968	1.030	.1074
Closed	32	-1.716	.9067	.1603

The discriminant function analysis, in addition to producing a viability score, also calculated the probability of a school being in either the open or closed category. A careful examination of the scores that approach equal probability provides a method for interpolating the threshold viability score for predicting closure. This threshold viability score for predicting closure was found to be approximately -1.0.

The descriptors Red, Orange, Yellow, and Green, analogous to traffic light colors, were chosen as the descriptor of school viability. Additionally, since there will be movement from year to year based upon whether the

change in K-8 enrollment is going up or down, whether tuition increases are above or below the CPI-U growth for St. Louis, and whether the school's enrollment lies above 200 or below, a directional component (+ or –) was added to the descriptor. The division line between Green and Yellow lies one standard deviation (1.0) below the mean viability score for open schools (approximately .6) which is -.4, the division line between Yellow and Orange lies at the threshold line for predicting closure (-1.0), and the division line between Orange and Red lies two standard deviations below the mean viability score for open schools (-1.4). Green represents viability scores of -.4 or higher, Yellow represents scores of -.4 to -1.0, Orange represents scores of -1.0 to -1.4, and Red is anything lower than -1.4. The change in value from one year to the next provides the directional sign. A school that has a score of .55 one year, but one of .43 the next would be "Green –." A school that has a score of -.84 one year, but has a score of -.75 the next would be "Yellow +" (see Figure 5).

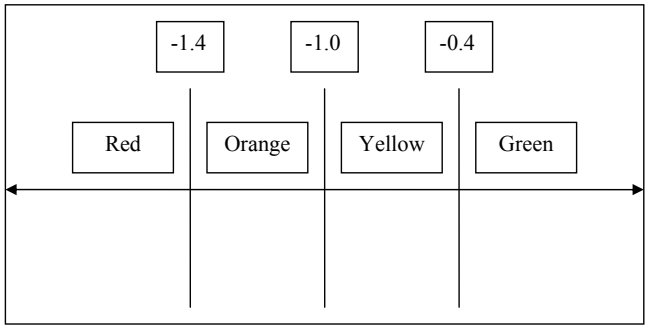

Figure 5. Viability descriptors for viability scores

ST. ELSEWHERE ELEMENTARY SCHOOL

A parish school named St. Elsewhere will serve as an example for the viability score calculations. St. Elsewhere has a median household income of $50,000 for the year 1999. St. Elsewhere had a precipitous decline in enrollment from 1999 to 2004, but has recently experienced modest growth. The tuition increased only 6% per year over the entire period as the parish subsidized the heavy losses incurred by the school when the enrollment plunged. The enrollment, the percentage change in enrollment, the tuition charged for one child, and the adjusted median household income are all shown in Table 9.

Table 9

Data for St. Elsewhere Parish Elementary School

	Enrollment	Change	Tuition	AMHI	Tuition/AMHI
1999-2000	225 (1)				
2000-2001	220 (1)	-.02222	$3,000	$51,428	.05833
2001-2002	210 (1)	-.04546	$3,180	$53,141	.05984
2002-2003	195 (0)	-.07143	$3,375	$53,236	.06340
2003-2004	175 (0)	-.1026	$3,575	$54,664	.06540
2004-2005	180 (0)	.02857	$3,790	$56,821	.06670
2005-2006	185 (0)	.02778	$4.025	$58,693	.06858
2006-2007	183 (0)	-.01081	$4.275	$59,899	.07137

Placing the appropriate values into the viability score equation produced the following viability scores and descriptors for St. Elsewhere (1999-2007; see Table 10).

Table 10

Enrollment, Viability Score and Descriptor for St. Elsewhere Parish School 1999-2007

	Enrollment	Score	Descriptor
2000-2001	220	.74	Green –
2001-2002	210	.52	Green –
2002-2003	195	-.99	Yellow –
2003-2004	175	-1.28	Orange –
2004-2005	180	-.24	Green +
2005-2006	185	-.27	Green –
2006-2007	183	-.64	Yellow –

St. Elsewhere's drop in enrollment of five students from 1999-2000 to 2000-2001 yielded only a minus sign on an overall healthy (Green) school profile; a viability score of .74 is above the archdiocesan average of .60 for open schools in the study. Another drop in 10 students puts the viability score below the archdiocesan average and merits another "Green –" rating. A loss of 15 students and a drop in enrollment below the 200 threshold merits a "Yellow –" rating. A loss of 20 more students the following year puts St. Elsewhere into the "Orange –" category. At this point, the model indicates that St. Elsewhere's profile is more like the schools that eventually closed than those that remained open. However, the following year, the enrollment decline reverses itself with a modest increase of 5 students, enough to merit a "Green +" rating. Another increase in students generates a slight decline in the viability score generates a "Green –." A very slight decline in enrollment

the following year puts St. Elsewhere back into the "Yellow –" zone. An explanation and interpretation of these changes follows below.

The example provides some insight into the mechanics of the viability score. As long as tuition rises above the rate of the CPI-U increases, the "tuitpctadjinc" term of the equation will provide a negative drag on the viability score. If enrollment drops below 200, a tipping point has been passed, and tuition as a function of adjusted median household income and changes in enrollment (either positive or negative) become very significant in the viability score; this explains why an increase of five students in one year and a loss of two in another can launch St. Elsewhere from "Orange –" to "Green +" and from "Green –" back to "Yellow –" respectively.

How did the addition of five students in two successive years take St. Elsewhere from "Orange –" to "Green +" in one year and from "Green +" to "Green –" the next? The answer lies in understanding the viability score as both an assessment of general health ("above200" and "tuitpctadjinc") and an indicator of the most recent trend ("pctchgsch1"). When St. Elsewhere reversed the enrollment decline, the "pctchgsch1" term of the equation went from a negative of substantial magnitude to a positive. This greatly improved the viability score. Should the addition of 5 students warrant such an extreme reversal from "Orange –" to "Green +" in one year? It could be argued that taking a school out of what appeared to be the prototypical "death spiral" demonstrated graphically in Table 5 by reversing rapid enrollment declines and holding the line on tuition is also very extreme and significant. So why does the school go to "Green –" the following year by adding the exact same number of students? The answer lies in both the "pctchgsch1" term and the "tuitpctadjinc" term of the equation. The former, while positive, was a slightly smaller percentage increase over the last year, and the latter, as stated earlier, is a negative drag on the viability score whenever the tuition rises above the increase in the CPI-U St. Louis.

A complicating issue not addressed in the St. Elsewhere example is the calculation of the viability scores when less than 50% of the students' parents reside within the parish boundaries or multi-parish grade schools. A logical fix would be a weighted adjusted income based upon the zip codes of the students actually attending the school. These and other issues will be monitored over time as the model is tested against reality.

CONCLUSIONS

A comparison of means between open and closed schools revealed many statistically significant and substantively meaningful differences. Subsequent discriminant function analyses identified three variables that were utilized to correctly classify 93% of parish schools as either open or closed. The model

achieved a correct classification of closed schools of 87.5%, a very important attribute for an early warning system, and is significantly higher than the 70% cited by Lundy (1999). It also achieved the same overall predictive value of Lundy's model using far fewer variables (3 variables instead of 14). Therefore, the viability score provides a framework and useful guide for understanding the variables that affect parish school viability

This study has produced an equation that can generate a credible viability score for parish grade schools within the Archdiocese of St. Louis. The model was also quickly validated in reality. A parish school that was open during the period of this study, but had the lowest viability score in the Archdiocese of St. Louis, closed soon after the completion of this study. The viability score captures the key drivers that have led to the closure of schools and therefore holds great promise as a component of an early warning system for parish schools. The viability score and the direction of its change has been integrated into an early warning system for the Archdiocese of St. Louis.

The obvious strengths of such a viability score also reveal its weaknesses. While the utility of a viability score has obvious appeal, parish school viability decisions should not be dependent upon the calculation of a quotient. Catholic schools are indispensable to the evangelizing mission of the Church. The contribution of Catholic schools to the educational mission of the Church cannot be reduced to a single number.

The viability score does not capture important elements such as mission, impact of the school on its geographic community, stakeholder satisfaction levels, quality of curriculum and instruction, Catholic identity, and quality of religious education and formation that are critically important in crafting a comprehensive early warning system. However, coupled with best practice program evaluation systems such as the Archdiocese of St. Louis' Instructional Program Review and AdvancEd's Quality Assurance Review, a comprehensive quantitative and qualitative instructional assessment of quality and viability can be performed.

In addition, as noted above, the model captures a significant proportion of the variance between schools that closed and schools that remain open. However, just as persons who score well on health risk assessments are not immune from health problems, and just as persons who score poorly may beat the odds, it is essential that the viability score not be treated as a self-fulfilling prophecy nor as a cause for complacency.

The viability score was developed from data in the Archdiocese of St. Louis, and while this research has demonstrated that the key terms of the viability quotient capture key drivers of school closure, these may not have the same magnitude of importance in other dioceses. Lundy's research (1999)

regarding closures in Chicago in the early 1990s found the keyratio, a measure of the aggregate parish-parish school financial picture, as the single strongest key driver, whereas the present research found enrollment, enrollment changes, and family costs as the key drivers of school closure. Some of these variables, which attempt to capture universal drivers, might have greater or lesser impact in other dioceses.

The viability score might serve as one of several variables within a comprehensive early warning system that takes a balanced scorecard approach (Kaplan & Norton, 2007). A balanced scorecard approach, taking first and foremost into account the Church's mission in a particular geographic area, that includes quantitative data such as the viability score, might provide the impetus for regional strategic planning. Such an approach by a diocese might actually require regional strategic planning and systems-thinking based upon the mission of the Church in a particular region when a parish or collection of parishes reaches critical thresholds. This approach prevents a parish-by-parish Darwinian survival of the fittest that has heretofore allowed for wholesale loss of schools in large swaths of a particular region without regard to overall mission. Given the financial costs of a school, the demographics required to supply the school with students, and the ability of Catholic schools to attract parishioners into a parish, changes in a parish school viability score might well serve as a key leading indicator of not only an individual parish school's viability but that of the parish and other parishes in the Deanery; as go the parish schools, so go the parishes.

RECOMMENDATIONS

In light of what has been stated earlier, large archdioceses ought to seriously consider a similar study, based upon their own historical data, to determine the drivers and magnitude of such drivers for school closures. Smaller dioceses without sufficient data to warrant an independent study, might consider the use of multiple measures of viability (e.g., the Lundy score as well as the viability score derived from the present research). As was stated earlier, these viability scores ought not be the determinant in school closures. Rather, these scores become individual measures of a comprehensive balanced scorecard approach that gives due consideration to questions of mission, regional impact, program quality, and systemic approaches to mission.

Within the Archdiocese of St. Louis, additional research needed to further refine the model includes:

- monitoring the predictive effectiveness of the model over time
- examining potential differences in the model's effectiveness for various types of schools (single parish, multiparish) and for schools in various

locations (urban, suburban, rural)
- determining further ways to address the median household income factor in the cases where more than half of the school families do not live within parish boundaries
- repeating the study when 2010 Census data become available.

The balanced scorecard approach lends itself to systems-thinking (Senge, 1990) regarding the importance and impact of the various Church structures like parishes and schools, and presupposes a thoughtful deliberation regarding mission. The questions of mission and how the Church ought to utilize its resources at any given point in time are perennial questions that must be revisited in light of changing circumstance. These are signs of a healthy, thoughtful, and evangelizing Church.

Such approaches may serve as the first steps in the development of an information architecture for the diocese that helps inform key decisions regarding mission. Information architecture, as the name implies, is real-time information, data, and data analysis that are made available in a timely and useful manner to all those engaged in the mission of the Church. Tools such as geographic information systems (GIS) that link any conceivable diocesan database to geographical location (parish, deanery, city, diocese, etc.) and statistical packages for the analysis of data (SPSS) that were utilized in this research and have historically been the province of city planners and academicians respectively, ought to be routinely employed by dioceses to make data-driven decisions in the service of the mission of the Church. Such tools will be the catalyst for "action research" by individual dioceses and may provide avenues for further research.

An example of just such an avenue of inquiry comes from a peripheral finding not explored in this article. There are indications from the data gathered that parishes with schools have a greater ability to attract families into the parish (James, 2008). These families are presumably younger families with children. This research coupled with that of Zech (2000) regarding the differential giving of Catholic school parents, may indeed reconfirm the original thesis of Greeley (1977) that Catholic schools are not only an effective mechanism in the evangelical mission of the Church, but actually are profit-making enterprises over the lifetime of the students.

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