

MEASURING THE PERFORMANCE OF AUCKLAND SECONDARY SCHOOLS: A PILOT STUDY USING DEA

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ABSTRACT

The New Zealand education system underwent a number of fundamental reforms at the beginning of the 1990s that effectively changed the governance structures of New Zealand state schools. These reforms provide an opportunity to examine the effect of increased levels of autonomy and accountability on the performance of schools. As part of a longer-term in-depth research project, this paper provides an exploratory examination of data related to Auckland secondary schools and uses Data Envelopment Analysis (DEA) to evaluate their relative performance.

1 Introduction

In 1994 the Ministry of Education published detailed measures of inputs and outputs for individual primary and secondary schools throughout New Zealand. The purpose of this study is to provide an exploratory examination of this data, concentrating on Auckland secondary schools. We use Data Envelopment Analysis (DEA) to examine these schools to determine whether credible conclusions regarding the efficiency of the schools can be made and to identify future areas of research. For this purpose, performance is defined in two ways. Firstly, performance is defined in terms of resource consumption per student using a model that relates the use of resources to the number of students enrolled. Secondly, performance is defined in terms of the conversion of resources into educational outcomes using a model that relates the use of resources per student to a range of measures of the quality of education provided.

This approach examines the efficiency of the education system by modelling the activity of the school in terms of the production of 'outputs' generated by the use of a range of 'inputs' and employing a production technology. The challenge when applying this approach to the education sector relates primarily to the identification and quantification of appropriate 'inputs' and 'outputs'. The majority of variables used by researchers have tended to be those routinely measured in schools. For example, inputs typically include teacher/pupil ratios, the level of teacher education and experience, expenditure per student and the extent of facilities available at schools. Output measures include the number of years of education attained by students and test scores in national

examinations. There are limitations to this approach. Norton *et al* (2000) argue that ‘hard’ measures do not ‘adequately describe the education process or school production function’ because they fail to capture the effect on education outcomes of factors such as school leadership or pedagogical style.

Research dealing with the estimation of the production function has used a variety of approaches including econometric models and Data Envelopment Analysis (DEA) to measure the production model (e.g. Grosskopf *et al.*, 1999; Ruggiero and Vitaliano, 1999; Jesson *et al.*, 1987). In this paper we use DEA to assess the relative performance of Auckland secondary schools.

2 Data Envelopment Analysis

Data Envelopment Analysis (DEA), an approach first introduced by Charnes *et al.* (1978), is a method for measuring the efficiency of decision-making units (DMUs) with similar attributes. Unlike traditional analytical tools that look for the average path through the middle of a series of data points, DEA identifies the most efficient units to construct a frontier of best performance as a reference for developing improvement strategies.

The primary focus of DEA is on modelling the production or performance function of DMUs. This requires identification of the major inputs and outputs that are believed to represent key attributes of performance. A key feature often overlooked is that once a production function has been identified and measured, factors that are candidates for explaining variabilities in performance can then be investigated. An example of this would be the hypothesis that socio-economic status is a driver of school performance across territorial zones.

DEA is non-parametric meaning that the precise form of the production function does not need to be specified or assumed as in, for example, regression analysis. DEA evaluates the inputs consumed and outputs produced by DMUs and identifies those units that comprise an efficient frontier and those that lie below this frontier. The standard DEA models have an input and output orientation. An input orientation identifies the efficient consumption of resources while holding outputs constant. An output orientation identifies the efficient level of output production given existing resource consumption. In addition, DEA models can be either constant or variable returns to scale (see Banker, Charnes, & Cooper (1984)).

Model DEA fractional input-orientation

$$\begin{aligned} \max \quad & z_o = \frac{y_o^T u}{x_o^T v} \\ s.t. \quad & \frac{Y u}{X v} \leq 1 \\ & u, v \geq 0 \end{aligned}$$

where Y ($n \times s$) and X ($n \times m$) are matrices containing s outputs and m inputs for n decision-making units (DMUs), y_o and x_o are vectors of outputs and inputs for the particular DMU evaluated. The model searches for weights, u and v , which maximize the efficiency score for a unit ‘o’ subject to the constraint that these weights, when applied to the output-input ratios for all of the other units (1 to n) including unit ‘o’, do not result in an efficiency score of greater than 1 for any of these units.

It should be noted that the only restriction on the weights is non-negativity. It is therefore possible that an optimal solution for a DMU may include a weight of (near) zero for certain inputs and/or outputs. It may be desirable to impose upper and lower limits on the values that weights are permitted to take.

Price ratios or virtual weights are two ways in which weights may be constrained. For example using price ratios and assuming two outputs with associated weights μ_1 and μ_2 ,

the following relationship can be specified where L and U are lower and upper bounds respectively:

$$L \leq \frac{\mu_1}{\mu_2} \leq U$$

This constraint can be interpreted as requiring the weight for output 1 to be ‘valued’ at least L times the weight for output 2 and at most, U times. In most organisations, determining an appropriate price ratio is not an easy task. An alternative approach is to constrain the virtual weights by selecting lower and upper bounds for the contribution to efficiency that a particular input or output is permitted to make:

$$L \leq \mu_1 y_1 \leq U$$

For example, we might decide that output 1 should contribute at least 10% of the efficiency score for a DMU and at most 30%. In initial implementation stages, this is an easier task than selecting price ratios. This is the approach used in this paper.

3 Models Used in this Study

The research questions and analyses have been confined to the available data. Notwithstanding, a key objective of this pilot study is to demonstrate some of the insights that can be provided through the application of frontier methods of performance measurement, in this case being DEA.

1. Efficiency of resource management – how well resources are matched to volumes as reflected in school rolls. This question focuses on both school management and resource allocations made by the central government funding body – the Ministry of Education. Operating and staff expenditure is generally provided on a per student basis and there is therefore a strong linear relationship between this expenditure and school rolls. The dataset does not include other funding sources such as school donations (fees), fundraising and fees from international students. In general, we expect structural efficiency to be high and variability low. However, once capital values are included as an input we expect this to change and structural efficiency to be lower with greater variability. Significant economies of scale are expected when all three inputs are included.
2. Effectiveness of education provision – how well the school performs in terms of educational outcomes or achievements. While overseas studies have used more refined analyses, the NZ dataset includes only school certificate and post school certificate examination outcomes. While strictly speaking effectiveness pertains more to the relationship between outputs and outcomes, we have used the resource inputs from Model 1 (see below) and outcomes as measured by the NZ external examination system.

3.1 Production Models 1 and 2

Two models are formulated to examine the relative performance of Auckland secondary schools in 1994. The first model (Model 1) examines performance using a production function that relates operating costs and teacher salary costs (the inputs) to school rolls (the output). The second model (Model 2) examines performance using a production function that relates operating costs per student and teacher salary costs per student (the inputs) to a range of quality measures (the outputs), such as the percentage of students leaving school with a formal qualification.

Both models are extended for the state schools in the sample (this particular dataset does not have capital values for integrated schools) by including the capital value of school land and buildings as an input (hereafter referred to as the land input). To provide appropriate comparative figures, DEA scores are calculated for the state school sample, first, excluding the land input (Model 1a and Model 2a) and then including the land input (Model 1b and Model 2b). To examine the effect of weight restrictions on the efficiency

scores we recalculated the scores for Model 1b and 2b applying different virtual weight constraints on the land input. Three recalculated efficiency scores were generated that apply the following virtual weight constraints on the land input (i) a 10% minimum weighting, with no maximum; (ii) a 20% minimum weighting, with no maximum; and (iii) a 20% minimum weighting, with a 50% maximum.

Environmental variables may be incorporated into the analysis in a number of ways. In this paper we have used a two-stage regression technique. Using this approach, the efficiency scores obtained for each school are regressed, using OLS, against the socio-economic decile for the areas from which each school draws its students. This indicator (SES) is based on Census data, with 1 being the poorest area and 10 the wealthiest area.

4 Description of Data

The data used in this study were obtained from education statistics published by the New Zealand Ministry of Education for the 1994 school year. These data cover all state and integrated primary and secondary schools in New Zealand, grouped by geographic region, and including the following major categories for both primary and secondary schools: student roll, SES decile, Maori and Pacific Island rolls, special class roll, number of teaching staff, operations funding, teacher salaries funding, land valuation and teaching area per student. In addition, the following major categories were also included for secondary schools: external examination results and the level of education attained by school leavers. For this study the sample consists of 69 Auckland secondary schools, comprising 52 state schools and 17 integrated schools. The Auckland secondary schools were selected because they comprise the largest sub-sample of New Zealand schools.

4.1 Input and Output Measures

Model 1: Education Resource Consumption

Input Measures

1. The total government funding of teacher salaries for each school (TEACH).
2. The total government funding for school operations (OPS). This amount excludes the funds in relation to teacher salaries.
3. The latest government valuation of each school's land and buildings (LAND). These valuations may be up to three years old and are only available for state schools.

Output Measure

1. The total headcount roll of the school as at 1 July 1994.

Model 2: Educational Attainment

Input Measures

1. The total government funding of teacher salaries per student for each school (TEACHPS).
2. The total government funding for school operations per student (OPSPS). This amount excludes the funds in relation to teacher salaries.
3. The latest government valuation of each school's land and buildings per student (LANDPS).

Output Measures

1. The percentage of all School Certificate papers sat in 1994 graded either A or B (SC).
2. The number of School Certificate candidates in 1994 divided by the number of Form 3 students at the school two years earlier in 1992 expressed as a percentage (SCPAT). This variable provides a measure of the examination participation rates at each school.
3. The percentage of University Bursary/ Entrance or Scholarship papers sat in 1994 graded either S (Scholarship pass), A or B (UE).
4. The percentage of school leavers (excluding students who have left to attend another school, foreign fee paying students, overseas students studying under MFAT

scholarships, adult or deceased students) who left with a Form 7 qualification (FORM7). A Form 7 qualification is defined as a University Bursary, Scholarship, Entrance Qualification from University Bursary or Higher School Certificate.

5. One minus the percentage of school leavers (as defined in 4 above) who left with no formal qualification (QUAL). This variable provides a measure of the percentage of students who left school with a formal qualification.

Table 1 provides descriptive statistics for the total sample of 69 schools.

Table 1: Descriptive Statistics - All Schools (n = 69)

	Mean	Std Deviation	Minimum	Maximum
TEACH	2,729,241	1,212,462	561,488	5,315,580
TEACHPS	3173	512	2,594	4,726
OPS	762,685	295,110	174,843	1,410,883
OPSPS	926	218	674	1,537
LAND	7,349,017	2,756,237	310,000	13,765,000
LANDPS	7,984	4,619	895	29,126
ROLL	906	451	131	1,904
SES	4.82	2.97	1	10
SC	25.5	13.1	1.9	61.9
SCPAT	91.4	18.9	50	170
UE	36.1	16.6	0	71.2
FORM 7	39.9	18.7	7.7	84.8
QUAL	84.9	13.4	42.8	100

5 Research Results

Due to space restrictions, only the results for variable returns to scale (output orientation) are presented in Appendix 1. As expected, the efficiency scores for the sample are high with a relatively low variability suggesting that the structural efficiency of the sample is high. Refer to Table 2 for a summary of the mean efficiency scores for Model 1 and Model 2.

Given the funding formula applied by the government to the total sample this result is consistent with expectations. In addition, the Model 1 efficiency scores (measuring consumption of resources) were higher with less variability than the Model 2 scores (measuring educational outcomes). This result suggests there is greater control over resource allocation than over the quality of educational outcomes.

Under constant returns to scale (CRS) there appears to be a significant difference between the efficiency scores Models 1 and 2. For variable returns to scale (VRS) the difference between Model 1 and Model 2 does not appear significant. This suggests that school size affects performance. Some support for this can be obtained by comparing the scale efficiencies (CRS divided by VRS) for Models 1 and 2. For Model 1 scale efficiency is close to unity (approximately 96%), whereas it is lower (approximately 89%) for Model 2. The difference in scale efficiency between Models 1 and 2 suggests that differences in size have relatively little impact on cost control (Model 1), but much greater impact on quality control (Model 2). This could be due to several reasons including (i) lack of specialist teachers, facilities and course offerings in small schools; (ii) large schools could have higher school leaving rates for students leaving with no qualifications; and (iii) large schools may concentrate resources at extreme ends and neglect their middle students.

Table 2: Summary Results for Model 1 and Model 2

DEA Scores	Model 1: Resource Consumption		Model 2: Educational Outcomes	
	CRS	VRS (Output)	CRS	VRS (Output)
Mean	0.848	0.885	0.780	0.879
Sample Variance	0.015	0.011	0.026	0.015
Minimum	0.550	0.590	0.280	0.430
Maximum	1.000	1.000	1.000	1.000

As an additional exercise, we have taken the efficiency scores for each school calculated under the VRS output orientation and used them to calculate an ‘optimum’ school roll (ie the roll that would make each school 100% efficient in the consumption of school resources). This analysis suggests that the most productive size for the school roll is between 700 and 1,500.

5.1 Comparison of the Restricted and Unrestricted Model

A comparison of the efficiency scores for the state schools excluding and including the land input (Models 1a and 1b and Models 2a and 2b) reveals few differences in the unrestricted model, suggesting that a near zero weighting is being applied to the land input for the majority of schools. A very small number of schools did achieve a higher efficiency score when the land input was included. The schools (eg Mahurangi College) that obtained higher scores in Models 1b and 2b were, generally, located in rural or near rural areas within the Auckland region, where land values are expected to be significantly lower than in the urban areas.

In the restricted model where schools were forced to take the land input into account when calculating the efficiency scores, the scores are lower for all schools (except those mentioned above). The difference in scores between the restricted and unrestricted models is likely to be the result of the large variation in land values within the sample.

5.2 Comparison of the State School and Integrated School Results

Table 3 summarises the CRS results for Model 1 and Model 2, splitting the total sample of 69 schools between state and integrated schools. There is little difference in the mean efficiency scores for Model 1 between the two sub-samples, suggesting that the cost control of the integrated schools is not substantially different to the state schools. However, there is a larger difference between the mean efficiency scores for Model 2, suggesting that there is less variance in the quality of educational outcomes for the integrated schools than for the state schools.

Table 3: Comparison of Results for State and Integrated Schools (CRS)

DEA Scores	Model 1: Resource Consumption		Model 2: Educational Outcomes	
	State (n = 52)	Integrated (n = 17)	State (n = 52)	Integrated (n = 17)
Mean	0.850	0.841	0.768	0.814
Sample Variance	0.015	0.018	0.029	0.017
Minimum	0.55	0.60	0.28	0.58
Maximum	1.00	1.00	1.00	1.00

Regression of Results Against SES – Model 1 and Model 2

Finally, the efficiency scores for Model 1 and Model 2 (calculated under the VRS input orientation) were regressed against the SES decile for each school using OLS. The results

of this regression are summarised in Table 4 and Table 5. As expected, the SES decile explains a significant amount of the variation in the efficiency scores.

Table 4: Regression Results for Model 1 (n = 69)

R Square	0.261602	F Value	23.73697
Adj R Square	0.250581	Significance F	7.08E-06

Parameter Estimates

	Parameter Estimate	Standard Error	T Statistic	P-value
Intercept	0.818178	0.018286	44.74249	1.23E-51
SES Decile	0.015753	0.003233	4.872061	7.08E-06

Table 5: Regression Results for Model 2 (n = 69)

R Square	0.308734	F Value	29.92357
Adj R Square	0.298416	Significance F	7.20E-07

Parameter Estimates

	Parameter Estimate	Standard Error	T Statistic	P-value
Intercept	0.760482	0.023493	32.37102	1.23E-42
SES Decile	0.022723	0.004154	5.470244	7.20E-07

6 Conclusion

The purpose of the study was to test the available data using DEA to determine whether the results obtained were credible and to identify future research issues. This study has shown that using a cross-sectional sample of Auckland schools, DEA has provided insights into variability in performance, the existence of scale economies, the sensitivity of efficiency scores to changes in the inputs included in the models, and the degree of structural efficiency of Auckland secondary schools.

The study has highlighted areas where the data are deficient. For example, only government funds were included. The omission of private sources of funds could have biased the results in favour of schools in more affluent areas. In addition, the measures of educational outcomes were only partial and further measures (such as the ‘true’ participation rates of students in external examinations) need to be incorporated in the analysis.

Given that this pilot study only uses a single year’s results (1994), no conclusion can be drawn regarding the effects of the educational reforms on school performance. Clearly, this is an area that requires further research to examine whether there are any differences in the overall efficiency levels and/ or differences in the relative efficiency of schools before and after the reforms. In addition, further study is required to attempt to examine the following:

- whether the marginal effect of schools on students’ educational outcomes can be identified;
- whether increased competition for students in the 1990s (following the abolition of school zoning) affected urban and rural schools differently;
- whether there were any differences in performance between schools that were bulk-funded for teacher salaries and those that were not;
- whether the increased level of accountability between the 1980s and 1990s resulted in performance improvements.

Finally, this study has used a high level quantitative method to assess school performance. Future research will consider whether such methods can provide a similar level of quality control as in-depth audits such as the ERO audits.

7 References

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APPENDIX I - Summary of Results - Variable Returns to Scale - Output Orientation

DMU Name	Unrestricted			Model 1b - Restricted			Unrestricted			Model 2b - Restricted		
	Model 1	Model 1a	Model 1b	10%	20%	20%-50%	Model 2	Model 2a	Model 2b	10%	20%	20% - 50%
Aorere College	0.86	0.86	0.87	0.85	0.81	0.81	0.96	0.96	0.96	0.95	0.92	0.92
Auckland Girls' Grammar School	0.93	0.93	0.94	0.92	0.88	0.88	0.75	0.75	0.75	0.75	0.75	0.75
Auckland Grammar	1.00	1.00	1.00	1.00	0.97	0.97	1.00	1.00	1.00	1.00	0.99	0.99
Auckland Metropolitan College	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Auckland Seventh-Day Adventist H.S.*	1.00						1.00					
Avondale College	1.00	1.00	1.00	1.00	1.00	1.00	0.80	0.81	0.82	0.82	0.82	0.82
Baradene College*	0.98						1.00					
Birkenhead College	0.85	0.86	0.86	0.84	0.78	0.78	0.94	0.94	0.94	0.90	0.86	0.86
Carmel College*	1.00						1.00					
De La Salle College*	0.90						0.81					
Edgewater College	1.00	1.00	1.00	0.97	0.89	0.89	1.00	1.00	1.00	1.00	1.00	1.00
Epsom Girls' Grammar School	1.00	1.00	1.00	0.99	0.96	0.96	1.00	1.00	1.00	1.00	1.00	1.00
Glendowie College	0.87	0.90	0.91	0.87	0.81	0.81	0.89	0.89	0.90	0.90	0.89	0.89
Glenfield College	0.89	0.89	0.89	0.87	0.83	0.83	0.88	0.89	0.89	0.87	0.85	0.85
Green Bay High School	0.68	0.69	0.69	0.68	0.64	0.64	0.83	0.84	0.84	0.80	0.77	0.77
Hato Petera College*	0.79						0.94					
Henderson High School	0.85	0.86	0.86	0.84	0.78	0.78	0.82	0.83	0.83	0.81	0.78	0.78
Hillary College	0.59	0.60	0.60	0.59	0.56	0.56	0.43	0.44	0.44	0.43	0.42	0.42
Howick College	1.00	1.00	1.00	0.95	0.91	0.91	1.00	1.00	1.00	1.00	0.98	0.98
James Cook High School	0.92	0.92	0.92	0.92	0.91	0.91	0.74	0.74	0.76	0.76	0.75	0.75
Kaipara College	0.85	0.87	0.89	0.85	0.80	0.80	0.86	0.86	0.89	0.89	0.85	0.85
Kelston Boys' High School	0.88	0.88	0.89	0.88	0.85	0.85	0.69	0.69	0.69	0.69	0.69	0.69
Kelston Girls' High School	0.83	0.83	0.85	0.82	0.78	0.78	0.86	0.86	0.86	0.85	0.84	0.84
Liston College*	0.97						0.85					
Long Bay College	0.93	0.93	0.94	0.91	0.85	0.85	0.97	0.97	0.98	0.98	0.94	0.94
Lynfield College	0.97	0.97	0.97	0.95	0.92	0.92	0.97	0.97	0.97	0.97	0.97	0.97
Macleans College	1.00	1.00	1.00	0.97	0.92	0.92	1.00	1.00	1.00	1.00	1.00	1.00
Mahurangi College	0.95	0.97	1.00	1.00	1.00	1.00	0.87	0.87	1.00	1.00	1.00	1.00
Mangere College	0.82	0.82	0.82	0.80	0.76	0.76	0.86	0.86	0.86	0.83	0.81	0.81
Manurewa College	1.00	1.00	1.00	1.00	0.98	0.98	0.82	0.82	0.86	0.86	0.85	0.85
Marcellin College*	0.93						1.00					
Marists Sisters College*	0.94						0.78					
Massey High School	0.93	0.93	0.93	0.92	0.90	0.90	0.88	0.88	0.89	0.89	0.87	0.87
McAuley High School*	0.82						0.96					
Mt Albert Grammar School	0.90	0.90	0.91	0.88	0.84	0.84	0.97	1.00	1.00	1.00	1.00	1.00
Mt Roskill Grammar	0.89	0.89	0.99	0.99	0.99	0.99	0.86	0.87	0.90	0.90	0.89	0.89
Nga Tapuwae College	0.62	0.64	0.64	0.62	0.59	0.59	0.73	0.73	0.73	0.70	0.67	0.67
Northcote College	0.85	0.87	0.87	0.84	0.78	0.78	0.92	0.93	0.93	0.91	0.87	0.87
Onehunga High School	0.94	0.94	0.95	0.92	0.88	0.88	0.71	0.71	0.73	0.73	0.71	0.71
Orewa College	0.95	0.95	1.00	1.00	1.00	1.00	0.80	0.80	0.94	0.94	0.94	0.94
Otahuhu College	0.88	0.88	0.89	0.87	0.86	0.86	0.75	0.76	0.77	0.77	0.76	0.76
Pakuranga College	0.86	0.86	0.86	0.85	0.84	0.84	0.94	0.94	0.94	0.94	0.92	0.92
Papakura High School	0.89	0.89	0.89	0.87	0.84	0.84	0.68	0.68	0.68	0.68	0.67	0.67

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	Model 1	Model 1a	Model 1b	10%	20%	20%-50%	Model 2	Model 2a	Model 2b	10%	20%	20% - 50%
Papatoetoe High School	0.81	0.82	0.82	0.81	0.79	0.79	0.93	0.93	0.94	0.94	0.90	0.90
Penrose High School	0.83	0.83	0.84	0.82	0.77	0.77	0.79	0.79	0.79	0.76	0.74	0.74
Pukekohe High School	0.95	0.95	0.96	0.94	0.92	0.92	0.89	0.89	0.92	0.92	0.88	0.88
Queen Victoria School*	0.87						1.00					
Rangitoto College	0.98	0.98	0.98	0.97	0.95	0.95	0.97	0.97	0.98	0.97	0.96	0.96
Rodney College	0.77	0.80	0.81	0.78	0.74	0.74	0.85	0.85	0.86	0.86	0.84	0.84
Rosehill College	0.95	0.95	0.95	0.91	0.86	0.86	0.85	0.85	0.85	0.83	0.81	0.81
Rosmini College*	1.00						1.00					
Rutherford High School	0.85	0.85	0.85	0.83	0.79	0.79	0.74	0.75	0.75	0.74	0.72	0.72
Sacred Heart College (Auckland)*	0.97						0.95					
Selwyn College	0.82	0.82	0.82	0.80	0.78	0.78	0.93	0.94	0.94	0.94	0.90	0.90
St Dominic's College (Henderson)*	0.94						0.96					
St Mary's College (Ponsonby)*	0.85						0.94					
St Paul's College (Ponsonby)*	0.83						1.00					
St Peter's College (Epsom)*	1.00						1.00					
St Stephen's College (Bombay)	0.65	0.67	0.67	0.64	0.61	0.61	0.96	0.96	0.96	0.89	0.83	0.83
Takapuna Grammar School	0.90	0.90	0.90	0.87	0.84	0.84	0.99	0.99	0.99	0.98	0.96	0.96
Tamaki College	0.63	0.66	0.66	0.63	0.60	0.60	0.55	0.55	0.55	0.54	0.53	0.53
Tangaroa College	0.63	0.65	0.65	0.62	0.60	0.60	0.56	0.56	0.56	0.54	0.53	0.53
Waiheke High School	0.74	0.76	0.77	0.75	0.71	0.71	0.94	0.94	0.94	0.92	0.90	0.90
Waitakere College	0.93	0.93	0.93	0.91	0.89	0.89	0.91	0.91	0.91	0.90	0.89	0.89
Waiuku College	0.89	0.92	0.93	0.88	0.82	0.82	0.91	0.91	0.92	0.92	0.92	0.92
Wesley College*	0.84						0.72					
Western Springs College	0.74	0.75	0.76	0.74	0.69	0.69	0.83	0.83	0.83	0.81	0.78	0.78
Westlake Boys' High School	0.99	0.99	0.99	0.97	0.95	0.95	0.99	0.99	1.00	1.00	0.99	0.99
Westlake Girls' High School	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

<i>DESCRIPTIVE STATISTICS</i>												
Mean	0.885	0.880	0.887	0.867	0.835	0.835	0.879	0.863	0.874	0.865	0.848	0.848
Median	0.900	0.895	0.905	0.875	0.840	0.840	0.910	0.885	0.905	0.900	0.870	0.870
Mode	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Sample Variance	0.011	0.011	0.012	0.012	0.014	0.014	0.015	0.016	0.016	0.017	0.017	0.017
Kurtosis	0.831	0.429	0.474	0.292	-0.139	-0.139	2.087	1.801	2.099	1.903	1.578	1.578
Skewness	-1.092	-1.004	-1.057	-0.915	-0.602	-0.602	-1.346	-1.272	-1.420	-1.331	-1.160	-1.160
Range	0.410	0.400	0.400	0.410	0.440	0.440	0.570	0.560	0.560	0.570	0.580	0.580
Minimum	0.590	0.600	0.600	0.590	0.560	0.560	0.430	0.440	0.440	0.430	0.420	0.420
Maximum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Count	69	52	52	52	52	52	69	52	52	52	52	52