Statistical Analysis

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It was necessary to undertake a good deal of detailed statistical analysis of the results. While for some questions, such as the question about "doubling / dubbing" on a bicycle, there was apparently little need for statistical analysis to see the results, there were many other questions where a tendency could be observed for one form to correlate with one region, but where that form was by no means absent from other regions. While simple counts of numbers of forms often showed these tendencies, it was felt that some more sophisticated analysis would lend weight to any conclusions on the basis of such forms. We also hoped that statistical analysis would let us sum the evidence from individual questions, to produce an overall picture of the variation observed. Statistical advice was provided by I-Ming Liu of the School of Mathematical and Computing Sciences at Victoria University of Wellington, and we wish to acknowledge with gratitude her help in producing and interpreting the statistics discussed below.

The Data for Statistical Analysis

Firstly, we selected from all the data collected those responses for each question which the preliminary analysis suggested might be variable along some dimension (regional, social, etc.). Thus we excluded from consideration forms like *munted, cool, lollies*, which were found widely throughout the country, and forms which were found sporadically throughout the country. In all, 237 forms were included in the data for statistical analysis (a 'form' in this context might mean 'tiggy' in answer to 1a, or 'golden princess' in answer to what goes with "Third the __" in 8, or the counting-out rhyme "The sky is blue" in response to 4). An Excel file was constructed which contained a binary (yes=1 – no=0) value for each of these variables for each participating school.

Determining the Regions

The SAS statistical program was then used to ascertain the level of agreement between pairs of schools using the values for these variables.

The program produces figures like the following:

Table 1: Comparison of Schools 50 and 57

	0	**1**
0	155	24
1	35	23

This is to be interpreted as follows: When we compare schools 50 and 57, neither school reported using 155 of the forms analysed; both schools reported using 23 of the forms analysed; school 50 reported using 35 forms which school 57 did not report; school 57 reported using 24 forms which school 50 did not report.

On the basis of this data, two statistical measures were calculated. The first is the Kappa coefficient, which measures the level of agreement between two schools. It has an associated 95% confidence interval; if the confidence interval includes

zero, then the two schools agree by chance; if it does not include zero, then we have 95% confidence that the true Kappa value falls within the confidence interval. Thus a small confidence interval gives us good confidence in the result, while a wide confidence interval gives us less confidence in the accuracy of the Kappa value calculated. The Kappa value for the above schools was 0.28, with a confidence interval from 0.14 to 0.421. In relation to the rest of our results, this is a moderate-low level of agreement, with a fairly average confidence interval.
On this measure, pairs of schools varied noticeably in the levels of agreement between them. The highest levels of agreement obtained approached 0.6 (ie 60% agreement); the lowest levels of agreement were less than 0.1 (ie less than 10% agreement). Here are the basic figures for a comparison between two schools with a high level of agreement:

Table 2: Comparison of Schools 60 and 61

	0	1
0	206	4
1	13	14

The Kappa value for these two schools was 0.584, with a confidence interval of 0.407 – 0.761. However, it will be seen that the main agreement between them is all the things they don't say. The total number of forms where they disagree, however, is very small: 17 out of 237. In fact, the number of forms in the "both say" box is seldom large, because we eliminated the forms which were common to the majority of schools. One of the highest levels of positive agreement is in the following set:

Table 3: Comparison of Schools 147 and 150

	0	1
0	178	17
1	18	24

This produced a Kappa value of 0.489, with a confidence interval of 0.343 – 0.635 for these schools.
At the other end of the scale, the type of distribution which gives rise to very low Kappa values is illustrated by the following (schools 19x21):

Table 4: Comparison of Schools 19 and 21

	0	1
0	132	86
1	6	13

This yielded a Kappa value of .099, with a confidence interval of 0.015 – 0.183. This was one of the lowest Kappa values where the confidence interval did not include zero.

For the record, here is the data for two cases where we cannot have confidence in the Kappa value, ie, where the statistics indicate that the schools agree by chance, although to different degrees:

Table 5: Comparison of schools 19 and 23

	0	1
0	145	73
1	11	8

The Kappa value here was 0.035, but the confidence interval was -0.059 – 0.128.

Table 6: Comparison of Schools 139 and 141

	0	1
0	210	13
1	10	4

For the above data, the Kappa value was 0.207, but the confidence interval was -0.005 – 0.418.

Intuitively, the two schools in this last comparison agree far more than they disagree: they record the same values for 214 forms, and different values for only 23 forms. However, the Kappa value does not provide a way of capturing this intuition.

For this reason, a second calculation was made for each pair of schools. This works out the odds ratio for two schools saying the same thing, or saying something different. Thus an odds ratio of 3.5 means that it is 3.5 times more likely that the schools will say the same thing as that they will say something different. It is also necessary to consider the confidence interval for this calculation: if the confidence interval is large, then we are less sure of the correctness of the odds ratio than we are if the confidence interval is small. The SAS program returns values for the confidence interval which increase exponentially from 0 to ∞, so it is difficult to assess from these numbers just how big the confidence interval is. A confidence interval from 0.1 – 0.9 may represent less confidence than the apparently larger confidence interval from 11 – 19, for example. For this reason, the natural logarithm of the odds ratio and associated confidence interval was used to assess these values. Taking the natural logarithm of these numbers maps the exponential series from zero to infinity onto a series which is arithmetic and symmetrical about zero. This means that an interval of the same size anywhere on the scale is equivalent, which is not true for the

exponential series. If the natural logarithm confidence interval includes zero, then the differences between the schools are not significant.
Because the Kappa value and the odds ratio are not measuring the same thing, there is no necessary correspondence between the two values. The figures for the pairs of schools discussed above are in the following chart. A ? beside the Kappa value indicates that the confidence interval included 0, so that the figure indicates chance agreement. CI = confidence interval; LB = lower bound; UB= upper bound; LN = natural logarithm:

Table 7: Kappa and Odds Values contrasted

Schools	**Kappa**	**Odds**	**CILB**	**CIUB**	**LN Odds**	**LNCILB**	**LNCIUB**
50x57	0.28	4.244	2.151	8.372	1.446	0.766	2.125
60x61	0.584	55.462	15.977	192.527	4.016	2.771	5.26
147x150	0.489	13.961	6.348	30.701	2.636	1.848	3.424
19x21	0.099	3.326	1.218	9.083	1.202	0.197	2.206
19x23	?0.035	1.445	0.557	3.747	0.368	-0.585	1.321
139x141	?0.207	6.462	1.783	23.421	1.866	0.578	3.154

The Odds figures are to be interpreted thus: it is 4.244 times more likely that schools 50 and 57 will agree in what they say than that they will disagree. We are 95% confident that the true odds figure is between 2.151 and 8.372. To see whether this is a large confidence interval or a small one, we can look at the natural log figures: the range there is from 0.766 to 2.125, an interval of 1.359. This indicates a reasonable level of confidence in the odds figure.
If we look at schools 60x61, we can see that they are 55.462 times more likely to agree than to disagree, indicating a high level of agreement on this measure. The confidence interval appears very wide (176.55) if we consider the basic value. However, the natural log interval is 2.489, which shows the point of converting to the natural log: we have more confidence in this result than might appear from the basic figures.
The natural log confidence interval for schools 147x150 is 1.576, which again is relatively narrow, so we are reasonably confident about the odds figure of 13.961.
With schools 19x21, where the odds figure is only 3.326, the natural log confidence interval is 2.009, which is a medium value, indicating moderate confidence in the odds value.
With schools 19x23, the odds value, like the Kappa value, is very low: they are only 1.445 times more likely to agree than to disagree. The basic figures for the confidence interval here do not look particularly wide, but the natural log figures include zero, so we conclude that the difference in agreement/disagreement is not significant.
With the last pair of schools in the table, we can see that the Kappa figure and the odds figure do not appear to say the same thing. The Kappa figure says they agree by chance; the odds figure says that they are 6.2 times more likely to agree than to disagree. While there is quite a large confidence interval (2.576), indicating that we are not overly sure about the accuracy of the value for the odds figure, it nevertheless indicates that there is a fair level of agreement between the schools. It is clear in this case that the odds ratio gives us a more intuitively appropriate measure of the agreement than the Kappa figure does.

This is why both values were considered. Notice, however, that it is sometimes necessary to look back at the chart of basic agreement values to interpret the values obtained from the two measures.

On the basis of the levels of agreement calculated between pairs of schools, the strongest lines of agreement were mapped, on the assumption that strong levels of agreement would show strong regional affiliation. Different coloured lines were drawn between the schools concerned, with “hot” colours for strong levels of agreement and “cooler” colours for lower levels of agreement. This network of lines was then inspected for “hot” and “cold” areas.

The values obtained for the South Island allowed division into regions without too many difficulties.

There were many Kappa values of .300 and above linking schools in Southland and East Otago, for example, but weaker levels of agreement linking them with south Canterbury or the Central Otago lake areas. This confirmed the boundary of the Southland-Otago region in the place suggested by the individual items.

From a consideration of the levels of agreement, a Timaru-based region emerged, stretching west to include the Central Otago lake district, and including areas of North Otago, but not including areas of Canterbury north of Timaru. (At the Coast, it is probably bounded by the Rangitata and Waitaki Rivers, but inland the area stretches well south of the Waitaki.) This area is probably the area of overlap between the Southland – Otago region and the Canterbury region.

Christchurch proved to be the most homogeneous linguistic area of the country by these measures, with many schools having agreement levels of over .500 on the Kappa measure. The Christchurch region covers the rest of Canterbury, and extends north to the Cheviots.

It was less clear whether the West Coast should be included in this area. The levels of agreement between the various West Coast schools were not particularly high, with only one value of .400 or more recorded, and there was one .4 value between a West Coast school and a Christchurch school. The levels of agreement between the West Coast schools and Nelson were much lower, suggesting that the West Coast looks to Christchurch rather than to Nelson as its chief contact. This fits with anecdotal evidence of West Coasters talking about “going over the hill”, meaning going over the Alps to Canterbury. In the end, it was decided to leave the West Coast as a separate region at this level of analysis.

The Nelson region had only moderate levels of internal agreement, but even lower levels of agreement with the rest of the South Island, and so it was kept separate. (It had higher levels of agreement with Wellington, but, like the West Coast, was left separate at this level.)

Marlborough did not have particularly strong links with Nelson, Christchurch, or Wellington but on balance, the links appeared stronger to Nelson, so these were incorporated into one region. (There were very few participating schools in Marlborough.)

The most problematic area of the South Island was Kaikoura, which had only chance levels of agreement with the Christchurch region, but slightly stronger ties with Marlborough. In the end, it was included with Marlborough in a North-of-the-South-Island grouping.

The results for the North Island proved much more difficult to interpret. In Northland, there appeared to be strong lines of agreement linking most of the eastern schools in the vicinity of State Highway 1, as far north as the Bay of

Islands. North of that, schools tend to agree with the more western schools, which were linked amongst themselves by fairly strong lines of agreement. In general there were only weak lines of agreement linking eastern and western schools. However, the western schools also showed reasonably strong levels of agreement with Whangarei in the East. This makes geographic sense: Whangarei is an important centre for both sides of the peninsula. On the basis of this, Northland was divided into two regions on an East-West basis. However, the western area immediately north of Auckland appeared more strongly integrated into Auckland than into Northland, and was thus counted as part of Auckland. It must also be noted that Whangarei showed quite strong levels of agreement with some Auckland schools, and thus raised similar problems to those of the West Coast and Christchurch).

Auckland showed quite strong levels of agreement throughout the city, although not to the same degree as Christchurch. There was no sign of the sorts of splits which one might have envisaged: between the north and centre and the south, or a distinct western or eastern area. The levels of agreement, however, dropped off sharply south of Pukekohe, so the southern boundary of the Auckland region seemed to be fairly clear. However, parts of the Coromandel peninsula linked more closely with Auckland than with e.g. the Hauraki Plains or the Bay of Plenty, and so these were included in the Auckland region.

South of Auckland, there were moderately high levels of agreement within all the potential regions: the Hauraki Plains, the Bay of Plenty-Rotorua, the Waikato, the timber belt, the King Country, the fringes of the volcanic plateau, and Taranaki. Less expectedly, there were equally high levels of agreement between these various areas: the agreement levels between the Waikato and the Bay of Plenty were no less than those within the Waikato or within the Bay of Plenty, etc. The highest levels of agreement within the areas mentioned were between Taranaki and the King Country, between the King Country and the western fringes of the volcanic plateau, and between the Hauraki Plains and the Rotorua area. Nowhere in this area were there consistently weak levels of agreement such as mark the southern edge of Auckland, for instance. It became clear that there were no obvious regional boundaries within this region. Thus a central North Island region was established, extending from the southern fringe of Auckland to Southern Taranaki in the West, the southern edge of the volcanic plateau, and through the Bay of Plenty to the edge of the Urewera, and into Northern Poverty Bay. Because we did not have any East Cape schools participating, we are unsure which region that area belongs to, but the best hypothesis is that it is part of this large Central North Island region.

Considerable time was spent investigating levels of agreement between schools on the fringes of these areas, in places between Taranaki and Wanganui, and in the Gisborne area, for example. One of these borderline schools showed no particularly strong links with any other schools in the area, and thus remains unclassifiable. Another showed equally strong links with all the border regions: a true linguistic melting pot. These two schools were given special status in the data which was the input to the next part of the analysis.

Hawkes Bay showed strong internal levels of agreement, and these extended up into the coastal areas of Poverty Bay, and down to the Wairarapa. However, the levels of agreement with the central North Island area were lower, indicating the presence of a boundary there, although the “border” town mentioned above caused some blurring of this. Wanganui and the Horowhenua and Manawatu also showed a reasonably high level of internal cohesion, but there were equally strong links with Wellington. The links between Hawkes Bay and Wellington were less strong. Thus two regions were established in the lower section of the North Island, divided between East and West: Hawkes Bay (including much of Poverty Bay and the Wairarapa), and Wellington, extending up the west coast as far as Wanganui. Wellington city, like Auckland, showed reasonably strong levels of internal agreement, although not to the same degree as Christchurch, but Wellington influence clearly extends a considerable distance north.

In this way, 11 sub-regions were established. The regions are shown on the map below.

This analysis also enabled us to confirm the boundaries for the three main regions suggested by the data: in particular, Taranaki clearly belongs in the Northern Region, and Hawkes Bay, equally clearly, belongs in the Central Region, despite the fact that the responses to certain individual questions suggest otherwise.

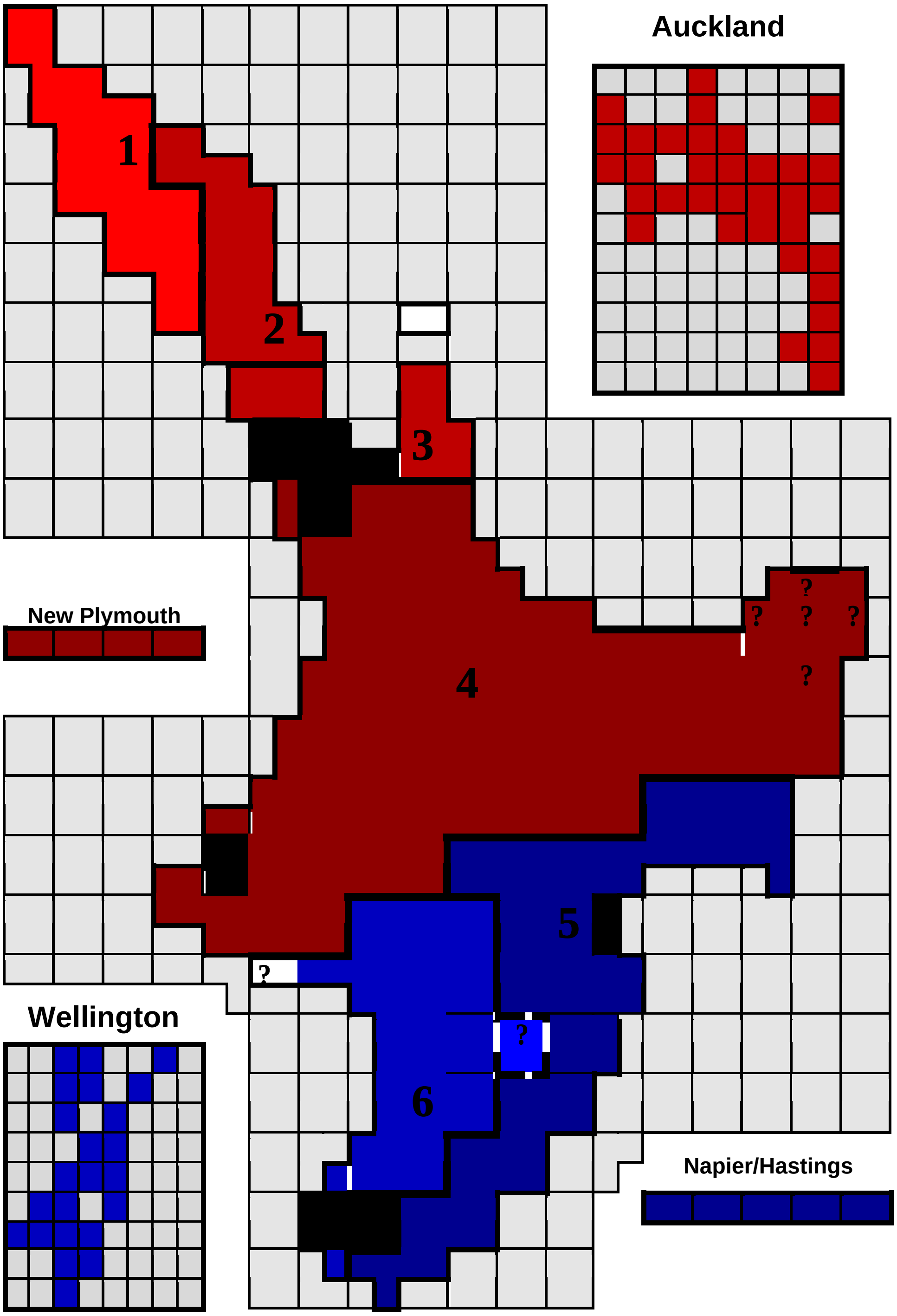
The Influence of School Size and Number of Responses

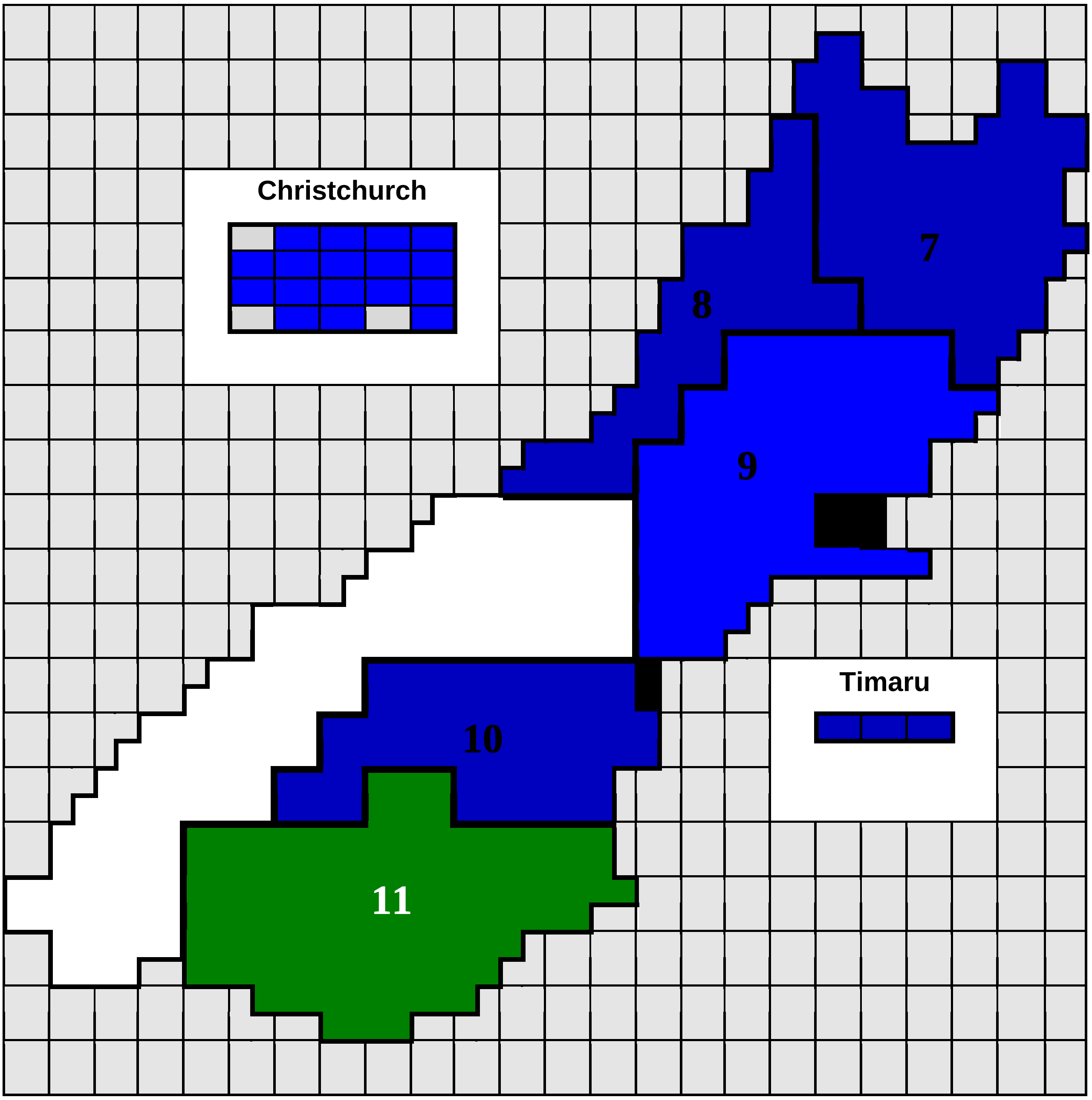
One of the patterns which appeared to influence the figures produced in the analysis outlined above was the number of responses to the questions provided by different schools. In some schools, the teachers reported only the majority forms from their classes, so that these questionnaires contained only a small number of forms. In other schools, the teachers wrote down all the forms that were suggested, so that their questionnaires contained large numbers of forms. Some schools (particularly intermediate and form 7-15 schools) reported that they did not play the basic chasing game, which meant that they left 5 questions unanswered, 5 questions, moreover, which were amongst the most strongly differentiated in terms of region. Such schools often showed relatively low levels of agreement with their neighbours in the statistics. As a further complication, it was clear that a school with a total of 6 students in Years 7 and 8 would inevitably produce fewer forms than a school with 600-700 students in these years. Some statistical analysis of these problems was also undertaken.

For each school, a count was made of the number of questions to which we coded no response. (These included cases where the teacher reported that a game was not played, or that the students had no special term for something and those where the only responses echoed the words of the question, which we were by definition, not interested in.). The results ranged from all questions answered, to 17 questions unanswered. For each school, a count was also made of the total number of coded responses in the entire questionnaire. (These included all the coded responses, including those which were subsequently eliminated from the analysis because they were reported from just that school, or because they were reported from virtually every school.) The figures obtained ranged from a total of 42 coded responses to a total of 622 coded responses! The average number of responses per question answered was also calculated, and ranged from 1.1 per question to 12 per question.

Some statistical analysis was performed on these results: the mean number of responses was calculated and the standard deviation for the mean. This enabled us to determine which schools were “outliers” in terms of the number of responses they gave (the same schools were in this group regardless of whether

Map 1: Main Regions and Sub-Regions





Note: The boundaries shown are very approximate: clearly we do not have participating schools on all boundaries, and are also constrained by the gridlines. They assign all participating schools to the appropriate region, but nothing further should be read into them.

Main Regions:
The Northern Region (red shading) comprises sub-regions 1, 2, 3 and 4.
The Central Region (blue shading) comprises sub-regions 5, 6, 7, 8, 9 and 10.
The Southern Region (green shading) is equivalent to sub-region 11.

the total responses were considered, or the average per question). As a result, it was determined that 8 schools had responded extremely richly to the questionnaire, and one school had responded very thinly. These schools were given special codes to indicate this for the purposes of the main analysis. In addition, the school which lost a section of its questionnaire, and so failed to respond to 10 questions, was given a special code.

We also investigated, using regression analysis, whether the size of the school affected the number of responses to the questionnaire. The size of the school was calculated by determining the number of year levels present in the school (2 for intermediates, 8 for full primaries, 13 for composite, 7 for year 7-15 schools, ignoring the two extra years for possible repeating students in these last two types.) The total school roll (figures for 1998 from the Ministry of Education) was divided by the number of years to produce an average number of students per year. This was the figure used for the size of the school. It is, of course, only approximate, but should give an accurate enough measure for our purposes. The numbers varied from 419 to 5. The regression analysis of these two variables of size and total number of responses suggested that, in general, while the number of responses did vary with the size of the school, so that bigger schools produced more responses, the influence of size on the results was not likely to have made other statistics invalid. However, this analysis did isolate three big schools which produced an overly rich response even given their size: they were 3 of the 8 "rich" outliers noted in the previous section. It also identified two schools which produced much thinner questionnaires than their size would have predicted as likely. These two schools were also given a special code.

Statistical Analysis of Individual Forms

The main part of the analysis allowed us to consider the effects on the results of some of the variables we had established: the decile rating of the school, which Island it belongs to, which Main Region it belongs to, which Sub-region it belongs to, whether it is urban or rural, whether Catholic or non-Catholic (other schools with special religions or philosophies were given special values for this variable), and whether the school had answered the questionnaire richly or thinly.

For each question, the SAS program (version 6.12) calculated the variation which could be ascribed to each of the basic covariates: decile, main region, sub-region, island, Catholic, urban/rural. It produced results which enabled us to identify which correlations were significant for each set of data.

A statistical method called the Generalized Estimating Equations (GEE) (Liang and Zeger, 1986) allows us to analyse this type of data. The statistical package SAS can implement the GEE approach, using PROC GENMOD. The PROC GENMOD attempts two kinds of analysis, "Analysis of Initial Parameter Estimates" and "Analysis of GEE Parameter Estimates". However, the data frequently did not permit successful calculation of GEE Parameter Estimates. Where there was a choice, the GEE Estimates were preferred to the Initial Estimates. The two analyses calculate p-values differently: the Initial Estimates return values for Pr>Chi while the GEE Estimates return values for Pr>|Z|. From our point of view, nothing hangs on this difference, and so the final column in each table is headed p-value.

As an example we will consider the results obtained for Q16, the words used for two people riding on a one-seater bicycle.

Q16: The Decile Co-variate

Table 8 shows the values returned for the distribution of the forms *doubling* and *dubbing* in relation to the decile of the school:

Table 8: Q16 by Decile

Analysis Of GEE Parameter Estimates – Empirical 95% Confidence Limits

parameter		Est.	StdErr	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.7518	0.4262	0.9164	2.5872	4.1098	0.0000
item	dubbing	-0.8002	0.3711	-1.5276	-0.0728	-2.156	0.0311
decile*item	doubling	-0.1814	0.0631	-0.3049	-0.0578	-2.876	**0.0040**
decile*item	dubbing	0.1290	0.0590	0.0134	0.2446	2.1875	**0.0287**
scale	0.9994	.	.	.	.	.	

For the non-statistician, the important figures are those against decile*item and the p-value, highlighted in the above table. Both figures show that the corresponding parameters are significant at the 0.05 level, and the first is significant at the 0.005 level. The Estimate for *doubling* is negative (-0.1814), while the Estimate for *dubbing* is positive (0.1290). This means that *doubling* is more likely to be reported by low decile schools, while *dubbing* is more likely to be reported by high decile schools. The correlation for *doubling* is considerably stronger than that for *dubbing*.

Q16: The Main Region Co-variate

The next table shows the distribution of *doubling* and *dubbing* in relation to the three Main Regions (the variable "region1" in the first column) which were established in the first stage of the analysis.

Table 9: Q16 by Main Region

Analysis Of GEE Parameter Estimates; Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.7918	0.7638	0.2948	3.2887	2.3460	0.0190
item	dubbing	-1.2993	0.6513	-2.5759	-0.0227	-1.995	0.0461
item*region1	doubling, 1	0.7922	0.9231	-1.0171	2.6016	0.8582	**0.3908**
item*region1	doubling, 2	-2.1019	0.7974	-3.6648	-0.5390	-2.636	**0.0084**
item*region1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*region1	dubbing, 1	0.1771	0.7204	-1.2348	1.5890	0.2459	**0.8058**
item*region1	dubbing, 2	2.1711	0.6971	0.8049	3.5373	3.1147	**0.0018**
item*region1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

The Northern Region was coded as 1 (in column 2), the Central Region was coded as 2, and the Southern Region was coded as 3. We are interested in the p-values against the lines with "item*region1" in the parameter column. The figures against "doubling, 1" compare the likelihood of a school in the Northern Region saying *doubling* and the likelihood of a school in the Southern Region saying *doubling*. If the p-value < 0.05, it suggests that there is a significant difference between the Northern Region and the Southern Region in relation to *doubling;* if the p-value > 0.05, it suggests that the difference between them is not significant. The figures against "doubling, 2" show the probability that a school in the Central Region will say *doubling* when compared with a school in the Southern Region. The figures against "doubling, 3" are all zero, since the program automatically uses the last item as the basis for comparison. The next three lines similarly compare the Northern and Southern Regions for *dubbing*, and the Central and Southern Regions for *dubbing*.

The p-value against "doubling, 1", is 0.3908, which is not significant. Thus, a school in the Northern Region is not significantly more likely to say *doubling* than a school in the Southern Region. However, the figure against "doubling, 2" is 0.0084, which is significant at the 0.05 level. Since the Estimate figure is negative, this tells us that a school in the Central Region is significantly less likely to say *doubling* than a school in the Southern Region. The figure against "dubbing, 1" is 0.8058, which tells us that a school in the Northern Region is not significantly more likely to say *dubbing* than a school in the Southern Region. The figure against "dubbing, 2", however, is 0.0018, which is significant at the 0.005 level, and this, together with the positive Estimate figure, tells us that a school in the Central Region is significantly more likely to say *dubbing* than a school in the Southern Region.

These statistics do not allow a direct comparison between the Northern and Central Regions. From our point of view, this was unsatisfactory, and so a further calculation was requested. The program was asked to produce "Contrast Statements" directly comparing these two regions for each of the two forms *doubling* and *dubbing*.

Table 10: Contrast Statement Results for Q16 Northern and Central Regions

Contrast	DF	ChiSquare	p-value	Type
1 –2 for *doubling*	1	41.6341	**0.0001**	LR
1 –2 for *dubbing*	1	28.9248	**0.0001**	LR

The figures of interest here are those under p-value, which tell us whether or not there is a significant difference between the two regions compared. The table tells us that when we compare the Northern (1) and Central (2) Regions for both of these forms, there is a highly significant difference between them: significant at the 0 0005 level. This means that the Northern and Central Regions contrast very strongly. To find out what the contrast is, it is necessary to look back at the previous table, at the appropriate Estimate figures. For *doubling*, these are 0.7922 for Northern and –2.1019 for Central. Since the figure for the Northern Region is larger than that for the Central Region, we can conclude that Northern Region schools are significantly more likely to say *doubling* than Central Region Schools. For *dubbing*, the figures are 0.1771 (Northern) and 2.1711 (Central). The Central figure is larger, and thus Central Region schools are significantly more likely to say *dubbing* than Northern Region schools.

Unfortunately, it was not always possible to get Contrast Statements from the program. If either of the two regions to be compared had no reports of a particular form, the program could not make the comparison, despite the fact that from our point of view, this would show the strongest possible correlation with region. Even where there were reports from both regions, the program sometimes was unable to make the calculations, leaving us to fall back on the evidence from the initial mapping process. Sometimes it was possible to obtain the contrast by eliminating the other forms from the data considered, and if the form was not reported from the Southern Region, the Northern – Central contrast could be fairly obtained by eliminating the Southern Region from the calculation.

Q16: The Sub-Region Co-variate

There were also major problems with the statistics provided by the program when we tried to calculate the variation in relation to the eleven sub-regions established. Inevitably, when the data is divided into 11 sets, there are only very small numbers of forms in any one set, and there are many regions which do not report particular forms. It is not possible for the program to handle this situation well, because there is not sufficient information to compare 11 regions using statistical methods.
The SAS program was never able to produce GEE Estimates for Sub-region data, so we are always using Initial Estimates here.

The 11 sub- regions established, with the numerical codes for each are:
1 West Northland (WNth)
2 East Northland (ENth)
3 Auckland (Ak)
4 Central North Island (CNIs)
5 Hawkes Bay – Wairarapa (HB-W)
6 Wellington (including areas north of Wellington on the west coast) (Wn)
7 Nelson – Marlborough (including Kaikoura) (N-M)
8 West Coast (WCst)
9 Christchurch and environs (Cntby)
10 Timaru – Central Lakes (T-CL)
11 Southland – East Otago (S-O)

Table 11 contains the figures produced for the correlation with the eleven sub-regions for *doubling* and *dubbin*g.
The table is to be interpreted in the same way as the table for Main Regions: the lines of interest are those with “item*region2” (the name for the Sub-region variable) in the parameter column.
The line “doubling, 1” compares the distribution of *doubling* in WNth and S-O. The line “dubbing, 3” compares the distribution of Ak and S-O. Because S-O is coded as sub-region 11, it always serves as the basis for comparison.
The lines for “doubling, 1” (WNth) and “doubling, 2” (ENth) show massive figures in the Standard Error column, and corresponding large numbers in the p-value column, almost 1.0000. This is a typical example of what the program produces when the data is totally or almost totally regionalised. *Doubling* was reported from every school in both of these areas. For us, this means that *doubling* is very highly correlated with both of these regions, but the SAS program cannot tell us that directly. What the figures in the table tell us is that, in WNth, the estimated odds of saying *doubling* are 23.5736 times higher than the odds of not saying *doubling*. If the probability of saying *doubling* is 1 (all schools report

doubling) and the probability of not saying *doubling* is 0 (no school does not report *doubling*), then the odds ratio is 1÷0, which is undefined.

The figures for *doubling* in regions 3 – 5 (Ak, CNIs, HB-W), 8 (WCst) and 10 (T-CL) tell us that the amount of use of *doubling* is not significantly different in these areas from the amount of use in S-O. However, the figures for *doubling* in 6, 7, and 9 (Wn, N-M, Cntby) show that these areas are significantly less likely to use *doubling* than S-O, with the figure for Cntby showing the most significant difference.

The figures for *dubbing* in regions 1, 3, 4, 5 and 10 tell us that these regions do not differ significantly in their use of *dubbing* from S-O. The large Standard Error in the line for Sub-region 2 (ENth) reflects the fact that no school in this area reported the form *dubbing*. The figures for regions 6, 7, 8 and 9 all show significantly more (note the positive Estimate figures) use of *dubbing* than S-O, although to varying degrees, with Cntby again the most significantly different.

Table 11: Q16 by Sub-region

Analysis Of Initial Parameter Estimates

parameter		DF	Estimate	Std Err	ChiSquare	p-value
intercept	0	0.00	0.0000	.	.	
item	doubling	1	1.7918	0.7638	5.5035	0.0190
item	dubbing	1	-1.2993	0.6513	3.9792	0.0461
item*region2	doubling, 1	1	23.5736	131502.510	0.0000	0.9999
item*region2	doubling, 2	1	23.5736	131502.511	0.0000	0.9999
item*region2	doubling, 3	1	0.3483	1.0687	0.1062	0.7445
item*region2	doubling, 4	1	0.6931	1.0607	0.4271	0.5134
item*region2	doubling, 5	1	-0.1823	1.0878	0.0281	0.8669
item*region2	doubling, 6	1	-2.7726	0.9014	9.4612	**0.0021**
item*region2	doubling, 7	1	-2.0149	1.0165	3.9289	**0.0475**
item*region2	doubling, 8	1	-1.7918	1.1180	2.5683	0.1090
item*region2	doubling, 9	1	-4.6250	1.2815	13.0258	**0.0003**
item*region2	doubling, 10	1	0.4055	1.3017	0.0970	0.7554
item*region2	doubling, 11	0	0.0000	0.0000	.	.
item*region2	dubbing, 1	1	-0.3102	1.2745	0.0592	0.8077
item*region2	dubbing, 2	1	-24.0660	131502.576	0.0000	0.9999
item*region2	dubbing, 3	1	0.9808	0.8001	1.5028	0.2202
item*region2	dubbing, 4	1	-0.1358	0.8197	0.0274	0.8684
item*region2	dubbing, 5	1	0.9628	0.8758	1.2085	0.2716
item*region2	dubbing, 6	1	2.8034	0.8543	10.7685	**0.0010**
item*region2	dubbing, 7	1	1.9924	0.9614	4.2952	**0.0382**
item*region2	dubbing, 8	1	2.9087	1.2745	5.2090	**0.0225**
item*region2	dubbing, 9	1	4.1325	1.2178	11.5150	**0.0007**
item*region2	dubbing, 10	1	0.4520	0.9489	0.2269	0.6338
item*region2	dubbing, 11	0	0.0000	0.0000	.	.
scale	0	1.00	0.0000	.	.	

As with the Main Regions, the SAS program compares each region with S-O, and does not allow direct comparisons between other pairs of regions, e.g. Sub-region 6 and Sub-region 9. In theory, it is possible to ask for contrast statements in the same way as for the Main Regions. There are 90 possible contrast statements for each form, so for this set of data with two forms, there are 180 possible statements. Some questions have 7 or more forms, so it is clear that it is not practical to ask for contrast statements for all the possibilities. Even when we requested contrast statements for crucial pairs of Sub-regions, the program often failed to produce results. However, it was able to produce results for the following sample pairs for the *doubling/dubbing* data:

Table 12: Contrast Statement Results for Q16 Sub-regions

Contrast	DF	ChiSquare	p-value	Type
1 -2 for doubling	1	-0.0000	.	LR
4 -5 for doubling	1	0.6584	0.4171	LR
4 -6 for doubling	1	23.6263	**0.0001**	LR
6 -7 for doubling	1	0.8383	0.3599	LR
7 -8 for doubling	1	0.0446	0.8327	LR
9 -10 for doubling	1	22.2726	**0.0001**	LR
4 -5 for dubbing	1	2.0441	0.1528	LR
4 -6 for dubbing	1	20.1399	**0.0001**	LR
9 -10 for dubbing	1	13.5617	**0.0002**	LR

The significant contrasts have been highlighted. It will be seen that the places of significant contrast are between regions 4 and 6 (CNIs and Wn) and between 9 and 10 (Chch and T-CL). Although there are differences between sub-regions 4 and 5, particularly with respect to *dubbing*, they are not significant: HB-W behaves like the Northern Region in this set of data. The non-result for Sub-regions 1 and 2 is an example of what happens if both regions are the same (both report *doubling* in every school).

Because of the limitations of the program in handling data like ours, it was seldom possible to produce contrast statements for Sub-regions.

Q16: The Island Co-variate

Table 13 compares the distribution of *doubling* and *dubbing* in the North Island (coded as 1) compared with the South Island (coded as 2). The lines of interest are those with “item*island” in the parameter column. The first shows that there is significantly more use of *doubling* in the North Island than the South Island. The third line shows that there is significantly less use of *dubbing* in the North Island than the South Island. However, the significance figures differ considerably in magnitude.

Table 13: Q16 by Island

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.		
item	doubling	0.0351	0.2649	-0.4842	0.5544	0.1324	0.8946
item	dubbing	0.3909	0.2700	-0.1383	0.9200	1.4478	0.1477
item*island	doubling, 1	1.0779	0.3577	0.3768	1.7790	3.0133	**0.0026**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.7163	0.3421	-1.3868	-0.0457	-2.094	**0.0363**
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Q16: The Catholic Co-variate

Table 14: Q16 by Catholic

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	-0.7885	0.5394	-1.8456	0.2687	-1.462	0.1438
item	dubbing	1.4663	0.6405	0.2110	2.7217	2.2893	0.0221
item*catholic	doubling, 1	1.6835	0.5727	0.5610	2.8059	2.9396	**0.0033**
item*catholic	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	dubbing, 1	-1.6655	0.6641	-2.9672	-0.3638	-2.508	**0.0122**
item*catholic	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Table 14 compares the distribution of *doubling* and *dubbing* in Catholic (coded 2) and non-Catholic (coded 1) schools. The line for “doubling, 1” thus measures the use of *doubling* in non-Catholic schools compared with Catholic schools. It tells us that there is significantly more *doubling* in non-Catholic schools. The line for “dubbing, 1” tells us that there is significantly less *dubbing* in non-Catholic schools (or, to put it the other way round, significantly more *dubbing* in Catholic schools.)

The Urban/Rural Co-variate

Table 15 compares the distribution of *doubling* and *dubbing* in urban (coded 2) and rural (coded 1) schools. It tells us that there is significantly more *doubling* in rural schools, and significantly less *dubbing* in rural schools (or, the other way round, significantly more *dubbing* in urban schools).

Table 15: Q16 by Urban/Rural

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	0.1018	0.2607	-0.4092	0.6128	0.3904	0.6962
item	dubbing	0.5199	0.2692	-0.0078	1.0475	1.9310	0.0535
item*urb_rur	doubling, 1	1.0921	0.3649	0.3770	1.8073	2.9933	**0.0028**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-0.9937	0.3488	-1.6773	-0.3100	-2.849	**0.0044**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Interrelations between Co-variates

After these investigations of the basic variables in the study, questions often arose as to whether these variables were independent or inter-related. We know from statistical analysis that there is a tendency for the Northern Region to have more low decile schools, and for the Central Region to have more high decile schools. We thus need to ask whether the significant differences in relation to Decile seen in Table 8 above are to be explained by the distribution of school deciles in our sample across the regions. We can also ask whether the distribution of these forms across the two Islands is merely a reflection of the distribution across the Main Regions. The distribution of Catholic schools is not even across the Main Regions: by chance there are no Catholic schools in the Southern Region. Questions like these can also in theory be answered by the SAS program. For each of the forms in Q16, there was a significant correlation with five factors: Main Region, Island, Decile, Urban/Rural and Catholicity. (The Sub-region correlations for these forms are for the most part explained by the Main Region distribution, and given the difficulties for the SAS Program of handling our Sub-regions, it was seldom practicable to investigate interactions between Sub-region and the other factors.
A full analysis of the factor interactions for these forms involves making 10 separate investigations, as shown in Table 16:

Table 16: Factor interactions for doubling and dubbing

	Urban/rural	Catholicity	Decile	Island	Main Region
Main Region (MR)	4	3	2	1	
Island	7	6	5		
Decile	9	8			
Catholicity (Cath)	10				
Urban/Rural (U/R)					

Main Region and Island interaction

Beginning at the right-hand side of this Table, we need to ask whether the fact that *doubling* and *dubbing* showed significant differences in terms of Island (Table

13) was dependent upon the distribution across Main Regions or not. Table 17 sets out the results of this investigation.

Table 17: Q16 by Island and Main Region

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.7918	0.7638	0.2948	3.2887	2.3460	0.0190
item	dubbing	-1.2993	0.6513	-2.5759	-0.0227	-1.995	0.0461
item*reg1	doubling, 1	0.5392	1.0318	-1.4831	2.5615	0.5226	0.6013
item*reg1	doubling, 2	-2.2166	0.8250	-3.8336	-0.5997	-2.687	**0.0072**
item*reg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*reg1	dubbing, 1	0.3461	0.8758	-1.3706	2.0627	0.3951	0.6928
item*reg1	dubbing, 2	2.2484	0.7347	0.8083	3.6884	3.0601	**0.0022**
item*reg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*is	doubling, 1	0.2530	0.4609	-0.6503	1.1564	0.5490	0.5830
item*is	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*is	dubbing, 1	-0.1689	0.4982	-1.1453	0.8075	-.3391	0.7345
item*is	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	doubling 1, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	doubling 2, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	doubling 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	doubling 3, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	dubbing 1, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	dubbing 2, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	dubbing 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*rg1*is	dubbing 3, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

First we consider the figures below the heavy lines. There is nothing but zeros. This is expected when two co-variates are highly correlated, like Main Region and Island. It means that we can ignore the last group of lines, and consider the first two groups of figures. (If there had been any non-zero figure, another calculation would have been necessary.)

The table rows immediately above the top heavy line show the figures for the distribution by Main Region when distribution by Island has been taken into account. The lines between the heavy lines show the distribution by Island when the distribution by Main Region has been taken into account.

If we consider the first group of figures, the lines for *doubling*, 1 and *dubbing*, 1 show that the p-values comparing the Northern and Southern Regions are not significant for either *doubling* or *dubbing*. There is thus no significant variation between these regions which has to be accounted for by their distribution across Main Regions when their distribution by Island has been taken into account. (These regions were not significantly different when Main Region was considered on its own, either, recall Table 9, where the p-values were 0.3908 for *doubling*, 1 and 0.8058 for *dubbing*, 1. We expect that the p-values will change,

since we are not measuring the same thing. However, the fact that they change relatively little is a sign that the Island distribution has very little capacity to explain this data in comparison with Main Region.) However, this is not the situation when we compare the Central and Southern Regions. There the figures for both *doubling* and *dubbing* show that there is a significant amount of their distribution which has to be accounted for by Main Region when Island has been taken into account. (The corresponding p-values from Table 9 were *doubling,* 2 – 0.0084 and *dubbing,* 2 – 0.0018.) We also need contrast statements to compare the Northern and Central Regions when Island is taken into account. The p-values obtained from these were 0.0001 for both *doubling* and *dubbing*, i.e. unchanged from the p-values for Main Region alone.
The figures between the heavy lines show that there is no significant variation to be accounted for by Island when Main Region has been taken into account. Thus we can conclude that Main Region and Island are highly correlated variables for this set of data, but that Main Region is more important than Island in accounting for the distribution of both of these forms. In other words, *doubling* is more common in the North Island almost entirely because the Northern Region is in the North Island, and bigger than the Southern Region, where *doubling* is also the norm. *Dubbing* is more common in the South Island only because more of the Central Region is located in the South Island than in the North Island.

Main Region and Decile interaction

Next, we ask whether the fact that *doubling* is low decile and *dubbing* high decile is a reflection of the differing distribution of school deciles in the Main Regions in our sample.
The program produced the following figures showing the uneven distribution; the figures are the percentage of the total schools in each region which fall into the decile in question:

Table 18a: Decile distribution of schools across Main Regions

	1	2	3	4	5	6	7	8	9	10
Nthn	10.53	12.28	19.30	5.26	8.77	10.53	10.53	14.04	3.51	5.26
Cntrl	3.85	6.41	5.13	7.69	15.38	10.26	10.26	14.10	11.54	15.38
Sthn	7.14	14.29	7.14	0.00	14.29	14.29	7.14	14.29	14.29	7.14

It is easier to see the difference between the regions if we cluster the deciles into low decile (deciles 1 – 3), medium decile (4 – 7) and high decile (8 – 10). Table 18b presents the differences in this way:

Table 18b: Grouped decile distribution of schools across Main Regions

	Low decile	Medium decile	High decile
Northern Region	42.11	35.09	22.81
Central Region	15.39	43.59	41.02
Southern Region	28.57	35.72	26.33

Table 18b shows that in the Northern Region, low decile schools form the highest percentage, followed by medium decile; in the Central Region, the largest percentage of schools are medium decile, followed closely by high decile; in the southern region, medium decile schools form the largest percentage, with low decile schools next. The Southern Region has the most even distribution. (Note that medium-decile incorporates four deciles while high and low incorporate 3, which exaggerates the percentage of medium decile schools.) If we ignore decile 4 schools, (which was the smallest group in the sample), and put three deciles into each group, the numbers are:

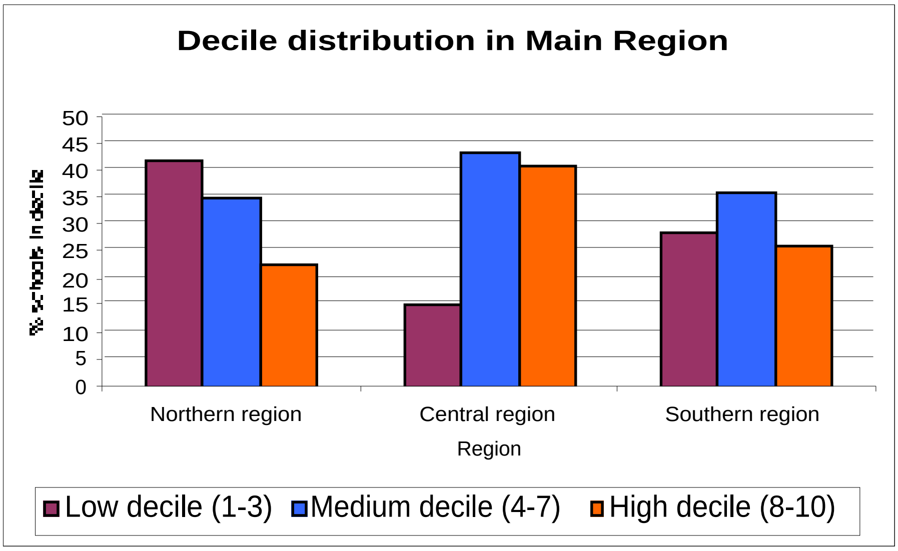
Table 18c: Decile distribution of schools across Main Regions ignoring decile 4

	Low decile	Medium decile	High decile
Northern Region	42.11	29.83	22.81
Central Region	15.39	36.24	41.02
Southern Region	28.57	22.72	26.33

Note that this reverses the order of high and medium deciles in the Central Region, and makes medium decile the least frequent in the Southern Region. (A good example of how to fiddle the results!)
For those who prefer to take in such information visually, here are two graphs of the way deciles are distributed in the three Main Regions. The first graphs the data from Table 18b. The second divides the deciles into two groups, low decile (1-5) and high decile (6-10).

Graphs 1: Decile distribution in the three Main Regions

a Deciles in three groups



b Deciles in two groups

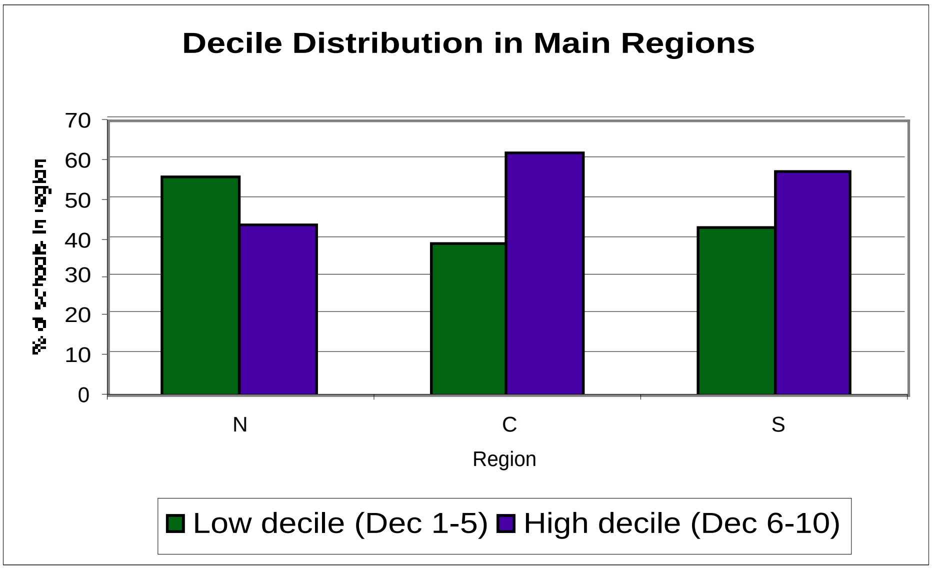


Table 19 provides statistics on the inter-relation between Decile and Main Region. We look first at the figures below the second heavy line, which relate to the interaction between Main Region and Decile. If there are significant figures in the p-value column here, (as there are for *dubbing*) this tells us that the effect of Decile on *dubbing* is significantly different from region to region. In order to assess the interaction between Decile and Main Region, it is then necessary to consider the effect of Decile in each region separately. The three tables 19a, b and c present those regional statistics.

None of the p-values in these three tables against the decile*item lines is significant. This means that Decile is not significant in accounting for the distribution of *dubbing* in any of the regions considered on its own, although the regions differ significantly in the extent to which Decile has an effect, and the way in which it has an effect. For instance, in the Northern Region schools are more likely to report *dubbing* as decile increases, but in the Southern Region, schools are less likely to report *dubbing* as decile increases. Given these figures, it is perhaps surprising that overall *dubbing* was significantly high decile.

Table 19: Q16 by Decile and Main Region

Analysis Of GEE Parameter Estimates – Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	4.0359	2.8413	-1.5329	9.6048	1.4205	0.1555
item	dubbing	1.3303	1.6514	-1.9063	4.5669	0.8056	0.4205
item*region1	doubling, 1	-0.7822	3.1379	-6.9323	5.3680	-.2493	0.8032
item*region1	doubling, 2	-3.8693	2.9043	-9.5616	1.8229	-1.332	0.1828
item*region1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*region1	dubbing, 1	-3.3773	1.7641	-6.8348	0.0803	-1.914	0.0556
item*region1	dubbing, 2	-1.0205	1.7838	-4.5167	2.4758	-.5721	0.5673
item*region1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
decile*item	doubling	-0.3463	0.3549	-1.0419	0.3494	-.9755	0.3293
decile*item	dubbing	-0.5724	0.2854	-1.1317	-0.0131	-2.006	**0.0449**
dec*itm*rg1	doubling, 1	0.2188	0.4141	-0.5928	1.0305	0.5284	0.5972
dec*itm*rg1	doubling, 2	0.2717	0.3658	-0.4452	0.9886	0.7428	0.4576
dec*itm*rg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
dec*itm*rg1	dubbing, 1	0.7497	0.3028	0.1562	1.3432	2.4756	**0.0133**
dec*itm*rg1	dubbing, 2	0.6614	0.3036	0.0664	1.2565	2.1785	**0.0294**
dec*itm*rg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	0.9920	.	.	.	.	.	

Table 19a: Dubbing by Decile in Northern Region

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	dubbing	-2.0348	0.6207	-3.2514	-0.8182	-3.278	0.0010
decile*item	dubbing	0.1746	0.1018	-0.0249	0.3740	1.7155	0.0862
scale	0.9960	.	.	.	.	.	

Table 19b: Dubbing by Decile in Central Region

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	dubbing	0.2986	0.6750	-1.0244	1.6216	0.4423	0.6582
decile*item	dubbing	0.0909	0.1038	-0.1126	0.2943	0.8752	0.3815
scale	1.0025	.	.	.	.	.	

Table 19c: Q16 by Decile in Southern Region

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	dubbing	1.2788	1.7863	-2.2223	4.7799	0.7159	0.4741
decile*item	dubbing	-0.5708	0.3058	-1.1701	0.0286	-1.867	0.0620
scale	0.9331	.	.	.	.	.	

In order to gain an overview of the relative importance of Decile and Main Region, it is useful to make another calculation, presented in Table 19d. This ignores the fact that for *dubbing*, the Regions differ in their decile patterns.

Table 19d: Q16 by Decile, Model 2

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	2.3664	0.8449	0.7105	4.0223	2.8010	0.0051
item	dubbing	-1.7091	0.9010	-3.4750	0.0567	-1.897	0.0578
decile*item	doubling	-0.1004	0.0759	-0.2492	0.0483	-1.323	0.1858
decile*item	dubbing	0.0717	0.0738	-0.0729	0.2163	0.9718	0.3312
item*region1	doubling, 1	0.7544	0.9062	-1.0218	2.5305	0.8324	0.4052
item*region1	doubling, 2	-2.0334	0.7753	-3.5529	-0.5139	-2.623	**0.0087**
item*region1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*region1	dubbing, 1	0.2235	0.7669	-1.2796	1.7266	0.2914	0.7707
item*region1	dubbing, 2	2.1259	0.7228	0.7093	3.5425	2.9413	**0.0033**
item*region1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	0.9999	.	.	.	.	.	

Contrast Statement Results for Table 19d:

Contrast	DF	ChiSquare	Pr>Chi	Type
1 –2 for doubling	1	36.1104	**0.0001**	LR
1 –2 for dubbing	1	24.6990	**0.0001**	LR

From the two rows immediately above the heavy line in 19d, we can see that the p-value for Decile is not significant for either form when Main Region is taken into account. From the rows below the heavy line, we can see that there are significant differences between the Central and Southern Regions after Decile is taken into account, and the Contrast Statements show that there are highly significant differences between the Northern and Central Regions for both *doubling* and *dubbing* when Decile is taken into account. These facts all point to the conclusion that Main Region is a more important factor than Decile in accounting for the distribution of both *doubling* and *dubbing*. In fact, the tendency for *doubling* to be low decile is largely a result of the fact that *doubling* is most common in the Northern Region, where there are a lot of low decile schools. Similarly, the tendency for *dubbing* to be high decile is the result of *dubbing* being common in the Central Region where there are a lot of high decile schools.

Main Region and Catholic interaction

Next we asked whether the distribution across Catholic and non-Catholic schools (Table 14) could be accounted for by the distribution according to Main Regions. The fact that Catholic schools are not evenly distributed across the Main Regions is demonstrated by the following table, where the figures are the percentage of Catholic and non-Catholic schools out of all the schools in that region:

Table 20: Distribution of Catholic Schools in Main Regions

	Northern	Central	Southern
Non-Catholic	92.86	84.42	100.00
Catholic	7.14	15.58	0.00

This variation arose purely by chance: our random selection process happened to choose more Catholic schools in the Central Region, and / or more Catholic schools in the Central Region agreed to help than in other regions.
Again, for those who prefer pictures, here is the graph corresponding to Table 20:

Graph 2: Distribution of Catholic Schools in the three Main Regions

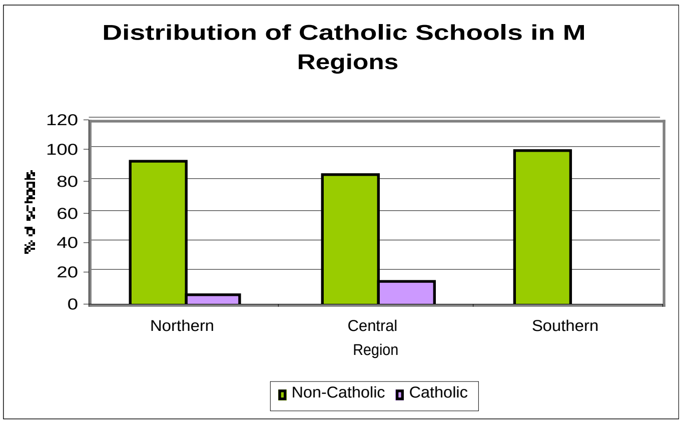


Table 21 (below) is interpreted in a parallel fashion to those above. We must look first at the figures below both the heavy lines, which show whether the Main Regions differ significantly in the effect of the Catholicity factor. It will be seen that there are no significant p-values, although there is some variation for both *doubling* and *dubbing* in the non-Catholic schools in the Northern Region. This means that we can ignore this interaction, and need to re-calculate the figures for the top two groups alone. (Because there are some non-zero figures in the bottom group, we cannot merely ignore the lowest lines, but must re-calculate the figures.) The second calculation is shown in Table 21a.

Table 21: Q16 by Catholic and Main Region, Model 1

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.5404	1.2608	-0.9307	4.0116	1.2218	0.2218
item	dubbing	0.5238	1.2621	-1.9499	2.9975	0.4150	0.6782
item*reg1	doubling, 1	-1.5404	1.6092	-4.6945	1.6136	-.9572	0.3384
item*reg1	doubling, 2	-2.6391	1.0702	-4.7365	-0.5416	-2.466	**0.0137**
item*reg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*reg1	dubbing, 1	-0.5238	1.6103	-3.6798	2.6323	-.3253	0.7450
item*reg1	dubbing, 2	1.8741	0.7086	0.4854	3.2629	2.6450	**0.0082**
item*reg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*cath	doubling, 1	0.9445	0.7116	-0.4502	2.3391	1.3273	0.1844
item*cath	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*cath	dubbing, 1	-1.7277	1.0769	-3.8383	0.3829	-1.604	0.1086
item*cath	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	doubling 1, 1	2.2744	1.4235	-0.5156	5.0644	1.5978	0.1101
item*r1*cth	doubling 1, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	doubling 2, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	doubling 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	doubling 3, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	dubbing 1, 1	0.5238	1.5060	-2.4279	3.4754	0.3478	0.7280
item*r1*cth	dubbing 1, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	dubbing 2, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	dubbing 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*r1*cth	dubbing 3, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Table 21a: Doubling by Catholic and Main Region, Model 2

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	0.9670	1.3217	-1.6235	3.5576	0.1847	0.8535
item	dubbing	0.1756	0.9509	-1.6882	2.0394	0.2201	0.8258
item*reg1	doubling, 1	0.2526	1.1480	-1.9974	2.5026	-2.408	**0.0160**
item*reg1	doubling, 2	-2.5754	1.0696	-4.6717	-0.4791	0.0129	0.9897
item*reg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*reg1	dubbing, 1	0.0095	0.7321	-1.4254	1.4443	2.6782	**0.0074**
item*reg1	dubbing, 2	0.7316	0.4644	1.8947	0.7074	0.5081	3.2813
item*reg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*cath	doubling, 1	1.5179	0.8147	-0.0788	3.1146	1.8632	0.0624
item*cath	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*cath	dubbing, 1	-1.3796	0.6862	-2.7246	-0.0346	-2.010	**0.0444**
item*cath	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	0.9786	.	.	.	.	.	

Contrast Statement Results for Table 21a

Contrast	DF	ChiSquare	Pr>Chi	Type
1 -2 for doubling	1	37.6560	**0.0001**	LR
1 -2 for dubbing	1	25.2834	**0.0001**	LR

This shows that the Catholic effect for *doubling* is not the same as that for *dubbing* (there is only one significant figure below the heavy line, for *dubbing*) and so we need to consider each form in turn.

For *doubling*, there are significant differences between the Northern and Southern Regions when Catholicity is taken into account, and also between the Northern and Central Regions, but not between the Central and Southern Regions. (Recall that when Main Region is considered alone, the Northern and Southern Regions do not contrast, but the Central and Southern Regions do.) The fact that the patterns of regional differences change in this way shows that the Catholic factor has a considerable impact on the distribution, but there are still important regional differences. If we look below the heavy line, we see that the Catholic factor is not significant when Main Region differences are taken into account. This tells us that, to a large extent, the apparent correlation between *doubling* and non-Catholic schools is just a reflection of the fact that our survey included very few Catholic schools in the regions where *doubling* predominates.

When we turn to *dubbing*, the regional contrasts are again different from the original calculations. The significant contrasts when Catholicity is taken into account are between the Northern and Central Regions and the Northern and Southern Regions (not Central and Southern). When we look at the *dubbing* figure below the heavy line, we can see that the Catholic factor is still just significant when Main Regions are taken into account. Thus for *dubbing*, we cannot simply dismiss the correlation with Catholic schools as a result of the high number of Catholic schools in the Central Region. Catholicity is an influential factor for *dubbing* in its own right.

Main Region and Urban/Rural interaction

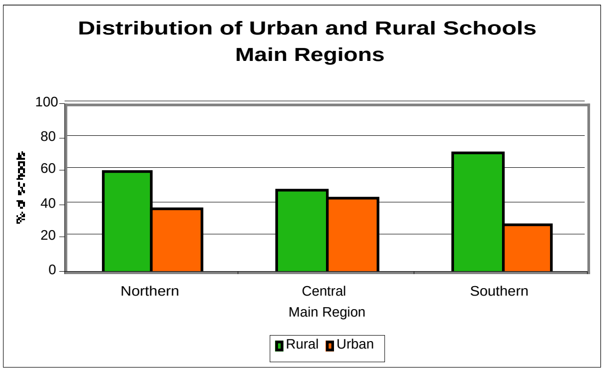
Next, it was necessary to ask whether the fact that the urban / rural factor appeared to be significant when taken alone (Table 15) is merely a reflection of the fact that urban schools are not evenly distributed across the three regions. The figures showing this uneven distribution are in the following table, where the figures are the percentage of schools in each region which are either urban or rural:

Table 22: Distribution of Urban and Rural Schools across Main Regions

	Northern	Central	Southern
rural	62.50	54.05	71.43
urban	37.50	45.95	28.57

This unevenness is almost certainly merely a reflection of the fact that the Central Region contains two major urban centres, which dominate the statistics for that region. Although the Northern Region contains both Auckland and Hamilton, Hamilton was considerably under-represented in our study, with only two of the desired 6 schools agreeing to participate.
For those who prefer the graph, here it is:

Graph 3: Distribution of Urban and Rural schools in the three Main Regions



The first table investigating the interaction of these two variables is Table 23. Because none of the figures below both the heavy lines is significant, the calculation was re-done, eliminating the comparison of both factors together. These figures are shown in Table 23a.
The contrasts between the Northern and Central Regions and the Central and Southern Regions are still significant for both *doubling* and *dubbing* when the Urban / Rural distribution is taken into account (from the rows above the heavy line and the contrast statements). The figures below the heavy line show that the Urban / Rural differences are still significant when the Main Region distribution is taken into account. This shows that both of these factors are important in accounting for the distribution of *doubling* and *dubbing*. *Doubling* is more likely in rural schools and *dubbing* is more likely in urban schools.

Between them, these four investigations show that Main Region is the dominant factor determining the distribution of *doubling* and *dubbing*, but that the Urban / Rural factor also plays a part. The significant figures for Island and Decile produced by the independent analysis of each variable are largely a result of the uneven way in which those variables are distributed across the Main Regions. The Catholic factor is important for *dubbing*, but not for *doubling*.

Table 23: Q16 by Urban/Rural and Main Region

Analysis Of GEE Parameter Estimates – Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.0986	1.1547	-1.1646	3.3618	0.9514	0.3414
item	dubbing	-1.0986	1.1547	-3.3618	1.1646	-.9514	0.3414
item*reg1	doubling, 1	1.1527	1.3733	-1.5389	3.8443	0.8393	0.4013
item*reg1	doubling, 2	-2.1203	1.2184	-4.5082	0.2677	-1.740	0.0818
item*reg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*reg1	dubbing, 1	0.6131	1.2391	-1.8154	3.0416	0.4948	0.6207
item*reg1	dubbing, 2	2.6391	1.2392	0.2102	5.0679	2.1296	**0.0332**
item*reg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*u_r	doubling, 1	1.0986	1.5635	-1.9657	4.1630	0.7027	0.4823
item*u_r	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*u_rr	dubbing, 1	-0.2877	1.3994	-3.0305	2.4551	-.2056	0.8371
item*u_r	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	doubling 1, 1	-0.5465	1.8781	-4.2276	3.1345	-.2910	0.7710
itm*rg1*u/r	doubling 1, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	doubling 2, 1	0.2253	1.6425	-2.9940	3.4446	0.1372	0.8909
itm*rg1*u/r	doubling 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	doubling 3, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	doubling 3, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	dubbing 1, 1	-0.8023	1.5367	-3.8142	2.2095	-.5221	0.6016
itm*rg1*u/r	dubbing 1, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	dubbing 2, 1	-0.8473	1.5050	-3.7969	2.1024	-.5630	0.5734
itm*rg1*u/r	dubbing 2, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	dubbing 3, 1	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
itm*rg1*u/r	dubbing 3, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Next, we need to see how the Island factor patterns against the three non-regional factors, Decile, Catholicity and Urban / Rural. Some short-cuts are taken in displaying the remainder of the data, on the assumption that enough examples have already been given.

Table 23a: Q16 by Urban/Rural and Main Region, Model 2

parameter		Est	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.0418	0.8174	-0.5603	2.6439	1.2745	0.2025
item	dubbing	-0.5957	0.7146	-1.9963	0.8049	-.8336	0.4045
item*region1	doubling, 1	0.9357	0.9614	-0.9487	2.8201	0.9732	0.3305
item*region1	doubling, 2	-1.9805	0.8246	-3.5967	-0.3643	-2.402	**0.0163**
item*region1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*region1	dubbing, 1	0.0920	0.7513	-1.3804	1.5644	0.1224	0.9026
item*region1	dubbing, 2	2.0979	0.7322	0.6629	3.5330	2.8653	**0.0042**
item*region1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	doubling, 1	1.1841	0.4218	0.3575	2.0108	2.8075	**0.0050**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-1.0742	0.4060	-1.8701	-0.2784	-2.646	**0.0082**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0163	.	.	.	.	.	

Contrast Statement Results for Table 23a

Contrast	DF	ChiSquare	Pr>Chi	Type
1 –2 for doubling	1	38.2918	0.0001	LR
1 –2 for dubbing	0	26.2947	0.0001	LR

Island and Decile interaction

First, we consider the interaction between Island and Decile. The Deciles are not evenly distributed between the two Islands, as the following tables show.

Table 24: The distribution of deciles between the Islands

Decile	1	2	3	4	5	6	7	8	9	10
North Island	6.0	8.0	8.0	4.0	7.33	5.33	4.67	8.67	4.0	6.0
South Island	0.67	2.0	2.67	2.0	5.33	5.33	5.33	5.33	4.67	4.67

The differences are clearer if deciles are grouped:

Table 24a: The distribution of Decile groups between the Islands

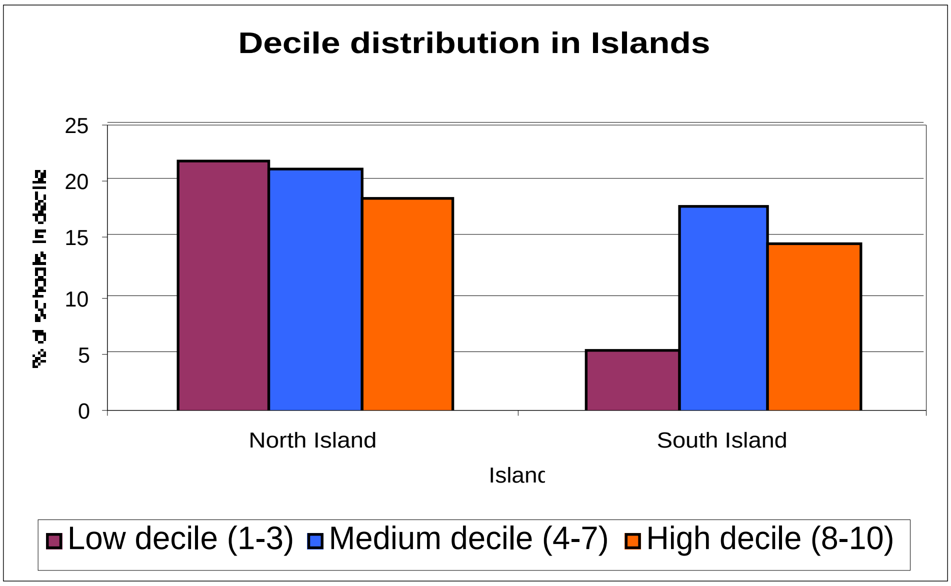
	Low decile (1-3)	**Medium decile (4-7)**	**High decile (8-10)**
North Island	22	21.33	18.67
South Island	5.34	17.99	14.67

The discrepancy between the Islands is seen most clearly in the low decile schools, which are concentrated in the North Island. (Given the fact that the North Island has 60% of the schools and the South Island 40%, if the deciles were completely evenly distributed, we would expect the North Island to have 18% of low and high decile schools, and the South Island to have 12%.)

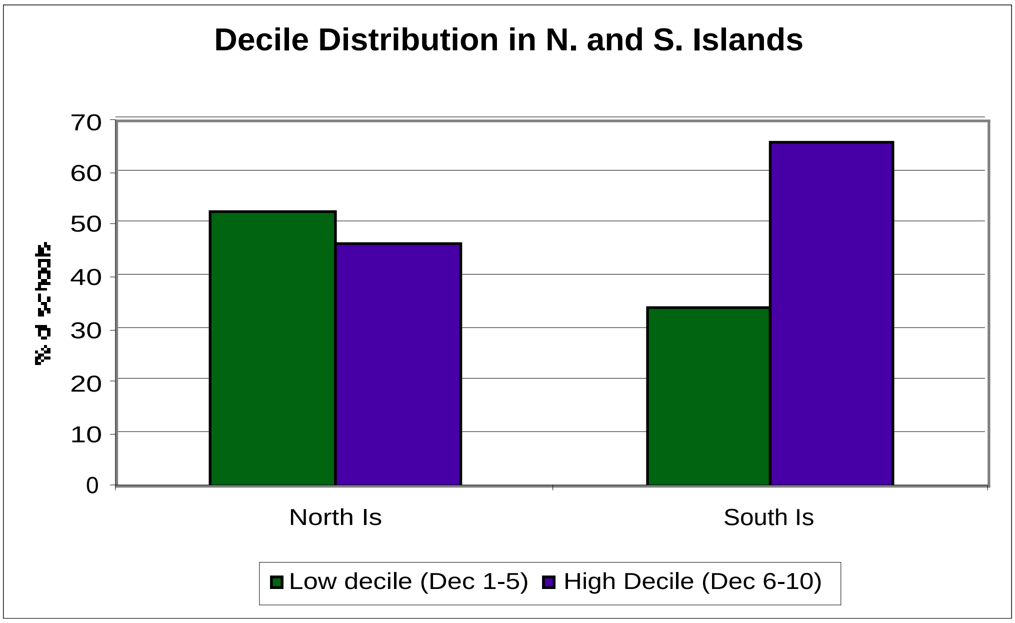
Two graphs of these figures are in Graph 4 below. The first divides the deciles into three groups, with a bigger middle group. The second divides them into two equal groups, as for the comparable Main Region graphs.

Graphs 4: Decile distribution in the North and South Islands

a Deciles in three groups



b Deciles in two groups



These uneven distributions have an impact on the *doubling* and *dubbing* data. The initial calculation showed that for *dubbing*, the Decile distribution was different in the two Islands. When the calculations were made for each Island separately, they showed that *dubbing* is significantly high decile in the North Island, but had a slight tendency to be low decile in the South Island. (Note that these tendencies are the opposite of those expected.) This almost certainly reflects the fact that in the Northern Region, it was primarily the high decile schools which reported *dubbing*, reflecting the migration of high decile families between Auckland and Wellington or Christchurch. To get an overall picture of the relative importance of Decile and Island, we ignore these differences, and consider the p-values in Table 25:

Table 25: Q16 by Decile and Island, Model 2

parameter	Estimate	Std	Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	1.0704	0.5199	0.0515	2.0893	2.0590	0.0395
item	dubbing	-0.3216	0.4662	-1.2353	0.5921	-.6899	0.4903
item*island	doubling, 1	0.9596	0.3716	0.2312	1.6880	2.5822	**0.0098**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.6001	0.3557	-1.2972	0.0971	-1.687	0.0916
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
decile*item	doubling	-0.1596	0.0671	-0.2911	-0.0282	-2.380	**0.0173**
decile*item	dubbing	0.1104	0.0606	-0.0084	0.2291	1.8214	0.0685
scale	1.0004	.	.	.	.	.	

Once more, the asymmetrical pattern of significant p-values alerts us to the fact that *doubling* and *dubbing* are different in their relation to these two factors. For *doubling*, even when its low decile tendency is taken into account, it is still significantly a North Island form. At the same time, when the North Island tendency is taken into account, it is still significantly low decile. The original p-value for Decile alone was 0.0040, and the original p-value for Island alone was 0.0026. This suggests that Island has a greater capacity to explain the Decile correlation than Decile has to explain the Island correlation. Thus Island appears to be a stronger factor than Decile in accounting for *doubling*, but both are important.

For *dubbing*, the Island correlation is not significant when Decile is taken into account, and neither is Decile significant when Island is taken into account. The original p-values for these factors taken alone were 0.0287 for Decile and 0.0363 for Island, and we can thus see that the change to the p-value for Decile is slightly smaller than the change to the p-value for Island. However, there is little to choose between these factors: either can explain the other to a significant degree.

Island and Catholic interaction

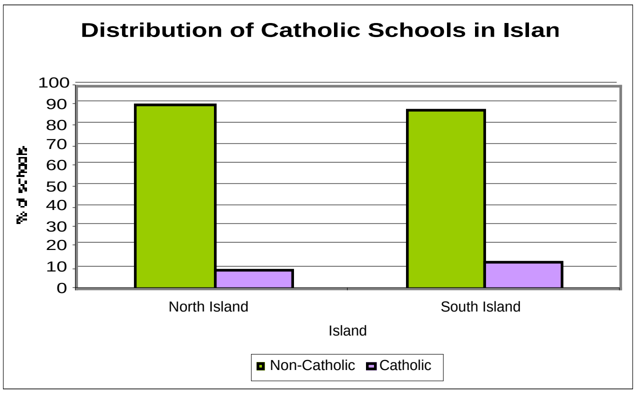
Next we consider Island and Catholicity. Catholic schools are not evenly distributed between the two Islands. The following table shows the discrepancies:

Table 26: The distribution of Catholic Schools between the Islands

	North Island	**South Island**
Non-Catholic	62.60	37.40
Catholic	56.25	43.45

The figures represent the percentage of Catholic or Non-Catholic schools which are found in each Island. If the schools were evenly distributed, a 60%-40% split between the Islands would be expected. It will be seen that there are more Catholic Schools than predicted in the South Island, and fewer in the North Island. Graph 5 is a pictorial representation of the difference.

Graph 5: Distribution of Catholic Schools in the two Islands



For *doubling* and *dubbing*, there is no necessity to consider the Table equivalent to Table 23, and so we are concerned with the figures in Table 27:

Table 27: Q16 by Island and Catholicity, Model 2

parameter		Est.	Std Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	-1.4733	0.5854	-2.6206	-0.3259	-2.517	0.0118
item	dubbing	1.9512	0.7045	0.5704	3.3320	2.7696	0.0056
item*island	doubling, 1	1.1096	0.3750	0.3745	1.8447	2.9586	**0.0031**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.7768	0.3557	-1.4739	-0.0797	-2.184	**0.0289**
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	doubling, 1	1.7327	0.5761	0.6035	2.8619	3.0074	**0.0026**
item*catholic	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	dubbing, 1	-1.6707	0.6796	-3.0027	-0.3388	-2.458	**0.0140**
item*catholic	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0010	.	.	.	.	.	

For both *doubling* and *dubbing*, the figures show that Island is a significant factor when Catholicity is taken into account, and Catholicity is a significant factor when Island is taken into account. For *doubling*, the p-values for the factors alone are Island: 0.0026, Catholic: 0.0033; for *dubbing* they are Island: 0.0363, Catholic:

0.0122. In both cases, there is a slightly greater change to the p-value for Island than the p-value for Catholicity (note that the Catholic p-value for *doubling* is smaller, i.e. more significant when Island is taken into account). This suggests that for both forms, the Catholic correlation is slightly more important than the Island correlation, but neither explains the other to any great extent, and we need both to account for the distribution.

Island and Urban/Rural interaction

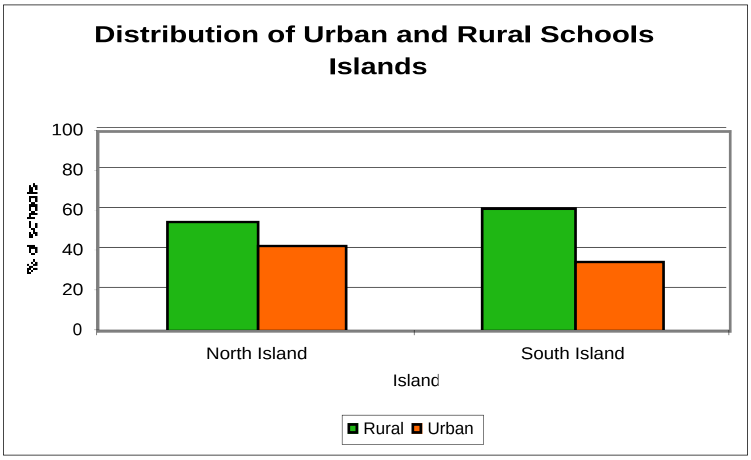
Lastly in the Island comparisons, is the interaction with the Urban / Rural factor. Urban and rural schools are not evenly distributed between the two Islands. The biggest discrepancy is in the South Island, where there are fewer urban schools and more rural schools than the neutral distribution, which would reflect the 60% rural and 40% urban mix of our total sample. The North Island has a tendency in the opposite direction, but it is less pronounced.

Table 28: Distribution of Urban and Rural schools in the North and South Islands

	Rural	Urban
North Island	56.04	43.96
South Island	64.81	35.19

These discrepancies are shown visually in Graph 6.

Graph 6: Distribution of Urban and Rural schools in the two Islands



Again, it is not necessary to consider the table equivalent to Table 23, but only Table 29. This shows that for both *doubling* and *dubbing*, each of these factors is significant when the other is taken into account. The original p-values for these factors for *doubling* are Island: 0.0026, Urban / Rural 0.0028, and for *dubbing*, Island: 0.0363 and Urban / Rural 0.0044. It will be seen that for *doubling*, both p-values are much more significant in Table 29 than they were on their own. This reflects the fact that this combination of factors is surprising. The expected correlation for the North Island is urban, reflecting the large number of urban centres in that Island. The expected correlation in the South Island is rural. This means that these two factors are unlikely to be connected. They are therefore both important. For *dubbing*, the p-values for the factors also get smaller, though to a less dramatic extent. Again, this shows that these two factors are not connected, and both are important.

Table 29: Q16 by Urban/Rural and Island, Model 2

parameter		Est	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	-0.8009	0.3778	-1.5414	-0.0605	-2.120	0.0340
item	dubbing	1.1483	0.3937	0.3766	1.9199	2.9166	0.0035
item*urb_rur	doubling, 1	1.3331	0.3928	0.5633	2.1029	3.3941	**0.0007**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-1.1303	0.3675	-1.8506	-0.4101	-3.076	**0.0021**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	doubling, 1	1.3177	0.3974	0.5387	2.0966	3.3155	**0.0009**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.8818	0.3702	-1.6074	-0.1562	-2.382	**0.0172**
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0064	.	.	.	.	.	

Next we consider the interaction between Decile and the other non-regional factors.

Decile and Catholic interaction

First, we consider Decile and Catholicity. Catholic schools are not evenly distributed across the 10 deciles: there are no very low decile Catholic schools in our sample, and overall, they have a tendency to be high decile.

Table 30: The distribution of Catholic Schools across the deciles

Decile	1	2	3	4	5	6	7	8	9	10
Non-Catholic	6.8	9.52	10.88	4.08	11.56	8.84	8.84	12.93	6.8	8.84
Catholic	0	0	0	2.04	1.36	2.04	1.36	1.36	1.36	1.36

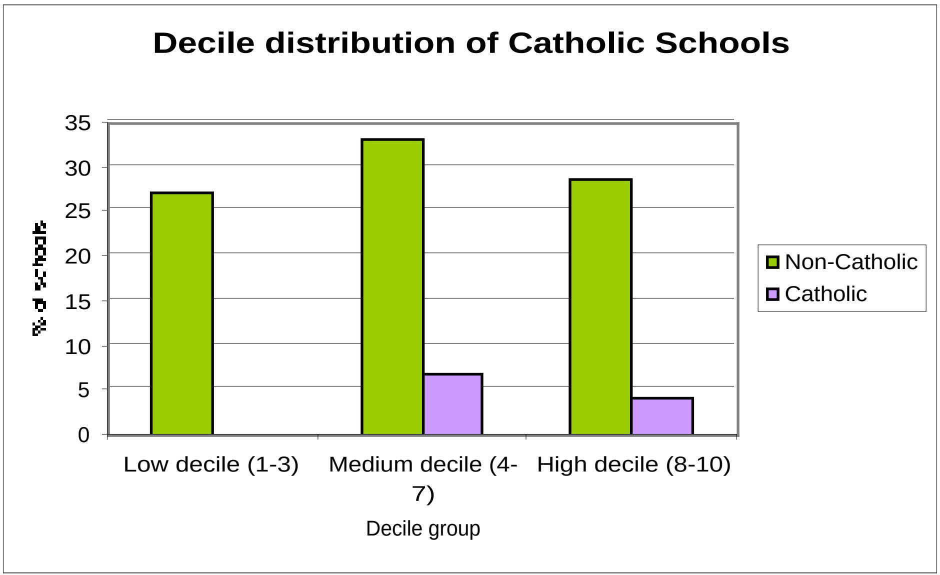
The table gives the percentage of total schools which fall into each category. The uneven distribution is shown even more clearly if the deciles are grouped, but note that there are more decile bands in the Medium decile group:

Table 30a: The distribution of Catholic Schools in decile groups

	Low decile (1-3)	**Medium decile (4-7)**	**High decile (8-10)**
Non-Catholic	27.2	33.32	28.57
Catholic	0	6.8	4.08

For those who prefer the graphs, here is the graph corresponding to Table 30a.

Graph 7: Distribution of Catholic and non-Catholic schools across the Deciles



For *doubling* and *dubbing*, there were no significant figures below the two heavy lines in the table equivalent to Table 23, so we need only consider Table 31:

Table 31: Q16 by Decile and Catholicity, Model 2

parameter		Est.	Std Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	0.1709	0.7004	-1.2019	1.5437	0.2440	0.8073
item	dubbing	0.7252	0.7523	-0.7493	2.1997	0.9640	0.3351
decile*item	doubling	-0.1451	0.0658	-0.2740	-0.0162	-2.206	**0.0274**
decile*item	dubbing	0.1125	0.0603	-0.0057	0.2307	1.8660	0.0620
item*catholic	doubling, 1	1.5750	0.5777	0.4426	2.7073	2.7261	**0.0064**
item*catholic	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	dubbing, 1	-1.5626	0.6737	-2.8830	-0.2423	-2.320	**0.0204**
item*catholic	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	0.9994	.	.	.	.	.	

Doubling and *dubbing* are again different in relation to these features. For *doubling*, Decile is still significant when the non-Catholic tendency is taken into account, and the non-Catholic tendency is still significant when Decile is taken into account. Thus, although these two factors could potentially explain each other, they do not to any great extent. The p-values for these factors alone were Decile: 0.0040 and Catholicity: 0.0033, so we can see that there has been a greater impact on the Decile figure than the Catholicity figure. This suggests that Catholic is probably more important than Decile in accounting for the schools that reported *doubling*.
For *dubbing*, the p-value for Decile is not significant when Catholicity is taken into account, but the p-value for Catholicity is significant when Decile is taken

into account. (The original p-values for the factors alone were Decile: 0.0287 and Catholicity: 0.0122.) This suggests that to a large extent, the tendency for *dubbing* to be more common in Catholic schools accounts for its tendency to be a high decile form.

Decile and Urban/Rural interaction

Finally in this group, we consider the relationship between Decile and the urban / rural factor. The Deciles are not evenly distributed across urban and rural areas in our sample. Most of the highest decile schools are in urban areas, while rural areas contain most of the low decile schools, and fewer high decile schools.

Table 32: The distribution of deciles in urban and rural areas

Decile	1	2	3	4	5	6	7	8	9	10
Rural	4.14	6.90	8.97	2.76	8.28	6.90	4.83	11.03	3.45	2.07
Urban	2.76	3.45	2.07	2.76	4.14	3.45	5.52	3.45	4.83	8.28

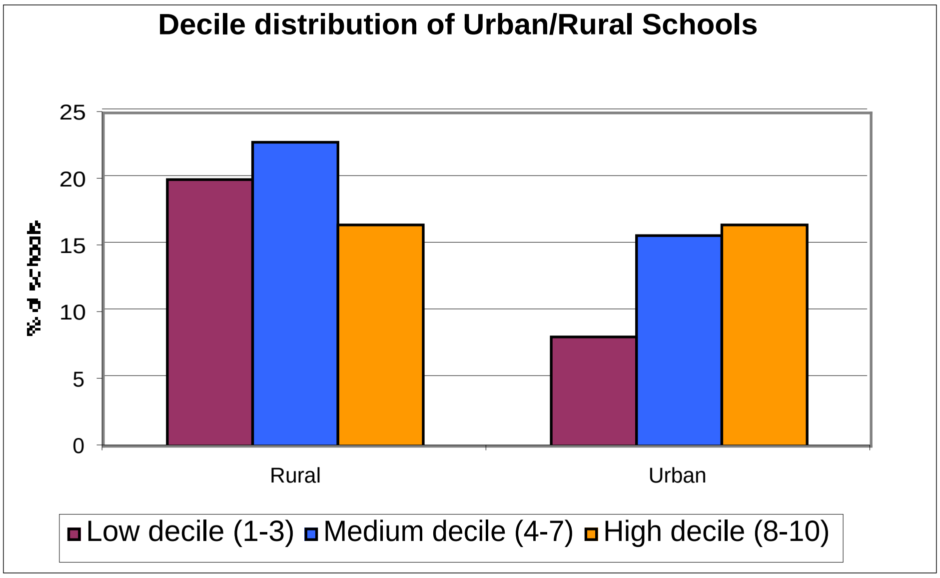
Again, the imbalance is shown more clearly if the deciles are grouped, but again note that the Medium group contains four bands, while the others have three:

Table 32a: The distribution of Urban and Rural Schools in decile groups

	Low decile (1-3)	**Medium decile (4-7)**	**High decile (8-10)**
Rural	20.01	22.77	16.55
urban	8.28	15.87	16.56

The graph corresponding to Table 32a is Graph 9.

Graph 8: Distribution of Deciles in Urban and Rural schools



For *doubling* and *dubbing*, it is again not necessary to consider the Table equivalent to Table 23, and we can confine ourselves to considering the data in Table 33.

Table 33: Q16 by Decile and Urban/Rural, Model 2

parameter		Est.	Std Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	1.1388	0.5104	0.1385	2.1390	2.2313	0.0257
item	dubbing	-0.1775	0.4659	-1.0906	0.7356	-.3810	0.7032
decile*item	doubling	-0.1581	0.0654	-0.2863	-0.0299	-2.416	**0.0157**
decile*item	dubbing	0.1088	0.0611	-0.0109	0.2285	1.7816	0.0748
item*urb_rur	doubling, 1	0.9168	0.3782	0.1755	1.6580	2.4240	**0.0154**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-0.8667	0.3545	-1.5614	-0.1719	-2.445	**0.0145**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	0.9926	.	.	.	.	.	

Doubling and *dubbing* again differ in their relation to these factors. For *doubling*, each of these factors is significant when the other is taken into account. The original p-values for the factors taken alone were Decile: 0.0040, Urban / Rural: 0.0028. It will be seen that the effect on both is of the same order. Thus we must conclude that both these factors are significant in accounting for the distribution of *doubling*.

For *dubbing*, however, Decile is not a significant factor when the Urban / Rural factor is taken into account, but the Urban / Rural factor is significant when Decile is taken into account. The original p-values for these factors are Decile: 0.0287, Urban / Rural: 0.0044. Thus Decile has an impact on the Urban / Rural factor, but the high decile tendency must be considered less important than the tendency for *dubbing* to be urban overall.

Catholic and Urban/Rural interaction

One final interaction investigation was undertaken: to see how Catholic and Urban / Rural interact in relation to this data. The uneven distribution of these two factors is demonstrated by the following table:

Table 34: The distribution of Catholic Schools in Urban and Rural areas

	Rural	**Urban**
Non-Catholic	64.29	35.71
Catholic	31.25	68.75

The figures are the percentage of the Catholic or Non-Catholic schools which are either rural or urban. It can be seen that a far higher proportion of Catholic schools are urban. Graph 9 corresponds to Table 34.

For *doubling* and *dubbing*, we need only consider Table 35:

Graph 9: Catholic and non-Catholic schools in Urban and Rural areas

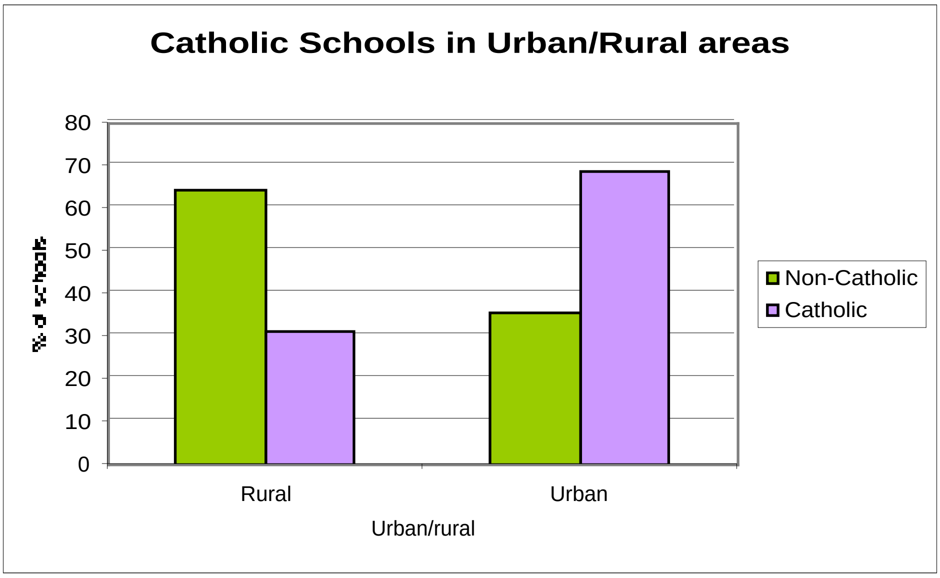


Table 35: Q16 by Catholic and Urban/Rural, Model 2

parameter		Est.	Std Err	Lower	Upper	Z	Pr>|Z|
intercept	0.0000	.	.	.	.	.	
item	doubling	-1.1061	0.5844	-2.2516	0.0394	-1.893	0.0584
item	dubbing	1.8134	0.6902	0.4607	3.1661	2.6275	0.0086
item*catholic	doubling, 1	1.5306	0.6021	0.3505	2.7107	2.5420	**0.0110**
item*catholic	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	dubbing, 1	-1.4498	0.6883	-2.7987	-0.1009	-2.107	**0.0352**
item*catholic	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	doubling, 1	0.8886	0.3848	0.1345	1.6427	2.3094	**0.0209**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-0.9234	0.3643	-1.6374	-0.2094	-2.535	**0.0112**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0020	.	.	.	.	.	

Once again, it will be seen that for both forms, each factor is significant when the other is taken into account. This tells us that the Catholic distribution is not explained by the Urban / Rural distribution, or vice versa, although since the correlations are the expected ones, they could have explained each other. This tells us that both factors are important.

Overview

For *doubling*, we have established the following relationships between the factors:

- ♦ The North Island connection for *doubling* is the result of the Main Region distribution, and Island is not an important factor for this form.

- Main Region largely explains the correlation with low decile for *doubling*, so Decile is not an important factor.
- Main Region is more important than Catholicity for *doubling*, but Catholicity cannot be totally disregarded.
- Main Region and Urban / Rural are both important. The strongest correlation is the difference between the Northern and Central Regions, and the Urban / Rural distribution has no visible impact on this.
- For Island and Decile, Island is stronger than Decile for *doubling*, but Decile is still significant.
- When Island and Catholicity are considered, they are also shown not to be related. Their predictive strength appears to be roughly equivalent.
- When Urban / Rural and Island are considered, they are shown not to be related. Their predictive strength seems to be about the same.
- For Decile and Urban / Rural, both have a capacity to explain the other, and their predictive strength is roughly equal.
- Catholic is stronger than Decile, but Decile is still significant.
- Catholic and Urban / Rural cannot explain each other, and are about equal as predictors.

This leaves us with some apparent contradictions in the relative strengths of the various factors affecting *doubling*. It is fairly clear that the Main Region factor is the most important, especially the contrast between the Northern and Central Regions, where the p-value was the strongest correlation recorded for this form, and this p-value remained unaltered when the other factors were considered. Both the Catholic and the Urban / Rural factors retain some explanatory value alongside the Main Region distribution, but Main Region accounted for both Island and Decile.

The contradictions in the comparative value of the Island factor arise from the fact that it is another way of looking at the regionalisation. In the absence of the Main Region factor, Island has some capacity to explain the regionalisation, and so it appears to be relatively important when considered alongside both the Urban / Rural factor and the Catholic factor. When we look at it in this light, as a (rather poor) representation of the regionalisation, the fact that it appears to be as strong as Urban / Rural and Catholic is just a reflection of the importance of the regionalisation. This allows us to say that, in the presence of the more explanatory Main Region factor, Island is less important than Urban / Rural or Catholic. However, Island is more important than Decile in explaining the distribution of *doubling*.

The same sort of argument allows us to understand why Decile, which seems to be the least important factor, should nonetheless appear to have the same sort of predictive power as the Urban / Rural factor when these are the only factors considered. Because the Main Regions, especially the Northern and Central Regions, have different Decile profiles, the Decile factor to some extent encapsulates the regional pattern. In the absence of either of the regional factors (Main Region and Island), the importance of the regional patterning shows up as supporting the Decile pattern. In the presence of either of the regional factors, Decile is unimportant.

There is no evidence from the study of any of the pairings which discriminates between the Urban / Rural factor and the Catholic factor in strength, and we must therefore conclude that they are equal in importance.

Thus for *doubling*, Main Region is the most important factor, followed by Catholic and Urban / Rural as second equal, with Island and Decile of very little importance.

For *dubbing*, the statistics showed the following relationships:

- The South Island connection for *dubbing* is the result of the Central Region location, and Island is not an important factor for this form.
- Main Region largely explains the correlation with high decile for *dubbing*, so Decile is not an important factor for this form.
- Both Main Region and Catholicity are important for *dubbing*. The strongest contrast is still that between the Northern and Central Main Regions.
- Main Region and Urban / Rural are both important. The strongest correlation is the difference between the Northern and Central Regions, and the Urban / Rural distribution has no visible impact on this.
- For Island and Decile, either can predict the other, so only one of these is needed. We cannot decide which one on the basis of these factors alone.
- When Island and Catholicity are considered, they are also shown not to be related. Their predictive strength appears to be roughly equivalent.
- When Island and Urban / Rural are considered, it was shown that these factors are not related to each other. Urban / Rural is more important than Island.
- For *dubbing*, the Urban / Rural factor is stronger than Decile.
- The Catholic factor is stronger than Decile.
- Catholic and Urban / Rural cannot explain each other, and are about equal as predictors.

There are fewer contradictions in the findings about the relative strength of the factors affecting *dubbing*. Again, Main Region is the most important factor, outweighing all the others because of the importance of the contrast between the Northern and Central Regions, which is again unaffected by any other factor considered.

Again, the Catholic factor and the Urban / Rural factors are roughly equal in importance, and next in rank after Main Region. (However, when the regionalisation is represented by the Island factor rather than Main Region, Urban / Rural outweighs Island in importance, while Catholic equals it in importance, which might suggest that Urban / Rural is a slightly stronger factor than Catholic.)

The least important factors are Island and Decile, and they probably fall in that order, because Catholic is equal to Island, but stronger than Decile. What that reflects is that Island is a better representation of the regionalisation than Decile. However, when just Island and Decile are considered together, there is little to choose between them.

Summary

It is important to note that, although the numbers produced by the statistical analysis help us to determine the relative strengths of the various factors, we need to use our understanding of what the factors are measuring to interpret the results. The picture for *doubling* and *dubbing* is complex: they are regionalised, but also affected by whether schools are in urban or rural areas (no doubt because the place of bicycles differs in those environments, and so too do the dangers of two people riding on one bicycle, and probably the likelihood of being caught doing it as well). It is less easy to understand why these forms should be affected by whether a school is Catholic or not, but the statistics show that we cannot discount this factor. For these forms, the Island factor is not important, being just a poor reflection of the regionalisation. *Doubling* and *dubbing*, unlike many other forms in our study, are not really linked to different social classes. The apparent link to social class is explained by the all-important regionalisation.

Basic Statistics when "Special" Schools are eliminated

It was mentioned earlier that there were a number of schools which had provided "rich" questionnaires, one that had provided a thin one, one which had lost a section of its questionnaire, two which provided thin questionnaires in relation to their size, and three which provided rich questionnaires in relation to their size. These schools were eliminated from the analysis, so that we could see to what extent these schools offering extreme levels of response might have coloured the results. (12 schools in all were eliminated on these various grounds.) The following tables show the effect of eliminating those schools. For ease of comparison, the crucial lines of the corresponding original tables are repeated below them.

Table 36: Doubling by Decile (excluding Special Schools)

Analysis Of GEE Parameter Estimates – Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.5866	0.4416	0.7211	2.4522	3.5930	0.0003
item	dubbing	-0.8637	0.3953	-1.6385	-0.0888	-2.185	0.0289
decile*item	doubling	-0.1667	0.0665	-0.2969	-0.0364	-2.508	**0.0121**
decile*item	dubbing	0.1342	0.0632	0.0104	0.2580	2.1254	**0.0336**
scale	0.9995	.	.	.	.	.	

Extract from Table 8: Q16 by Decile

parameter		Est.	StdErr	Lower	Upper	Z	p-value
decile*item	doubling	-0.1814	0.0631	-0.3049	-0.0578	-2.876	**0.0040**
decile*item	dubbing	0.1290	0.0590	0.0134	0.2446	2.1875	**0.0287**

A comparison of the p-values in these two tables shows that when these special schools are eliminated, the correlations of *doubling* and *dubbing* with low and high decile respectively are still significant, but to a lesser degree. The change in the figure for *doubling* is quite marked.

Next the distribution across Main Regions was calculated. A comparison of the two tables below shows that eliminating the special schools has almost no effect on the significance figures for *doubling* and *dubbing* in relation to the Main Regions.

Table 37: Doubling by Main Region (excluding Special Schools)

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Est.	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	1.7918	0.7638	0.2948	3.2887	2.3460	0.0190
item	dubbing	-1.2993	0.6513	-2.5759	-0.0227	-1.995	0.0461
item*reg1	doubling, 1	0.6286	0.9250	-1.1843	2.4415	0.6796	0.4968
item*reg1	doubling, 2	-2.1190	0.7993	-3.6855	-0.5524	-2.651	**0.0080**
item*reg1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*reg1	dubbing, 1	-0.0617	0.7415	-1.5151	1.3917	-.0832	0.9337
item*reg1	dubbing, 2	2.1595	0.6992	0.7890	3.5300	3.0884	**0.0020**
item*reg1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Extract from Table 9: Q16 by Main Region

parameter		Est.	Std Err	Lower	Upper	Z	p-value
item*region1	doubling, 1	0.7922	0.9231	-1.0171	2.6016	0.8582	0.3908
item*region1	doubling, 2	-2.1019	0.7974	-3.6648	-0.5390	-2.636	**0.0084**
item*region1	doubling, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*region1	dubbing, 1	0.1771	0.7204	-1.2348	1.5890	0.2459	0.8058
item*region1	dubbing, 2	2.1711	0.6971	0.8049	3.5373	3.1147	**0.0018**
item*region1	dubbing, 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

The next two tables compare the distribution across the Islands:

Table 38: Doubling by Island (excluding Special Schools)

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	0.0351	0.2649	-0.4842	0.5544	0.1324	0.8946
item	dubbing	0.3909	0.2700	-0.1383	0.9200	1.4478	0.1477
item*island	doubling, 1	1.0147	0.3667	0.2960	1.7335	2.7671	**0.0057**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.8170	0.3529	-1.5086	-0.1253	-2.315	**0.0206**
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Extract from Table 13: Q16 by Island

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
item*island	doubling, 1	1.0779	0.3577	0.3768	1.7790	3.0133	**0.0026**
item*island	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*island	dubbing, 1	-0.7163	0.3421	-1.3868	-0.0457	-2.094	**0.0363**
item*island	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

A comparison of these tables shows that the changes to the p-values for *doubling* and *dubbing* in relation to Island are fairly small: it is still the case that *doubling* correlates strongly with the North Island, and *dubbing* correlates with the South Island, but much less strongly.

Table 39: Doubling by Catholic (excluding Special Schools)

Analysis Of GEE Parameter Estimates – Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	-1.0116	0.5839	-2.1560	0.1328	-1.733	0.0832
item	dubbing	1.3863	0.6455	0.1211	2.6514	2.1476	0.0317
item*cath	doubling, 1	1.8589	0.6169	0.6498	3.0680	3.0132	**0.0026**
item*cath	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*cath	dubbing, 1	-1.6207	0.6712	-2.9362	-0.3052	-2.415	**0.0157**
item*cath	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Extract from Table 14: Q16 by Catholic

parameter		Est.	Std Err	Lower	Upper	Z	p-value
item*catholic	doubling, 1	1.6835	0.5727	0.5610	2.8059	2.9396	**0.0033**
item*catholic	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*catholic	dubbing, 1	-1.6655	0.6641	-2.9672	-0.3638	-2.508	**0.0122**
item*catholic	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

It will be seen that the figures for the distribution between Catholic and non-Catholic schools are scarcely influenced at all by the elimination of these schools.

Table 40: Doubling by Urban/Rural (excluding Special Schools)

Analysis Of GEE Parameter Estimates –Empirical 95% Confidence Limits

parameter		Estimate	Std Err	Lower	Upper	Z	p-value
intercept	0.0000	.	.	.	.	.	
item	doubling	-0.1178	0.2805	-0.6676	0.4321	-.4198	0.6746
item	dubbing	0.4383	0.2868	-0.1239	1.0004	1.5281	0.1265
item*u/r	doubling, 1	1.3165	0.3837	0.5645	2.0685	3.4312	**0.0006**
item*u/r	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*u/r	dubbing, 1	-0.8845	0.3654	-1.6007	-0.1684	-2.421	**0.0155**
item*u/r	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
scale	1.0000	.	.	.	.	.	

Extract from Table 15: Q16 by Urban/Rural

parameter		Est.	Std Err	Lower	Upper	Z	p-value
item*urb_rur	doubling, 1	1.0921	0.3649	0.3770	1.8073	2.9933	**0.0028**
item*urb_rur	doubling, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
item*urb_rur	dubbing, 1	-0.9937	0.3488	-1.6773	-0.3100	-2.849	**0.0044**
item*urb_rur	dubbing, 2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

It will be seen that, although the figures here are still both significant, there are substantial changes to the p-values when the special schools are eliminated. The correlation of *doubling* with rural schools is much stronger, and the correlation of *dubbing* with urban schools is considerably less strong. Since the previous calculations suggested that urban / rural variation was important alongside Main Region variation, it is to be expected that this would remain true when the special schools are eliminated.

Table 41: Doubling by Sub-region (excluding Special Schools)

Analysis Of Initial Parameter Estimates

parameter		DF	Estimate	Std Err	ChiSquare	p-value
intercept	0	0.00	0.0000	.	.	
item	doubling	1	1.7918	0.7638	5.5035	0.0190
item	dubbing	1	-1.2993	0.6513	3.9792	0.0461
item*region2	doubling, 1	1	23.5736	161057.024	0.0000	0.9999
item*region2	doubling, 2	1	23.5736	144053.782	0.0000	0.9999
item*region2	doubling, 3	1	-0.0000	1.0801	0.0000	1.0000
item*region2	doubling, 4	1	0.6931	1.0607	0.4271	0.5134
item*region2	doubling, 5	1	-0.4055	1.0992	0.1361	0.7122
item*region2	doubling, 6	1	-2.6391	0.9063	8.4787	**0.0036**
item*region2	doubling, 7	1	-2.0149	1.0165	3.9289	**0.0475**
item*region2	doubling, 8	1	-1.7918	1.1180	2.5683	0.1090
item*region2	doubling, 9	1	-4.6250	1.2815	13.0258	**0.0003**
item*region2	doubling, 10	1	0.4055	1.3017	0.0970	0.7554
item*region2	doubling, 11	0	0.0000	0.0000	.	.
item*region2	dubbing, 1	1	0.2007	1.3257	0.0229	0.8797
item*region2	dubbing, 2	1	-24.0660	144053.855	0.0000	0.9999
item*region2	dubbing, 3	1	0.3830	0.8799	0.1895	0.6634
item*region2	dubbing, 4	1	-0.1358	0.8197	0.0274	0.8684
item*region2	dubbing, 5	1	0.4520	0.9489	0.2269	0.6338
item*region2	dubbing, 6	1	3.0339	0.9035	11.2744	**0.0008**
item*region2	dubbing, 7	1	1.9924	0.9614	4.2952	**0.0382**
item*region2	dubbing, 8	1	2.9087	1.2745	5.2090	**0.0225**
item*region2	dubbing, 9	1	4.1325	1.2178	11.5150	**0.0007**
item*region2	dubbing, 10	1	0.4520	0.9489	0.2269	0.6338
item*region2	dubbing, 11	0	0.0000	0.0000	.	.
scale	0	1.00	0.0000	.	.	

Extract from Table 11: Q16 by Sub-region

parameter		DF	Estimate	Std Err	ChiSquare	p-value
item*region2	doubling, 1	1	23.5736	131502.510	0.0000	0.9999
item*region2	doubling, 2	1	23.5736	131502.511	0.0000	0.9999
item*region2	doubling, 3	1	0.3483	1.0687	0.1062	0.7445
item*region2	doubling, 4	1	0.6931	1.0607	0.4271	0.5134
item*region2	doubling, 5	1	-0.1823	1.0878	0.0281	0.8669
item*region2	doubling, 6	1	-2.7726	0.9014	9.4612	**0.0021**
item*region2	doubling, 7	1	-2.0149	1.0165	3.9289	**0.0475**
item*region2	doubling, 8	1	-1.7918	1.1180	2.5683	0.1090
item*region2	doubling, 9	1	-4.6250	1.2815	13.0258	**0.0003**
item*region2	doubling, 10	1	0.4055	1.3017	0.0970	0.7554
item*region2	doubling, 11	0	0.0000	0.0000	.	.
item*region2	dubbing, 1	1	-0.3102	1.2745	0.0592	0.8077
item*region2	dubbing, 2	1	-24.0660	131502.576	0.0000	0.9999
item*region2	dubbing, 3	1	0.9808	0.8001	1.5028	0.2202
item*region2	dubbing, 4	1	-0.1358	0.8197	0.0274	0.8684
item*region2	dubbing, 5	1	0.9628	0.8758	1.2085	0.2716
item*region2	dubbing, 6	1	2.8034	0.8543	10.7685	**0.0010**
item*region2	dubbing, 7	1	1.9924	0.9614	4.2952	**0.0382**
item*region2	dubbing, 8	1	2.9087	1.2745	5.2090	**0.0225**
item*region2	dubbing, 9	1	4.1325	1.2178	11.5150	**0.0007**
item*region2	dubbing, 10	1	0.4520	0.9489	0.2269	0.6338
item*region2	dubbing, 11	0	0.0000	0.0000	.	.

It will be seen that almost all of these figures are unchanged, because the schools eliminated were not spread evenly across the Sub-regions, and none of them were in Sub-region11, which serves as the basis for comparison. The significant figures which are different are those for *doubling* in the Wellington region (6), where the tendency to less *doubling* than in S-O is even more significant; and *dubbing* in the same region, where the correlation is slightly less significant. However, neither of these changes is of a degree worth notice. (There are noticeable changes in some of the non-significant figures, as well.)

The overall conclusion from this investigation eliminating special schools is that they do not have a particularly important influence on the results for this set of data, at any rate.

It must be emphasised that because this set of data was strongly patterned, and involved only two forms, *doubling* and *dubbing*, the statistical results are much clearer than those which the SAS program provided for many of our sets of data. Nevertheless the same types of procedures were followed for all the sets of data, although, of course, the particular pairs of correlations investigated depended on the results for the individual factors for each question. The results presented in relation to each individual question, while not discussed in such depth, are based on the same types of calculation.

