Methodologies to produce measures of performance, funding and staffing in primary and secondary schools at Local Authority level

In the past, measures of academic performance, school finance and staff to pupil ratios have been produced at the school or Local Education Authority (LEA) level. However, since January 2002, the Department for Education and Skills (DfES) has been compiling a database with individual records of pupils attending schools in England. This Pupil Level Annual School Census (PLASC), an expanded version of the Annual School Census is completed by maintained state schools (primary, middle and secondary) and maintained special schools every January and is a statutory requirement under the Education Act 1996. Information on all pupils is provided, for example School ID, gender, date of birth, home postcode, ethnic group, and free school meals eligibility, as well as information on teaching and non teaching staff, classes as taught and admission appeals. Because PLASC has the home postcode of almost all pupils,[1] it is possible to produce results at different area aggregates, for example Local Authority (LA)/district, ward or even the new Census Output Area (OA) level. This paper describes the methods for constructing measures of value added, expenditure per pupil and pupil to teacher ratios at LA level, and presents a selection of results for each. These methodologies were originally devised to produce indicators for a Health Poverty Index (HPI) project for the Department of Health,[2] but do have wider relevance.

The methods are broadly similar in each case as all make use of the same core dataset, PLASC. The cut of PLASC supplied for the project by DfES is for the academic year 2001–2002 and has data on 7,739,213 pupils. The variation in method comes from the use of different datasets containing information on individual pupil performance, school expenditure and pupil to teacher ratios, and the fact that the observations are at different levels; records are either for individuals or schools.

Value Added in Education

To construct a measure of value added, PLASC and the National Pupil Database (NPD) were used. The NPD contains Key Stage 2, 3 and 4 results for 1,847,159 pupils[3] in maintained state and special schools and City Technology Colleges. Key Stage 2 (KS2) is usually taken in Year 6, the final year at primary school (aged 10 or 11), KS3 is usually

[1] Approximately 1% of pupils are missing a postcode.

[2] See http://www.hpi.org.uk

[3] The original figure was 1,847,184 pupils, but on closer inspection a number of duplicate cases (same pupil matching reference) were found. These were deleted from the dataset as it was not possible to establish which was the genuine case. With the PLASC dataset also there were duplicated pupil matching reference numbers and some cases with no reference number at all; these cases were removed, leaving 7,739,213 pupil records. An examination of the postcodes of these children showed that they were not all from one area (the most from any area was 273 pupils) and nor were they from one school (the most was 205 from one school). Thus the results should not be adversely affected by removing these children altogether.

taken in Year 9 (aged 13 or 14) and KS4 is GCSE, usually taken in Year 11 (aged 15 or 16). DfES provided data for all pupils who took their KS2, KS3 or KS4 tests in summer 2002. For the KS3 pupils the NPD extract we are using also has their KS2 results and for KS4 pupils, their KS3 and KS2 results (where a match could be found). The results are given in a number of different ways for each pupil: overall levels for KS2 and KS3 tests, individual marks and levels for each KS2 and KS3 test (English, Maths and Science), total numbers of GCSEs, GCSE points scores, teachers assessments and so on.

It was possible to link together the PLASC and NPD datasets by the unique pupil matching reference numbers.[4] To this were also matched 1998 (2003 version) LA codes and the Child Poverty Index score produced by the Social Disadvantage Research Centre for the English Indices of Deprivation 2000.[5] This was done by using a postcode to OA lookup table, and then linking by home postcode.

DfES Measure of Value Added

Pupils are statutorily assessed, using the national tests, at the end of the three Key Stages. They are awarded a level on a scale of 1 to 8 plus 'exceptional performance' and each Key Stage targets a different range of levels. The expected performance from pupils at KS1 is levels 1 to 3, at KS2, levels 2 to 5, and at KS3, levels 3 to 7. A typical 7 year old will normally be working at level 2, a typical 11 year old at level 4 and a typical 14 year old at level 5 or level 6.

The DfES has produced a value added measure, which they include in the school performance tables published annually. This looks at the progress pupils make between Key Stage assessments. For progress between KS2 and KS3 they have chosen to use the levels awarded, to which they have then allocated a point score. So for example at KS2 a pupil who attained a level 5 would be given a point score of 33, regardless of whether they just achieved the level or just missed out on the level above. The point score for KS2 is shown in Table 1 below.

[4] This can be carried out using a standard statistical software package such as SPSS or SAS, although the combined dataset may be too large for SPSS to process satisfactorily.

[5] Noble, M., Smith, G.A.N., Wright, G., Dibben, C., and Lloyd, M. (2000) *Measuring Multiple Deprivation at the Small Area Level: The Indices of Deprivation 2000*, Department of the Environment, Transport and the Regions.

Table 1: Key Stage 2 point score

Key Stage 2 test outcome (Level)	**Points: all subjects**
6	39
5	33
4	27
5	33
4	27
3	21
Compensatory 2	15
N (not awarded a test level)	15
B (working below the level of the test)	15
Disapplied	Disregarded
Absent	Disregarded
Lost script	Disregarded

To calculate the value added between KS2 and KS3, the input measure for each pupil is the average point score achieved in the English, Maths and Science KS2 tests and the output measure is the average point score achieved in the KS3 tests. The value added score is then obtained by comparing a pupil's KS3 performance with the national median KS3 performance of other pupils with the same prior attainment at KS2.

A similar calculation is made for the value added between KS3 and KS4, by comparing a pupil's KS4 performance with the national median KS3 score of pupils with the same prior attainment. The output measure at KS4/GCSE is capped at a pupil's best eight GCSE/GNVQs and a point score is again allocated to the results (see Appendix 1 for further details of the DfES points allocation).

HPI Measure of Value Added

There has been some discussion recently about whether value added analysis should be a measure of pure progress controlling only for prior attainment (i.e. the DfES method); a measure that controls for prior attainment as well as a range of other pupil and school level background factors (for example, Special Educational Needs and eligibility for free school meals); or, a measure that controls for pupil and school level background factors but not prior attainment.[6] The view taken here is that it is important to look at both prior attainment *and* background factors.

The KS4 capped scores that DfES developed for their calculation of value added were used, but their use of KS2 and KS3 test scores were modified in a number of ways. Instead of using the levels, at KS2 it was decided to use a sum of the total marks awarded

[6] Benton, T., Hutchison, D., Schagen, I. and Scott, E. (2003) 'Study of the Performance of Maintained Secondary Schools in England', Report for the National Audit Office.

to each pupil for the English, Mathematics and Science tests. It was felt this would give a wider range of results with which to distinguish between pupils and would avoid the rather arbitrary allocation of points to test levels.[7]

For KS3 the process was slightly more complicated as pupils are entered into different tiers in the three subjects depending on their ability. The range of marks given at each level varies for the different tiers. Therefore the marks for each separate subject were converted to a scale that incorporated all tiers. Based on the assumption that, for example, a level 4 on tier 36 is equivalent to a level 4 on tier 57, it was possible to calculate what a given mark in the lower tier would represent in the higher tier.

The assumption was made that each level is the same width: in other words, the difference in ability between a level 1 and a level 2 is the same as the difference between level 2 and level 3, etc. The scale runs from 11 to 100, with each level set at 10 mark intervals (mark range B in Table 2 below). Thus a mark between 11 and 20 corresponds to a level 1, a mark between 21 and 30 to a level 2, and so on ending with a mark between 91 and 100 for pupils classed as 'exceptional performers'. Using the final test level, the tier and the marks awarded, a new score was calculated for each of the subjects. Below is an example from the KS3 Science tests. The threshold tables for English and Mathematics can be found in Appendix 2.

[7] Ian Schagen from the National Foundation for Educational Research claims however that when actual scores are used 7% of the data is lost and that using scores instead of levels only actually explains 1% more of the variance (Royal Statistical Society Meeting on Value Added Monitoring Using National Pupil Data Sets, 15 June 2004).

Table 2: Key Stage 3 Science

QCA KS3 LEVEL THRESHOLDS		HPI CALCULATIONS	
Level	**Mark range (A)**	**Number of marks to be allocated**	**New mark range (B)**
Tier 36			
Not awarded a level	0 – 36	36 – 0 = 36	Excluded
2	37 – 43	43 – 37 = 6	21 – 30
3	44 – 72	72 – 44 = 28	31 – 40
4	73 – 102	102 – 73 = 29	41 – 50
5	103 – 131	131 – 103 = 28	51 – 60
6	132 – 180	180 – 132 = 48	61 – 70
Tier 57			
Not awarded a level	0 – 42	42 – 0 = 42	Excluded
4	43 – 48	48 - 43 = 5	41 – 50
5	49 – 78	78 – 49 = 29	51 – 60
6	79 – 103	103 – 79 = 24	61 – 70
7	104 – 150	150 – 104 = 46	71 – 80
Extension paper			
8	32 – 44	44 – 32 = 12	81 – 90
Exceptional performance	45 – 60	60 – 45 = 15	91 – 100

e.g. KS3 Science Tier 36, Level 4:

KS3 Science score = ((9/29) x *(KS3 Science mark – 73)) + 41*

i.e. ((41 - 50) / (102 – 73)) x (KS3 Science mark – first mark in range A) + first mark in range B

KS3 Science Tier 57, Level 4:

KS3 Science score = ((9/5)) x *(KS3 Science mark – 43) + 41*

The new scores for English, Mathematics and Science were then summed to produce an overall KS3 total for each pupil.[8] Although there is an extension test at KS2, it was not

[8] Several categories of pupil have been excluded from the analysis. Some pupils do not take the Key Stage tests for two reasons: a) they are working at a level below that assessed by the tests, or b) they are disapplied – that is exempt from the National Curriculum under Section 364 or 365 of the 1996 Education Act. These pupils are identifiable in the dataset. It may be the case that they took some but not all of the tests and therefore have some scores. However, a full set of scores is necessary for the calculation of the Key Stage total, and as it is not clear how far below the level of the test the pupils are, or the reason why they are disapplied, it is not possible to assign scores where they are missing. Therefore pupils who are working below the test or who are disapplied in one or more subject are excluded entirely. Similarly, pupils who are absent for one of the tests in one or more subjects are not included. The final category is pupils who took the tests but were not awarded a level (the N's in the table above). It is not clear whether a

necessary to use this as only a small proportion actually score the very highest marks on the main tests and so it is possible to distinguish between the pupils at the top using the main test marks. Besides, as no pupil in the dataset was actually awarded 'Exceptional Performance' at KS2, there is probably little extra information on pupil performance to be gained by taking into account the scores from the extension test.

The basic model is a linear regression with a test score as the dependent variable and either a previous test score, a measure of socio-economic position, or both as the main explanatory variable(s). As a measure of socio-economic position, Child Poverty Index scores from the Index of Multiple Deprivation and the eligibility for free school meals variable from PLASC were used. Other variables such as age and gender can be added to this model, and also an interaction effect between the Child Poverty Index and free school meals to see whether the influence of either of these variables differs depending on the score on the other. The calculation of value added uses the residual value; that is the difference between the actual test score attained and the expected test score given the background factors taken into account. Positive residuals suggest a pupil is performing above expectations; negative residuals suggest they are making less progress than expected (see Figure 1).

The method described above is not intended to be a faultless model for measuring value added. While many of the important issues have been considered in the development of the method, the intention was to produce a valid measure of value added at Local Authority level for a project that aimed to provide a graphical summary of the situation of 'health poverty'. The data development principle applied in the project was one of maximum access to information rather than maximum precision in the data. This was in order to produce a large number of often novel indicators in the timeframe of the project. This does not mean that the data is inaccurate but rather that some caution should be applied when using the results.

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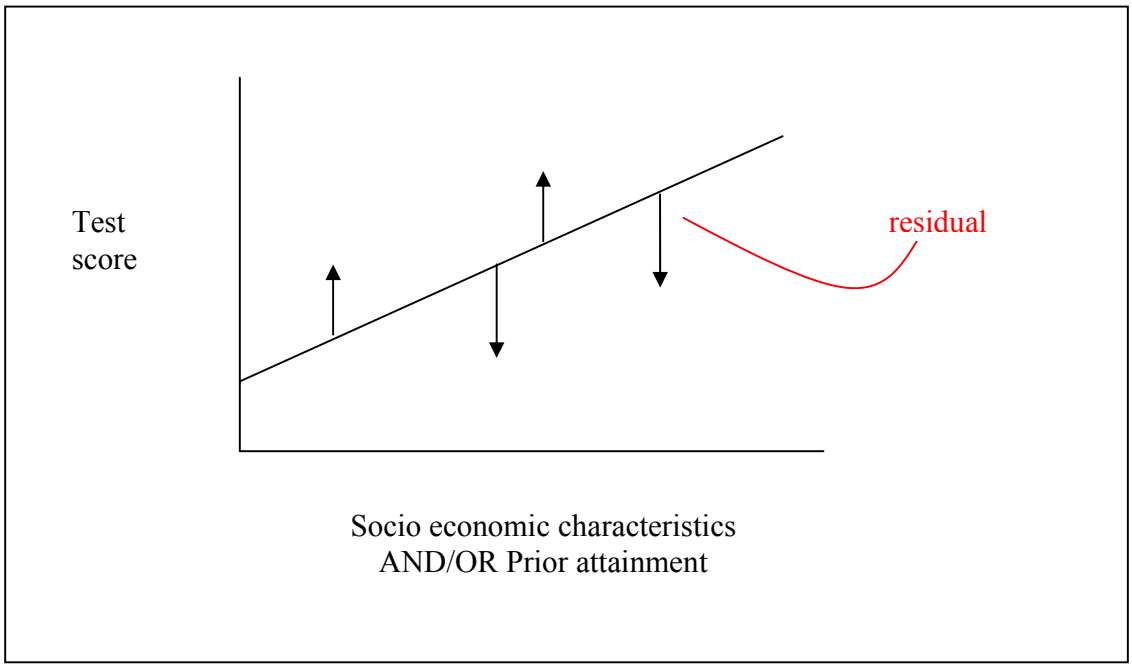
pupil scoring N on one tier is the same ability as a pupil scoring N in a different tier (for example, is a score of 0 in the lower tier equivalent to a score of 0 in the higher tier?). If the N pupils were included, the results would bias against schools who decided to risk putting pupils in for the higher tiers, or who selected the 'wrong' tier. This means that data on approximately 10 per cent of pupils is disregarded.

Figure 1: The value added model



After testing a series of models on a random sample of 50,000 cases and analysing the results it was decided to run three models on the full dataset.[9] A more detailed explanation of the variables is given in Appendix 4.

[9] Some of the pupils had ages which made them either very old or very young for their respective tests (e.g. 4 years old at KS2 or 19 years old at KS4). Thus the dataset used for the models was restricted to pupils who were between 9 years 11 months and 12 years 11 months at KS2, 12 years 11 months to 15 years 11 months at KS3 and 14 years 11 months to 17 years 11 months at KS4.

Model 1

Y = KS3 Total
X = KS2 Residuals[10]
Child Poverty Index
Free School Meal
KS3 Age[11]
Gender
Interaction between Child Poverty Index and Free School Meal

Model 2 [12]

Y = KS4 Total
X = KS2 Residuals
Child Poverty Index
Free School Meal
Gender
Interaction between Child Poverty Index and Free School Meal

Model 3

Y = KS4 Total
X = KS3 Total
Child Poverty Index
Free School Meal
Gender
Interaction between Child Poverty Index and Free School Meal

The results are in Appendix 4.

From these models it was possible to calculate the residuals for each pupil and then to aggregate to Local Authority level. Home postcodes are used to situate individuals rather

[10] The tests on a random sample revealed that when using KS2 results to predict KS3 and 4 results, age appears to have a negative effect. This is because the effect of age is underestimated at KS2; younger pupils may appear to have performed poorly, but really their lower achievement is due to their slower development. When KS2 is used to predict KS4 therefore, the younger children are found to perform better than expected based on prior performance, and older children to perform badly. To overcome this underestimation, the residuals of KS2 Total against KS2 Age are used instead of just the KS2 Total.

[11] The date of birth variable was missing from the cut of PLASC provided by DfES. The dates of birth from an earlier cut were merged into the file by the pupil matching reference number, but some pupils still had this information missing. For these pupils ages at date of test were therefore calculated using the September age and months variable.

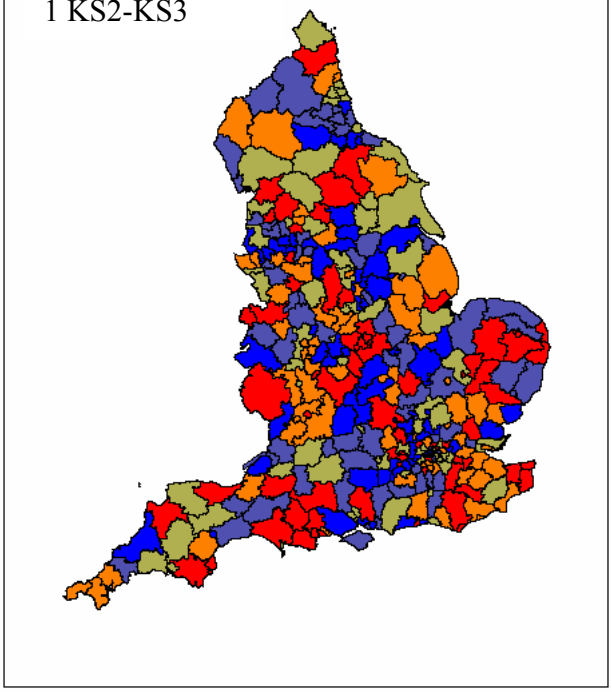
[12] The tests on a random sample showed that age is not really significant and as there are a number of missing values for the KS4 age, it was decided not to include age in Models 3 and 4.

than the school ID, which does assume to a certain extent that pupils attend schools in their local area and do not cross area boundaries for their education. This of course is not always the case, although it is more likely to hold true for primary education.

Value Added across England: Results

The following maps show value added in the different LA areas across England. Next to each is the same map zoomed in on the London boroughs.

Figure 2: Model 1 KS2-KS3



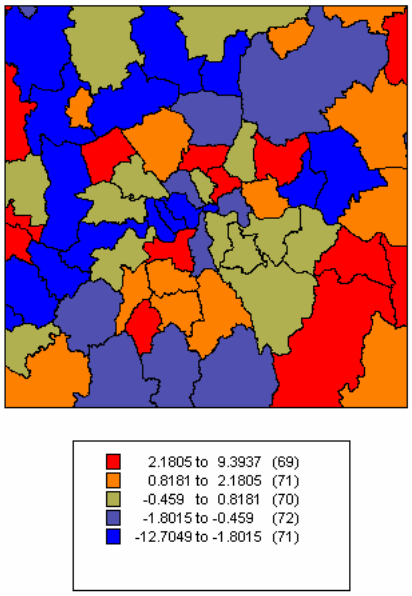
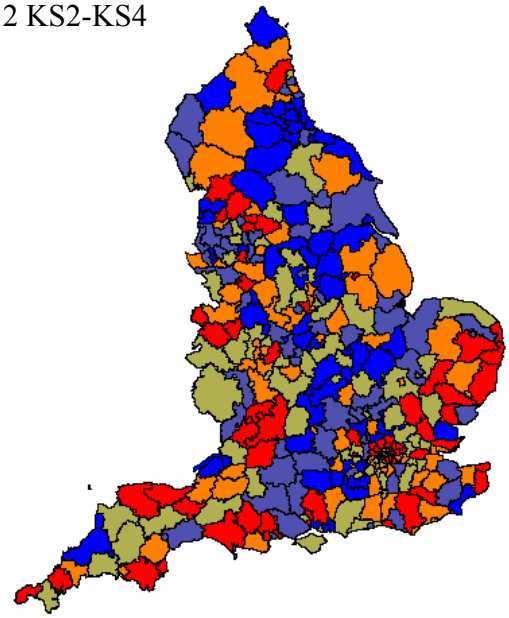
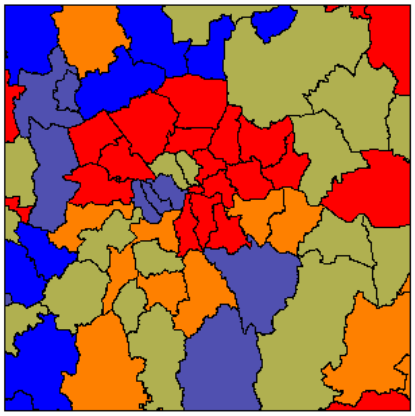


Figure 3: Model 2 KS2-KS4





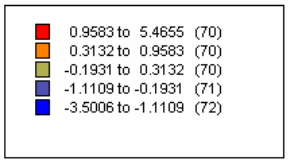
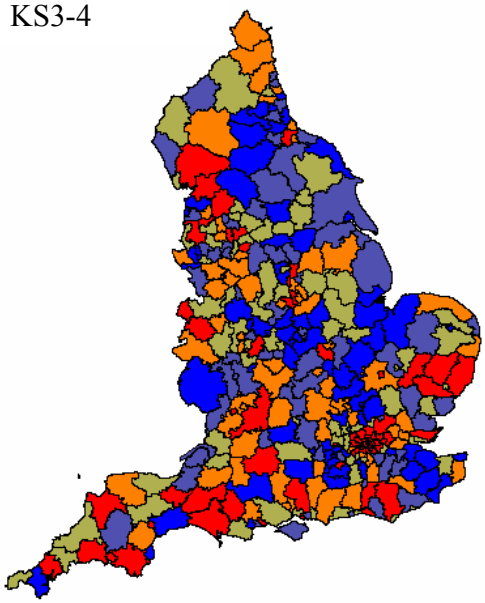
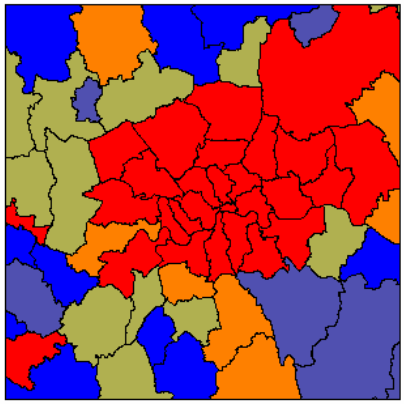
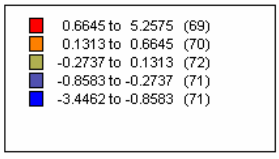


Figure 4: Model 3 KS3-4

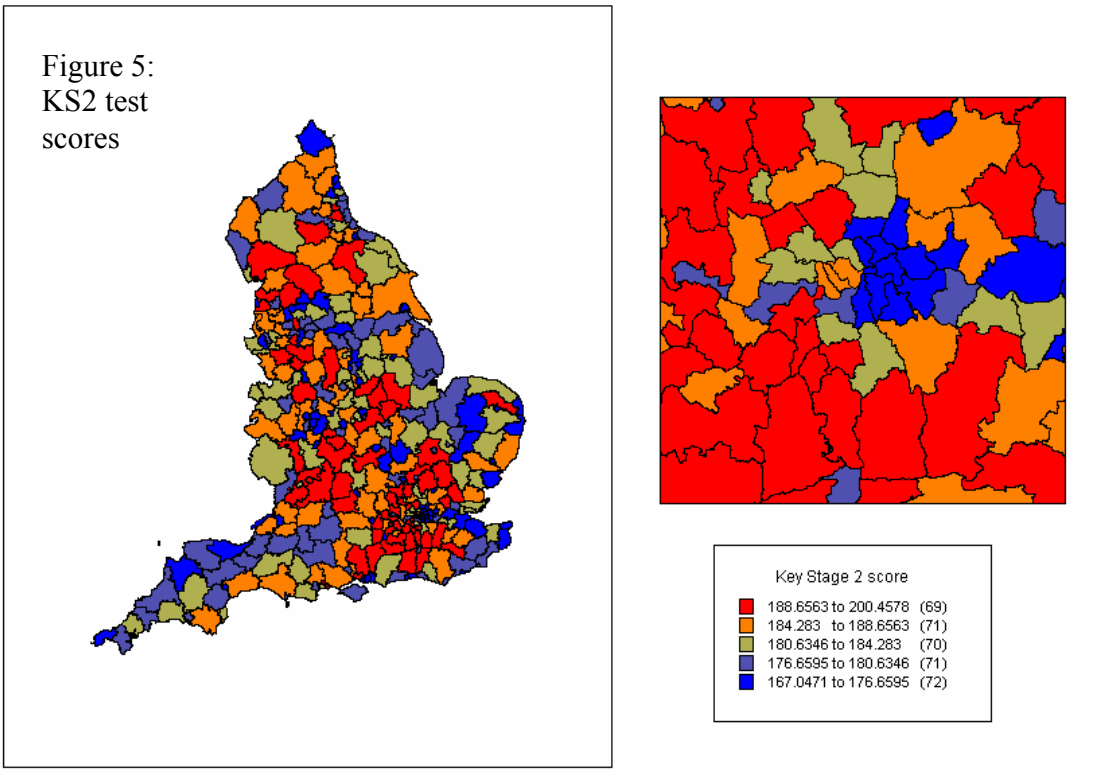






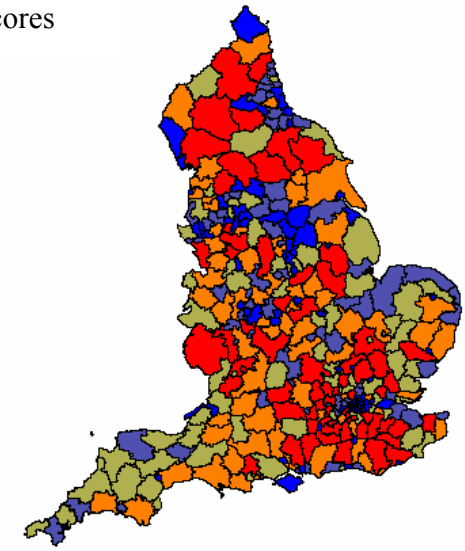
These can be compared to the actual Key Stage test scores.[13]

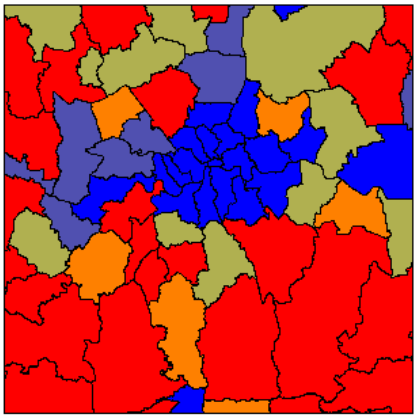
Figure 5: KS2 test scores



[13] These were produced using the KS2 total scores, the new KS3 scores and the capped KS4 scores, only for the pupils included in the value added calculation.

Figure 6: KS3 test scores





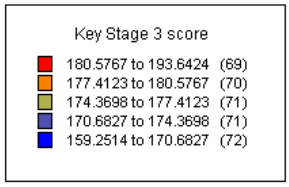
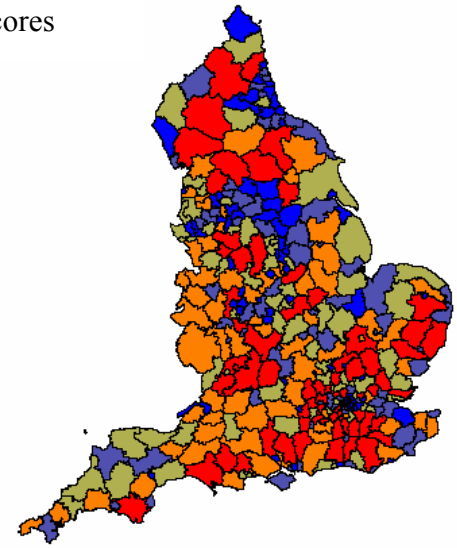
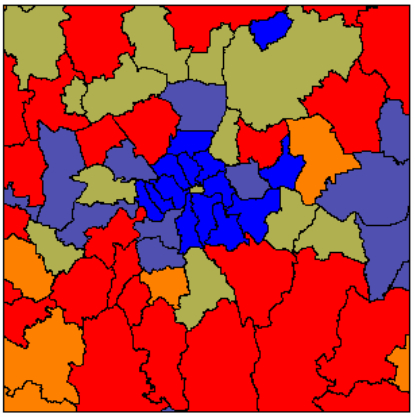
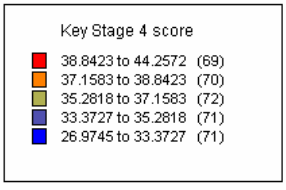


Figure 7: KS4 test scores







It is a little complex to fully describe the maps, but a general summary is possible by referring to individual counties. For Model 1, KS2-KS3 (Figure 2), in the South, Essex, Kent (except Ashford), East Sussex, Dorset and Cornwall all have high value added, as do parts of Norfolk, Suffolk and Lincolnshire in the East. In the Midlands, Hereford and Worcester, Warwickshire, Leicestershire, Derbyshire and Nottinghamshire are in the highest category, while North Yorkshire has the highest performance in the North of England. In London, a few areas have positive value added, but the LAs falling in the highest category are Hackney, Haringey, Harrow, Redbridge and Wandsworth.

For Model 3, KS3-KS4 (Figure 4), the picture changes a little. Some LAs continue to achieve high value added (those in North and West Dorset and in Warwickshire and Suffolk), while other areas that did not perform as well at KS2-KS3 do better at the later stage. These include LAs in South and East Somerset, South Devon, South Cambridgeshire, Gloucestershire, Warwickshire, North Lancashire and East and South Cumbria. All London LAs are in the highest category of value added with the exception of Bexley, Bromley, Croydon, Hillingdon, Hounslow, Kingston upon Thames, Merton and Sutton.

The lowest value added at KS2-KS3 (Figure 2) can be seen in the extreme North, especially Northumberland and Durham, parts of South Yorkshire, Lancashire, North Lincolnshire and Nottinghamshire, Shropshire, North Norfolk and coastal Suffolk, Cambridgeshire, and a swathe through Northamptonshire, Oxfordshire, Berkshire and Hampshire. There are also pockets in North Cornwall, Devon, Somerset, Gloucestershire and the Isle of Wight.

At KS3-KS4 (Figure 4), areas with low value added are in some cases the same as for KS2-KS3. Durham, Northumberland, South Yorkshire, Northamptonshire and the Isle of Wight are some examples. In the South, Bedfordshire, Hertfordshire and Kent join these areas, with Hereford and Worcester and Leicestershire in the Midlands, and also North Yorkshire and much of the North-East.

The dramatic change in the value added of London LAs can be seen in the following table, which shows how many of the 33 London LAs are in the top 10, 30, 50, 100, 200 and 300 LAs in the country at the different stages. Between KS2 and KS3, there are no London LAs in the top 10 and only 3 in the top 50, while at KS3 to KS4, London LAs make up 9 of the top 10 and nearly half of the top 50. Their performance nationwide in terms of scores is less impressive at all stages. Only 4 London LAs are in the top 50 and either 6 or 7 in the top 100 for each Key Stage. Between 50 and 70 percent of London LAs are in the 300 threshold for KS2, KS3 and KS4.

Table 3: Position of London Local Authorities in England

Number of London Local Authorities…	Value Added		Average Score		
	KS2-3	KS3-4	KS2	KS3	KS4
in top 10 nationwide	0	9	1	0	0
in top 30 nationwide	2	18	1	2	0
in top 50 nationwide	3	22	4	4	4
in top 100 nationwide	8	28	6	6	7
in top 200 nationwide	20	32	16	10	11
in top 300 nationwide	26	33	22	17	23

ONS has produced an Area Classification of Local Authorities to group together geographic areas according to key characteristics common to the population in that grouping. These groupings, called clusters, are derived using Census data (demographic, household composition, housing, socio-economic, employment and industry) and are available at three levels of hierarchy: 'supergroups', 'groups' and 'subgroups'.[14] Some interesting results that substantiate the above analysis are produced when the value added scores for each LA are aggregated to the ONS Classification to give a mean score for each. The table below presents the results for ONS supergroups.

Table 4: ONS Area Classification

ONS Supergroup	Model 2 KS2-3	Model 3 KS2-4	Model 4 KS3-4
Cities and Services	0.19	0.03	-0.05
London Suburbs	0.78	1.86	1.52
London Centre	-2.47	0.97	2.28
London Cosmopolitan	0.99	2.40	2.33
Prospering UK	0.24	-0.9	-0.23
Coastal and Countryside	1.13	0.30	-0.17
Mining and Manufacturing	-0.84	-0.88	-0.42

Between KS2 and KS3 the London LAs (Suburbs, Centre and Cosmopolitan) all have low value added, but between KS3 and KS4, the value added is much greater. Overall, between KS2 and KS4, there is a positive figure for value added. Cities and Services show higher value added at KS2-3 than at KS3-4 although at KS3 the value added is not much above 0. Areas classified as Prospering UK show a similar pattern. The negative value added between KS3 and KS4 is however much lower than for Cities and Services. For Coastal and Countryside areas too, the pattern is the same, although the overall value added between KS2 and KS4 is higher. One general point is worth highlighting here: if

[14] For more information visit the ONS website: http://www.statistics.gov.uk/about/methodology_by_theme/area_classification/default.asp

pupils make a lot of progress at primary school or in their first years at secondary school then there is little extra value that can be added in later years. Thus the value added between KS3 and KS4 is likely to be lower. Finally, Mining and Manufacturing areas show negative value added at all stages, but less so between KS3 and KS4.

There are numerous further analyses that can be performed on the dataset. However, the main purpose here is to outline the different methodologies that can be used to produce LA level analysis of educational data.

Education resourcing per capita

The datasets used in constructing this measure were the DfES Section 52 Budget and Outturn Statements for 2001-2002 and PLASC. Section 52 statements are produced by Local Education Authorities at the beginning (Budget) and end (Outturn) of every financial year and are a statutory requirement under Section 52 of the School Standards and Framework Act 1998. These are available to the general public on the DfES website and individual LEAs also have a duty to provide the information when requested.

There were a small number of schools in both the Budget and Outturn statements where there was no DfES reference for the school and for some no school name either so they could not be traced on the DfES list of all schools. For consistency therefore, these were all removed from the respective datasets before they were merged. There were a few duplicated DfES numbers but with a little investigation it was possible to establish why and amend the dataset. Any schools that had closed during the financial year were also deleted. On the DfES website, from where the data was taken, some LEAs had not provided either a Budget or Outturn statement, and one LEA had no information at all. This meant that some schools were without either a value for the total number of pupils in the school (given in the Budget) or a value for actual school expenditure (given in the Outturn). As the dataset stood, it would not be possible to calculate the expenditure per capita for each school. Thus some LEAs were contacted directly for the information[15], or to fill in the gaps in the data for number of pupils, values derived from the PLASC dataset were used. A predicted expenditure was calculated for schools without a value for school expenditure by using the coefficients from a regression of budgeted expenditure against actual school expenditure for those cases with a value for these variables. It was then possible to calculate the expenditure per pupil for each school by dividing the school expenditure by the number of pupils. For any school without an expenditure per pupil, the LEA average expenditure was inputted. Two subsequent rounds of data cleaning followed as it was obvious that the data for some schools was inaccurate because the expenditures were far too high or extremely low. Some time was spent checking these schools' pupil numbers and school expenditures against the PLASC dataset, OFSTED reports and the school look-up tool on the Teachernet[16] website to

[15] Only LEAs where over 5%of schools were missing values were actually contacted. The entire Budget and Outturn statements were put into the main dataset, replacing the previous data. The LEA which was missing all data was also contacted.

establish if there was some error in the data. The dataset was further amended and the new predicted school expenditures and per pupil expenditures calculated.

The measure of education resourcing per capita was calculated in two stages – first at school level – as described above - and then again at a larger area level. The PLASC and Section 52 datasets were linked together by the unique school ID codes in each pupil's record, and to this were also matched OA, ward and LA codes using the home postcode variable as with the value added measure. Pupils from all schools were used, although it has been suggested that perhaps special schools should have been excluded because of their often high levels of expenditure and relatively small numbers of pupils. However, for the purpose of the Health Poverty Index project it was felt that these schools are providing a resource to their communities and therefore should be included. For pupils without a per pupil expenditure after the merge, but who did have an LEA code, it was possible to add in an LEA average per pupil expenditure. With the majority of the pupils in the PLASC dataset now having a value for expenditure per pupil, the data was then aggregated to Local Authority level with a sum of school expenditures per capita and a sum of the number of pupils in each LA in the PLASC dataset. From this it was possible to calculate an expenditure per capita for each LA by dividing the sum of the school level per pupil expenditures by the number of pupils.

Results

The two maps below show average educational expenditure per capita in the different LA areas across England. The first shows the average expenditure using equal ranges while the second displays the same data with equal numbers of Local Authorities in each expenditure category. Next to each is the same map zoomed in on the London boroughs. The most striking feature of the maps is the high levels of expenditure in the London boroughs. This is especially so given the high value added seen in the same areas in secondary education. Looking at the first map, the LA with the highest expenditure per pupil is the Isles of Scilly, but 22 out of the top 25 LAs in England are London LAs. There are high levels of expenditure in the North of the country, especially in Cumbria and parts of Northumberland. Most LAs along the East side of England from Norfolk down to Kent and Sussex are also in the higher ranges of expenditure per pupil. Areas with low expenditure are scattered, but LAs in Durham and Tyneside, Cheshire, parts of Lancashire and the Midlands, and most of Devon and Cornwall.

When this map is compared to the one showing equal ranges it becomes clear that the majority of LAs (253 in total) have a similar average expenditure per pupil (between £2431 and £2832). Only 8.75 per cent of all LAs are in the top three ranges, and as discussed above, the LAs with the highest expenditure are mostly in London. Roughly 20 per cent of LAs fall into the lowest range (£2030 to £2431).

[16] See http://www.teachernet.gov.uk/management/tools/SchoolLookup/

Figure 8: Expenditure per pupil (equal counts)

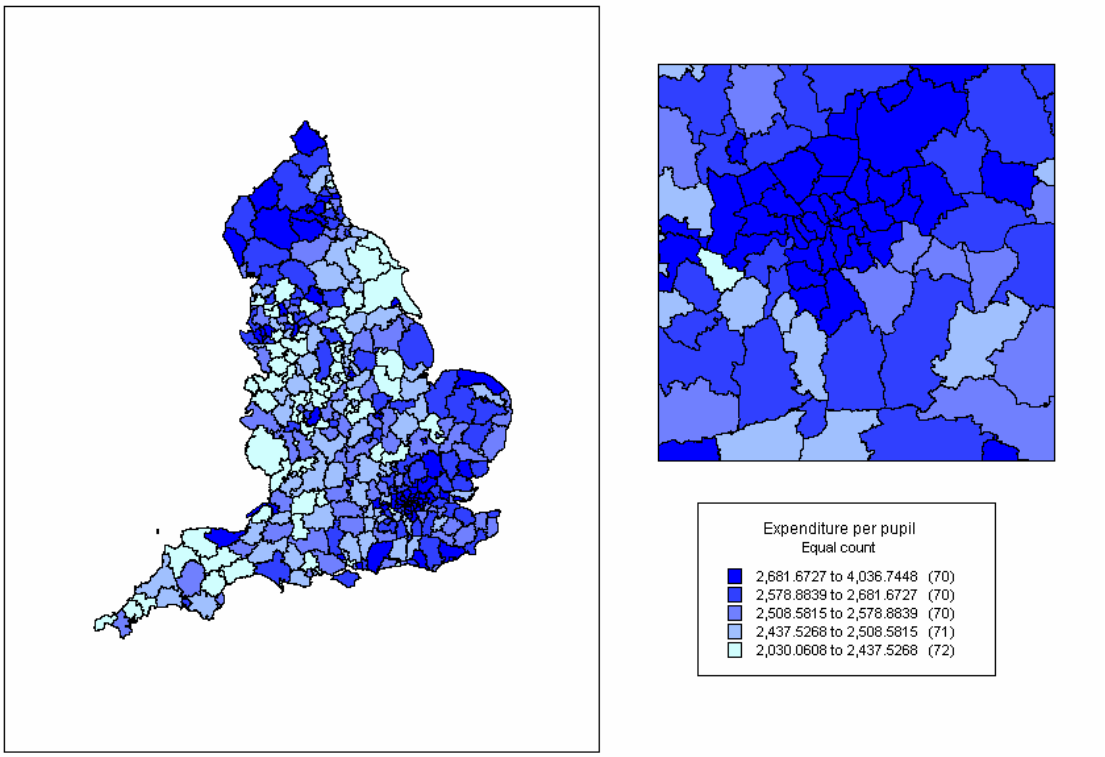
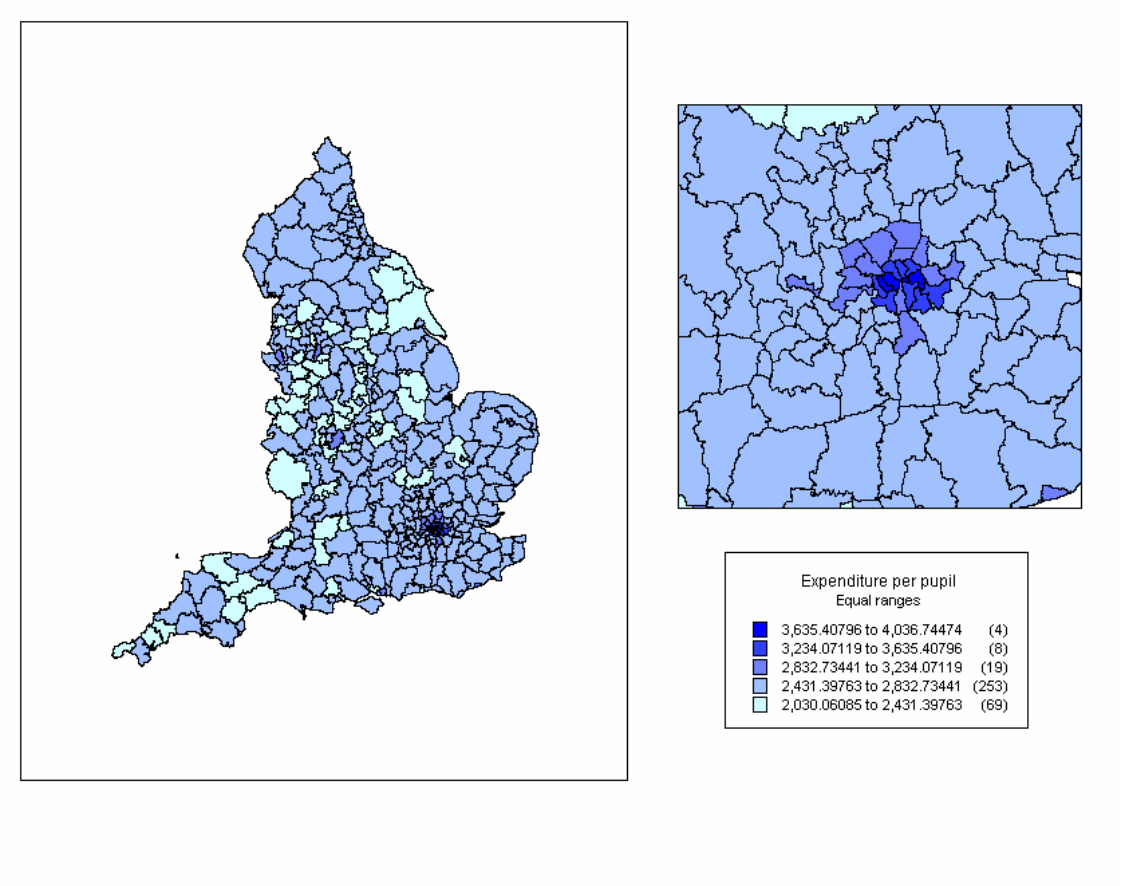


Figure 9: Expenditure per pupil (equal ranges)



Pupil to Teacher Ratios

A fairly similar method was used to produce an LA level measure of the average number of pupils per teacher. The data supplied by DfES gave a pupil to teacher ratio for every school. This dataset was linked to PLASC using the school ID so that each individual pupil had a school level value. The data was then aggregated to give an average pupil to teacher ratio for each LA. The table below shows the highest and lowest LA level pupil to teacher ratios in England.

Table 5: Highest and lowest pupil to teacher ratios by Local Authority

Local Authority	Pupil to Teacher ratio
Lowest ratios	
Isles of Scilly	14.79
Kensington and Chelsea	17.87
Eden	17.94
Mid Suffolk	18.37
Teesdale	18.49
Isle of Wight	18.59
Wealden	18.68
Oxford	18.70
Camden	18.71
Craven	18.93
Highest ratios	
Penwith	21.79
Barnsley	21.82
Fenland	21.83
High Peak	21.94
Harlow	22.08
Basildon	22.08
North East Derbyshire	22.16
Amber Valley	22.23
Bolsover	22.29
Erewash	22.50

In general there are only small differences between LAs in the number of pupils to each teacher. The Isles of Scilly is the exception here as the pupil to teacher ratio of 14.79 is much lower than the next closest (Kensington and Chelsea with 17.87).

The Isles of Scilly LEA[17] is the second smallest LEA in the country, containing only one school, The Five Island School which in January 2004 had a total of 266 pupils. In a recent reorganisation, all local schools were federated into this Voluntary controlled school. Prior to this move there was one primary and one secondary on St. Mary's and one primary school on each of the Off-Islands of St. Agnes, St. Martin's and Tresco. All centres continue to run and are linked by a centralised administration. The numbers of pupils in each centre are small in comparison to national averages, yet there may be a fair number of teachers to educate the children. Thus the pupil to teacher ratios will be high.

[17] The Isles of Scilly LEA is equivalent to the LA (i.e. the boundaries are the same). This is not true for all LEAs as in some cases several LAs may constitute an LEA.

APPENDIX 1.

Allocation of points: GCSE/GNVQ results

GCSE grade	GCSE points	GCSE (Short Course) points
A*	8	4
A	7	3.5
B	6	3
C	5	2.5
D	4	2
E	3	1.5
F	2	1
G	1	0.5
U,X	0	0

GNVQ: Equivalence to GCSE and allocation of points

Qualification	GCSE equivalence (shown as the number of GCSE passes and grades)		GNVQ point scores		
			Distinction	Merit	Pass
GNVQ Full					
Intermediate	4	A*-C	30	24	20
Foundation	4	D-G	16	12	6
GNVQ Part One					
Intermediate	2	A*-C	15	12	10
Foundation	2	D-G	8	6	3
GNVQ Language Unit					
Intermediate	½	A	-	-	3.5
Foundation	½	D	-	-	2

Calculation of capped GCSE/GNVQ point score

In order to calculate the capped GCSE/GNVQ point score for each pupil, each qualification has been divided into records to show its equivalence to the smallest qualification, which is a GCSE (Short Course) and has half the weight of a full GCSE as shown below:

Qualification	Number of records
GCSE (Short Course)	1
GCSE	2
GNVQ Language Unit	1
GNVQ Part One	4
GNVQ Full	8

The point score allocated to each result is also divided by the number of records. For example, a pupil who achieved 3 Bs and 3Cs at GCSE, an A* for a GCSE (Short Course) and a full Intermediate GNVQ with distinction would have their results broken down and their capped GCSE/GNVQ point score calculated in the following way:

Result	Number of records	Points awarded (per record)	Included in highest 16
GCSE grade B - worth 6 points (equivalent to 2 GCSE short courses)	2	3	Yes
		3	Yes
GCSE grade B - worth 6 points (equivalent to 2 GCSE short courses)	2	3	Yes
		3	Yes
GCSE grade B - worth 6 points (equivalent to 2 GCSE short courses)	2	3	Yes
		3	Yes
GCSE short course A* - worth 4 points	1	4	Yes
Full intermediate GNVQ: Distinction - worth 30 points (equivalent to 8 GCSE short courses)	8	3.75	Yes
		3.75	Yes
		3.75	Yes

		3.75	Yes
		3.75	Yes
		3.75	Yes
		3.75	Yes
		3.75	Yes
GCSE grade C - worth 5 points (equivalent to 2 GCSE short courses)	2	2.5	Yes
		2.5	No
GCSE grade C - worth 5 points (equivalent to 2 GCSE short courses)	2	2.5	No
		2.5	No
GCSE grade C - worth 5 points (equivalent to 2 GCSE short courses)	2	2.5	No
		2.5	No

Only the 16 highest scoring records (i.e. the best 8 GCSEs/GNVQs) are used to calculate a pupil's point score. In this case the lowest five records worth 2.5 points each and representative of two and a half GCSEs at grade C are disregarded. In this example the pupil's point score is 54.50.

Information taken from the DfES website:

http://www.dfes.gov.uk/performancetables/schools_02/sec3b.shtml

APPENDIX 2.

QCA Key Stage 3 Level Thresholds

KS3 English

QCA KS3 LEVEL THRESHOLDS		HPI CALCULATIONS	
Level	**Mark range (A)**	**Number of marks to be allocated**	**New mark range (B)**
Main paper			
Not awarded a level	0 – 14	14 – 0 = 14	Excluded
3	15 – 19	19 – 15 = 4	31 – 40
4	20 – 34	34 – 20 = 14	41 – 50
5	35 – 52	52 – 35 = 17	51 – 60
6	53 – 68	68 – 53 = 15	61 – 70
7	69 – 99	99 – 69 = 30	71 – 80
Extension paper			
8	16 – 25	25 – 16 = 9	81 – 90
Exceptional performance	26 – 36	36 – 26 = 10	91 – 100

KS3 Mathematics

QCA KS3 LEVEL THRESHOLDS		HPI CALCULATIONS	
Level	**Mark range (A)**	**Number of marks to be allocated**	**New mark range (B)**
Tier 35			
Not awarded a level	0 – 25	25 – 0 = 25	Excluded
2	26 – 31	31 – 26 = 5	21 – 30
3	32 – 65	65 – 32 = 33	31 – 40
4	66 – 101	101 – 66 = 35	41 – 50
5	102 – 150	150 – 102 = 28	51 – 60
Tier 46			
Not awarded a level	0 – 26	26 – 0 = 26	Excluded
3	27 – 32	27 – 32 = 5	31 – 40
4	33 – 58	58 – 33 = 25	41 – 50
5	59 – 87	87 – 59 = 28	51 – 60
6	88 – 150	150 – 88 = 62	61 – 70
Tier 57			
Not awarded a test level	0 – 30	30 – 0 = 30	Excluded
4	31 – 36	36 – 31 = 5	41 – 50
5	37 – 58	58 – 37 = 21	51 – 60
6	59 – 88	88 – 59 = 29	61 – 70
7	89 – 151	151 – 89 = 62	71 – 80

Tier 68			
Not awarded a test level	0 – 31	31 – 0 = 31	Excluded
5	32 – 37	37 – 32 = 5	51 – 60
6	38 – 57	57 – 38 = 19	61 – 70
7	58 – 93	93 – 58 = 35	71 – 80
8	94 – 150	150 – 94 = 56	81 – 90
Extension paper			
Exceptional performance	23 – 42	42 – 23 = 19	91 – 100

The QCA KS3 level thresholds are taken from the Qualifications and Curriculum Authority website:

http://www.qca.org.uk/ages3-14/tests_tasks/2667_6278.html

APPENDIX 3.

Explanation of variables:

KS3 Total	Sum of scores awarded in KS3 English, Maths and Science tests taking into account the tier for which each pupil is entered (pupils classified as working below the level of the test, disapplied, absent or not awarded a test level were excluded)
KS4 Total	Sum of points score for best eight KS4 examinations
KS2 Residuals	Regression of KS2 Total against KS2 Age → KS2 Residuals = Actual KS2 Total – Predicted KS2 Total
Free School Meals	Whether pupil has claimed free school meals (eligibility depends on receipt of Income Support, Income Based Jobseeker's Allowance or support under Part 6 of Immigration and Asylum Act 1999). Dummy variable: Y = 1, N = 0
Child Poverty Index	% of children in area aged under 16 living in families that claim means tested benefits
Interaction	Child Poverty Index * Free School Meals
KS3 Age	Age at 31 July in year of test (calculated from age of birth and date of test variables, or where no date of birth was given, from the September age at the beginning of the academic year in which the tests were taken)
Gender	Dummy variable: M = 1, F = 0

APPENDIX 4.

Results

The regressions produced the following results:

Model 1

	DF	Parameter Estimate	Standard Error	t Value	Sig
Constant	1	73.29480	1.02137	71.76	<.0001
CPI	1	-0.14057	0.00132	-106.54	<.0001
FSM	1	-6.16481	0.16149	-38.17	<.0001
KS2 Residual	1	0.59849	0.00053193	1125.14	<.0001
KS3 Age	1	7.16903	0.07082	101.23	<.0001
Gender	1	-1.97081	0.04131	-47.70	<.0001
Interaction	1	0.06088	0.00342	17.78	<.0001

N = 471634
Adjusted R Square = 0.7564

Model 2

	DF	Parameter Estimate	Standard Error	t Value	Sig
Constant	1	45.62661	0.03322	1373.35	<.0001
CPI	1	-0.08692	0.00089010	-97.65	<.0001
FSM	1	-7.09225	0.11381	-62.32	<.0001
KS2 Residual	1	0.23878	0.00036990	645.53	<.0001
Gender	1	-3.07901	0.02806	-109.72	<.0001
Interaction	1	0.07955	0.00237	33.61	<.0001

N = 459738
Adjusted R Square = 0.5432

Model 3

	DF	Parameter Estimate	Standard Error	t Value	Sig
Constant	1	-21.38983	0.07466	-286.48	<.0001
KS3 Total	1	0.36428	0.00038100	956.11	<.0001
CPI	1	-0.02547	0.00067999	-37.46	<.0001
FSM	1	-4.34474	0.08772	-49.53	<.0001
Gender	1	-2.67954	0.02121	-126.36	<.0001
Interaction	1	0.06256	0.00182	34.28	<.0001

N = 460102
Adjusted R Square = 0.7032