QUASE
Quantitative Analysis for Self-Evaluation

Technical Report 1996
Analysis of GCSE Cohorts 1993 to 1995

Ian Schagen

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National Foundation for Educational Research

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Published in July 1996
by the National Foundation for Educational Research,
The Mere, Upton Park, Slough, Berkshire SL1 2DQ

Registered Charity No. 313392
ISBN 0 7005 14325

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1. INTRODUCTION

The QUASE project began with a pilot study of the 1992 and 1993 GCSE cohorts and continued with its first operational phase including the 1994 GCSE cohorts. It completed its second operational phase with 93 schools supplying data on their 1995 GCSE cohorts. In addition, some schools provided retrospective data on cohorts prior to 1995, giving a very rich database of information on secondary schools, including GCSE results, prior attainment measures, attendance, destinations and a whole host of background data on both pupils and schools.

The first priority of the service is to feed back to schools detailed reports which help them to evaluate 'how they're doing' in comparison with expectations based on their backgrounds and their students' prior attainments. This is achieved through sophisticated statistical modelling, allowing only for those variables which can be consistently measured across all schools and which can be relatively objectively assessed.

A second priority of QUASE is to carry out further analysis of the data collected to gain understanding of the relationships between Year 11 performance and the complete array of background variables collected as part of the process. In this analysis we may make use of a much wider range of variables, including some which are more subjective and less easy to quantify than those included in the school feedback reports.

The analyses detailed in this report cover:

- The seven overall performance indicators, controlling for all available background variables at both the pupil and school levels;
- Performance in the main 15 broad subject groupings, controlling for total GCSE score as well as pupil-level factors;
- Attendance, and its relationships with prior attainment and with GCSE performance;
- Destinations, and their relationships with GCSE performance and other variables.
- Pupil and parent questionnaires, and factors derived from these.

2. THE QUASE SCHOOLS

Before discussing the results obtained from the analysis of the QUASE data, it is worth seeing to what extent the schools involved are representative of secondary schools in general. The NFER's schools database allows us to derive, for each secondary school in England and Wales, values of the following variables:

- Type of school;
- Type of LEA;
- Region;
- GCSE results 1995 (% 5+ A to C grades).

Table 2.1 shows these variables for QUASE schools and for the entire population, and the same information is displayed graphically in Figure 2.1.

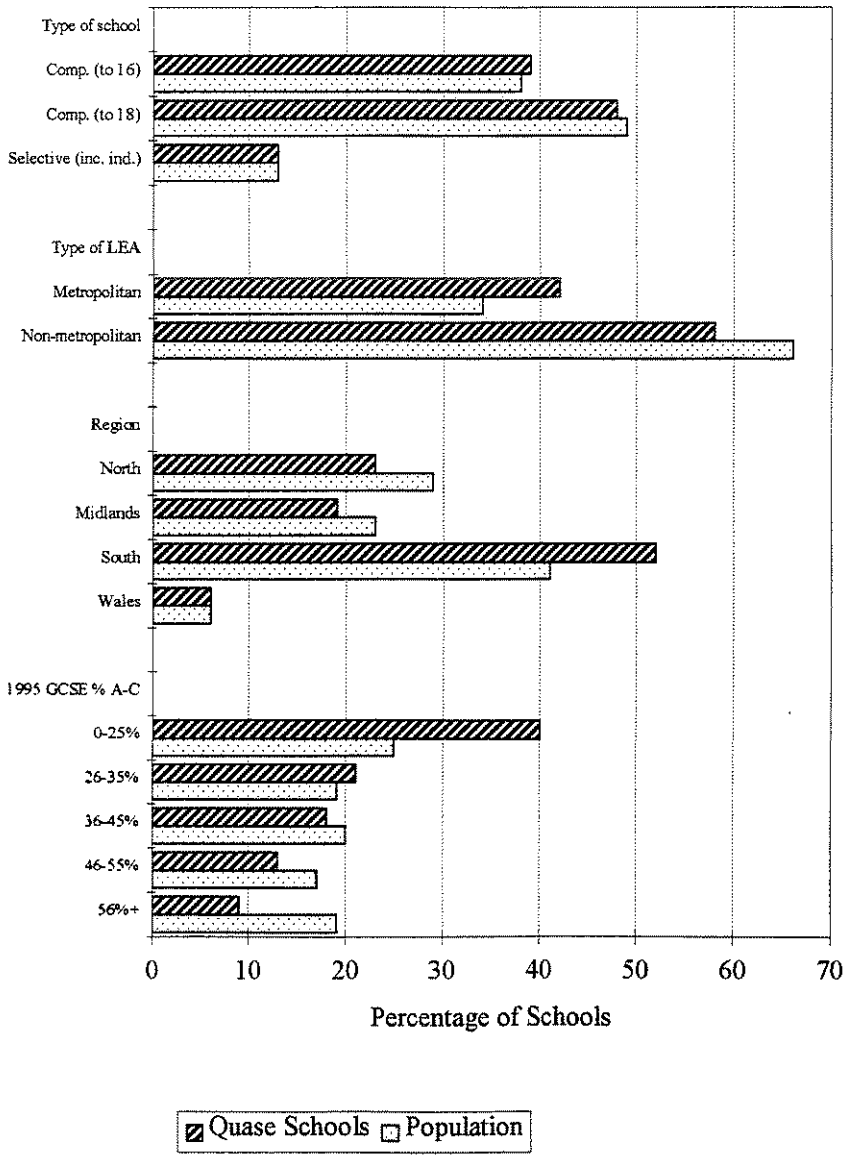
Table 2.1: QUASE schools compared with population, 1995

	QUASE schools		Population	
	%	Number	%	Number
Total	100%	93	100%	3343
Type of school				
Comprehensive (to 16)	39%	36	38%	1309
Comprehensive (to 18)	48%	45	49%	1682
Selective (including independent)	13%	12	13%	452
Type of LEA				
Metropolitan	42%	39	34%	1154
Non-metropolitan	58%	54	66%	2289
Region				
North	23%	21	29%	990
Midlands	19%	18	23%	806
South	52%	48	41%	1426
Wales	6%	6	6%	221
1995 GCSE Results - % A-C				
25% or lower	40%	31	25%	750
26-35%	21%	16	19%	579
36-45%	18%	14	20%	597
46-55%	13%	10	17%	499
Over 55%	9%	7	19%	578

(Since percentages are rounded to the nearest integer, they may not always sum to 100)

Consideration of the above table and the associated figure shows that the types of schools in QUASE are very similar to the national distribution. The split between metropolitan and non-metropolitan LEAs is reasonably close to the national. Regionally, more QUASE schools come from the south, and other regions are slightly under-represented. Looking at 1993 GCSE results, it seems that lower-attaining schools are over-represented, although there are significant percentages in all bands up to the highest. The comparisons show that the range of schools in QUASE is not restricted in any way, and that any findings from the analysis will not be negated because only a limited set of schools was included.

Figure 2.1: Comparison of QUASE Schools and Population (1995)



3. QUASE DATA

The data collected from QUASE schools can be classified as:

- Pupil-level prior attainment measures (at or near intake to secondary school).
- Pupil outcome data (GCSE results, attendance, destinations).
- Background measures, at pupil and school level.
- Questionnaire responses.

3.1 Intake Data

As in the previous phase, a large number of different test results were provided by schools for their students, aiming to measure their level of attainment at or near intake to secondary school. The quality of this data was variable; some tests are clearly valid and reliable measures of prior attainment, relative to a representative national sample. Others were more questionable. As before, we decided to classify each test as follows:

1. 'First division' tests.
2. 'Second division' tests.
3. Tests which could not be used for prior attainment.

The criteria for first division tests were that they should satisfy **all** the following criteria:

- Reputable tests covering the whole ability range;
- Nationally standardised relatively recently (not before about 1970);
- With results presented as standardised scores.

Second division tests failed to satisfy all these criteria, but could still be used to give an approximate picture of pupils' attainment relative to national standards (for example, the results may be presented as reading ages, or the test may have been standardised pre-1970). Some tests, in particular those for selective entry to secondary schools, had not been nationally standardised at all, and could not therefore be used for this purpose. This classification of tests was carried out by a group of staff, in consultation with experts in test development. Where appropriate, publishers' catalogues and manuals were consulted, as well as the review by Levy and Goldstein (1984).

In all, 21 tests were considered to be 'first division', and each was separately analysed in terms of its predictive power for GCSE results. The 'second division' tests were combined into 4 groups, as follows:

1. Verbal Reasoning/Non-Verbal Reasoning bands.
2. English Reading.
3. English Spelling.
4. Mathematics.

Table 3.1 shows the correlations between the 21 first division tests and the four second division groups and three of the GCSE outcomes: total score (TOTSCORE), mathematics score (MATHS) and English score (ENG).

Table 3.1: QUASE Intake Measures Related to GCSE Outcomes, 1995

Test	Number	Corr. with TOTSCORE	Corr. with MATHS	Corr. with ENG
CAT - Verbal	2935	.6985	.6579	.6614
CAT - Non-Verbal	2476	.6000	.6477	.5191
CAT - Quantitative	2549	.7015	.7296	.6294
NFER-Nelson NVR (DH)	3205	.6374	.6831	.5794
NFER-Nelson VR	2649	.7061	.7228	.6482
Richmond - Vocabulary	1067	.6026	.6051	.5352
Richmond - Reading Comp.	1844	.6269	.6226	.5796
Richmond - Maths Concepts	1301	.6327	.7027	.5539
Richmond - Problem Solving	874	.5745	.6382	.4999
Suffolk Reading Scale	209	.4731	.4689	.5484
NFER-Nelson Reading Comp.	1190	.6520	.6373	.6183
London Reading Test	733	.4968	.4341	.5475
Edinburgh Reading Test	283	.7693	.7586	.7286
NFER-Nelson Maths	1665	.7070	.7286	.6570
Richmond - Unknown subject	630	.6481	.6852	.5870
Profile of Maths Skills *	111	.6659	.6605	.5801
Widespan Reading *	469	.6386	.5585	.6283
N-N English Progress Tests	677	.7880	.7586	.7205
Moray House Verbal Reasoning *	379	.6569	.6623	.7734
SPAR *	98	.6438	.5718	.6745
Schonell English *	159	.5900	.6035	.5251
2nd div: VR/NVR bands	792	.5953	.5791	.5466
2nd div: Eng. reading	6944	.5739	.5601	.5609
2nd div: Eng. spelling	1936	.5301	.5459	.5228
2nd div: Maths.	1146	.7541	.8032	.6627

(* - no new cases in 1995)

In the above table, correlations based on small numbers of cases should be regarded as subject to a fair degree of uncertainty. Those based on around a thousand cases or more may be treated as reasonably reliable.

Although each of these tests measures a different aspect of pupils' attainment, our sole purpose in QUASE is to consider their predictive power in terms of GCSE results, and to combine them together into a single variable which is as strong a predictor as possible. The procedure to achieve this makes the assumption that each test was standardised on a representative national sample of pupils, so that a score of 100 corresponds to an 'average' ability. The method proceeds as follows:

1. Regress total GCSE score (TOTSCORE - see section 3.2) against the results from each test, to get a 'conversion factor' from test score above or below 100 to GCSE score above or below national average.
2. Convert each pupil's score on each intake test to an equivalent predicted GCSE score above or below average.
3. Where pupils take more than one test, take the mean predicted score. Thus a composite intake score of +3.0 implies a prediction that the pupil would score three points more than the national average at GCSE.

A simple worked example will serve to illuminate this. Suppose a pupil takes two tests at intake, a CAT Non-Verbal test and a Schonell English test, with the following parameters:

Test	Regression coefficient (TOTSCORE)	Standardised score
CAT Non-Verbal	0.9588	109
Schonell	0.9415	113

To work out the student's 'composite' intake measure, we take 100 away from each score and multiply by the corresponding regression coefficients, giving results of 8.629 and 12.239 for the two tests. The average of these is 10.434, implying that we would predict for this student between 10 and 11 points above average in terms of total GCSE score. This value becomes their 'composite intake measure', with units corresponding to GCSE grade points. Of course, we know that individual pupils' results cannot be predicted with a great deal of accuracy, but over a whole cohort the average prediction should be reasonably accurate.

Appendix A gives details of the regression models fitted for each of the 21 first division intake measures and the four second division groups, and shows predicted GCSE results and associated confidence intervals for each. Table 3.2 shows the number of students with GCSE data and with any intake data (first or second division). It also shows the numbers of schools involved, with one or more students having the relevant intake data. Note that in this study we have included **all** schools and pupils in the three years of interest, not just those schools who participated in the 1995 phase.

Table 3.2: Numbers of Pupils and Schools with Intake Data, all years

	Students				Schools		
Year	**93**	**94**	**95**	**All**	**93**	**94**	**95**
With any intakes	1797 68%	6225 62%	9378 65%	17400 65%	16 80%	58 78%	73 78%
Total with GCSE data	2637	9979	14335	26951	20	74	93

(The percentage figures represent the percentage of students or schools with intake data)

3.2 Outcome Measures

Inevitably, the focus of analysis in QUASE, as in so much of 'value-added' research, has been on GCSE results as outcomes. They are fairly universally available, relatively consistent across the country, easily quantifiable and have a high perceived status in terms of secondary school performance. However, since each individual student can receive a range of grades in each of up to about 10 subjects, it is not clear how this essentially multidimensional data should be translated into a single numerical indicator which expresses unambiguously the performance of a student, and by aggregation that of a school.

The present government's favoured measure for school league tables is percentage of students gaining five or more A to C grades (also a component of National Targets for Education and Training). This has various disadvantages, not least that it loses more information from the student-level data than is necessary. Additionally, it may tend to encourage schools to concentrate effort on pupils at the C/D borderline, to improve their league table positions, while neglecting the very high or low attaining pupils. The truth is that there is no single 'right' measure for analysing school performance, especially since schools have variable policies on entering students for GCSE. We defined a set of seven outcome measures based on GCSE results, which altogether should give a good overall perspective on student and school outcomes. These are all based on a simple GCSE grade to score conversion (A = 7, B = 6, C = 5, D = 4, E = 3, F = 2, G = 1, U etc. = 0), and are defined as:

1. Total GCSE score (TOTSCORE), summed over all subjects attempted.
2. Average GCSE score (AVSCORE), averaged over subjects attempted.
3. Mathematics score (MATHS).
4. English score (ENG), averaged over Language/Literature, if necessary.
5. Science score as a **total** (SCI), summed over Single/Double award or separate subject.
6. Number of A to C grades achieved (NATOC).
7. Number of A to G grades achieved (NATOG).

It is important to note that the science score used as an overall performance indicator is based on the total score over all the science subjects entered. In this it differs from the scores for mathematics or English, which are averages. The aim is to account for the total amount of science achieved, and to differentiate between schools offering Single science, Double science, and three separate sciences. When it comes to the analysis of subject areas, however, the science score used is an average over subjects entered. It is important to bear this distinction in mind when considering the results.

The question of starred A (A*) grades arose in 1994 GCSE data for the first time. We decided to treat it as equivalent to A (seven points), for two reasons. The first related to the desire to ensure year-on-year comparability between the 1994 data and that for earlier years. The second concern was the variable criteria across subjects and exam boards for setting the A/A* boundary. The position will continue to be reviewed annually.

Another unresolved issue is that of non-GCSE qualifications, especially vocational, taken in Year 11. Unfortunately, there is as yet no commonly-accepted method for

equating such qualifications to GCSE, and in the absence of this it is not possible to include non-GCSE results in any of the seven examination-based outcome measures. It is quite likely that in the future further research may lead to some agreed basis for doing this, but in the interim those schools whose students have gained such qualifications will have to make their own allowances for this.

In addition to the seven overall performance indicators, some analysis was carried out on 15 subject areas, using the NCER's classification of subjects (see Appendix B). In these cases the score for a pupil was the average GCSE score for the relevant subjects entered.

As well as examination-based outcomes, two other pupil-level measures were collected from the majority of schools: attendance and destinations. The former was collected as percentage attendance during the autumn and spring terms of Year 11, and averaged to give a single numerical value for each student. Student destinations after year 11 were collected as a set of codes, and had to be converted to a destination 'score' before any analysis could be carried out. The destination score was allocated as follows:

10	if student was in full-time education or training;
5	if student was in part-time education or work without training; and
0	if student was unemployed or otherwise occupied.

Clearly this is a fairly crude conversion procedure, but it was hoped that it would give some information on the factors affecting students' post-16 progression.

3.3 Background Data

As well as intake and outcome measures, a wide range of other data was collected about each student and each school. At the student level, information was requested about sex and ethnicity, as well as whether or not the pupil received free school meals, used English as a second language, or had some level of special educational need (SEN). The ethnicity variable was grouped and used to create three dichotomy variables for analysis: whether or not the student was black, Asian or of other (non-white) ethnic group. The white category was used as a default in the multilevel analysis. In this study, for the first time, students' ages were recorded and used in the analysis.

Each school supplied data on a school context questionnaire, which included information about the type of school, its catchment area, and some background information about teaching practices and school background. Table 3.3 comprises a complete breakdown of each variable included in the multilevel analysis, with its codename, description and range of values.

Table 3.3: Variables used in Multilevel Modelling, 1995

	Range		
Name	**Min.**	**Max.**	**Description**
DESNO			School DFEE number
YEAR	93	95	Year of GCSE results
ID	0	9999	Pupil id
SEX	0	2	Sex: 0 = male, 2 = female, 1 = not known
FSM	0	1	Entitled to free school meals?
ESL	0	1	English second language?
SEN	0	6	Special educational need?
BLACK	0	1	Black ethnic group
ASIAN	0	1	Asian ethnic group
OTHER	0	1	Other (non-white) ethnic group
NUDEST	0	2	Destination (coded)
AVATT	0	100	Average attendance
TOTSCORE	0	84	Total GCSE score
AVSCORE	0	7	Average GCSE score
MATHS	0	7	Maths score
ENG	0	7	Average English score
SCI	0	27	Science GCSE score (total)
NATOC	0	12	No. GCSEs A-C
NATOG	0	13	No. GCSEs A-G
SUBA1	0	7	Subject area A : Science
SUBA2	0	7	Subject area B : Maths
SUBA3	0	7	Subject area C : Computing & IT
SUBA4	0	7	Subject area D : Technology
SUBA5	0	7	Subject area E : Art etc.
SUBA6	0	7	Subject area F : Geography
SUBA7	0	7	Subject area G : History
SUBA8	0	7	Subject area H : Humanities etc.
SUBA9	0	7	Subject area I : English
SUBA10	0	7	Subject area J : Welsh
SUBA11	0	7	Subject area K : Languages
SUBA12	0	7	Subject area L : Music etc.
SUBA13	0	7	Subject area M : PE etc.
SUBA14	0	7	Subject area N : Misc. Vocational
SUBA15	0	7	Subject area P : General Studies
XCOMP1	-999	41	Composite intake measure (1st div.)
XCOMP2	-999	45	Composite intake measure (all)

Table 3.3: Variables used in Multilevel Modelling, 1995 (continued)

Name	Min.	Max.	Description
GM	0	1	Grant-maintained school
CTC	0	0	CTC school
IND	0	1	Independent school
VOL	0	1	Voluntary aided/controlled school
GIRLSCH	0	1	Girls' school
BOYSCH	0	1	Boys' school
ALEV	0	1	School with 6th form
CATCH	0	4	Catchment area: 0 = inner city; 4 = rural
ACADEM	-1	1	Overall academic ability (estimated)
STREAM	0	1	Groups streamed by ability
MIXAB	0	1	Mixed ability throughout
TURNOVER	0	2	Staff turnover (low to high)
SUPPLY	0	2	Use of supply cover (low to high)
UNFILLED	0	1	Unfilled staff vacancies (low to high)
PARATT	0	2	Parental attendance at meetings (low to high)
Y11SIZE	28	368	Size of Year 11 cohort
PCFSM	2	90	% free school meals
PCSEN	0	68	% special educational needs
PCESL	0	53	% English as a second language
IN93	0	1	In 1993 GCSE cohort
IN94	0	1	In 1994 GCSE cohort
AGE	16	16.9	Age at 1/9 of exam year (Years+decimals)

4. RESULTS OF MULTILEVEL ANALYSES

4.1 Analysis of Overall Performance Indicators

The main objective of QUASE was to provide feedback to schools in terms of their own performance, relative to what might be expected given the students they had and their own circumstances. The main thrust of that analysis was to produce school-level residuals plus standard errors, so that each school could be informed as to whether it was above, below or not significantly different from predicted levels in each performance indicator. Analysis was carried out in three phases, for each outcome measure:

1. 'Raw' results, taking no background data into account;
2. Controlling for pupil prior attainment and sex;
3. Controlling, in addition to the above, for school context and ethnic background.

In these analyses, a limited subset of the background data available was used, since many of the variables, although interesting, were either not relevant to this task or not sufficiently objective to validate their inclusion. Because of the variable occurrence of prior attainment data, the analysis was repeated for two different groups of students and schools:

1. Those with any prior attainment data;
2. All students in the Year 11 cohort.

For this report, the focus has shifted from feeding back results to individual schools to investigating the effects of different student and school background variables on outcomes. Prior attainment is important in this, so analysis was concentrated on students with some form of prior attainment measure (17,400 in total from 99 schools).

Tables 4.1 to 4.7 and Figures 4.1 to 4.7 give the results of this analysis for each of the seven performance indicators. Each table shows the variance in the outcome variable at the school, cohort and pupil levels, as well as its standard error and a star to show if it is significantly non-zero at the 5% level. Similarly, background variables which have regression coefficients which are significant, or nearly so, are shown. Stars indicate which are significant at the 5% level, and the columns headed 'Low' and 'High' give the upper and lower 95% confidence intervals for each coefficient.

The coefficients which are estimated by the multilevel model represent the expected change in the outcome variable per unit change in the relevant background variable. This is fine as far as it goes, but it makes it difficult to compare the effect which different background variables have on the same outcome, or which a given background variable has on different outcomes. One way of dealing with this is to convert the coefficients to 'effect sizes' by multiplying by the ratio of the standard deviations of the background and outcome variables and converting to a percentage. The resulting effect size is independent of units and represents the change in the outcome measure, as a percentage of its standard deviation, associated with a change in the background variable of one standard deviation. It may be regarded as

equivalent to the correlation between the two variables when other variables in the model are also taken into account.

Figures 4.1 to 4.7 illustrate these effect sizes graphically, with each cross representing a 95% confidence interval. Those which do not touch the zero baseline can be considered significantly different from zero, i.e. those variables appear to be significantly related to the outcome, when other variables are taken into account.

Looking at the seven tables (4.1 to 4.7), it seems that the variables which are significant in all of them are sex, prior attainment (XCOMP2), free school meals (at the student level - FSM), special educational needs, Asian ethnic background, parental attendance and percentage of free school meals (PCFSM). Performance in 1993 and 1994 seems consistently lower than 1995 (when other background variables are taken into account). Sex has a positive coefficient (girls outperforming boys) for five of the outcomes, and it is negative (boys outperforming girls) in mathematics and science - so some old stereotypes still seem to be active. Note that the coefficient of SEX is actually twice the average difference between girls and boys, because of the way this variable was coded. **Prior attainment is very positively related to outcomes throughout, and the school-level variable PCFSM is strongly negatively related. These two are the main predictors of GCSE performance at student and school levels.** The individual free school meal variable is also strongly related (negatively) to outcomes.

Some variables have significant coefficients in a majority of the tables: other non-white ethnic background (OTHER - positive), age within the Year 11 band (AGE - positive), and being at a boys' school (BOYSCH - positive). The latter is interesting, although it is not clear to what extent it is a surrogate for other aspects of the schools concerned over and about their single-sex status. The only significant effect for girls' schools is in science, which may be just because there are relatively few involved in the analysis.

Other variables are significant in a few cases. English as a second language has a positive relationship with total GCSE score and number of A to C grades. Black students appear to under-perform in mathematics, science and number of A to C grades. Schools classified as voluntary are associated with higher results in four cases, and independent schools in two (one is total science score - this might be expected, if independent schools tend to enter more students for three sciences). The variable based on level of supply cover is negatively related to four outcomes and positively to one (mathematics) - it is not easy to find an instant explanation of this.

Tables 4.1 to 4.7 show the results of models with simple random parts - i.e. random errors at the pupil, cohort and school levels but otherwise all the effects of background variables are assumed to be the same for every school. We may make more complex assumptions, including that certain variables (sex and prior attainment) have coefficients which differ from school to school. This can be modelled by including these variables with coefficients which are random at the school level.

Running such models for TOTSCORE and AVSCORE showed that both SEX and XCOMP2 indeed had random coefficients at the school level with a variance which was significantly different from zero. In other words, some schools have male-female

differences which are significantly different from average, and it is also the case that the relationship between prior attainment and GCSE results varies significantly from school to school.

The latter effect is quite interesting, as it implies that some schools have rather 'flat' slopes, with lower attaining pupils at intake 'catching up' with their higher attaining peers by GCSE. Conversely, other schools have quite 'steep' slopes, with increased differentiation between high and low achievers. To investigate possible relationships between these effects and different school types, some extra variables were introduced into the model, corresponding to 'interaction terms'.

GMINT - Interaction between GM (grant-maintained) and prior attainment;
VOLINT - Interaction between VOL (voluntary) and prior attainment;
INDINT - Interaction between IND (independent) and prior attainment.

Models were fitted to both TOTSCORE and AVSCORE including these interaction terms and with random coefficients of SEX and XCOMP2 at the school level. Results are shown in Tables 4.8 and 4.9. Of the interaction terms, INDINT is significant on both occasions, with a negative value. This implies that independent schools, as a group, have a significantly flatter slope than the default group (LEA-maintained schools). It is interesting to speculate on the reason for this. Possibly independent schools are dealing with a more restricted range of prior attainments, and are able to bring all their students up to a high level of achievement. Furthermore, there is a 'ceiling' to GCSE performance which will tend to reduce the slope for higher attaining students. The interaction term GMINT is similarly negative for AVSCORE, though not significantly so for TOTSCORE, but any effect for GM schools is much less marked than for independent schools.

Figure 4.8 shows the difference in performance (measured by TOTSCORE) between girls and boys for each school in the study, as estimated by the multilevel model with random coefficients. Each school is represented by a vertical line, whose midpoint is the estimated difference and whose length measures the 95% confidence interval. It is clear that about one-third of schools have female/male differences which are not significantly different from zero, while the others are all showing significant advantages to the females. These can go up to about five GCSE points (one grade C) in some schools.

In Figure 4.9 we can see the relationships between prior attainment and GCSE total score for all the schools, with the steepest slopes being about twice the shallowest. The question of differential performance between schools has often been raised, but the data from QUASE seems to indicate quite clearly that different schools do have different relationships between prior attainment and GCSE performance.

Figures 4.10 and 4.11 show 'quadrant plots' for the schools in QUASE with prior attainment data. These represent, in the case of total GCSE score (TOTSCORE) and average score (AVSCORE), the changes in each school's position when school and pupil background data is taken into account. In Figure 4.10 the unadjusted residuals in TOTSCORE are plotted along the bottom axis and adjusted residuals, taking account of pupil and school data, are plotted up the side. Each school is represented by a dot, and it is clear that the effect of allowing for background information is to

reduce the variation between schools and to change their relative rankings. Schools in the top right and bottom left quadrants retain the same position relative to the average (zero residual) before and after adjustment, but there are a number of schools in the other two quadrants who change from below average to above or vice versa. Similar comments apply to Figure 4.11, for AVSCORE.

Table 4.1: Analysis of Total GCSE Score (TOTSCORE)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	109.400	17.040	*	76.002	142.798
Cohort variance	9.407	2.438	*	4.629	14.185
Pupil variance	250.500	2.697	*	245.214	255.786
Pupil level only					
School variance	35.460	6.240	*	23.230	47.690
Cohort variance	7.818	1.889	*	4.116	11.520
Pupil variance	140.000	1.507	*	137.046	142.954
Final model					
School variance	13.490	3.088		7.438	19.542
Cohort variance	7.100	1.731	*	3.707	10.493
Pupil variance	140.000	1.507	*	137.046	142.954
CONS	7.766	7.014		-5.981	21.513
IN94	-4.339	0.629	*	-5.571	-3.107
IN93	-5.826	0.969	*	-7.724	-3.928
SEX	1.439	0.096	*	1.251	1.627
FSM	-5.218	0.261	*	-5.729	-4.707
ESL	1.402	0.697	*	0.035	2.769
SEN	-3.505	0.161	*	-3.821	-3.189
BLACK	-1.205	0.678		-2.535	0.125
ASIAN	5.170	0.639	*	3.917	6.423
OTHER	3.754	0.940	*	1.911	5.597
AGE	1.719	0.417	*	0.903	2.535
XCOMP2	0.956	0.010	*	0.937	0.976
VOL	2.971	1.408	*	0.211	5.731
BOYSCH	8.859	1.901	*	5.133	12.585
SUPPLY	-1.543	0.710	*	-2.935	-0.151
PARATT	2.219	0.668	*	0.909	3.529
PCFSM	-0.167	0.030	*	-0.226	-0.108

Table 4.2: Analysis of Average GCSE Score (AVSCORE)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	0.881	0.141	*	0.606	1.157
Cohort variance	0.096	0.025	*	0.047	0.144
Pupil variance	2.552	0.027	*	2.498	2.606
Pupil level only					
School variance	0.212	0.045	*	0.125	0.299
Cohort variance	0.091	0.022	*	0.049	0.134
Pupil variance	1.451	0.016	*	1.420	1.482
Final model					
School variance	0.085	0.026		0.033	0.136
Cohort variance	0.086	0.020	*	0.047	0.125
Pupil variance	1.451	0.016	*	1.420	1.482
CONS	1.155	0.711		-0.239	2.549
IN94	-0.307	0.065	*	-0.434	-0.180
IN93	-0.337	0.101	*	-0.535	-0.138
SEX	0.139	0.010	*	0.120	0.158
FSM	-0.519	0.027	*	-0.571	-0.466
ESL	0.111	0.071		-0.028	0.250
SEN	-0.348	0.016	*	-0.380	-0.316
BLACK	-0.102	0.069		-0.238	0.033
ASIAN	0.499	0.065	*	0.371	0.626
OTHER	0.288	0.096	*	0.101	0.476
AGE	0.164	0.042	*	0.081	0.247
XCOMP2	0.096	0.001	*	0.094	0.098
BOYSCH	0.647	0.169	*	0.316	0.978
SUPPLY	-0.142	0.067	*	-0.273	-0.011
PARATT	0.209	0.061	*	0.089	0.328
PCFSM	-0.011	0.003	*	-0.017	-0.006

Table 4.3: Analysis of Mathematics GCSE Score (MATHS)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	1.188	0.192	*	0.811	1.565
Cohort variance	0.153	0.038	*	0.078	0.228
Pupil variance	3.334	0.036	*	3.264	3.404
Pupil level only					
School variance	0.323	0.068	*	0.191	0.456
Cohort variance	0.141	0.032	*	0.077	0.204
Pupil variance	1.871	0.020	*	1.832	1.910
Final model					
School variance	0.156	0.044		0.070	0.241
Cohort variance	0.133	0.030	*	0.073	0.192
Pupil variance	1.871	0.020	*	1.832	1.910
CONS	1.386	0.809		-0.200	2.972
IN94	-0.280	0.081	*	-0.438	-0.122
IN93	-0.358	0.125	*	-0.603	-0.113
SEX	-0.065	0.011	*	-0.087	-0.043
FSM	-0.450	0.030	*	-0.509	-0.391
ESL	0.097	0.081		-0.061	0.255
SEN	-0.322	0.019	*	-0.358	-0.285
BLACK	-0.305	0.078	*	-0.458	-0.151
ASIAN	0.452	0.074	*	0.307	0.597
OTHER	0.219	0.109	*	0.006	0.432
AGE	0.140	0.048	*	0.046	0.234
XCOMP2	0.116	0.001	*	0.114	0.118
BOYSCH	0.830	0.421	*	0.004	1.656
SUPPLY	0.631	0.222	*	0.196	1.066
PARATT	0.217	0.078	*	0.063	0.371
PCFSM	-0.015	0.003	*	-0.022	-0.008

Table 4.4: Analysis of English GCSE Score (ENG)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	0.889	0.149	*	0.597	1.181
Cohort variance	0.145	0.036	*	0.074	0.215
Pupil variance	3.090	0.033	*	3.025	3.155
Pupil level only					
School variance	0.218	0.053	*	0.115	0.322
Cohort variance	0.138	0.032	*	0.076	0.200
Pupil variance	1.842	0.020	*	1.803	1.881
Final model					
School variance	0.075	0.032		0.012	0.138
Cohort variance	0.132	0.029	*	0.074	0.189
Pupil variance	1.843	0.020	*	1.804	1.882
CONS	0.467	0.800		-1.102	2.035
IN94	-0.382	0.076	*	-0.532	-0.233
IN93	-0.316	0.121	*	-0.552	-0.080
SEX	0.290	0.011	*	0.269	0.312
FSM	-0.499	0.030	*	-0.558	-0.441
ESL	0.042	0.080		-0.115	0.198
SEN	-0.499	0.018	*	-0.535	-0.463
BLACK	0.069	0.078		-0.083	0.221
ASIAN	0.479	0.073	*	0.336	0.623
OTHER	0.209	0.108		-0.002	0.420
AGE	0.221	0.048	*	0.127	0.315
XCOMP2	0.094	0.001	*	0.092	0.096
VOL	0.376	0.132	*	0.118	0.634
BOYSCH	0.600	0.181	*	0.244	0.955
SUPPLY	-0.140	0.074		-0.285	0.004
PARATT	0.139	0.067	*	0.007	0.271
PCFSM	-0.015	0.003	*	-0.020	-0.009

Table 4.6: Analysis of Total Science Score (SCI)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	7.309	1.124	*	5.106	9.512
Cohort variance	0.567	0.147	*	0.279	0.855
Pupil variance	14.840	0.160	*	14.527	15.153
Pupil level only					
School variance	2.761	0.486	*	1.808	3.714
Cohort variance	0.625	0.148	*	0.336	0.915
Pupil variance	9.490	0.102	*	9.290	9.690
Final model					
School variance	0.912	0.219		0.482	1.341
Cohort variance	0.546	0.130	*	0.292	0.800
Pupil variance	9.491	0.102	*	9.291	9.691
CONS	6.098	1.829	*	2.513	9.683
IN94	-1.025	0.172	*	-1.362	-0.688
IN93	-2.200	0.264	*	-2.718	-1.682
SEX	-0.253	0.025	*	-0.302	-0.204
FSM	-1.035	0.068	*	-1.168	-0.902
ESL	0.048	0.182		-0.308	0.404
SEN	-0.703	0.042	*	-0.786	-0.621
BLACK	-0.512	0.177	*	-0.859	-0.166
ASIAN	0.906	0.167	*	0.580	1.233
OTHER	0.640	0.245	*	0.160	1.120
AGE	0.162	0.109		-0.051	0.375
XCOMP2	0.218	0.003	*	0.212	0.223
IND	3.825	0.953	*	1.958	5.692
GIRLSCH	0.825	0.456		-0.068	1.718
BOYSCH	2.169	0.516	*	1.157	3.181
TURNOVER	-0.417	0.213	*	-0.834	0.000
SUPPLY	-0.569	0.192	*	-0.946	-0.191
PARATT	0.486	0.179	*	0.136	0.837
PCFSM	-0.035	0.008	*	-0.050	-0.020

Table 4.6: Analysis of Number of A to C Grades (NATOC)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	3.813	0.582	*	2.673	4.953
Cohort variance	0.218	0.064	*	0.092	0.344
Pupil variance	9.923	0.107	*	9.714	10.132
Pupil level only					
School variance	1.203	0.213	*	0.786	1.620
Cohort variance	0.262	0.066	*	0.132	0.392
Pupil variance	6.135	0.066	*	6.006	6.264
Final model					
School variance	0.433	0.104		0.230	0.636
Cohort variance	0.241	0.061	*	0.121	0.361
Pupil variance	6.135	0.066	*	6.006	6.264
CONS	-4.253	1.457	*	-7.109	-1.397
IN94	-0.628	0.118	*	-0.858	-0.397
IN93	-0.672	0.181	*	-1.026	-0.317
SEX	0.290	0.020	*	0.251	0.329
FSM	-0.731	0.055	*	-0.838	-0.624
ESL	0.308	0.146	*	0.022	0.593
SEN	-0.163	0.034	*	-0.229	-0.097
BLACK	-0.419	0.142	*	-0.697	-0.141
ASIAN	0.848	0.134	*	0.586	1.110
OTHER	0.488	0.197	*	0.102	0.873
AGE	0.484	0.087	*	0.313	0.655
XCOMP2	0.192	0.002	*	0.188	0.196
IND	1.913	0.658	*	0.624	3.202
VOL	0.537	0.256	*	0.034	1.039
BOYSCH	1.915	0.351	*	1.227	2.603
PARATT	0.357	0.123	*	0.116	0.597
PCFSM	-0.027	0.005	*	-0.038	-0.016

Table 4.7: Analysis of Number of A to G Grades (NATOG)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	1.868	0.320	*	1.241	2.495
Cohort variance	0.368	0.088	*	0.195	0.540
Pupil variance	6.428	0.069	*	6.292	6.564
Pupil level only					
School variance	0.836	0.163	*	0.517	1.155
Cohort variance	0.279	0.067	*	0.148	0.409
Pupil variance	4.858	0.052	*	4.755	4.961
Final model					
School variance	0.411	0.103		0.209	0.613
Cohort variance	0.271	0.064	*	0.145	0.397
Pupil variance	4.858	0.052	*	4.755	4.961
CONS	8.846	1.305	*	6.288	11.404
IN94	-0.689	0.120	*	-0.923	-0.454
IN93	-1.066	0.186	*	-1.430	-0.702
SEX	0.135	0.018	*	0.100	0.170
FSM	-0.919	0.049	*	-1.014	-0.824
ESL	0.192	0.130		-0.063	0.447
SEN	-0.993	0.030	*	-1.052	-0.934
BLACK	0.083	0.126		-0.165	0.330
ASIAN	0.776	0.119	*	0.542	1.009
OTHER	0.569	0.175	*	0.226	0.913
AGE	-0.017	0.078		-0.169	0.135
XCOMP2	0.087	0.002	*	0.083	0.090
VOL	0.534	0.253	*	0.039	1.030
SUPPLY	-0.345	0.129	*	-0.597	-0.093
PARATT	0.315	0.122	*	0.076	0.555
PCFSM	-0.028	0.005	*	-0.038	-0.017

Table 4.8: TOTSCORE analysis with random effects and interactions

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
School variance	25.690	4.948	*	15.992	35.388
SEX intcpt variance	-2.440	0.837	*	-4.081	-0.799
SEX slope variance	0.675	0.226	*	0.232	1.118
XCOMP2 intcpt var.	0.266	0.123	*	0.025	0.507
XCOMP2 by SEX covariance	0.031	0.027		-0.021	0.084
XCOMP2 slope var.	0.031	0.006	*	0.019	0.042
Cohort variance	6.762	1.662	*	3.504	10.020
Pupil variance	136.500	1.477	*	133.605	139.395
CONS	8.316	6.907		-5.222	21.854
IN94	-4.481	0.624	*	-5.705	-3.257
IN93	-5.777	0.962	*	-7.662	-3.892
SEX	1.297	0.134	*	1.034	1.560
FSM	-5.139	0.259	*	-5.646	-4.632
ESL	1.286	0.695		-0.076	2.648
SEN	-3.584	0.164	*	-3.905	-3.263
BLACK	-1.160	0.673		-2.479	0.159
ASIAN	5.527	0.639	*	4.275	6.779
OTHER	3.854	0.932	*	2.027	5.681
AGE	1.816	0.413	*	1.007	2.625
XCOMP2	0.957	0.027	*	0.903	1.010
PCFSM	-0.199	0.032	*	-0.262	-0.136
GM	1.983	1.304		-0.573	4.539
VOL	5.256	1.627	*	2.067	8.445
IND	17.650	4.353	*	9.118	26.182
GMINT	-0.074	0.049		-0.171	0.022
VOLINT	0.103	0.065		-0.024	0.230
INDINT	-0.590	0.181	*	-0.944	-0.236

Table 4.9: AVSCORE analysis with random effects and interactions

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
School variance	0.194	0.043	*	0.110	0.279
SEX intcpt variance	-0.022	0.008	*	-0.037	-0.007
SEX slope variance	0.006	0.002	*	0.002	0.011
XCOMP2 intcpt var.	0.000	0.001		-0.002	0.003
XCOMP2 by SEX covar.	0.000	0.000		0.000	0.001
XCOMP2 slope var.	0.000	0.000	*	0.000	0.000
Cohort variance	0.082	0.020	*	0.044	0.121
Pupil variance	1.415	0.015	*	1.385	1.445
CONS	1.356	0.702		-0.020	2.732
IN94	-0.309	0.066	*	-0.439	-0.180
IN93	-0.339	0.103	*	-0.540	-0.137
SEX	0.125	0.014	*	0.099	0.151
FSM	-0.507	0.026	*	-0.558	-0.455
ESL	0.106	0.071		-0.033	0.245
SEN	-0.354	0.017	*	-0.387	-0.321
BLACK	-0.099	0.069		-0.233	0.036
ASIAN	0.542	0.065	*	0.415	0.670
OTHER	0.300	0.095	*	0.114	0.486
AGE	0.169	0.042	*	0.087	0.251
XCOMP2	0.099	0.003	*	0.094	0.104
PCFSM	-0.017	0.003	*	-0.023	-0.011
GM	0.107	0.121		-0.130	0.344
VOL	0.345	0.148	*	0.055	0.634
IND	1.645	0.409	*	0.844	2.446
GMINT	-0.013	0.005	*	-0.023	-0.003
VOLINT	-0.001	0.007		-0.014	0.012
INDINT	-0.064	0.019	*	-0.100	-0.027

Fig 4.1: Effect Sizes for TOTSCORE

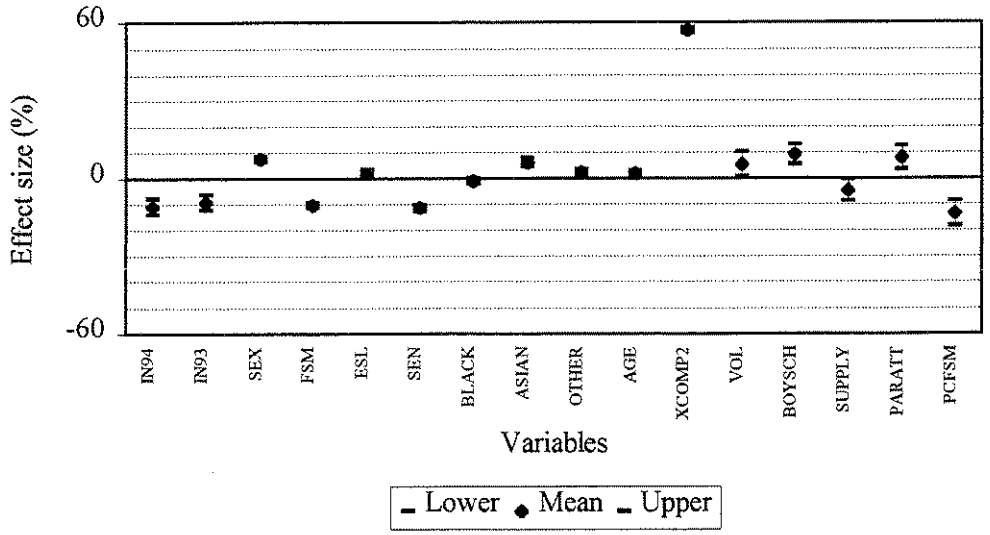


Fig 4.2: Effect Sizes for AVSCORE

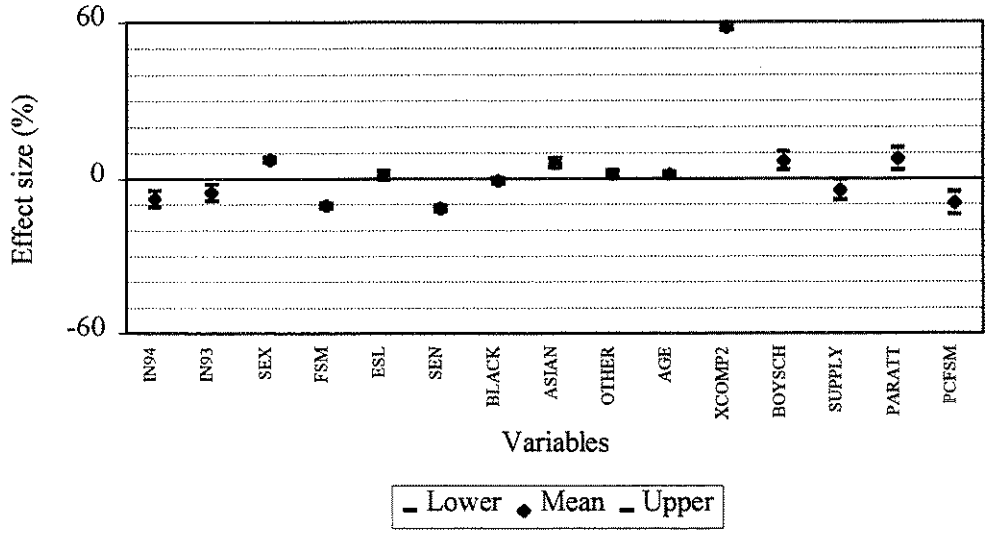


Figure 4.3: Effect Sizes for MATHS

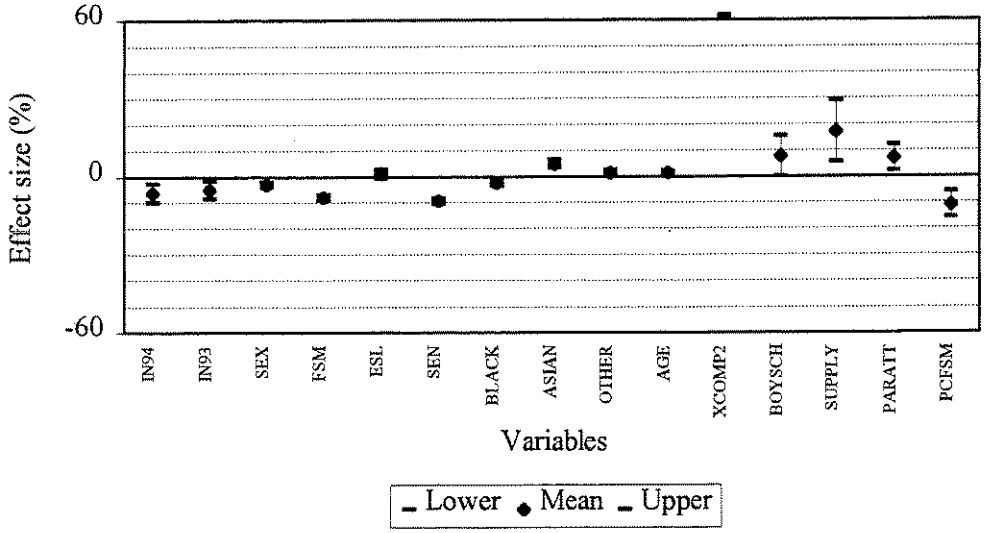


Figure 4.4: Effect Sizes for ENG

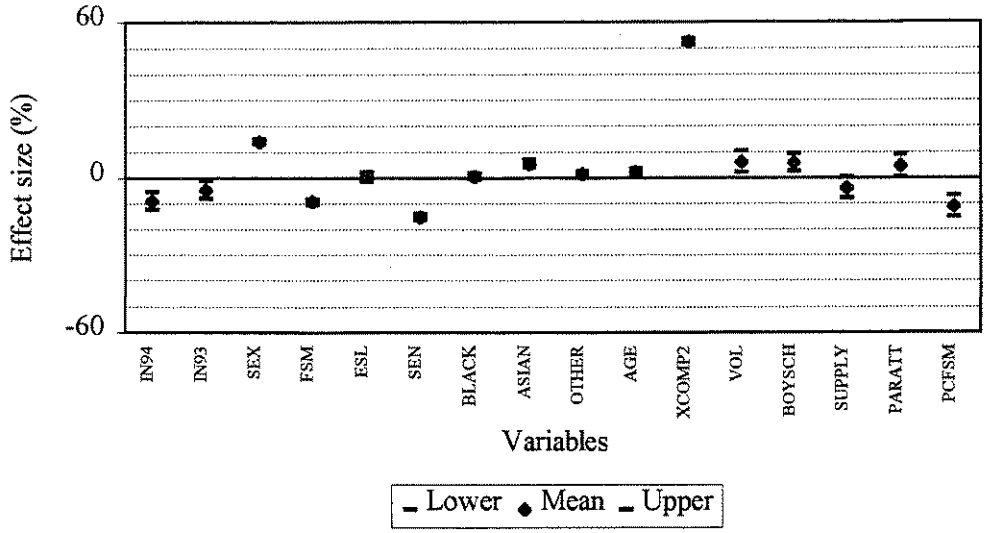


Figure 4.5: Effect Sizes for SCI

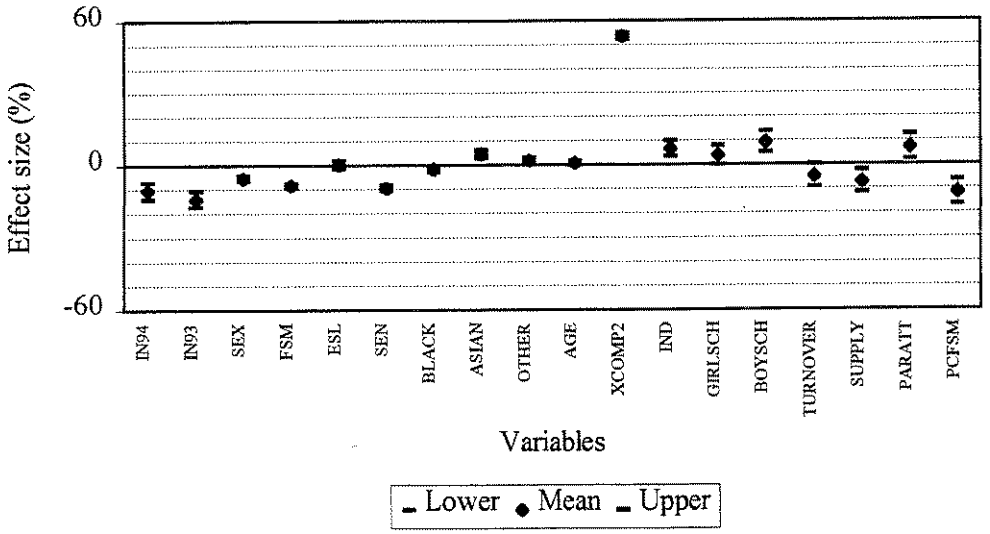


Figure 4.6: Effect Sizes for NATOC

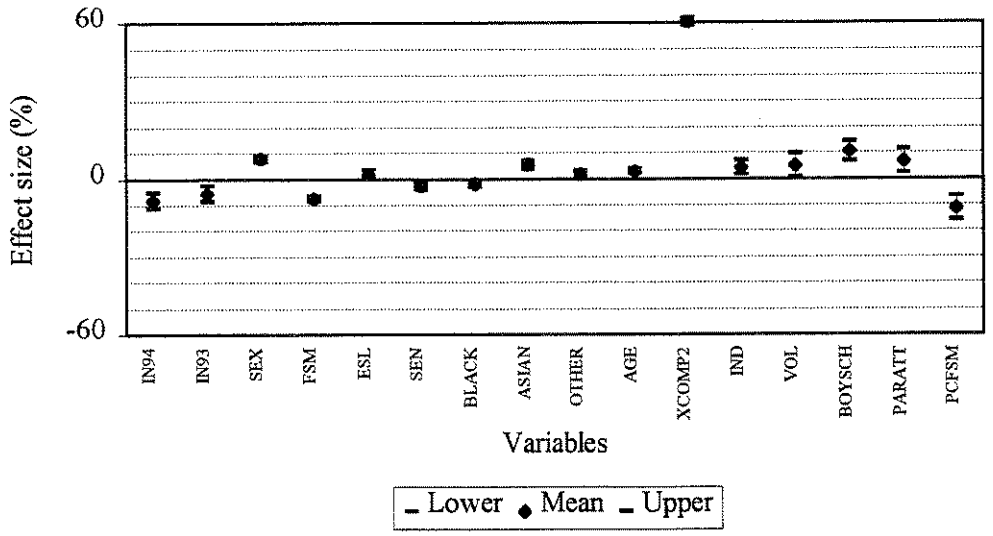


Figure 4.7: Effect Sizes for NATOG

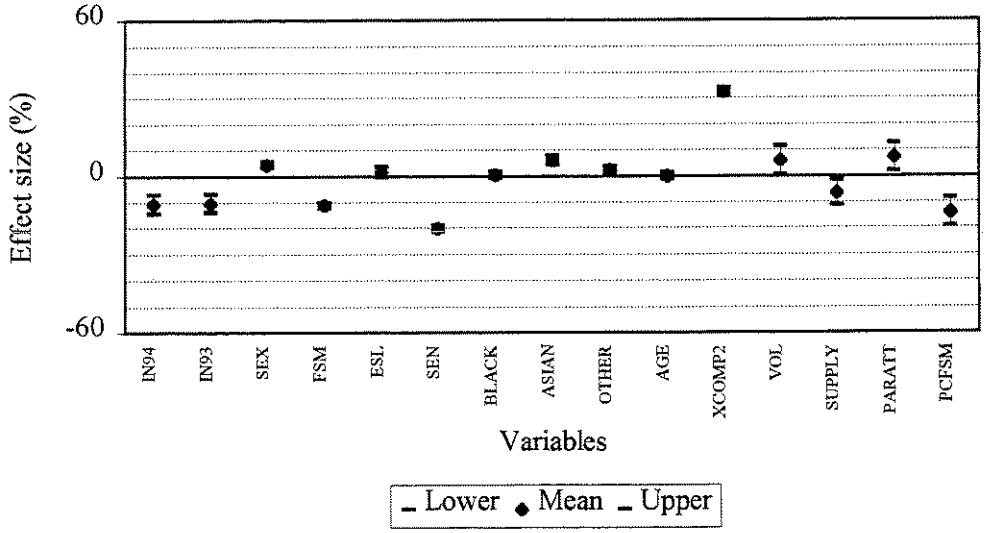


Figure 4.8: Total GCSE Score differential performance between girls and boys for each school, showing 95% confidence intervals

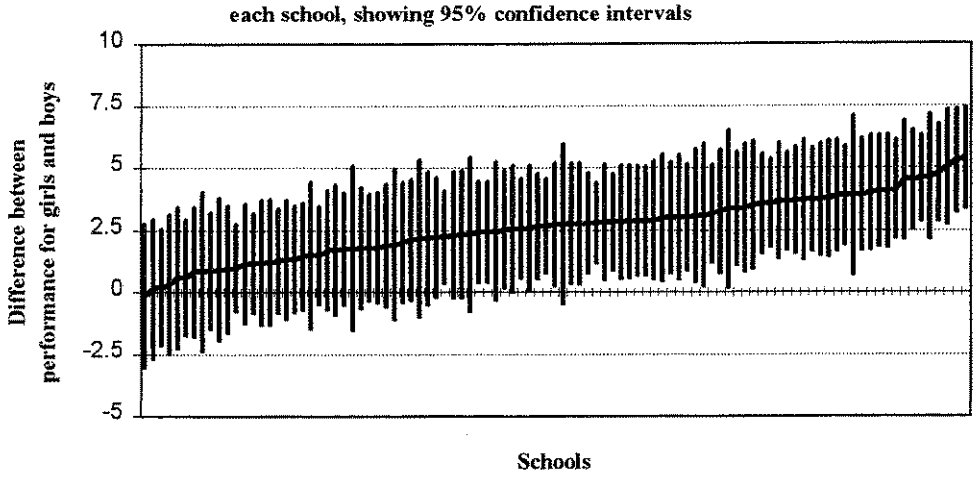


Figure 4.9: Total GCSE Score versus prior attainment slope for each school, showing 95% confidence intervals

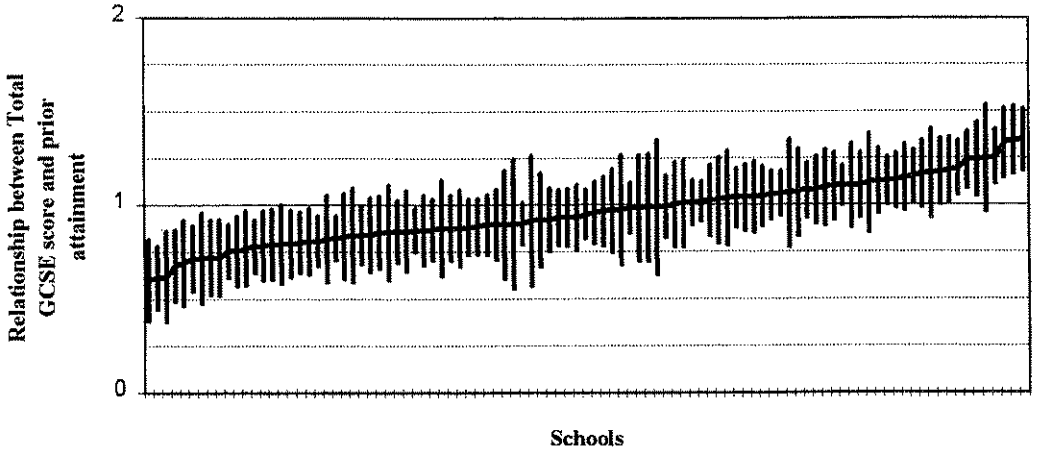


Figure 4.10: Adjusted versus Unadjusted residuals (Total GCSE Score)

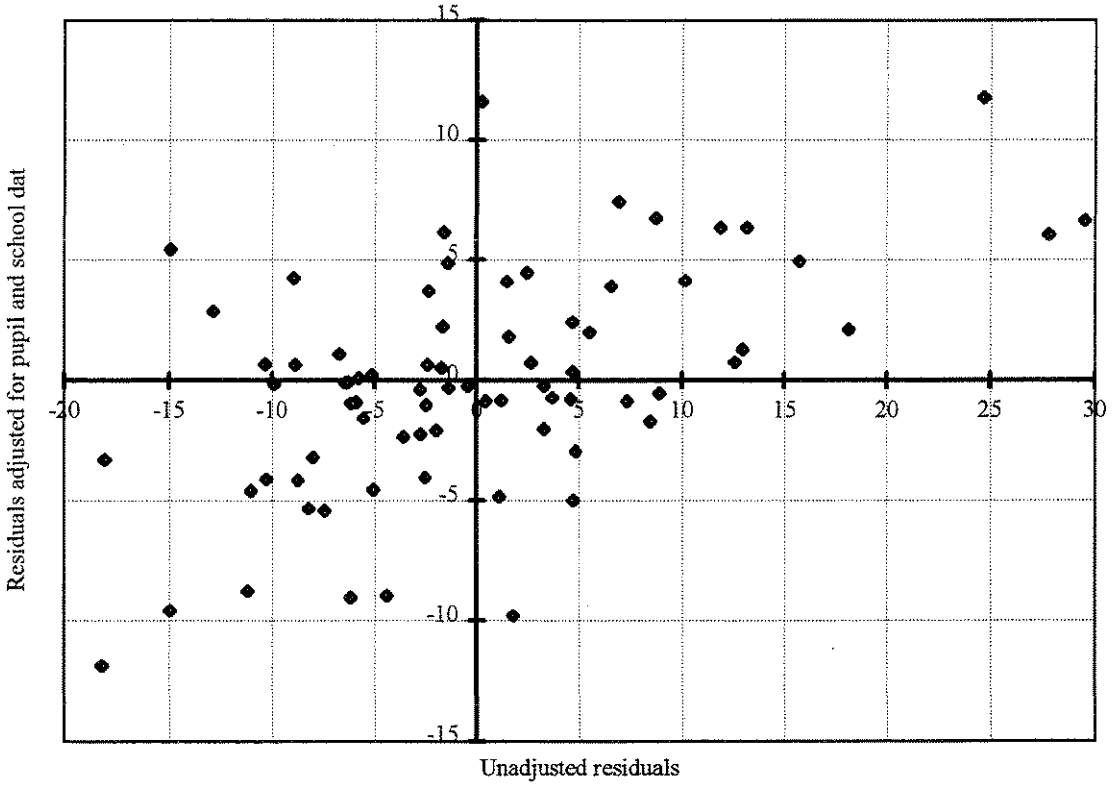
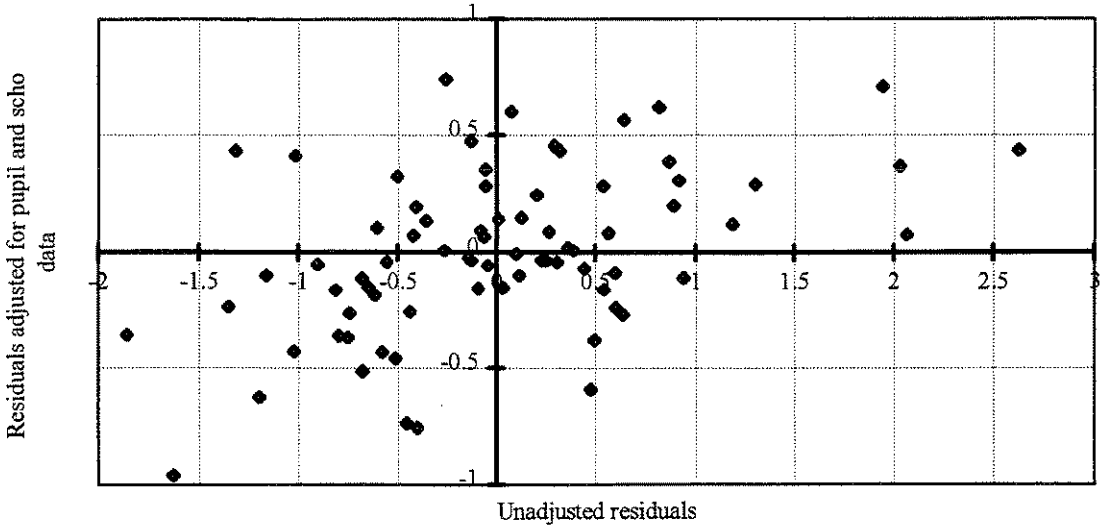


Figure 4.11: Adjusted versus Unadjusted residuals (Average GCSE Score)



4.2 Subject Area Analysis

The fifteen subject areas as defined by the NCER coding were each analysed by comparison with the students' overall performance in GCSE, measured in this case by total GCSE score (TOTSCORE). This kind of analysis has the advantage that it does not depend on estimating relative difficulties between subject - each is analysed separately, relative to total GCSE score. The other variables taken into account were the 1993 and 1994 cohort indicators, sex and ethnicity. Results are shown in Table 4.10, in terms of the effect sizes for each background variable relative to each subject area (while controlling for total GCSE score). Only effects which are significant at the 5% level are shown.

Table 4.10: Subject area results, in terms of effect sizes of background variables while controlling for total GCSE score

	No. of cases	IN94	IN93	TOT-SCORE	SEX	AGE	BLACK	ASIAN	OTHER
1: Science	24027		-4	81	-11	0	-1	0	0
2: Maths	24909	3		83	-9		-1	0	
3: Computing	1805			59	-4		3		2
4: Technology	18723	5	7	78	6		-1		
5: Art etc.	8814			58	6		2		1
6: Geography	11290		3	91	-3	1	-1	0	-1
7: History	8960			93			2		
8: Humanities	4655	7		84	8		1		
9: English	25146	-3		77	7	1	1	0	-1
10: Welsh	158			71	10				
11: Languages	17708			74	8			1	2
12: Music etc.	1564			70				-1	
13: PE etc.	1924	-16		70	-11	3		-1	
14: Misc. Voc.	533			75	4			-1	
15: Gen. Studies	105			55	10				

In each subject, as expected, there is a strong positive relationship with total GCSE score (ranging from 55% to 93% in terms of effect sizes). After allowing for this, the coefficients of the other variables are interesting. The 1993 cohort (IN93) is significantly better, relative to total score, in Technology and Geography; in 1994 (IN94) the results are better in Mathematics, Technology and Humanities. This implies a decline in these subjects from 1993 and/or 1994 to 1995, when compared with total score (or alternatively that total score has risen while these subject scores remained static). For Science, however, there is a negative coefficient for 1993, and negative coefficients for 1994 in both English and PE. These might imply an improvement in subject score relative to total score for these subjects.

When the sex coefficient is studied, it appears that girls are outperforming boys (when total score is taken into account) in English, Welsh, Technology, Languages,

Humanities, Art, Miscellaneous Vocational and General Studies, whereas boys have the edge over girls in Mathematics, Science, Computing, Geography and PE.

Considering ethnic background, the those students whose ethnic origin is classified as 'black' are performing well, relative to total score, in Computing, English, History, Humanities and Art, and not so well in Science, Mathematics, Technology and Geography. Students of Asian ethnic origin are significantly above expectation in Languages, and down in Music, PE and Miscellaneous Vocational. The other (non-white) ethnic grouping is above expectation in Computing and Languages, but below in English and Geography.

Part of the analysis carried out on subject-level results involved scatterplots for each school of pupils' grades against total GCSE scores, compared with an overall regression line based on all pupils attempting the subject. Table 4.11 shows the parameters of the regression lines fitted to the results for each subject. It gives the intercept (a) and slope (b) of each line. To use these to predict the grade for a subject, given a pupil's known or estimated total score, we use the equation:

$$\text{Predicted grade} = a + b.\text{TOTSCORE}.$$

For example, to predict the science grade for a pupil with total score equal to 50, we would compute:

$$0.37 + 0.0994 \times 50 = 5.34,$$

which is equivalent to a predicted overall science grade between a B and a C.

In Table 4.11, the subjects with the lowest value of slope (b) can be regarded as having a less strong relationship between subject grade and overall GCSE score. Subjects with low values of slope (below 0.09) include computing, art, Welsh, music, drama and single award science.

Table 4.11: Parameters of Subject Regression Lines against TOTSCORE

Subject	Intercept (a)	Slope (b)
Science	0.37	0.0994
Mathematics	-0.01	0.1018
Computing & IT	-0.19	0.0867
Technology	-0.12	0.1015
Art etc.	1.37	0.0840
Geography	-0.21	0.1099
History	-0.45	0.1121
Humanities	-0.29	0.1085
English	0.73	0.0978
Welsh	0.93	0.0836
Languages	0.18	0.0937
Music	0.66	0.0878
PE etc.	0.38	0.1014
Misc. Vocational	0.46	0.1007
General Studies	0.22	0.0990
English Language	0.73	0.0970
English Literature	0.40	0.1019
Drama & Expressive Arts	1.79	0.0830
Business Studies	-0.24	0.1101
French	0.10	0.0968
German	-0.25	0.1006
RE.	-0.49	0.1087
Other Humanities	-0.15	0.1115
Single Science	0.72	0.0854
Double Science	0.31	0.1014
CDT	-0.46	0.1044
Other Technology	0.10	0.1046

4.3 Analysis of Attendance

The analysis of attendance was carried out in two ways: first, using attendance as an outcome, in a very similar way to GCSE performance; and secondly, using it as a background measure in alliance with others to explain total GCSE score.

Table 4.12: Analysis of Attendance

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
School variance	6.934	1.988	*	3.038	10.830
Cohort variance	4.100	1.405	*	1.346	6.854
Pupil variance	203.300	2.307	*	198.778	207.822
Fixed model					
CONS	116.800	8.395	*	100.346	133.254
IN94	-0.789	0.534		-1.835	0.257
IN93	-0.102	1.226		-2.505	2.301
SEX	-1.056	0.121	*	-1.294	-0.818
FSM	-6.007	0.321	*	-6.635	-5.379
ESL	3.907	0.841	*	2.258	5.556
SEN	-2.611	0.197	*	-2.998	-2.224
BLACK	2.147	0.818	*	0.544	3.750
ASIAN	2.915	0.775	*	1.395	4.435
OTHER	1.529	1.141		-0.707	3.765
AGE	-1.547	0.505	*	-2.537	-0.557
XCOMP2	0.232	0.013	*	0.207	0.257
SUPPLY	-1.193	0.560	*	-2.291	-0.095
PARATT	1.833	0.530	*	0.795	2.871
PCFSM	-0.103	0.023	*	-0.148	-0.058

It is clear from the above table that the relationship between attendance and other background variables is very similar to that for each of the GCSE-based outcome measures. It is positively linked to prior attainment, Black and Asian ethnic backgrounds, having English as a second language, and parental attendance at meetings, and negatively to free school meals (at both the pupil and school levels), SEN, age, and level of supply cover used. As seen in last year's analysis, it is also significantly related to sex, in that girls have a lower attendance rate than boys. Differences between 1993, 1994 and 1995 cohorts are not statistically significant.

As well as the above analysis, treating attendance as an outcome variable in a similar way to GCSE results, it is interesting to consider the 'triangle' of measures: prior attainment - attendance - GCSE results. To study this we have analysed total GCSE score (TOTSCORE), controlling for prior attainment (XCOMP2) and other background variables, as well as for attendance (AVATT). Results of this analysis are shown in Table 4.13 below.

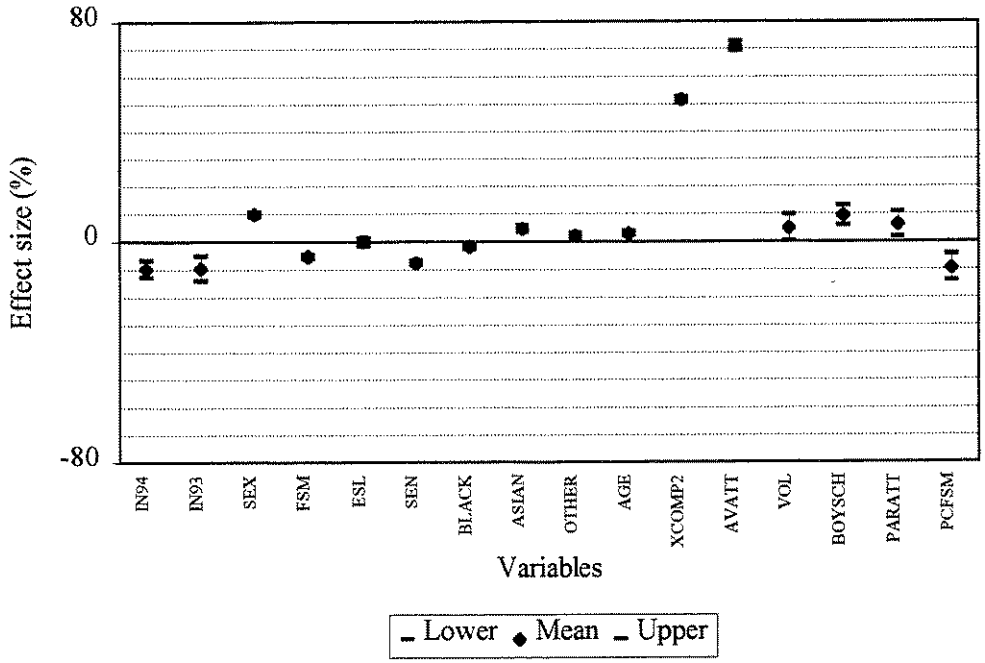
An interesting effect of including attendance in the regression has been to 'sharpen up' the effects of the other background variables, that is to make them more significant than before (compare Table 4.1). It is also clear that, even when prior attainment is taken into account, there is a very significant effect of attendance on GCSE results. To some extent attendance can be regarded as a proxy measure of a student's experiences of and reactions to secondary school, and would be expected to influence GCSE outcomes, even when controlling for attainment on entry.

Table 4.13: Analysis of Total GCSE Score, controlling for Prior Attainment and Attendance

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
School variance	12.120	2.983		6.273	17.967
Cohort variance	6.844	1.830	*	3.257	10.431
Pupil variance	103.800	1.178	*	101.491	106.109
Fixed Model					
CONS	-44.570	6.134	*	-56.593	-32.547
IN94	-3.967	0.615	*	-5.173	-2.761
IN93	-6.136	1.425	*	-8.929	-3.343
SEX	1.914	0.087	*	1.743	2.085
FSM	-2.747	0.232	*	-3.202	-2.292
ESL	-0.175	0.607		-1.364	1.015
SEN	-2.343	0.143	*	-2.623	-2.063
BLACK	-2.304	0.589	*	-3.458	-1.150
ASIAN	3.859	0.558	*	2.765	4.953
OTHER	3.094	0.819	*	1.488	4.700
AGE	2.551	0.361	*	1.843	3.259
XCOMP2	0.859	0.009	*	0.841	0.877
AVATT	0.411	0.006	*	0.400	0.423
VOL	2.765	1.369	*	0.082	5.448
BOYSCH	8.985	1.798	*	5.461	12.509
PARATT	1.673	0.653	*	0.392	2.954
PCFSM	-0.117	0.029	*	-0.174	-0.060

Figure 4.10 shows the above results in terms of effect sizes, so it is possible to compare the relative relationships between total GCSE score, prior attainment and attendance. In this case it seems that attendance is slightly more strongly related to GCSE results than prior attainment.

Figure 4.12: Total GCSE score related to both prior attainment (XCOMP2) and attendance (AVATT)



4.4 Analysis of Destinations

As stated above, student destinations post-16 were converted to a score in the range 0 to 10 (variable NUDEST) before analysis. The analysis was carried out controlling for pupils' sex, ethnicity and other factors, as well as total GCSE score (TOTSCORE), and also for school factors. Results are shown in Table 4.14 below.

Table 4.14: Analysis of Destination Score (NUDEST)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	0.255	0.121	*	0.017	0.493
Cohort variance	0.468	0.112	*	0.249	0.687
Pupil variance	5.767	0.067	*	5.637	5.897
Final model					
School variance	0.000	0.000		0.000	0.000
Cohort variance	0.409	0.058	*	0.296	0.523
Pupil variance	5.017	0.058	*	4.903	5.131
Fixed parameters					
CONS	9.920	1.271	*	7.429	12.411
SEX	0.051	0.019	*	0.013	0.089
FSM	-0.077	0.053		-0.182	0.027
SEN	0.015	0.032		-0.047	0.076
BLACK	0.708	0.120	*	0.473	0.942
ASIAN	0.442	0.094	*	0.258	0.627
OTHER	0.428	0.155	*	0.124	0.732
AGE	-0.189	0.077	*	-0.340	-0.038
TOTSCORE	0.055	0.001	*	0.052	0.057
ALEV	0.355	0.123	*	0.115	0.595

However, in addition to the destination 'score' analysed above, another pair of measures were developed relating to post-16 destinations. One was an indicator showing whether or not each student stayed on in full-time education post-16 (variable named STAYON, with values 0 or 1). The other referred to destinations coded as 'unemployed' or 'other' on the destination code (variable named UNEMP, with values 0 or 1).

Binary outcome variables of this type should not strictly be modelled using conventional regression models - the more correct procedure allows for the binary nature of the data using a different type of model, quite commonly a logistic regression model. Such models allow us to predict the probabilities of certain outcomes given values of the background variables, but they are numerically more complex and more difficult to interpret.

The multilevel program MLn contains a provision for logistic regression (see Woodhouse, 1995, pp.88-101) and was applied to the binary variables STAYON and

UNEMP, using the same background variables as for NUDEST. Results are shown in Table 4.15 and 4.16.

Table 4.15: Analysis of Probability of Staying On (STAYON - Logistic Regression)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	0.701	0.152	*	0.404	0.999
Cohort variance	0.251	0.068	*	0.116	0.385
Final model					
School variance	0.569	0.140	*	0.294	0.844
Cohort variance	0.268	0.078	*	0.116	0.420
Fixed parameters					
CONS	-1.491	0.163	*	-1.811	-1.171
IN93	0.441	0.264		-0.075	0.957
IN94	-0.055	0.136		-0.322	0.211
SEX	0.125	0.024	*	0.078	0.172
SEN	0.119	0.033	*	0.054	0.184
BLACK	0.794	0.155	*	0.490	1.098
ASIAN	1.109	0.143	*	0.828	1.390
OTHER	1.100	0.254	*	0.602	1.598
TOTSCORE	0.077	0.002	*	0.073	0.080
ALEV	0.611	0.200	*	0.219	1.003

As stated above, the interpretation of logistic regression models is not straightforward. Variables with significant coefficients in the fitted model can still be regarded as being significantly related to the probability of the outcome, but in order to see how much effect they appear to have it is worth working through some examples.

For STAYON, the probability of staying in education post-16, we may estimate probabilities from the fitted model for certain categories of pupil. Note that, unless otherwise stated, all background variables are assumed to have their default (zero) value. From the fitted model, it is possible to predict that, for example:

- A male student with a total GCSE score of 30 has a probability of 69.1%;
- A female student with a total GCSE score of 30 has a probability of 74.2%;
- A male student with a total GCSE score of 60 has a probability of 95.7%;
- A black male student with a total GCSE score of 30 has a probability of 83.2%.

Table 4.16: Analysis of Probability of Unemployment/Other Destination (UNEMP - Logistic Regression)

				95% Confidence interval	
Parameter	**Estimate**	**Standard error**	**Sig.**	**Min.**	**Max.**
Base case					
School variance	0.444	0.320		-0.182	1.070
Cohort variance	1.407	0.337	*	0.746	2.068
Final model					
School variance	0.000	0.000		0.000	0.000
Cohort variance	0.896	0.152	*	0.598	1.193
Fixed parameters					
CONS	-0.861	0.175	*	-1.203	-0.519
IN93	-0.084	0.425		-0.917	0.748
IN94	0.068	0.219		-0.360	0.496
SEX	0.093	0.043	*	0.008	0.177
OTHER	-1.495	0.676	*	-2.820	-0.170
BLACK	-0.546	0.288		-1.110	0.018
TOTSCORE	-0.083	0.003	*	-0.090	-0.077
ALEV	-0.658	0.199	*	-1.049	-0.267

Similar calculations using the model fitted to UNEMP yield the following examples:

- A male student with a total GCSE score of 30 has a probability of 7.6%;
- A female student with a total GCSE score of 30 has a probability of 9.0%;
- A male student with a total GCSE score of 60 has a probability of 0.7%;
- A black male student with a total GCSE score of 30 has a probability of 2.4%.

It is interesting to see that, in terms of destinations controlling for GCSE results, black students appear to achieve slightly better outcomes than their white counterparts. This runs counter to other findings (which, however, may not control for GCSE results).

5. ANALYSIS OF PUPIL AND PARENT QUESTIONNAIRES

These datasets are logically different from those analysed previously, as they relate to the **current** Year 11 cohort (not those who completed GCSEs in the previous summer) and are concerned with attitudes rather than examination results. Data was available for 6242 pupils and 2986 parents over two years (school year 94/95 and 95/96).

5.1 Pupil Questionnaires

The pupil questionnaire covered a variety of topics, relating to attitudes to school in general and their school in particular, plus the pupils' impressions of their parents' attitudes. A factor analysis was carried out on the 42 main variables in order to combine them into a set of more 'fundamental' factors which seek to explain the relationships between the variables. Investigation revealed that four factors seemed to be appropriate, which between them explain about 30% of the variance in the 42 variables. Table 5.1 shows the main 'loadings' between each of the variables and the four factors. The loading of a variable on a factor shows how much that variable depends on the factor, or its correlation with the factor - in the table only loadings with values of the order of 0.35 or above are shown.

From these results, it is possible to interpret the factors in the following ways:

Factor	% of variance explained	Interpretation
1	10.7%	Comments about this school and teaching
2	10.2%	Attitude to school in general
3	5.5%	Parents' views
4	3.2%	Bullying

From this factor analysis it is possible to compute 'factor scores' for each pupil which represent their overall responses on each factor in a single measure. High scores represent positive reactions and low scores negative ones. Analysis of these factor scores by sex and ethnicity revealed a few interesting differences.

The only factor on which there was a significant difference between boys and girls was factor 2 (attitude to school in general), where girls were more positive than boys. This is illustrated in Table 5.2, which shows the results for Question 1.1 ('I like being at school') by sex.

Differences between ethnic groups were more significant, and are outlined below.

- Factor 1 (comments about this school and teaching) scores were significantly higher for Asian pupils than for whites, and for whites than for other ethnic groups or for black pupils. Table 5.3 illustrates this for Question 6a.5 ('Education in Year 11 has been suitable for my individual needs'), which is strongly linked to factor 1.

- Factor 2 (attitude to school in general) scores were significantly different for each ethnic group, with the Asian group highest, followed by other ethnic, whites and finally black pupils with the lowest scores. Table 5.4 illustrates this for Question 1.1 ('I like being at school').
- Factor 3 (parents' views) scores were significantly higher for black pupils than for the other three groups. This is illustrated in Table 5.5, using Question 3.2 ('My parents are interested in how I do at school').
- Factor 4 (bullying) scores were also significantly higher for black pupils than for the other groups - in other words, they reported less bullying. Table 5.6 illustrates this with reference to Question 5d.2 ('Been bullied this year?').

5.2 Parent Questionnaires

The questionnaires to parents also covered a wide range of questions on their attitudes and their children's. Factor analysis extracted four main factors which explained over one-third of the variance in the 34 variables used. Table 5.7 shows the loading of each variable for each factor (those below 0.35 are not shown).

From these results, it is possible to interpret the factors in the following ways:

Factor	% of variance explained	Interpretation
1	10.5%	Satisfaction with information/teaching
2	10.0%	Generally a 'good' school
3	9.7%	Satisfaction with educational outcomes
4	6.6%	Attitudes to school in general

Analysis of the scores derived from these factors by sex (of the pupil) and ethnicity yielded a few interesting results. Factor 1 scores were significantly higher for girls than for boys, while scores for factors 2 and 4 were significantly higher for boys. Tables 5.8 to 5.10 illustrate these results, using responses to questions strongly loaded on these factors.

Analysis by ethnic groups showed only two significant differences, both with white having lower scores than Asians, on factors 2 and 4. These are illustrated in Tables 5.11 and 5.12, again with questions strongly loaded on these factors.

Table 5.1: Factor loadings for Variables on Pupil Questionnaire

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Description
Q1.1		0.56			I like being at school
Q1.2		-0.54			I don't want to go to school
Q1.3		0.40			School work is worth doing
Q1.4		0.44			School has sensible rules
Q1.5	0.38				People think it is a good school
Q1.6	0.42				School is clean & attractive
Q1.7		0.44			Homework is important
Q1.8					Doesn't help get job
Q1.9	0.45				Would recommend school to others
Q2.1		0.43			I work as hard as I can
Q2.2		-0.45			Often count minutes to end
Q2.3		-0.59			I am bored in lessons
Q2.4		-0.50			Lesson work waste of time
Q2.5	0.35	0.51			Lesson work interesting
Q3.1			0.54		Parents: Important to do well
Q3.2			0.68		Parents: Interested in how I do
Q3.3			0.47		Parents: Come to parents' evenings
Q3.4			0.57		Parents: Make sure I do homework
Q3.5			-0.35		Parents: School waste of time
Q3.6			0.47		Parents: Should behave well in school
Q4A.1	0.46				Teachers: Make sure homework done
Q4A.2	0.51				Teachers: Clear how to behave
Q4A.3	0.54				Teachers: Take action on rule-breaking
Q4A.4	0.46				Teachers: Praise for good work
Q4A.5	0.39	0.51			Teachers: Like them
Q4A.6	0.49				Teachers: Can keep order
Q4B	0.41				Teachers: Level of work required
Q4C	0.40				Teachers: Marking work
Q4D.1					Personal talk with form teacher?
Q4D.2					Personal talk with other teacher?
Q5A		-0.43			Discipline
Q5B		-0.44			Number of rules
Q5C.1		0.37			Last year behaviour of self & peers
Q5C.2		0.42			This year behaviour of self & peers
Q5D.1				0.78	Bullying last year
Q5D.2				0.77	Bullying this year
Q6A.1	0.44				Covered wide range of subjects
Q6A.2	0.45				Good balance of general/specialised
Q6A.3	0.52				Equipped with right skills & knowledge
Q6A.4	0.52				Prepared for adult & working life
Q6A.5	0.54				Suitable for individual needs
Q6B	0.35				Careers guidance

Table 5.2: Q1.1 'I like being at school'

	Boys	Girls
Strongly agree	6.7%	7.9%
Agree	60.6%	63.4%
Disagree	17.2%	15.3%
Strongly disagree	5.4%	5.1%
Not sure	10.0%	8.3%
Total respondents	**3316**	**2897**

Table 5.3: Q6a.5 'Education in Year 11 has been suitable for my individual needs'

	White	Black	Asian	Other
Very well	10.7%	11.0%	16.1%	8.1%
Quite well	52.0%	41.7%	51.3%	46.5%
Not very well	24.1%	24.1%	17.7%	22.1%
Not at all well	7.1%	16.2%	5.5%	12.8%
Not sure	6.1%	7.0%	9.4%	10.5%
Total respondents	**5248**	**228**	**577**	**172**

Table 5.4: Q1.1 'I like being at school'

	White	Black	Asian	Other
Strongly agree	6.1%	6.5%	17.2%	10.4%
Agree	61.5%	59.1%	67.4%	59.0%
Disagree	17.3%	17.7%	7.7%	13.9%
Strongly disagree	5.3%	6.5%	3.3%	8.1%
Not sure	9.7%	10.3%	4.4%	8.7%
Total respondents	**5257**	**232**	**574**	**173**

Table 5.5: Q3.2 'My parents are interested in how I do at school'

	White	Black	Asian	Other
Always	68.2%	72.1%	70.4%	66.9%
Nearly always	20.2%	17.6%	17.5%	19.2%
Sometimes	9.3%	9.0%	8.8%	11.6%
Hardly ever	1.7%	0.4%	2.3%	1.7%
Never	0.6%	0.9%	1.0%	0.6%
Total respondents	**5266**	**233**	**577**	**172**

Table 5.6: Q5d.2 'Been bullied this year?'

	White	Black	Asian	Other
Never	77.3%	85.7%	78.3%	75.9%
Once or twice	17.5%	10.0%	14.6%	17.1%
Quite often	3.0%	2.2%	2.6%	1.2%
Often	2.1%	2.2%	4.4%	5.9%
Total respondents	**5217**	**230**	**568**	**170**

Table 5.7: Factor loadings for Variables on Parent Questionnaire

Variable	Factor 1	Factor 2	Factor 3	Factor 4	Description
Q2.1				0.54	Child likes being at school
Q2.2				-0.53	Child doesn't want to go to school
Q2.3				0.47	School work is worth doing
Q2.4		0.49		0.45	School has sensible rules
Q2.5		0.60		0.29	People think it is a good school
Q2.6		0.51		0.21	School is clean & attractive
Q2.7				0.48	Homework is important
Q2.8				-0.35	Doesn't help get job
Q2.9		0.60		0.36	Would recommend school to others
Q3.1	0.41			0.04	Enough info on subjects studying?
Q3.2				0.04	Enough info on choices post-Yr 11?
Q3.3	0.47			0.04	Enough info on progress?
Q3.4	0.44			0.10	Enough info on difficulties?
Q3.5		0.38		0.12	Enough info on rules & regs.?
Q4.1	0.51	0.41		0.20	How child being taught
Q4.2	0.53			0.13	Progress in Maths
Q4.3	0.48			0.10	Progress in Science
Q4.4	0.48			0.13	Progress in English
Q4.5	0.65			0.13	Kind of homework
Q4.6	0.60			0.10	Amount of homework
Q4.7	0.36			0.32	How treated by teachers
Q4.8				0.19	How treated by students
Q4.9		0.36		0.17	Religious & moral teaching
Q4.10		0.44		0.03	Exam results
Q4.11		0.46		-0.03	Equipment & resources
Q4.12		0.37		-0.03	Opportunities for sports
Q4.13				-0.02	Opportunities for music, drama etc.
Q5.1			0.59	0.22	Covered wide range of subjects
Q5.2			0.63	0.20	Good balance of gen. & spec. subjects
Q5.3			0.71	0.24	Equipped with right skills & knowledge
Q5.4			0.66	0.25	Prepared for further ed/training
Q5.5			0.63	0.19	Prepared for adult & working life
Q5.6			0.62	0.23	Suitable for individual needs
Q7				-0.01	Careers guidance

Table 5.8: Q4.5 'Kind of homework'

	Boys	Girls
Very satisfied	23.9%	28.4%
Mostly satisfied	49.6%	51.0%
Not at all satisfied	19.4%	15.0%
Not sure	7.2%	5.6%
Total respondents	**1463**	**1523**

Table 5.9: Q2.5 'People think it is a good school'

	Boys	Girls
Strongly agree	25.6%	20.8%
Agree	58.0%	54.8%
Disagree	7.0%	9.8%
Strongly disagree	1.1%	2.3%
Not sure	8.4%	12.3%
Total respondents	**1467**	**1517**

Table 5.10: Q2.1 'Child likes being at school'

	Boys	Girls
Strongly agree	27.2%	29.0%
Agree	61.9%	57.7%
Disagree	6.3%	8.3%
Strongly disagree	2.0%	2.7%
Not sure	2.6%	2.3%
Total respondents	**1470**	**1525**

Table 5.11: Q2.5 'People think it is a good school'

	White	Black	Asian	Other
Strongly agree	23.1%	24.2%	25.4%	18.5%
Agree	56.1%	60.6%	57.9%	61.5%
Disagree	8.7%	3.0%	6.1%	6.2%
Strongly disagree	1.8%	1.5%	1.8%	0.0%
Not sure	10.4%	10.6%	8.8%	13.8%
Total respondents	**2599**	**66**	**228**	**65**

Table 5.12: Q2.1 'Child likes being at school'

	White	Black	Asian	Other
Strongly agree	27.3%	36.9%	31.1%	32.3%
Agree	60.0%	52.3%	61.8%	58.5%
Disagree	8.0%	3.1%	2.2%	6.2%
Strongly disagree	2.6%	1.5%	0.9%	1.5%
Not sure	2.2%	6.2%	3.9%	1.5%
Total respondents	**2611**	**65**	**228**	**65**

6. CONCLUSIONS

The ongoing development of the QUASE project has provided useful and accessible information to schools about their own performance, relative to what might be expected given their pupils' prior attainment and their own social context. In addition, however, the rich database of information collected about schools and their GCSE pupils enables us to carry out fairly sophisticated analyses to determine the relationships between GCSE results and other outcomes, and a range of background variables at both the pupil and school levels. These analyses confirm and expand those reported after last year's survey (see Schagen, 1995). Reference may also be made to the results reported by Kendall (1996), to compare the findings from a similar study of all schools within a group of metropolitan LEAs.

A brief summary of the main findings of the analyses carried out so far shows the following key outcomes.

In terms of the seven academic performance indicators

- Different tests used to assess attainment at intake to secondary school can be linked together to form a single composite measure which is the best available predictor of GCSE performance, explaining around 40% of the variance between pupils in their GCSE results.

- Girls outperform boys in most GCSE-based performance indicators, except for maths and science, in which boys outperform girls.

- Students with an Asian or other (than white or black) ethnic background tend to outperform white students in terms of GCSE results. Students with a black ethnic background have a slight tendency to under-perform relative to whites.

- Students with any level of special educational need under-perform in terms of GCSE results; the same is true of those who are eligible for free school meals.

- There is a significant age effect on examination performance, with the youngest students in the cohort achieving between one and two grade points less on average than their oldest colleagues.

- There is evidence of higher performance in 1995, relative to the 1993 and 1994 GCSE results.

- Between 80 per cent and 90 per cent of the variance between schools in GCSE performance is explained by pupil and school level factors. The major factors affecting performance are, at pupil level, prior attainment and, at school level, degree of social disadvantage as measured by percentage of pupils eligible for free school meals. The latter is very strongly negatively related to all performance indicators.

- There is strong evidence of differential performance relative to sex and to prior attainment between schools. Some schools have essentially no boy/girl difference in performance, while others have very clear signs of higher

performance by girls. Some schools have a much steeper relationship between prior attainment and GCSE results than do others.

- Good attendance is significantly related to better GCSE performance, even when prior attainment is taken into account. The attendance of girls is significantly below that of boys (by over 2 percentage points) when other factors are taken into account.

- Boys' schools tend to perform better in terms of GCSE results than would be predicted. The same is true of those with a higher level of parental attendance at meetings.

In terms of subject results, controlling for total GCSE score:

- When subject area results are analysed, controlling for total GCSE score, performance in Mathematics, Technology, Geography and Humanities was higher in 1993 and/or 1994 than in 1995. The reverse is true for Science, English and PE, which had relatively better results in 1995 than in 1993 or 1994.

- Relative to total GCSE scores, girls outperformed boys in English, Technology, Humanities, languages and Art, whereas boys performed better in Mathematics, Science, Geography and Computing.

- Asian students performed better, relative to total scores, in languages, while under-performing in Music and PE. Students from other ethnic groups (except white and black) performed better in Computing, Art and languages but less well in English and Geography. Black students had better results in English, Computing, Art, History and Humanities, but did worse than predicted from total score in Science, Mathematics, Technology and Geography.

In terms of pupil destinations post-16:

- The probability of a student staying on in education is strongly related to their GCSE results, but is relatively higher for girls and ethnic minorities and for students in schools with sixth forms. The probability of being unemployed is strongly negatively related to GCSE results, but is also relatively higher for girls, and lower for ethnic minorities and students in schools with sixth forms.

In terms of attitudes of both pupils and their parents:

- Girls appear to show a more positive attitude to school in general than boys.

- More positive comments about their school and about school in general were made by Asian pupils than by whites, and by whites than black pupils.

- Black pupils reported higher interest by their parents in their schooling than other ethnic groups, and they also reported a lower incidence of bullying.

- Parents of girls were more likely to be satisfied with the information received from and the teaching given by the school. On the other hand, parents of boys scored more highly in saying that the school was a 'good' one and in positive attitudes to school in general.

- Asian parents also scored more highly than whites in saying that the school was 'good' and in positive attitudes to school in general.

Appendix A contains detailed results of the analysis of each separate intake measure, with particular emphasis on their relationship to GCSE performance. It also contains tables which allow grades in particular subjects to be predicted from total GCSE score, and hence from prior attainment.

References

KENDALL, L. (1996). *Examination Results in Context.* London: AMA.

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SCHAGEN, I. (1995). *QUASE: Technical Report of Analysis 1995.* Slough: NFER.

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Appendix A: Relationships Between Intake Measures and GCSE Performance

As stated in the main report, the wide variety of test results supplied by schools as measuring pupils' attainment at or near intake to secondary school were grouped and classified according to the reliability which could be placed on them and the extent to which they could be referred to national norms. A total of 21 'first division' intake measures have been defined, plus four groups of 'second division' tests. Certain tests could not be used at all, mainly because they could not be related to national norms. It should be noted, however, that in the 1995 round of data collection only 16 first division tests had new data added.

Each of the 25 intake measures was separately related to the GCSE results for the individuals for whom test scores were available. In particular, total GCSE score (TOTSCORE) was used as the principal measure of GCSE achievement. Regression analysis was used to define, for each intake measure, the slope and intercept of the best straight line which could be used to predict GCSE score from intake test score. Table A1 shows the results of this analysis for the 16 updated intake measures, in terms of the slope and intercept of the prediction line, and the range of possible values of individuals' GCSE scores either side of the prediction line. For information on the other intake measures, not updated this year, readers should refer to last year's technical report.

The column headed 'Slope' refers to the ratio between outcome and intake scores; in other words to the GCSE total points increase, on average, for one unit increase in test score. The 'Intercept' column refers to the average total GCSE score for an intake standardised score of 100. The 'Range' column contains the possible range of variation above or below the prediction total GCSE score within which we expect 95% of students to lie.

To use the table to predict a student's likely GCSE from their intake test score, first multiply by the slope:

e.g. **CAT Verbal** test score = 115

Multiply by slope:	115x 0.9153	=	105.26
Add to intercept to get predicted GCSE score:			105.26 - 57.45 = 47.81.

This is the predicted total GCSE score for students with this intake score. To derive the range of values which ought to include 95% of students with an intake score of 115, take away and add the range value from and to the above:

Lower limit:	47.81 - 26.84	=	20.97
Upper limit:	47.81 + 26.84	=	74.65

Thus, in round terms, we expect students with a CAT Verbal standardised score of 115 to achieve between 21 and 75 total GCSE points, with a best estimate of 48 points.

Table A1: QUASE Intake Measures Related to GCSE Outcomes

Test	Number	Slope	Intercept	Range
CAT - Verbal	2779	0.9153	-57.45	26.84
CAT - Non-Verbal	2465	0.8367	-52.44	30.62
CAT - Quantitative	2396	0.9536	-61.01	27.45
NFER-Nelson NVR (DH)	3176	0.8350	-52.10	27.72
NFER-Nelson VR	2312	0.8755	-51.48	24.62
Richmond - Vocabulary	1067	0.7813	-45.32	27.91
Richmond - Reading Comp.	1753	0.8209	-46.74	27.96
Richmond - Maths Concepts	1212	0.9094	-53.62	27.15
Richmond - Problem Solving	785	0.7833	-40.48	28.62
Suffolk Reading Scale	146	0.9008	-52.16	28.93
NFER-Nelson Reading Comp.	1038	0.9102	-55.25	27.00
London Reading Test	731	0.5822	-28.59	28.36
Edinburgh Reading Test	279	1.0450	-71.65	24.81
NFER-Nelson Maths	1656	0.9055	-57.08	25.86
Richmond - Unknown subject	628	0.8954	-57.49	26.34
N-N English Progress Tests	677	1.1616	-81.58	25.66

Figures A1 to A16 illustrate the relationships shown in Table A1 for each test or group of tests, with the prediction line and 95% confidence interval for each and the data points used to derive the line.

Predicting Subject Grades from Intake Measures

Figures A1 to A16 allow us to predict a student's total GCSE point score based on their score on a given intake measure. However, there may also be an interest in predicting students' grades in certain GCSE subjects, given intake measure scores. Tables A2 to A10 enable us to do this, in combination with Figures A1 to A16.

Each of the tables (A2 to A10) shows grade results for a particular major subject, as percentage of students achieving each grade, depending on which of several total GCSE predicted score 'bands' they fall into. These tables are based on QUASE data for over 17,000 students with prior attainment data. The bands used are as follows (based on predicted GCSE total scores correct to 1 decimal place):

1. 0 to 9.9;
2. 10 to 19.9;
3. 20 to 29.9;
4. 30 to 39.9;
5. 40 to 49.9;
6. 50 to 59.9;
7. 60 and over.

A worked example will show how to use these tables in combination with Figures A1 to A16. Suppose a student obtains a score of 120 on the CAT Verbal Test in Year 7. From Figure A1 their predicted GCSE score is about 52, putting them in band 6 (50 to 59.9).

Table A2 shows predicted mathematics grades for a student in this band:

29.6% of such students would expect to achieve A or A*;
35.7% of such students would expect to achieve grade B;
23.0% of such students would expect to achieve grade C;
etc.

From Table A6 we may read off predicted grades in English language:

32.8% of such students would expect to achieve A or A*;
35.7% of such students would expect to achieve grade B;
etc.

It is interesting to compare the overall structures of these tables for different subjects. For example, Figures A17 and A18 illustrate the corresponding tables for mathematics and English language - the different shapes of the distributions shown here represent differences in the kinds of results obtained in the two subjects.

Table A2: Mathematics Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.1	0.3	2.2	10.4	29.6	60.0
B	0.3	0.5	2.5	9.6	24.1	35.7	23.2
C	1.1	2.8	8.8	23.6	32.6	23.0	13.3
D	1.1	6.2	15.2	21.6	16.8	6.7	1.9
E	8.5	15.3	24.2	20.6	9.1	2.5	0.6
F	15.3	26.5	25.9	13.4	4.0	1.1	0.3
G or below	73.8	48.9	23.0	8.9	3.0	1.4	0.6

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A3: Art Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	3.3	4.8	12.5	20.4	32.6	42.2
B	0.3	7.6	10.3	15.3	21.4	26.7	25.6
C	13.2	17.1	25.5	28.4	29.8	26.2	22.2
D	17.8	23.5	24.2	22.0	16.6	11.2	8.9
E	24.4	26.0	19.5	13.4	7.2	2.2	0.0
F	21.1	14.0	9.3	5.3	2.3	0.5	0.0
G or below	21.1	8.4	6.5	3.1	1.3	0.5	1.1

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A4: Geography Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.8	1.8	6.0	20.0	38.8	56.5
B	0.9	0.9	5.5	14.1	23.5	28.1	22.9
C	1.9	6.0	11.6	22.8	25.9	18.8	13.5
D	2.8	12.5	20.1	22.5	16.1	9.2	4.7
E	10.3	24.4	25.5	18.4	9.2	3.2	1.2
F	23.4	26.1	20.5	10.5	3.3	1.4	0.6
G or below	60.7	29.3	15.0	5.6	1.9	0.6	0.6

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A5: History Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	1.0	1.5	5.6	18.7	37.4	56.4
B	6.3	1.4	6.8	15.3	25.8	32.0	27.3
C	1.6	5.4	15.8	22.7	26.0	18.3	11.6
D	6.3	15.9	19.6	19.2	13.6	7.4	2.3
E	9.4	18.4	19.6	16.7	9.1	3.1	1.2
F	17.2	24.1	17.0	10.6	4.5	1.2	0.6
G or below	59.4	33.8	19.6	9.9	2.4	0.6	0.6

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A6: English Language Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.3	0.8	4.4	17.1	32.8	48.0
B	0.0	0.7	6.6	16.2	31.0	35.7	29.1
C	1.0	9.5	20.3	33.3	31.5	22.5	17.6
D	11.4	26.4	34.6	28.4	13.9	7.0	4.1
E	20.9	29.5	23.2	12.6	5.0	1.1	1.4
F	41.3	21.4	10.0	4.1	1.1	0.8	0.0
G or below	25.4	12.2	4.5	1.7	0.4	0.2	0.0

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A7: English Literature Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.0	1.8	5.4	17.1	32.7	48.3
B	0.0	2.0	9.7	20.0	31.0	35.0	31.3
C	5.2	15.2	25.7	34.3	31.5	22.1	15.6
D	13.4	28.8	30.3	23.7	13.9	6.8	4.1
E	23.7	24.6	21.1	11.5	5.0	2.3	0.7
F	38.1	19.9	8.6	3.7	1.1	0.9	0.0
G or below	19.6	9.5	2.7	1.5	0.4	0.2	0.0

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A8: French Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.0	2.4	6.8	16.0	36.6	64.8
B	2.2	3.7	5.9	11.6	21.9	24.6	14.3
C	1.1	9.6	11.8	20.6	27.0	23.9	14.3
D	4.4	15.1	23.6	23.8	18.9	10.0	4.8
E	26.4	21.7	23.9	19.2	8.3	3.1	1.9
F	25.3	30.6	21.4	12.7	5.6	1.6	0.0
G or below	40.7	19.3	11.0	5.5	2.3	0.2	0.0

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A9: Double Science Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.2	0.6	3.9	15.2	33.5	56.6
B	0.6	0.9	5.3	15.0	27.8	33.8	24.5
C	1.7	5.1	13.9	23.5	27.6	19.3	13.2
D	4.6	17.1	27.5	28.2	18.3	9.4	4.7
E	9.7	28.4	28.3	19.5	8.4	2.8	0.0
F	34.3	30.8	17.9	7.3	1.9	0.6	0.9
G or below	49.1	17.4	6.6	2.6	0.8	0.7	0.0

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Table A10: Single Science Grades from Predicted Total GCSE Score

	Total GCSE point score (predicted)						
Grade	**0 to 9.9**	**10 to 19.9**	**20 to 29.9**	**30 to 39.9**	**40 to 49.9**	**50 to 59.9**	**60+**
A/A*	0.0	0.0	0.3	0.7	4.7	19.0	10.0
B	0.0	0.0	3.8	6.9	14.1	19.0	60.0
C	0.0	1.8	6.5	16.6	26.6	28.6	10.0
D	2.6	11.8	23.5	31.4	30.5	14.3	10.0
E	2.6	26.6	34.8	27.1	19.5	19.0	10.0
F	30.8	30.2	21.8	9.0	1.6	0.0	0.0
G or below	64.1	29.6	9.2	8.3	3.1	0.0	0.0

Note: The numbers in each column represent the percentage of students in the given total GCSE predicted score band achieving the relevant GCSE grade.

Figure A1: Total GCSE Score versus CAT Verbal Test

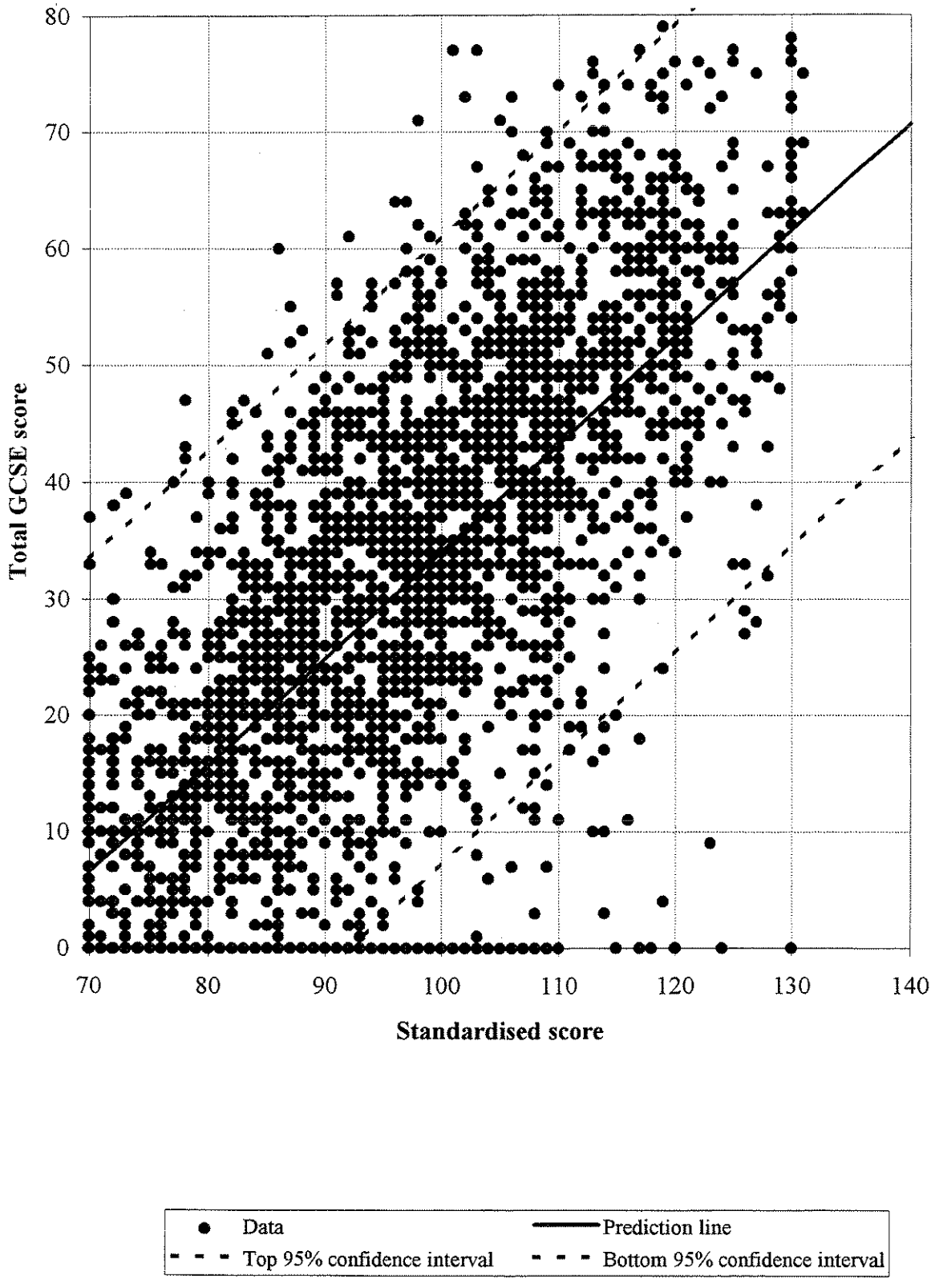


Figure A2: Total GCSE Score versus CAT Non-Verbal Test

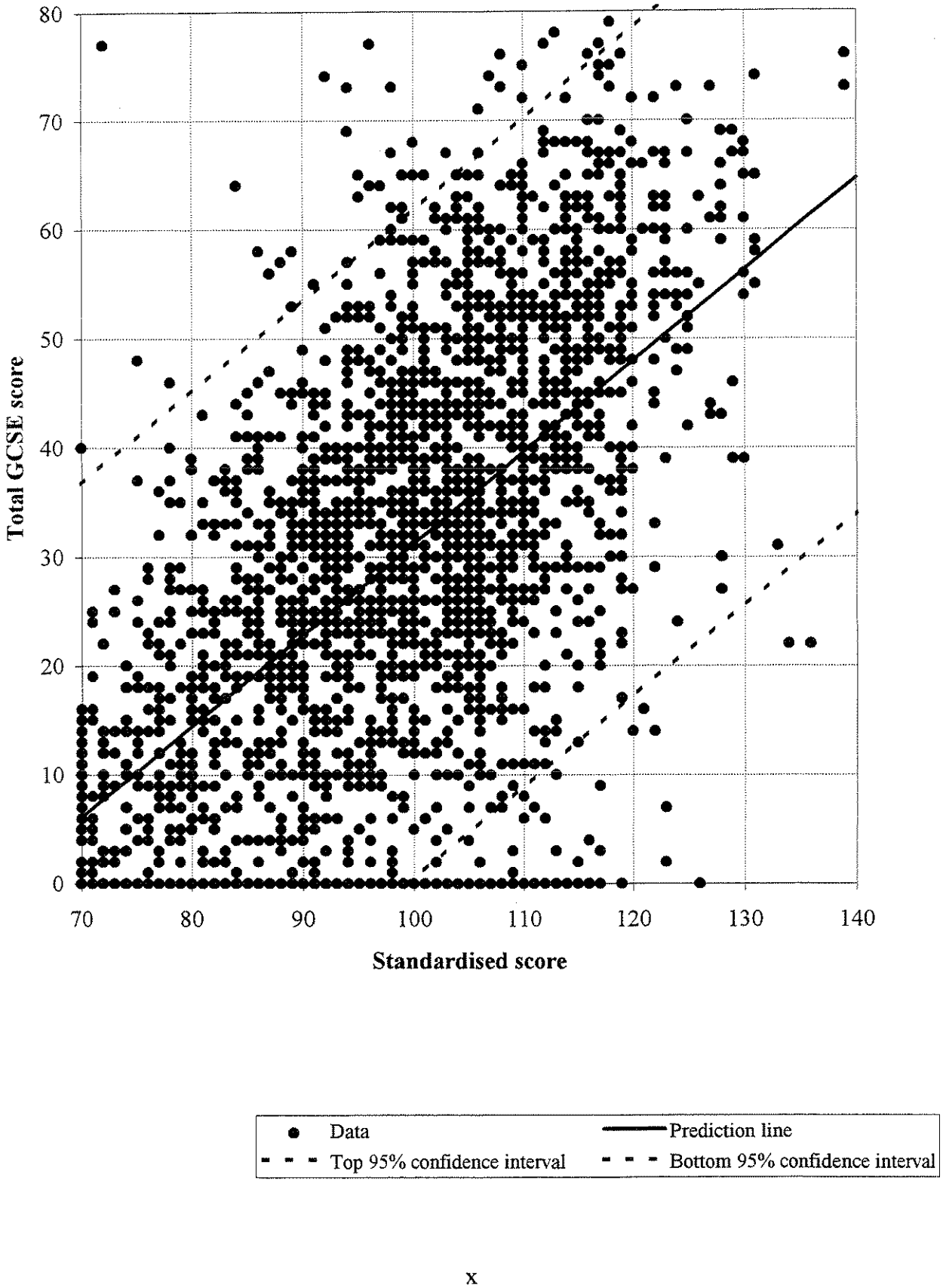


Figure A3: Total GCSE Score versus CAT Quantitative Test

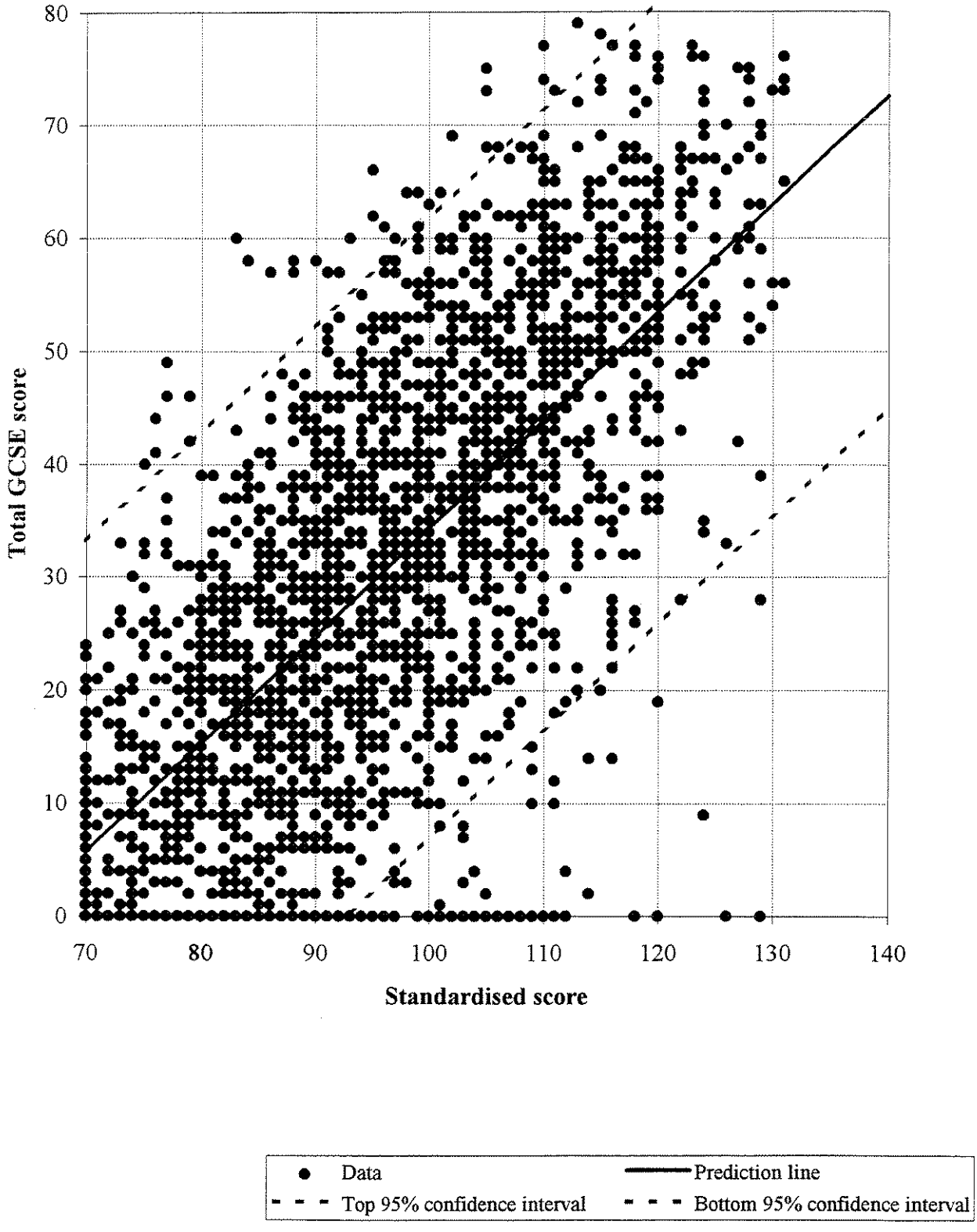


Figure A4: Total GCSE Score versus NFER-Nelson Non-Verbal Reasoning Test

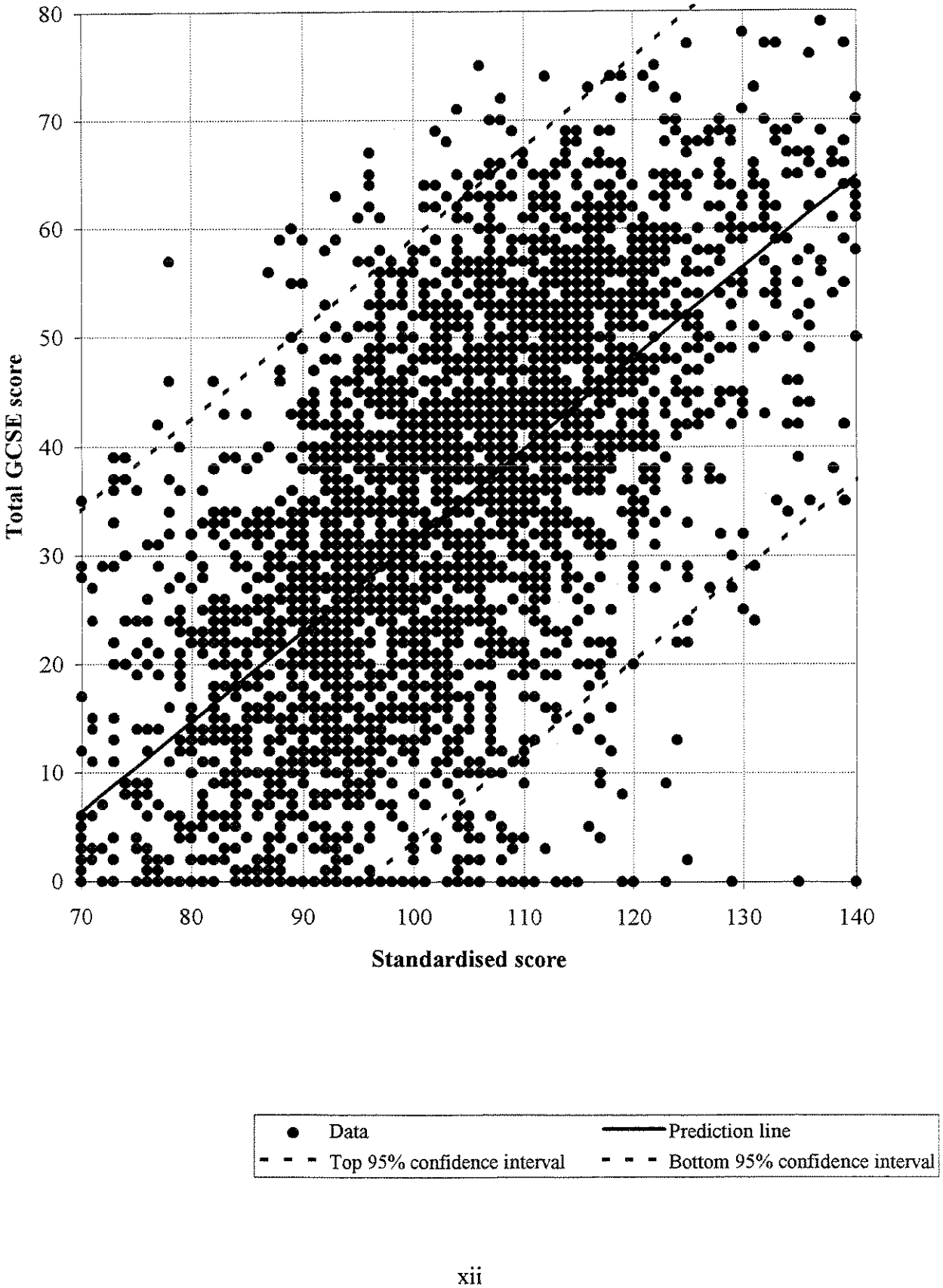


Figure A5: Total GCSE Score versus NFER-Nelson Verbal Reasoning Test

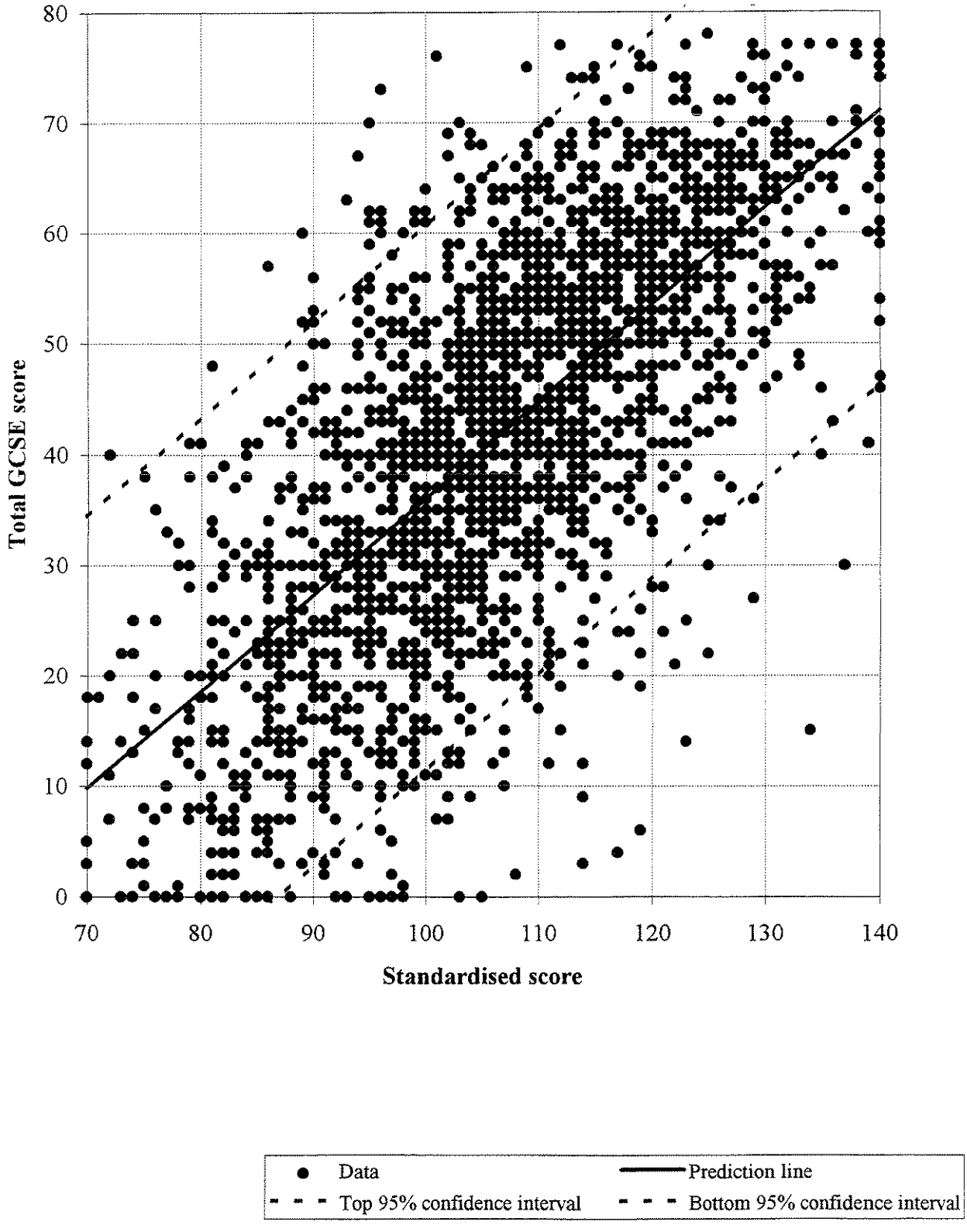


Figure A6: Total GCSE Score versus Richmond Test of Basic Skills - Vocabulary

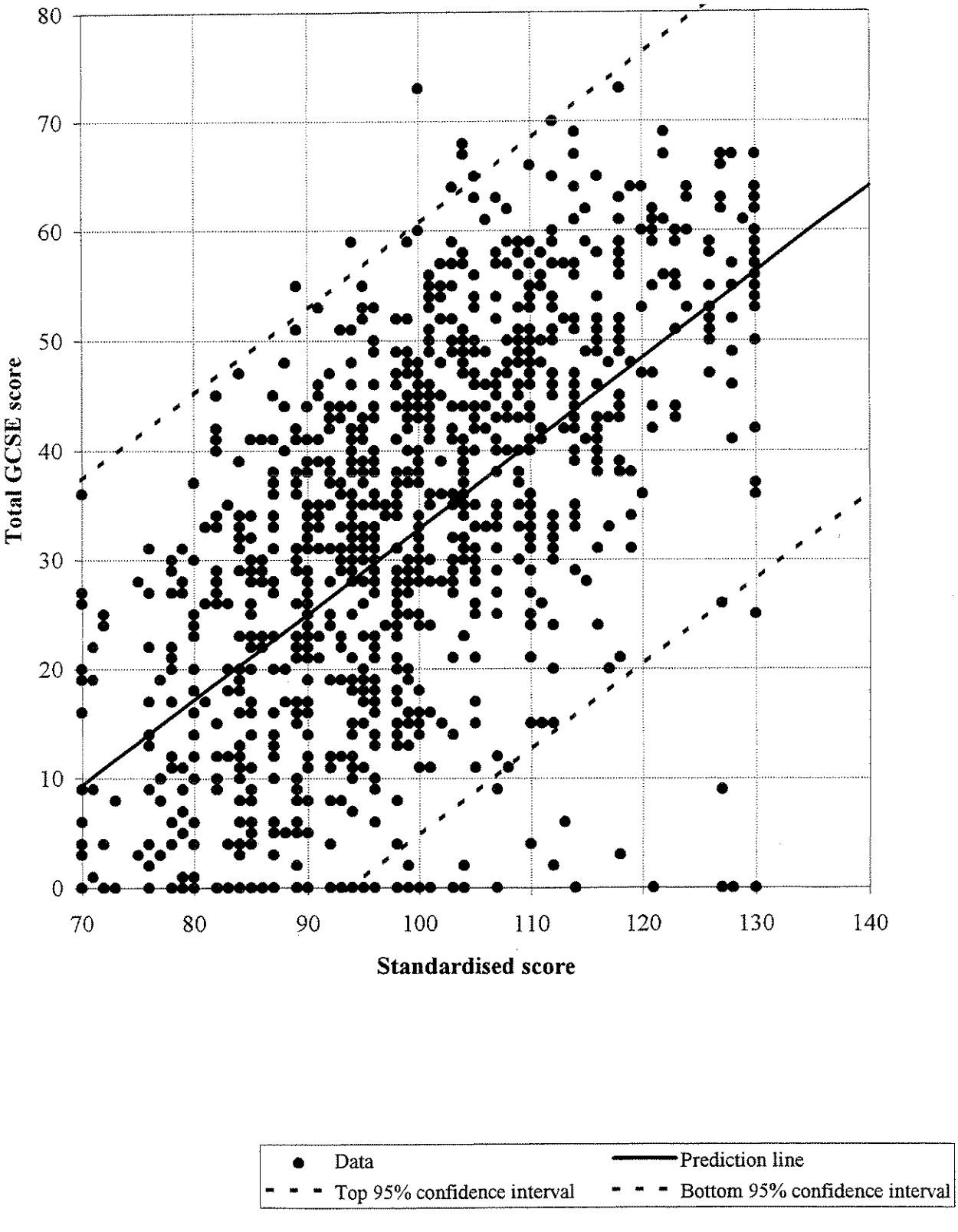


Figure A7: Total GCSE Score versus
Richmond Test of Basic Skills - Reading Comprehension

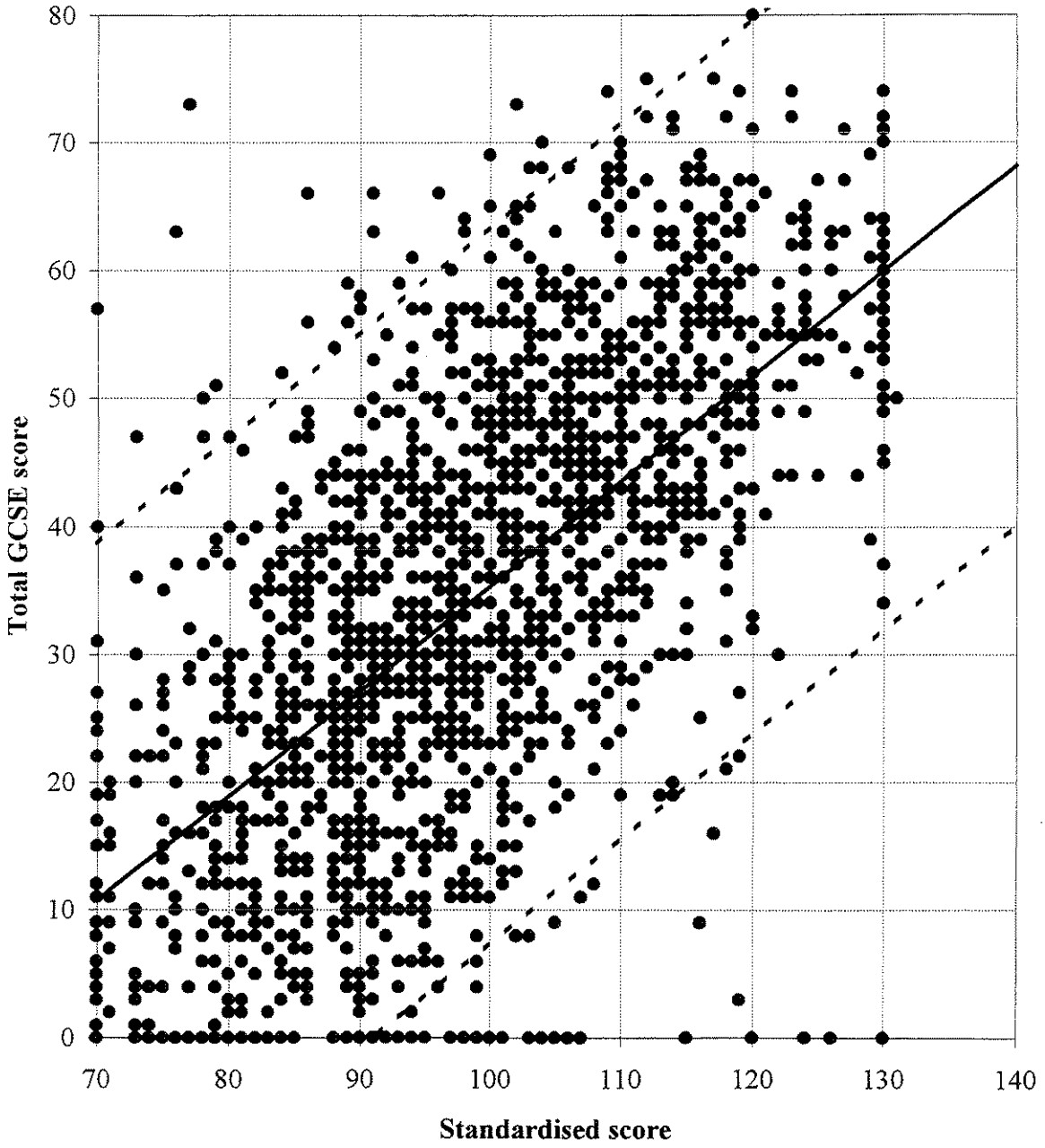


Figure A8: Total GCSE Score versus Richmond Test of Basic Skills - Maths Concepts

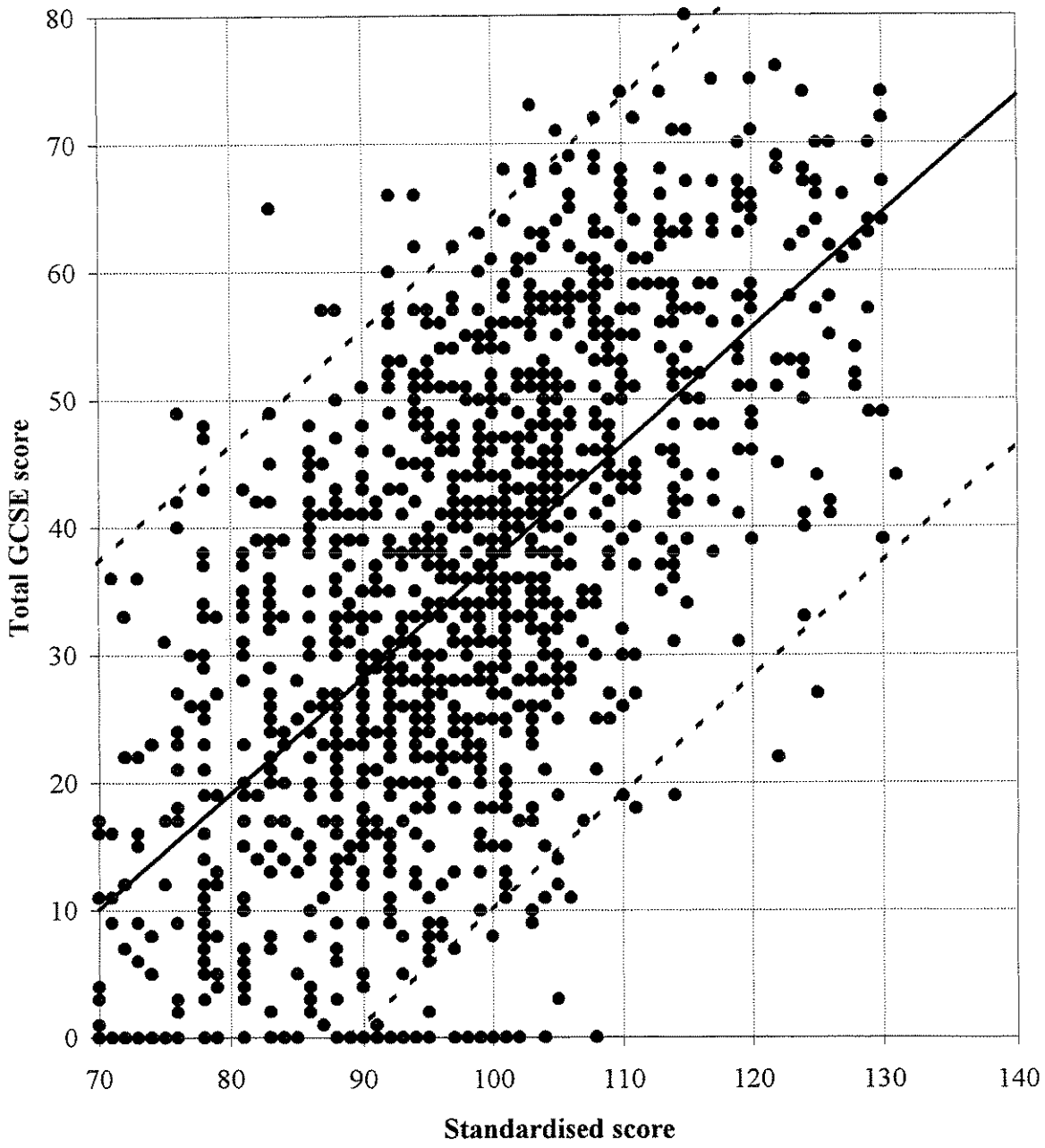


Figure A9: Total GCSE Score versus Richmond Test of Basic Skills - Problem Solving

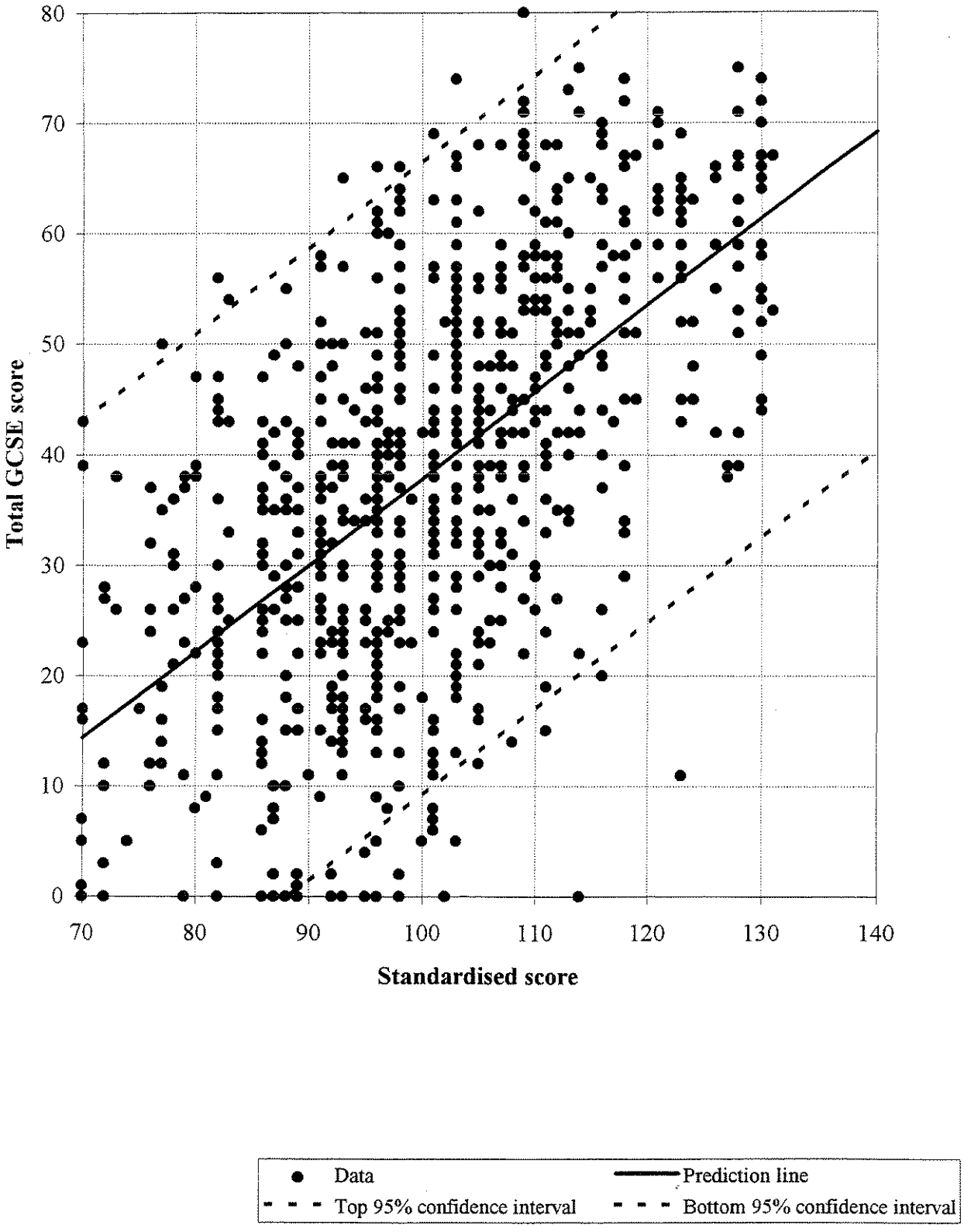


Figure A10: Total GCSE Score versus Suffolk Reading Scale

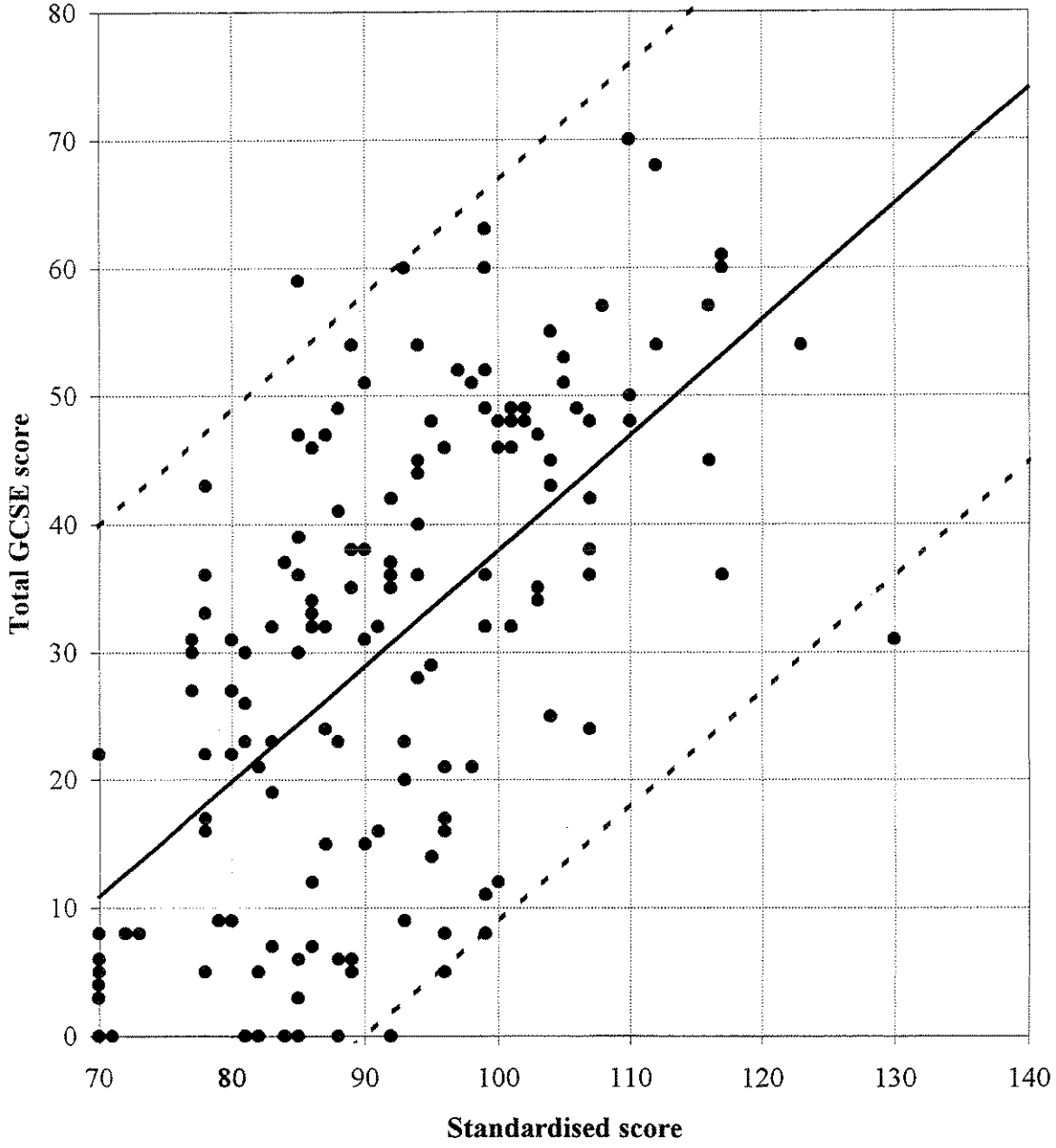


Figure A11: Total GCSE Score versus NFER-Nelson Reading Comprehension

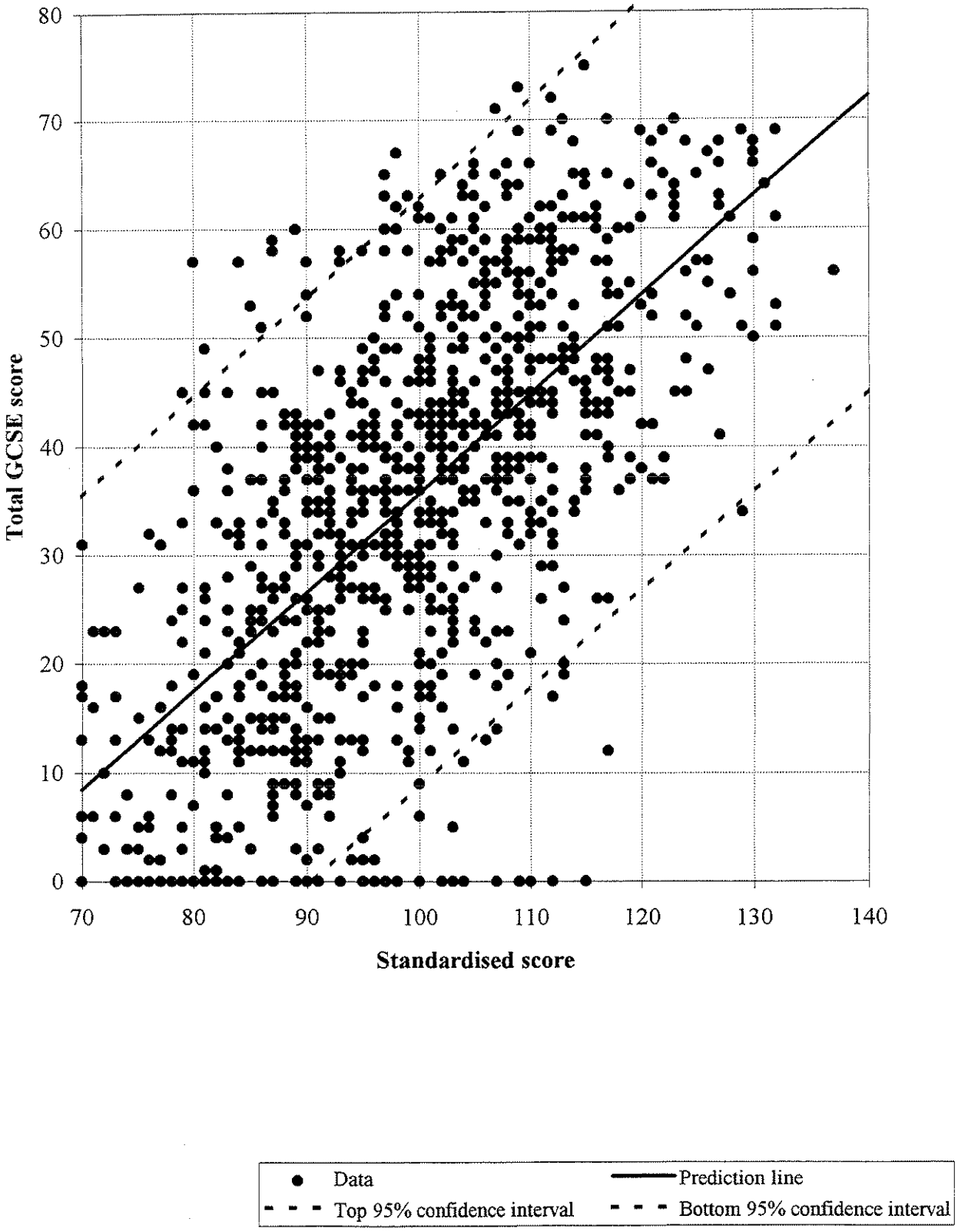


Figure A12: Total GCSE Score versus London Reading Test

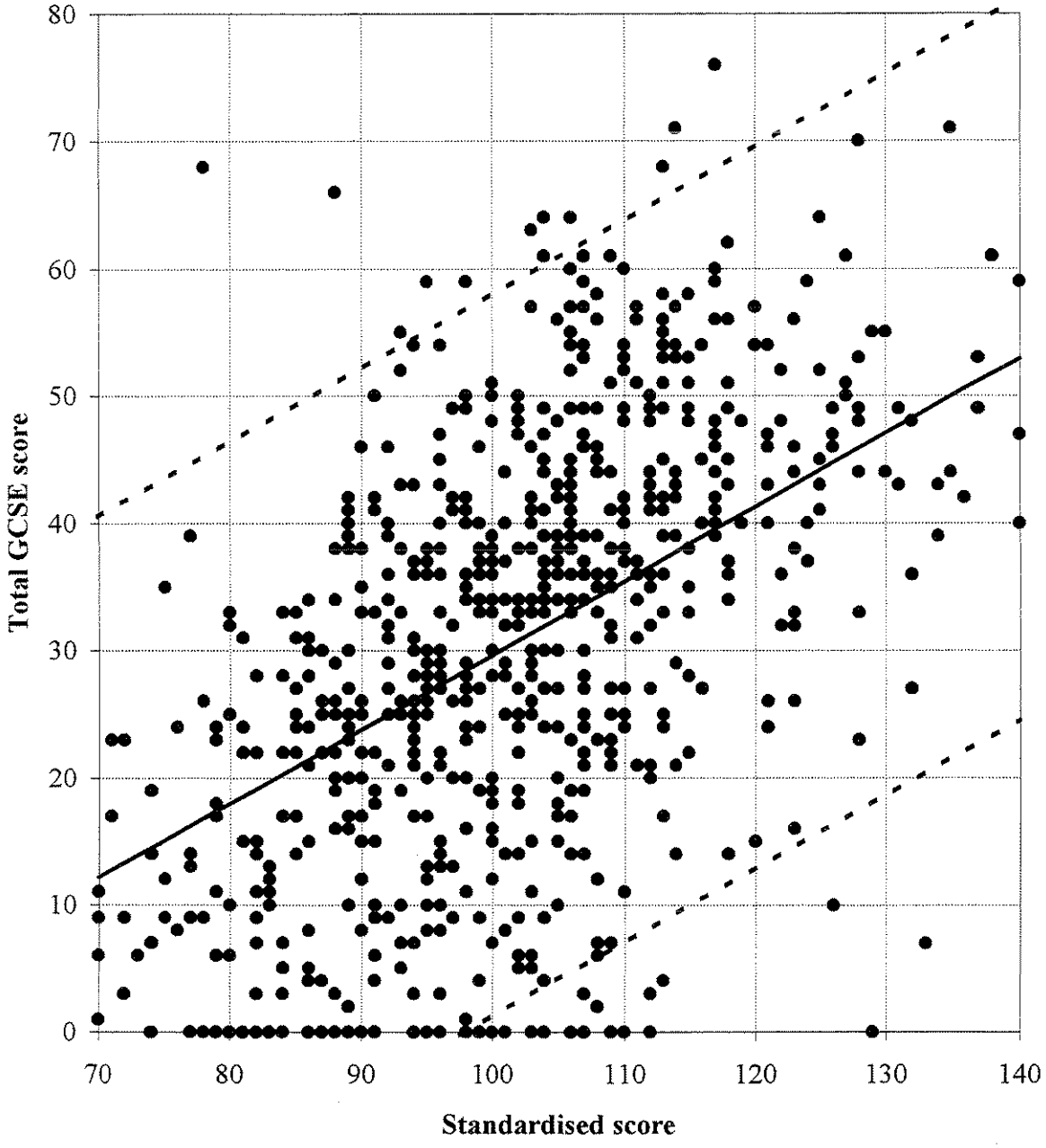


Figure A13: Total GCSE Score versus Edinburgh Reading Test

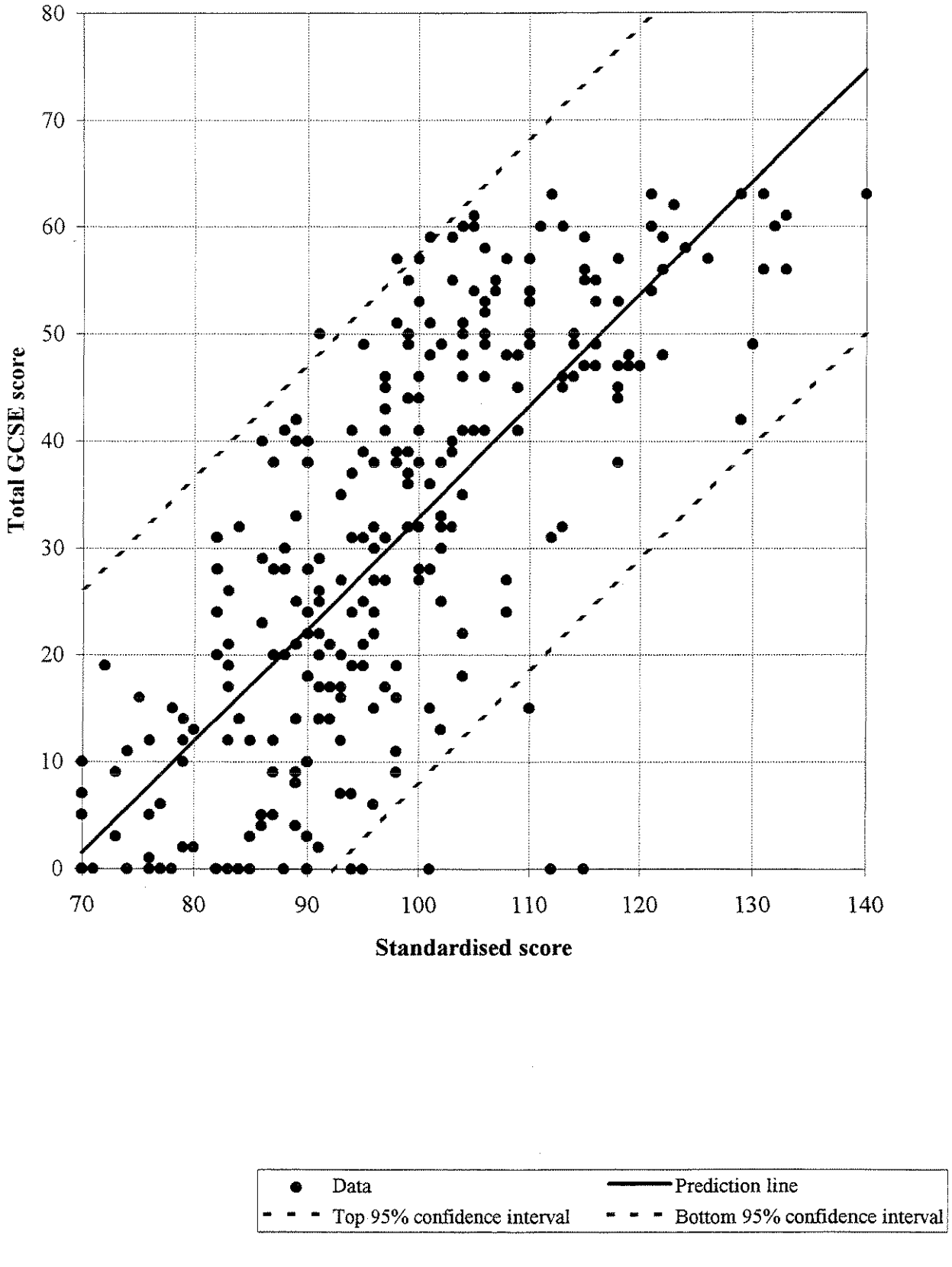


Figure A14: Total GCSE Score versus NFER-Nelson Maths Test

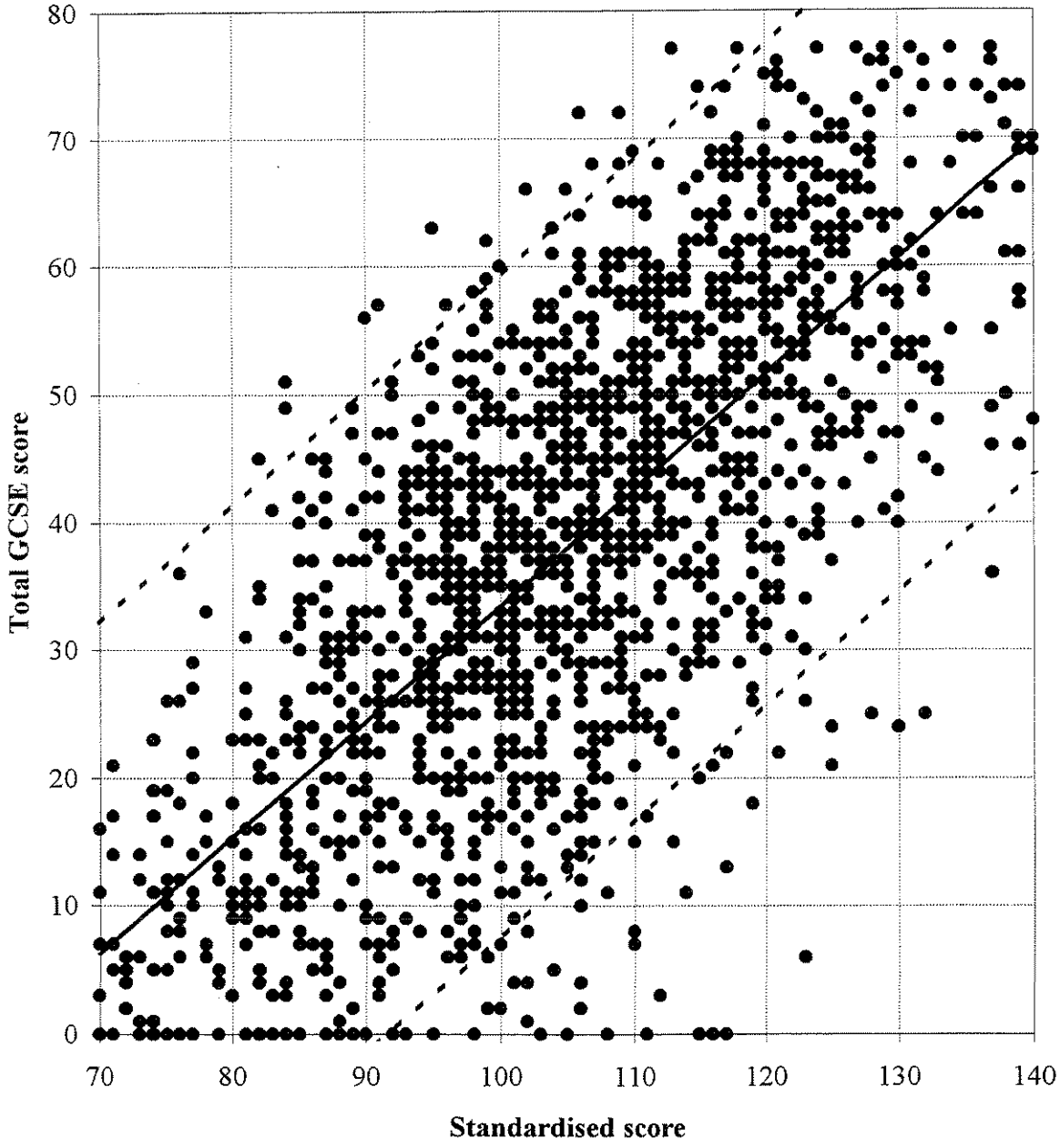


Figure A15: Total GCSE Score versus Richmond Test of Basic Skills (unknown subject)

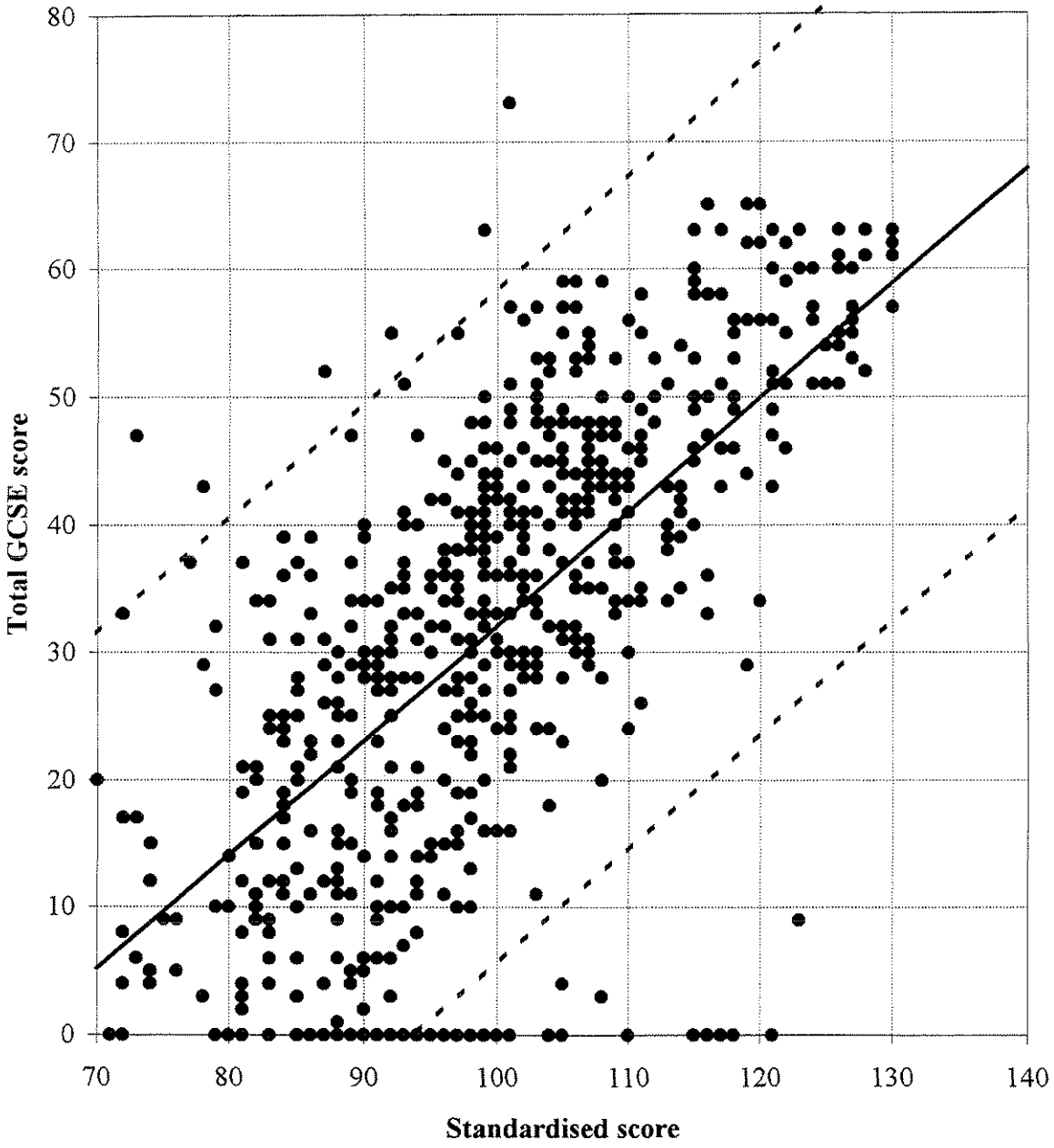


Figure A16: Total GCSE Score versus NFER-Nelson English Progress Test

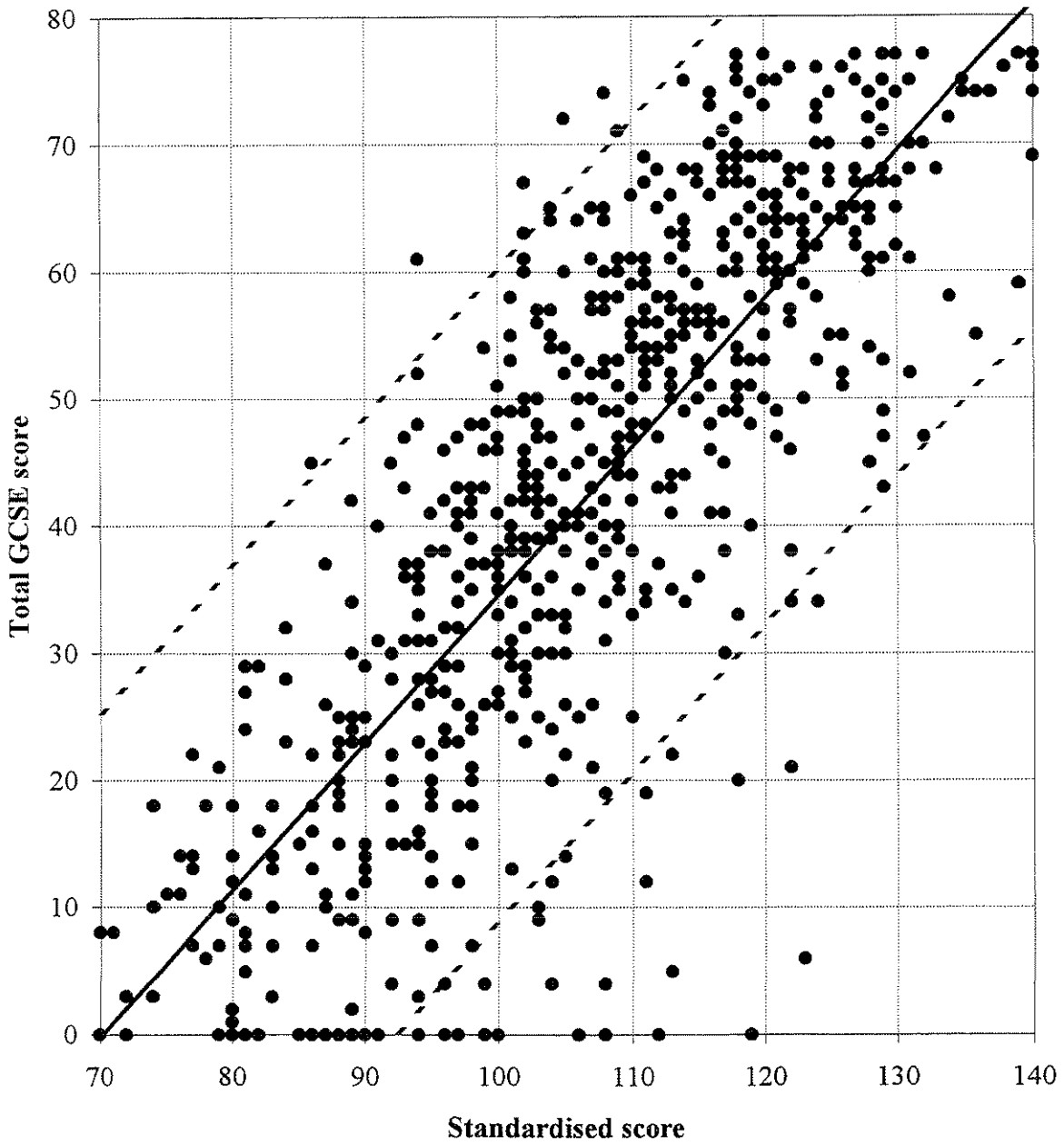


Figure A17: Mathematics Grades based on predicted Total GCSE Score

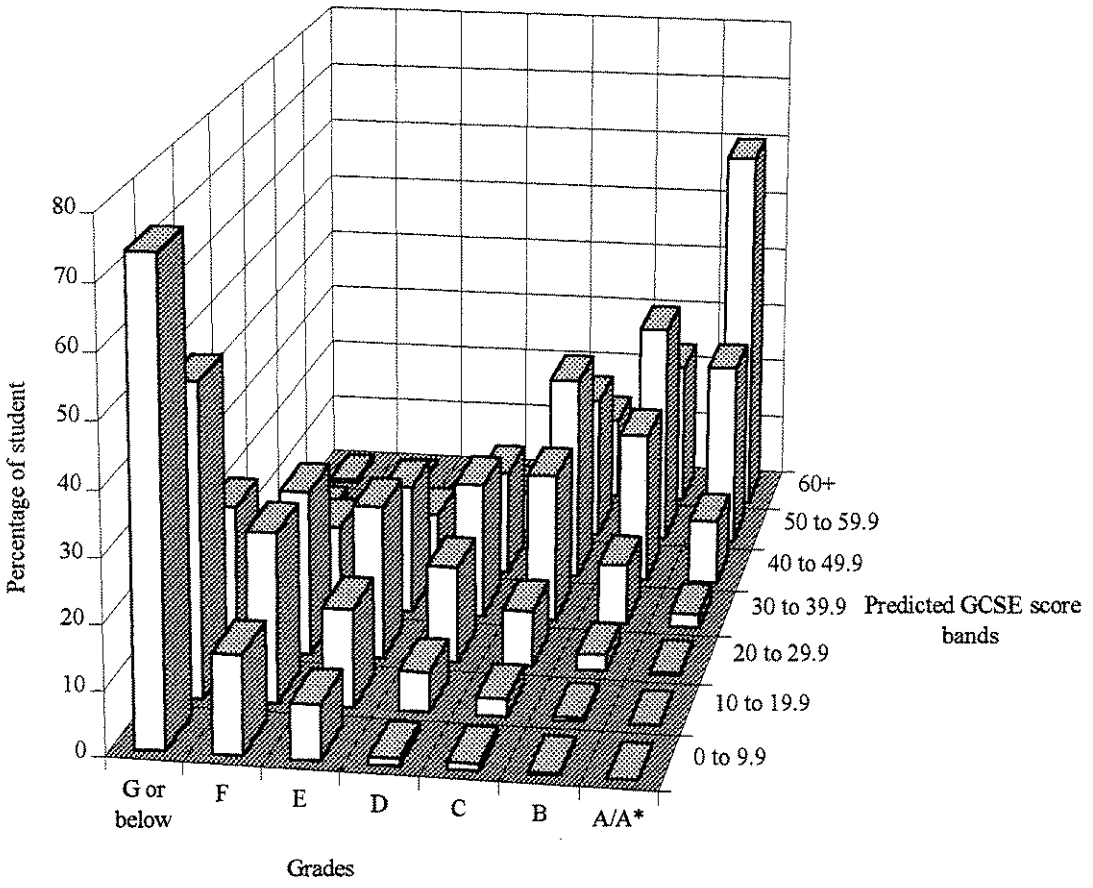
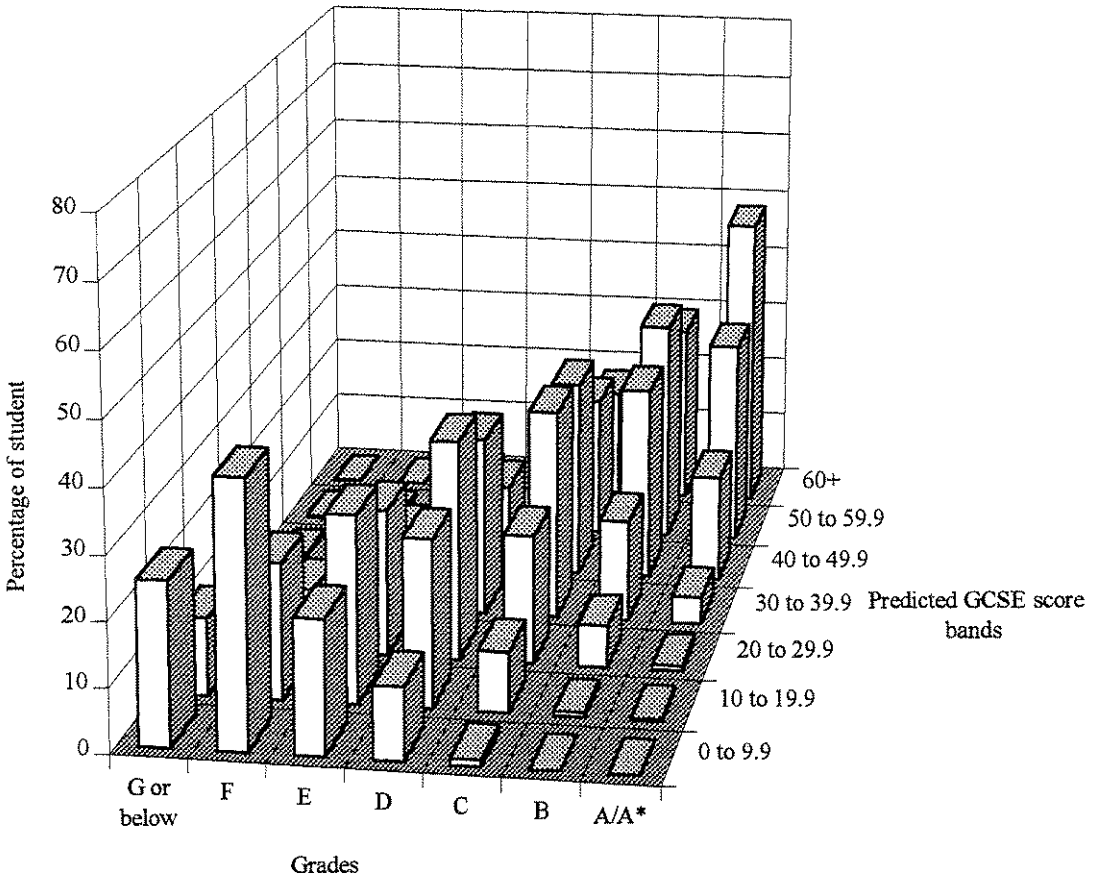


Figure A18: English Language Grades based on predicted Total GCSE Score



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QUASE
Technical Report 1996
Analysis of GCSE Cohorts 1993 to 1995

This report is essential reading for all who want to find out the factors which affect performance in secondary schools at the end of Year 11 (age 15–16). Data from 27,000 pupils in almost 100 schools over three cohorts has been assembled as part of the QUASE (Quantitative Analysis for Self-Evaluation) service to schools. The information analysed includes detailed GCSE examination results, as well as attendance and post-16 destinations. These results are analysed in terms of student background data such as sex, ethnicity, age, eligibility for free school meals, and prior attainment. Information relating to type of school, social background and parental involvement is used to give further valuable insights.

GCSE results are analysed both overall, and subject by subject. The relationship between prior attainment, attendance in Year 11, and GCSE performance is explored in detail. The destinations of pupils after Year 11 are analysed in terms of their GCSE results and other factors which affect the probability of them staying on in education, or becoming unemployed. Questionnaires to pupils and parents in Year 11 reveal important factors in attitudes to school, and significant differences with respect to sex and ethnicity.

The QUASE data gives an unparalleled source of information about the relationships between a whole range of commonly-used tests at intake to secondary school and pupils' performance at GCSE. The charts and tables contained in this report can be used to predict a student's overall results at GCSE from knowledge of their intake test score. Grades in different subjects may also be predicted, within the range of uncertainty which is inevitable with individual predictions of this type.

The results of the QUASE service are thus not only of value to the schools who receive the detailed reports on their own performance, but also give valuable insights for educational researchers and others who are concerned about the factors which influence performance in secondary school.

ISBN 0 7005 1432 5

£5.00