

# Value Added in English Schools

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# Overview

**Current use of value added in England**

**2007 model for secondary schools**

**Presentation of value added in achievement and attainment tables**

**Presentation of value added in RAISEonline**



# Use of value added in England

Autumn 2007

National “league tables” of school contextual value added (CVA) scores are **published** annually for 14,000 primary and 3,000 secondary schools – on web and in national and local press

CVA generally **accepted** by schools as a reasonable measure of school effectiveness, despite complexity of the model - using multi-level modelling with a range of contextual factors

CVA analysis **used** by national **inspectorate** (Ofsted) to frame inspection questions; and used by **schools** for self-evaluation and school development planning, through interactive system RAISEonline



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# Where we started out

Autumn 1998

Identifiable pupil-level results centrally collected for:

- National tests/assessments of attainment in core subjects for 600,000 pupils reaching the end of each “key stage” ie age 7 (KS1), 11 (KS2) and 14 (KS3)
- A range of academic and vocational qualifications achieved by pupils at age 16 (KS4, end of compulsory schooling)

Publication of raw-scores “league tables” of schools (KS4 for secondary schools from 1992, and KS2 for primaries from 1996)

A commitment to make these fairer for comparing schools with different intakes



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# How we reached current position

Initial VA scores over single key stages produced using simplistic methodology (from 2002 onwards), paving the way for more sophisticated developments

Pupil Level Annual School Census introduced in 2002 - contextual information for all 8 million pupils in England

Advisory group of leading academics and practitioners

Schools involved in piloting CVA developments at every stage (eg 430 secondaries in 2005 KS2-4 CVA pilot)

Presentations and tools developed to help users engage and understand the calculations



# 2007 Secondary school model KS2-4

How it appears in the paper

$$y_{ij(t_2)} = \beta_0 + \beta_1 y_{1ij(t_1)} + \dots + \beta_4 y_{4ij(t_1)} + \beta_5 x_{5ij} + \dots + \beta_p x_{pij} + \beta_q y_{qj(t_1)} + \beta_s y_{sj(t_1)} + \varepsilon_{ij}$$

$$\varepsilon_{ij} = u_j + e_{ij}$$

Pupil outcome  $y_{ij(t_2)}$  predicted using

- four prior attainment terms  $y_{ij(t_1)}$
- a range of pupil contextual terms  $x_{ij}$  ;and
- two contextual terms  $y_{jt_1}$  at school level derived from pupil prior attainment

Model fitted using MLwiN



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# 2007 Secondary school model KS2-4

We need pilot schools to engage and understand so we can have an informed debate about what factors to include

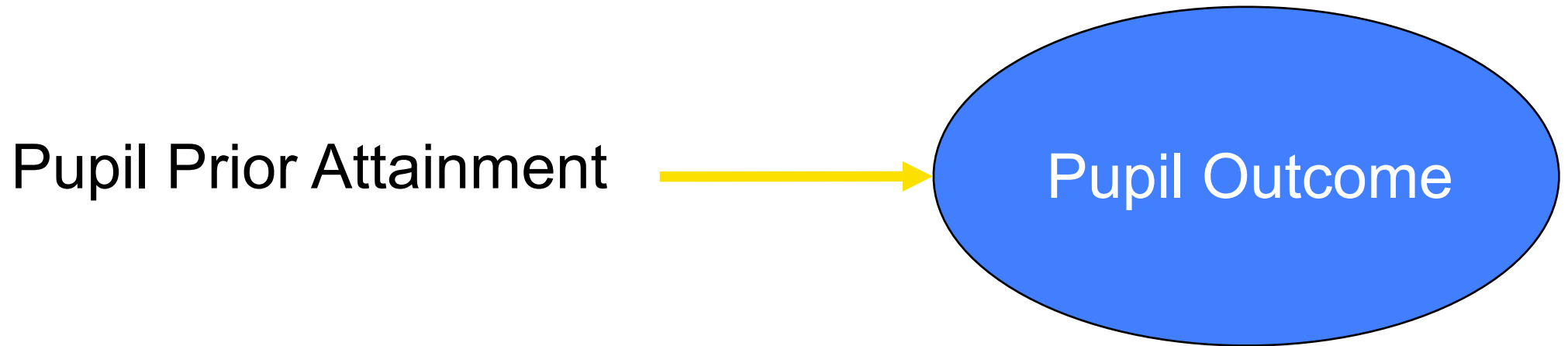
We need to be open with any school or local authority or tables user who wants to understand how the models work

So how we explain it to schools

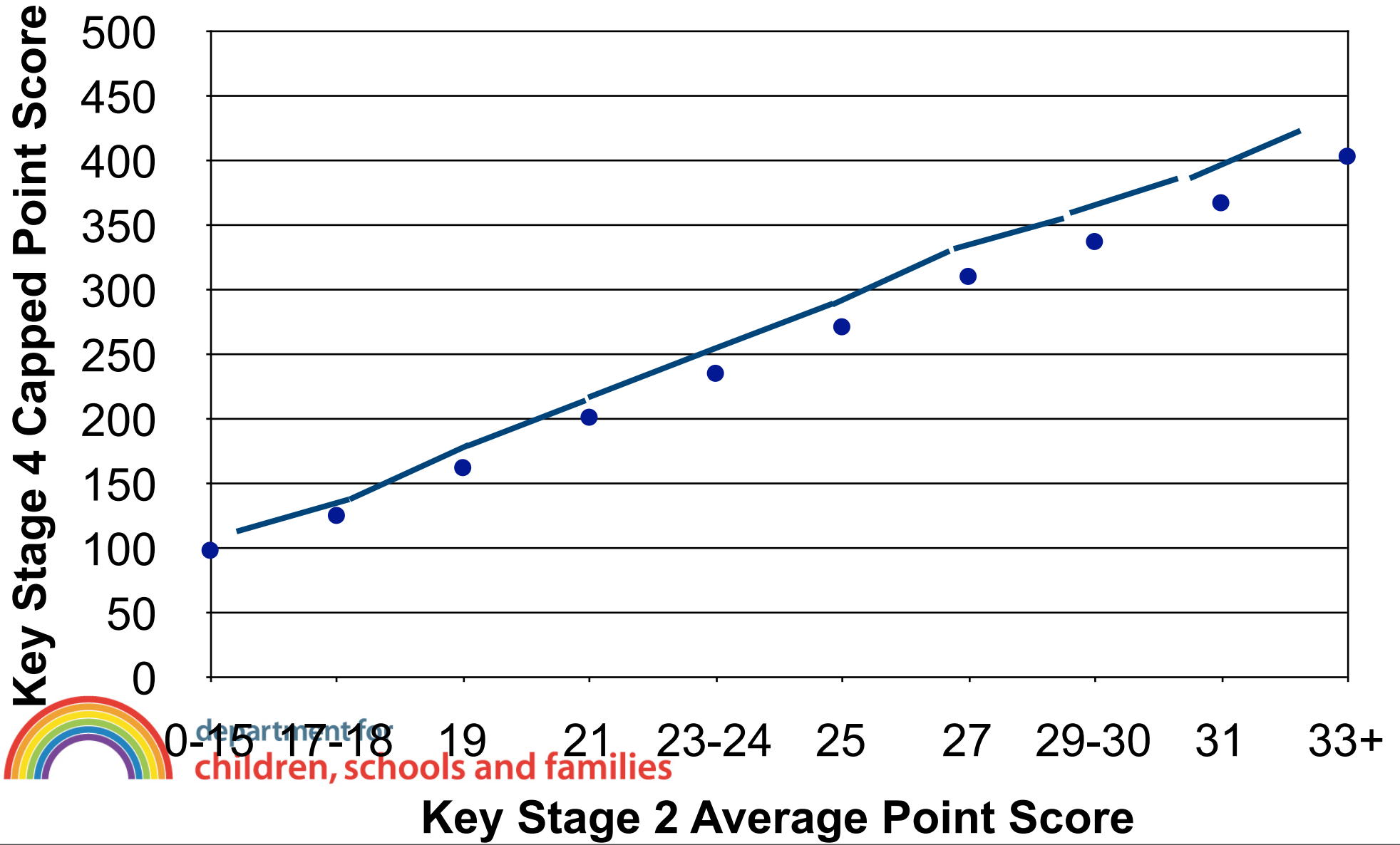
- no algebra
- no subscripts or Greek letters
- no “black box”



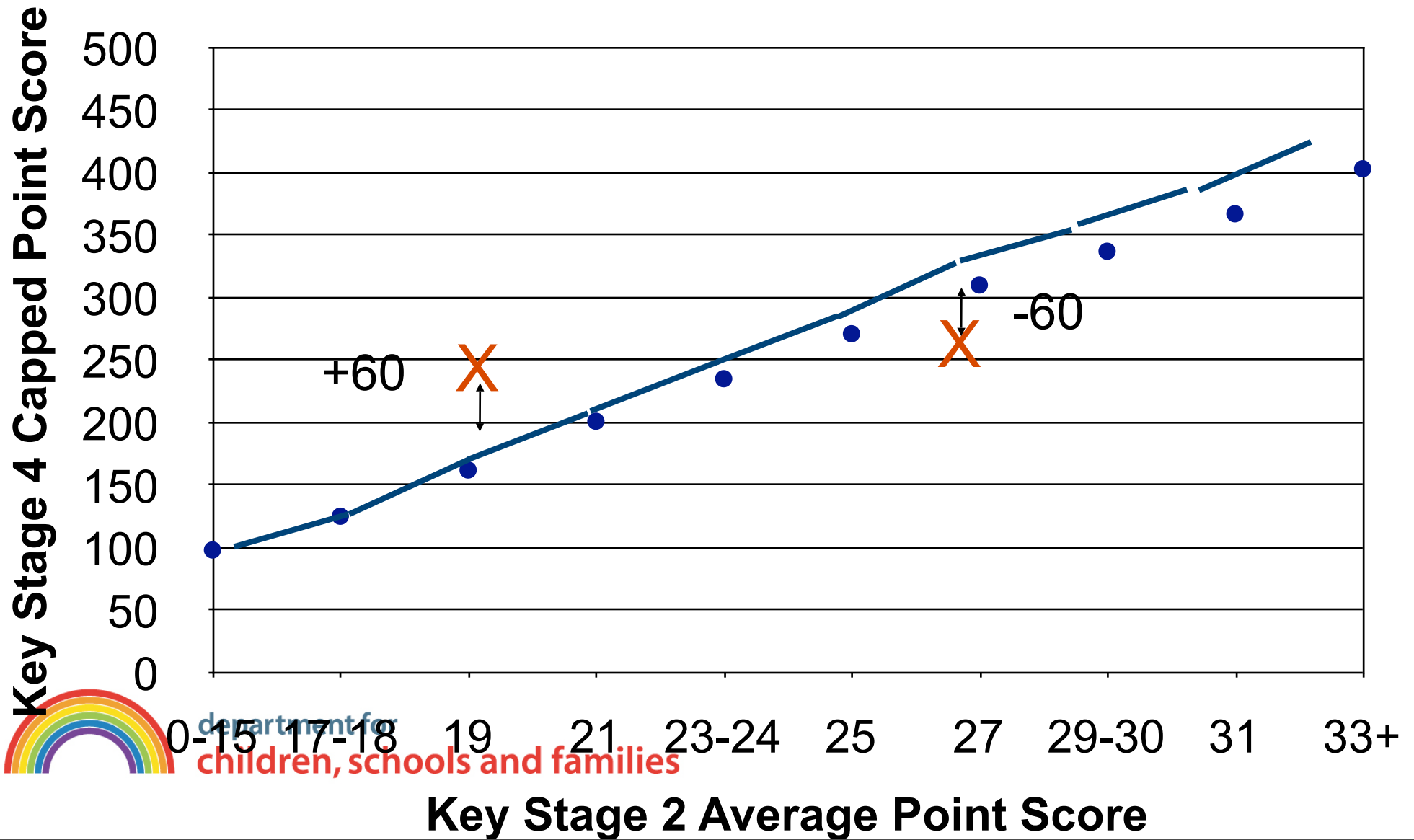
The old 'simple' Value Added model predicts outcomes based on pupil prior attainment only ...



- Pupils are grouped by prior attainment and the *median* outcome is found for each group.
- The *national median line* is then constructed.



Pupil value added scores are then their distance from this line...



A pupil's value added score is the difference between their *predicted* and their *actual* result

$$\text{Pupil VA} = \text{Actual Result} - \text{Predicted Result}$$



The old 'simple' Value Added model predicts outcomes based on pupil prior attainment...

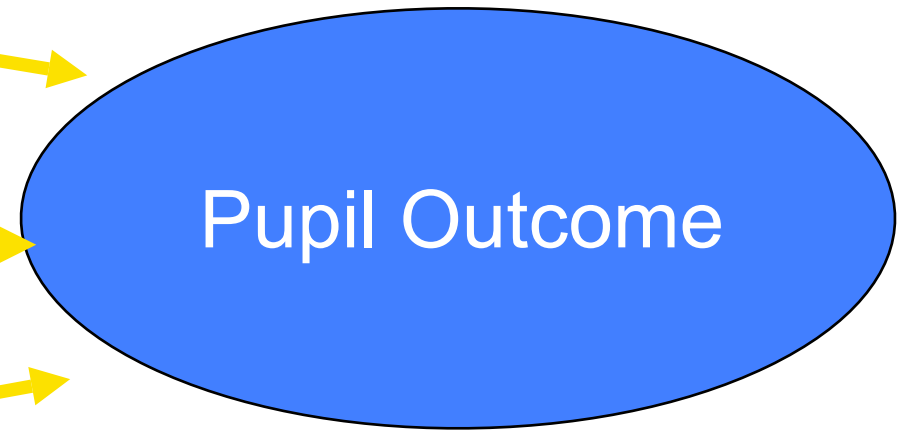
Pupil Characteristics



Pupil Prior Attainment



School Characteristics



... a contextualised model predicts outcomes using a range of factors



In the contextualised value added model we get a predicted value that takes into account

Prior attainment  
Pupil characteristics  
School factors

But a pupil's value added score remains the difference between their *predicted* and their *actual* result:

**Pupil VA = Actual Result – Predicted Result**



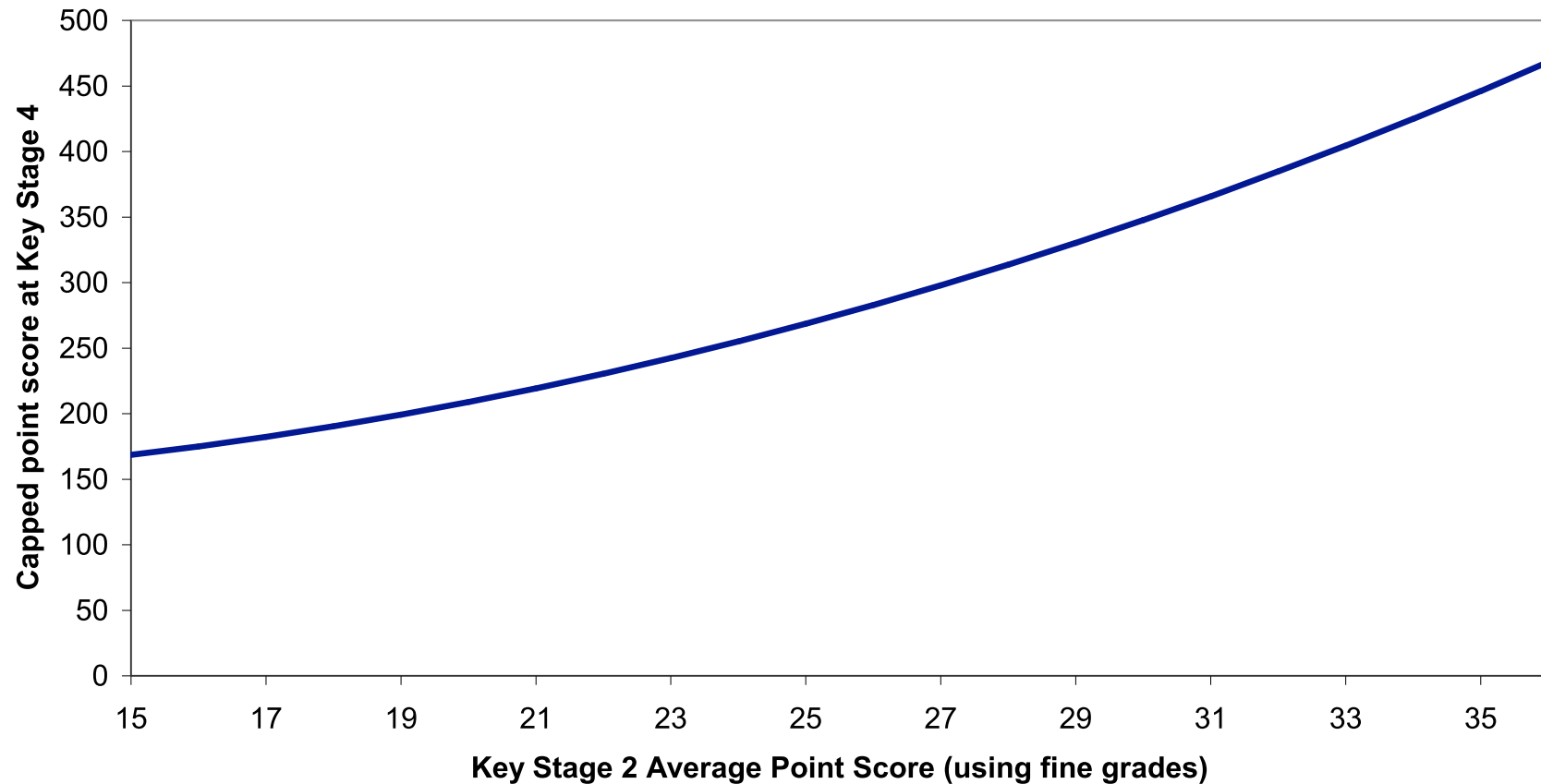
# Outcome Measure

The KS4 outcome measure is the total point score for GCSE and equivalent qualifications (capped at the equivalent of best 8 GCSEs).



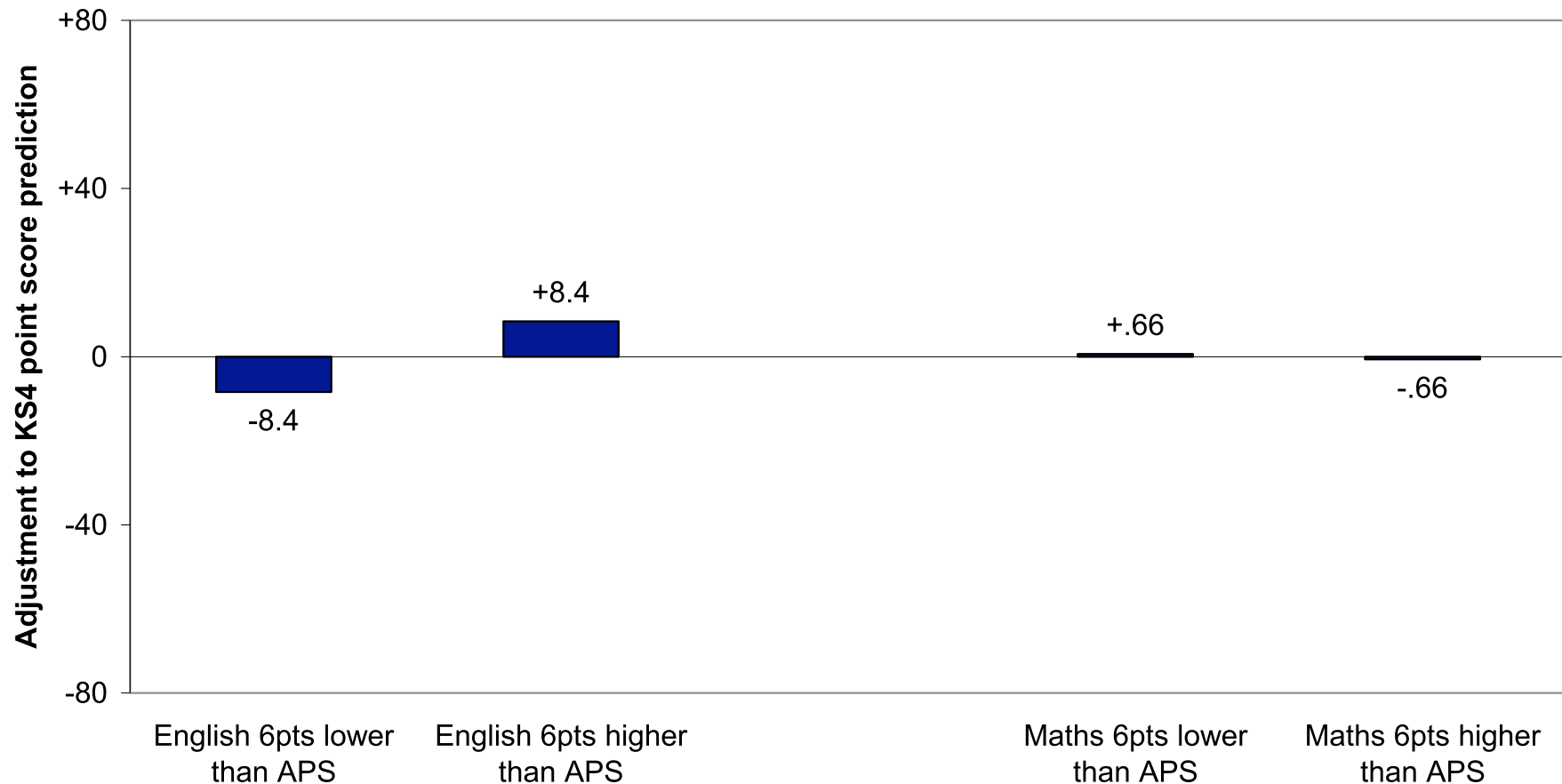
# Prior attainment

## Model prediction from KS2 average point score



# Prior attainment

Adjustments where point scores in English or maths differ from the average point score



# Missing values and defaults

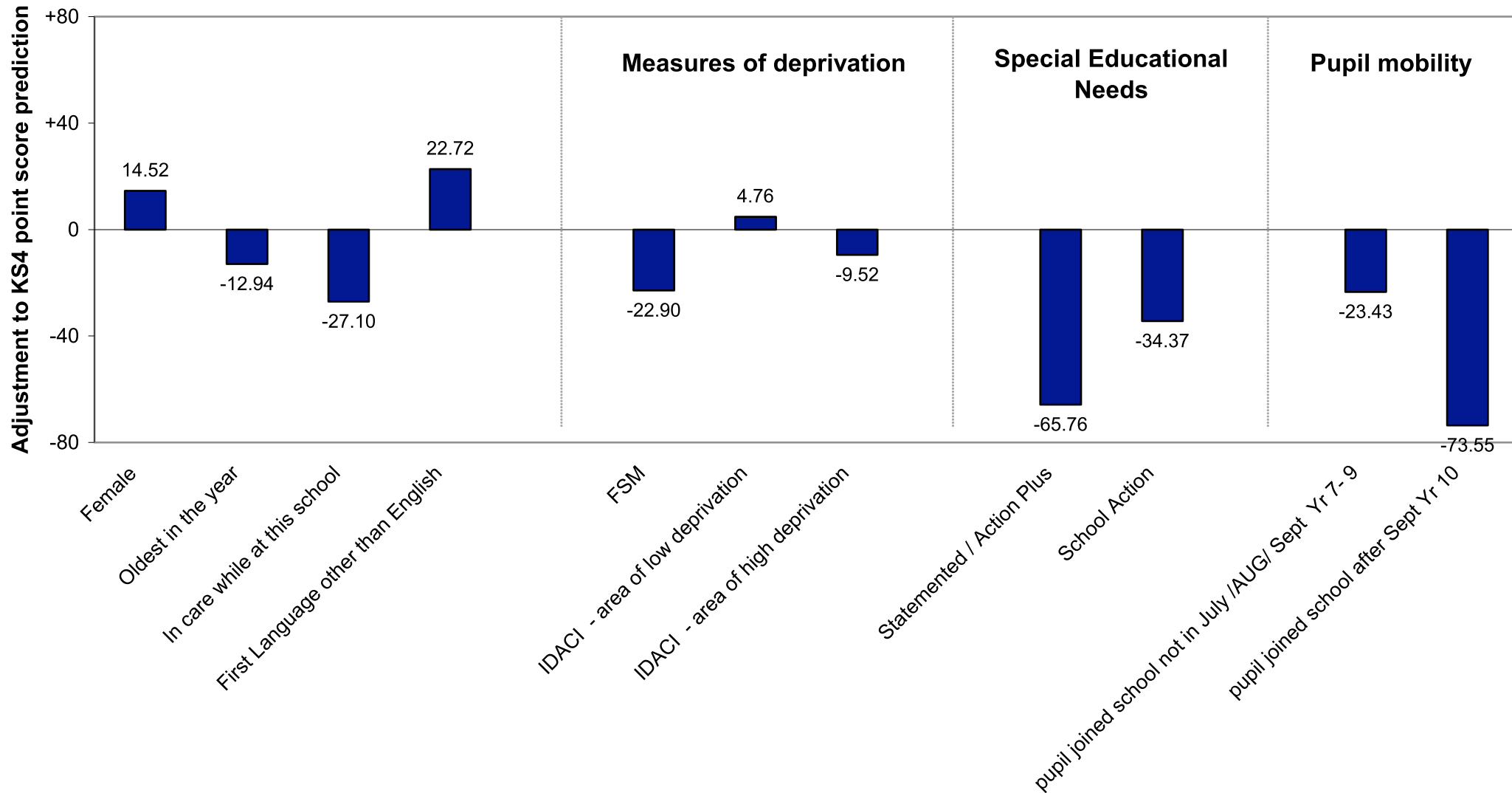
**All pupils have scores provided they have at least one item of prior attainment, and an outcome measure**

- **“Average” prior attainment based on available data**
- **Subject divergences default = 0**
- **Default postcode deprivation = school mean**
- **Other default values = non-FSM, non-SEN, non-EAL unclassified ethnicity etc**

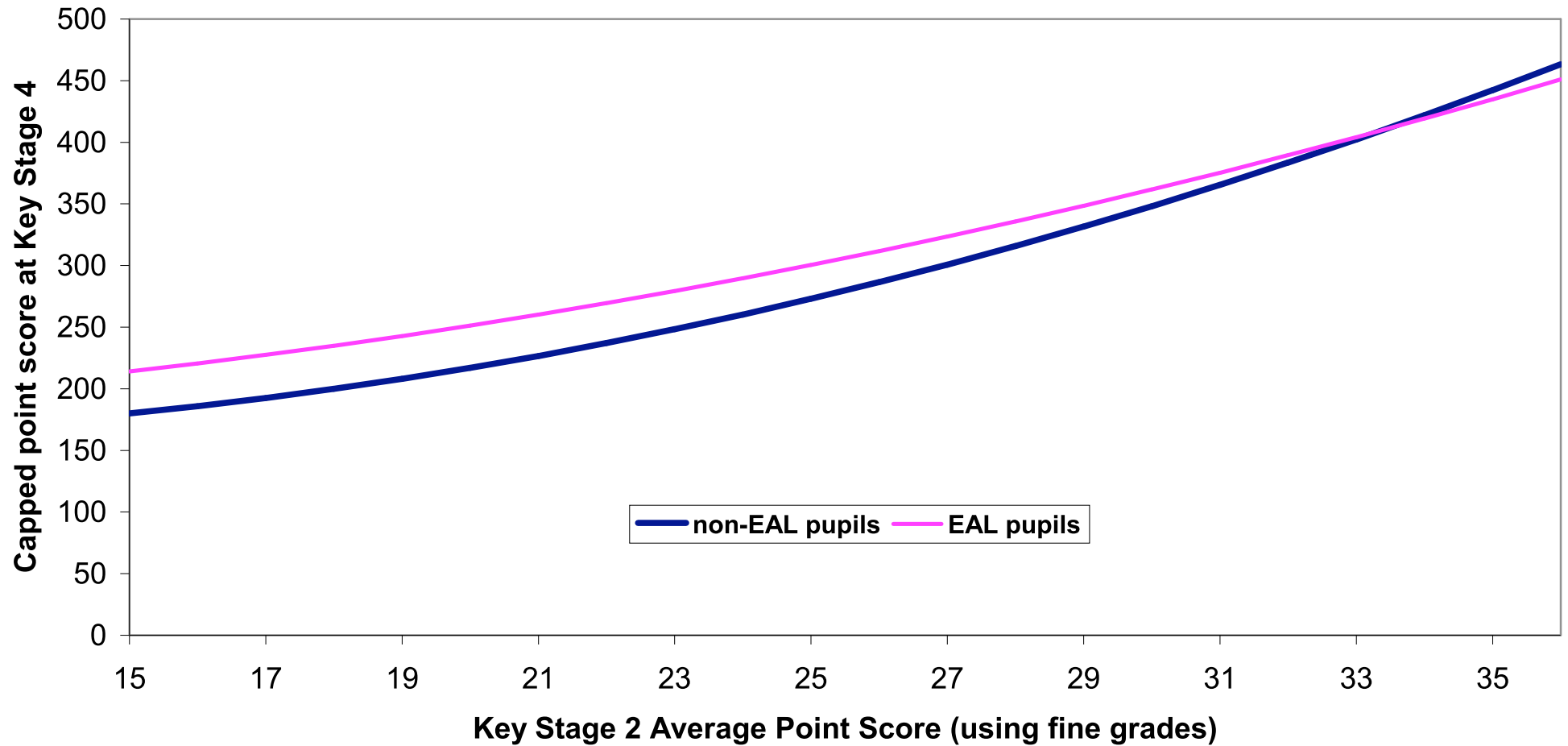
**Pupils with only default values are not included in coefficient estimation, but have scores calculated**



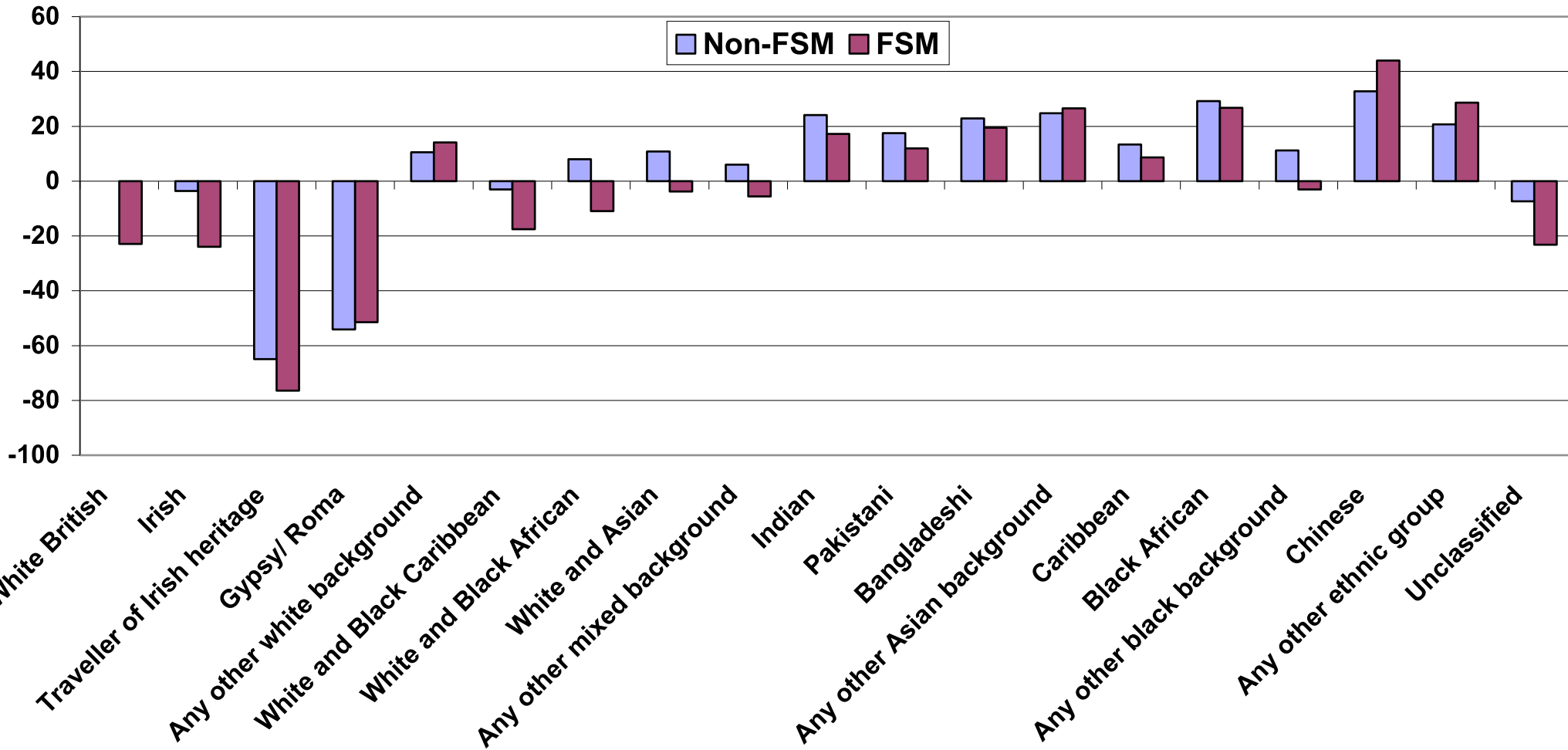
# Adjustments due to pupil characteristics



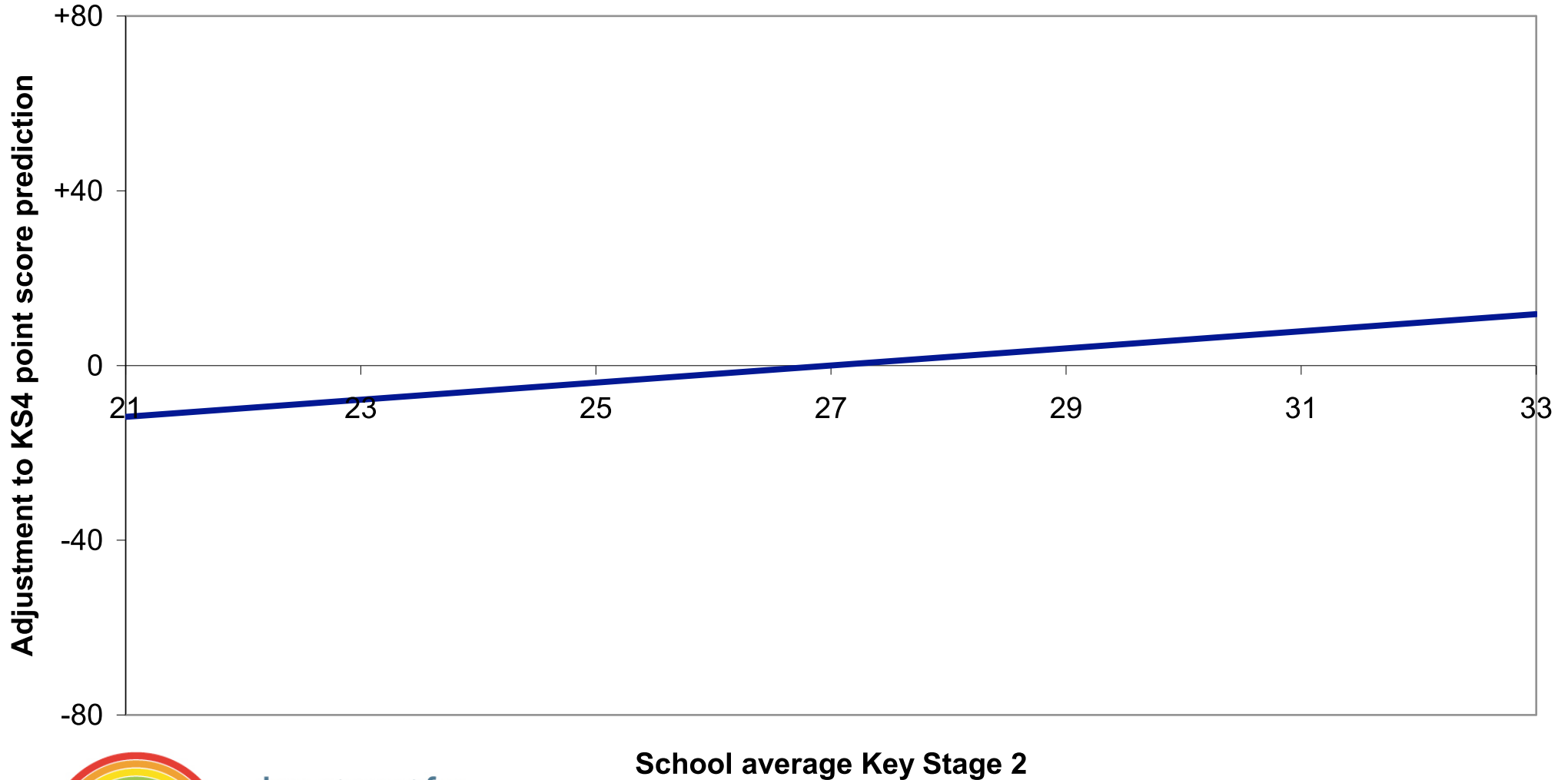
# Effect of having English as an Additional Language - depends on prior attainment



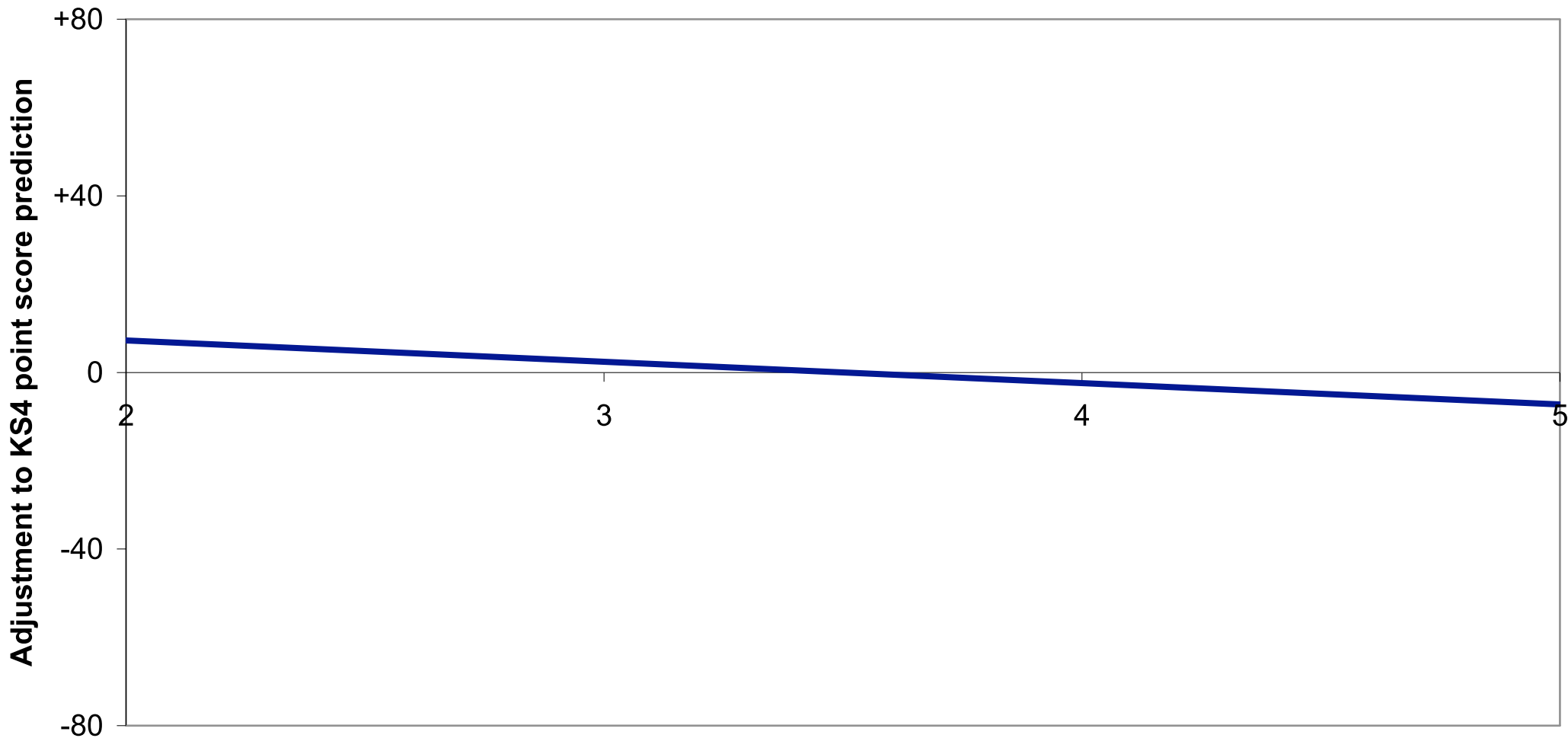
# Adjustments due to pupil ethnicity and FSM



# School level factor: Adjustments due to average Key Stage 2 of cohort



# School level factor: Adjustments due to spread of Key Stage 2 amongst cohort



Standard deviation of Key Stage 2 point scores within the school



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# Calculating a prediction for a pupil

We combine the effects of all of the factors to get a prediction for a pupil.

We can use the Ready Reckoner to add the factors together.

For this pupil the prediction is 291.9



Key Stage 2 (Prior attainment finely graded point scores)				Notes
To calculate these scores click <a href="#">HERE</a>				
English	28.64	-1.71	-3.93	
Mathematics	31.09	0.74	+0.24	
Science	31.33			
Average Point Score	30.35		+353.94	<b>+350.3</b>

Pupil Characteristics			Notes
Gender	Male		0.0
SEN	Non-SEN		0.0
FSM	Yes		-21.3
First Language	English or believed to be English		0.0
Date of Joining (DDMMYYYY)	15112001		-23.8
Ethnicity	White British		0.0
Date of Birth (DDMM)	1210		-5.4
In care whilst at school	No		0.0
IDACI	0.19		-3.3

School Characteristics			Notes
Prior Attainment	26.0		-3.3
Spread of Prior Attainment	3.7		-1.3

# Moving from pupil to school scores

**We take the mean (average) of all the pupil scores.**

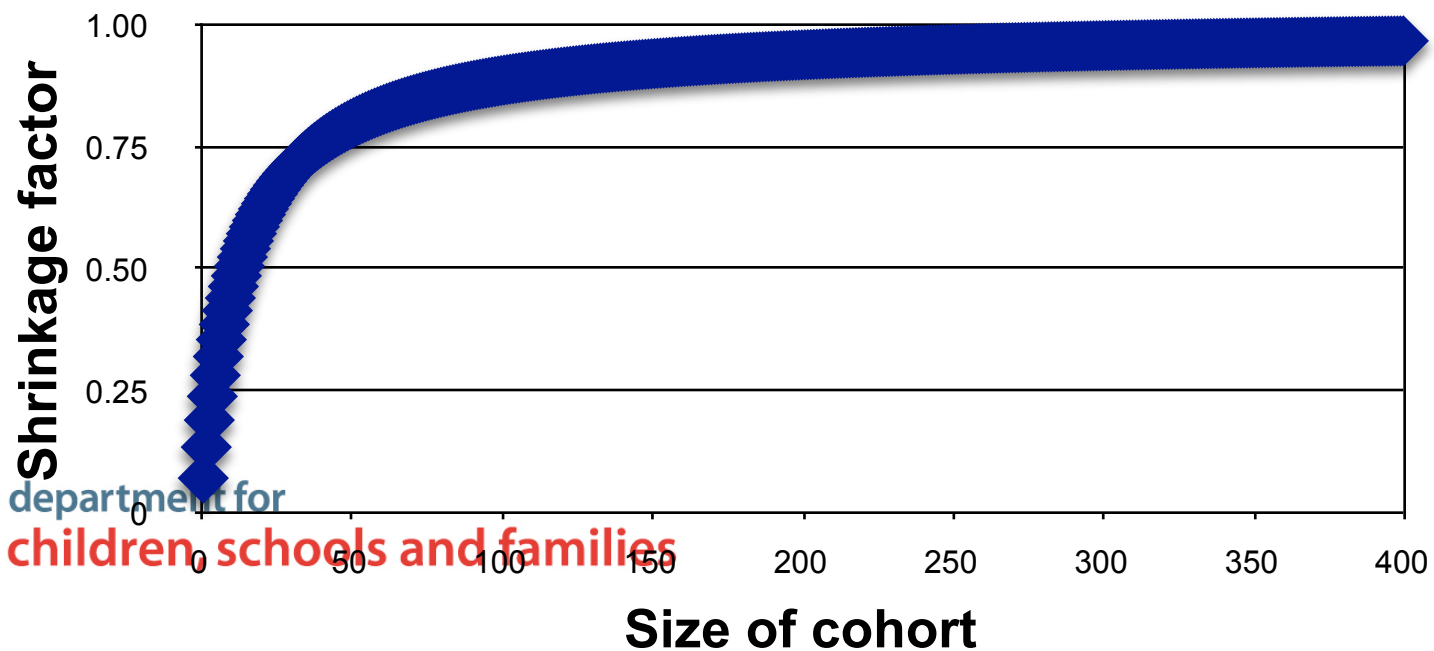
**We apply the shrinkage factor to get a school measure of CVA.**

**We then add confidence intervals to give a range of scores in which we are confident that the true value lies.**



# Shrinkage by cohort size at Key Stage 4

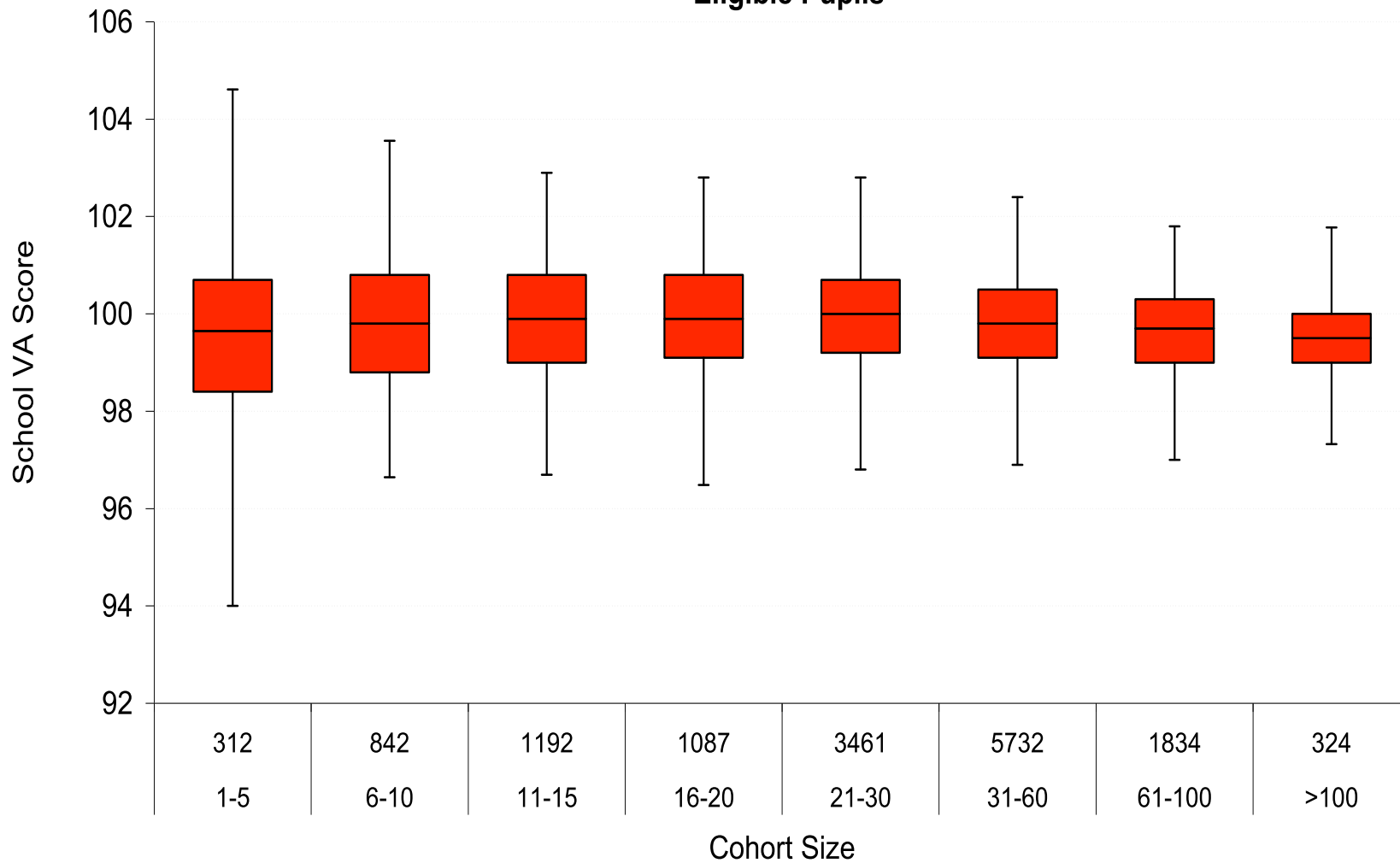
Cohort size	Shrinkage factor	Example raw score	After shrinkage
50	0.80	+50.0	+40.0
100	0.89	+50.0	+44.5
150	0.92	+50.0	+46.0
200	0.94	+50.0	+47.0



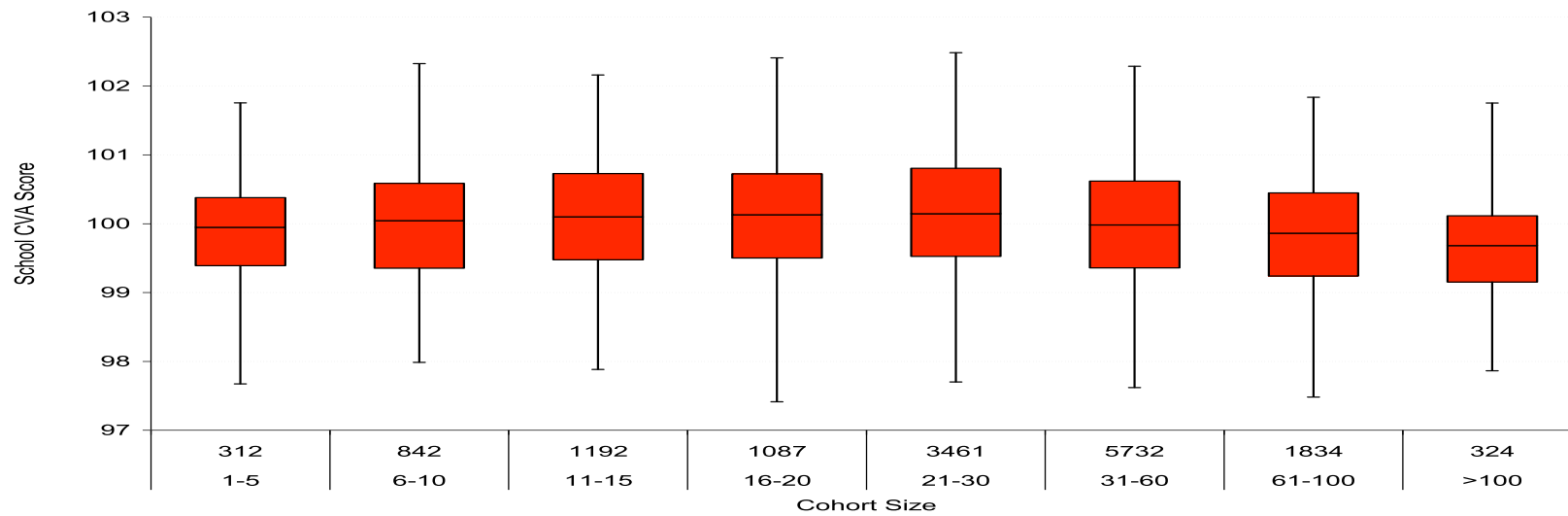
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# Without shrinkage

Boxplots of School KS1-2 Maintained Mainstream VA Scores by Cohort Size of Eligible Pupils



# With shrinkage



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## Secondary School achievement and attainment tables 2007

LA : Surrey

### Key Stage 2 to 4 Contextual Value Added

GCSE and equivalent	Key Stage 2 to 4 CVA	Key Stage 3 to 4 CVA	Year on year comparisons		Absence	Background
	Measure centred on 1000	Limit of Key Stage 2 to 4 CVA Confidence Intervals		Coverage		Number of qualifications
	CVA measure based on progress between Key Stage 2 and Key Stage 4	Upper	Lower	% of students at the end of Key Stage 4 included in CVA calculation	Average number of qualifications taken by students in Key Stage 2 to 4 CVA calculation	
LA Average	996.3					
England Average						
ACS Cobham International School						
ACS Egham International School						
All Hallows Catholic School	999.6	1008.2	990.9	95%	9.8	
Apple Orchard Education Unit	NP	NP	NP	NP	NP	
Ash Manor School	990.9	999.8	982.0	96%	9.7	
The Ashcombe School	996.6	1004.1	989.1	98%	9.2	
The Beacon School	954.6	962.5	946.7	96%	7.9	
The Bishop David Brown School	1007.2	1018.3	996.0	86%	8.6	

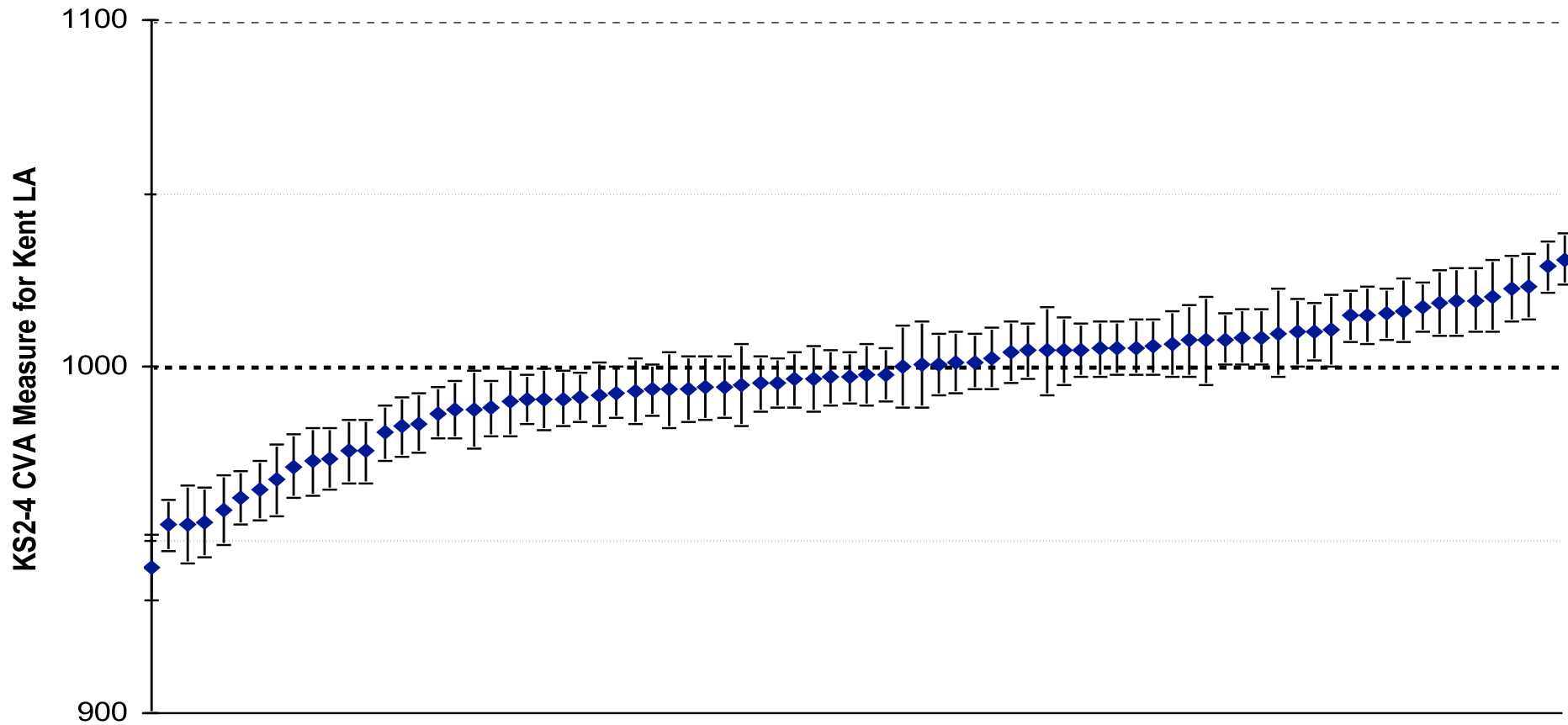
# RAISEonline

Provides a common set of analyses for schools, Local Authorities, inspectors and School Improvement Partners.

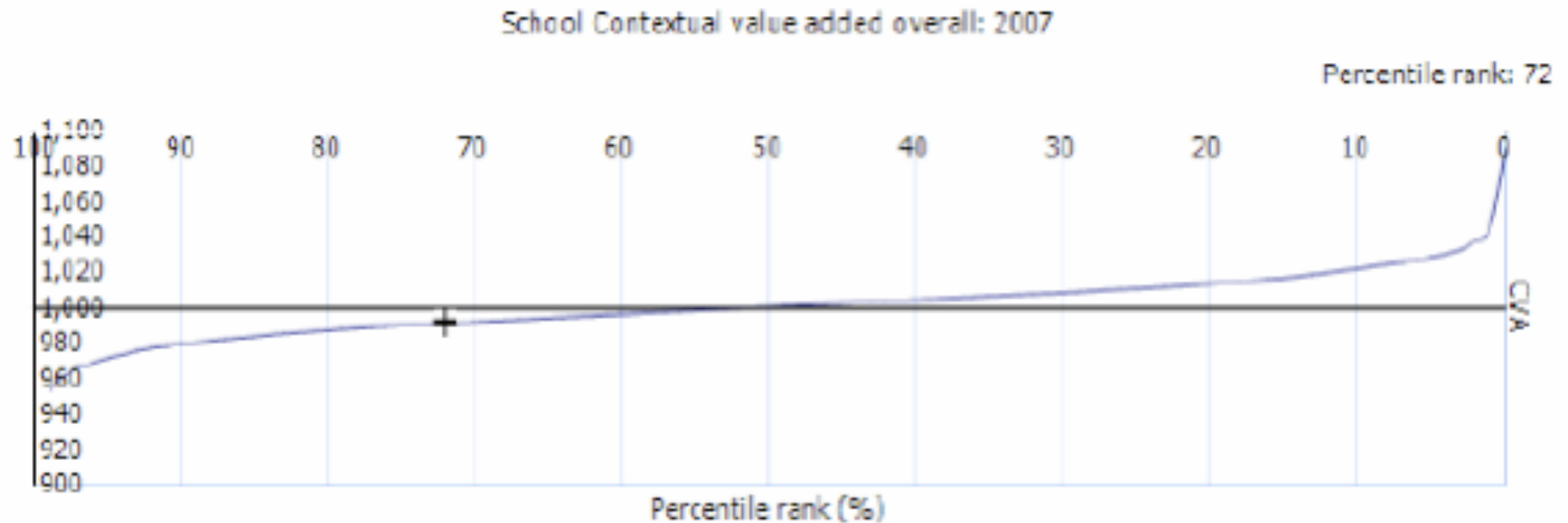
- Standard reports and analysis covering the attainment and progress of pupils in Key Stage 1, 2, 3 and 4,
- interactive drill-down features to allow exploration of pupil performance
- Contextual information about the school, including comparisons to schools nationally
- Target-setting to support schools in the process of monitoring, challenging and supporting pupil performance



# MLM usually presents school scores as a caterpillar...



**But with 3000 schools the whiskers get too close, so RAISE superimposes each school on a “snake” plot**

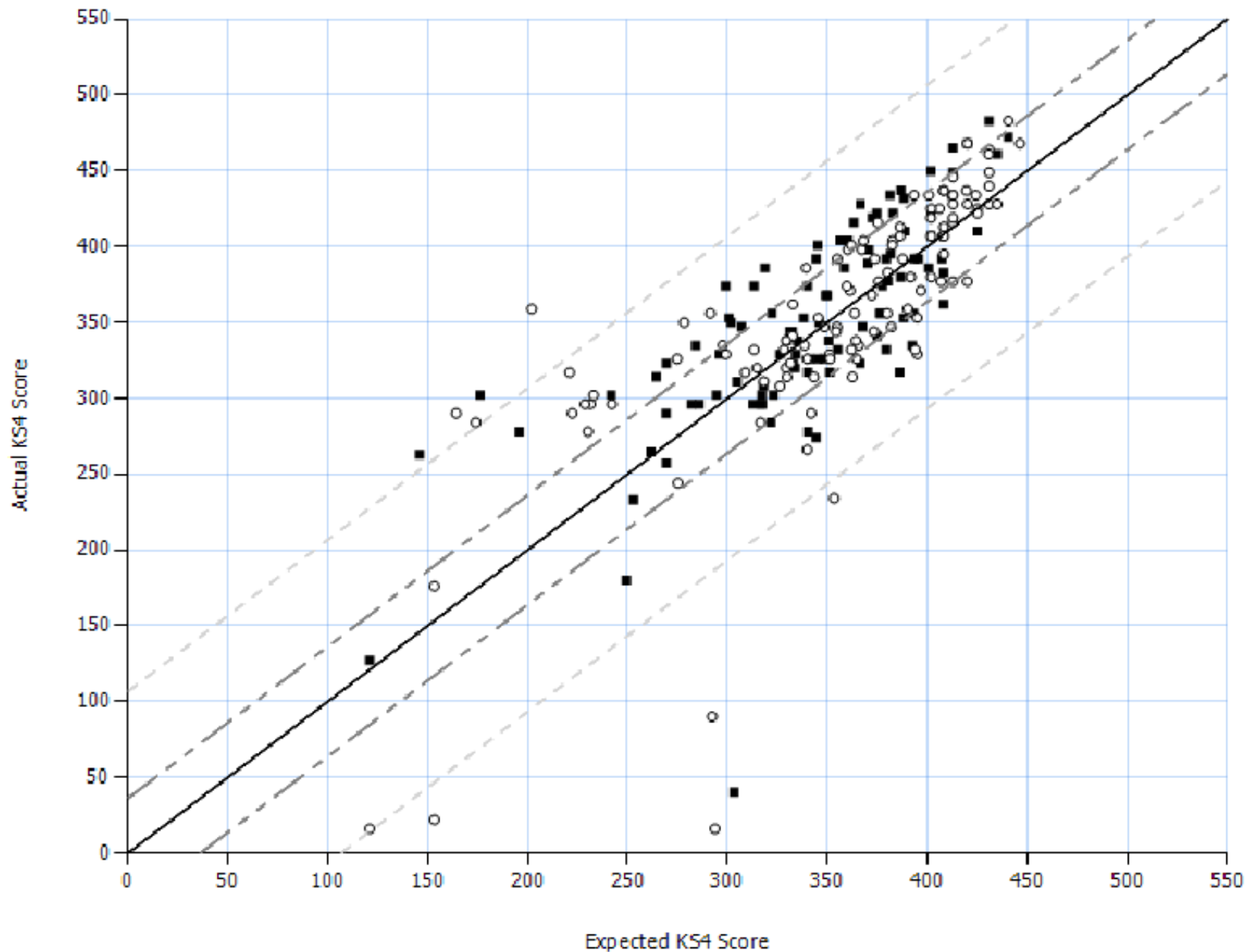


# RAISE shows a range of measures – by subject, year and pupil groupings

	Number of pupils in latest year	Contextual Value Added			CVA By Subject 2007		
		2005	2006	2007	English	Maths	Science
<b>All Pupils</b>	218	981.2	1009.2	↑ 1005.0	999.9	1000.9	-
<b>Gender</b>							
Girls	115	976.7	1007.5	↑ 1002.3	999.5	1000.3	↓ -
Boys	103	987.5	1009.7	↑ 1007.4	1000.4	1001.4	-
<b>Attainment at KS2</b>							
Below Level 4	21	965.2	1012.3	↑ 1029.8	1002.2	1003.4	-
At Level 4	91	983.0	1006.9	↑ 1000.9	999.5	1000.5	-
Above Level 4	106	990.2	1008.0	1000.4	999.5	1000.3	-
<b>Free School Meals</b>							
Non-FSM	214	980.9	1009.4	↑ 1003.7	999.9	1000.8	-
FSM	4	1001.4	998.7	1017.7	1000.8	1000.8	-



# And shows the distribution of pupils



# Conclusions for VA implementation

- Involve schools and local authorities in trialling
- Allow users to see how calculations are done
- Aim for the best model but....
- Recognise trade-off between model complexity and ease of explanation
- Think about presentation of results for different audiences



# Links to English CVA materials

Achievement and attainment tables home page

<http://www.dcsf.gov.uk/performance/tables/index.shtml>

**Guide to CVA**

[http://www.dcsf.gov.uk/performance/tables/schools\\_07/2007GuidetoCVA.pdf](http://www.dcsf.gov.uk/performance/tables/schools_07/2007GuidetoCVA.pdf)

**Example ready reckoner for KS2-4**

[http://www.dcsf.gov.uk/performance/tables/schools\\_07/KS24\\_2007\\_Mainstream.xls](http://www.dcsf.gov.uk/performance/tables/schools_07/KS24_2007_Mainstream.xls)

**RAISEonline home page**

<https://www.raiseonline.org/login.aspx>



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