CAMBRIDGE ASSESSMENT

Should we age-standardise GCSEs?

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Table of contents

Introduction

Successive research reports have identified a gap between the academic achievement of the oldest pupils in a year group, born in September, and the youngest, born in August (see Crawford et al 2007, 2013, and DfE 2010 for example[1]). A Cambridge Assessment report reviewing this literature was completed by Sykes et al (2009) and, as such, the main research findings will not be repeated here. Suffice to say that research has identified an achievement gap, and that, whilst this narrows as pupils get older, it remains persistent in secondary education.

Having said this, it is worth noting that there is little evidence of any such effects persisting into adulthood. For example Crawford et al (2013, page 2) found essentially no effects of month of birth on any of chances of employment, earnings, or subjective ratings of health and happiness. This, combined with the tendency for the age-gap to narrow over time, means that those born in August reach adulthood with very little disadvantage as regards to educational achievement, equal prospects in the job market, and (presumably) an additional 11 months (on average) to earn money before retirement (or death) compared to their peers born in September.

Crawford et al recommend that "National achievement test scores should be age-adjusted to account for the fact that children born at different times of the year have to sit the tests when they are different ages". This recommendation is extended all the way to the end of key stage 4; that is, GCSEs. The rationale for this change is that age adjusted scores give a better indicator of pupils' academic potential (as younger children are not disadvantaged by being young) and will thus provide a more suitable indicator on which to select pupils to continue into further and higher education. Similar suggestions are also made in Sharp (1995) and Sharp et al (2009).

This research in this report provides a counterpoint to the suggestion that GCSEs should be age-standardised. There are two elements to the argument: that by the time candidates take GCSEs age-effects are small in any case, and that on close inspection of individual assessments, we encounter practical issues in applying age-standardisation that would be difficult to address. These research findings will are expanded further below.

A summary of the size of the month of birth effect at GCSE

Results based upon GCSE grades (NPD data)

To begin with, we use data from the National Pupil Database (NPD) supplied by the Department for Education (DfE) to examine the size of the association between month of birth and the grades achieved in various GCES subjects[2]. Analysis was restricted to GCSEs taken in June 2013, by pupils in year 11, and with dates of birth between September 1996 and August 1997. Only GCSE subjects with at least 1000 entrants meeting these criteria were included in analysis. Achievement in each GCSE was quantified in terms of the grade achieved with grades converted in numeric scores in the usual way (A*=8, A=7, B=6,…,G=1, U=0).

To begin with, the strength of the association between pupils' ages (in months within the year) and achievement was quantified in terms of the Pearson correlations between age and grade. These correlations are shown in table 1. As can be seen, all of the correlations in table 1 range between -0.04 and 0.07 with the average correlation (across subjects) being just above 0.03. There are various rules of thumb for interpreting whether correlations should be considered as "large", "moderate", "weak" or "negligible"[3] , however, by any widely used categorisation, all of the correlations displayed in table 1 would be described as negligible. To see this further, note that by squaring the correlations in table 1 we can estimate the percentage of the variance in

[1] A longer reading list on this topic has been made available by the NFER and can be downloaded from http://www.nfer.ac.uk/research/Early-years/Season-of-birth.cfm.

[2] GCSEs were grouped into subjects using the field "KS4_Mapping" provided within the NPD.

[3] See for example http://www.strath.ac.uk/aer/materials/4dataanalysisineducationalresearch/unit4/correlationsdirectionandstrength/ (viewed 5th June 2014) or Cohen (1992).

GCSE grades that is “attributable” to differences in age. Even if we take the largest correlation (just below 0.07) this approach suggests that less than 0.5 per cent of the variance in GCSE grades is attributable to month of birth. To further illustrate the small size of the correlations in table 1, we have also calculated the percentage of schools (of those with at least 20 entrants to the subject) displaying a positive correlation (that is, greater than zero) between age in months and GCSE grade. As can be seen, for an average GCSE subject, for more than 40 per cent of schools there is no positive relationship between age within year and achievement. That is, the relationship between GCSE achievement and age is so small that for nearly half of all schools it does not appear at all – presumably as it is masked by the usual variation in achievement between pupils.

The largest correlations between age and achievement are found in Performing Arts and in PE. This is perhaps not a surprise as both subjects require direct physical performances and the oldest children in a school year may be at a noticeable advantage. However, even for these subjects the correlations remain small and within more than a third of schools there is no positive association between age and achievement at all.

Table 1: Correlations between age in months (within year group) and grade achieved for GCSEs completed in June 2013

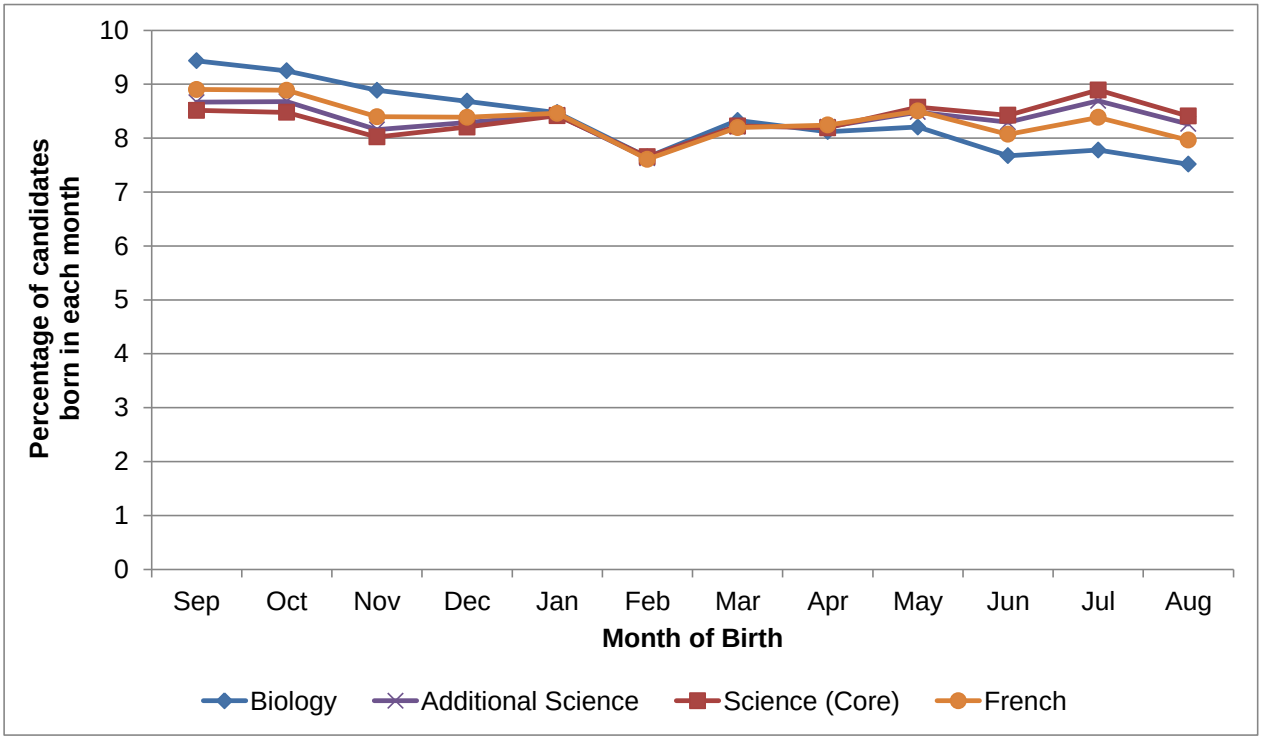
	Correlation between age and grade	**Number of entrants**	**% of centres displaying positive correlation**	**Number of centres with at least 20 entrants**
Summary statistics across 65 subjects				
Mean	0.034	60881	58.3	824
Median	0.036	11728	58.8	248
Minimum	-0.036	1077	44.4	6
Maximum	0.069	424300	74.0	3398
Individual subjects				
Performing Arts	0.069	2046	60.0	35
Physical Education/Sports Studies	0.064	87728	65.6	1891
Methods in Mathematics	0.062	9903	61.5	109
Urdu	0.062	3046	74.0	50
Classical Greek	0.060	1077	66.7	6
Health & Social Care	0.059	2654	68.4	57
Art & Design	0.056	77826	64.0	1599
Drama & Theatre Studies	0.056	66453	63.2	1471
English Language	0.054	388196	68.7	3025
Latin	0.052	8338	52.0	148
Film Studies	0.052	3879	62.7	75
Applications of Mathematics	0.052	11728	54.3	127
Art & Design (Fine Art)	0.050	47718	62.7	969
Office Technology	0.048	10355	57.4	183
D&T Product Design	0.047	30567	56.8	585
Social Science: Citizenship	0.046	9995	62.6	123
English Literature	0.044	410373	66.9	3142
Italian	0.043	3332	52.6	57
D&T Systems & Control	0.042	3286	55.7	70
History	0.042	224754	62.1	3136
Religious Studies	0.042	213963	65.3	2060
D&T Graphic Products	0.042	34001	58.9	704
Mathematics	0.040	424300	65.7	3398

	Correlation between age and grade	Number of entrants	% of centres displaying positive correlation	Number of centres with at least 20 entrants
D&T Textiles Technology	0.040	26145	58.3	480
Expressive Arts & Performance Studies	0.040	1998	62.2	37
D&T Food Technology	0.039	40522	60.0	859
Music	0.039	38938	59.3	585
Business Studies & Economics	0.039	4080	57.3	89
Information & Communications Technology	0.038	49659	59.4	769
Geography	0.038	191881	60.6	2994
D&T Resistant Materials	0.037	48992	58.8	1047
D&T Electronic Products	0.036	7989	59.6	151
Media/Film/TV Studies	0.036	40740	59.7	837
Dance	0.035	10521	59.9	147
Computer Studies/Computing	0.035	3864	56.5	85
Astronomy	0.034	1331	53.3	15
Arabic	0.034	1502	63.6	11
Humanities: Single	0.034	6947	60.0	65
Law	0.032	2099	59.2	49
English Language & Literature	0.032	149264	58.5	1810
Art & Design (Photography)	0.032	12966	59.7	278
Business Studies: Single	0.031	57720	58.1	1145
Statistics	0.030	26716	52.2	450
Sociology	0.030	17920	58.8	388
Home Economics: Food	0.029	9025	57.4	169
French	0.028	147604	57.6	2505
Art & Design (Textiles)	0.028	7251	53.7	134
Applied Engineering	0.027	1954	60.9	46
Home Economics: Child Development	0.026	15288	58.0	376
Art & Design (Graphics)	0.023	6273	59.3	135
Classical Civilisation	0.022	3590	47.9	71
General Studies	0.021	4300	48.9	47
Biology	0.019	146301	53.8	2442
Spanish	0.018	76731	54.8	1491
Economics	0.018	4162	59.6	89
Psychology	0.017	11371	54.4	248
Science (Core)	0.017	113089	52.8	1592
German	0.017	56194	55.2	1048
Physics	0.015	144500	53.2	2439
Chemistry	0.012	145659	52.6	2447
Additional Science	0.012	239722	51.7	2879
Environmental Science	0.005	2120	57.6	33
Russian	-0.001	1282	44.4	17
Art & Design (3d Studies)	-0.007	1931	48.3	29
Chinese	-0.036	1619	46.7	15

The smallest correlations tend to occur within modern languages and science subjects. A particularly striking example, due to the large number of candidates involved, is Additional Science GCSE, taken by more than 200,000 pupils. This subject displays a correlation between age in months and grade achieved of only just above 0.01. Furthermore, for this subject, within any individual school we are nearly as likely to see younger children outperform older ones in

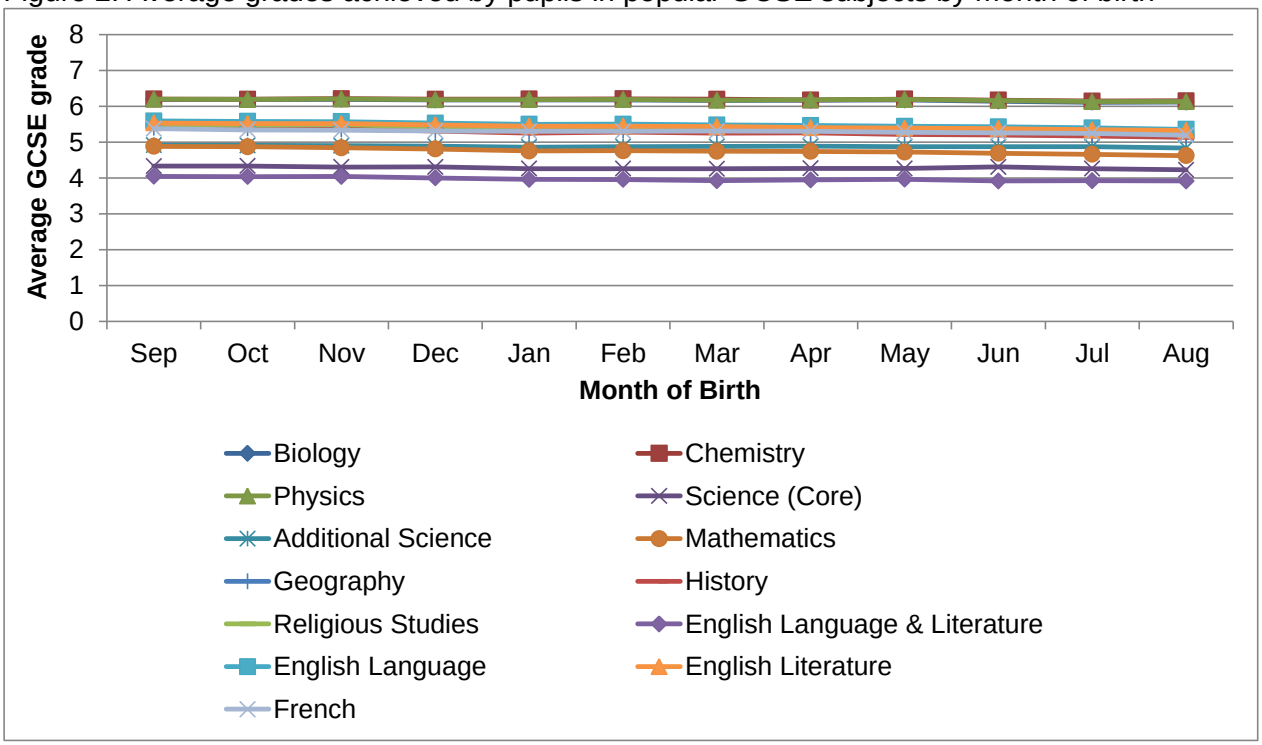
this subject as the reverse. A possible explanation for these findings may be that these are subjects where entry is strongly determined by prior ability which is itself associated with relative age. For example, those with the strongest ability in science tend to take separate sciences, rather than combined science, at GCSE. Similarly, modern languages tend to attract higher ability pupils than some other subjects. Thus, the effect of age is already partially at work in determining pupils' subject choices and the remaining effect of age *within* particular subjects is somewhat smaller. This possibility is further illustrated for a small number of subjects in figure 1. This shows that Biology and, to a lesser extent, French tend to attract greater numbers of pupils born in the autumn. In contrast Core Science and Additional Science attract a larger number of pupils from the summer months with both subjects having the highest percentage of their entrants born in July.

Figure 1: Percentage of candidates born in each month for Biology, French, Science (Core) and Additional Science



To further illustrate the size of the differences between pupils with different months of birth, figure 2 shows the average grade achieved in each of the 13 most popular GCSE subjects (all of those with more than 100,000 entrants) within each month of birth. When viewed within the full range of possible grades, the trend is barely visible. Indeed differences between subjects (partially due to differences in the prior attainment of candidates) are seen to be far larger than differences between candidates born in different months. Overall, for a typical subject, the average difference between autumn-born pupils and summer-born pupils[4] is one seventh of a grade.

Figure 2: Average grades achieved by pupils in popular GCSE subjects by month of birth



Slightly (but only slightly) more obvious trends are visible in figures 3 and 4. These display the percentage of candidates achieving A or above and C or above in each of the same 13 subjects. As can be seen younger pupils have a very slightly reduced chance of achieving higher grades with the largest (displayed) differences occurring in History. In this subject, 32 per cent of pupils born in September achieved a grade A or above compared to 26 per cent of those born in August. Furthermore, 72 per cent of those born in September achieved grade C or above compared to 67 per cent of those born in August. In contrast, Chemistry GCSE displays much smaller differences with the equivalent percentages being 44 and 42 at grade A. Furthermore, in Chemistry, pupils born in August were just as likely as those born in September to achieve grade C or above (91 per cent for both months).

[4] In order to divide the year into three equal parts for analysis, autumn is defined as the months September to December and summer is defined as May to August.

Figure 3: Percentage of pupils achieving A or above in popular GCSE subjects by month of birth

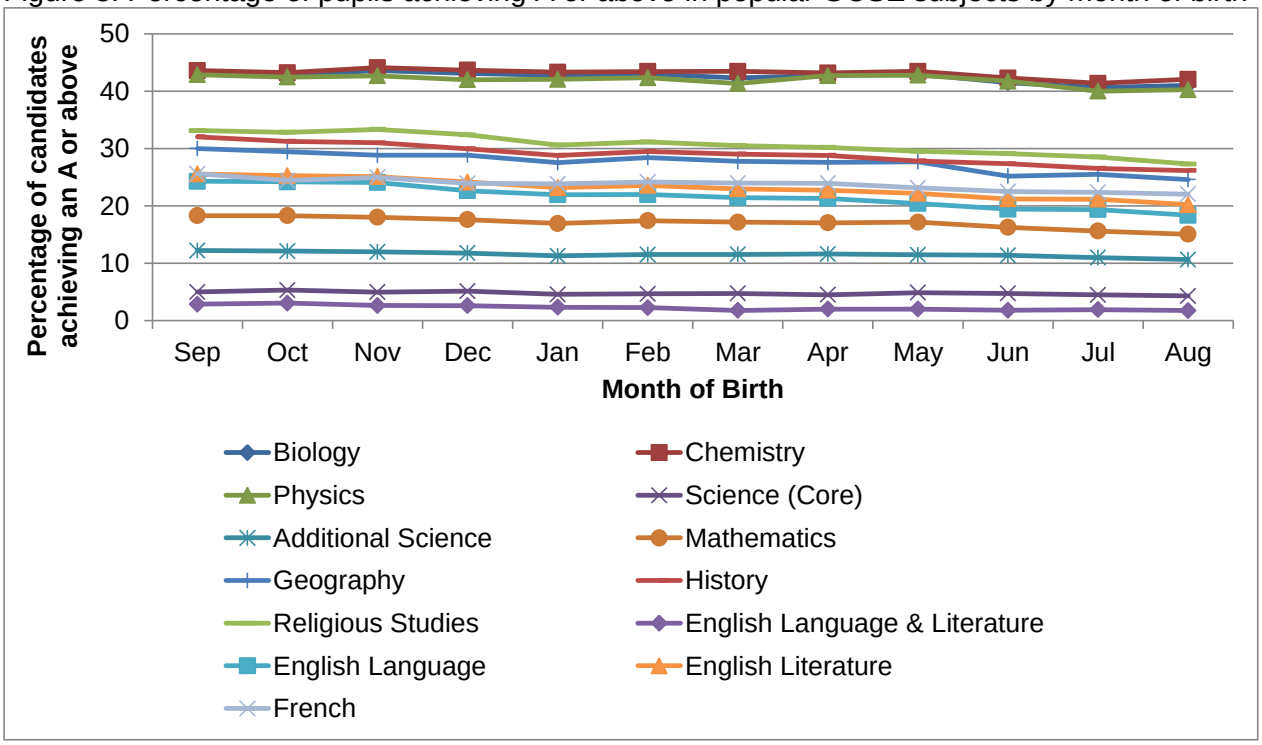
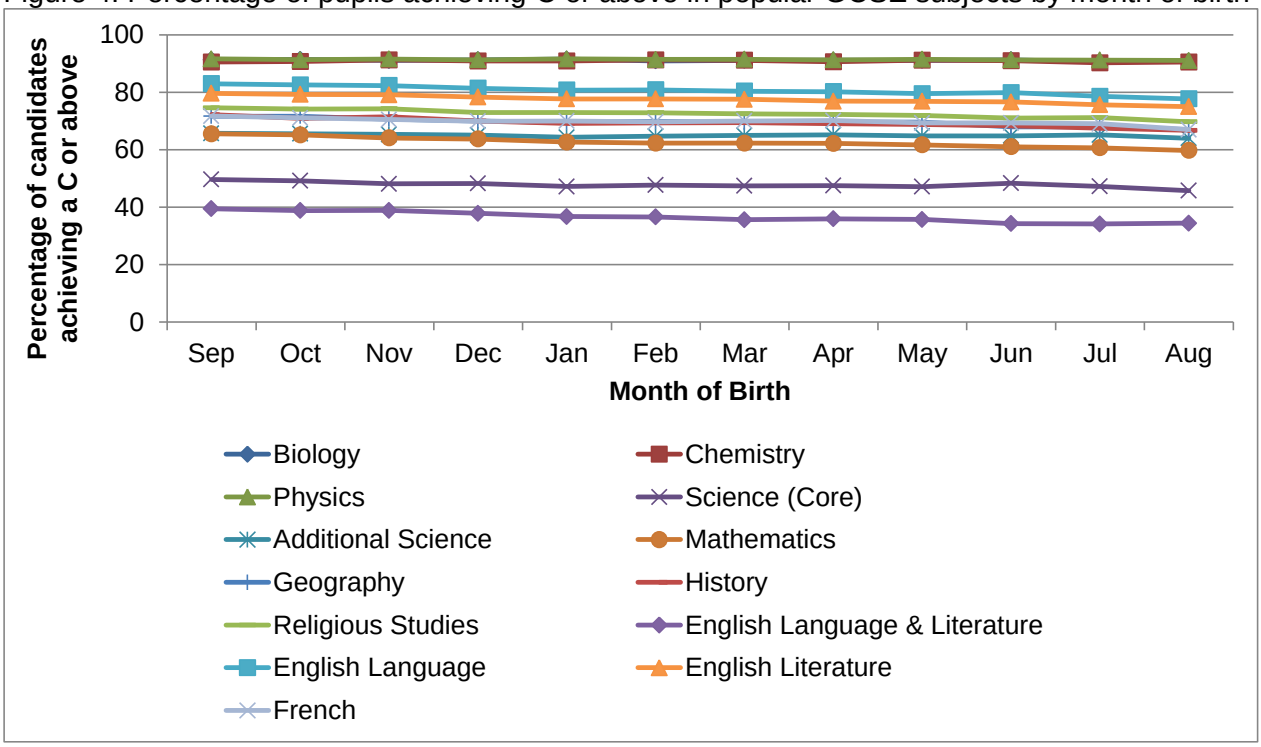


Figure 4: Percentage of pupils achieving C or above in popular GCSE subjects by month of birth



All of the above analysis depends upon treating GCSE grades either as if they are a continuous scale (so that figures such as the "average grade" are meaningful) or upon focussing upon a particular grade threshold rather than examining differences across the full range of abilities. To avoid these necessities, we can instead quantify the differences between months using the metric of *Probability of Superiority* (Ruscio and Gera, 2013). This metric is intended to provide a meaningful, scale-free way of comparing the scores of different groups on ordinal scale. In our case, the probability of superiority calculates the probability that a randomly chosen pupil born in

one month outperforms a randomly chosen pupil chosen from those born in all other months[5]. This gives an overall, instantly understandable calculation of the proportion of instances where pupils born in one month underperform relative to those born in other months. These figures are recorded in table 2. Comparing those born in each month (particular August) to those born in all other months contrasts with the standard approach of simply comparing everyone to pupils who are born in September. Comparing to other pupils more generally rather than to the oldest within the year group is sensible as the latter effectively assumes that almost all pupils are disadvantaged by not being the oldest in their year group; a somewhat strange definition of disadvantage. Indeed the more common approach which (often) involves comparing everyone to the month with the maximum level of achievement leads to greatly inflated estimates of the effect of age when compared to the more reasonable approach to quantifying advantage/disadvantage by comparing each month to the average of all other months.

Of particular interest in table 2 are the probabilities of superiority for August-born pupils and the subjects in the table are sorted in order of these probabilities. As can be seen, for all subjects, the probability of superiority for August-born pupils is close to 50 per cent. For example, even in PE, a randomly chosen pupil born in August will outperform a randomly chosen pupil born in another month 46 per cent of the time. For an average subject this probability is even closer to evens at 48 per cent and for a small number of subjects this probability is at or above 50 per cent. This implies that children born in August (or indeed in other summer months) have an almost even chance or outperforming their peers from other months.

Table 2: Probability of superiority effect sizes for each month of birth compared to all other months of birth

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	N
Summary statistics across 65 subjects													
Mean	0.52	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.48	60881
Median	0.52	0.52	0.51	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.48	11728
Min	0.48	0.47	0.44	0.47	0.47	0.46	0.46	0.42	0.46	0.44	0.45	0.45	1077
Max	0.55	0.56	0.54	0.55	0.54	0.55	0.53	0.55	0.53	0.53	0.54	0.56	424300
Number of subjects where Probability>0.50	58	60	62	47	37	41	25	24	14	10	2	5	
Individual subjects													
Performing Arts	0.55	0.53	0.53	0.48	0.50	0.50	0.50	0.50	0.51	0.49	0.47	0.45	2046
Film Studies	0.53	0.51	0.52	0.50	0.54	0.49	0.50	0.50	0.47	0.48	0.50	0.46	3879
Physical Education/Sports Studies	0.53	0.52	0.52	0.51	0.50	0.50	0.50	0.49	0.49	0.48	0.47	0.46	87728
Art & Design	0.53	0.52	0.52	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.48	0.47	77826
Russian	0.49	0.55	0.44	0.48	0.51	0.52	0.46	0.51	0.53	0.52	0.54	0.47	1282
Home Economics: Food	0.52	0.50	0.51	0.51	0.53	0.49	0.50	0.50	0.50	0.50	0.49	0.47	9025
Music	0.51	0.51	0.52	0.50	0.51	0.50	0.50	0.50	0.49	0.49	0.48	0.47	38938
D&T Product Design	0.52	0.52	0.52	0.50	0.51	0.50	0.50	0.50	0.50	0.49	0.48	0.47	30567
English Language	0.53	0.52	0.52	0.51	0.50	0.50	0.50	0.49	0.49	0.48	0.48	0.47	388196
Astronomy	0.49	0.52	0.52	0.47	0.54	0.52	0.47	0.53	0.50	0.49	0.48	0.47	1331
Art & Design (Fine Art)	0.53	0.52	0.51	0.50	0.51	0.50	0.50	0.49	0.50	0.49	0.47	0.47	47718
Drama & Theatre Studies	0.53	0.52	0.52	0.51	0.51	0.50	0.50	0.50	0.49	0.48	0.48	0.47	66453
Art & Design (Graphics)	0.52	0.52	0.52	0.48	0.49	0.51	0.49	0.50	0.52	0.50	0.50	0.47	6273
Art & Design (Photography)	0.51	0.52	0.53	0.49	0.50	0.50	0.52	0.49	0.48	0.49	0.49	0.47	12966
Social Science: Citizenship	0.53	0.51	0.52	0.51	0.51	0.51	0.50	0.48	0.48	0.49	0.48	0.47	9995
Art & Design (Textiles)	0.53	0.51	0.50	0.50	0.49	0.50	0.52	0.50	0.48	0.49	0.50	0.47	7251
Business Studies: Single	0.52	0.51	0.50	0.51	0.50	0.51	0.51	0.50	0.50	0.49	0.48	0.47	57720
Methods in Mathematics	0.53	0.52	0.50	0.53	0.51	0.51	0.50	0.49	0.49	0.49	0.45	0.47	9903
Religious Studies	0.52	0.52	0.52	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.47	213963
Applied Engineering	0.53	0.51	0.50	0.50	0.50	0.51	0.48	0.49	0.53	0.50	0.49	0.47	1954
D&T Textiles Technology	0.51	0.53	0.51	0.51	0.49	0.51	0.50	0.51	0.49	0.48	0.49	0.47	26145
English Literature	0.52	0.52	0.52	0.51	0.50	0.50	0.50	0.49	0.49	0.49	0.48	0.47	410373
Environmental Science	0.52	0.47	0.51	0.49	0.51	0.51	0.53	0.52	0.46	0.51	0.51	0.48	2120
Office Technology	0.52	0.53	0.52	0.52	0.49	0.49	0.49	0.50	0.49	0.48	0.49	0.48	10355

[5] With instances where their grade is tied treated as a 50 per cent chance of superiority either way.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	N
History	0.52	0.52	0.52	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.48	224754
Geography	0.52	0.52	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.48	0.48	0.48	191881
Applications of Mathematics	0.52	0.51	0.51	0.52	0.51	0.52	0.52	0.49	0.50	0.48	0.45	0.48	11728
D&T Resistant Materials	0.51	0.52	0.51	0.52	0.50	0.50	0.50	0.49	0.50	0.48	0.48	0.48	48992
Mathematics	0.52	0.52	0.51	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.48	0.48	424300
Urdu	0.55	0.50	0.52	0.52	0.53	0.52	0.48	0.45	0.50	0.49	0.47	0.48	3046
French	0.52	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.48	147604
Media/Film/TV Studies	0.52	0.51	0.52	0.51	0.51	0.50	0.50	0.49	0.49	0.49	0.48	0.48	40740
Information & Communications Technology	0.52	0.51	0.52	0.52	0.50	0.50	0.49	0.51	0.50	0.48	0.48	0.48	49659
Classical Civilisation	0.50	0.48	0.51	0.55	0.50	0.46	0.52	0.54	0.49	0.49	0.48	0.48	3590
D&T Food Technology	0.52	0.52	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.49	0.48	0.48	40522
Business Studies & Economics	0.52	0.49	0.52	0.51	0.53	0.52	0.48	0.50	0.47	0.50	0.49	0.48	4080
D&T Electronic Products	0.52	0.54	0.50	0.49	0.50	0.51	0.49	0.48	0.48	0.51	0.50	0.48	7989
D&T Graphic Products	0.52	0.51	0.53	0.51	0.50	0.50	0.50	0.50	0.49	0.49	0.47	0.48	34001
Health & Social Care	0.54	0.55	0.50	0.48	0.53	0.50	0.51	0.50	0.46	0.50	0.45	0.48	2654
Italian	0.49	0.53	0.53	0.49	0.54	0.52	0.49	0.47	0.49	0.47	0.50	0.48	3332
Statistics	0.52	0.51	0.52	0.50	0.50	0.48	0.50	0.50	0.51	0.48	0.49	0.49	26716
Sociology	0.52	0.52	0.52	0.50	0.49	0.50	0.50	0.49	0.49	0.50	0.49	0.49	17920
Economics	0.51	0.52	0.51	0.51	0.49	0.47	0.48	0.55	0.49	0.50	0.49	0.49	4162
Spanish	0.50	0.51	0.51	0.51	0.49	0.50	0.50	0.50	0.50	0.49	0.50	0.49	76731
Science (Core)	0.51	0.51	0.50	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	113089
Humanities: Single	0.52	0.50	0.53	0.49	0.50	0.49	0.49	0.51	0.50	0.50	0.47	0.49	6947
Biology	0.51	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.49	0.49	146301
D&T Systems & Control	0.48	0.53	0.54	0.50	0.49	0.55	0.52	0.50	0.49	0.46	0.45	0.49	3286
English Language & Literature	0.52	0.52	0.52	0.51	0.50	0.50	0.49	0.49	0.50	0.49	0.49	0.49	149264
Physics	0.51	0.50	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.49	144500
Law	0.50	0.52	0.54	0.48	0.49	0.51	0.49	0.51	0.49	0.51	0.46	0.49	2099
German	0.51	0.50	0.51	0.50	0.50	0.50	0.51	0.50	0.50	0.49	0.49	0.49	56194
Additional Science	0.51	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	239722
Classical Greek	0.52	0.50	0.50	0.54	0.54	0.47	0.46	0.53	0.47	0.49	0.48	0.49	1077
Chemistry	0.50	0.50	0.51	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.49	0.49	145659
Home Economics: Child Development	0.51	0.51	0.52	0.51	0.51	0.50	0.51	0.49	0.48	0.48	0.49	0.49	15288
Latin	0.50	0.53	0.51	0.52	0.51	0.48	0.51	0.49	0.48	0.48	0.48	0.49	8338
Psychology	0.51	0.51	0.52	0.49	0.49	0.50	0.50	0.51	0.49	0.49	0.49	0.49	11371
Dance	0.51	0.54	0.51	0.52	0.49	0.51	0.50	0.50	0.49	0.49	0.47	0.50	10521
General Studies	0.53	0.52	0.49	0.52	0.49	0.50	0.47	0.49	0.49	0.50	0.49	0.50	4300
Computer Studies/Computing	0.50	0.50	0.52	0.53	0.51	0.50	0.48	0.49	0.50	0.48	0.47	0.50	3864
Art & Design (3d Studies)	0.49	0.48	0.51	0.51	0.52	0.51	0.52	0.48	0.48	0.51	0.47	0.51	1931
Expressive Arts & Performance Studies	0.55	0.51	0.50	0.52	0.48	0.50	0.51	0.47	0.47	0.49	0.48	0.51	1998
Arabic	0.50	0.56	0.54	0.52	0.52	0.47	0.49	0.42	0.51	0.44	0.47	0.54	1502
Chinese	0.51	0.49	0.50	0.49	0.47	0.49	0.49	0.50	0.49	0.53	0.50	0.56	1619

Results based upon GCSE marks (OCR data)

The previous section has shown the small size of the relationship between age and achievement across different GCSE subjects. The analysis in this section takes this further and explores the relationship for individual GCSE assessments. Note that, if age-standardisation is to be applied, it needs to be applied at the level of individual assessments as this is the level where grade boundaries are determined. Thus, whilst it may be of interest to examine the relationship between age and various aggregated measures of performance (such as was examined by Crawford et al, 2013), if we wish to directly apply age-adjustments to scores then it is at the level of individual assessments that we must consider this relationship.

The correlation between age in months and the number of marks achieved was calculated for 235 OCR GCSE components taken in June 2013 – that is, all components taken by more than 1000 year 11 candidates born between September 1996 and August 1997. For the OCR components with the largest entries, these correlations are displayed and summarised in table 3. An extended table with results for all components is provided in Appendix 1. When viewed at the level of individual components, the correlations in table 3 (and appendix 1) are, on average,

even lower than those displayed earlier in table 1, with the average correlation now just above 0.02 rather than 0.03. As with the earlier analysis, none of the correlations exceed 0.1, with only a small minority (28 assessments) exceeding 0.05. In contrast more than a quarter of assessment (65) display correlation below 0.01 and exactly a fifth (47) display correlations below zero showing that within these assessments there is no evidence of summer-born children being disadvantaged at all.

The final column of table 3 converts these correlations to effects in terms of regression coefficients. These show the expected increase in the percentage of marks a student will achieve for every additional month in age. In the worst case (A971_17 – a History GCSE paper – see Appendix 1) each additional month in age in associated with pupils achieving just over an additional 0.4 per cent of marks. This would imply a pupil born in August would achieve on average 5 per cent fewer marks than one born in September. However a more typical case (averaging across components) is that pupils will only achieve an additional 0.1 per cent of the marks for each additional month of age. This implies that for the majority of assessments there is a tiny difference amounting to little more than 1 per cent of marks (if that) between those born in August and those born in September.

Table 3: Correlations between marks and age in months for individual components

		Correlation between age and mark	**N**	**Regression coefficient (% marks per month)**
	Summary across (all) 235 components			
	Mean	0.022	8072	0.104
	Median	0.022	4249	0.106
	Minimum	-0.054	1000	-0.201
	Maximum	0.095	49342	0.423
Individual components (with at least 12,000 entrants. Full results in Appendix 1).	**Component Name**			
A651_02	Extended Literary Text And Imaginative Writing (Controlled Assessment - Postal Moderation)	0.071	25878	0.275
A661_02	Literary Heritage Linked Texts (Controlled Assessment - Postal Moderation)	0.066	28108	0.291
A652_04	Speaking, Listening And Spoken Language (Speaking and Listening - Postal Moderation)	0.056	27696	0.197
A953_02	History Around Us Or Modern World Study Controlled Assessment (Postal Moderation)	0.054	27728	0.279
A652_02	Speaking, Listening And Spoken Language (Spoken Language - Postal Moderation)	0.051	27657	0.241
B604_01	Ethics 2 (Peace And Justice, Equality, Media) (Written Paper)	0.046	43757	0.252
A952_21	Historical Source Investigation (Historical Source Investigation with Developments in British Medicine, 1200-1945)	0.045	23106	0.226
B603_01	Ethics (Relationships, Medical Ethics, Poverty And Wealth) (Written Paper)	0.044	47509	0.214
B562_02	Geographical Enquiry (Controlled Assessment - Postal Moderation)	0.044	21644	0.227
B602_01	Philosophy 2 (Good And Evil, Revelation, Science) (Written Paper)	0.041	44146	0.229
A973_02	Historical Enquiry (Postal Moderation)	0.041	49342	0.192
A951_14	Study In Development And Study In Depth (Study in Development with Germany, c.1919-1945)	0.039	14861	0.222

		Correlation between age and mark	N	Regression coefficient (% marks per month)
B743_02	Chemistry Controlled Assessment (Controlled Assessment - Postal Moderation)	0.037	21792	0.135
A951_13	Study In Development And Study In Depth (Study in Development with The American West, 1840-1895)	0.036	15045	0.204
A184_02	Physics A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.036	23981	0.142
A680_02	Information And Ideas (Written Paper (Higher))	0.035	24924	0.144
A174_02	Chemistry A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.034	24312	0.136
A164_02	Biology A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.034	24054	0.136
B601_01	Philosophy 1 (Deity, Religious And Spiritual Experience, End Of Life) (Written Paper)	0.034	37985	0.192
A971_11	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with Germany, 1918-1945)	0.031	27139	0.155
A663_02	Prose From Different Cultures (Written Paper (Higher))	0.030	17027	0.125
A664_02	Literary Heritage Prose And Contemporary Poetry (Written Paper (Higher))	0.030	26368	0.152
B753_02	Physics Controlled Assessment (Controlled Assessment - Postal Moderation)	0.029	21910	0.103
B723_02	Additional Science Controlled Assessment (Controlled Assessment - Postal Moderation)	0.024	36035	0.106
B733_02	Biology Controlled Assessment (Controlled Assessment - Postal Moderation)	0.024	21902	0.088
A972_21	British Depth Study (British Depth Study with How was British society changed, 1890-1918?)	0.021	39036	0.092
J567_01	Mathematics B (Paper 1 (Foundation))	0.021	14444	0.101
A971_13	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with The USA, 1919-1941)	0.020	14845	0.111
A662_02	Modern Drama (Written Paper (Higher))	0.019	18216	0.070
J567_03	Mathematics B (Paper 3 (Higher))	0.019	14606	0.105
A154_02	Additional Science A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.019	36010	0.092
J567_04	Mathematics B (Paper 4 (Higher))	0.017	14568	0.103
A163_02	Biology A Module B7 (Written Paper - Higher)	0.017	23806	0.070
J567_02	Mathematics B (Paper 2 (Foundation))	0.015	14392	0.072
A144_02	Science A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.014	25714	0.074
A183_02	Physics A Module P7 (Written Paper - Higher)	0.012	23946	0.068
A173_02	Chemistry A Module C7 (Written Paper - Higher)	0.010	24124	0.056
B732_02	Biology Modules B4, B5, B6 (Written Paper - Higher)	0.010	20902	0.042
B563_02	Key Geographical Themes (Written Paper (Higher))	0.008	22499	0.036
B713_02	Science Controlled Assessment (Controlled Assessment - Postal Moderation)	0.007	13378	0.034
B752_02	Physics Modules P4, P5, P6 (Written Paper - Higher)	0.002	21018	0.008
B742_02	Chemistry Modules C4, C5, C6 (Written Paper - Higher)	-0.004	20851	-0.018
B722_02	Additional Science Modules B4, C4, P4 (Written Paper - Higher)	-0.005	23958	-0.020
A153_02	Additional Science A Modules B6, C6, P6 (Written Paper - Higher)	-0.015	18297	-0.061
B722_01	Additional Science Modules B4, C4, P4 (Written Paper - Foundation)	-0.020	12445	-0.078

As noted earlier, across the whole of the table in Appendix 1, forty-seven components display a negative correlation between age and achievement. Further inspection reveals that the majority of such correlations (43) occur for tiered assessments. Indeed, across a total of 93 tiered assessments only just over half (50) display a positive correlation between age and achievement. Furthermore, the mean correlation across tiered assessments is only 0.003 compared to 0.034 for those that are untiered.

The lack of any relationship between age and achievement within tiered assessments has been noted in previous research (see Massey et al, 1996). The explanation for this would be that any difference in the abilities of pupils of different ages is already captured within the way in which they are assigned to tiers[6]. Thus, within tiers, there is no remaining relationship between age and achievement.

At first glance this might suggest a chronic tendency for schools to incorrectly assign summer born children to the foundation tier – ignoring their tendency to develop more quickly than older peers[7]. However, some perspective is required. Table 4 shows the numbers of pupils assigned to each tier by month of birth for the largest tiered GCSE component considered: Additional Science component B722. As can be seen from table 4, there is a slight tendency for older pupils to be entered via the higher, rather than the foundation, tier. For example, 68 per cent of candidates born in October were entered for the higher tier compared to 63 per cent of those born in August. However, it can also be seen that only a tiny minority of pupils are likely to be affected by this trend. For example, even if we were to assume that the assignment of pupils to tiers should be independent of age (a "worst-case scenario" which itself would assume that there is *zero* association between ability and age) then only just over 3 per cent of August-born pupils (that is, less than 100 of these pupils) would need to be reassigned to the higher tier. Indeed, overall, less than 300 pupils out of more than 36,000 (0.7 per cent) would need to be reassigned from the foundation to the higher tier. This indicates that relative age makes no difference to tier assignment for the vast majority of pupils.

Table 4: Estimated numbers of pupils where age affects decisions about tiers for Additional Science component B722 (modules B4, C4 and P4).

	Sep	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Foundation	1006	1002	995	992	1122	984	1028	983	1082	1032	1113	1106
Higher	2101	2139	2017	2109	2064	1793	2007	1958	1982	1973	1963	1852
Total	3107	3141	3012	3101	3186	2777	3035	2941	3064	3005	3076	2958
% to higher within month												
Actual	67.6%	68.1%	67.0%	68.0%	64.8%	64.6%	66.1%	66.6%	64.7%	65.7%	63.8%	62.6%
If equal across months	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%	65.8%
N difference	56	72	35	68	-33	-35	10	22	-35	-5	-61	-95

It is striking to note that despite the tiny association between relative age and tiers, this is sufficient to completely remove any association between age and achievement *within* tiers. This once again serves to illustrate just how small the association between age and achievement is if it can be effectively masked by a minor difference in the way in which pupils are assigned to tiers.

The fact that, for many GCSEs, the effect of age is contained within the way in which pupils are assigned to tiers rather than in the relationship between age and test scores, would create some difficulties for any application of age-standardisation. Usually, age-standardisation is applied directly to test scores, however, this approach will not work for these assessments as no

[6] Note that, although similar, this is not quite the same as the "restriction of range" effect where a reduction in the range of abilities of pupils being assessed can lead to a reduction in the observed correlation with other measurements. Although such an effect can reduce the size of a correlation it cannot remove it completely and, other than in very extreme circumstances, cannot lead to the levels of reduction observed within our data.

[7] As evidenced by the tendency for the gap between pupils born in different months to narrow as they get older (Sykes et al 2009).

relationship between test scores and age is evident. For this reason, any attempt to age-standardise would require (at least) a two-stage process:

1. Firstly, scores across the two tiers would need to be placed on a single continuous scale. This is by no means a straightforward process. At present, in unitised assessments, this is partially achieved by the application of UMS scores. However, these scores have some unusual features (such as caps – leading to strange score distributions) which would make them unsuitable for age-standardisation.
2. Now we could apply age-standardisation to scores on the newly revised scale. Note that, since we know there is no relationship between age and achievement *within* tiers and, furthermore, because tiers (typically) only overlap between grades C and E, the age-adjustments developed at this stage are likely to have a rather unusual shape and only affect a proportion of pupils.

Even if the above problems were overcome they would still leave other difficulties. For example, at present, tiers dictate the grades that are available to pupils. Specifically, no pupils on the foundation tier can achieve above grade C. Thus, regardless of any age-adjustments, any August-born pupils in the foundation tier who achieved a C (often the modal grade) could not have their grade adjusted upwards. This would mean that age-standardisation would be pointless for a large proportion of pupils. The only way to avoid this would be to change the rules so that grade B *was* available in the Foundation tier but only for those pupils born in summer – a highly controversial (and probably unjustifiable) move.

Similar issues apply to the age-standardisation of particular subjects noted earlier (such as single sciences or modern languages) where the effect of age is already largely spent through its effect on subject choice. For example, if the effect of age on achievement in Chemistry GCSE is largely through its effect on choosing the subject in the first place rather than on achievement *within* the subject (remaining correlation equal to only 0.01 – see table 1), how can we possibly identify appropriate age-related adjustments to make to test scores. This situation is even worse than for tiered assessments as whilst it is vaguely plausible that a single board may put scores achieved on different tiers onto a single scale (such as UMS), there is no mechanism for scores in different subjects (probably across multiple exam boards) to be placed onto a single scale. Thus it would not be possible for the effect of age upon subject choice to be factored into any process of age standardisation.

The reliability of age standardisation

Notwithstanding the difficult issues noted above, we now move on to examine the reliability of age-standardisation itself; assuming that this can be meaningfully applied. The aim of this analysis is to evaluate the stability with which scores from each month can be equated to the distribution as a whole. That is, to what extent are the adjustments based upon age-standardisation independent of the particular sample of students who have chosen to enter the given examination.

As noted elsewhere, any adjustments to scores based upon age-standardisation are based on *estimates* of the relationship between age and scores and may differ depending upon the sample of pupils used to undertake age standardisation. Indeed, Tymms (1998) suggested that in some circumstances the uncertainty around adjustments, amongst other reasons, may make the entire process of age-standardisation inadvisable[8]. By evaluating the size of any such uncertainty we can assess the extent to which any gains in equity through the application of age-standardisation may be eroded by decreases in reliability.

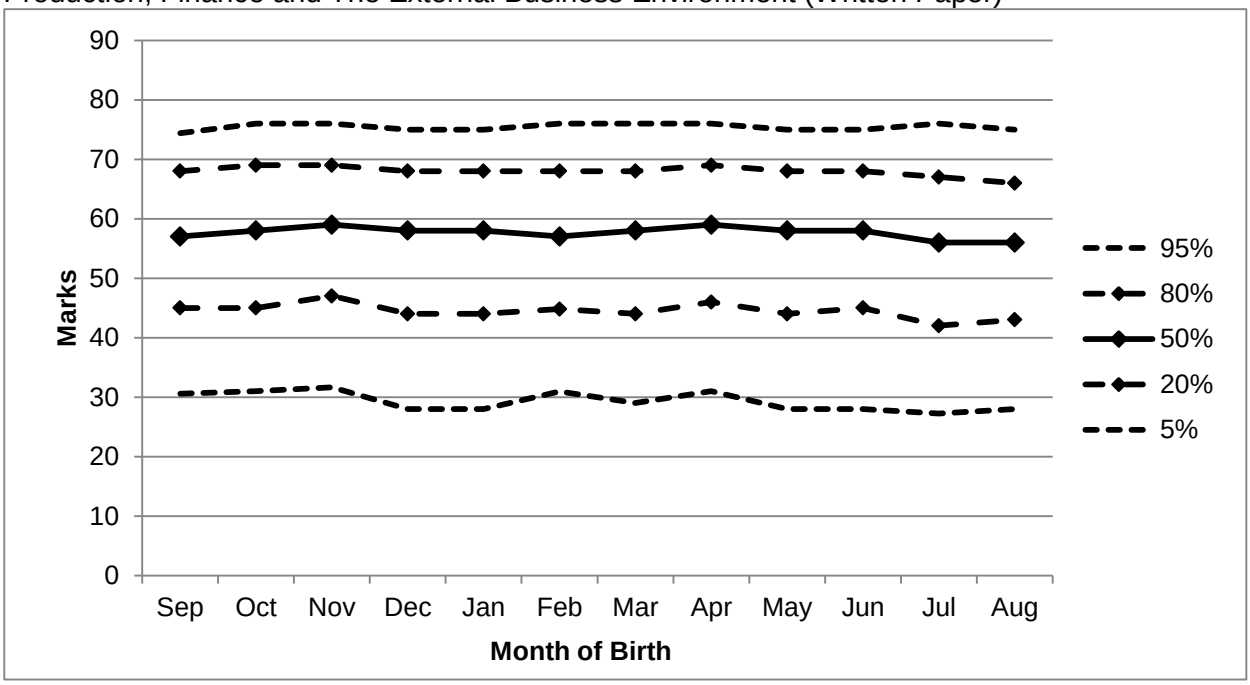
Analysis in this section focusses upon a typical, untiered GCSE unit. The unit chosen is component A293_01: Production, Finance and the External Business Environment. This GCSE

[8] This article prompted a fierce debate between the author and Schagen (1999) regarding when and if age-standardisation should be applied (also see Tymms, 1999).

Business studies unit is typical in that the relationship between age and achievement is just above average for an untiered unit (correlation=0.038). The number of candidates is also comfortably above the median level (10,855) which may reflect an expected number of candidates to enter a GCSE unit now that, since 2014, all GCSEs are "linear" so that there are fewer options for the time when candidates will take the required units for their GCSEs. This component consists of 90 marks.

The relationship between age and marks is shown in figure 5. This relationship is barely visible overall. Nonetheless, close inspection reveals that the 5th percentile of achievement for pupils born in the summer is roughly 3 marks below the 5th percentile for those born in the autumn, there is a difference of roughly 2 marks at the 20th percentile, of just over 1 mark at the 50th percentile (the median) and the 80th percentile, and essentially no difference between different months of birth at the 95th percentile.

Figure 5: Relationship between month of birth and quantiles of achieved scores for A293_01 - Production, Finance and The External Business Environment (Written Paper)



In order to age-standardise this test it is necessary to estimate a smooth relationship between age and changes in the shape of the distribution. This was done using a generalised additive model for location scale and shape (GAMLSS, see Stasinopoulos and Rigby, 2007). The score distribution (in terms of the proportion of possible marks that were achieved by each pupil) was modelled as an inflated beta distribution[9]. The model estimated simple trends for the way in which both the mean score and the standard deviation of scores changed with age[10]. The estimated score distribution for each age group could then be equated to the estimated overall score distribution[11]. The estimated adjustments to make to each raw score dependent upon the month of birth of each candidate are shown in figure 6. Figure 6 shows that pupils born between March and August should have their scores adjusted upwards whilst those born between September and February should have their scores adjusted downwards. The largest positive

[9] This is an appropriate distribution to model (essentially) continuous scores within the interval [0,1]. The inflated beta distribution differs from the standard beta distribution in that it allows a positive probability for proportions of exactly 0 or exactly 1 (that is, pupils getting full marks or no marks).

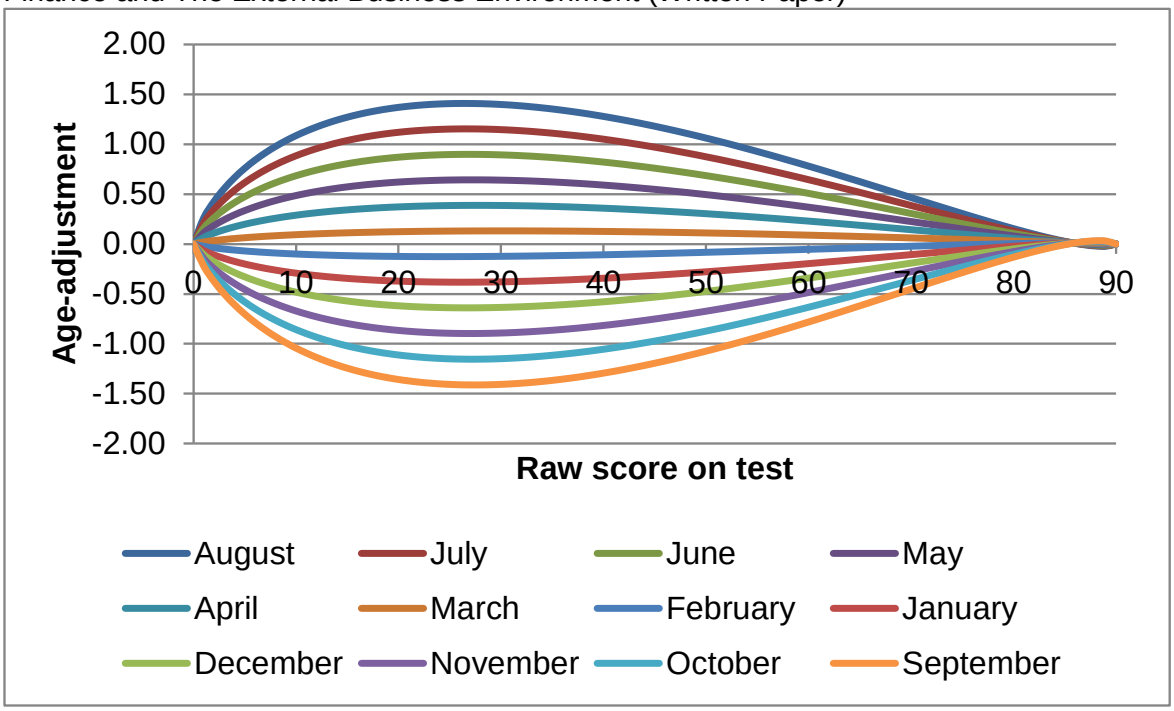
[10] Only linear terms were allowed in these models although the same software allows for the estimation of complex curvilinear relationships. Furthermore, the software also allows for the exploration of changes in skewness and kurtosis. However, none of these additions was found to improve the overall fit of the model and may have led to an increase in the variance of age-standardised scores. For this reason only a simple form of the model was fitted.

[11] Also estimated as an inflated beta distribution. Note that in this step we are equating estimated smooth, continuous distributions. This is in contrast to the usual practice of score equating which also requires a discrete continuization step.

changes are for those pupils born in August. For those scoring between 10 and 50 marks (relatively low scores on the distribution – see figure 5) these adjustments are just above 1 mark. However, for those with more than 70 marks the adjustment is less than half a mark. Averaged across all August-born pupils taking the test, and accounting for their overall score distribution, the average adjustment for an August-born pupil is 0.9 marks. These positive adjustments are almost exactly balanced out by the negative adjustments suggested for September-born pupils.

Note that the adjustments in figure 6 do not fully remove all of the differences in the score distribution between months of birth. Only the general trends in scores shown in figure 4 are addressed whilst the remaining peaks and troughs for individual months are treated as if they are purely the result of sample fluctuation. A more thorough method to address all differences between months of birth would be to directly equate the score distribution within each month to the overall score distribution. However this would have two disadvantages. Firstly, it would assume that there is a necessity to address all such differences; for example, assuming that the lower scores achieved at the 5th percentile for pupils born in December (figure 5) is as a result of some kind of disadvantage that needs to be addressed. Secondly, adjustments based on direct equating of each month would be far more vulnerable to sampling variation than the model based approach we have adopted and, as such, would provide age-adjustments that are far less reliable. For these reasons we have not adopted this approach.

Figure 6: Estimated age-adjustments by month of birth of pupils for A293_01 - Production, Finance and The External Business Environment (Written Paper)



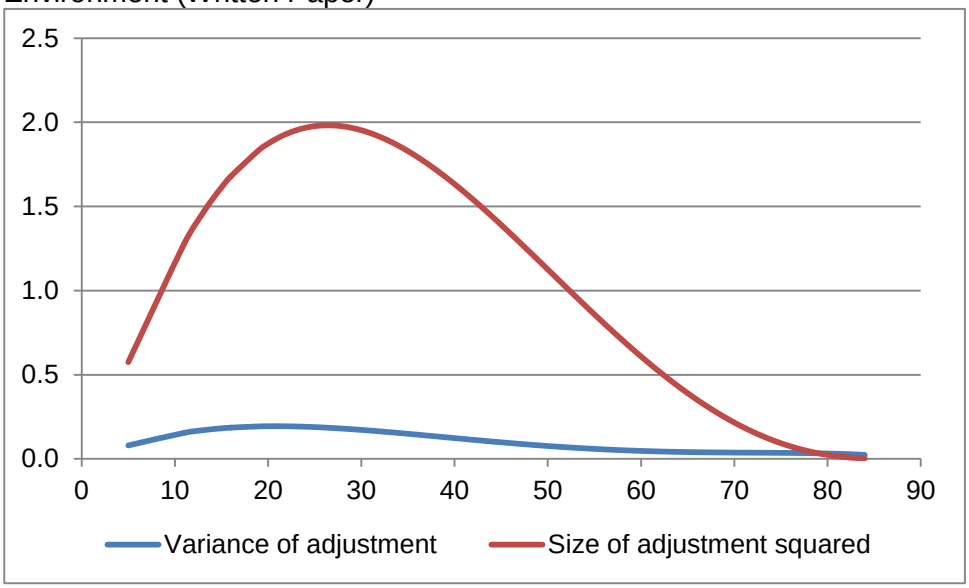
The size of the small adjustments shown in figure 6 and their ability to address inequity in outcomes between pupils born in different months must be set against the added sampling variance associated with applying such adjustments. Specifically, we need to know the extent to which the adjustment made to a particular pupil within one school is dependent upon which pupils at other schools have also chosen to take this assessment. If many (other) schools where there is little association between age and attainment (see table 1) enter candidates for this assessment then the adjustment will be smaller. If, instead, many schools where there is a strong relationship enter their pupils, then larger adjustments will be applied.

The sampling variance of the adjustments in figure 6 was estimated via the method of balanced repeated replication (Rust and Rao, 1996). By recalculating the adjustments based upon successive sub-samples consisting of the candidates from exactly half of the centres, but using

exactly the same methodology, this method directly estimates the variance of adjustments across different samples of schools. A total of 80 half-samples were used to estimate the variances.

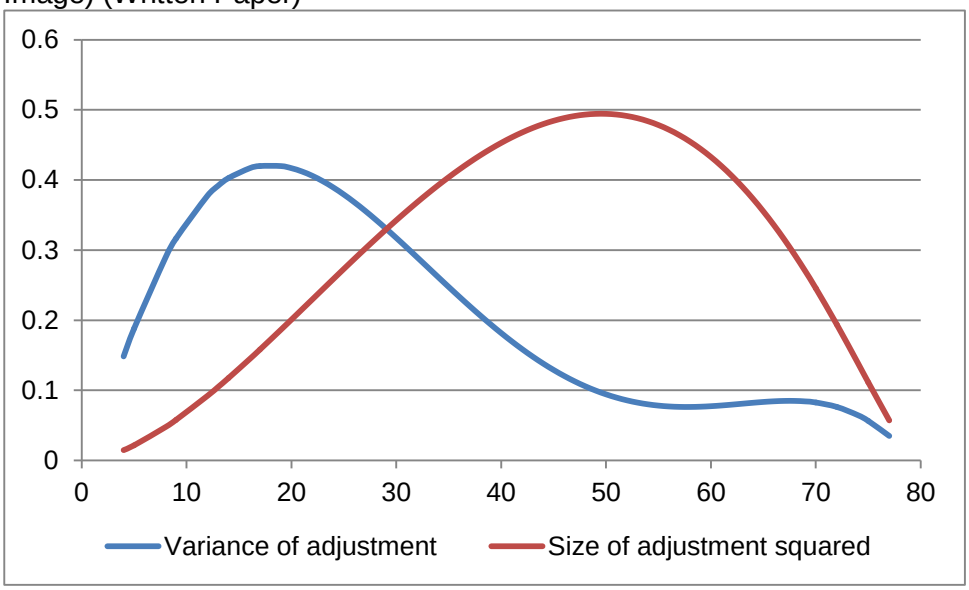
The variance of adjustments can be directly compared to the size of the adjustments squared. The rationale for this comparison is that the these elements represent the overall mean square error of adjusted and unadjusted scores respectively relative to “true” adjusted scores if the actual underlying relationship between month of birth and expected score was known. Thus, if the variance is larger than the size of the adjustments squared then this indicates that the added variability due to the instability in the estimates will outweigh any improvement in the equity of outcomes. This comparison is made for August-born pupils in figure 7. As can be seen, although the squared sizes of the suggested adjustments are small, the sampling variances of these adjustments are considerably smaller. Averaged across all August-born pupils, the average squared adjustment is 0.9 marks squared whereas the average variance is roughly 0.08 marks squared. Thus just less than 10 per cent of the improvement in equity due to age-adjustment is lost by increased sampling variance. Thus, in these terms, for an untiered assessment with this size of entry, there is some evidence that age-adjustment may be worthwhile.

Figure 7: Size of squared adjustments and variances of adjustments for different raw scores for August-born pupils on component A293_01 - Production, Finance and The External Business Environment (Written Paper)



Having said this, repeating the full procedure above for an assessment with a slightly smaller entry (a Media Studies assessment - B322_01: Textual Analysis and Media Studies Topic - Moving Image) gives a less positive picture. This assessment has an entry of 5,160 candidates (still above the median for those assessments analysed) and has 80 marks available. The correlation between scores and age is only slightly below the median for untiered assessments at 0.029. A comparison of the squared size of suggested adjustments to the sampling variance for August-born pupils is shown in figure 8. As can be seen, for all pupils scoring 30 or less, the sampling variances of suggested adjustments are greater than the squared size of adjustments suggesting that these do more harm than good. Averaged across the score distribution for August-born pupils, more than a third of the benefit in terms of equity from applying age adjustments will be lost due to sampling variance. This suggests that if either the sample size, or the estimated size of adjustments falls only slightly below the level suggested in the earlier example, then any form of age-adjustment will be hardly worthwhile.

Figure 8: Size of squared adjustments and variances of adjustments for different raw scores for August-born pupils on component B322_01 - Textual Analysis And Media Studies Topic (Moving Image) (Written Paper)



Discussion

Despite its high media profile, by the end of key stage 4, the effect of month of birth on attainment is small. This can be seen in numerous ways. For a typical GCSE subject:

- The correlation between age and grade achieved is below 0.04.
- The difference in the average grade achieved by pupils born in different months is so small it is barely visible to the naked eye and is dwarfed by the differences between different GCSE subjects.
- Within as many of 40 per cent of schools (with large entries) there is no positive correlation between age in months and achievement at all.
- The chance of an August-born pupil outperforming pupils born in another month is only very slightly below 50 per cent (48 per cent).

The effects above are even smaller within particular GCSE subjects such as modern languages or science. For these subjects it is likely that the effect of age is largely through the mechanisms via which pupils choose these subjects rather than any relationship between age and the grades pupils achieve.

Furthermore, when we look within subject at individual GCSE assessments, we find that for a large number of these the age effect is actually non-existent. This raises serious practical issues of how such assessments could be age-standardised when the mechanism for the (slight) effect of age is captured within the way in which pupils are assigned to tiers or make subject choices rather than in the relationship between age and test scores. One possibility is that such mechanisms are influenced by results at key stage 2, that is, pupils are assigned to ability sets on the basis of key stage 2 results when they arrive at secondary school and this in turn influences their subsequent tiers and possibly their subject choices. For this reason, it may be that age-standardisation of key stage 2 could address some of the issues we see at GCSE. This is more attractive than age-standardisation of GCSE as the age-effects in question are larger, and the structure of the examinations is simpler[12].

Even where the above difficulties in age-standardisation of GCSEs do not occur, our analysis has shown that unless we have a large number of entrants to an examination (roughly 10,000 in our example) then sampling variance will mean that, for particular groups of pupils, applying

[12] In that, at KS2, all pupils take the same tests with no tiering.

age-adjustments will do more harm than good. That is, there is a possibility that the size of the random variability of such adjustments will exceed the (small) size of the age-effects we are trying to remove. Even where this is not the case, a large proportion of the gain in equity through age adjustment may be lost through sampling variance.

It should be noted that the discussion in this report has focussed on the effectiveness of age-standardisation when applied to individual assessments at key stage 4. This is in contrast to many previous analyses of age effects at key stage 4 (for example, Crawford, 2013, DfE, 2010) which have tended to focus on achievement at key stage 4 aggregated across all subjects. It is possible that age-standardisation would be more effective when applied to overall aggregated measures of achievement at KS4. However, such measures are not available at the time of GCSE awarding but only after all results, across multiple exam boards, have been collated into a single database such as the NPD. As such, within the current system of GCSE awarding, they could not be made available at the same time as GCSE results in general and as such could not be used to influence progression to further education post-16.

There are further issues not discussed in this report. For example:

- How can (and should) age-standardisation be applied so that it has a consistent effect across different subjects and different exam boards?
- Should age-adjustments be consistent across years? What would be the implications for equity of applying last year's adjustments when data this year shows that the relationship between age and achievement has changed?
- Would summer-born candidates entering unpopular subjects, where there is insufficient data for age-standardisation, be unfairly disadvantaged?
- How can age-standardisation be fairly applied to children who are born prematurely? Is it fair that age-standardisation be based on their actual date of birth rather than their due date (or date of conception)?[13]
- Will age-adjustments of less than a mark make any difference at all given that (at present) all grade boundaries are determined in terms of whole numbers of marks? Would schools and pupils be willing to accept grade boundaries expressed as decimals where (potentially) the minimum possible performance to achieve a given grade was only available to pupils born within one particular month[14]?
- How can the interpretation of GCSE grades as indicating that candidates have mastered particular skills be maintained if grades are dependent not only on what they know and can do but also on their month of birth?

This final question regarding the purpose of GCSEs was in fact also noted in the work by Crawford et al (2013). They argued "that employers would find an absolute measure of attainment more valuable, as it should signify the skills that a young person has already acquired" (Crawford et al, 2013, page 70) and that age-standardisation of GCSEs should only apply when GCSEs are to be used as an indicator of a pupil's suitability to continue into further or higher education. However, this present research has drawn attention to the technical difficulties of applying age-standardisation even for this limited purpose.

Of course, many of the above issues apply to any age-standardised test. However, they are particularly acute for GCSEs given that the effects of age are so small and, as such, the prima facie case for age-standardisation is much weaker than for assessments at younger ages. This leads to the fundamental question behind all the others: Is the controversy associated with age-standardisation worth it given the small size of the effects we are dealing with? The research in this report would suggest it is not.

[13] This is not purely a theoretical criticism but rather something the author has had to face in practice. A parent, who's child had just missed out on a place in a selective school due to the entrance test being age-standardised, complained that the process was unfair as their child was born prematurely and was thus younger than was indicated by their date of birth.

[14] That is, the score exactly equal to the grade boundary could only be achieved by pupils born in one particular month.

Having said the above, the evidence in this report should not be used to deny that any age effects exist; it is clear from both this report and others that they do. Furthermore, the evidence in this report of the effects of month of birth on subject choice and entry tiers may suggest that this is an area that requires further intervention. In particular, if entry tiers are strongly related to the sets and streams into which pupils are placed on arrival at secondary school, and if these sets and streams are somewhat determined by performance in national tests at key stage 2, it is important that "schools should consider age-position when allocating pupils to sets and streams" (Sharp, 1995, page 264). With this in mind, age-standardisation of key stage 2 results may indeed be an appropriate policy response. Age-standardisation of GCSEs is not necessary, although, given the small, remaining differences that exist between pupils born in different months, the recommendation that "Teachers should be sympathetic to summer-born students who wish to re-sit their GCSE or A-level examinations" (Sharp, 1995, page 265) remains a sensible one.

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Appendix 1: Correlations between marks and age in months for individual components

Table A1: Correlations between marks and age in months for individual components

		Correlation between age and mark	N	Regression coefficient (% marks per month)
	Summary across 235 components			
	Mean	0.022	8072	0.104
	Median	0.022	4249	0.106
	Minimum	-0.054	1000	-0.201
	Maximum	0.095	49342	0.423
Individual components	**Component Name**			
B574_01	Christianity (Roman Catholic) 2 (Worship, Community And Family, Sacred Writings) (Written Paper)	0.095	1104	0.366
A405_02	Sources For Latin (Written Paper (Higher))	0.083	1047	0.313
B572_01	Christianity 2 (Worship, Community And Family, Sacred Writings) (Written Paper)	0.082	1560	0.418
B452_01	Practical Performance And Analysis 1 (Controlled Assessment)	0.076	9833	0.249
A971_17	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with the USA, 1945-1975 - a land of freedom?)	0.075	1045	0.423
A651_02	Extended Literary Text And Imaginative Writing (Controlled Assessment - Postal Moderation)	0.071	25878	0.275
A343_01	Rights And Responsibilities- Extending Our Knowledge And Understanding (Written Paper)	0.067	2521	0.342
B351_01	Integrated Tasks (Controlled Assessment - OCR Repository)	0.066	1307	0.285
A914_02	Safeguarding And Protecting Individuals (Written Paper)	0.066	1290	0.274
A661_02	Literary Heritage Linked Texts (Controlled Assessment - Postal Moderation)	0.066	28108	0.291
A344_02	Identity, Democracy And Justice- Leading The Way As An Active Citizen (Controlled Assessment - Postal Moderation)	0.064	2518	0.330
B404_01	Classical Greek Verse Literature (Written Paper)	0.060	1115	0.187
B061_02	ICT In Today's World (Written Paper)	0.059	3485	0.255
A120_01	Art And Design OCR-Set Task (OCR-Set Task)	0.059	7635	0.294
A562_01	Resistant Materials: Sustainable Design (Written Paper)	0.057	1840	0.242
A121_01	Fine Art: Art And Design OCR-Set Task (OCR-Set Task)	0.056	10162	0.288
B571_01	Christianity 1 (Beliefs, Special Days, Divisions And Interpretations) (Written Paper)	0.056	1934	0.299
B401_01	Classical Greek Language 1 (Written Paper)	0.056	1201	0.187
A110_01	Art And Design Portfolio (Portfolio)	0.056	7705	0.259
A652_04	Speaking, Listening And Spoken Language (Speaking and Listening - Postal Moderation)	0.056	27696	0.197
A111_01	Fine Art: Art And Design Portfolio (Portfolio)	0.055	10258	0.261
A971_15	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with Causes & Events of the First World War, 1890-1918)	0.055	1505	0.321
A672_02	You As A Global Citizen - The Impact Of Our Decisions (Controlled Assessment - Postal moderation)	0.055	4615	0.284
A953_02	History Around Us Or Modern World Study Controlled Assessment (Postal Moderation)	0.054	27728	0.279
A403_02	Latin Prose Literature (Written Paper (Higher))	0.054	7717	0.248

		Correlation between age and mark	N	Regression coefficient (% marks per month)
B033_02	Humanities Independent Enquiry (Controlled Assessment - Postal Moderation)	0.052	1000	0.308
A652_02	Speaking, Listening And Spoken Language (Spoken Language - Postal Moderation)	0.051	27657	0.241
A401_02	Latin Language 1 (Written Paper (Higher))	0.050	7799	0.219
B589_01	Perspectives On World Religions (Written Paper)	0.050	3890	0.226
A351_02	City Life In The Classical World (Written Paper (Higher))	0.049	2241	0.185
A532_01	Graphics: Sustainable Design (Written Paper)	0.048	1099	0.243
B454_01	Practical Performance And Analysis 2 (Controlled Assessment)	0.048	9932	0.158
B403_01	Classical Greek Prose Literature (Written Paper)	0.047	1103	0.143
A524_01	Food Technology: Technical Aspects Of Designing And Making (Written Paper)	0.047	4745	0.222
B032_01	Application Of Knowledge (Written Paper)	0.047	1426	0.238
B604_01	Ethics 2 (Peace And Justice, Equality, Media) (Written Paper)	0.046	43757	0.252
A354_02	Culture And Society In The Classical World (Controlled Assessment - Postal moderation)	0.046	2404	0.219
A573_02	Textiles Technology: Making Quality Products (Controlled Assessment - Postal Moderation)	0.046	1997	0.218
A952_21	Historical Source Investigation (Historical Source Investigation with Developments in British Medicine, 1200-1945)	0.045	23106	0.226
B453_01	Developing Knowledge In Physical Education (Written Paper)	0.045	9228	0.202
A714_01	German: Writing (Controlled Assessment (Examiner Marked))	0.044	4357	0.214
B603_01	Ethics (Relationships, Medical Ethics, Poverty And Wealth) (Written Paper)	0.044	47509	0.214
B562_02	Geographical Enquiry (Controlled Assessment - Postal Moderation)	0.044	21644	0.227
B064_02	Creative Use Of ICT (Controlled Assessment - Postal Moderation)	0.043	4527	0.253
A552_01	Product Design: Designing And Making Innovation Challenge (Test)	0.043	2358	0.157
A534_01	Graphics: Technical Aspects Of Designing And Making (Written Paper)	0.042	3182	0.178
B602_01	Philosophy 2 (Good And Evil, Revelation, Science) (Written Paper)	0.041	44146	0.229
A973_02	Historical Enquiry (Postal Moderation)	0.041	49342	0.192
A564_01	Resistant Materials: Technical Aspects Of Designing And Making (Written Paper)	0.040	4595	0.179
A453_02	Programming Project (Controlled Assessment - Postal Moderation)	0.040	2477	0.262
B352_02	Practical Portfolio (Controlled Assessment - Postal Moderation)	0.040	6952	0.175
A951_14	Study In Development And Study In Depth (Study in Development with Germany, c.1919-1945)	0.039	14861	0.222
B321_02	The Individual Media Studies Portfolio (Controlled Assessment - Postal Moderation)	0.039	5842	0.197
A531_02	Graphics: Introduction To Designing And Making (Controlled Assessment - Postal Moderation)	0.039	1540	0.229
A292_01	Business And People (Written Paper)	0.039	4119	0.195
A563_02	Resistant Materials: Making Quality Products (Controlled Assessment - Postal Moderation)	0.038	4325	0.207
A574_01	Textiles Technology: Technical Aspects Of Designing And Making (Written Paper)	0.038	1955	0.170

		Correlation between age and mark	N	Regression coefficient (% marks per month)
A342_02	Identity, Democracy And Justice- Understanding Our Role As Citizens (Written Paper)	0.038	7218	0.183
A293_01	Production, Finance And The External Business Environment (Written Paper)	0.038	10855	0.170
B743_02	Chemistry Controlled Assessment (Controlled Assessment - Postal Moderation)	0.037	21792	0.135
B001_02	Food And Nutrition Short Tasks (Controlled Assessment - Postal Moderation)	0.037	3771	0.178
A551_02	Product Design: Developing And Applying Design Skills (Controlled Assessment - Postal Moderation)	0.036	3307	0.202
A951_13	Study In Development And Study In Depth (Study in Development with The American West, 1840-1895)	0.036	15045	0.204
A184_02	Physics A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.036	23981	0.142
A353_02	Community Life In The Classical World (Written Paper (Higher))	0.036	2201	0.152
A452_02	Practical Investigation (Controlled Assessment - Postal Moderation)	0.035	2338	0.228
A402_02	Latin Language 2 (Written Paper (Higher))	0.035	8100	0.186
A680_02	Information And Ideas (Written Paper (Higher))	0.035	24924	0.144
A404_02	Latin Verse Literature (Written Paper (Higher))	0.035	7824	0.172
A452_01	Practical Investigation (Controlled Assessment - OCR Repository)	0.035	1070	0.206
A174_02	Chemistry A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.034	24312	0.136
A164_02	Biology A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.034	24054	0.136
B601_01	Philosophy 1 (Deity, Religious And Spiritual Experience, End Of Life) (Written Paper)	0.034	37985	0.192
A952_22	Historical Source Investigation (Historical Source Investigation with Developments in Crime and Punishment in Britain, 1200-1945)	0.034	3086	0.150
A533_02	Graphics: Making Quality Products (Controlled Assessment - Postal Moderation)	0.033	2951	0.188
B351_02	Integrated Tasks (Controlled Assessment - Postal Moderation)	0.033	6852	0.147
A521_02	Food Technology: Introduction To Designing And Making (Controlled Assessment - Postal Moderation)	0.032	2862	0.166
B063_02	ICT In Context (Written Paper)	0.032	5403	0.136
A144_01	Science A Controlled Assessment (Controlled Assessment - OCR Repository)	0.031	1254	0.169
B013_01	Principles Of Child Development (Written Paper)	0.031	7373	0.113
A971_11	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with Germany, 1918-1945)	0.031	27139	0.155
A583_01	From Concept To Creation (Practical Examination)	0.031	4906	0.167
A453_01	Programming Project (Controlled Assessment - OCR Repository)	0.030	1299	0.199
B672_01	Socialisation, Culture And Identity (Written Paper)	0.030	4348	0.162
A663_02	Prose From Different Cultures (Written Paper (Higher))	0.030	17027	0.125
A664_02	Literary Heritage Prose And Contemporary Poetry (Written Paper (Higher))	0.030	26368	0.152
A582_01	Drama In The Making (Performance)	0.030	4621	0.144
B578_01	Islam 2 (Worship, Community And Family, Sacred Writings) (Written Paper)	0.029	1295	0.137

		Correlation between age and mark	N	Regression coefficient (% marks per month)
A341_02	Rights And Responsibilities- Getting Started As An Active Citizen (Controlled Assessment - Postal Moderation)	0.029	9644	0.161
A592_01	How The Economy Works (Written Paper)	0.029	2148	0.154
A712_02	German: Speaking (Task 1 (Postal Moderation))	0.029	2523	0.130
B322_01	Textual Analysis And Media Studies Topic (Moving Image) (Written Paper)	0.029	5160	0.137
B753_02	Physics Controlled Assessment (Controlled Assessment - Postal Moderation)	0.029	21910	0.103
A523_02	Food Technology: Making Quality Products (Controlled Assessment - Postal Moderation)	0.028	4872	0.145
A973_01	Historical Enquiry (OCR Repository)	0.028	1830	0.127
B002_02	Food Study Task (Controlled Assessment - Postal Moderation)	0.028	4264	0.150
A722_01	Spanish: Speaking (Task 1 (OCR Repository))	0.028	2625	0.139
A972_22	British Depth Study (British Depth Study with How far did British society change, 1939-1975?)	0.028	9259	0.133
B561_02	Sustainable Decision Making Exercise (Written Paper (Higher))	0.028	4467	0.106
A642_02	Imaginative Writing (Controlled Assessment - Postal Moderation)	0.028	8343	0.133
A123_01	Photography - Lens And Light-Based Media: Art And Design OCR-Set Task (OCR-Set Task)	0.028	1570	0.135
A971_12	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with Russia, 1905-1941)	0.027	2399	0.142
B673_01	Applying Sociological Research Techniques (Written Paper)	0.027	3657	0.118
B064_01	Creative Use Of Ict (Controlled Assessment - OCR Repository)	0.027	1019	0.160
A643_02	Speaking And Listening (Speaking and Listening - Postal Moderation)	0.027	8370	0.124
A724_01	Spanish: Writing (Controlled Assessment (Examiner Marked))	0.026	5725	0.131
A671_01	Extreme Environments (Written Paper (Foundation))	0.026	1388	0.101
A503_02	Mathematics Unit C (Written Paper (Higher))	0.026	7793	0.128
A522_01	Food Technology: Sustainable Design (Written Paper)	0.025	2317	0.121
B354_01	Listening Test (Listening Test)	0.025	8050	0.118
A703_02	French: Reading (Written Paper (Higher))	0.025	9074	0.112
B723_02	Additional Science Controlled Assessment (Controlled Assessment - Postal Moderation)	0.024	36035	0.106
B733_02	Biology Controlled Assessment (Controlled Assessment - Postal Moderation)	0.024	21902	0.088
B451_01	An Introduction To Physical Education (Written Paper)	0.024	3291	0.097
A161_02	Biology A Modules B1, B2, B3 (Written Paper - Higher)	0.023	3092	0.112
A553_02	Product Design: Making, Testing And Marketing Products (Controlled Assessment - Postal Moderation)	0.023	4249	0.131
A674_01	Issues In Our Fast Changing World (Written Paper (Foundation))	0.022	1841	0.078
A641_02	Reading Literary Texts (Controlled Assessment - Postal Moderation)	0.022	7489	0.108
B012_02	Child Study Task (Controlled Assessment - Postal Moderation)	0.022	7590	0.138
A581_01	From Page To Stage (Performance)	0.022	4008	0.105
A171_01	Chemistry A Modules C1, C2, C3 (Written Paper - Foundation)	0.021	1856	0.076
B011_02	Child Development Short Tasks (Controlled Assessment - Postal Moderation)	0.021	7147	0.121

		Correlation between age and mark	N	Regression coefficient (% marks per month)
A972_21	British Depth Study (British Depth Study with How was British society changed, 1890-1918?)	0.021	39036	0.092
A561_02	Resistant Materials: Introduction To Designing And Making (Controlled Assessment - Postal Moderation)	0.021	2368	0.124
B353_01	Creative Task (Creative Task)	0.021	7901	0.106
A913_02	Promoting Health And Wellbeing (Controlled Assessment - Postal Moderation)	0.021	1365	0.119
A704_01	French: Writing (Controlled Assessment (Examiner Marked))	0.021	11673	0.094
A154_01	Additional Science A Controlled Assessment (Controlled Assessment - OCR Repository)	0.021	1391	0.099
J567_01	Mathematics B (Paper 1 (Foundation))	0.021	14444	0.101
B671_01	Sociology Basics (Written Paper)	0.020	2593	0.100
A971_13	Aspects Of International Relations, 1919-2005 And The Chosen Depth Study (Aspects of International Relations, 1919-2005 with The USA, 1919-1941)	0.020	14845	0.111
A291_02	Marketing And Enterprise (Controlled Assessment - Postal Moderation)	0.020	5165	0.102
B541_01	Studies And Applications In Psychology 1 (Written Paper)	0.020	1193	0.104
A701_02	French: Listening (Written Paper (Higher))	0.020	8969	0.078
A172_02	Chemistry A Modules C4, C5, C6 (Written Paper - Higher)	0.020	10590	0.112
A162_02	Biology A Modules B4, B5, B6 (Written Paper - Higher)	0.020	11150	0.106
A591_02	How The Market Works (Written Paper)	0.020	1792	0.076
B711_02	Science Modules B1, C1, P1 (Written Paper - Higher)	0.019	1954	0.085
A662_02	Modern Drama (Written Paper (Higher))	0.019	18216	0.070
J567_03	Mathematics B (Paper 3 (Higher))	0.019	14606	0.105
B352_01	Practical Portfolio (Controlled Assessment - OCR Repository)	0.019	1350	0.080
A154_02	Additional Science A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.019	36010	0.092
A702_01	French: Speaking (Task 1 (OCR Repository))	0.018	4847	0.088
A113_01	Photography - Lens And Light-Based Media (Portfolio)	0.018	1636	0.083
B324_02	Production Portfolio In Media Studies (Controlled Assessment - Postal Moderation)	0.018	5958	0.094
J567_04	Mathematics B (Paper 4 (Higher))	0.017	14568	0.103
B731_02	Biology Modules B1, B2, B3 (Written Paper - Higher)	0.017	1527	0.086
A554_01	Product Design: Designing Influences (Written Paper)	0.017	3116	0.075
A673_01	Similarities And Differences (Written Paper (Foundation))	0.017	1821	0.073
A163_02	Biology A Module B7 (Written Paper - Higher)	0.017	23806	0.070
A702_03	French: Speaking (Task 2)	0.016	11611	0.079
A722_02	Spanish: Speaking (Task 1 (Postal Moderation))	0.016	3107	0.077
A911_02	Health, Social Care And Early Years Provision (Controlled Assessment - Postal Moderation)	0.015	4376	0.087
J567_02	Mathematics B (Paper 2 (Foundation))	0.015	14392	0.072
A144_02	Science A Controlled Assessment (Controlled Assessment - Postal Moderation)	0.014	25714	0.074
B402_01	Classical Greek Language 2 (Written Paper)	0.014	1118	0.065
A182_02	Physics A Modules P4, P5, P6 (Written Paper - Higher)	0.014	11646	0.071
A702_02	French: Speaking (Task 1 (Postal Moderation))	0.014	6770	0.070
A451_01	Computer Systems And Programming (Written Paper)	0.014	3638	0.081
B577_01	Islam 1 (Beliefs, Special Days, Divisions And Interpretations) (Written Paper)	0.013	1694	0.070
B003_01	Principles Of Food And Nutrition (Written Paper)	0.013	4194	0.056
A171_02	Chemistry A Modules C1, C2, C3 (Written Paper - Higher)	0.013	3327	0.059

		Correlation between age and mark	N	Regression coefficient (% marks per month)
A680_01	Information And Ideas (Written Paper (Foundation))	0.013	9184	0.047
A183_02	Physics A Module P7 (Written Paper - Higher)	0.012	23946	0.068
A722_03	Spanish: Speaking (Task 2)	0.012	5715	0.058
B392_02	Methods In Mathematics 2 (Written Paper - Higher)	0.011	1374	0.062
A593_01	The UK Economy And Globalisation (Written Paper)	0.011	2298	0.045
A352_02	Epic And Myth (Written Paper (Higher))	0.011	2224	0.045
A173_02	Chemistry A Module C7 (Written Paper - Higher)	0.010	24124	0.056
A382_02	Applications Of Mathematics 2 (Written Paper - Higher)	0.010	1987	0.052
B062_02	Practical Applications In ICT (Controlled Assessment - Postal Moderation)	0.010	4198	0.059
A712_03	German: Speaking (Task 2)	0.010	4290	0.047
A713_02	German: Reading (Written Paper (Higher))	0.010	3257	0.040
B732_02	Biology Modules B4, B5, B6 (Written Paper - Higher)	0.010	20902	0.042
A721_01	Spanish: Listening (Written Paper (Foundation))	0.010	1434	0.036
A662_01	Modern Drama (Written Paper (Foundation))	0.009	3062	0.047
B721_01	Additional Science Modules B3, C3, P3 (Written Paper - Foundation)	0.009	6264	0.031
B542_01	Studies And Applications In Psychology 2 (Written Paper)	0.008	3771	0.047
B741_02	Chemistry Modules C1, C2, C3 (Written Paper - Higher)	0.008	1321	0.040
B563_02	Key Geographical Themes (Written Paper (Higher))	0.008	22499	0.036
B713_02	Science Controlled Assessment (Controlled Assessment - Postal Moderation)	0.007	13378	0.034
A712_01	German: Speaking (Task 1 (OCR Repository))	0.005	1773	0.024
A151_01	Additional Science A Modules B4, C4, P4 (Written Paper - Foundation)	0.004	2943	0.015
B711_01	Science Modules B1, C1, P1 (Written Paper - Foundation)	0.003	3410	0.014
A674_02	Issues In Our Fast Changing World (Written Paper (Higher))	0.003	3496	0.010
B752_02	Physics Modules P4, P5, P6 (Written Paper - Higher)	0.002	21018	0.008
A713_01	German: Reading (Written Paper (Foundation))	0.000	1071	0.001
B712_01	Science Modules B2, C2, P2 (Written Paper - Foundation)	0.000	7382	0.000
A503_01	Mathematics Unit C (Written Paper (Foundation))	0.000	3534	0.000
B742_01	Chemistry Modules C4, C5, C6 (Written Paper - Foundation)	0.000	1287	-0.001
A381_02	Applications Of Mathematics 1 (Written Paper - Higher)	0.000	1426	-0.001
B543_01	Research In Psychology (Written Paper)	0.000	2434	-0.001
B732_01	Biology Modules B4, B5, B6 (Written Paper - Foundation)	-0.002	1192	-0.006
B031_01	Cross-Curricular Themes (Written Paper)	-0.002	1466	-0.009
A673_02	Similarities And Differences (Written Paper (Higher))	-0.002	3033	-0.009
A193_02	Science Work Related Portfolio (Controlled Assessment - Postal Moderation)	-0.002	4450	-0.011
B742_02	Chemistry Modules C4, C5, C6 (Written Paper - Higher)	-0.004	20851	-0.018
B722_02	Additional Science Modules B4, C4, P4 (Written Paper - Higher)	-0.005	23958	-0.020
A711_01	German: Listening (Written Paper (Foundation))	-0.005	1148	-0.017
B721_02	Additional Science Modules B3, C3, P3 (Written Paper - Higher)	-0.006	7986	-0.027
A181_02	Physics A Modules P1, P2, P3 (Written Paper - Higher)	-0.007	3702	-0.031
A671_02	Extreme Environments (Written Paper (Higher))	-0.008	1728	-0.035
A663_01	Prose From Different Cultures (Written Paper (Foundation))	-0.009	2659	-0.047
B712_02	Science Modules B2, C2, P2 (Written Paper - Higher)	-0.010	6074	-0.042
A723_02	Spanish: Reading (Written Paper (Higher))	-0.010	4529	-0.045
A143_01	Science A Modules B3, C3, P3 (Written Paper - Foundation)	-0.010	7359	-0.046
A192_01	Science Of Materials And Production (Written Paper -	-0.012	3606	-0.048

		Correlation between age and mark	N	Regression coefficient (% marks per month)
	Foundation)			
B561_01	Sustainable Decision Making Exercise (Written Paper (Foundation))	-0.012	2672	-0.047
A151_02	Additional Science A Modules B4, C4, P4 (Written Paper - Higher)	-0.013	4350	-0.052
A152_01	Additional Science A Modules B5, C5, P5 (Written Paper - Foundation)	-0.013	5245	-0.048
A162_01	Biology A Modules B4, B5, B6 (Written Paper - Foundation)	-0.013	2751	-0.044
A152_02	Additional Science A Modules B5, C5, P5 (Written Paper - Higher)	-0.014	10862	-0.063
A181_01	Physics A Modules P1, P2, P3 (Written Paper - Foundation)	-0.015	2072	-0.059
A153_02	Additional Science A Modules B6, C6, P6 (Written Paper - Higher)	-0.015	18297	-0.061
B563_01	Key Geographical Themes (Written Paper (Foundation))	-0.016	7988	-0.078
A721_02	Spanish: Listening (Written Paper (Higher))	-0.016	4299	-0.070
A664_01	Literary Heritage Prose And Contemporary Poetry (Written Paper (Foundation))	-0.018	4679	-0.114
A912_01	Understanding Personal Development And Relationships (Written Paper)	-0.019	1810	-0.085
B722_01	Additional Science Modules B4, C4, P4 (Written Paper - Foundation)	-0.020	12445	-0.078
A191_01	Science In Society (Written Paper - Foundation)	-0.020	1802	-0.097
A703_01	French: Reading (Written Paper (Foundation))	-0.022	2591	-0.096
B751_02	Physics Modules P1, P2, P3 (Written Paper - Higher)	-0.023	1569	-0.108
A711_02	German: Listening (Written Paper (Higher))	-0.023	3143	-0.109
A161_01	Biology A Modules B1, B2, B3 (Written Paper - Foundation)	-0.026	1733	-0.088
A143_02	Science A Modules B3, C3, P3 (Written Paper - Higher)	-0.027	9691	-0.099
A141_02	Science A Modules B1, C1, P1 (Written Paper - Higher)	-0.027	1344	-0.110
A153_01	Additional Science A Modules B6, C6, P6 (Written Paper - Foundation)	-0.028	7821	-0.101
A142_01	Science A Modules B2, C2, P2 (Written Paper - Foundation)	-0.029	2449	-0.106
A701_01	French: Listening (Written Paper (Foundation))	-0.029	2702	-0.128
A723_01	Spanish: Reading (Written Paper (Foundation))	-0.030	1193	-0.105
A142_02	Science A Modules B2, C2, P2 (Written Paper - Higher)	-0.033	1752	-0.117
A141_01	Science A Modules B1, C1, P1 (Written Paper - Foundation)	-0.035	1764	-0.126
A172_01	Chemistry A Modules C4, C5, C6 (Written Paper - Foundation)	-0.040	2906	-0.174
A182_01	Physics A Modules P4, P5, P6 (Written Paper - Foundation)	-0.043	3187	-0.167
B752_01	Physics Modules P4, P5, P6 (Written Paper - Foundation)	-0.054	1149	-0.201