

**Key Stage Assessments:
Levels of Progression 2015/16**

Methodology Paper

February 2017

Version 1.0

1. Background

This paper outlines the methodology applied by the Department of Education (DE) to 2015/16 Key Stage Assessment data in order to generate specific high-level NI averages which can be utilised by the Department and schools in their key policies and target setting.

Key Stage Levels of Progression (LoP) are used to measure Literacy and Numeracy targets set out in the Department of Education Strategy 'Count, Read: Succeed' which contains long-term targets by 2019/20. Since 2013/14, ongoing industrial action has heavily impacted on the number of schools submitting their KS data to CCEA (for moderation purposes) and DE. In turn, an exercise has been carried out to firstly determine how representative the 2015/16 returns are within the NI context and, accordingly, adjust the data for non-response within each cohort.

End of Key Stage Assessments (KSAs) are carried out in primary schools at the end of Year 4 (KS1) and Year 7 (KS2), as well as in post-primary schools at the end of Year 10 (KS3).

2. Representativeness of 2015/16 achieved returns

Due to industrial action, around a third of all primary schools (31%), and two-thirds of post-primary schools (60%) submitted 2015/16 KSA results. In turn, there is a strong likelihood of non-response bias in any subsequently produced average. Bias arises if the characteristics of non-responding schools (or pupils) differ significantly from those of responding schools (or pupils). The extent of such non-response bias can only be examined by comparing the characteristics of respondents with the distribution of the same characteristics in the entire school population.

To assess how accurately the sample of 2015/16 LoP data reflect the complete Year 4 (KS1), Year 7 (KS2) and Year 10 (KS3) school populations in Northern Ireland, the characteristics of each group have been compared with those collected through the 2015/16 School Census, an extract of which is presented in Table 2.1.

Table 2.1: Comparisons of the distribution of participating school pupils (KS1) with all Year 4 pupils in Northern Ireland, 2015/16

	KS1 Submissions (%)	2015/16 School Census (%)
Former ELB Area¹		
Belfast	17.7	15.1
Western	14.0	16.6
North Eastern	38.1	22.2
South Eastern	11.3	21.7
Southern	18.9	24.4
Gender		
Girl	49.5	49.0
Boy	50.5	51.0
FSME²		
Non-FSME	69.1	67.9
FSME	30.9	32.1

Notes:

1. The Education Authority came into existence on 1st April 2015 and assumed the responsibilities of the former Education and Library Boards (ELBs).
2. Free School Meal Entitled (FSME) status was unknown for 18 pupils with submitted KS1 results.

3. Weighting

In order to accurately reflect the composition of Northern Ireland's Years 4, 7 and 10 school populations, weights have been calculated and applied to the data to compensate and adjust for non-response bias in KSA data returns. Figures from the 2015/16 School Census were used to derive 3 individual sets of weights, one for each year group.

It was considered appropriate to consider school and pupil characteristics, as presented in Table 3.1, as each will, independently and collectively, influence the expected attainment levels at an individual pupil level.

Table 3.1: School and pupil characteristics used to construct weights accounting for non-response bias in KS1, KS2 and KS3 Levels of Progression submissions, 2015/16

			Primary		Post-Primary
			KS1	KS2	KS3
School	Former ELB Area ¹	Belfast	✓	✓	✓
		Western	✓	✓	✓
		North Eastern	✓	✓	✓
		South Eastern	✓	✓	✓
		Southern	✓	✓	✓
	Management Type	Controlled	✓	✓	✓
		Catholic Maintained	✓	✓	✓
Other ²		✓	✓	✓	
School Type	Grammar	-	-	✓	
	Non-Grammar	-	-	✓	
Pupil	FSME	FSME	✓	✓	✓
		Non-FSME	✓	✓	✓
	Gender	Girl	✓	✓	✓
		Boy	✓	✓	✓

Notes:

1. The Education Authority came into existence on 1st April 2015 and assumed the responsibilities of the former Education and Library Boards (ELBs).
2. Includes schools within 'other maintained', 'controlled integrated', 'grant maintained integrated' and 'voluntary' sectors.

It should be noted that weighting cannot generate data for certain groups lost through non-response. In this particular exercise, all KS1 and KS2 pupil groupings were represented and only one grouping in KS3 was not represented (i.e. non-grammar pupils from 'other' management type schools in the former BELB).

While multiple sets of individual weights can be derived based on school (ELB, Type, Management Type) or pupil (Gender, Free School Meal Entitled (FSME)) characteristics, this methodology has focussed on the construction of a single set of pupil-level weights at each Key Stage combining these characteristics given that a pupil's expected attainment will be inter-reliant on a combination of these variables. The set of KS1 weights derived for Year 4 pupils is shown in Table 3.2.

Table 3.2: Details of weights to be applied to KS1 LoP data submitted in 2015/16

Former ELB Area ¹	Management Type	FSME	Gender	
			Girl	Boy
Belfast	Controlled	Non-FSME	0.46	0.48
		FSME	0.58	0.52
	Catholic Maintained	Non-FSME	2.13	2.71
		FSME	1.41	1.72
	Other	Non-FSME	0.71	0.72
		FSME	5.60	2.06
Western	Controlled	Non-FSME	0.66	0.68
		FSME	0.71	0.63
	Catholic Maintained	Non-FSME	1.46	1.59
		FSME	3.02	2.14
	Other	Non-FSME	1.02	1.43
		FSME	1.17	1.05
North Eastern	Controlled	Non-FSME	0.51	0.54
		FSME	0.51	0.50
	Catholic Maintained	Non-FSME	0.75	0.75
		FSME	0.66	0.65
	Other	Non-FSME	0.64	0.80
		FSME	0.72	0.61
South Eastern	Controlled	Non-FSME	1.92	2.00
		FSME	2.53	2.39
	Catholic Maintained	Non-FSME	1.66	1.88
		FSME	2.70	2.28
	Other	Non-FSME	1.42	1.40
		FSME	1.10	1.38
Southern	Controlled	Non-FSME	0.89	0.86
		FSME	0.91	0.84
	Catholic Maintained	Non-FSME	1.94	2.22
		FSME	1.66	1.81
	Other	Non-FSME	1.16	1.09
		FSME	0.75	1.63

Notes:

1. The Education Authority came into existence on 1st April 2015 and assumed the responsibilities of the former Education and Library Boards (ELBs).
2. Weights are rounded to 2 decimal places for presentational purposes.
3. While the data in this table illustrate the 30 separate weighted values derived for Primary School pupils (KS1 and KS2), the number of values doubles at KS3 to incorporate school type (i.e. Grammar and Non-Grammar).

The effect of applying the above weighting is depicted in Table 3.3 which shows the proportion of Year 4 pupils (KS1) achieving the expected level (Level 2 or above) before and after weighting.

Table 3.3: Effects of weighting on KS1 averages, by gender, 2015/16

% achieving level 2 or above		Unweighted %	Weighted %
Communication	Girls	90.3	90.5
	Boys	83.9	84.5
	All	87.1	87.5
Using Maths	Girls	89.7	90.0
	Boys	87.1	87.0
	All	88.3	88.4

This technique corrects for over- and under- representation in the various groups when compared with the entire population. Table 3.4 presents an updated version of Table 2.1 showing how weighting has adjusted the proportion of responding schools in line with school census data.

Table 3.4: Effects of weighting on the distribution of participating pupils (KS1) with all Year 4 pupils in Northern Ireland, 2015/16

	KS1 Submissions		2015/16 School Census (%)
	Unweighted %	Weighted %	
Former ELB Area¹			
Belfast	17.7	15.1	15.1
Western	14.0	16.6	16.6
North Eastern	38.1	22.2	22.2
South Eastern	11.3	21.7	21.7
Southern	18.9	24.4	24.4
Gender			
Girl	49.5	49.0	49.0
Boy	50.5	51.0	51.0
FSME²			
Non-FSME	69.1	67.9	67.9
FSME	30.9	32.1	32.1

Notes:

1. The Education Authority came into existence on 1st April 2015 and assumed the responsibilities of the former Education and Library Boards (ELBs).

2. Free School Meal Entitled (FSME) status was unknown for 18 pupils with submitted KS1 results.

4. Standard error and confidence intervals

Given that only a proportion of schools submitted KSA returns in 2015/16, any averages derived from these data may differ from those that would have been obtained if all schools had responded. The extent of this difference naturally depends on the level of non-response. It is, however, possible to calculate the range of values between which the (true) population figures are estimated to lie. This is known as the confidence interval, sometimes referred to as a margin of error.

Confidence intervals at the 95% confidence level have been stated alongside the various estimates produced for 2015/16. This means that, while the best estimate represents the weighted mean figure drawn from the data, there is 95% certainty that the true population mean lies between the lower and higher estimates. To put it another way, it is assumed (and accepted) that there is a one in 20 chance that the true population value will fall outside the 95 percent confidence interval calculated for the (best) estimate.

Confidence intervals have been calculated using the standard error of proportions, using the formula:

$$se(p) = \sqrt{\frac{p \times (1 - p)}{n}}$$

5. Statistical significance of change

Because these KSA estimates are subject to sampling error, differences between estimates from successive years or between population subgroups may occur by chance. It is possible to measure whether this is likely to be the case using standard statistical tests and conclude whether differences are likely to be due to chance or represent a real difference.

For the purposes of this exercise, where differences have emerged as being statistically significant, these have been reported at the 5% ($p < 0.05$) level of probability (two-tailed tests). This means that, for any observed result that is found to be statistically significant, one can be 95% confident that this has not happened by chance. Within Table 6.2, any increases or decreases that are statistically significant at the five per cent level ($p < 0.05$), and are therefore considered to be real, are indicated by a double asterisk (**).

6. Results - NI averages

Table 6.1 displays weighted headline results at the NI level for KS1, KS2 and KS3 pupils achieving the expected level in both Communication (in English) and Using Maths, together with confidence intervals.

Table 6.1: Levels of progression in Communication and Using Maths, NI averages with Confidence Intervals 2015/16^{1,2}

% pupils achieving the expected level			2015/16		
			Best Estimate ³	Lower Estimate ³	Higher Estimate ³
KS1	Level 2 or above	Communication (English)	87.5	86.8	88.2
		Using Maths	88.4	87.7	89.1
KS2	Level 4 or above	Communication (English)	78.0	77.0	79.0
		Using Maths	78.7	77.7	79.7
KS3	Level 5 or above	Grammar and Non-Grammar:			
		Communication (English)	78.2	77.5	78.9
		Using Maths	78.7	78.0	79.4
		Grammar:			
		Communication (English)	97.6	97.2	98.0
		Using Maths	98.0	97.6	98.4
Non-Grammar:					
Communication (English)	64.1	63.0	65.2		
Using Maths	63.6	62.5	64.7		

Source: CCEA (DE)

Notes:

1. Excludes Special and Independent schools.
2. Data have been weighted to account for non-response bias.
3. The best estimate is the mean figure drawn from the sample. The lower and higher estimates are for the 95% confidence interval. There is 95% certainty that the true population value lies between the lower and higher estimates.

Results suggest that, in 2015/16, there is no significant difference in the percentage of KS1 pupils attaining the expected level in Communication from that in 2014/15. In contrast, the percentage achieving the expected level in Using Maths at KS1 has seen a fall since 2014/15 (Table 6.2).

While there is no significant difference in the percentage of pupils attaining the expected level in either subject at KS2, the KS3 outcomes show more variation. Overall, there has been a significant increase in the percentage of post-primary school pupils achieving the expected level in both Communication and Using Maths. However, the underlying data shows there has been a fall in the percentage of Grammar school pupils assessed as achieving the expected level in both subjects while those attending Non-Grammar schools have shown an increase in the percentage assessed as attaining the expected level in Communication and no significant difference in Using Maths (Table 6.2).

As a caveat when interpreting these results, it is acknowledged that these LoP assessments, first introduced in 2012/13, need time to embed and the Department recommends caution when analysing data from the first years' implementation.

Table 6.2: Levels of progression in Communication and Using Maths, NI averages 2012/13 to 2015/16¹

% pupils achieving the expected level			2012/13	2013/14 ²	2014/15 ²	2015/16 ²	Statistically significant change, 2014/15 to 2015/16? ³
KS1	Level 2 or above	Communication (English)	90.1	91.1	88.7	87.5	** ↓
		Using Maths	90.8	92.2	90.3	88.4	
KS2	Level 4 or above	Communication (English)	77.1	79.8	76.8	78.0	
		Using Maths	78.5	80.3	77.4	78.7	
KS3	Level 5 or above	Grammar and Non-Grammar:					
		Communication (English)	72.2	74.1	74.0	78.2	** ↑
		Using Maths	73.9	77.1	77.3	78.7	** ↑
		Grammar:					
		Communication (English)	96.8	98.6	98.4	97.6	** ↓
		Using Maths	98.8	99.4	99.7	98.0	** ↓
Non-Grammar:							
Communication (English)	58.8	59.3	58.5	64.1	** ↑		
Using Maths	59.8	62.1	63.5	63.6			

Source: CCEA (DE)

Notes:

1. Excludes Special and Independent schools.
2. 2013/14, 2014/15 and 2015/16 data have been weighted to account for non-response bias.
3. Statistical significance of change at the 5% level (two-tailed test) is indicated by a double asterisk (**) with the direction of change indicated by an arrow.