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Life course and cohort factors in adult basic skills levels

Future of Skills & Lifelong Learning

Evidence Review

Foresight, Government Office for Science

Life course and cohort factors in adult basic skills levels

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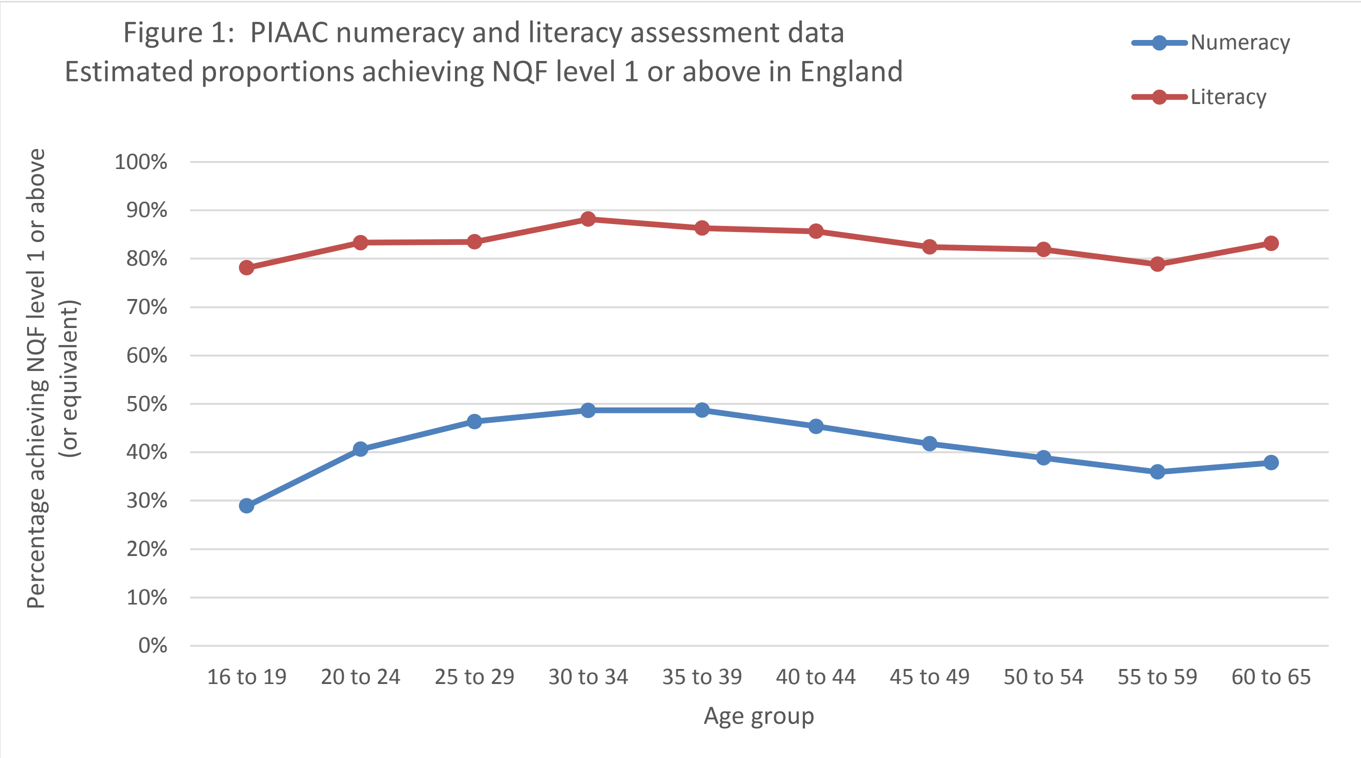
Contents

Executive summary

The average attainment in literacy and numeracy skills of adults in England follows a shallow inverted U-shaped curve across age-groups, rising during young adulthood, remaining roughly level for the main part of the working life, and then decreasing in older age. This is broadly visible in Figure 1, which shows the average literacy and numeracy performance of adults in England by 5-year age-groups, according to the PIAAC 2012 Survey of Adult Skills.



In the past, it has sometimes been assumed that this pattern was the result of cohort factors, whereby the lower than average literacy and numeracy performance of 16- to 24-year-olds in England, as measured in the PIAAC survey in 2012, would stay at that level across their lives; however, this assumption is untested. An alternative explanation is that the pattern observed is the result of life course factors, that is, young people's literacy and numeracy skills would follow the inverted U-shaped trajectory.

This review therefore addresses the following questions:

- What is the balance between life course and cohort factors in determining adult literacy and numeracy levels in England?
- Are average skills levels high enough?
- What are the implications of an insufficiently skilled population?

To address these questions, we first analysed data from eight adult basic skills surveys conducted in England (and sometimes other parts of the UK) during the period 1981-2012 (see Annex A), focusing on those for which full data were available.

In order to check for the presence of life course or cohort factors, two pairs of surveys were analysed: the first and second Skills for Life Surveys (SfL1, 2003 and SfL2, 2011); and the International Adult Literacy Survey (IALS, 1996) and the Survey of Adult Skills, also known as PIAAC (2012). The results suggest that life course factors have persisted across surveys and time points, such that average skills levels improve from ages 16–24 up to ages 25–34, before plateauing and finally declining from age 45, or even earlier. In addition, relative to cohort factors, life course factors appear to be more strongly linked to literacy and numeracy proficiency.

Finally, we compared literacy and numeracy levels from international data. The UK performs to a standard that is roughly around the OECD average. Younger age groups (16–24 years of age) were the exception to this rule, demonstrating below average attainment in literacy and numeracy. It is apparent that many young people in England leave the school system with lower literacy skills, and especially lower numeracy attainment, than their peers in other developed countries.

Introduction

The 2012 OECD Programme for International Assessment of Adult Competences (PIAAC) study highlighted that English school-leavers' basic skills attainments are poorer than those of their peers in certain competitor countries. In addition, the relationship between numeracy and literacy proficiency and age appears to follow an inverted U-shape pattern, whereby skills levels rise during young adulthood, and plateau for the main part of the working life, before decreasing in later years.

It is logically possible that the average literacy and numeracy levels of 16- to 24-year-olds in the UK shown in Figure 1 will be fixed for life; this would entail attributing the U-shaped pattern observed to cohort factors. The alternative explanation is that people's average attainment follows a shallow inverted U-shaped trend during their lives. This distinction has important implications when comparing the performance of the UK to other countries, and how skills might change throughout the life course. The analysis we present here suggests that the latter possibility is more likely, whereby the low skills levels among those aged 16–24 in 2012 will (at least partly) mitigate themselves over time.

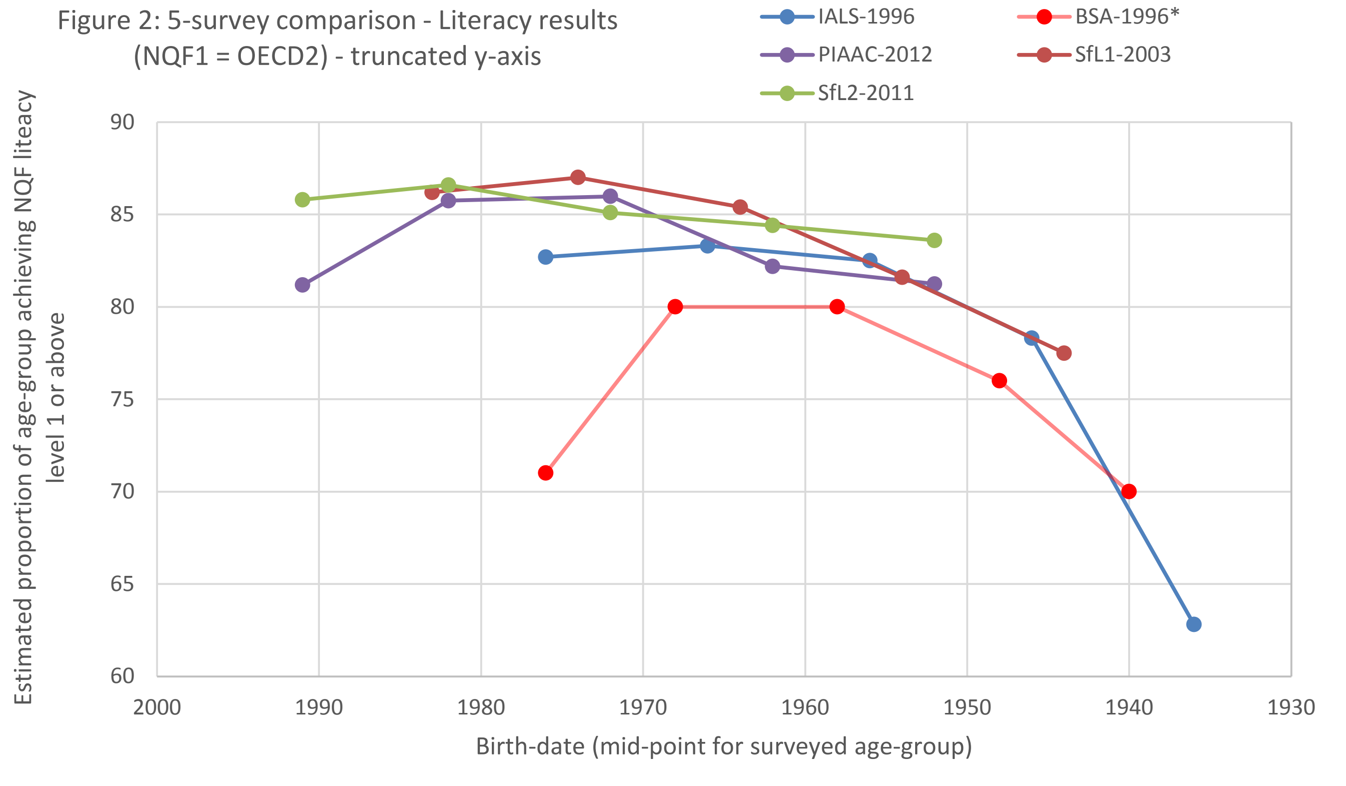
We analysed data from eight adult basic skills surveys conducted during the period 1981–2012, with particular reference to four surveys for which full data were available: the national (England-only) *Skills for Life* surveys of 2003 and 2011 (SfL1 and SfL2, respectively), and the international studies International Adult Literacy Survey (IALS), conducted throughout the UK in 1996, and the PIAAC (also known as the [International] Survey of Adult Skills), conducted in England and Northern Ireland in 2012.

2. National Surveys

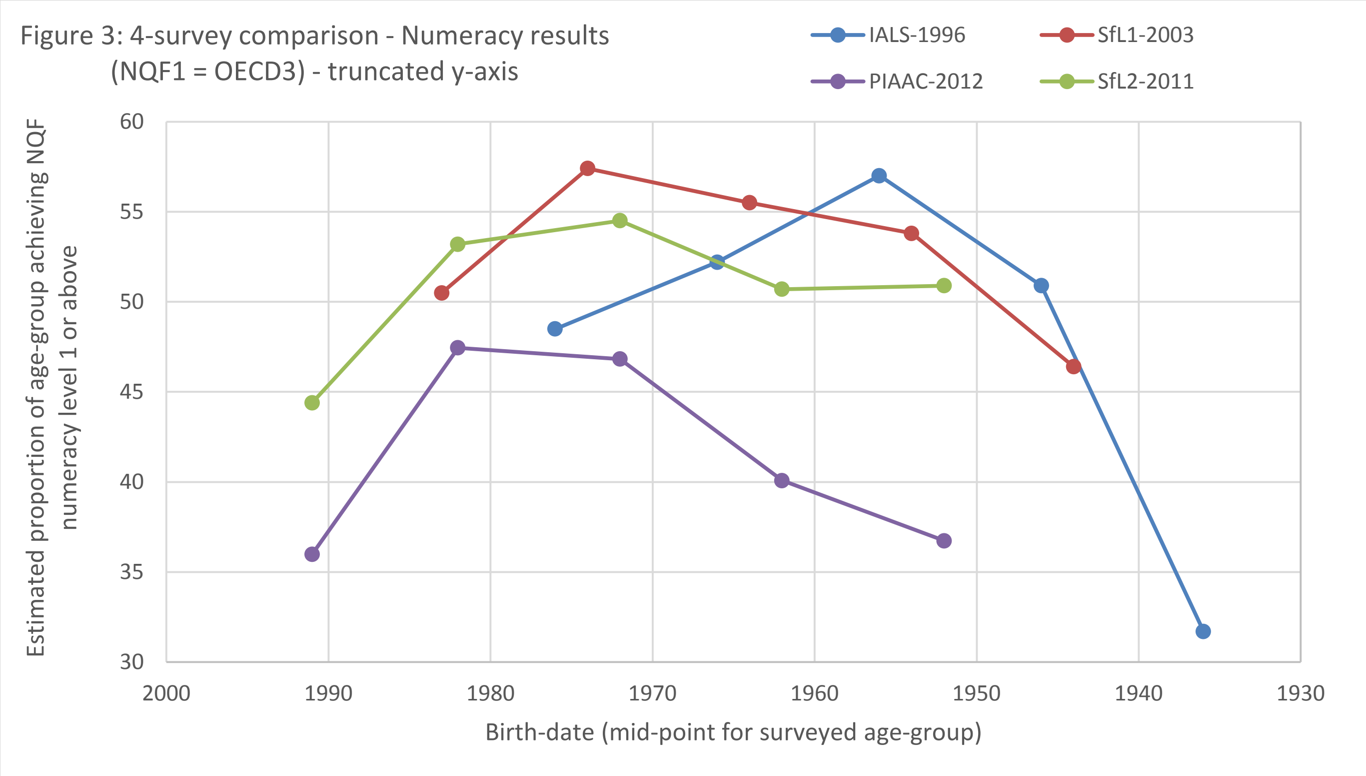
2.1 How long has the inverted U-shape pattern persisted?

Figures 2 and 3 show the estimated proportion of different age-groups achieving UK National Qualifications Framework (NQF) level 1 or above in literacy (Figure 2) and numeracy (Figure 3) in various surveys. We have arranged the curves according to the dates of birth (d.o.b.) ranges of the age groups, with each data point above the mid-point of the relevant date of birth range. For example, in the curves for PIAAC (conducted in 2012) the data points represent the average scores for the (mostly) 10-year age-groups 16-24, 25-34, etc. For the 16- to 24-year-old group in PIAAC, whose dates of birth ranged between 1988 and 1996, the mid-point is therefore above 1992, and so on for all the other data-points shown. In each case the curves follow the aforementioned U-shaped pattern, indicating that this trend has persisted for many years (Annex A). We would also argue that it shows that life course is the predominant influencing factor rather than the cohort factor (see Annex B for detailed analysis and for the references to OECD levels).

Figure 2: 5-survey comparison - Literacy results (NQF1 = OECD2) - truncated y-axis



* Data derived from the Basic Skills Agency's 2001 re-coded CD-ROM (see Annex A), but still reflecting the position in 1996.



Historical longitudinal evidence further supports these conclusions: In 1961, members of the 1946 National Survey of Health and Development (NSHD) cohort study, who were 15 years of age at the time, took the 35-item Watts-Vernon reading test (Douglas *et al*., 1968). In 1972, at the age of 26 years, a representative sample of the original participants took the test again. The average score was found to have increased (Rodgers, 1986). The only other similar case of members of one of the lifetime cohort studies taking a reading test on two occasions is the British Cohort Study 1970 (BCS70). In 1991, when BCS70 cohort members were aged 21 years, a 10% sub-sample took a specially-designed test (Ekinsmyth and Bynner, 1994). In 2004, at the age of 34, all cohort members who could be contacted took another specially-designed test, which contained seven literacy and six numeracy items repeated from the 1991 test. The data suggested that there had been very little change in the participants' literacy levels overall, but a slight improvement in numeracy (see Bynner and Parsons, 2006a, specifically Table 4.3, p.56; and Bynner and Parsons, 2006b, specifically Table 2, p. 17).

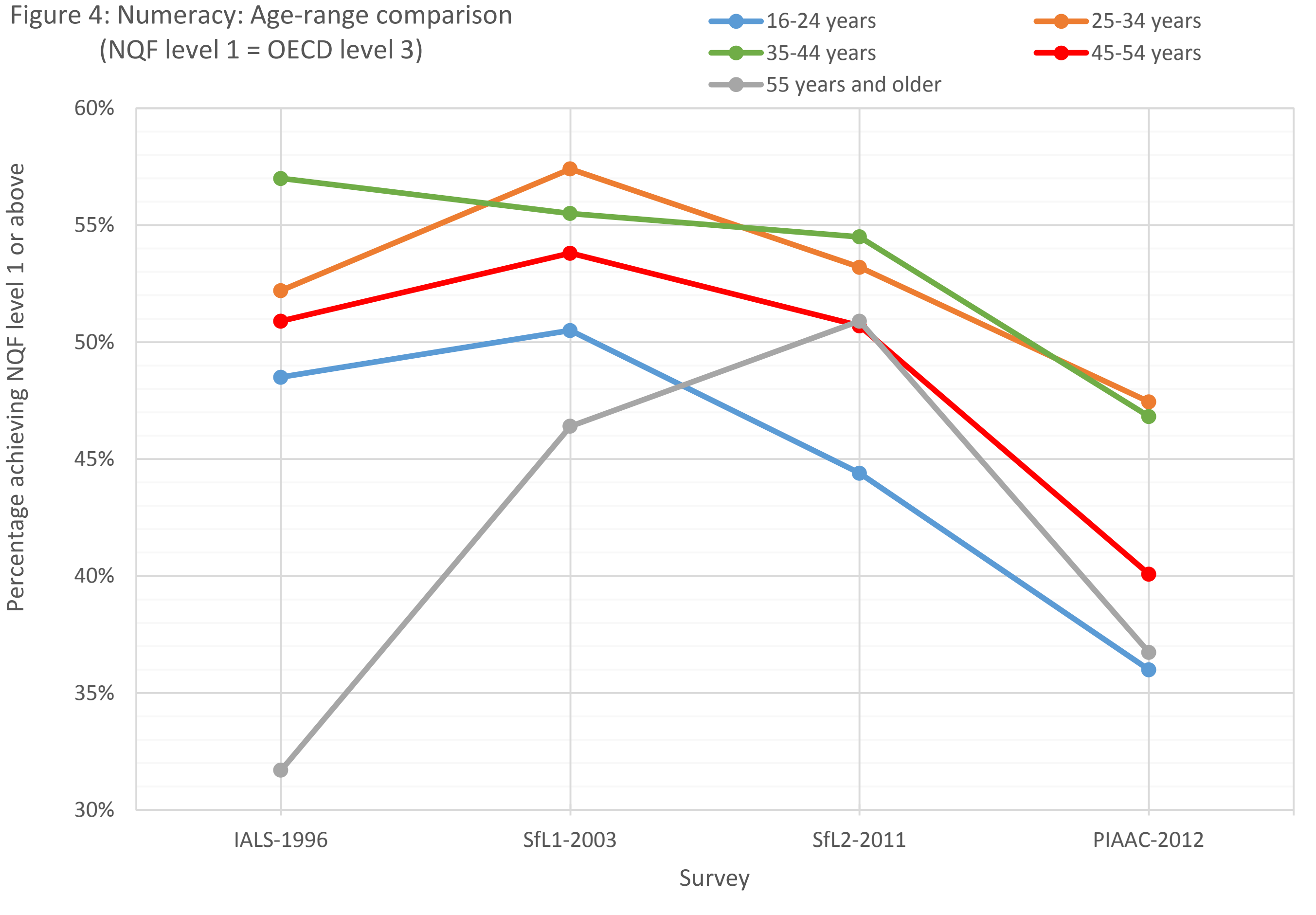
Thus both pieces of longitudinal evidence support, or at least do not contradict, the role played by life course factors in determining basic skills levels; and the findings from the 1946 NSHD study further support the notion that the inverted U-shaped pattern has a long history (see Annex B for detailed analysis).

2.2 Is there evidence of a skills gap?

Trends suggest that, although 16- to 24-year-olds in England have had poorer skills than some older age groups (and their peers in some other countries – see section 3), by the time they reached ages 25–34 years, they had caught up or overtaken in basic skills levels. The deficiency in school-leavers' skills, therefore, had reduced (for more discussion on this see section A.7 in Annex A). The 'staggered' graphs above (Figures 2 and 3) further suggest that this phenomenon is nothing new, but rather that it is a longstanding feature of the education system in England. Deeper analysis of causes and remedies is required – some attention is given to this in section 4.

Comparison of numeracy levels over time (Figure 4) reveals what may be a widening skills gap in numeracy. There is a clear downward trend after 2003 in all age groups except ages 55–64 (but see the following section on whether this possible cohort factor shows up in more detailed analyses). So school-leavers' numeracy in recent years may have been less up to the job than formerly, and this problem may have been growing. The observed trend is consistent with complaints from university departments regarding the insufficient capacity of incoming students to grasp heavily quantitative subjects due to poor mathematical skills (see Tariq and Durrani, 2009). (For more detail see section A.7 in Annex A.)

Figure 4: Numeracy: Age-range comparison
(NQF level 1 = OECD level 3)



2.3 Life course factors predominate over cohort factors

From our analysis (Annex B) we conclude that the data do not provide evidence of obvious cohort factors. Where they do occur, they appear to be weak in contrast to the clear life course factors. Our analyses also lead us to reject the assumption that the average literacy levels of 16- to 24-year-olds in the UK and elsewhere are fixed for life (a cohort factor), and would therefore remain lower here than in countries whose 16- to 24-year-olds had a higher score in PIAAC than ours (for example, South Korea and Germany, but higher than in the USA, whose 16- to 24-year-olds had a lower score in PIAAC than ours. Instead, it appears that young people in the UK will follow the shallow inverted U-shaped trend which would lift them above those in other countries by the age of 25-34 years and beyond (a life course factor).

But international comparisons from a different perspective might still raise cause for concern.

3. International Comparisons

It is clear from looking at the data from IALS (1996) – see Figures 5 and 6 – and PIAAC (2012) – see Figures 7 and 8 – that the United Kingdom performs roughly to the OECD average, deviating slightly at the extremes (generally below average at younger ages and above average at older ages). Secondly, the inverted U-shaped graph is not limited to the UK; almost every country exhibits a graph of more or less that shape. This is consistent with the much more detailed analysis of data from IALS (and the Adult Literacy and Lifeskills Survey (ALL) of 2003-07 in which the UK did not participate). Desjardins and Warnke (2012) concluded that:

The relationship between literacy and age is, on average, negative when the entire lifespan of working age adults (from 16 to 65 years) is considered.

When education is not controlled for, cohorts up to about the age of 31 years are found to score higher on average than younger cohorts.

When education is controlled for, older cohorts score on average progressively lower than younger cohorts.

There are several countries where young people have emerged from national education systems with distinctly better literacy and numeracy skills than is the case in the UK. In many of those countries, performance declines more rapidly across the age groups. This may be due to the way those countries have developed over the past few decades. Finland, for example, was left severely impoverished after the second World War, but industrialised determinedly, and has for some time achieved a very high GDP; this economic trajectory is reflected in the trend of its average literacy level from very low to very high. However, it is notable that some countries outperform the UK at all ages (Annex C). Another interesting observation is that overall levels of numeracy appear to be distinctly lower than literacy levels in Anglophone countries.

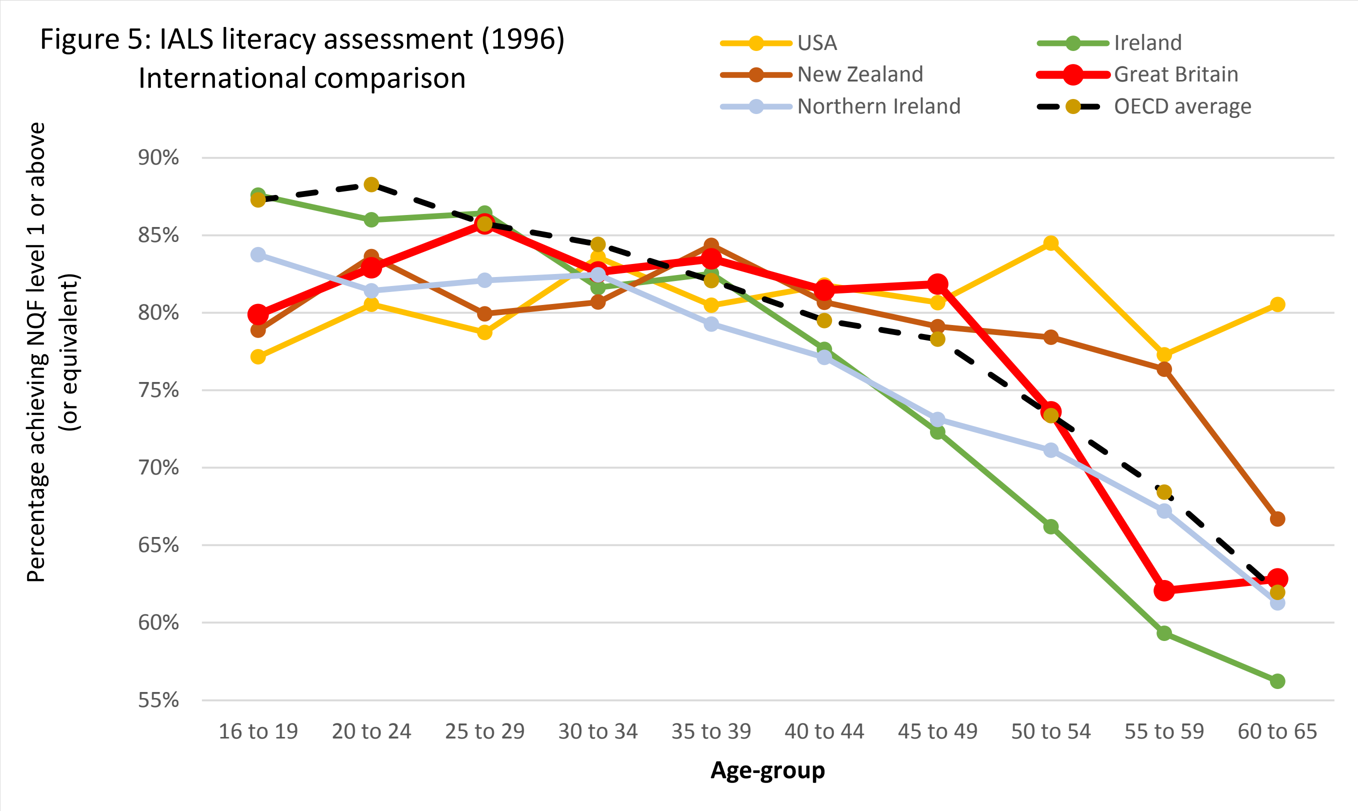


Figure 5: IALS literacy assessment (1996)
International comparison
USA
New Zealand
Northern Ireland
Ireland
Great Britain
OECD average
Percentage achieving NQF level 1 or above (or equivalent)
90%
85%
80%
75%
70%
65%
60%
55%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group

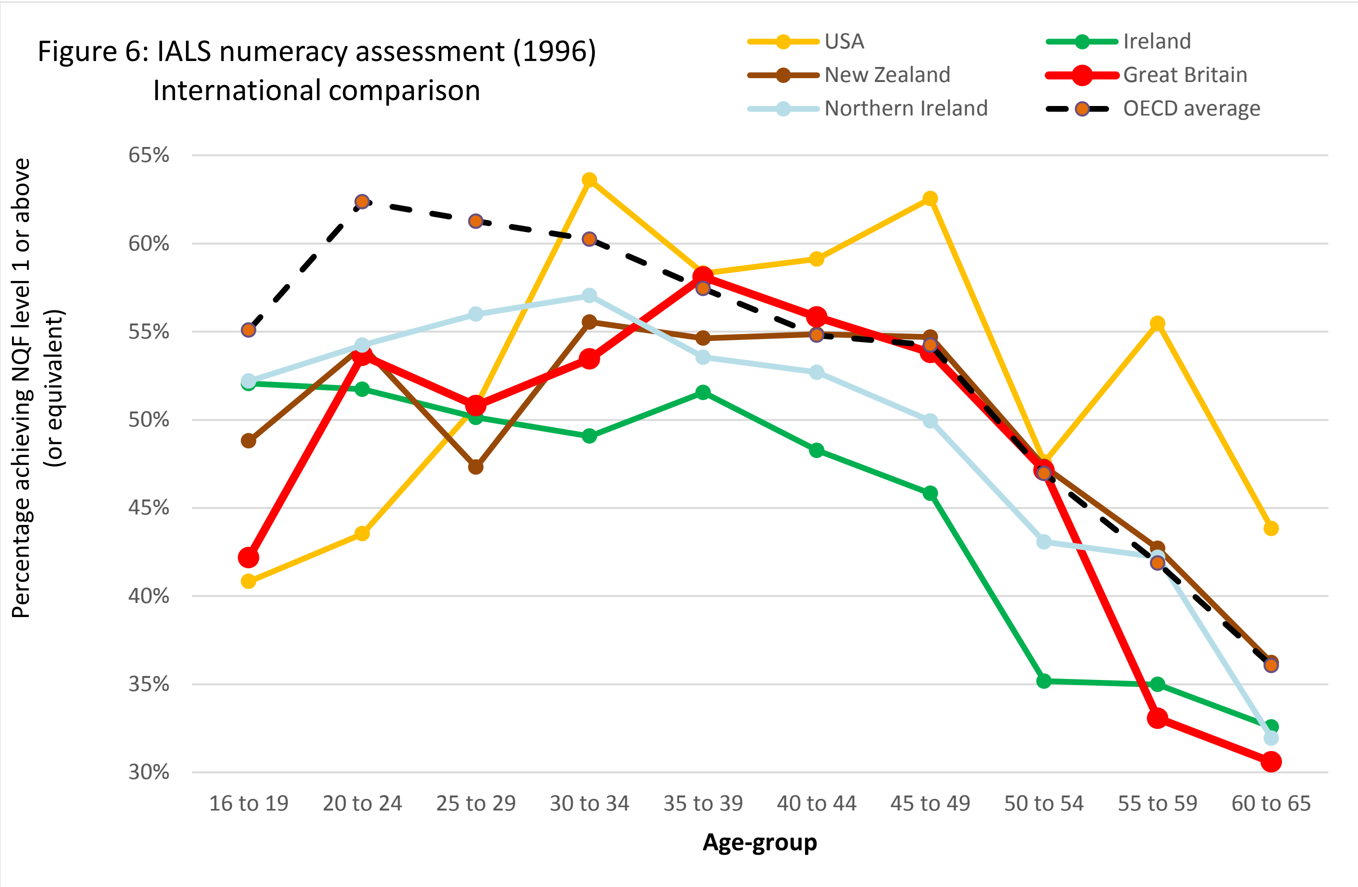


Figure 6: IALS numeracy assessment (1996)
International comparison
USA
New Zealand
Northern Ireland
Ireland
Great Britain
OECD average
Percentage achieving NQF level 1 or above (or equivalent)
65%
60%
55%
50%
45%
40%
35%
30%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group

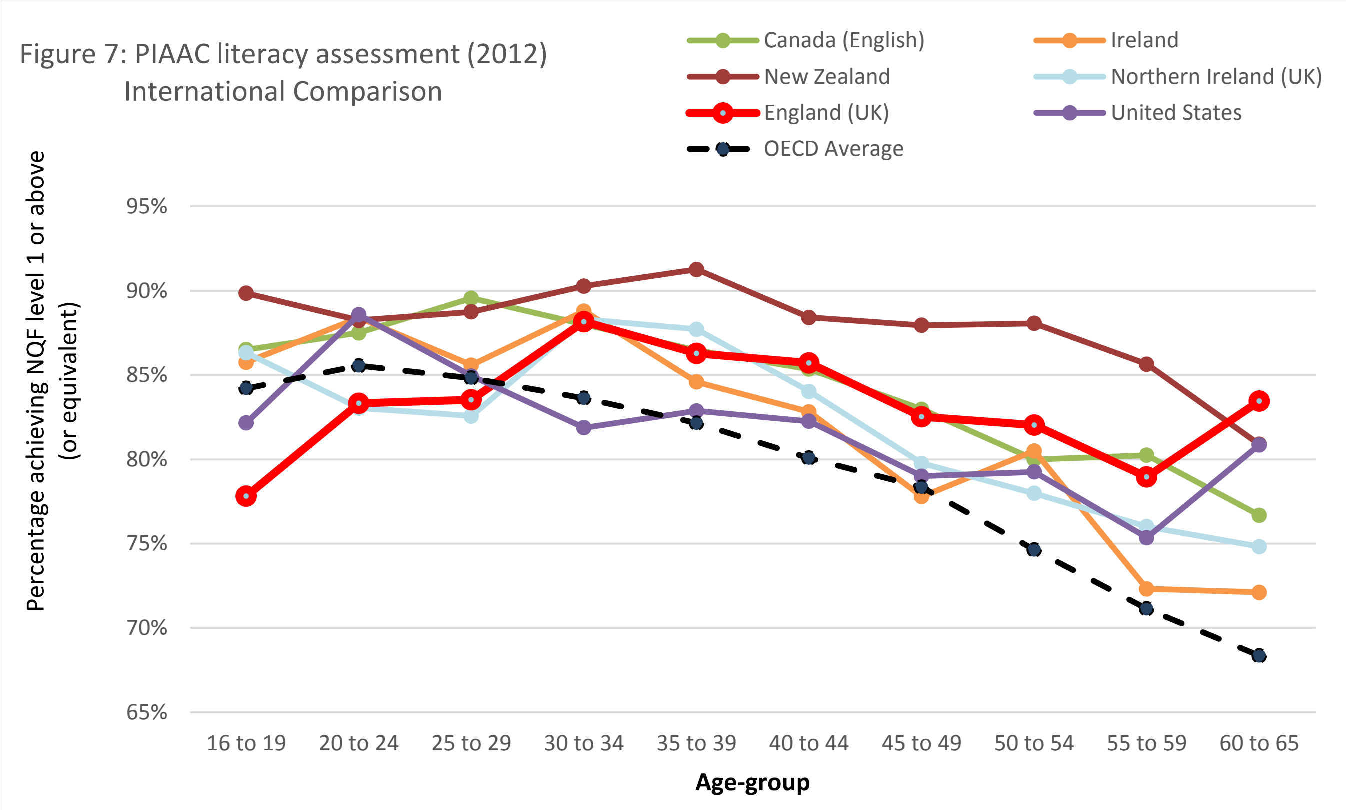


Figure 7: PIAAC literacy assessment (2012)
International Comparison
Canada (English)
Ireland
New Zealand
Northern Ireland (UK)
England (UK)
United States
OECD Average
Percentage achieving NQF level 1 or above (or equivalent)
95%
90%
85%
80%
75%
70%
65%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group

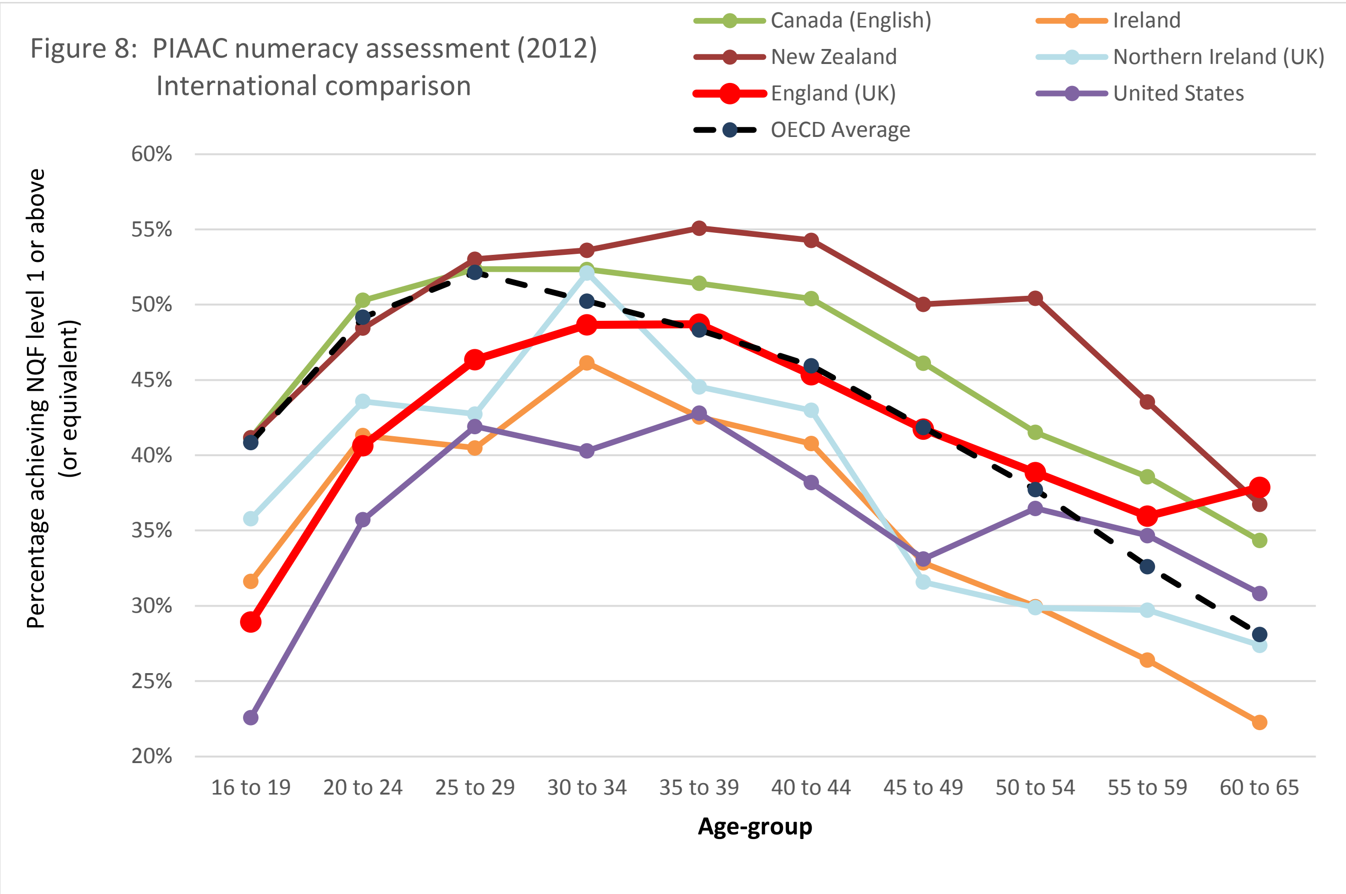


Figure 8: PIAAC numeracy assessment (2012)
International comparison
Canada (English)
Ireland
New Zealand
Northern Ireland (UK)
England (UK)
United States
OECD Average
Percentage achieving NQF level 1 or above (or equivalent)
60%
55%
50%
45%
40%
35%
30%
25%
20%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group

4. Discussion and Policy Implications

4.1 The effects of employment on basic skills

Life course factors have been consistently observed in adult literacy and numeracy achievement levels over time in England. The effect of employment, or at least involvement in the world of work, on basic skills is positive. It is argued that, in employment, people encounter the need to improve their skills. This is a possible explanation for why young people's skills improve, on average, between the ages of 16–24 and 25–34. Interruptions to employment or jobs below an employee's attained level of education result in insufficient use of their abilities, potentially leading to skill atrophy (Calero et al., 2016). There is confirmatory evidence of loss of skills among adults in England who are unemployed (Bynner and Parsons, 1998, 2006a). Bynner and Parsons' (1998) analysis showed that, relative to literacy, the loss of numeracy skills was more acute, and started to deteriorate at an earlier point, following loss of employment. Additionally, unemployed people tend to have worse spelling and punctuation than those in work (Basic Skills Agency [BSA], 1996).

There is some evidence that the decline in skills in later life may be becoming less severe: the 55–64 age group seem to have performed less far below the 45-54 age group in later surveys than in earlier ones, especially in literacy. This may be the effect of people working until later in life than previously. Overall, the policy implication is that higher levels of employment/lower levels of unemployment might contribute to improving average skills levels. It is worth noting, however, that although an increasing number of jobs in the UK are currently insecure, part-time and low-paid, their literacy and numeracy demands have not necessarily lessened (cf. the increasing numbers of minicab and delivery drivers).

Given the rising dependency ratio and that people now retire from work later in life, policy should also address the need to maintain older people's skills. Some of this can be done through effective adult literacy and numeracy provision (Brooks et al., 2007; Coben et al., 2007; Grief et al., 2007), but participation and achievement rates are low (see Bathmaker, 2007; Rhys Warner et al., 2008; Vorhaus et al., 2009) and rates of progression, that is, of adult learners moving on from a course at one level of the NQF to another course, are even lower (Adams et al., 2010). Therefore employer-provided training will be crucial in up-skilling the workforce.

There is also a strong association between levels of inequality in societies and degrees of difference in skills according to socioeconomic status (Sahlberg, 2011, 2015; Wilkinson and Pickett, 2009), such that the decline in average levels of numeracy and literacy down the socio-economic scale is less acute in more equal societies. The policy implication here would seem to be that reducing inequality may contribute to raising the average skills levels of adults.

4.2 Implications for school and pre-school systems

Given that young people in this country leave the school system with lower than average literacy and particularly numeracy levels than their peers in some other countries, the preschool and school systems must of course be central to the push to raise attainment. Whole volumes have been, and continue to be, written on this, so here we restrict our comments to a few areas in which we have expert knowledge.

- **Family literacy programmes have been shown to benefit young children's development.** This is true both in this country (Brooks et al., 1996, 1997, 1999; Swain et al., 2009, 2015) and internationally (Brooks et al., 2008; Carpentieri et al., 2011).

- **There is an argument for improving the numeracy levels of primary teachers.** Most primary teachers are arts and humanities graduates, who appear to have steered themselves away from quantitative subjects during their upper secondary and tertiary education. There is evidence for teachers unwittingly transmitting their bias against numeracy to their pupils (Goulding et al., 2002; Bibby, 2002). Current degree courses for primary teachers strengthen them further in subjects in which they are already strong, while neglecting to improve their grasp of subjects in which they are weaker, but which they are going to have to teach.

- **Lasting change requires sustained effort and commitment over decades.** Such commitment is exemplified by Finland (see again Sahlberg 2011, 2015) which, over a period of 30 or more years, moved from an impoverished, underdeveloped nation to the top of the international educational league tables. Sahlberg gives a first-hand, comprehensive account of how Finland built a world-class education system during the past three decades. He traces the evolution of education policies in Finland. He shows how, rather than relying on competition, choice (e.g. selection at secondary level was abolished), and external testing of students, education reforms in Finland have focused on professionalising teachers' work (all teachers are trained to Master's level), developing instructional leadership in schools, and enhancing trust in teachers and schools. Above all, time was spent trying new ideas out on smaller scales, and then dropping those that did not work for Finland before rolling out those that did nationally.

Annex A - Statistical analysis of PIAAC and earlier data from surveys of the basic skills levels of adults in England

A.1 The database: surveys of the basic skills levels of adults in England

There have been eight such surveys over the period 1981-2012, as shown in Table 1 (which also shows the acronyms we have used). A survey led by the Advisory Council for Adult and Continuing Education (ACACE) and the International Numeracy Survey (INS) covered only numeracy, while the other six covered both literacy and numeracy. The age ranges were broadly similar in all but the Older and Younger (O&Y) study. The earliest-born participants in any of the surveys were those over the age of 65 years who took part in the ACACE survey; they would have been born about 1917 or just before. The most recently born survey members were the 16-year-olds involved in PIAAC, who were born in 1996.

Table 1: Cross-sectional surveys of adult basic skills in England, 1981-2012

Survey	Date	Ages	Sources
Advisory Council for Adult and Continuing Education (ACACE)	1981	16-65+	ACACE (1982), Social Surveys (Gallup Poll) Ltd (1981)
Older and Younger (O&Y)	1993-94	22-24, 32-34, 42-44, 52-54, 62-64, 72-74	Basic Skills Agency (1995)
International Adult Literacy Survey (IALS)	1996	16-65	Carey *et al.* (1997)
International Numeracy Survey (INS)	1996	16-60	Basic Skills Agency (1997a)
BSA survey of needs (BSA1, BSA2)	1996-97*	16-60	Basic Skills Agency (1997b, 2001)
1st *Skills for Life* survey (SfL1)	2003	16-64	Williams *et al.* (2003)
2nd *Skills for Life* survey (SfL2)	2011	16-65	BIS (2012)
Survey of Adult Skills (PIAAC)	2012	16-65	BIS (2013)

* The data from this survey have been issued on 2 CD-ROMs, first in 1997 with boundaries between levels set against the BSA's pre-2000 Communication and Numeracy Standards, then in 2001 with some boundaries adjusted to correspond to the OECD boundaries used in IALS and (later) in PIAAC. The data in this report have been derived from the 2001 CD-ROM.

Key:

BSA Basic Skills Agency

PIAAC Programme for the International Assessment of Adult Competences

Some of these surveys were restricted to England (BSA1 & 2, SfL1 & 2), but the others covered England and Wales (O&Y, INS), England, Wales and Scotland (IALS – Northern Ireland took part as a separate jurisdiction; also ACACE), or England and Northern Ireland (PIAAC), and the data for England can be separated out only within PIAAC. However, since 84% of the population of the UK live in England, separate analyses for England would differ very little from those for the wider groupings.

For the purposes of this review we did not use data from lifetime cohort studies (with the two exceptions mentioned in section 2.1 and in section A.6 in Annex A), despite their proven value for social policy (Pearson, 2016), because each covers only one age-cohort, and even then only those born in a particular week in 1946, 1958 or 1970. Nor did we use data from surveys of basic skills *learners* since they are by definition not representative of the population as a whole.

The amount of evidence on the surveys available to us varied widely. For IALS, SfL1 & 2, and PIAAC we obtained full datasets. Our attempts to track down full datasets for ACACE, O&Y, INS and BSA1&2 were unavailing. However, for ACACE, O&Y, INS and BSA2, documents we obtained allowed us to construct graphs differentiating various age-cohorts. For BSA1 we did not have even the data to construct such a graph.

The assessment instruments also varied widely. Only SfL1 & 2 used all the same items. A few items from IALS were used in BSA1 & 2, and it is likely (we were not able to check this) that a few from IALS were re-used in PIAAC – but in neither case would there have been enough to base detailed analyses on. Apart from these exceptions, each survey seems to have been based on a separate and specially-devised set of items. However, the statistical techniques used in IALS and PIAAC were the same, and ought to have reliably placed the data on a comparable scale.

It should also be noted that IALS provided separate estimates for 'prose literacy' (based on continuous texts) and 'document literacy' (based on non-continuous texts such as timetables). For this report we have merged the two, using arithmetic means. There was no such distinction in PIAAC.

A.2 Two early numeracy-only surveys; average score data

Previous work (Brooks, 1997, 1998) demonstrated the inverted U-shape of the data across age groups in O&Y according to average scores that were calculated making various assumptions, e.g. what 'scores' to attribute to different attainment levels. Other data tables (see Rashid and Brooks, 2010) showed that the data distributions in several other surveys have this shape. Using average 'scores' for population samples is an unsophisticated approach because it does not show the extent of low or adequate attainment and, as such, we argue below for a more appropriate metric for most of the results reported here. However, average scores were the only way we had of presenting data on ACACE and INS because the only information provided by the reports on them in our possession was number of items correct out of 11 (ACACE) or 12 (INS), and there was no principled way of relating numbers of items correct to levels. Table 2 and Figures 9a and 9b present the data from these surveys.

Table 2: Average scores (number of numeracy items correct) in ACACE and INS, by age-group and overall

Age-group Survey	16-24	25-34	35-44	45-54	55-60	45-64	65+	Overall	Maximum
ACACE	7.97	8.47	8.14			7.49	6.25	7.7*	11
INS	7.1	8.3	7.7	8.8	7.6			7.9	12

* or 8.0 if over-64s excluded

Figure 9a: Average scores (number of numeracy items correct) in ACACE by age group

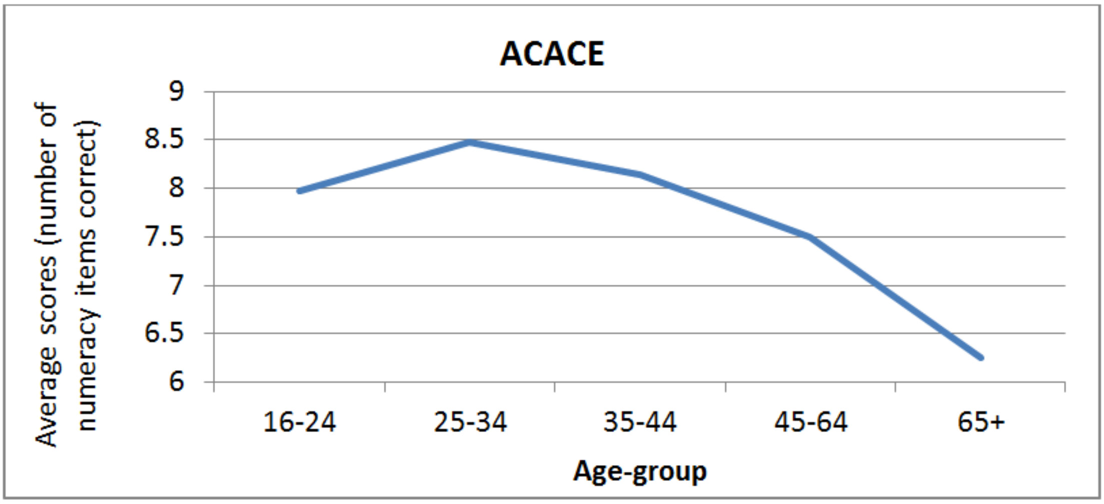
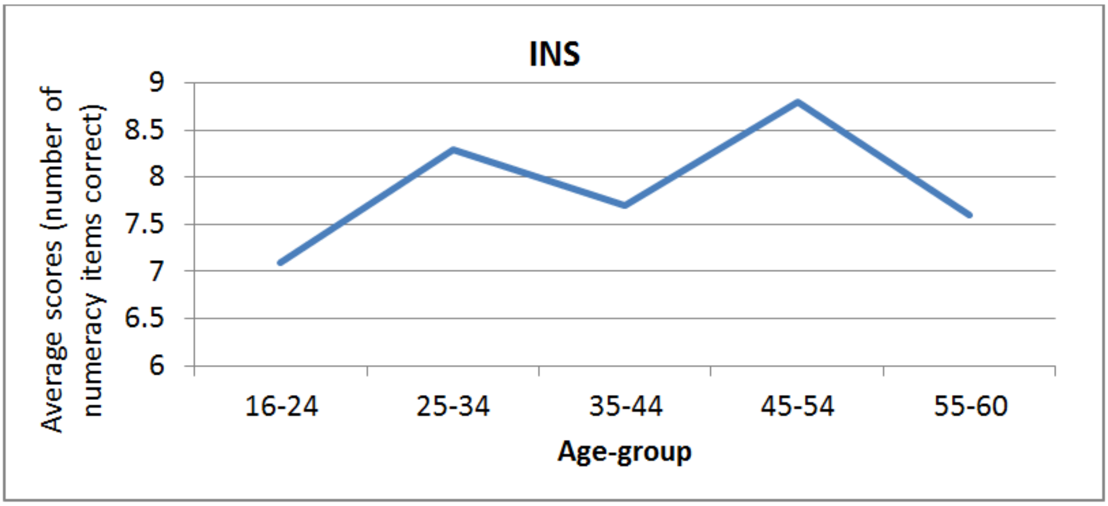


Figure 9b: Average scores (number of numeracy items correct) in INS, by age group



The ACACE data fit the description of an inverted U-shaped curve, with a rise in numeracy skills as we move from 16- to 24-year-olds to the subsequent group, and the two oldest age groups distinctly below the others. But, curiously, the INS data do not follow the same trend: the youngest age-group had the lowest average score, and above that the graph zigzags. No obvious explanation for the observed pattern in INS, or for the discrepancy between the surveys, presents itself. Also, the INS result was very low relative to other countries, as we show in the sections on international comparisons, below.

A.3 Literacy and numeracy surveys; proportions with Level 1 or above

All the remaining surveys analysed here covered both literacy and numeracy. For the four surveys for which we had full data (SfL1&2, IALS, PIAAC), plus BSA2 and (sometimes) O&Y, the percentage of adults scoring at UK NQF Level 1 or above, or the OECD equivalent, was graphed. We could instead have chosen to show average scores, but those would have been subject to the limitations already mentioned. The choice of 'Level 1 or above' as the criterion to be analysed and displayed was largely forced on us by the nature of the data, as we explain below; however, it also had the virtue of being the government’s preferred criterion for both national data and international comparisons. The only other way of displaying the data in line with that criterion would have been to show the proportions scoring below Level 1 – this would have produced graphs which would have been the exact inverse (horizontal mirror-images) of those in the rest of this review. While that would have stressed the extent of the basic skills deficits in this country, such graphs would have been less easy to interpret against our main research interest – the balance between life course and cohort factors.

For literacy, the choice of ‘Level 1 or above’ meant comparing performance at this UK level or above in national surveys with performance at OECD Level 2 or above in international surveys because the numbering of levels in the two scales is out of sync by one. However, in 2001 the (then) Department for Education and Employment and the BSA deliberately re-aligned the UK Entry level/Level 1 boundary for literacy with the OECD Level 1/Level 2 boundary (they had previously been a few percentiles apart; for details of this adjustment see Brooks *et al*., 2001: 121–122 and Rashid and Brooks, 2010: 63-64), and the BSA therefore issued the revised CD-ROM which we have called BSA2. This boundary between levels is the only one which the five surveys have in common, as shown in Table 3.

Table 3: Literacy levels against which the five surveys of most interest were reported

<table>
<tr><th>UK NQF scale</th><th>BSA2</th><th>SfL1</th><th>SfL2</th><th>IALS</th><th>PIAAC</th><th>OECD scale</th></tr>
<tr><td rowspan="2">Level 3+</td><td rowspan="4"></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="2"></td><td rowspan="2"></td><td>Level 5</td></tr>
<tr><td>Level 4</td></tr>
<tr><td>Level 2</td><td></td><td></td><td>Level 3</td></tr>
<tr><td>Level 1</td><td></td><td></td><td></td><td></td><td>Level 2</td></tr>
<tr><td>Entry level 3</td><td rowspan="3"></td><td></td><td></td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3">Level 1</td></tr>
<tr><td>Entry level 2</td><td></td><td></td></tr>
<tr><td>Entry level 1</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>Below Entry level</td><td></td><td></td><td></td><td>Below level 1</td></tr>
</table>

Table 3 shows, for each survey, which literacy levels its data were reported against: the British surveys reported against the UK NQF scale; and the international surveys against the OECD scale. Where boxes stretch across levels (vertically), the relevant reports do not give differentiated data, so it is clear that the UK Entry level/Level 1 boundary is the only one the five surveys have in common. Although the pre-2000 Entry (then called Foundation) level/Level 1 boundary was slightly lower, occasionally we will treat it as sufficiently like the later one for O&Y data to be included with those from the five surveys of most interest.

For numeracy, in line with the government’s preferred equivalences, the UK Entry level/Level 1 boundary is instead aligned with the OECD Level 2/Level 3 boundary, as shown in Table 4. Again, this is the only boundary the five surveys have in common.

Table 4: Numeracy levels against which the five surveys of most interest were reported

UK NQF scale	BSA2	SFl1	SfL2	IALS	PIAAC	OECD scale
Level 3+						Level 5
Level 2						Level 4
Level 1						Level 3
Entry level 3						Level 2
Entry level 2						Level 1
Entry level 1						
Below Entry level						Below level 1

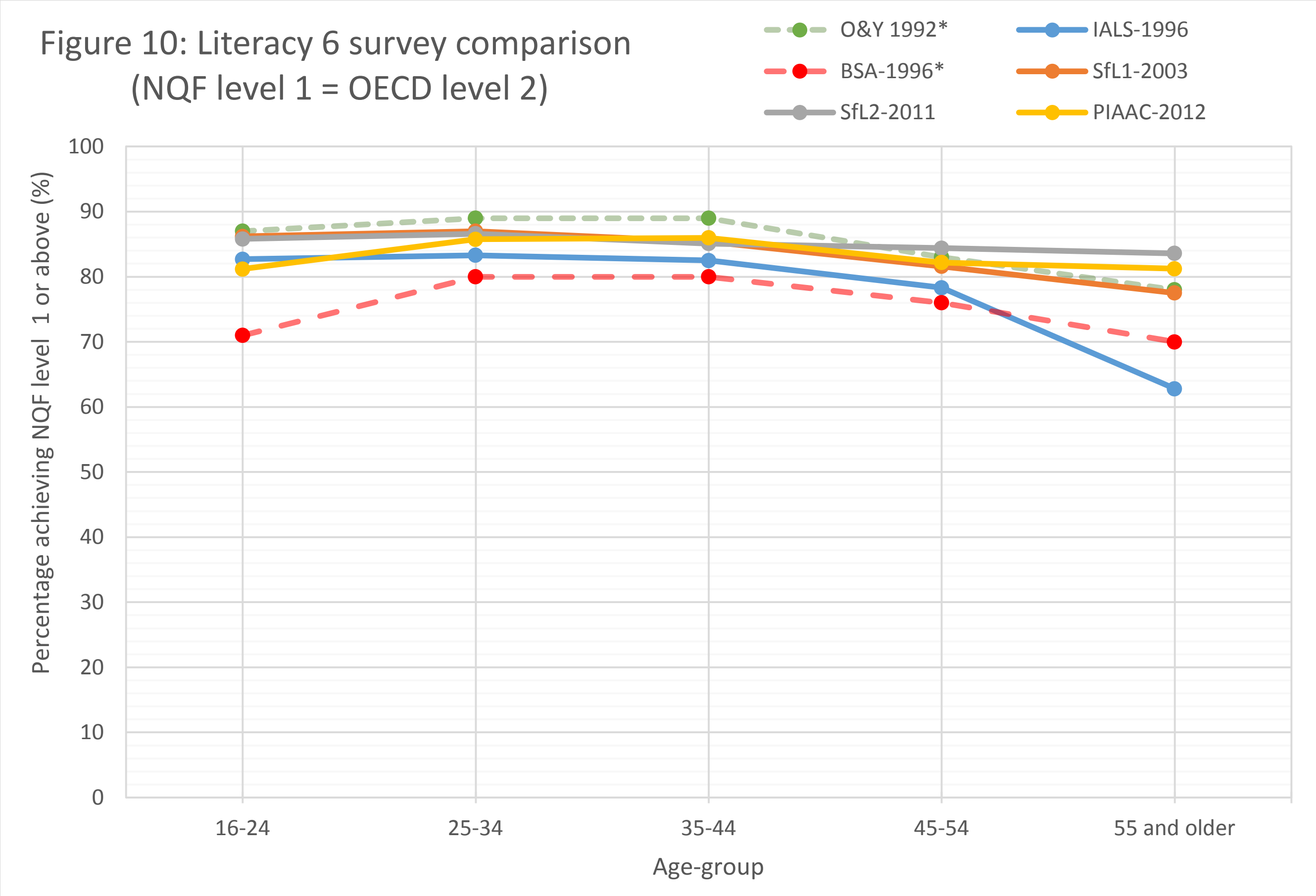
A.4 Results for the surveys of most interest, plus O&Y

Tables 5 (literacy) and 6 (numeracy) show the percentages of adults in England at UK Level 1 or above by 10 year age bands in the five surveys of most interest, plus figures from O&Y against its idiosyncratic age groups. Figures 10 and 11 show the literacy and numeracy age distributions for all six surveys (but omitting the oldest age group in O&Y, which would prolong the dive at the right-hand side).

Table 5: Percentages of adults in England at UK Level 1 or above for literacy, by survey and age band (standard errors in brackets where full dataset available)

Age-group Survey	16-24	25-34	35-44	45-54	55-64	
IALS (1996)	82.7 (2.1)	83.3 (1.5)	82.5 (1.6)	78.3 (1.9)	62.8 (2.1)	
BSA2 (1996*)	71	80	80	76	70	
SfL1 (2003)	86.2 (1.2)	87 (1)	85.4 (0.9)	81.6 (1.1)	77.5 (1.2)	
SfL2 (2011)	85.8 (1.5)	86.6 (1.2)	85.1 (1.3)	84.4 (1.2)	83.6 1.1)	
PIAAC (2012)	81.2 (2.1)	85.8 (1.5)	86.0 (1.4)	82.2 (1.5)	81.2 (1.5)	
Age-group	**22-24**	**32-34**	**42-44**	**52-54**	**62-64**	**72-74**
O&Y (1993-94)	87	89	89	83	78	71

* Data derived from the Basic Skills Agency's 2001 re-coded CD-ROM (see Annex A), but still reflecting the position in 1996

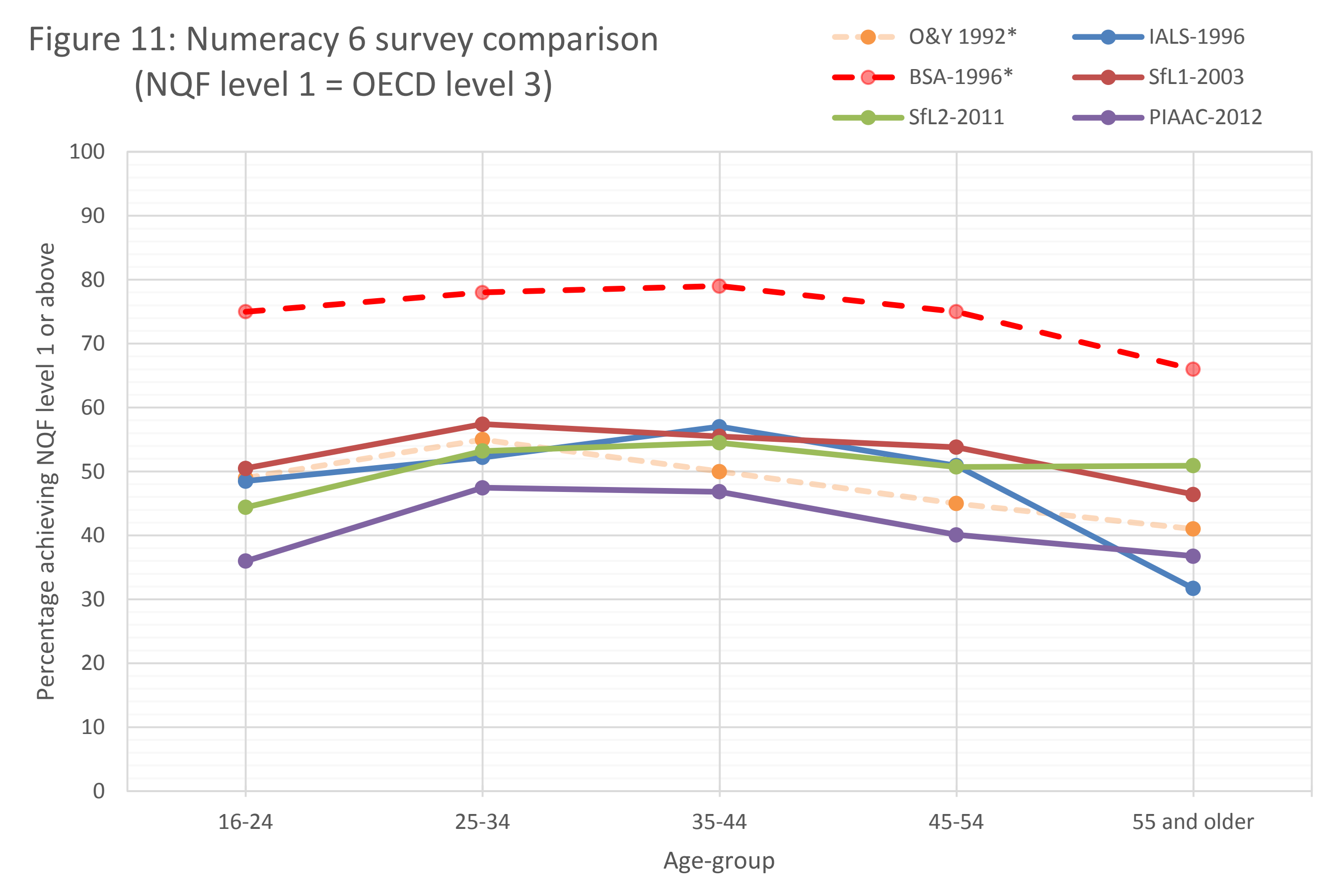


*Dashed lines indicate curves obtained from summary statistics only, rather than original datasets. Note that for the Older and Younger survey (O&Y, above), only a very small subset of each age-range was actually tested.

Table 6: Percentages of adults in England at UK Level 1 or above for numeracy, by survey and age-band (standard errors in brackets where full dataset available)

Age-group Survey	16-24	25-34	35-44	45-54	55-64	
IALS (1996)	48.5 (2.8)	52.2 (2.0)	57.0 (2.0)	50.9 (2.2)	31.7 (2.0)	
BSA2 (1996*)	75	78	79	75	66	
SfL1 (2003)	50.5 (1.7)	57.4 (1.4)	55.5 (1.2)	53.8 (1.4)	46.4 (1.4)	
SfL2 (2011)	44.4 (2.0)	53.2 (1.7)	54.5 (1.5)	50.7 (1.6)	50.9 (1.5)	
PIAAC (2012)	35.99 (2.7)	47.45 (2.1)	46.82 (1.7)	40.08 (2.2)	36.74 (2.2)	
Age-group	22-24	32-34	42-44	52-54	62-64	72-74
O&Y (1993-94)	49	55	50	45	41	25

* Data derived from the Basic Skills Agency's 2001 re-coded CD-ROM (see Annex A), but still reflecting the position in 1996



*Dashed lines indicate curves obtained from summary statistics only, rather than original datasets. Note that for the Older and Younger survey (O&Y), only a three-year subset of each age-range was actually tested.

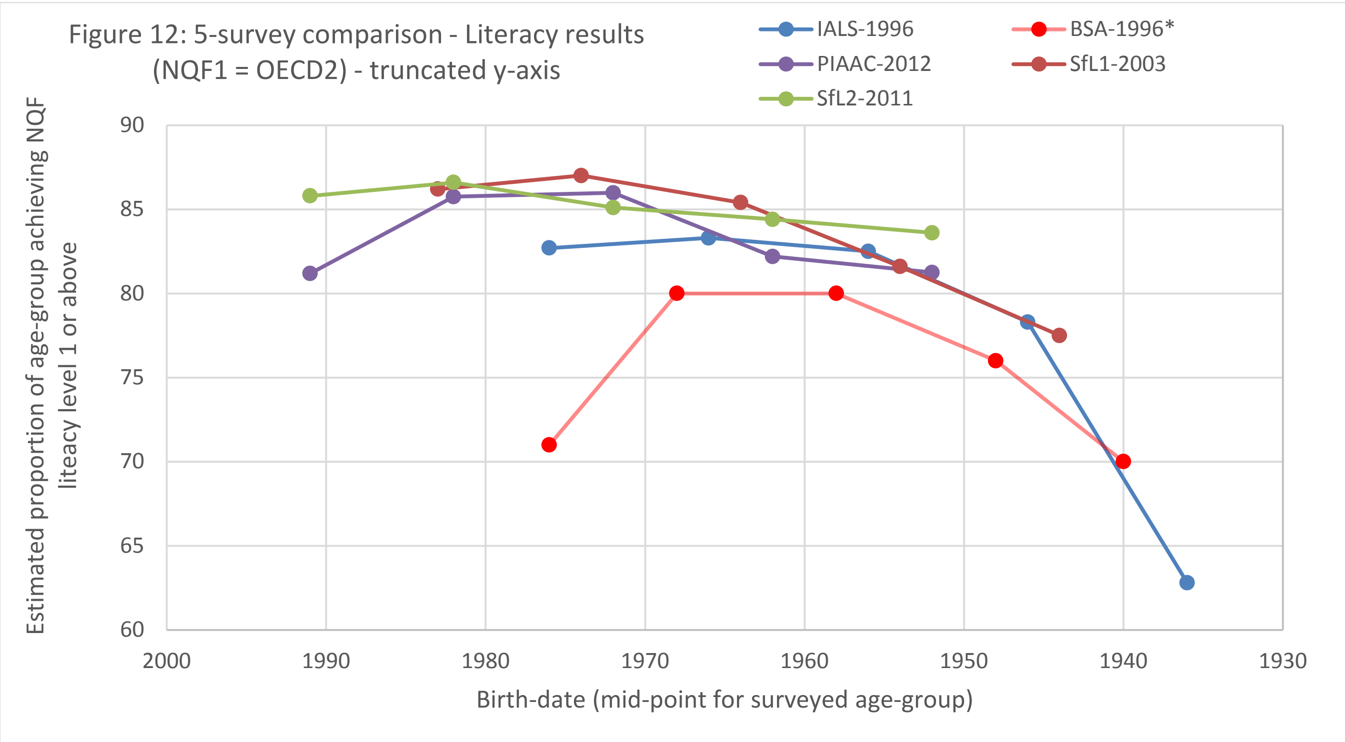
A.5 The inverted U-shaped curve is ubiquitous

Taking numeracy first, the BSA curve in Figure 11, based on the 2001 CD-ROM, is substantially out of line with all the others. We could not show the curve based on the 1997 CD-ROM because the age-group data were not available. However, we know that it would have been lower than the 2001 curve. The 1997 version indicated that, nationally, 67% of adults aged 16–60 years exhibited numeracy skills that exceeded Level 1 of the Agency's pre-2001 Numeracy Standards, based on the threshold for Level 1 being defined as 14 out of the 18 items in the test having been answered correctly (Basic Skills Agency, 1997b). When the BSA issued the revised CD-ROM in 2001, the threshold for Level 1 had been lowered to 13 answers correct out of 18. According to the results of the updated survey, the proportion of adults having literacy above (the new) Level 1 was 76%. This was done deliberately to make the figure for England almost exactly equal to the IALS figure for Britain of 77% at OECD Level 2 or above (see Rashid and Brooks, 2010: 54). If the IALS curve in Figure 8 had been based on the age distribution associated with that overall figure of 77%, it would have been rather close to the BSA2 curve – but since then a further decision has been taken within government, for numeracy survey data, to equate UK NQF Level 1 with OECD Level 3, which produces the IALS curve shown. That aside, all six numeracy curves show the inverted U-shape (some more markedly than others), the only oddity being the very slight uptick at age 55–64 in the case of SfL2 (2011).

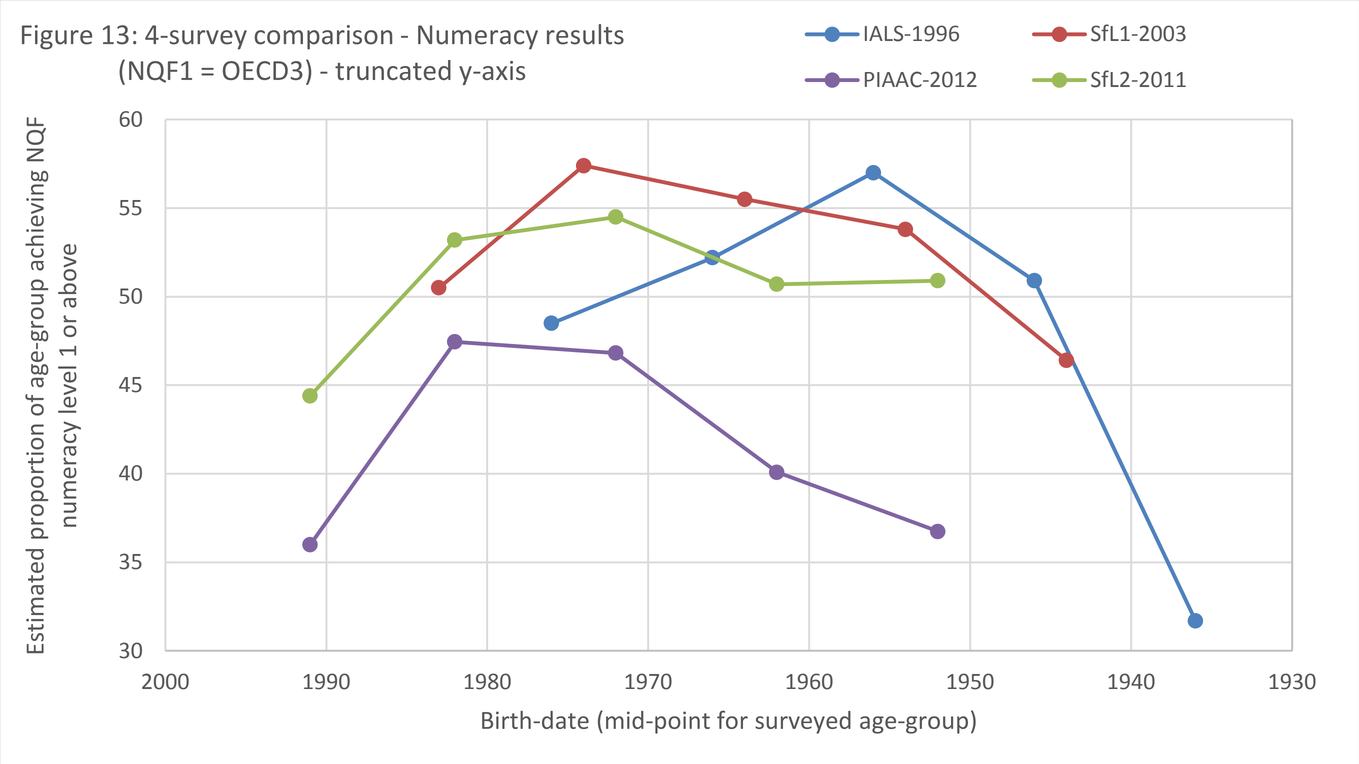
The inverted U-shape is also clear in some of the literacy curves in Figure 10 (O&Y, IALS, BSA2), but the graphs for SfL1 & 2 and PIAAC are much flatter, so that the trend in the data is more clearly visible in Table 5.

A.6 How long has this pattern persisted?

A very long time – see Figures 12 and 13 below, in which we have put various curves on ‘staggered’ graphs (omitting BSA2 numeracy, which would distort Figure 13), and truncated the y-axis to allow the curves to be distinguished (we acknowledge that this exaggerates the differentiation.) In both Figures, instead of superimposing the curves on each other, we have arranged them according to the dates of birth (d.o.b.) ranges of the age groups, with each data point above the mid-point of the relevant d.o.b. range. In order to keep the curves recognisable as those from Figures 2 and 3, we have omitted O&Y (which has very short d.o.b. ranges), the y-axis is again truncated, and the d.o.b. ranges are sorted from right to left, such that the oldest participants in any of the surveys included (the 55- to 64-year-olds in IALS, mid-point d.o.b. 1936) are on the far right, while the youngest (16- to 24-year-olds in PIAAC, mid-point d.o.b. 1992) are on the far left. (Any correlation with political tendency is purely coincidental.)



* Data derived from the Basic Skills Agency’s 2001 re-coded CD-ROM (see Annex A), but still reflecting the position in 1996



The data indicate that the phenomenon of the inverted U-shaped pattern is by no means new. We would also argue that it shows that life course is the predominant influencing factor rather than the cohort factor – this has been verified by unpicking the balance between them (Annex B).

Looking now at other historical longitudinal studies, in 1961, at age 15 years, the members of the 1946 lifetime cohort study, the National Survey of Health and Development (NSHD), all took the 35-item Watts-Vernon reading test (N≈5,500) (Douglas *et al*., 1968). In 1972, when the participants were 26 years of age, a representative sample of the cohort (N>3,000) took the test again. The average score had increased (Rodgers, 1986).

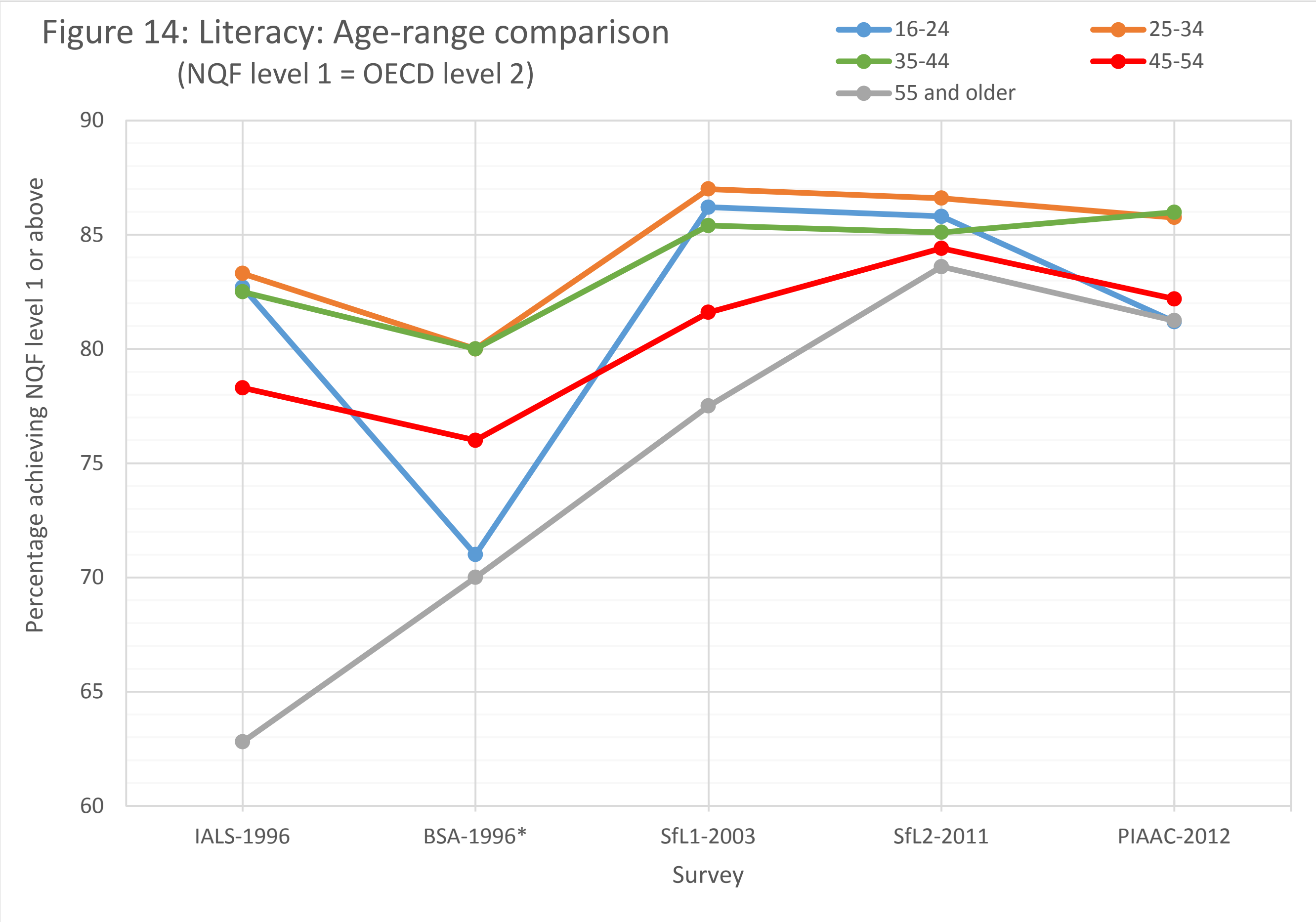
The only other instance of participants in a lifetime cohort study taking a reading test on two occasions is the British Cohort Study 1970 (BCS70), whose members were all born in a week in April that year. In 1991, when they were 21 years old, a 10% sub-sample (N=1,627) took a specially designed test (Ekinsmyth and Bynner, 1994). In 2004, when they were 34, all those cohort members who could be contacted (N≈9,500) took another specially designed test, which contained seven literacy and six numeracy items repeated from the 1991 test (with a few minor updates, e.g. to reflect inflation). This is an insubstantial basis on which to deduce trends over time, but the data suggested that there had been very little change in the participants' literacy levels overall, but a slight improvement in numeracy (see Bynner and Parsons, 2006a, especially Table 4.3, p.56; and Bynner and Parsons, 2006b, especially Table 2, p. 17).

Thus both pieces of longitudinal evidence support, or at least do not contradict, the impact of life course factors; and the NSHD finding further supports the idea that the inverted U-shaped pattern has a long history.

A.7 Is there evidence of a skills gap?

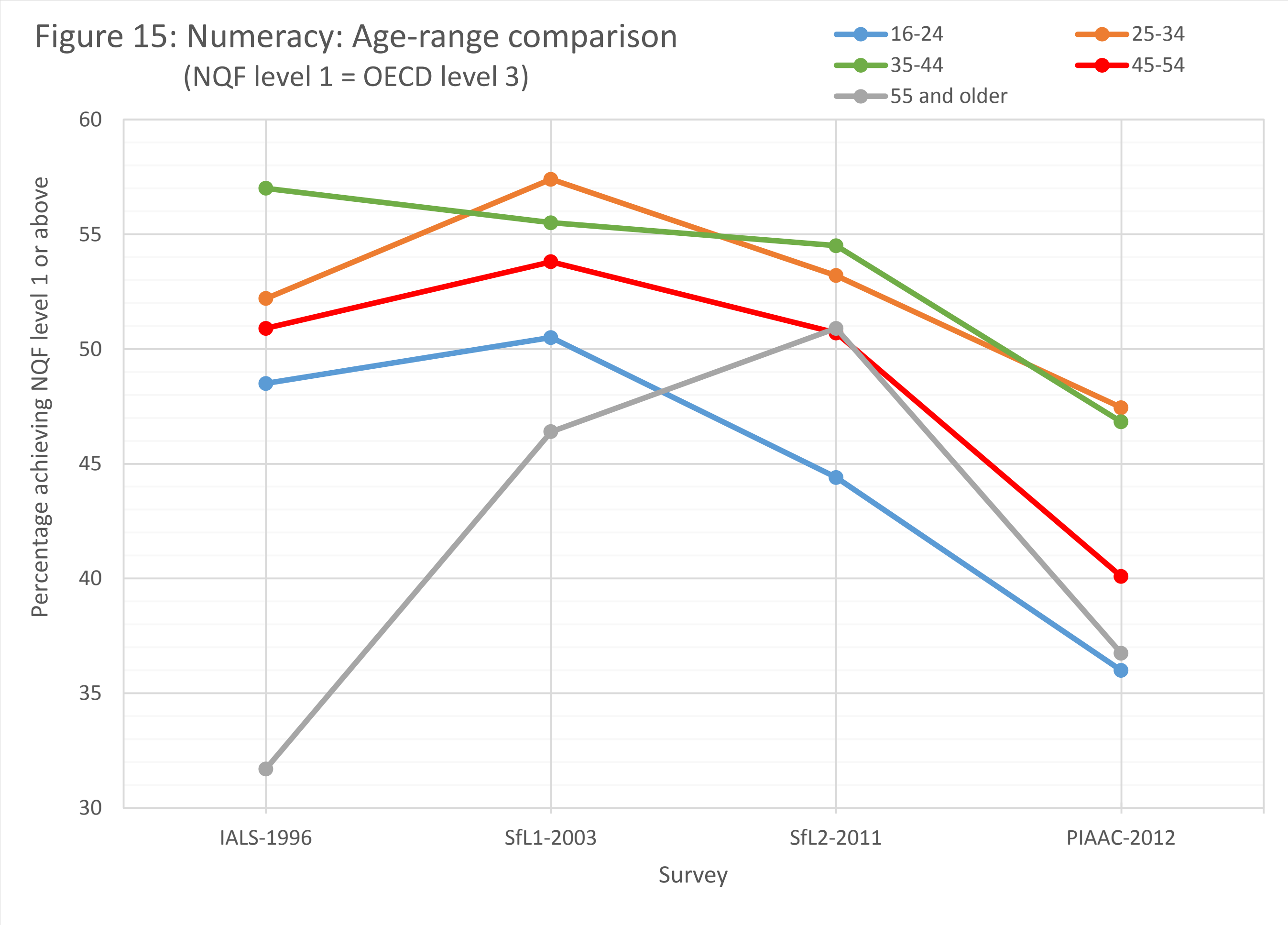
The inverted U-shaped pattern mainly suggests that, although 16- to 24-year-olds in England exhibited poorer skills than some older age groups (and their peers in some other countries – see Annex C), by the time they reached ages 25–34 they had caught up, and in some cases overtaken, their peers. This implies that the deficiency in school leavers' skills had been somewhat reduced (for more discussion on this see section 4) – but this still means that school leavers could, and should, have had more developed skills. The 'staggered' graphs above (Figures 12 and 13) further suggest that this phenomenon is also not new, but rather that it is a regular feature of the output of the education system in England, requiring deeper analysis of causes and remedies – some attention is also given to this in section 4.

However, we can look at the data another way, specifically by making graphs in which the curves represent age groups, and changing the x-axis so that we can compare skills levels across different age groups, as measured by the various surveys – see Figures 14 and 15, where once again the y-axis is truncated. Also, the x-axis scale keeps surveys a fixed distance apart, rather than the distances being proportional to the gap in years (which would place two pairs of literacy surveys and one pair of numeracy surveys on top of each other).



* Data derived from the Basic Skills Agency's 2001 re-coded CD-ROM (see Annex A), but still reflecting the position in 1996

N.B.: To aid comparisons, it should be noted that (for example) the tightly bunched data points for SfL2 correspond to the rather 'flat' curve in previous Figures, and so on.



In both Figures, the data points are somewhat more bunched in the later surveys. In particular, the 55 and older age group seems less far below other age groups, especially in literacy. This suggests that the samples of older people who took part in later surveys had not lost quite as much of their skills as earlier groups of older people had.

Where literacy is concerned, the ‘dip’ in the 16–24 average between IALS and BSA2 is illusory – the two surveys were virtually simultaneous, so the differing estimates are just that, and the three later estimates for this age group are close to each other and to IALS.

Figure 15, however, does reveal what may be a widening skills gap in numeracy: the curves for all age-groups except 55-64 trend downwards after 2003 (but see section 2.3 on whether this possible cohort factor shows up in more detailed analyses). It might be deduced that, in recent years, school-leavers’ numeracy levels may have declined, and this issue may have worsened over time. This observation is consistent with complaints from university departments, over some years, regarding the insufficient capacity of incoming students to grasp heavily quantitative subjects due to poor mathematical skills. Tariq and Durrani (2009: 7-8) summarise the position as follows, citing key references:

“University admissions tutors and lecturers across the UK have reported that many of their students are mathematically ill-prepared to meet the demands of their chosen academic discipline. Empirical research in this area supports such a perception. For example, deficits in the numeracy skills of bioscience undergraduates have been well documented (Tariq, 2008). Similarly, a decline in numeracy skills over time has been demonstrated amongst psychology

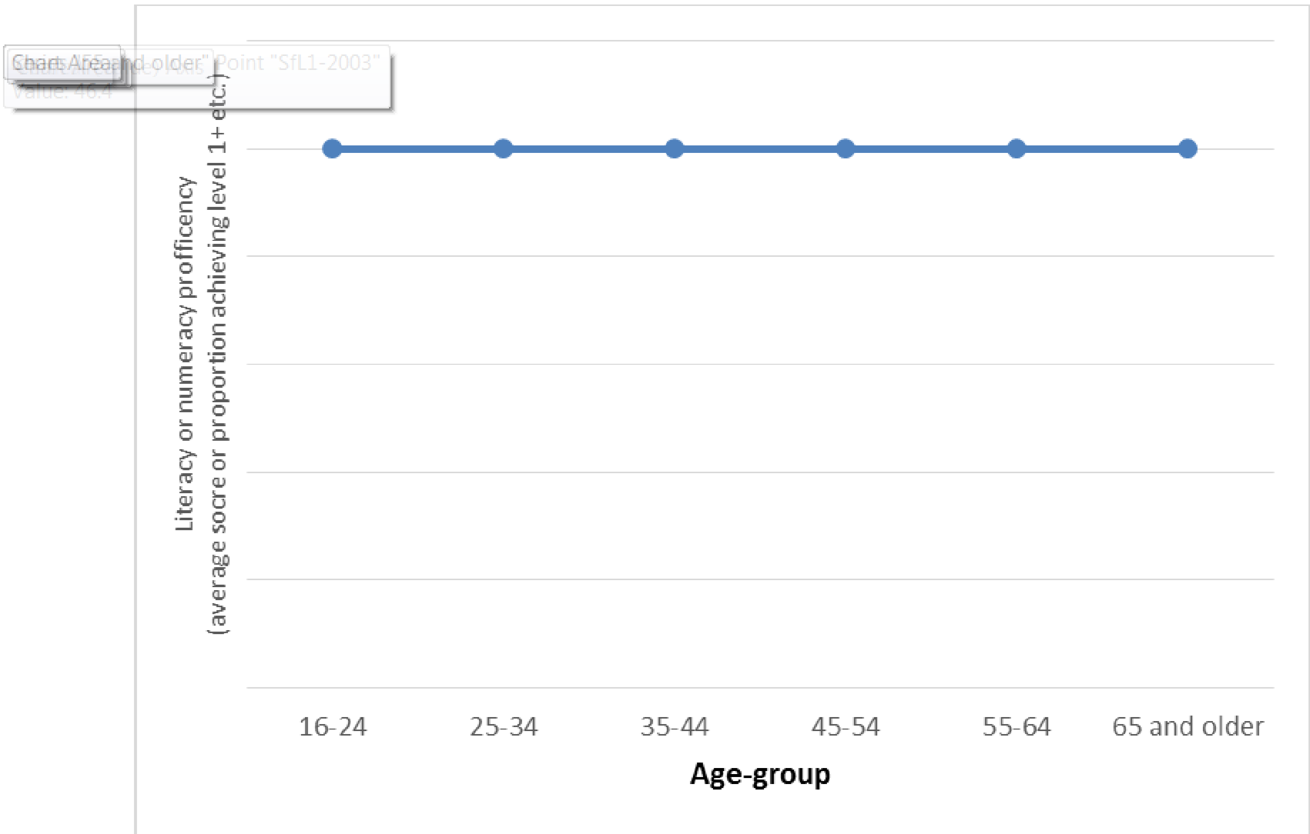
(Mulhern and Wylie, 2004), pharmacy (Malcolm and McCoy, 2007), and mathematics, physics and engineering undergraduates (The Engineering Council, 2000)."

Annex B - Factors explaining that analysis, in particular the balance between life course and cohort factors

B.1 How can life course and cohort factors be teased apart?

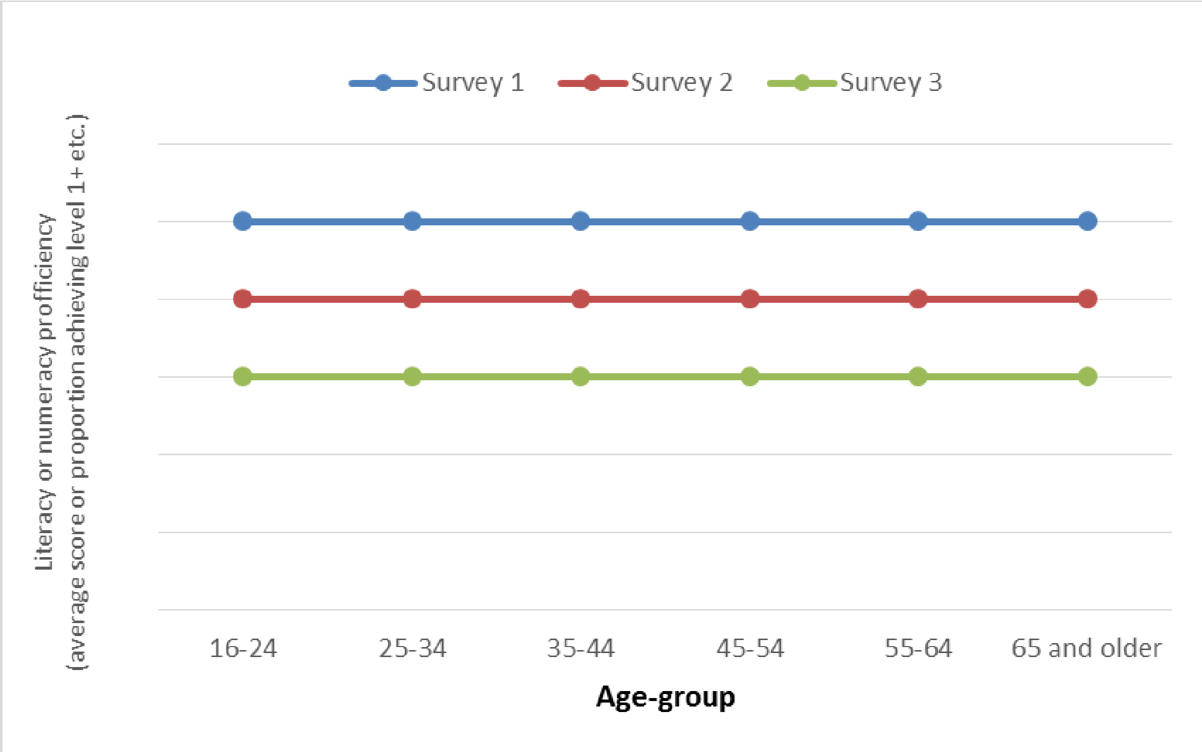
We start with some counterfactuals: what would graphs showing either a pure cohort or a pure life course factor look like? A graph showing a pure and unvarying cohort factor would be a horizontal line from age 16 to age 65 and beyond, as in Figure 16. Such a graph would imply that (a) each cohort's skills levels were fixed on leaving school at age 16, and remained unchanged throughout life, and (b) all cohorts' skills levels were identical, regardless of when they left school.

Figure 16: Pure and unvarying cohort factor



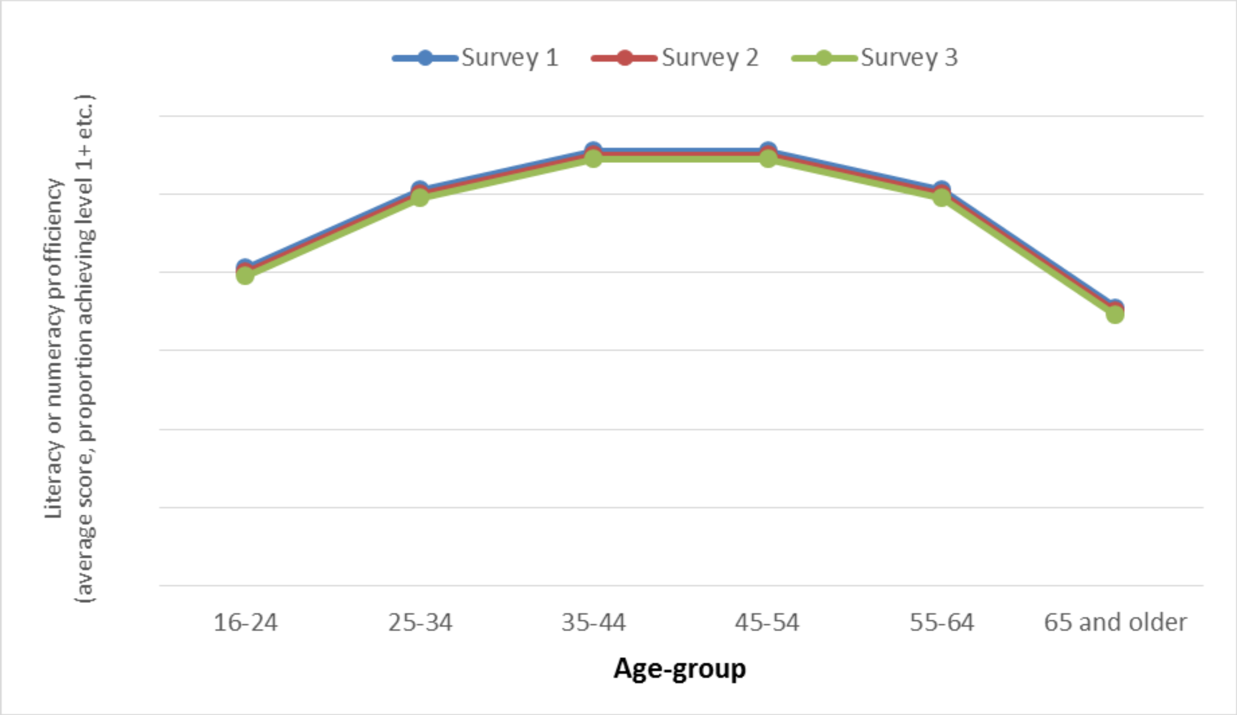
But supposing 'output' levels at age 16 did vary between cohorts, but were then fixed for life (that is, there was no trace of a life course factor): this would produce a graph with several horizontal lines, as in Figure 17.

Figure 17: Pure but varying cohort factors



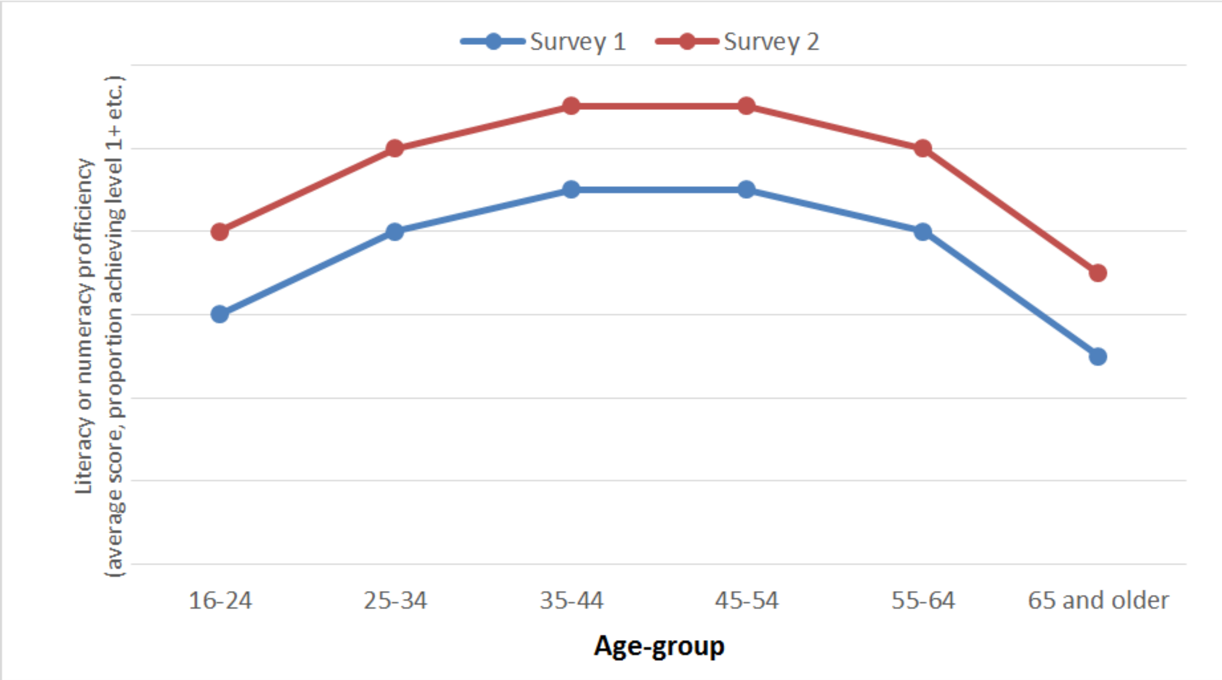
But we know from the evidence summarised above that the situation in England resembles neither of those Figures. So at the other extreme, what would a graph showing a pure life course factor with no trace of a cohort factor look like? This would be the case if every survey, whenever conducted, produced exactly the same curve, with the same average level for each age range in every survey, as in Figure 18, where all the curves are congruent (coincide).

Figure 18: Pure and congruent life course factors



Logically, we then arrive at the question: what would a graph supposedly showing pure but non-congruent life course factors look like? This would be case if identically organised surveys conducted some years apart produced identically shaped curves, with different 'output' levels at age 16 but with the same difference in average levels for each age range, as in Figure 19 (in which, for simplicity, just two such surveys are imagined).

Figure 19: Pure but non-congruent life course factors?



But in this case, the gap between the curves would be an (unvarying) cohort factor – hence in response to the query in the heading of Figure 19, the graph actually shows both a pure life course factor and an unvarying cohort factor, with no interaction between the two. In reality, the less than perfectly-formed curves shown everywhere else in this review, even though supporting our argument that the life course factor has predominated, indicate that to some degree a cohort factor may also have been at work. We deduce that the differences in curves from different surveys constitute the data from which a cohort factor can be estimated.

B.2 Period effects

Each of the mock graphs above assumes an idealised scenario, which does not account for so-called period effects: “Period effects are similar to cohort effects but the term is often reserved for effects that could have impacted everyone at the time of assessment…” (Desjardins and Warnke, 2012: 16). In the context of this study, it is important to note that the possibility of period effects places a limitation on what it is reasonable to claim from data which are highly dependent on the particular time and context from which they were obtained. Each of the four surveys for which complete data were available – SfL1&2, IALS and PIAAC – contained different content and applied different sampling methodologies, and even *within* each survey it has been questioned how reasonable it is to assume that translation of test items across languages and cultures is “neutral” (Blum, Goldstein and Guérin-Pace, 2001: 233; Brown and Micklewright, 2004: 42). One striking example can be observed between SfL2 and PIAAC: though conducted in consecutive years, the numeracy content of PIAAC was contained within “mathematical literacy” questions which require a greater degree of language fluency than the simpler SfL2 questions. This is a likely contributor to the notably lower proportion of the population achieving OECD level 3 or above on PIAAC than in SfL2.

As a counter-point, the nature of our study is not purely focused on the relative differences between the tests; while it is not realistic to consider the SfL1&2 or the IALS and PIAAC surveys to be *precisely* comparable indications of the literacy and numeracy skills of the population at different time-points, the fact that the characteristic ‘curve’ is observed across such a range of surveys *and* time-points strongly supports the existence of a meaningful life course factor. Distinguishing this from the cohort factor is nonetheless rendered problematic due to the ‘period effects’ just described; thus, in the absence of true longitudinal studies that would allow a more complete appraisal of the age-period-cohort problem (Goldstein, 1981), we must carefully consider which of the national and international cross-sectional surveys would be most closely comparable for our purposes.

B.3 Choosing surveys where the life course and cohort factors can potentially be teased apart

Note the reference above (prior to Figure 19) to ‘identically-organised surveys conducted some years apart’; it follows from the intervening argument that such surveys are the only ones from whose data the two factors can potentially be teased apart. Among the eight surveys for which we had information, there were just two candidate pairs of such surveys: SfL1 & 2, and IALS & PIAAC. SfL1 & 2, conducted in 2003 and 2011 respectively, used exactly the same items and adaptive computer-based testing system, and their samples were drawn by the same methods, such that they were both representative of the adult population. Thus, within the inevitable errors of measurement inherent in all tests, they could be considered for our purposes as the nearest thing we had to ‘identically-organised surveys conducted some years apart’.

IALS and PIAAC, conducted (in England) in 1996 and 2012 respectively, were less alike. They used the same sampling approach (so again their samples should have been equally representative of the adult population) and statistical analysis. The statistical model used places all item scores, individual scores and, therefore, national scores on the same scale, with the international mean in particular, and the numerical cut-off scores between OECD Levels 1 and 2 and between Levels 2 and 3 (crucial for our literacy and numeracy comparisons respectively), held constant over time. The literacy items in the two surveys were of similar types (with the ‘prose’ and ‘document’ types separate in IALS but merged in PIAAC), but the types of numeracy item used differed: in IALS they assessed ‘quantitative literacy’, arithmetical problems embedded in text, whereas in PIAAC the items were more straightforwardly mathematical. It is also unclear how many items from IALS were re-used in PIAAC. Despite all this, IALS and PIAAC are the second nearest thing we had to ‘identically-organised surveys conducted some years apart’. Our teasing apart of the factors was based on these two pairs of surveys.

For both comparisons we undertook more granular analyses than those shown so far. In particular, we used shorter age ranges, especially separating ages 16–19 and 20–24. Also, in order to show whether there was a cohort factor and, if so, how large it was, we needed to show not just the ‘point’ mean scores for each (shortened) age range, but also the confidence intervals around those means, derived from the tabulated standard error values (where the confidence intervals do not overlap, the difference is statistically significant).

B.4 Separating life course and cohort factors in IALS and PIAAC

The data for these analyses are shown in Tables 7 (literacy) and 8 (numeracy), and are graphed with truncated y-axes in Figures 20 (literacy) and 21 (numeracy).

Table 7: Percentages achieving NQF Level 1 or above and standard errors for literacy in IALS and PIAAC, by age range

Survey	IALS-1996		PIAAC-2012	
Age-group	%	s.e.	%	s.e.
16-19	81.5	3.4	78.1	3.6
20-24	83.6	2.6	83.3	2.6
25-29	85.4	2.1	83.5	2.3
30-34	81.5	2.1	88.2	1.8
35-39	83.8	2.1	86.3	2.0
40-44	81.1	2.4	85.7	1.8
45-49	82.6	2.3	82.4	2.2
50-54	72.6	3.2	81.9	2.3
55-59	62.9	3.2	78.9	2.6
60-65	62.7	2.8	83.2	1.8

Figure 20: Literacy - proportion of age-group achieving NQF Level 1 (OECD Level 2) or above in IALS and PIAAC with 95% CI

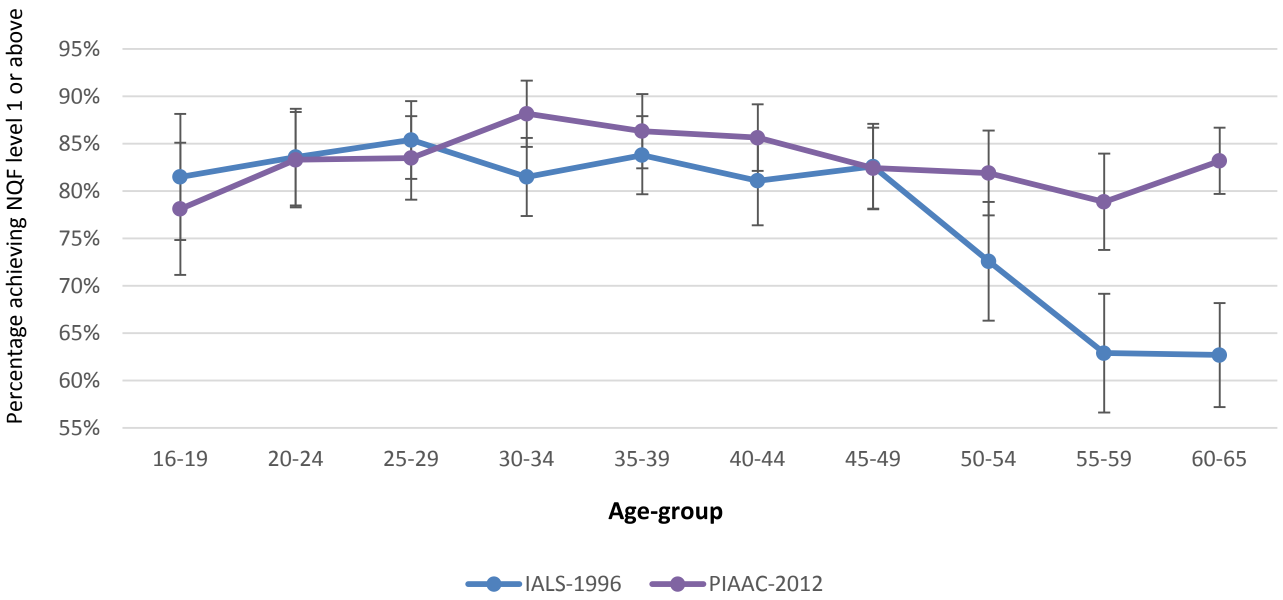
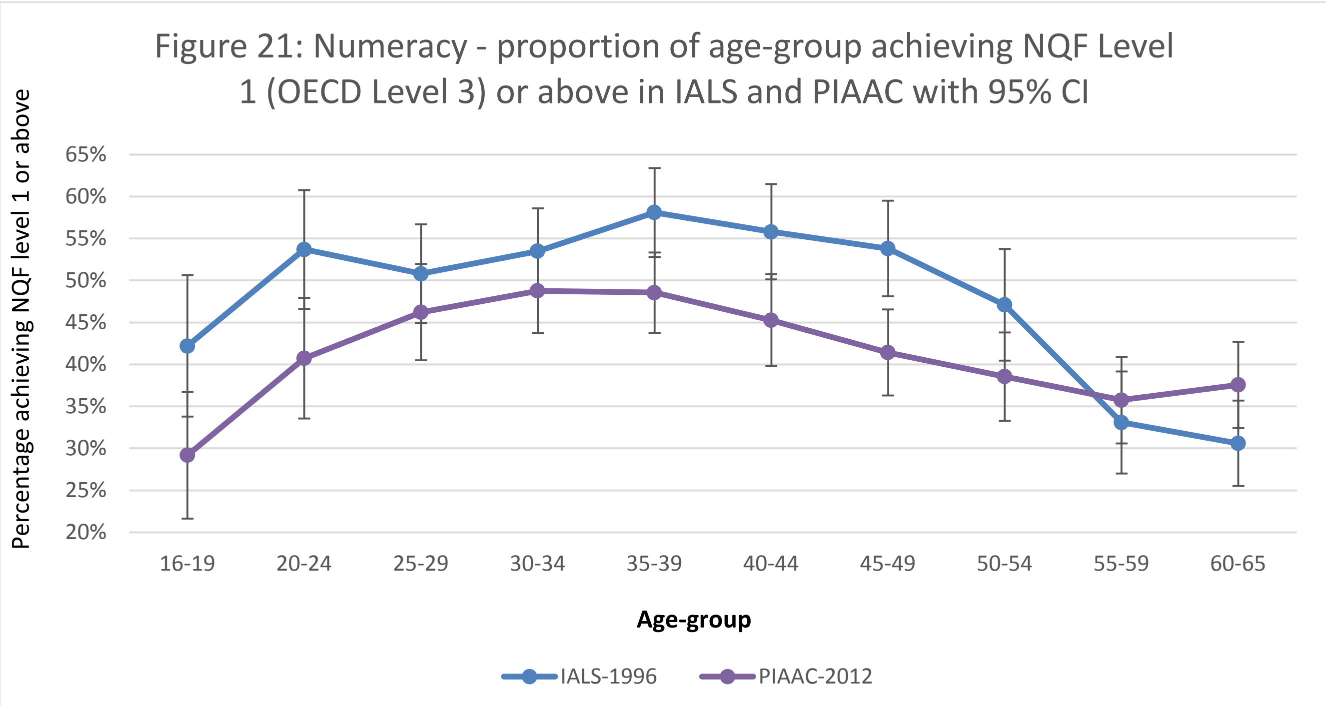


Table 8: Percentages achieving NQF Level 1 or above and standard errors for numeracy in IALS and PIAAC, by age-range

Survey	IALS-1996		PIAAC-2012	
Age-group	%	s.e.	%	s.e.
16-19	42.2	4.3	29.2	3.9
20-24	53.7	3.6	40.7	3.7
25-29	50.8	3.0	46.2	2.9
30-34	53.5	2.6	48.8	2.6
35-39	58.1	2.7	48.6	2.4
40-44	55.8	2.9	45.3	2.8
45-49	53.8	2.9	41.4	2.6
50-54	47.1	3.4	38.6	2.7
55-59	33.1	3.1	35.8	2.6
60-65	30.6	2.6	37.6	2.6



These analyses show that, for literacy, the only statistically significant differences between the results from the two international surveys occurred at ages 55–59 and 60–64, while for numeracy such a difference only existed at ages 45–49. Although the differences in numeracy at ages 16–19 and 20–24 failed to achieve statistical significance, the larger gaps at those ages tend to confirm the impression (see section 2.3) that the skill gap in numeracy may be widening.

B.5 Separating life course and cohort factors in SfL1 and SfL2

The corresponding data for these analyses are shown in Tables 9 (literacy) and 10 (numeracy), and are graphed with truncated y-axes in Figures 22 (literacy) and 23 (numeracy).

Table 9: Percentages achieving NQF Level 1 or above and standard errors for literacy in SfL1 & 2, by age-range

Survey	SfL1-2003		SfL2-2011	
Age-group	%	s.e.	Age-group	%
[illegible]	[illegible]	1.8	85.8	2.1
20-24	87.8	1.5	85.9	2.1
25-29	86.5	1.5	86.1	1.7
30-34	87.4	1.3	87.1	1.8
35-39	85.9	1.2	84.1	2.0
40-44	84.7	1.4	86.1	1.7
45-49	83.5	1.5	85.9	1.5
50-54	80.0	1.6	82.7	1.9
55-59	78.6	1.7	85.4	1.6
60-65	76.4	1.8	82.2	1.6

Series "55 and older" Point "SfL1-2003"
Value: 46.4

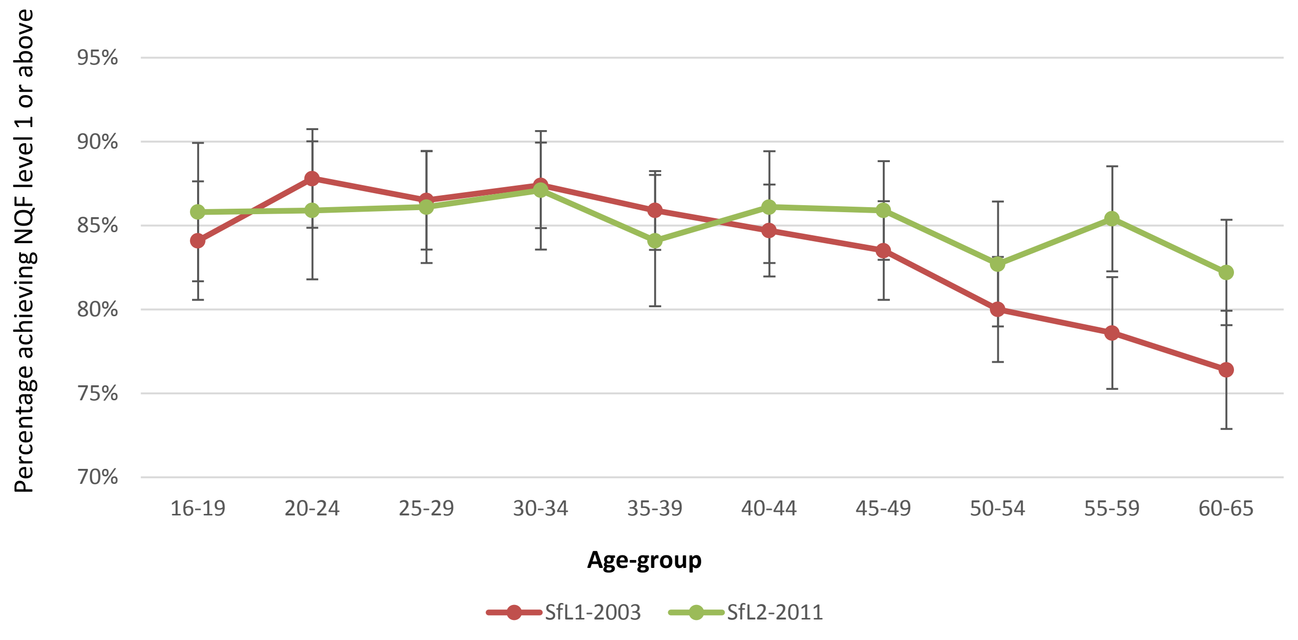
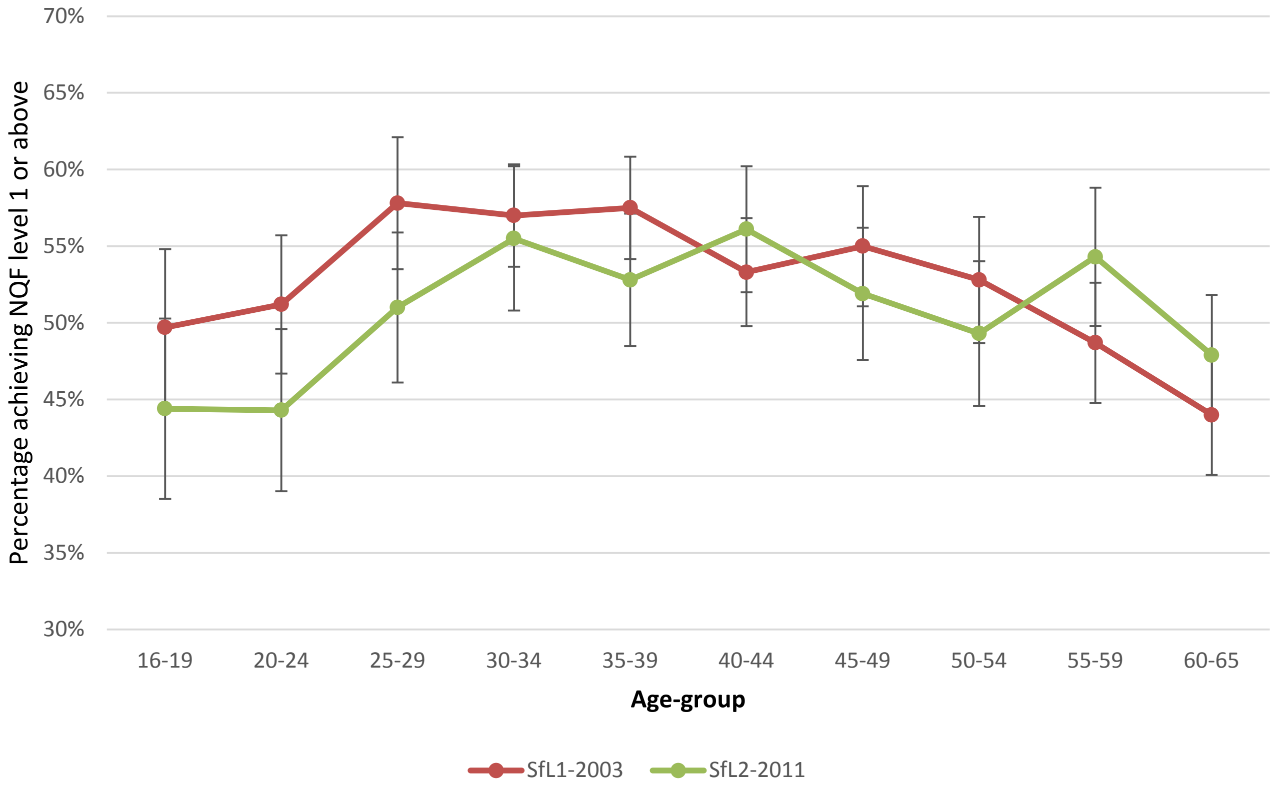


Figure 22: Literacy - proportion of age-group achieving NQF level 1 or above in SfL1 & 2 with 95% CI

Table 10: Percentages achieving NQF Level 1 or above and standard errors for literacy in SfL1 & 2, by age-range

Survey	SfL1-2003		SfL2-2011	
Age-group	%	s.e.	%	s.e.
16-19	49.7	2.6	44.4	3.0
20-24	51.2	2.3	44.3	2.7
25-29	57.8	2.2	51.0	2.5
30-34	57.0	1.7	55.5	2.4
35-39	57.5	1.7	52.8	2.2
40-44	53.3	1.8	56.1	2.1
45-49	55.0	2.0	51.9	2.2
50-54	52.8	2.1	49.3	2.4
55-59	48.7	2.0	54.3	2.3
60-65	44.0	2.0	47.9	2.0

Figure 23: Numeracy - proportion of age-group achieving NQF level 1 or above in SfL1 & 2 with 95% CI



These analyses show that, for literacy, the only statistically significant difference between the results from the two SfL surveys occurred at ages 55–59, while for numeracy there was no trace of such a difference at any age. Life course factors have predominated, and seem likely to continue doing so.

From both comparisons (SfL1 vs SfL2, IALS vs PIAAC) we concluded that the data do not provide evidence of obvious cohort factors, and that, where they do occur, they appear to be weak, especially by contrast to the clear life course factors. This further supports our opinion that life course factors have predominated.

The only previous attempt to estimate life course and cohort factors using data for England appears to be that in BIS Research Report no. 182 (BIS, 2014: 17). To estimate the life course factor the authors computed the difference in average literacy scores of native-born adults aged 16–24 in IALS in 1996 and of native-born adults aged 32-40 in PIAAC in 2012. This procedure picked up the same dates of birth range (1972–80) but, unless some very unlikely coincidence occurred, none of the same individuals – a ‘pseudo-longitudinal’ study. To estimate the cohort factor, the authors computed the difference in average literacy scores of native-born adults aged 16–24 in IALS in 1996 (people born in 1972-80) and native-born adults aged 16-24 in PIAAC in 2012 (people born in 1988-96). The results showed quite a large positive life course factor, with people born in 1972–80 exhibiting improved literacy over time, alongside a small negative cohort factor, whereby the sample born in 1988–96 had a slightly lower average score than those born earlier.

In general, the improvement over time, and the ratio of the life course factor to the cohort factor, in the BIS analyses are consistent with our results, but a key difference in approach needs to be noted: the authors of the BIS analyses used only native-born adults, whereas we were concerned with the whole working-age population. However, these extended analyses of trends across age-groups and of the balance of life course and cohort factors have led us to reject the assumption that cohort factors are largely responsible for the observed inverted U-shape trend.

Annex C – Comparison of international data

C.1 The International Numeracy Survey (1996)

We begin our own international comparisons with the International Numeracy Survey (1996), despite its flaws. The 12 questions used in that study tested subtraction, addition and multiplication (but not division), area, and fractions, percentages and proportions. None of the items should have been beyond the capability of anyone who had received a sound primary-school grounding in mathematics. While 43% of those included in the survey in Japan got all 12 tasks right, only 20% did so in England and Wales. At the other end of the scale, while more than a fifth of those in England and Wales (22%) could only answer up to 5 of the questions posed, only 4% of those in the Netherlands were as poor as this with numbers. While overall the UK sample achieved an average of 7.9 answers correct out of 12, all the other countries managed to get 9 or more.

For our main international comparisons we used IALS and PIAAC. We provide the following analyses, in this order:

- IALS literacy and numeracy, all available countries (Figures 24 & 25)
- PIAAC literacy and numeracy, all available countries (Figures 26 & 27)
- IALS literacy and numeracy, Anglophone countries only (Figures 28 & 29)
- PIAAC literacy and numeracy, Anglophone countries only (Figures 30 & 31).

There were two odd gaps in the data available to us: we had no data for Australia in either IALS or PIAAC, even though it took part in both (Jamal Lahmar established that it would have cost AU$1,700 just for the PIAAC data); and we had no numeracy data for Canada in IALS because it did not participate in that part of the survey. Also, our IALS files do not contain age data for Canada (only 10 year age bands), so Canada's literacy data cannot be plotted in our IALS graphs either.

It should be noted that the 'all countries' PIAAC graphs treat Canada as one jurisdiction (i.e. they do not show the data for English speakers and French speakers separately), whereas the 'Anglophone countries' PIAAC graphs show the data for English-speaking Canada only. Also, in the IALS graphs (both 'all countries' and 'Anglophone') the UK curves are for Great Britain (England, Wales and Scotland; the curves for England alone would be very unlikely to differ greatly from those shown) and Northern Ireland separately. In the PIAAC 'all countries' graphs the UK data cover England and Northern Ireland together (Scotland and Wales did not participate; the curves for England alone are likely to be very similar to those shown), whereas the 'Anglophone' graphs show England and Northern Ireland separately.

As with the England only (or England and Wales, or Great Britain) data presented in earlier sections, these graphs show the proportions of adults at various ages achieving UK NQF level 1 or above – or more precisely in this case the British government's preferred international equivalents, namely OECD Level 2 or above for literacy, OECD Level 3 or above for numeracy. The age bands are the 5 year ranges shown in the life course versus cohort factors analyses in sections B.4 and B.5. The alternative approach of showing the average score for each age-group would have produced graphs with very similar curves. The ‘Anglophone’ graphs have a truncated y-axis, but this is not possible for the ‘all countries’ graphs because some countries scored close to 100% and others scored very low. Nowhere do we show the confidence intervals because these would have entirely overwhelmed already complex graphs.

C.2 Using all available countries

Figures 24-27 show the IALS and PIAAC data for all the countries that participated and for which we had data, with Figures 24 and 26 showing literacy, and Figures 25 and 27 showing numeracy.

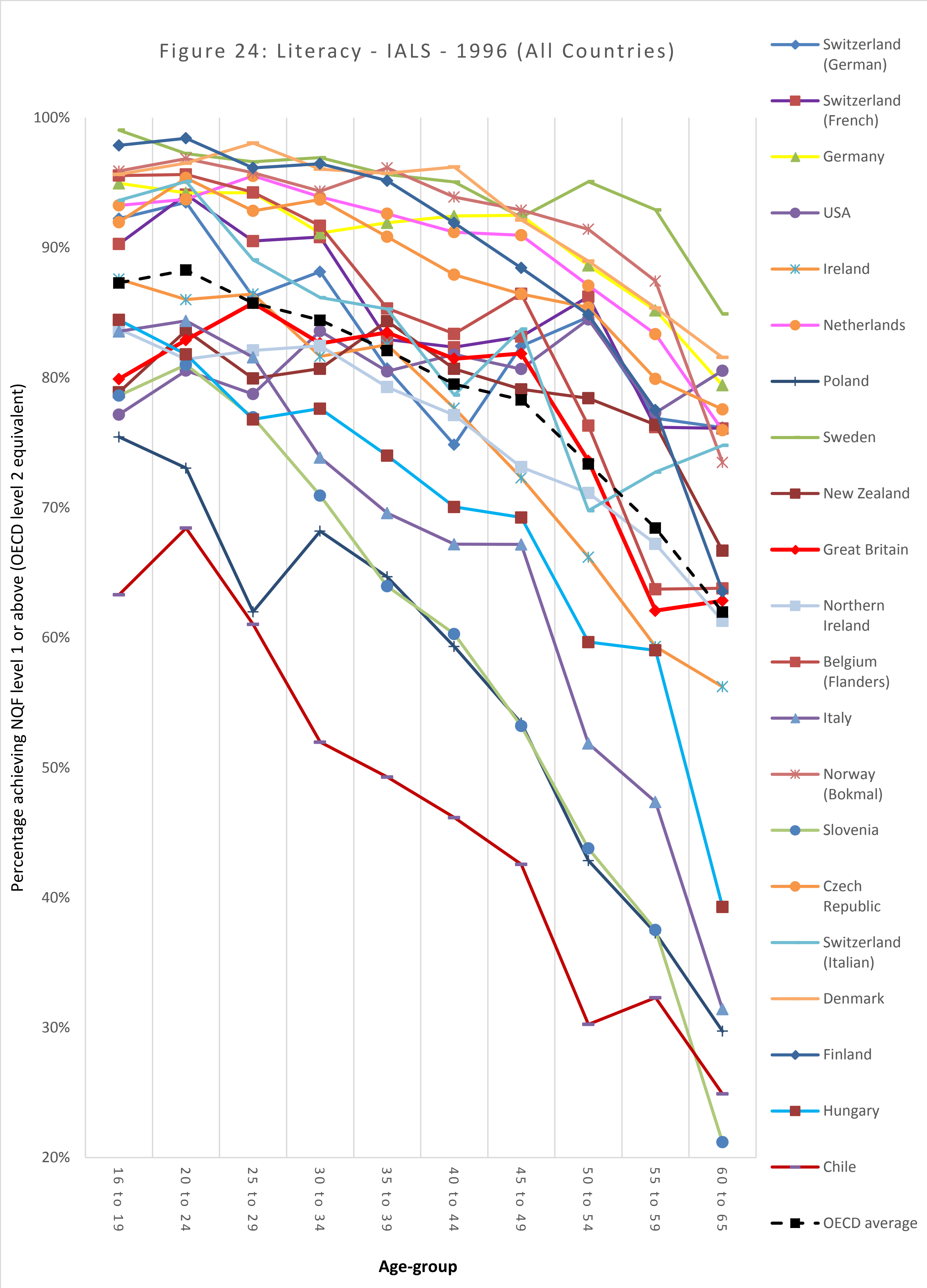


Figure 24: Literacy - IALS - 1996 (All Countries)
Percentage achieving NQF level 1 or above (OECD level 2 equivalent)
100%
90%
80%
70%
60%
50%
40%
30%
20%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
Switzerland (German)
Switzerland (French)
Germany
USA
Ireland
Netherlands
Poland
Sweden
New Zealand
Great Britain
Northern Ireland
Belgium (Flanders)
Italy
Norway (Bokmal)
Slovenia
Czech Republic
Switzerland (Italian)
Denmark
Finland
Hungary
Chile
OECD average

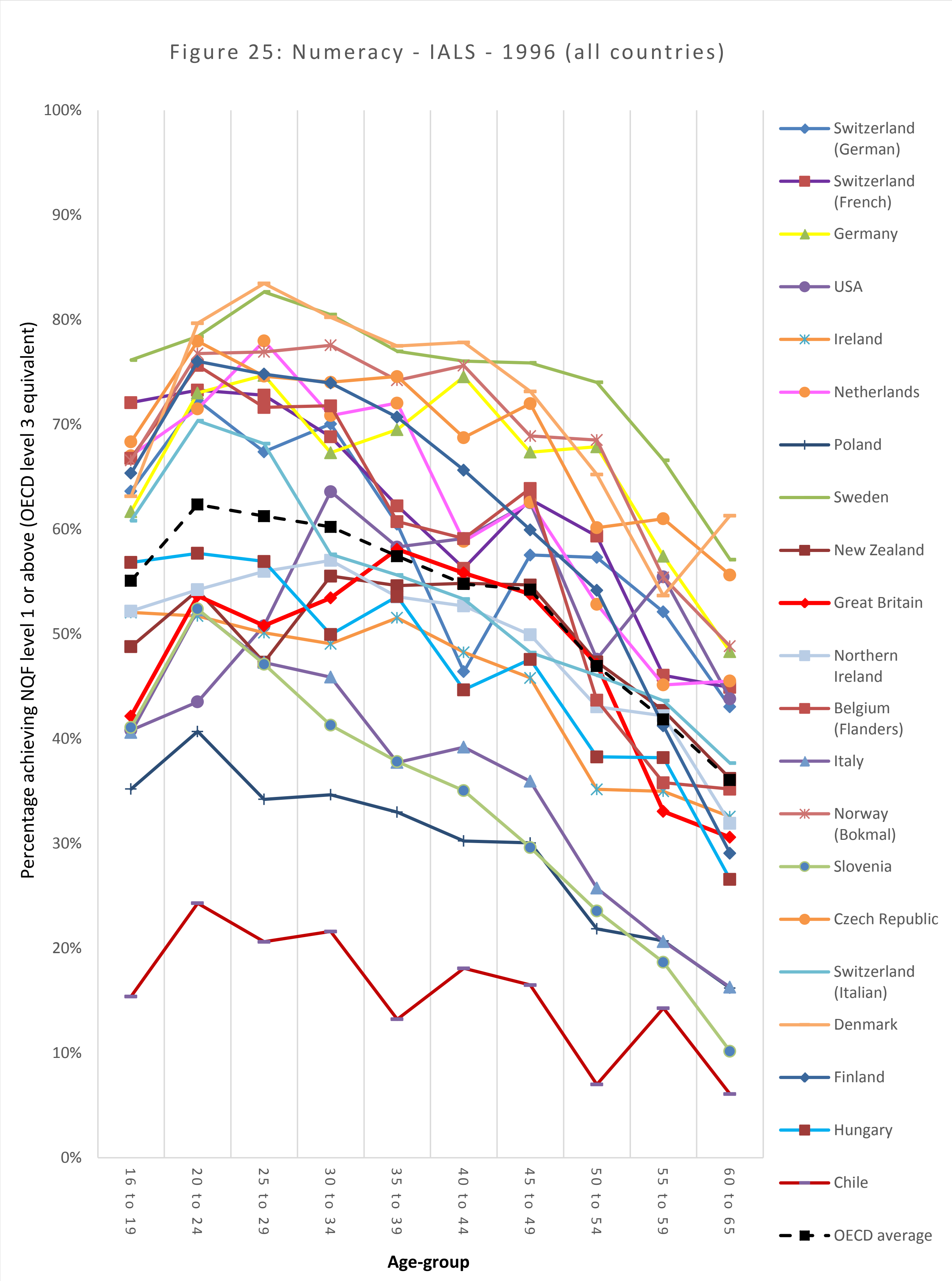


Figure 25: Numeracy - IALS - 1996 (all countries)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage achieving NQF level 1 or above (OECD level 3 equivalent)
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
Switzerland (German)
Switzerland (French)
Germany
USA
Ireland
Netherlands
Poland
Sweden
New Zealand
Great Britain
Northern Ireland
Belgium (Flanders)
Italy
Norway (Bokmal)
Slovenia
Czech Republic
Switzerland (Italian)
Denmark
Finland
Hungary
Chile
OECD average

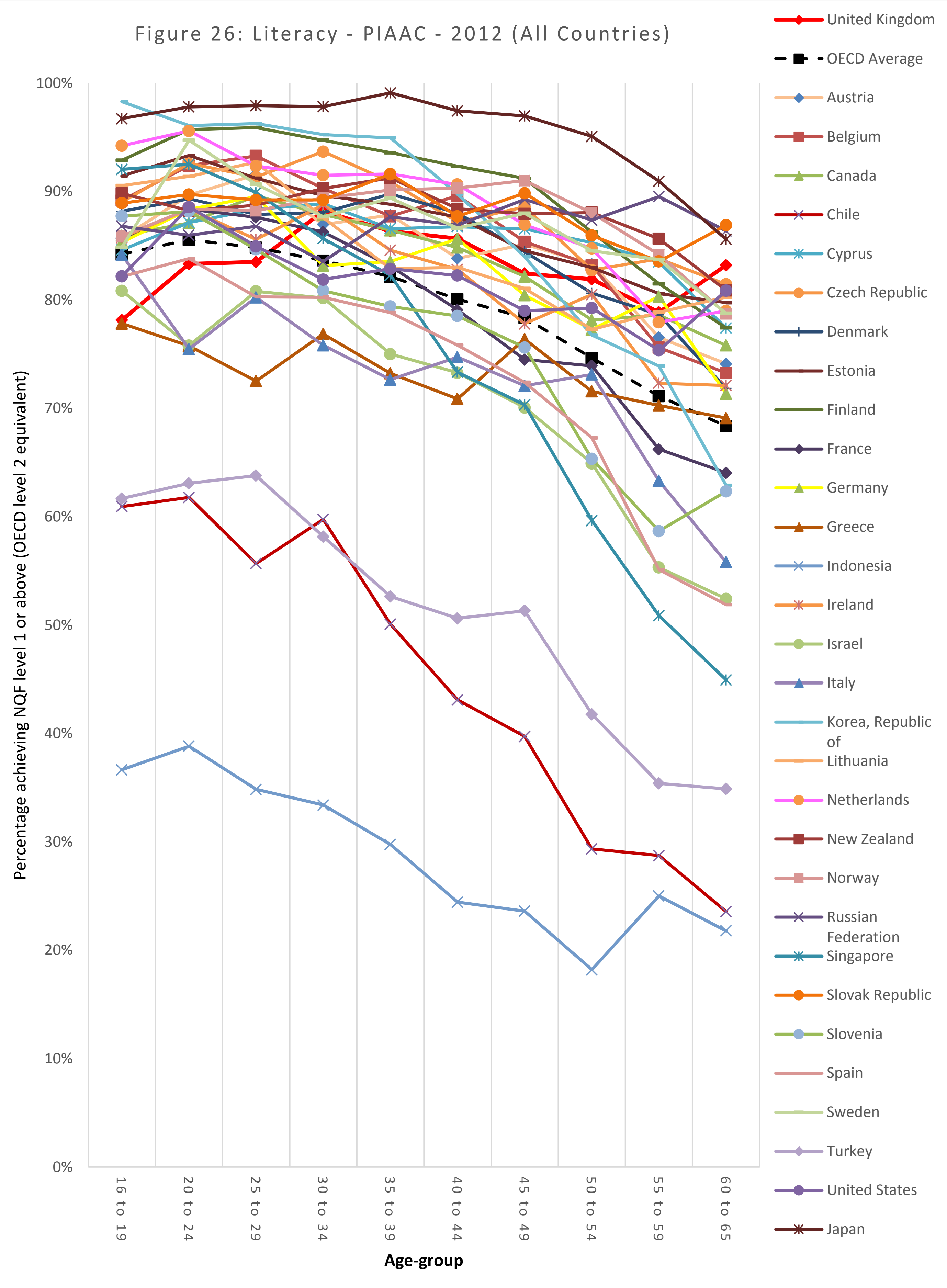


Figure 26: Literacy - PIAAC - 2012 (All Countries)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percentage achieving NQF level 1 or above (OECD level 2 equivalent)
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
United Kingdom
OECD Average
Austria
Belgium
Canada
Chile
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Indonesia
Ireland
Israel
Italy
Korea, Republic of
Lithuania
Netherlands
New Zealand
Norway
Russian Federation
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Turkey
United States
Japan

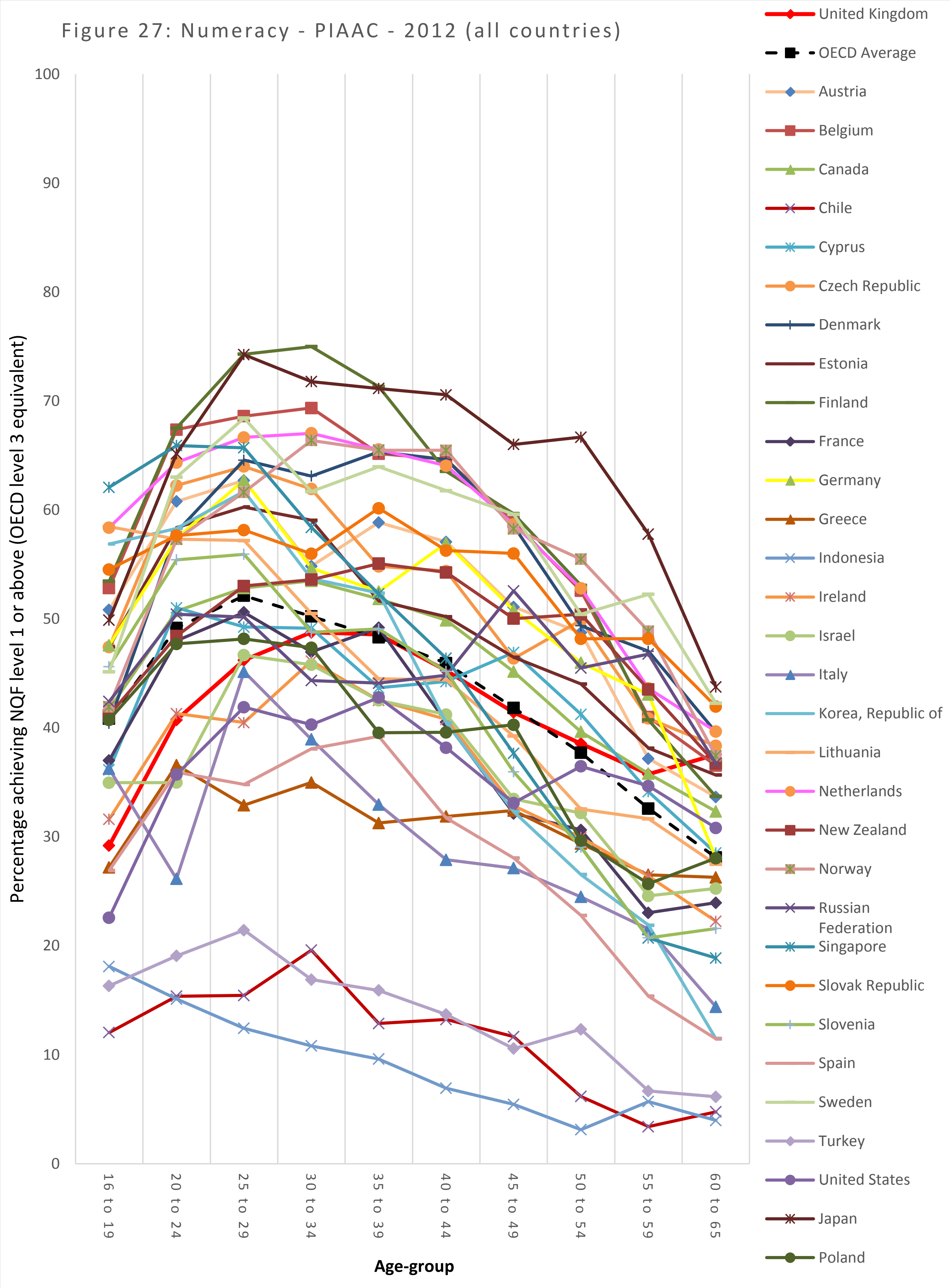
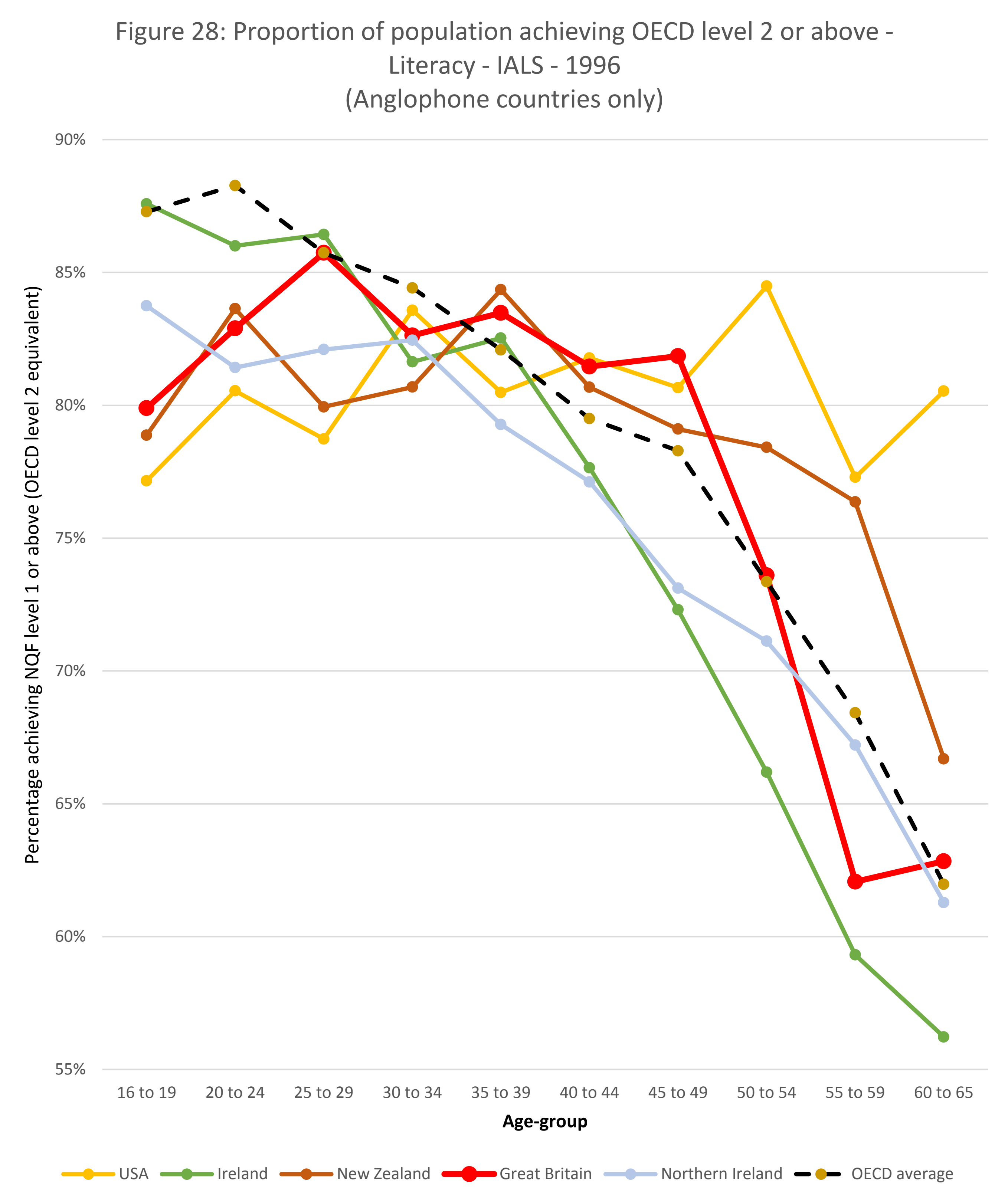


Figure 27: Numeracy - PIAAC - 2012 (all countries)
Percentage achieving NQF level 1 or above (OECD level 3 equivalent)
0
10
20
30
40
50
60
70
80
90
100
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
United Kingdom
OECD Average
Austria
Belgium
Canada
Chile
Cyprus
Czech Republic
Denmark
Estonia
Finland
France
Germany
Greece
Indonesia
Ireland
Israel
Italy
Korea, Republic of
Lithuania
Netherlands
New Zealand
Norway
Russian Federation
Singapore
Slovak Republic
Slovenia
Spain
Sweden
Turkey
United States
Japan
Poland

C.3 Using only Anglophone countries

Figures 26–29 show the IALS and PIAAC data for the Anglophone countries which participated and for which we had data. Figures 26 and 28 show literacy, Figures 27 and 29 numeracy.



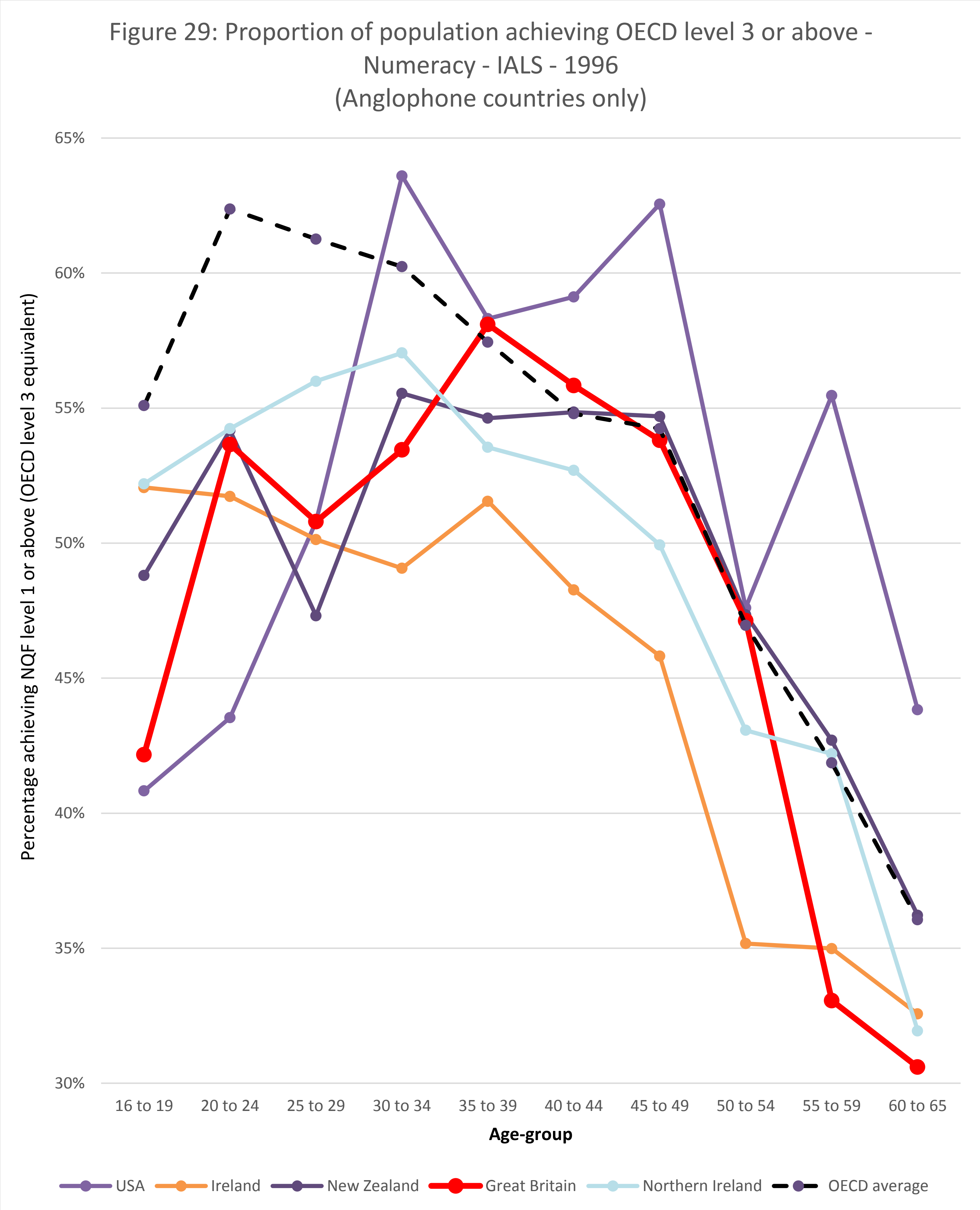
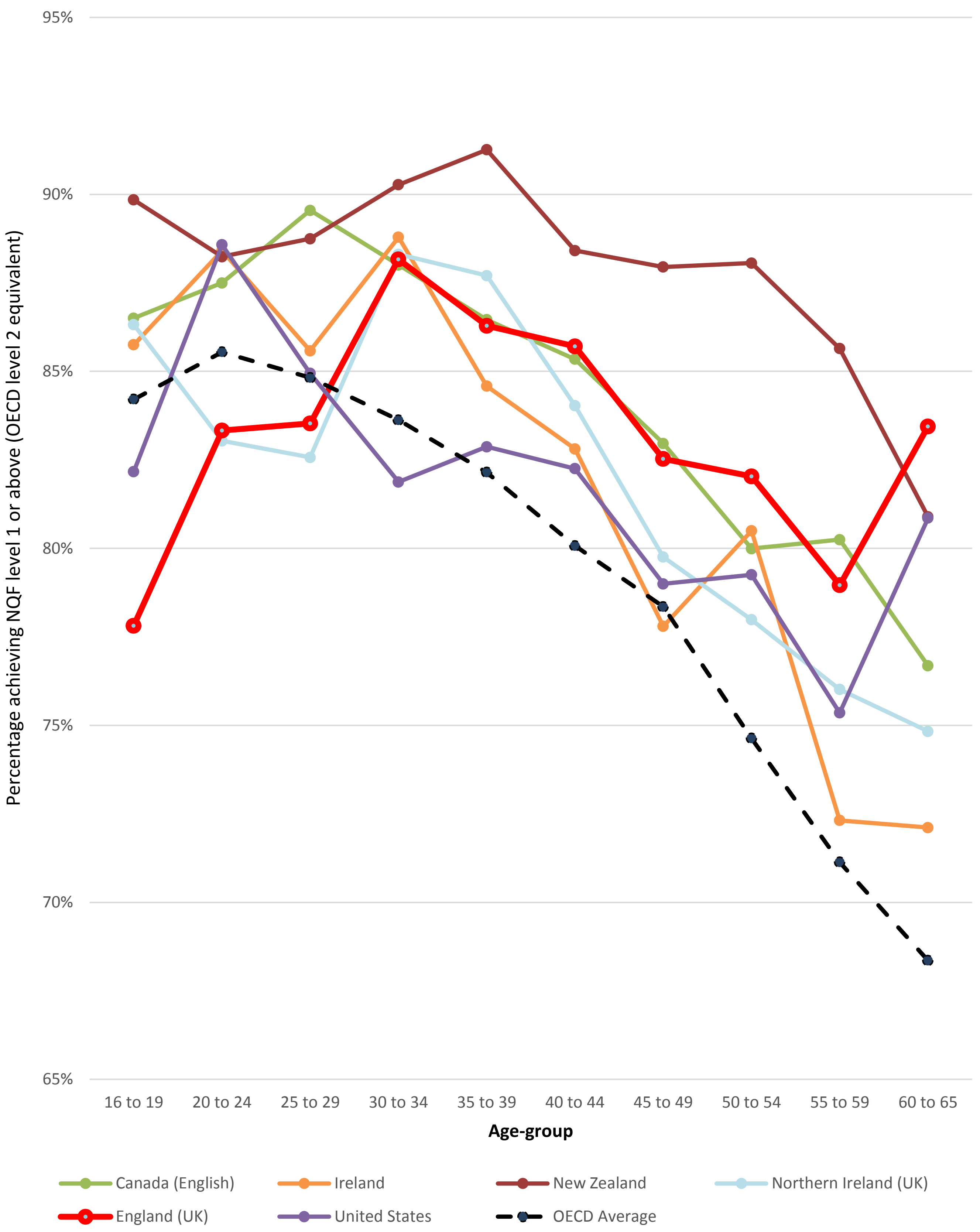


Figure 29: Proportion of population achieving OECD level 3 or above - Numeracy - IALS - 1996
(Anglophone countries only)
Percentage achieving NQF level 1 or above (OECD level 3 equivalent)
65%
60%
55%
50%
45%
40%
35%
30%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
USA
Ireland
New Zealand
Great Britain
Northern Ireland
OECD average

Figure 30: Proportion of population achieving OECD level 2 or above - Literacy - PIAAC - 2012
(Anglophone countries only)



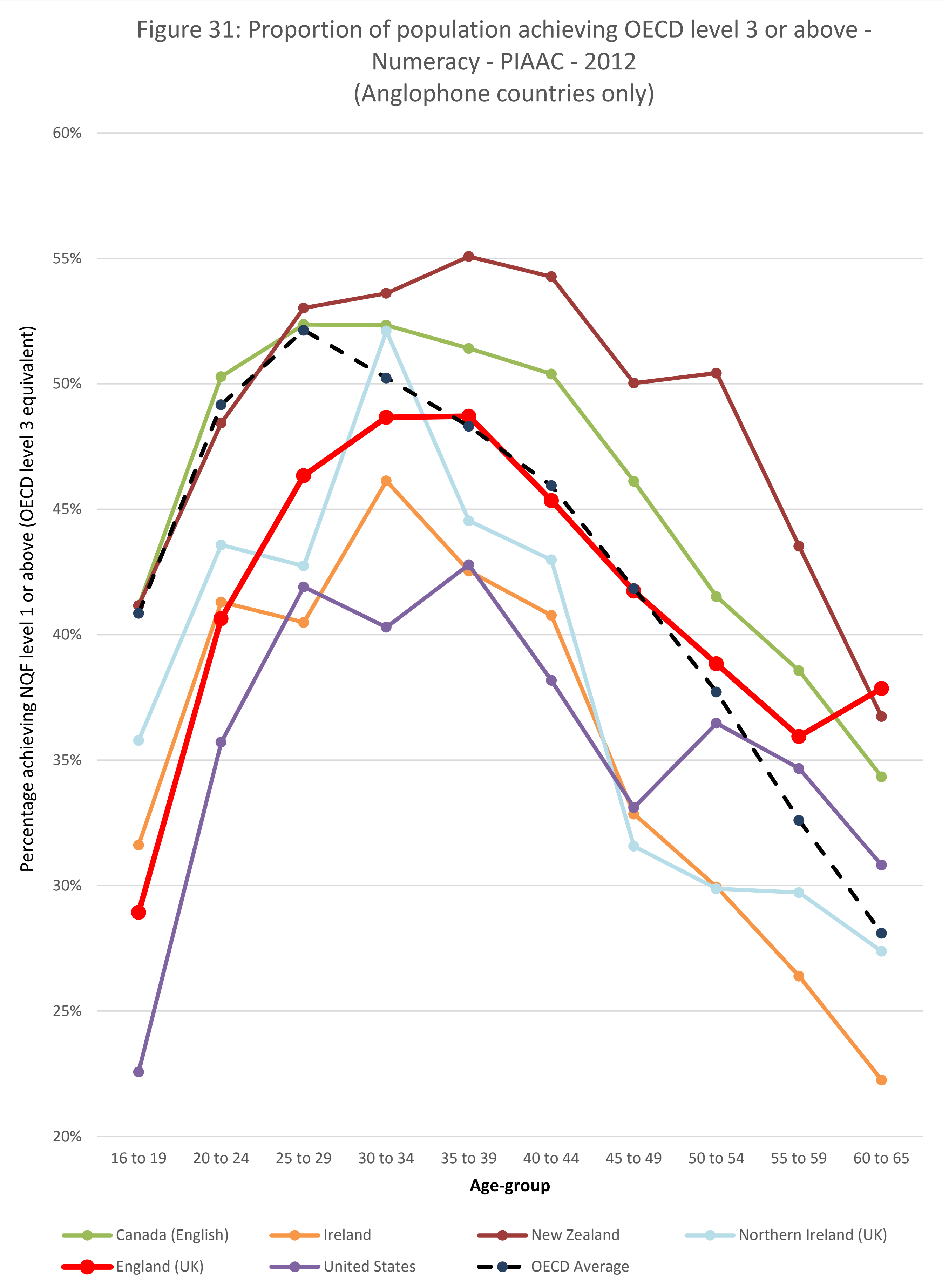


Figure 31: Proportion of population achieving OECD level 3 or above - Numeracy - PIAAC - 2012
(Anglophone countries only)
Percentage achieving NQF level 1 or above (OECD level 3 equivalent)
60%
55%
50%
45%
40%
35%
30%
25%
20%
16 to 19
20 to 24
25 to 29
30 to 34
35 to 39
40 to 44
45 to 49
50 to 54
55 to 59
60 to 65
Age-group
Canada (English)
Ireland
New Zealand
Northern Ireland (UK)
England (UK)
United States
OECD Average

C.4 Some inferences from the international comparisons

First, the most obvious point across all these graphs is that England (or GB, or England and Northern Ireland) has mainly been near the OECD average, sometimes below it at younger ages but in most cases close to it, and sometimes above it, at older ages.

Secondly, the shallow inverted U-shaped graph is not unique to the UK. Almost every country exhibits a graph of more or less that shape. This is consistent with the much more detailed analysis of data from IALS (and the Adult Literacy and Lifeskills Survey (ALL) of 2003–07 in which the UK did not participate) conducted by Desjardins and Warnke (2012) whose conclusions (p.38) were:

“116. First, … the relationship between a foundation skill measure (literacy) and age is on average negative when the entire lifespan of working age adults (from 16 to 65) is considered. Older cohorts in both IALS and ALL, regardless of country, are found to perform consistently lower on the measured skill on average than younger cohorts.

117. Second, when education is not controlled for, cohorts up to about the age of 31 are found to score higher on average than younger cohorts but by progressively smaller increments. After the age of 31, older cohorts score on average progressively lower than younger cohorts.

118. Third, when education is controlled for, older cohorts score on average progressively lower than younger cohorts, already from the early age of 16, but the differences from mid 20s to mid-50s are not large.”

In general, Calero *et al*. (2016: 3) concur with Desjardins and Warnke:

“[A]lthough skill gains and losses with ageing vary from one person to another, age-skill profiles tend to show a negative trend, with competencies declining from adulthood onwards.”

Thirdly, it is clear from the ‘all countries’ graphs that there are quite a few countries whose young people have emerged from their education systems with distinctly better literacy and numeracy skills than those in this country. Some of those countries’ graphs then plunge rather precipitously across the age groups – but some may have been much less developed economically than the UK in earlier decades, so that in future surveys their curves may more closely resemble, or exceed, ours. And some countries have outperformed the UK at all ages.

Finally, the different truncations of the literacy and numeracy Anglophone graphs obscure the fact that overall levels of numeracy appear to have been distinctly lower than literacy levels (at least in these countries, including ours), as also identified earlier.

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