





Paying the price: The cost of very poor adult literacy

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Pro Bono Economics uses economics to empower the social sector and to increase wellbeing across the UK. We combine project work for individual charities and social enterprises with policy research that can drive systemic change. Working with 400 volunteer economists, we have supported over 500 charities since our inception in 2009.



National Literacy Trust is an independent charity which works with schools and communities to improve the literacy skills of disadvantaged children around the UK. We want to increase people's knowledge about the importance of early language skills and the tools available to them to improve the skills of children.

16.6%

of working age adults in the UK are estimated to have very poor literacy skills

The average worker in the UK with very poor literacy skills earns approximately

£1,500

less per year than they would if they had a basic level of literacy

The average 18-year-old with very poor literacy skills will earn around

£33,000

less over their lifetime than if they had a basic level of literacy

This is equivalent to an additional

1.5 years

of work over the lifetime as the average worker with very poor literacy skills earns around £21,000 annually

Adult literacy skills in the UK

Our core skills affect us throughout our lives. Without these solid foundations in place from early in life, people are more likely to struggle to find work, they are likely to face lower wages while in employment, are more likely to have poor health and even live shorter lives.^{1 2}

Literacy – or the ability to read, write, speak and listen in a way that lets us communicate effectively and make sense of the world – is a key component of these basic skills.³ It acts as the foundation on which more complex skills are built.⁴ It not only impacts a person's ability to read and write, but one's ability to communicate their ideas to others. That is key to a successful education, close relationships and performing well in the workplace.⁵

The OECD Survey of Adult Skills provides the best available evidence on levels of literacy in the UK although it focuses on a narrower definition related specifically to the ability to understand and use written texts.⁶ We use this study to identify people who are defined as having very poor literacy skills - those in our society who do not have the literacy skills to cope with everyday life.⁷ They may be able to understand short, straightforward texts on familiar topics but reading information from unfamiliar sources, or on unfamiliar topics, could cause problems.⁸

Analysis of the OECD Survey of Adult Skills suggests that, in 2011/2012, approximately 16.6% of working age adults (aged 16-65) in England and Northern Ireland had very poor literacy skills. This is equivalent to nearly 7 million working age adults in the UK.⁹ As shown in Figure 1, of the 32 OECD countries surveyed, England ranks 16th and Northern Ireland 18th in literacy

¹ Kuczera M, Field S, Windisch HC (2016): *Building skills for all: A review of England. Policy insights from the Survey of Adult Skills. OECD Skills Studies*. Retrieved from <https://www.oecd.org/unitedkingdom/building-skills-for-all-review-of-england.pdf>

² Gilbert L, Teravainen A, Clark C, Shaw S (2018): *Literacy and life expectancy: An evidence review exploring the link between literacy and life expectancy in England through health and socioeconomic factors*. London: National Literacy Trust.

³ <https://literacytrust.org.uk/information/what-is-literacy/>

⁴ Evans D, Hares S (2021): *Should governments and donors prioritize investments in foundational literacy and numeracy?* Center for Global Development Working Paper 579.

⁵ Dugdale G, Clark C (2008): *Literacy changes lives: An advocacy resource*. London: National Literacy Trust.

⁶ Their specific definition is “the ability to understand, evaluate use and engage with written texts to participate in society”, see here: <https://www.oecd-ilibrary.org/sites/0e96cba5-en/index.html?itemId=/content/component/0e96cba5-en>

⁷ To measure and categorise literacy levels in the UK, this report uses the OECD's Survey of Adult Skills measure of literacy. This is a robust, multi-country survey of adult skills which has been used in academic literature to estimate the relationship between literacy and wages. The OECD survey sampled nearly 9,000 adults in England and Northern Ireland between 2011 and 2012. We define adults with very poor literacy as those scoring at Level 1 or below on the OECD's literacy measure:

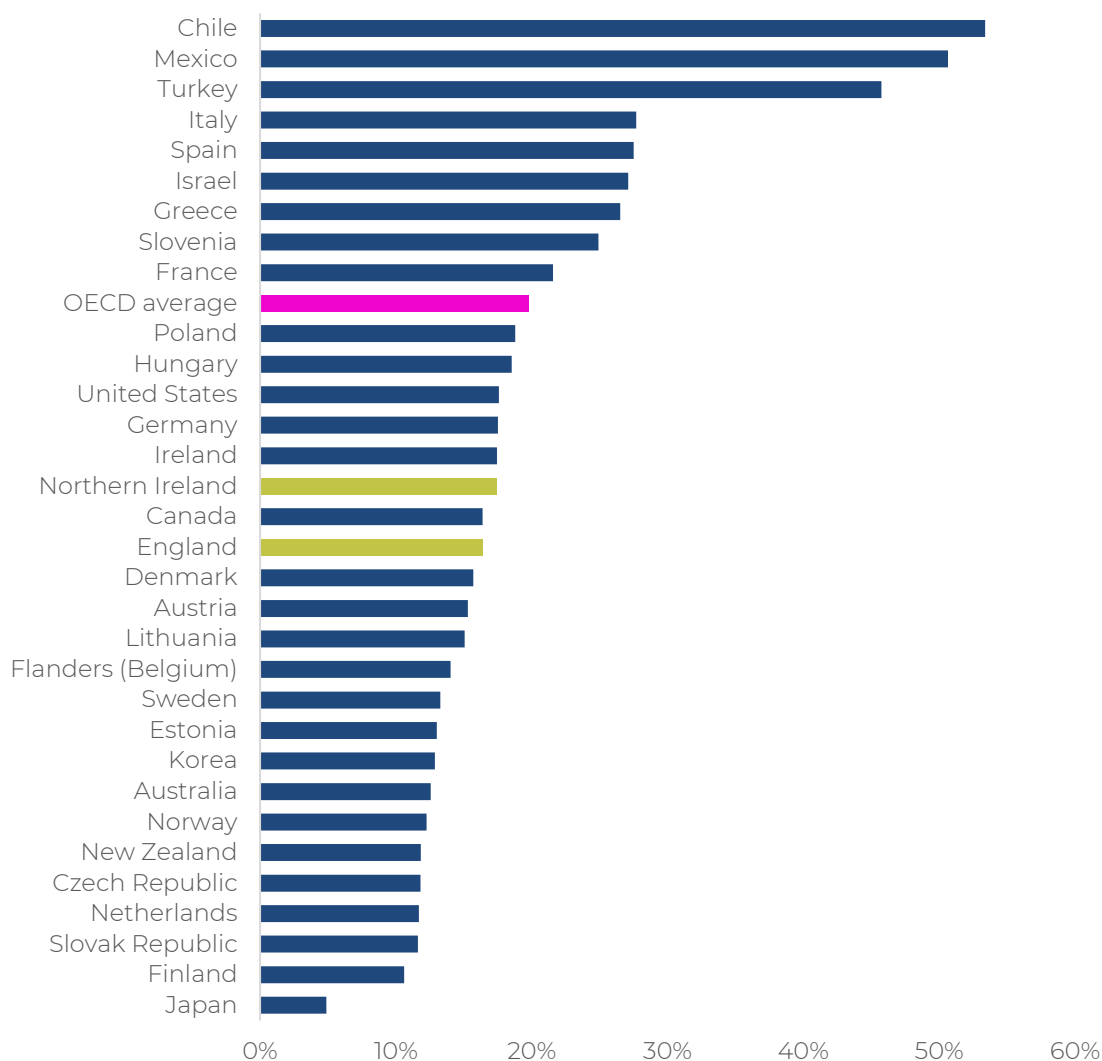
<https://literacytrust.org.uk/parents-and-families/adult-literacy/what-do-adult-literacy-levels-mean/>

⁸ <https://literacytrust.org.uk/parents-and-families/adult-literacy/>

⁹ This assumes that Scotland and Wales also have very poor literacy prevalence of 16.6%.

when analysing the percentage of adults with very poor literacy skills. Even though the UK ranks higher than the OECD average, there is still significant room for improvement. For example, only 5% of working adults in Japan have very poor literacy.

Figure 1. Percentage of adult population with very poor literacy skills



Source: OECD (2019): *Skills matter: Additional results from the Survey of Adult Skills*, Table A2.1. Very poor literacy is defined as Level 1 and below.

This is the most recent, national survey of adult literacy skills in the UK,¹⁰ but literacy skills are unlikely to have shifted substantially over the decade since.¹¹ Indeed, there are concerns that low levels of skills remain across generations. Parents' education levels in the UK are strongly predictive of

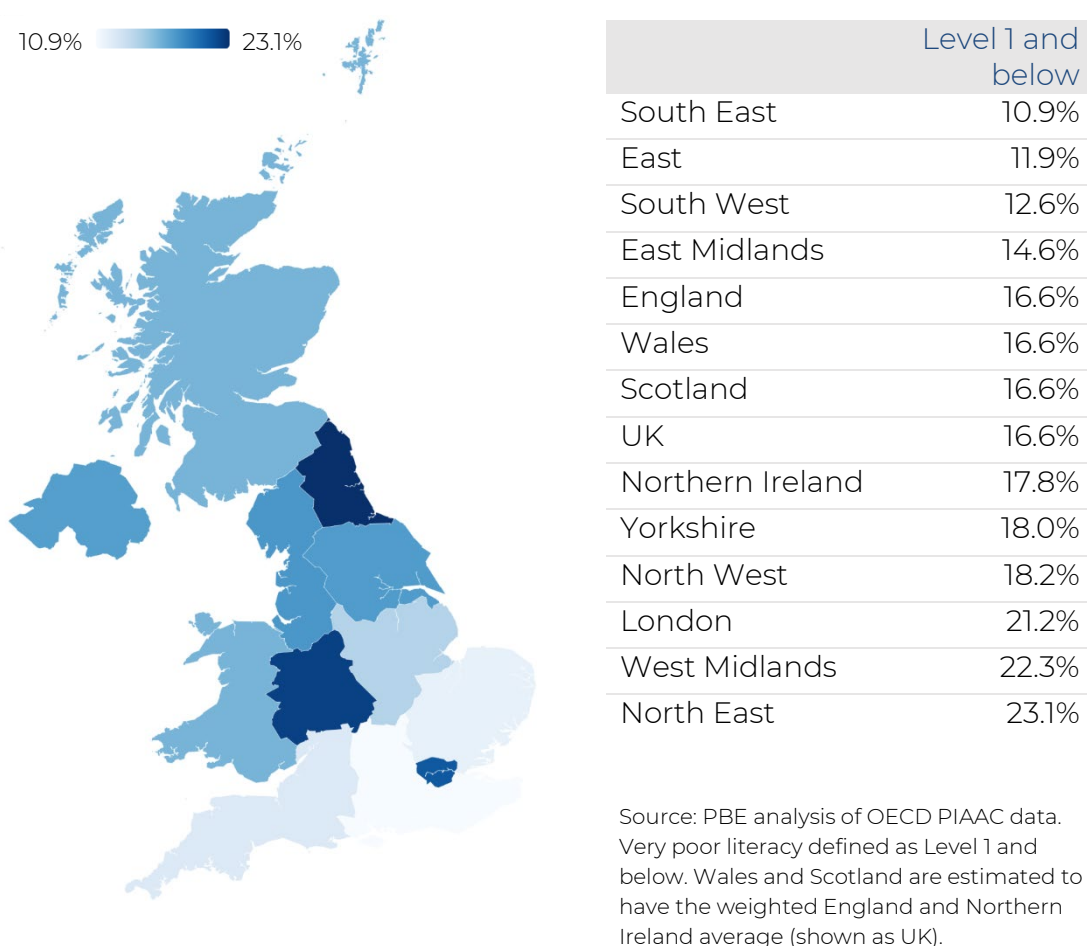
¹⁰ We assume that literacy rates have remained stable from 2011/2012 to today.

¹¹ Sizmur J, Ager R, Bradshaw J, Classick R, Galvis M, Packer J, Thomas D, Wheater R (2019): *Achievement of 15-year-olds in England: PISA 2018 results: Research report*. This report finds that the average reading scores for students in England have remained constant since 2006.

their children's adult literacy levels. For example, adults in England and Northern Ireland who themselves and their parents have low levels of education are eight times more likely to have poor proficiency in literacy than adults who have more educated parents.¹²

There are also significant differences in literacy levels within the UK as shown in Figure 2. The North East (23%) and West Midlands (22%) have the highest percentage of working age adults with very poor literacy while the South East (11%) and East (12%) have the lowest percentage. These are the same regions which have the highest and lowest percentages of adults with low numeracy skills respectively.¹³ This may indicate that regional inequalities in basic skills are driving other inequalities we see play out across the country.

Figure 2. Significant variation in literacy levels across UK regions



¹² OECD (2013): *Survey of Adult Skills first results: England & Northern Ireland (UK)*. OECD Publishing. [OECD \(2013\): Survey of adult skills first results: England & Northern Ireland \(UK\)](#). OECD Publishing.

¹³ Franklin J (2021): *Counting on the recovery: The role for numeracy skills in 'levelling up' the UK*.

Literacy skills have a material impact on individuals' lives

The impacts of poor basic skills can permeate throughout multiple facets of an individual's life, affecting social, health and economic experiences.^{14 15}

¹⁶ Individuals with very poor literacy are found to have lower levels of trust in others and civic participation, as well as worse physical and mental health compared to those with higher levels of literacy.^{17 18 19}

Individuals with poor literacy are also more likely to be unemployed and earn lower wages. Analysis of the OECD data shows that very poor literacy rates are twice as high for people not working (26%) compared to those working (13%) in Northern Ireland. In England very poor literacy rates are ten percentage points higher for those not working (23%) compared to those working (13%). Studies suggest that time out of the workforce leads to a depreciation of basic skills with the greatest losses experienced by those with the lowest levels of skills.^{20 21} This can create a vicious cycle where a lack of basic skills can lead to difficulty gaining employment which in turn leads to skill depreciation, exacerbating the problem further.

The OECD finds that workers with the highest levels of literacy have 94% higher median hourly wages than workers with very poor literacy.²² These raw wage differences are a result of a host of different factors including other basic skills, academic qualifications, parental backgrounds, age, work experience and sectors of work – all of which are associated with low literacy but not driven by low literacy alone. However, it is possible to more closely isolate the potential effect of literacy skills on wages from other potential causes. Using published studies, we calculate that the average worker in the UK with very poor literacy skills is earning approximately 7.1%

¹⁴ Kuczera M, Field S, Windisch HC (2016): *Building skills for all: A review of England. Policy insights from the Survey of Adult Skills. OECD Skills Studies.*

¹⁵ Learning and Work Institute (2016): *Skills and poverty: Building an anti-poverty learning and skills system.*

¹⁶ Dugdale G, Clark C (2008): *Literacy changes lives: An advocacy resource.* London: National Literacy Trust.

¹⁷ Dugdale G, Clark C (2008): *Literacy changes lives: An advocacy resource.* London: National Literacy Trust.

¹⁸ OECD (2013): *Survey of adult skills first results: England & Northern Ireland (UK).* OECD Publishing.

¹⁹ Kuczera M, Field S, Windisch HC (2016): *Building skills for all: a review of England. Policy insights from the Survey of Adult Skills. OECD Skills Studies.*

²⁰ Bynner J, Parsons S. *Use it or lose it? The impact of time out of work on literacy and numeracy skills.* 1998 Nov.

²¹ Edin PA, Gustavsson M (2008): *Time out of work and skill depreciation.* ILR Review; 61(2):163-80.

²² OECD (2013): *Survey of adult skills first results: England & Northern Ireland (UK).* OECD Publishing.

less than they would if they had a basic level of literacy skills – the equivalent of nearly £1,500 less per year.²³

This means that the average 18-year-old with very poor literacy skills will earn around £33,000 less over their lifetime than if they had a basic level of literacy.²⁴ This is an economically significant amount: the average person with very poor literacy skills earns around £21,000 per year so they would need to work an additional 1.5 years over their lifetime to make up the lost income.

Imposing a significant potential cost on the wider economy

With approximately 4 million workers (13%)²⁵ estimated to have very poor literacy skills, in the UK, this is a large percentage of the population earning lower wages and operating less productively. Aggregating the annual individual lost earnings related to very poor literacy to the entire population of working adults with very poor literacy skills requires some additional assumptions. In this analysis, the lost individual earnings are estimated as the increase in earnings if the individual's literacy skills improved to a basic level of proficiency. Therefore, by extrapolating to the entire population of workers with very poor literacy skills, we assume that everyone with very poor literacy skills increases their skills and receive higher wages. In this situation, it is likely the current wage premium associated with improved literacy skills would be smaller than those currently estimated in the literature.²⁶

However, as an illustrative scenario of the maximum potential total scale of this income differential, a £1,500 increase in wages for the estimated 4 million workers in the UK with very poor literacy skills is the equivalent of a total differential in income of £6 billion per year in 2020 prices.

²³ This is assuming that the average person with very poor literacy skills earns approximately £21,000 annually. Please see Annex A for full details of these calculations.

²⁴ This value is expressed in present value terms, with future income discounted at a rate of 3.5% to age 18 in line with standard economic appraisal approaches.

²⁵ This 13% is calculated using the OECD data which has information on whether a person works and their literacy score. Using this data, we estimate the percentage of people in work with very poor literacy skills.

²⁶ This issue is discussed in more detail in Annex B.

There is an urgent need to go beyond investment in basic skills

The UK is at a critical point. Currently there are approximately 1.6 million adults unemployed following the Covid crisis and potential for more to come as furlough ends.²⁷ With lower paying sectors such as retail, hospitality and leisure badly hurt by lockdowns, workers in these fields face a hard road back to normality.²⁸ The government has an opportunity as the economy recovers, to put the UK on a path to a more productive future by seeking to give people the basic skills they need to move into higher skill, higher wage opportunities rather than back into lower paid roles.

The UK government already invests in adult skills through formal classroom-based education, training courses, apprenticeships and other courses.²⁹ The Adult Education Budget provides funding for adults to improve their skills including to gain English and Maths qualifications.³⁰ Recently, the government announced an investment of £2.5 billion in the National Skills Fund and Lifetime Skills Guarantee to improve adult skills in the UK through free access to Level 3 qualifications and more informal education through Skills Bootcamps.^{31 32 33}

However, adult education programmes have been shifting a higher proportion of funding towards apprenticeships.³⁴ Focussing on increasing occupation-specific adult skills is beneficial but strengthening basic skills such as literacy may provide an adult with more transferable skills that can be helpful in the event of a job loss or economic downturn.

Additionally, financial investment in basic skill courses may not be enough to tackle this long-standing, widespread challenge. In 2019 the Social Mobility Commission found that adults with the lowest qualifications are

²⁷ Unemployment by age and duration (seasonally adjusted). August 2021. Office of National Statistics.

²⁸ Real-time PAYE dataset Tables 19 and 20. August 2021. Office of National Statistics.

²⁹ Britton J, Farquharson C, Sibieta L, Tahir I, Waltmann B (2020): *2020 annual report on education spending in England*. IFS Report.

³⁰ Education & Skills Funding Agency (2021): *ESFA funded adult education budget (AEB): Funding and performance management rules 2021 to 2022*.

³¹ <https://www.gov.uk/guidance/national-skills-fund#history>

³² Department for Education (2021): *Hundreds of free qualifications offer to boost skills and jobs*. Press release. Retrieved from: <https://www.gov.uk/government/news/hundreds-of-free-qualifications-on-offer-to-boost-skills-and-jobs>

³³ Bhattacharya A, Corfe S, Norman A (2020): *(Adult) education, education, education: How adult education can improve the life chances of those on low incomes*. Social Market Foundation.

³⁴ Britton J, Farquharson C, Sibieta L, Tahir I, Waltmann B (2020): *2020 annual report on education spending in England*. IFS Report.

the least likely to participate in adult education and training.^{35 36} Participation in English and Maths courses fell by approximately 37% between the 2014/15 and 2018/19 academic years with the largest declines for those with the lowest levels of literacy.³⁷

Greater engagement with the people who stand to benefit the most is therefore key. Coordinated government action with campaigns targeting individuals, and initiatives from the social and private sectors could enable more adults to access adult educational resources to improve their basic skills.³⁸ In recent years, the government devolved the Adult Education Budget to six Combined Authorities and the Greater London Authority. This provides an opportunity for more flexibility – the potential for government to work alongside local partner organisations to target funding towards the needs of a given geographic area and reach those that need it most.^{39 40 41}

This action needs to be accompanied by additional investment in basic data on adult skills. The UK has excellent data collection on the educational outcomes of children; however, there is a lack of data on the skills of people once they leave education and are in the workforce. This is highlighted by the fact that the most recent national survey of adult literacy is from the OECD's 2011-2012 survey. While the OECD is in the process of updating their survey, at present only England has chosen to participate.⁴² This means that we still will not have a comprehensive baseline from which to measure progress. To understand how to target and improve the skills of adults in a world where the economy is constantly evolving, more careful and regular data collection is necessary.

Ultimately, having high levels of basic skills can not only help individuals to progress into higher earning roles, but it can also insulate them from sector-specific downturns as seen during the pandemic. Having a more productive and agile workforce can help the country recover and shift with the changing economic landscape.

³⁵ Luchinskaya D, Dickinson P (2019): *The adult skills gap: Is falling investment in UK adults stalling social mobility?* Social Mobility Commission.

³⁶ Bhattacharya A, Corfe S, Norman A (2020): *(Adult) education, education, education: How adult education can improve the life chances of those on low incomes.* Social Market Foundation.

³⁷ Department for Education (2020): *Further Education and skills, England: January 2020.* Retrieved from:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/861932/FE_and_Skills_commentary_January_2020.pdf

³⁸ Learning and Work Institute (2019): *Evidence review: What works to improve adult basic skills?*

³⁹ Britton J, Farquharson C, Sibieta L, Tahir I, Waltmann B (2020): *2020 annual report on education spending in England.* IFS Report.

⁴⁰ Department for Education (2020): *Further Education and skills, England: January 2020.*

⁴¹ Foster D (2019): *Devolution of the Adult Education Budget.* House of Commons briefing paper Number 8596.

⁴² <https://www.oecd.org/skills/piaac/about/#d.en.481111>

Annex A. Individual pay differential

What wage differential is very poor literacy likely to impose on an individual worker throughout their lifetime?

We use a four-step process to estimate the impact that very poor literacy skills could have on an individual across their lifetime:

1) we estimate annual earnings for those with very poor literacy, 2) we estimate the annual pay differential of individuals with very poor literacy, 3) we estimate the differential in wages at various ages related to very poor literacy skills, 4) we calculate the total wage differential across an individual's lifetime related to very poor literacy skills.

Figure A1. Summary of approach to estimating the individual pay differential related to very poor literacy skills



Step 1: Estimate annual earnings for those with very poor literacy

The baseline level of wages earned by individuals with very poor literacy will be affected by a range of other factors that might be correlated with an individual's literacy such as the level of other basic skills, education, their choice of which sector to work in and socio-economic background – these all need to be reflected in our baseline. We therefore estimate baseline wage rates by taking the average annual earnings by region from the

ONS⁴³ and adjust them downwards to reflect the fact that individuals with very poor literacy skills tend to earn less.⁴⁴ We use the following formula:

$$E_{low_r} = E_r * \beta_r$$

Where:

E_{low_r} = estimated average annual earnings for adults with very poor literacy in region or nation r

E_r - average annual earnings in region or nation r

β_r = ratio of average earnings in region r for adults with very poor literacy to average earnings taken from OECD PIAAC data for region or nation r

Our estimates are summarised in Figure A2 below:

⁴³ ONS (2020): Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5, Table 5.7a

⁴⁴ The OECD PIAAC data contains information on the monthly earnings of respondents; therefore, we are able to calculate the average monthly earnings for all workers and the average monthly earnings for workers with very poor literacy skills. We calculate the ratio of average earnings for workers with very poor literacy to the average earnings for all workers for each region and nation (with Wales and Scotland adjusted by a population weighted mean of the England and Northern Ireland figures).

Figure A2. Estimated baseline wage rates

	Mean wage in the region (E_r)	Adjustment factor for wage (β_r)	Mean wage in the region for those with very poor literacy ($E_{low,r}$)
North East	£26,995	0.81	£21,967
North West	£28,652	0.63	£18,103
Yorkshire	£27,494	1.00	£27,428
East Midlands	£28,210	0.68	£19,134
West Midlands	£29,347	0.63	£18,612
East	£29,527	0.74	£21,914
London	£47,345	0.61	£28,839
South East	£32,217	0.57	£18,464
South West	£27,207	0.67	£18,348
Wales	£26,249	0.68	£17,753
Scotland	£29,706	0.68	£20,091
Northern Ireland	£27,061	0.80	£21,697
England	£32,262	0.67	£21,701
UK	£31,590	0.68	£21,365

Source: PBE analysis of OECD PIAAC Public Use Files for England and Northern Ireland and ONS (2020): Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5, Table 5.7a. Wales and Scotland use the population weighted average as their estimates for adjustment factor for wage. The first two columns may not multiply exactly to the final column due to rounding. The mean wage in Yorkshire was only slightly larger than the mean wage in Yorkshire for those with very poor literacy skills. This could be a result of a different labour market in Yorkshire.

Step 2: Estimate individual annual pay differential related to very poor literacy

The most up-to-date estimate of the relationship between literacy and wages we are aware of is provided by Hanushek et al. (2015).⁴⁵ It draws on the same OECD PIAAC data we have used in our analysis and outlines a number of outcomes for the UK using a variety of different controls. We use results from one of the most complete specifications available, incorporating both numeracy and literacy skills as explanatory variables alongside several controls for individual characteristics (such as years of education), to consider the impacts of these effects on wages.⁴⁶ This model estimates that a one standard deviation improvement in literacy skills

⁴⁵ Hanushek E, Schwerdt G, Wiederhold S, Woessmann L (2015): *Returns to skills around the world: Evidence from PIAAC*, European Economic Review, 73, 103-130.

⁴⁶ Table A3 in Hanushek et al. (2015).

increases wages by 11.3%⁴⁷ - broadly in line with estimates on the returns to literacy in other research using longitudinal data.⁴⁸

To apply this evidence to our data we need to assess the average improvement required by those within our very poor literacy group before they would reach the threshold for Level 2 literacy. We have calculated that for each region using the OECD PIAAC data, expressed in standard deviations, and multiplied this by the strength of the relationship from Hanushek et al. (2015) to identify the overall % change in wages we would expect.⁴⁹ We apply this percentage change to our baseline wage rates in Step 1 to give an estimated monetary value of the wage differential for individuals with very poor literacy skills.

$$Diff_r = E_{low_r} * \delta_r * \Delta E$$

Where:

$Diff_r$ - estimated wage differential for adults with very poor literacy in region r

E_{low_r} - from Step 1

δ_r - % of a standard deviation increase in literacy score required to get out of very poor literacy category in region r

ΔE – 11.3% change in earnings related to one standard deviation increase in literacy scores from Hanushek et al. (2015)

⁴⁷ Hanushek et al. (2015).

⁴⁸ Vignoles A, De Coulon A, Marcenaro-Gutierrez O (2011); *The value of basic skills in the British labour market*. Oxford Economic Papers. 63(1):27-48.

⁴⁹ For Wales and Scotland we have assumed that the average improvement required to reach the Level 2 literacy threshold is equal to the weighted average of England and Northern Ireland.

Figure A3. Estimated wage differential for regions of England and UK nations related to very poor literacy skills

	Average required improvement in literacy to meet threshold for basic skills (δ_r)	% Wage gap related to very poor literacy skills ($\delta_r * 11.3\%$)	Average wage differential related to very poor literacy skills (Diff.)
North East	0.56	6.3%	£1,394
North West	0.74	8.3%	£1,507
Yorkshire	0.56	6.4%	£1,745
East Midlands	0.66	7.5%	£1,432
West Midlands	0.65	7.3%	£1,360
East	0.71	8.1%	£1,764
London	0.68	7.7%	£2,207
South East	0.53	6.0%	£1,110
South West	0.54	6.1%	£1,111
Wales	0.63	7.1%	£1,269
Scotland	0.63	7.1%	£1,436
Northern Ireland	0.54	6.2%	£1,336
England	0.64	7.2%	£1,559
UK	0.63	7.1%	£1,528

Source: PBE analysis of OECD PIAAC Public Use Files for England and Northern Ireland and ONS (2020): Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5, Table 5.7a. Wales and Scotland use the population weighted average as their estimates for average required improvement in literacy and % wage gap related to very poor literacy. Estimates may not perfectly align due to rounding.

It is important to highlight that these wage differences will be driven by both differences in progression within a particular sector that are associated with literacy skills as well as the original choice of which sector an individual chooses to work in.

Step 3: Estimate individual annual pay differential related to very poor literacy by age

When calculating the lost earnings for an individual over their lifetime, it is important to incorporate different earnings for different ages. Using data from the ONS on annual earnings by region from Step 1 and annual

earnings by age⁵⁰ we estimate the average annual earnings by age within a region using the following formula:

$$Diff_{r,a} = Diff_r * Age_Ratio_a$$

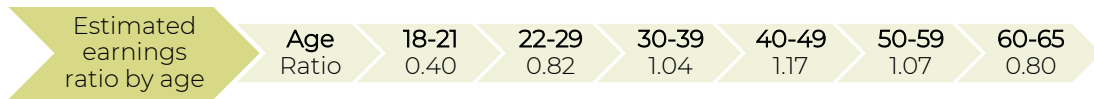
Where:

Diff_{r,a} – Annual pay differential related to very poor literacy at each age a in region r

Diff_r – from Step 2

Age_Ratio_a = ratio of national average annual earnings for age a to national average earnings across all ages (£31,590)

Figure A4. Earnings ratios based on age bracket



This means for ages 18-21, we calculate the annual earnings differential by age in region r by taking the average annual earnings differential in region r from Step 2 and multiplying by the *Age_Ratio_a* as shown in Figure A4 above. We then do this for all ages up to age 65 with the relevant age ratio. Figure A5 below shows the average annual earning differentials by region and age.

⁵⁰ ONS (2020): Earnings and hours worked, age group: ASHE Table 6, Table 6.7a

Figure A5. Estimated wage differential for regions of England and UK nations related to very poor literacy skills by age and region

Age bracket	18-21	22-29	30-39	40-49	50-59	60-65
North East	£556	£1,136	£1,444	£1,633	£1,498	£1,110
North West	£602	£1,228	£1,561	£1,765	£1,619	£1,200
Yorkshire	£697	£1,423	£1,809	£2,045	£1,875	£1,390
East Midlands	£572	£1,168	£1,484	£1,678	£1,539	£1,141
West Midlands	£543	£1,109	£1,409	£1,593	£1,461	£1,083
East	£704	£1,438	£1,828	£2,067	£1,896	£1,405
London	£881	£1,799	£2,288	£2,586	£2,372	£1,759
South East	£443	£905	£1,151	£1,301	£1,193	£884
South West	£444	£906	£1,152	£1,302	£1,194	£885
Wales	£507	£1,035	£1,315	£1,487	£1,364	£1,011
Scotland	£573	£1,171	£1,489	£1,683	£1,544	£1,144
Northern Ireland	£533	£1,089	£1,385	£1,565	£1,436	£1,064
England	£623	£1,271	£1,616	£1,827	£1,676	£1,242
UK	£610	£1,245	£1,583	£1,790	£1,641	£1,217

Source: PBE analysis of ONS (2020): Earnings and hours worked, UK region by industry by two-digit SIC: ASHE Table 5, Table 5.7a and ONS (2020): Earnings and hours worked, age group: ASHE Table 6, Table 6.7a. Estimates may not perfectly align due to rounding.

Step 4: Estimate individual lifetime pay differential related to very poor literacy

We take the annual pay differential for a given age and region and sum these up across the lifetime of an individual while discounting according to HM Treasury Green Book guidance.⁵¹

⁵¹ Discounting involves the downward adjustment to flows of money in the future in order to reflect the preference of individuals and society to receive money sooner rather than later – it is standard practice for economic appraisals.

$$Lifetime_Cost_r = \sum_{T=0}^{47} Diff_{r,a} * DF^T$$

Where:

$Diff_{r,a}$ - from Step 3

DF^T - is the discount factor (3.5%), with T representing the 47 years between age 18 and 65 which is in line with HM Treasury's Green Book guidance.

Figure A6 below shows the lifetime pay differentials related to very poor literacy. We also express these estimates as the number of years of additional work necessary for the average person with very poor literacy skills based on the estimate that the average person with very poor literacy skills earns approximately £21,000 annually (as shown in Figure A2).

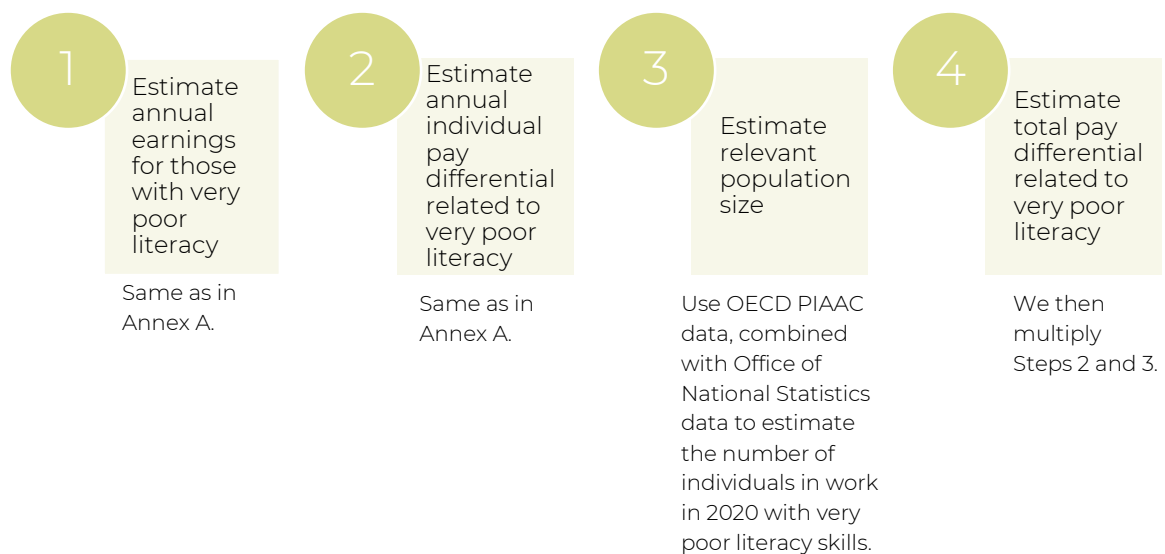
Figure A6. Estimated individual lifetime wage differentials for regions of England and UK nations related to very poor literacy skills

	Total individual lifetime wage differential related to very poor literacy skills ($\sum_{T=0}^{47} Diff_{r,a} * DF^T$)	Expressed as years of work within region
North East	£29,711	1.35
North West	£32,120	1.77
Yorkshire	£37,206	1.36
East Midlands	£30,534	1.60
West Midlands	£28,990	1.56
East	£37,609	1.72
London	£47,059	1.63
South East	£23,669	1.28
South West	£23,693	1.29
Wales	£27,060	1.52
Scotland	£30,624	1.52
Northern Ireland	£28,484	1.31
England	£33,242	1.53
UK	£32,566	1.52

Annex B. Total pay differential

To estimate the total pay differential for every person who has very poor literacy skills, we follow Step 1 and Step 2 from Annex A to calculate the individual pay differential related to very poor literacy. We then extrapolate this to everyone in the UK who is estimated to have very poor literacy skills.

Figure B1. Summary of approach to estimating the total pay differential related to very poor literacy skills



Step 3: Estimate relevant population size

We use ONS data to estimate the number of individuals in work for each region.⁵² We then use OECD data to estimate the percentage of workers within a region that have very poor literacy skills. Both combined then give us an estimate the number of individuals in work with very poor literacy skills for each region, summarised as follows:

$$P_r = w_r * low_lit_work_r$$

Where:

P_r - population of in-work adults with very poor literacy by region r

w_r - # of adults working in region r

⁵² Rates of employment taken from ONS (2021): *Labour market in the regions of the UK: January - May 2021*, Population estimates taken from ONS (2020): *Annual Population Survey estimates of the country of birth and nationality of residents in the UK, by region and age group, 2004 to 2018*

$low_lit_work_r$ - percentage of working adults with very poor literacy in region r

Figure B2. Estimated number of individuals in work with very poor literacy skills for English regions and nations of the UK

	Number of people in work (w_r)	Percentage in work with very poor literacy skills ($low_lit_work_r$)	Number in work with very poor literacy skills (P_r)
North East	1,178,864	21.32%	251,334
North West	3,278,307	12.15%	398,314
Yorkshire	2,452,467	14.15%	347,024
East Midlands	2,205,102	10.16%	224,038
West Midlands	2,638,663	18.08%	477,070
East of England	2,913,718	10.86%	316,430
London	4,477,795	16.13%	722,268
South East	4,346,201	10.23%	444,616
South West	2,554,447	9.98%	254,934
Wales	1,401,783	13.13%	184,054
Scotland	2,550,917	13.13%	334,935
Northern Ireland	821,190	13.07%	107,330
England	26,047,386	13.14%	3,422,627
UK	30,822,000	13.13%	4,046,929

Source: PBE analysis of OECD PIAAC Public Use Files for England and Northern Ireland and rates of employment taken from ONS (2021): *Labour market in the regions of the UK: January - May 2021*, Population estimates taken from ONS (2020): *Annual Population Survey estimates of the country of birth and nationality of residents in the UK, by region and age group, 2004 to 2018*. Wales and Scotland use the population weighted average as their estimates for percentage in work with very poor literacy skills. Sums for the UK may not align due to rounding. Estimates may not perfectly align due to rounding.

Step 4: Estimate total pay differential related to very poor literacy

We take the estimated annual individual pay differential for a person with very poor literacy skills from Step 2 and multiply this by the estimated population of workers with very poor literacy skills from Step 3 to estimate the total value of wage differentials related to very poor literacy skills.

$$Total_Diff_r = Diff_r * P_r$$

Where:

$Total_Diff_r$ – total pay differential related to very poor literacy

$Diff_r$ - from Step 2

P_r - from Step 3

To account for regional differences in wages, these total wage differentials can be expressed as a percentage of the total value of wages earned in the region as shown in Figure B3 below:⁵³

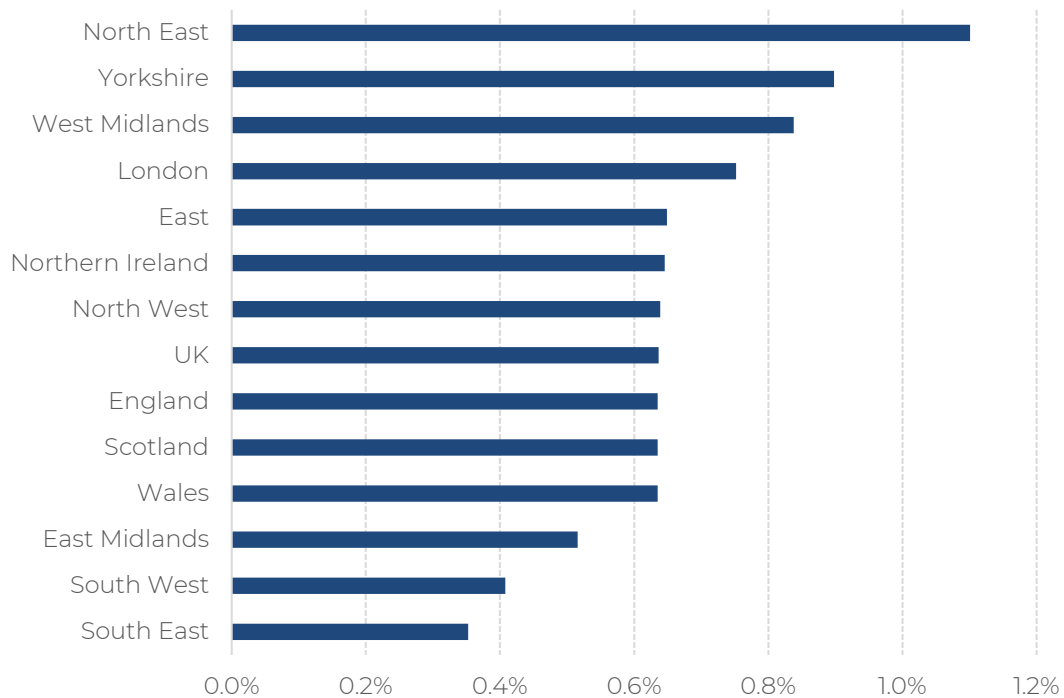
Figure B3. Estimated total wage differentials for regions of England and UK nations related to very poor literacy skills

	Total value of wage differential related to very poor literacy skills ($Diff_r * P_r$)	As a % of total income generated by workers in region
North East	0.4B	1.10%
North West	0.6B	0.64%
Yorkshire	0.6B	0.90%
East Midlands	0.3B	0.52%
West Midlands	0.6B	0.84%
East	0.6B	0.65%
London	1.6B	0.75%
South East	0.5B	0.35%
South West	0.3B	0.41%
Wales	0.2B	0.63%
Scotland	0.5B	0.63%
Northern Ireland	0.1B	0.65%
England	5.3B	0.64%
UK	£6.2B	0.64%

Estimates may not perfectly align due to rounding.

⁵³ This is based on the mean earnings for each region and the total number of individuals employed, as provided in Figures A2 and B2.

Figure B4. Total value of wage differentials related to very poor literacy as a % of total income generated by workers in region



Key assumptions behind the analysis

Our analysis is based on several key underlying assumptions:

- We do not have estimates for very poor literacy rates for Wales and Scotland as their surveys on literacy skills are not directly comparable to the OECD PIAAC data. Therefore, we have used the population weighted average very poor literacy rate for England and Northern Ireland as estimates for their very poor literacy rates.
- We assume that the estimated employment effects taken from Hanushek et al. (2015) represent a good causal estimate of the impact of very poor literacy on wage rates. Their analysis incorporates controls for factors such as work experience, age and other skills. However, it remains possible that there are still unobserved characteristics that affect both wage levels and levels of literacy and therefore bias the results we are using.
- We have not incorporated any “general equilibrium effects” in our analysis. In a theoretical example where all individuals with very poor literacy skills suddenly received support to reach our basic threshold for literacy this would reduce the wage premium for literacy skills (and effectively reduce the scale of the total wage differentials we have identified in this paper). The scale of this effect is uncertain – in a small open economy such as the UK the effects could be relatively

limited provided that the economy re-structures over time towards high skills, high wage sectors. This was demonstrated in an Institute of Fiscal Studies analysis of historical changes in skill levels in the UK that highlighted that the proportion of people with a university degree by age 30 more than doubled between those born in 1965-69 compared to those born 10 years later, and yet the high skill wage premium remained largely unchanged in the UK over this period as firms adapted their production approach to make use of the more highly skilled labour force.⁵⁴ Analysis of educational interventions in the USA have also estimated that these broader General Equilibrium Effects may reduce estimated wage benefits by around 10% when compared to a “partial equilibrium” approach similar to the one used in this study.⁵⁵ On this basis we believe that our estimates of the total wage differentials are useful as an indicative scenario for the total potential scale of wage increases that could be possible with improved literacy but should not be treated as precise estimates.

- We have assumed that the relationship between literacy skills and wages is the same across all ages and in all regions of the UK and that it remained stable over time. As people progress in their careers, or suffer career interruptions, it is possible that returns to literacy may change. Additionally, it is possible that the percentage wage differential from very poor literacy would vary between different regions of the UK based on the pre-existing mixture of industrial sectors. It is also possible that the increasing introduction of automation and increased use of computers will have altered the wage impact of literacy skills since the Hanushek paper was originally written. Unfortunately, there is no evidence on which to provide a more up-to-date or detailed differentiation of evidence across different regions at this time.

⁵⁴ Blundell R, Green D, Jin W (2016): *The UK wage premium puzzle: how did a large increase in university graduates leave the education premium unchanged?* Institute for Fiscal Studies Working Paper W16/01.

⁵⁵ Heckman J, Lochner L, Taber C (1999): *Human capital formation and general equilibrium treatment effects: a study of tax and tuition policy*, Fiscal Studies vol20(1), pp25-40.



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