Lifelong Learning and Well-being: An Analysis of the Relationship Between Adult Learning and Subjective Well-being

IFLL Public Value Paper 3

IFLL
Inquiry into the Future
for Lifelong Learning

Matrix Knowledge Group

niace

promoting adult learning

NIACE has a broad remit to promote lifelong learning opportunities for adults. NIACE works to develop increased participation in education and training, particularly for those who do not have easy access because of class, gender, age, race, language and culture, learning difficulties or disabilities, or insufficient financial resources.

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Foreword

This is the third of the Inquiry into the Future for Lifelong Learning's Public Value papers. This series of papers grapples with a range of questions about how we should understand the effects of lifelong learning. The 'public value' of lifelong learning resides in the benefits it brings, not only to the learners themselves, but to wider society. If learning makes individuals healthier, for example, that is good for them, but also for their family, their community and for the health service and the taxpayer. It signals a general uplift in the quality of life. This is public value.

The notion of public value is easy to grasp but not so easy to measure. For many of us it is almost self-evident that lifelong learning brings personal and social benefits as well as economic ones. Yet we need to examine the evidence as rigorously as we can: what actually are the effects; can we get an idea of how big they are; and what is the process by which they occur? We know that we cannot produce perfect answers to these questions. But by assembling a range of responses, the Inquiry aims to fill in much more of the picture than is currently available; to give a clearer focus to the policy options involved; and to prompt further reflection and debate.

This paper, prepared by the Matrix Knowledge Group, addresses the question of how far learning can contribute to improving well-being. It takes a particular approach, applying cost-benefit analysis to produce very specific results, quantified and even given monetary values. Such an approach is open to criticism, but it helps to focus the debate on alternative choices.

For the Inquiry, this is a key part of our mission. The aim is not to prove that lifelong learning is the most socially productive form of investment, but to generate serious discussion around what its contribution might be – and how we can best estimate this. The Inquiry is also publishing a Thematic Paper on *Well-being and Lifelong Learning*, which contains substantive proposals on this issue.

We are grateful to the Matrix Knowledge Group for their contribution to the Inquiry's work.

Published papers are available from the IFLL website: http://www.niace.org.uk/lifelonglearninginquiry/Publishedpapers.htm

Periodic updates on IFLL progress are to be found in our Bulletin (you can register for Inquiry Bulletins at: http://www.niace.org.uk/lifelonglearninginquiry/register.htm).

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1. Introduction

A wide variety of studies have investigated the relationship between education and well-being. Some studies identify a positive relationship between education and well-being, while others find that middle-level education is related to the highest levels of well-being (Dolan et al, 2008a; Sabates and Hammond, 2008). However, there is very little research on the relationship between lifelong learning and well-being.

Sabates and Hammond undertook a review of the literature on the relationship between lifelong learning and well-being. They identified a number of studies suggesting that having higher qualifications is associated with greater happiness, life satisfaction, self-esteem, self-efficacy, and reduced risk of depression. However, they failed to identify any studies on lifelong learning and well-being.

Sabates and Hammond (2008) also identified limitations in the quality of the existing research on the relationship between education and well-being. In particular, they identified a 'need for more robust empirical studies that provide evidence about the effects of education, over and above mere associations'. What is the causal direction between education and well-being? Does education increase well-being, or do people who are happy gain more qualifications?

1.1 Defining and measuring well-being

A number of competing definitions of well-being are employed in the literature. These can be divided into subjective and objective measures. Objective measures are based on assumptions about basic human needs and rights (for example, autonomy, self-acceptance). Sen (1999) presents a well-known version of the objective approach to defining well-being. He argues that the satisfaction of these needs provides people with the capabilities to develop their own well-being and to choose from among the opportunities available to them.

The objective-list approach has at least two principal advantages. First, it focuses the policy-maker's attention on addressing primary needs. Second, the approach points the way to the development of practical lists of objective indicators of well-being. Examples of the measures employed by proponents of the objective approach include the Human Development Index and the Index of Social Health. However, the objective approach also suffers from a number of challenges. Although some needs, such as the needs for food and freedom, are likely to be universal, others, especially at the higher levels of some form of hierarchy (for example, the need for individual mastery and self-esteem), may be more a feature of particular cultural contexts and sets of values. Even if wide agreement on an objective list could be obtained, questions about how to weight the items would remain.

The subjective approach characterises well-being as 'psychological phenomenon characterised by feelings of pleasure and displeasure, happiness and sadness, and satisfaction and dissatisfaction'[1]. Such accounts of well-being are grounded in the hedonistic philosophy[2] and are concerned with how people evaluate their lives, as well as how they feel in a strict hedonic sense. Subjective well-being has been shown to be a reasonably valid indicator for utility or well-being. For example, it has shown to be highly correlated with actual behaviour (for example, suicide) and key physiological variables[3]. Furthermore, subjective well-being has intuitive appeal to policy-makers, and has the advantage that there are data to measure the relationship between subjective well-being and people's experiences. For these reasons, a subjective definition of well-being is adopted in this paper.

1.2 Valuing social policy outcomes

One of the challenges of undertaking economic analysis of social policy interventions is that it is impossible to directly monetise intervention outcomes, as there is no market for them. Economists have developed a number of techniques to overcome this challenge and indirectly monetise such non-market goods. Typically, they have relied on information about people's preferences, either revealed through existing markets or stated in hypothetical contingent markets. Such methods have become standard practice for public policy-making in the USA[4] and in the UK[5].

Preference-based valuation methods suffer from a number of limitations. Revealed preference studies can be used to value impacts on health and human life using the preference information revealed through existing markets. For example, the value of preventing a fatality (VPF) has been calculated by estimating the compensating differentials for on-the-job risk exposure in labour markets, or the price–risk trade-offs in product markets, such as for automobiles and fire alarms[6]. However, the validity of revealed preference studies depends on the markets being studied functioning well, and the ability to isolate the impact of the goods being valued on market prices; two requirements that are rarely fulfilled in practice. The difficulty in fulfilling these requirements is thought to explain the large variation in estimates produced by revealed preference studies. Dolan et al (2008b) identify VPF estimates ranging from £0.5 million to £64 million.

Stated preference studies construct a hypothetical contingent market where the individual is asked to state their willingness to pay (WTP) for the non-market goods. The advantage of such studies is their ability to elicit exactly the information that is required. The use of contingent valuation questions is recommended by NOAA[7] and

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[1] Dolan and White (2007).
[2] Bentham (1996); Kahneman (2000a; 2000b).
[3] Dolan and White (2007).
[4] Office of Management and Budget (1990).
[5] H.M. Treasury (2003).
[6] Dolan et al (2008b).
[7] Arrow et al (1993).

H.M. Treasury guidelines[8]. However, stated preference techniques also face a number of challenges, perhaps the main challenge being the assumption that individuals have a coherent set of preferences. A number of phenomena have been identified as evidence that such coherent preferences may not be observed in practice and that the results obtained from such techniques may be biased[9].

Given the limitations of such preference-based methods, economists have turned their attention to measuring people's experiences rather than people's preferences. In particular, given data on subjective well-being, statistical techniques can be employed to estimate the amount of income that is required to hold well-being constant following a change in experience, such as health, employment, or education. This approach to valuing non-market goods is increasingly being employed by economists as an input to public policy-making[10].

The use of well-being measures to value policy impacts has a number of advantages over the preference-based approaches discussed above. They do not require the assumption of equilibrium in markets, and there is no need to construct a hypothetical market. Thus, measures of subjective well-being can avoid many of the problems inherent in individual preferences, particularly those that are elicited in unfamiliar contexts, and they avoid the focusing effect – that is, the tendency of respondents to contingent valuation studies to place more emphasis on the goods being valued than they would do outside the context of the study.

[8] H.M. Treasury (2003).
[9] Dolan and Metcalfe (2007); Dolan and Kahneman (2008).
[10] Dolan et al (2008a).

2. Methodology

The source of data employed in the analysis was the British Household Panel Survey (BHPS). The BHPS has a number of advantages. First, it is a nationally representative sample of over 10,000 adult individuals. Second, the BHPS is longitudinal, having been carried out annually since 1991. The panel nature of the data allows the analysis to control for individual heterogeneity and begin to make inferences about causality. Specifically, the panel nature of the data controls for the influence of unobserved factors on both well-being and whether someone participates in lifelong learning, such as motivation, intelligence, optimistic outlook or family background.

The following model was specified to explore the relationship between lifelong learning and well-being:

$$SWB_i = \beta_0 + \beta_1 \ln(y_i) + \beta_2 R_i + \beta' X + \varepsilon_i \tag{1}$$

Where SWB_i is individual i's subjective well-being, $\ln(y_i)$ is the natural logarithm of household income, R_i is lifelong learning, X are the personal and social characteristics, and ε_i is the standard error term.

According to the Inquiry into the Future for Lifelong Learning, '*lifelong learning includes people of all ages learning in a variety of contexts – in educational institutions, at work, at home and through leisure activities. It focuses on adults returning to learning rather than on the initial period of education. However, [...] initial education increasingly stretches well into adulthood, especially with many students mixing study and employment, and with the rapid growth of postgraduate education*'.[11] Given this definition, the data available in the BHPS allowed three measures of lifelong learning to be constructed:

- Undertaking formal (leading to a qualification) part-time education or training, currently or in the last year.

- Undertaking informal (not leading to a qualification) part-time education or training, currently or in the last year.

- Having received an educational qualification later than at the conventional age.[12]

As the variables relating to formal and informal part-time education were only introduced in the BHPS from wave eight onwards, the analysis was restricted to waves eight to 15.

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[11] http://www.niace.org.uk/lifelonglearninginquiry/AboutIFLL.htm
[12] Where the conventional age for receiving qualifications is defined as: 17 years old for GCE O-levels or CSE grade 2-5; 19 years old for GCE A-levels; 22 years old for first degree; and 25 years old for higher degree, teaching, nursing or other higher qualification.

The BHPS also provided a number of measures of subjective well-being. The model was run for each of the following measures of subjective well-being:

- subjective well-being GHQ12 (scale: 1 least distressed; 12 most distressed);
- subjective well-being GHQ36 (scale: 1 least distressed; 36 most distressed);
- unhappiness or depression (scale: 1 not at all; 4 much more than recently);
- life satisfaction (scale: 1 not satisfied at all; 7 completely satisfied).

Variables 1 and 2 summarised the answers to 12 questions that make up the General Health Questionnaire (GHQ – more detail on the questions that make up the GHQ are available in *Appendix A*), originally developed as a screening instrument for psychiatric illness, but often used as an indicator of subjective well-being[13]. Respondents answer 12 health-related questions on a scale of 1 to 4. GHQ12 converts valid answers to the GHQ to a single scale by recoding 1 and 2 values on individual variables to 0, and 3 and 4 values to 1, and then summing, giving a scale running from 0 (the least distressed) to 12 (the most distressed). GHQ36 converts valid answers to the GHQ to a single scale by recoding so that the scale for individual variables runs from 0 to 3 instead of 1 to 4, and then summing, giving a scale running from 0 (the least distressed) to 36 (the most distressed).

Variable 3 reported the response to the question: 'Here are some questions regarding the way you have been feeling over the last few weeks. Have you recently... been feeling unhappy and depressed?' Variable 4 reported the response to the question: 'How dissatisfied or satisfied are you with your life overall?' In order to ensure that improvements in well-being were reflected in a higher score on all four scales, variables 1, 2 and 3 were multiplied by -1.

The income variable included in the model was real equivalised annual household income, adjusted for the number of dependents in the household.

The review undertaken by Dolan et al (2008a) was used to identify the other factors that are known to influence subjective well-being. These factors were included in the model to ensure that confounding influences were controlled for, including sex, age, marital status, number of children, health, employment status, whether the respondent is a full-time carer, relative income (i.e. the average income of the respondent's age and gender cohort), educational attainment, wealth, and social contact with friends and family.

Further details on the type of regression model run, and the methods employed to overcome endogeneity in the relationships in the model are available in *Appendix C*.

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[13] Taylor et al (2007).

The results from the regression model were used to estimate the monetary value of the change in well-being associated with engaging in lifelong learning. Specifically, the coefficients on the lifelong learning variable and the income variable in the models were compared to estimate the amount that income would have to be increased to produce the same increase in well-being as that gained from participating in lifelong learning. Further details of this calculation are available in *Appendix D*.

3. Results

Table B2 in *Appendix B* summarises the descriptive analysis of the variables included in the model. It demonstrates that 12 per cent of individuals in the sample undertook part-time formal education or training, and that ten per cent undertook part-time informal education or training. Almost one-quarter of individuals had no formal qualification, 54 per cent received a formal qualification at the conventional age, and 22 per cent received a formal qualification later than at the conventional age.

The same proportion of men and women undertook part-time informal education (ten per cent). However, the proportion of women who undertook part-time formal education (12 per cent) was slightly greater than for men (11 per cent); the difference being statistically significant at a 95 per cent confidence level.

Table 1 summarises the proportions of different age groups undertaking part-time education. It demonstrates that people younger than 34 years old are most likely to be engaged in part-time formal education, being twice as likely to engage in part-time formal education as those aged 45–65 years. A different pattern is observed for part-time informal education. In this case, those aged 25–44 years are most likely to engage in part-time informal education. However, the proportions in each age group are more similar than for formal education. Only a small minority of people older than 65 years participate in either formal or informal education.

Table 1: Percentage of individuals undertaking part-time education by age groups

	<25yr	25–34yr	35–44yr	45–65yr	>65yr	Total
Part-time formal	18%	18%	16%	9%	1%	12%
Part-time informal	9%	14%	14%	11%	2%	10%

Table 2 summarises the proportions of people of different employment status participating in part-time education. A greater proportion of those who are employed participate in both formal and informal education than those from any other group. While it might be expected that those who are unemployed, retired or inactive may take greater advantage of part-time education, only ten per cent of those who are unemployed, seven per cent of those who are inactive, and two per cent of those who are retired participate in part-time formal education. An even smaller proportion of these groups participate in part-time informal education – five per cent of those who are unemployed, three per cent of those who are inactive, and three per cent of those who are retired.

Table 2: Percentage of individuals undertaking part-time education by labour force status

	Employed	Unemployed	Retired	Student	Inactive	Total
Part-time formal	17%	10%	2%	10%	7%	12%
Part-time informal	16%	5%	2%	4%	3%	10%

Table 3 summarises the mean well-being of those undertaking and not undertaking lifelong learning. It demonstrates that those in part-time education, either formal or informal, or who have undertaken part-time education at some point in the previous year, have a greater level of well-being than those who are either not in part-time education or have not recently undertaken part-time education (difference in means is statistically significant at a 95 per cent confidence level). The only exceptions to this rule are those participating in part-time formal education when well-being is measured as life satisfaction. This finding would suggest that the process of participating in lifelong learning has a positive effect on people's well-being levels.

Table 3: Average well-being scores by lifelong learning status (on all measures a higher score is associated with greater well-being)

	ghq12	ghq36	happy	lifesat
Part-time formal education				
No	-1.91	-11.28	-1.91	5.23
Yes	-1.81	-10.70	-1.89	5.20
Part-time informal education				
No	-1.92	-11.26	-1.91	5.23
Yes	-1.74	-10.75	-1.87	5.25
Qualifications earned				
No qualification	-2.19	-12.08	-1.95	5.25
Received qualification later than conventional age	-1.88	-11.10	-1.90	5.15
Received qualification at conventional age	-1.79	-10.91	-1.88	5.25

Table 3 also summarises the relationship between receiving a qualification, whether this qualification was received at the conventional age or later, and well-being. It suggests that receiving a qualification, whether at the conventional age or later, is associated with higher levels of well-being than not receiving qualification (differences being statistically significant at a 95 per cent confidence level). The only exceptions to this rule are those receiving a qualification at a later than conventional age when well-being is measured using life satisfaction scores. However, the analysis also suggests that receiving a qualification at the conventional age is associated with higher levels of well-being than receiving a qualification at a later than conventional age (all differences are statistically significant at a 95 per cent confidence level).

Thus, Table 3 could be interpreted as suggesting that the process of undertaking lifelong learning has a positive effect on people's well-being, and that having obtained a qualification through lifelong learning also has a positive impact on well-being compared with not having obtained a qualification. Those people who gained a qualification at the conventional age tend to be happier than they would have been had they obtained the qualification through lifelong learning.

However, the analysis reported in Table 3 does not control for differences in the personal and social characteristics (confounding factors) of those who undertake lifelong learning and those who don't, which may explain some of the variation in well-being levels. Table B3 in *Appendix B* summarises the results of the regression analysis undertaken to overcome this limitation. The regression analysis measures the relationship between lifelong learning and well-being, while controlling for the influence of other factors known to influence well-being.

In support of the validity of the analysis run, the results support a number of findings from the existing literature on the relationship between these confounding factors and well-being[14]: income and contact with family and friends are positively related to well-being; and health problems, being unemployed, and being a full-time carer are all negatively associated with well-being. The average income of people in a respondent's peer age and sex group is also negatively associated with well-being. Again, this supports the findings of the existing literature. That is, the greater the income of a person's peer group, the lower their perceived relative income, and the lower their well-being.

The existing literature is inconclusive about the relationship between educational levels and well-being[15]. In support of this ambiguous relationship between education and well-being, the results reported in Table B3 demonstrate a **positive** but **non-significant** relationship between years of education and well-being. However, before this result is interpreted as evidence of the ambiguous relationship between education and well-being, an alternative explanation needs to be rejected. As few respondents will change their education level between waves eight and 15 – the waves included in the analysis – there will be insufficient variation in the years of education variable within a fixed effect model to identify any significant relationship between years of education and well-being.

The results reported in Table B3 suggest that participating in lifelong learning has a positive impact on well-being[16]:

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[14] See Dolan et al (2006) for a summary of the existing literature on the factors that influence well-being.
[15] Dolan et al (2006).
[16] Estimates of percentage change in well-being are calculated using the average well-being score for those not in part-time education or those with no qualifications. Details of this calculation are available in Table B4 in *Appendix B*.

1. Undertaking formal (leading to a qualification) part-time education or training, currently or in the last year, has a **significant positive** effect on all four measures of well-being. Specifically, participating in part-time formal education results in:
   a. A 0.06 (3.1%) improvement on the GHQ12
   b. A 0.18 (1.6%) improvement on the GHQ36
   c. A 0.02 (1.0%) improvement on the unhappiness or depression scale
   d. A 0.03 (0.6%) improvement in life satisfaction scores

2. Undertaking informal (not leading to a qualification) part-time education or training, currently or in the last year, has a **significant positive** effect on three of the four measures of well-being. Specifically, participating in part-time formal education results in:
   a. A 0.12 (1.0%) improvement on the GHQ36
   b. A 0.02 (1.2%) improvement on the unhappiness or depression scale
   c. A 0.03 (0.5%) improvement in life satisfaction scores

However, a negative relationship is identified between well-being and having obtained a formal qualification later than at the conventional age. That is, having received the highest educational qualification later than at the conventional age, compared to having no educational qualification at all, has a **significant negative** impact on well-being. This result prevails for all well-being measures except life satisfaction. Specifically, obtaining an educational qualification later than at the conventional age, compared with not obtaining an educational qualification, results in:

   a. A 0.45 (20.6%) deterioration in the GHQ12
   b. A 0.78 (6.4%) deterioration in the GHQ36
   c. A 0.13 (6.9%) deterioration in the unhappiness or depression scale
   d. A 0.03 (0.6%) deterioration in life satisfaction scores

A similar relationship is identified between well-being and having obtained a formal qualification at the conventional age. Having received the highest educational qualification at the conventional age, compared to having no educational qualification at all, has a **significant negative** effect on well-being when measured using the 'happy' variable (an 0.12 [6.3 per cent] deterioration in the unhappiness or depression scale). The relationship between having received a qualification at the conventional age and well-being is not statistically significant when estimated using the other three measures of well-being.

It is important to note that the above relationships reflect the relationship between well-being and obtaining a formal qualification, once the relationship between well-being and years in education has been controlled for. Thus, it is inappropriate to attach much importance to the absolute coefficients on these variables. It is perhaps more appropriate to interpret these variables in comparison with each other. Comparing the relationship between qualifications obtained at conventional and non-conventional ages and well-being, using the one measure of well-being with which both measures demonstrate a statistically significant relationship, suggests that obtaining a

qualification at a conventional age increases well-being compared with obtaining a qualification at a non-conventional age.

Table 4 shows the income compensation calculation for lifelong learning, where statistically significant relationships were identified between both income and the measure of lifelong learning and well-being. That is, it shows the change in income that would produce the same well-being change as participating in lifelong learning. The calculation of income compensation is equation 2 in *Appendix D.*

It demonstrates that the monetary value of undertaking part-time education ranges from £2,500 to £5,100 for formal education and £3,400 and £4,100 for informal education. Put another way, undertaking part-time education, or having done so in the last year, increases the level of well-being by the same amount as an increase in annual household income of between £2,500 and £5,100.

Table 4: Income compensation calculations for lifelong learning

	ghq12	ghq36	happy	lifesat
Part-time formal	£2,481	£5,143	£3,421	£4,740
Part-time informal	–	£3,355	£3,996	£4,066
Received qualification later than at the conventional age	£-13,392	£-14,922	£-15,850	–
Received qualification at the conventional age	–	–	£-14,962	–

Once again, the absolute values of the income compensation for having received a formal qualification, either at a conventional or non-conventional age, are not very meaningful on their own. However, they can be interpreted in comparison with each other. From this perspective, the results suggest that having received a qualification at a conventional age, when compared with having received a qualification at a later than conventional age, is associated with increase in well-being, the equivalent of an increase in annual household income of £900.

4. Conclusions: headline messages for the Inquiry

This paper studies the impact on a person's well-being of engaging in lifelong learning, and uses this relationship to estimate the economic value of lifelong learning. It suggests that undertaking part-time education, or having done so in the last year, is associated with an increase in well-being, and that this improvement in subjective well-being is equivalent to an increase in annual household income of between £2,500 and £5,100. However, having obtained a formal qualification at a later than conventional age results in a lower level of subjective well-being compared with obtaining a formal qualification at the conventional age. This result could be interpreted as suggesting that the process of undertaking lifelong learning has a positive effect on people's well-being, but that those people who gained a qualification at the conventional age tend to be happier than they would have been had they obtained the qualification through lifelong learning.

There are a number of important limitations with this study that need to be considered when interpreting the above results. First, the above estimates are based on an analysis of the BHPS. While the panel nature of the data allows the analysis to control for individual heterogeneity and begin to make inferences about causality, the analysis cannot claim to definitively identify the causal relationship between lifelong learning and well-being. For instance, the study of the factors that influence well-being is still in its relative infancy. Further research is required before models for explaining well-being can be specified with certainty.

Second, in order to overcome problems of endogeneity in the relationship between well-being and income, it is necessary to instrument income. However, the employment of instrumental variables in research on well-being is still relatively rare[17]. Further research is required on the quality of different instrumental variables.

Third, it is likely that the results are subject to selection bias. That is, the impact of part-time education on well-being is measured for those who chose to go into part-time education. It is likely that these estimates exceed the well-being gains expected if other members of the population were to receive part-time education.

While this study is the first to attempt to measure the impact of lifelong learning on well-being, there are a number of questions that the study does not answer, including: Is the relationship between lifelong learning and well-being maintained across education levels and time? Through what mechanism does lifelong learning impact on well-being? Does the impact of lifelong learning on well-being vary with age? Further research is required to explore these questions and improve the understanding of the relationship between lifelong learning and well-being.

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[17] Oswald and Powdthavee (2007); Dolan and Metcalfe (2007).

Appendix A: General Health Questionnaire

"Have you recently...	1	4
been able to concentrate on whatever you are doing?"	Better than usual	Much less than usual
lost much sleep over worry?"	Not at all	Much more than usual
felt that you are playing a useful part in things?"	More than usual	Much less capable
felt capable of making decisions about things?"	More so than usual	Much less capable
felt constantly under strain?"	Not at all	Much more than usual
felt you could not overcome your difficulties?"	Not at all	Much more than usual
been able to enjoy your normal day-to-day activities?"	Much more than usual	Much less than usual
been able to face up to your problems?"	More so than usual	Much less able
been feeling unhappy and depressed?"	Not at all	Much more than usual
been losing confidence in yourself?"	Not at all	Much more than usual
been thinking of yourself as a worthless person?"	Not at all	Much more than usual
been feeling reasonably happy all things considered?"	More so than usual	Much less than usual

Appendix B: Detailed results

Table B1: Description of variables included in the analysis

Variable code	Variable description
ghq12	subjective well-being GHQ12 (scale: 0 most distressed – 12 least distressed)
ghq36	subjective well-being GHQ36 (scale: 0 most distressed – 36 least distressed)
Happy	feeling happy or not depressed (scale: 1 not at all – 4 much more than usual)
Lifesat	satisfaction with life (scale: 1 not satisfied at all – 7 completely satisfied)
female	= 1 if female
age	age
agesqr1000	age square / 1000
single	= 1 if single
c_married	= 1 if married or living as couple
e_married	= 1 if widowed, divorced or separated
hhsize	number of persons in household
own_children	number of own children in household
hlthprob_none	= 1 if number of health problems= 0
hlthprob_few	= 1 if number of health problems= 1 to 3
hlthprob_many	= 1 if number of health problems > 3
gpvisits	number of visits to GP
employed	= 1 if employed
unemployed	= 1 if retired
inactive	= 1 if full-time student
student	= 1 if unemployed
retired	= 1 if inactive
ftcare	= 1 if full-time carer
ry_hh_eq_ln	natural log of real equivalised household income (annual)
ry_ind_gr_ln	natural log of real reference (age group and sex) income (annual)
years_edu	years of education (scale: 0 no education; 12 GCE O-levels or CSE grade 2-5; 14 GCE A-levels; 17 first degree; 20 higher degree, teaching, nursing or other higher qualification)
noqual	= 1 if no qualification
qual_late	= 1 if received qualification at later than expected age
qual_exp	= 1 if received qualification at expected age
pt_for	= 1 if attending or attended (in the last year) part time education leading to qualification
pt_inf	= 1 if attending or attended (in the last year) part time education not leading to qualification
hous_probl	= 1 if problems paying for housing
cfl_1	= 1 if contact family: on most days
cfl_2	= 1 if contact family: once or twice a week
fl_3	= 1 if contact family: once or twice a month
cfl_4	= 1 if contact family: less than once a month
cfr_1	= 1 if contact friends: on most days
cfr_2	= 1 if contact friends: once or twice a week
cfr_3	= 1 if contact friends: once or twice a month
cfr_4	= 1 if contact friends: less than once a month

Table B2: Descriptive statistics

Variable code	Obs	Mean	Std. Dev.	Min	Max
ghq36	115265	11.210	5.467	0	36
happy	116560	1.904	0.822	1	4
lifesat	98951	5.230	1.301	1	7
female	125248	0.540	0.498	0	1
age	125246	45.730	18.590	15	102
agesqr1000	125246	2.437	1.853	0.225	10.404
single	124960	0.209	0.406	0	1
c_married	124960	0.643	0.479	0	1
e_married	124960	0.149	0.356	0	1
hhsize	125252	2.857	1.396	1	14
own_children	125188	0.288	0.453	0	1
hlthprob_none	125252	0.397	0.489	0	1
hlthprob_few	125252	0.526	0.499	0	1
hlthprob_many	125252	0.077	0.266	0	1
gpvisits	119194	2.437	1.213	1	5
employed	125174	0.570	0.495	0	1
unemployed	125174	0.035	0.183	0	1
inactive	125174	0.130	0.336	0	1
student	125174	0.058	0.233	0	1
retired	125174	0.209	0.406	0	1
ftcare	125252	0.035	0.185	0	1
ry_hh_eq_ln	121797	9.953	0.705	-0.362	14.061
ry_ind_gr_ln	125242	9.423	0.431	8.747	10.085
years_edu	114380	12.078	7.577	0	20
noqual	120804	0.236	0.425	0	1
qual_late	120804	0.223	0.416	0	1
qual_exp	120804	0.541	0.498	0	1
pt_for	119310	0.117	0.322	0	1
pt_inf	119310	0.102	0.302	0	1
hous_probl	120841	0.057	0.231	0	1
cfl_1	119292	0.391	0.488	0	1
cfl_2	119292	0.380	0.485	0	1
cfl_3	119292	0.139	0.346	0	1
cfl_4	119292	0.090	0.286	0	1
cfr_1	119294	0.467	0.499	0	1
cfr_2	119294	0.405	0.491	0	1
cfr_3	119294	0.102	0.302	0	1
cfr_4	119294	0.027	0.162	0	1

Table B3: Results of the fixed effects OLS models

	ghq12	ghq36	happy	lifesat
ry_hh_eq_ln	0.738	1.088	0.172	0.200
	(3.02)**	(2.57)*	(2.54)*	(1.96)
Age	0.002	-0.079	-0.008	-0.021
	(0.15)	(3.23)**	(2.04)*	(3.62)**
agesqr1000	-0.093	0.354	0.068	-0.035
	(0.71)	(1.55)	(1.90)	(0.67)
c_married	0.035	-0.012	0.037	0.125
	(0.46)	(0.09)	(1.74)	(3.90)**
e_married	-0.700	-1.165	-0.173	-0.164
	(7.92)**	(7.60)**	(7.11)**	(4.47)**
Hhsize	-0.001	-0.015	-0.005	-0.028
	(0.07)	(0.51)	(0.98)	(3.91)**
own_children	0.058	0.095	0.015	0.049
	(0.93)	(0.87)	(0.88)	(1.83)
Hlthprob_few	-0.335	-0.624	-0.090	-0.094
	(12.65)**	(13.61)**	(12.35)**	(8.32)**
Hlthprob_many	-1.044	-1.936	-0.233	-0.258
	(19.81)**	(21.20)**	(16.09)**	(11.52)**
Gpvisits	-0.298	-0.519	-0.062	-0.062
	(29.99)**	(30.11)**	(22.68)**	(14.63)**
unemployed	-0.819	-1.472	-0.140	-0.208
	(12.33)**	(12.78)**	(7.67)**	(7.35)**
Inactive	-0.534	-0.851	-0.058	-0.111
	(9.80)**	(9.00)**	(3.85)**	(4.75)**
Student	0.231	0.309	0.074	0.124
	(2.43)*	(1.87)	(2.82)**	(2.96)**
Retired	0.036	0.241	0.039	0.095
	(0.47)	(1.80)	(1.82)	(2.93)**
Ftcare	-0.361	-0.632	-0.092	-0.088
	(6.22)**	(6.28)**	(5.78)**	(3.54)**
ry_ind_gr_ln	-0.207	-0.343	-0.039	-0.022
	(3.10)**	(2.97)**	(2.14)*	(0.77)
years_edu	0.013	0.027	0.003	0.003
	(1.40)	(1.75)	(1.30)	(0.71)
qual_late	-0.451	-0.775	-0.134	-0.033
	(2.15)*	(2.13)*	(2.31)*	(0.37)
qual_exp	-0.359	-0.611	-0.123	-0.040
	(1.86)	(1.82)	(2.31)*	(0.49)
pt_for	0.060	0.176	0.019	0.030
	(2.04)*	(3.47)**	(2.38)*	(2.44)*
pt_inf	0.052	0.118	0.022	0.026
	(1.68)	(2.21)*	(2.63)**	(1.97)*
hous_probl	-0.528	-0.969	-0.098	-0.219
	(11.44)**	(12.11)**	(7.73)**	(11.04)**

cfl_1	0.200	0.317	0.050	0.115
	(4.83)**	(4.42)**	(4.38)**	(6.56)**
cfl_2	0.119	0.186	0.027	0.089
	(3.11)**	(2.80)**	(2.57)*	(5.45)**
cfl_3	-0.016	-0.032	-0.001	0.049
	(0.40)	(0.46)	(0.08)	(2.86)**
cfr_1	0.195	0.444	0.058	0.101
	(3.23)**	(4.23)**	(3.46)**	(3.94)**
cfr_2	0.174	0.396	0.051	0.074
	(2.92)**	(3.83)**	(3.09)**	(2.94)**
cfr_3	0.162	0.356	0.044	0.045
	(2.63)**	(3.33)**	(2.58)**	(1.74)
Constant	-7.396	-16.887	-2.849	4.499
	(0.00)	(0.00)	(4.72)**	(4.96)**
Observations	100614	100614	101713	85789
Number of pid	21950	21950	21994	21193

Absolute value of z statistics in parentheses: * significant at 5%; ** significant at 1% female (dropped)

Table B4: Estimating percentage change in well-being with lifelong learning

	Baseline	Coeff	Percentage change
Part-time formal			
wb12	1.91	0.06	3.1%
wb36	11.28	0.176	1.6%
lifesat	5.23	0.03	0.6%
happy	1.91	0.019	1.0%
Part-time informal			
wb12	–	–	–
wb36	11.26	0.118	1.0%
lifesat	5.23	0.026	0.5%
happy	1.91	0.022	1.2%
No qualification vs. lifelong learning			
wb12	2.19	-0.451	-20.6%
wb36	12.08	-0.775	-6.4%
lifesat	5.25	-0.033	-0.6%
happy	1.95	-0.134	-6.9%
No qualification vs. qualification at conventional age			
wb12	2.19	-0.359	-16.4%
wb36	12.08	-0.611	-5.1%
lifesat	5.25	-0.04	-0.8%
happy	1.95	-0.123	-6.3%

Appendix C: Modelling methods

The Breusch-Pagan test was run to determine that a fixed effects model was most appropriate for the data. An ordinary least squares (OLS) model was run. While the measures of subjective well-being are scalar in nature, the evidence suggests that assuming cardinality and estimating the model using OLS makes little difference to the estimated coefficients[18].

A key challenge in constructing the model was the fact that education is considered to have an impact on well-being through a number of avenues. For instance, education may have a direct effect on well-being. However, it is also likely to have an indirect effect on well-being through its impact on other factors, such as health and income. The influence of income on well-being means that a well-specified model needs to include income among the explanatory variables. This then implies that, if the impact of education on well-being is partly due to the impact of education on income, controlling for income underestimates the full contribution that education is making to well-being.

Another challenge when constructing the above models is that income is likely to be endogenous; that is, subjective well-being is likely to depend on income, but income itself is a function of well-being. As Oswald and Powdthavee (2007: 17) put it:

> "A potential weakness [...] is that income is arguably endogenously determined. This raises the standard identification problem: if happiness depends on income, and income is itself a function of happiness, then the parameter estimates are biased and inconsistent. To solve this, a valid instrument for income is needed."

When attempting to estimate the causal effect of some variable *x* (income) on another *y* (well-being), an instrument is a third variable *z*, which affects *y* only through *z*'s effect on *x*. In practice, the use of instruments to overcome this issue of 'reverse causality' involves identifying a variable that does not belong in the explanatory equation, is correlated with the endogenous explanatory variable (in this case income), and is not correlated with the error term in the explanatory equation. That is, the instrument does not suffer the same endogeneity problem as the original explanatory variable. The instrument, as well as the other control variables (*X* in equation 1; see *Section 2* for more information) are used to predict the endogenous explanatory variable (income). The predicted endogenous variable is then included in the original equation to predict well-being. Following Dolan and Metcalfe (2007), whether a respondent's partner has a job was used as the instrument in this study.

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[18] Ferrer-i-Carbonell and Frijters (2004).

Appendix D: Income compensation calculation

Using the coefficients for lifelong learning and household income from equation (1) (see *Section 2* for more information), the income compensation (IC) for lifelong learning was estimated using the following equation:

$$IC = \bar{y}_0 - e^{\left(\frac{\hat{\beta}_2}{\hat{\beta}_1} + \ln(y_0)\right)} \tag{2}$$

Where $\bar{y}_i$ is average household income of the sample population. The IC represents the income that is required to hold well-being constant following a change in lifelong learning, or the amount that income would have to be increased to produce the same increase in well-being as that gained from participating in lifelong learning.

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