

APRIL
2017



**If you
could
bottle it...**
A wellbeing and human
capital value for money
analysis of the NCS
2015 programme



KEY FINDINGS

- In terms of the impact on short-term life satisfaction for NCS participants, we find that the NCS 2015 programme produces between £3,556 and £5,748 of value per NCS graduate.
- This impact on life satisfaction works out to a benefit-to-cost ratio of between 2.20 and 4.15 when costs of running the NCS programme are accounted for.
- In the long-term the entry rates for NCS graduates into higher education are, on average, 12% higher than for non-NCS graduates.
- An even more positive finding for higher education is that the value of NCS participation is significantly higher for those living in areas of low and medium entry into higher education.
- With the wellbeing and higher education impacts added together (a full technical explanation is in this report) **NCS is able to report a social benefit-to-cost ratio of between 5.93 and 8.36.**
- From reviewing the existing data using a number of different methodologies (explained in full in Appendix 3), we can see that the increase in life satisfaction of NCS graduates is driven most prominently by young people feeling they have the skills and experience to get a job in the future and the confidence to handle problems.

A value for money assessment of NCS: wellbeing and human capital

Contents

- 1. Executive Summary** Page 3
- 2. Value for Money (VfM) analysis of NCS** Page 8
- 3. Methodology (wellbeing and human capital approach)** Page 11
- 4. VfM results** Page 14

Appendix 1

Technical methodology for wellbeing valuation

Appendix 2

Technical explanation of the human capital approach for higher education valuation

Appendix 3

Contribution to life satisfaction and mediation analysis

Tables and Figures

Table 1: A wellbeing VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual NCS graduate level	Page 4
Table 2: VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual and total programme level over the participants' lifetimes	Page 7
Table 3 (same as Table 1): A wellbeing VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual NCS graduate level	Page 14
Table 4: Value of NCS participation through entry into higher education	Page 17
Table 5: Overall value for money assessment (Cost-Benefit Analysis) of the NCS programme at the individual and total programme level over the participants' lifetime	Page 18

1. Executive summary

National Citizen Service (NCS) is a Government-backed initiative that brings together young people aged 15-17 from different backgrounds, giving them the chance to take part in a programme of personal and social development, and community action. Evaluations of NCS to date have measured the experience of participants, as well as four key impact areas:

- **Teamwork, communication and leadership**
- **Community involvement**
- **Transition to adulthood**
- **Social mixing**

The main NCS 2015 evaluation report from Ipsos MORI¹ states on page 4:

*“The value for money analysis has been undertaken in line with the principles of the HM Treasury Green Book, and seeks to monetise (as far as possible) the resource costs and benefits associated with the scheme. **NCS has the potential to deliver a number of benefits that are not currently possible to monetise, such as wellbeing.**”*

NCS Trust is constantly evaluating the structures, delivery and impacts of the NCS programme on graduates. As part of this ongoing process, NCS wants to fully explore all NCS impacts – particularly the impact on wellbeing – and how these can be monetised as part of the Value for Money (VfM) analysis of the programme.

Jump, working alongside NCS Trust, has developed a complementary report to the main NCS 2015 evaluation report from Ipsos MORI in order to:

1. understand and quantify the short-term, **wellbeing impacts** for the NCS programme and how this could be monetised in line with the latest economic thinking;
2. understand and quantify what were the key **drivers of this wellbeing** impact on NCS graduates e.g. confidence, problem-solving etc.
3. take a first look at tracking the longer term impacts of NCS on **entry of graduates into higher education.**

This report is a first step to addressing some the immediate wellbeing value (measured 3 months after NCS participation) and longer term impacts of the NCS programme. In most of the work undertaken for this report, Jump have worked primarily with the existing data from the Ipsos MORI 2015 NCS evaluation and have not collected any new primary data. This has restricted the type of analysis we were able to undertake. For the work to track movement into higher education we have been able to work with a new service from UCAS (UCAS STROBE and EXACT).

¹ Cameron, D., Stannard, J., Leckey, C., Hale, C., & Di Antonio, E. (2017). *National Citizen Service 2015 Evaluation Main report*. Ipsos MORI; Cabinet Office

The wellbeing impact of NCS and a complementary VfM

NCS has a significant impact on the life satisfaction of participants and we have been able to put a monetary value on this impact using the subjective wellbeing valuation approach – one of three Social Cost-Benefit analysis approaches recommended for valuing social impacts in the HM Treasury Green Book for appraisal and evaluation of policy². We find that:

- the NCS 2015 programme produces between £3,556 and £5,748 of value per NCS graduate
- this works out to a benefit-to-cost ratio of between 2.20 and 4.15 when costs of running the NCS programme are accounted for
- this means that for every £1 spent on the NCS programme in 2015, there is a return to society of £2.20 to £4.15 in short-term wellbeing impacts.

Table 1 – A wellbeing VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual NCS graduate level

NCS programme	Life satisfaction improvement versus control group	Delivered cost of programme (per graduate)*	Value of life satisfaction improvement (per graduate)	Benefit-to-cost ratio (return on investment)
Spring	0.46	£1,520	£5,246	3.45
Summer	0.30	£1,620	£3,556	2.20
Autumn	0.51	£1,385	£5,748	4.15

* All programme costs are taken from the Ipsos MORI NCS 2015 evaluation report.

The drivers of wellbeing

As we have seen, participation in the NCS programme is associated with higher mean life satisfaction in the three-month post-participation period. In addition to the work on monetising the wellbeing impact of NCS, Jump was asked to investigate the existing data in an attempt to establish which of the positive outcomes of the NCS programme are responsible for the improvement in life satisfaction. This work is explained in Appendix 3 and will be helpful in understanding which elements of the NCS programme are driving the positive increase in life satisfaction in order to inform the future design of the programme.

With the work Jump has been able to undertake on wellbeing for this report, we have been limited by working with the data shared from the 2015 evaluation by Ipsos MORI. This means that the regressions used to estimate the contribution of outcomes (such as confidence or life

² HM Treasury. (2011). *The Green Book: Appraisal and Evaluation in Central Government* (pp. 1–114). HM Treasury; Organisation for Economic Co-operation and Development (OECD). (2006). *Cost-Benefit Analysis and the Environment: Recent Developments*. Paris, France.

satisfaction) do not use any further demographic controls (such as income, age, gender, housing and local conditions) that may also affect life satisfaction. The result of this is that we look at the broad associations between these outcomes and life satisfaction within this sample group of young people without such controls.

We have looked at understanding how NCS produces an improved life satisfaction score in two ways:

1. Looking at the data to see what contributes to life satisfaction within this sample of young people. This gives an insight into the association between outcomes and life satisfaction but we cannot establish through this methodology whether NCS participation plays a role via this outcome improving life satisfaction. For example, with this approach we find that not smoking is associated with improved life satisfaction, but we know that NCS is not designed to help participants to quit smoking and so is unlikely to actually contribute to this element of the improvement in life satisfaction.
2. A type of analysis known as mediation analysis. This helps us understand *how* NCS participation contributes to life satisfaction: it is the mechanism which we are interested in, both now and for future programme design. The mediation analysis in this approach (explained in detail in Appendix 3) shows us that NCS participation does not impact significantly on smoking, and therefore this is not a path via which NCS participation affects life satisfaction.

Once we undertake the further mediation analysis in approach 2, we begin to see a clearer view of the mechanisms through which NCS works. **NCS participation is impacting life satisfaction scores through more young people feeling they have the skills and experience to get a job in the future and the ability to handle problems.**

A more comprehensive analysis of the findings are in Appendix 3 of this report.

Longer term impacts – movement into higher education

We have seen above, and discuss in full detail later in this report, that the short-term wellbeing impacts (measured 3 months after participation) of the programme are significant and valuable. We now turn to assessing the longer-term impacts, and in particular entry into higher education.

We were able to match data sets from NCS with a new service from UCAS (UCAS STROBE) to establish whether participation in NCS has an impact on entry into higher education. Higher education has well-recognised impacts on individual wellbeing along with economic benefits to wider society. We focus on the earnings premium associated with higher education.

We found that NCS participants have a significantly higher entry rate to higher education than non-NCS participants (4 percentage points). A higher entry rate for NCS participants is associated with an average net present value³ in terms of extra life time earnings of £6,861 per participant.

Even more positively, we found that the impact and value of NCS participation is significantly higher for young people living in areas of low and medium entry into higher education.

The total impacts and Social Cost-Benefit ratio – from wellbeing to human capital

On page 13, we explain the human capital approach by which the higher education impact can be added to the wellbeing value. The human capital approach is a valuation method for educational attainment which measures the value of education through the impact that it has on wages in later life.

Care has to be taken when combining the wellbeing value and higher education values. This is due to our finding (as explained in full in Appendix 3) that participants' perceived improved future prospects (including the likelihood of going onto higher education) are to some extent included in the reported increase in life satisfaction value.

Therefore, while it is clear that not *all* of the future educational benefits have been accounted for, we need to account for the fact that participants seem to incorporate *some* of the value of future education benefits in their life satisfaction scores. We do this in order to avoid counting the same benefits twice.

What this means for the final VfM calculation is that we can add *some* but not all of the wellbeing value to the higher education value. The work done to arrive at the figures in Table 2 below in order to avoid double-counting is explained on pages 17 and 18 of this report.

The final findings in Table 2 present a very positive and complementary new VfM calculation for the NCS programme in terms of wellbeing and human capital.

³ applying a 3.5% discount rate as recommended by HM Treasury's Green Book (2001)

Table 2: VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual and total programme level over the participants' lifetimes

	Values by Programme		
	Spring	Summer	Autumn
Life Satisfaction (discounted to avoid double-counting)	£5,183	£3,513	£5,679
Earnings Premium	£6,861	£6,861	£6,861
Total Benefit per Individual	£12,044	£10,375	£12,540
Number of Participants	4671	59471	11453
Total Benefit for Programme	£56,261,789	£617,015,079	£143,631,263
Total Costs*	£7,668,000	£104,112,000	£17,172,000
Benefit-to-cost ratio (return on investment)	7.34	5.93	8.36

* Costs sourced from Cameron, Stannard, Leckey & Di Antonio (2017). Costs scaled to include an opportunity cost of 8% as in Jenkins and Kuo (2007).

The remainder of this report comprises a full technical explanation as to how we arrived at this valuation. This is essential to open up the work to review by peers and informed stakeholders, as well as economists in the sector and government.

2. Value for Money (VfM) analysis of the NCS

The main NCS 2015 evaluation report⁴ undertook a comprehensive analysis of the impact of participation in the NCS programme on a wide range of outcomes related to the four key impact areas. The evaluation employed a propensity score matching (PSM) method to assess the impact on outcomes. After controlling for a range of background characteristics at baseline, trends in outcomes were measured for NCS participants against a control group of those expressing interest in the NCS programme, but who did not participate. A large number of outcomes were found to be statistically different between the NCS group and the control group (and the large majority of these showed a positive difference in favour of the NCS participants).

Two of the outcomes were used to perform a value for money (VfM) assessment in the 2015 report: (i) the impact on **volunteering behaviour**; and (ii) the impact on **leadership skills**. The 2015 evaluation proceeds to undertake a VfM analysis of these outcomes *“in accordance with the principles of the HM Treasury Green Book, and seeks to monetise (as far as possible) the resource costs and benefits associated with the programme”*.

While these are important outcomes to measure and value for VfM analysis, there are limitations to this approach, as the authors of the NCS 2015 evaluation report acknowledge. (*“NCS has the potential to deliver a number of benefits that are not currently possible to monetise, such as wellbeing.”*)

This report therefore seeks to provide a complementary analysis of VfM by assessing some of the other outcomes from the 2015 evaluation with the aim of providing a fuller picture of the VfM of the NCS programme.

The VfM approach taken in this report

For this report, Jump had to work with the existing data collected as part of the Ipsos MORI 2015 evaluation and was not able to collect primary survey data. In the VfM analysis we used the results for life satisfaction from the 2015 report plus data collected on entry into higher education which were not used in the 2015 report’s results.

Data on life satisfaction can be used to undertake wellbeing valuation (WV) to monetise the impacts. This is one of three approaches recommended by the HM Treasury Green Book⁵ (alongside stated preference and revealed preference valuation methods). Wellbeing and in particular wellbeing valuation is an emerging area of policy evaluation. HM Treasury Green Book supplementary guidance⁶ states on page 5 in the foreword:

⁴ Cameron, D., Stannard, J., Leckey, C., Hale, C., & Di Antonio, E. (2017). *National Citizen Service 2015 Evaluation Main report*. Ipsos Mori; Cabinet Office.

⁵ HM Treasury. (2011). *The Green Book: Appraisal and Evaluation in Central Government* (pp. 1–114). HM Treasury; Organisation for Economic Co-operation and Development (OECD). (2006). *Cost-Benefit Analysis and the Environment: Recent Developments*. Paris, France.

⁶ Fujiwara, D., & Campbell, R. (2011). *Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches. A Discussion of the Current Issues* (pp. 1–76). London, UK: HM Treasury.

“[S]ubjective wellbeing measurement may soon provide a complement to the more traditional economic approaches. And in the meantime it can play an important role in challenging decision makers to think more carefully about the full range of impacts of their proposed policies. First and foremost, to demonstrate that the valuation of non-market goods, and specifically the measurement of well-being, is a live research issue across government and academia, and one which Departments should be challenged to pursue further”.

And further recommends:

“If the decision relates to a multi-billion pound programme or to regulation that will impose costs of similar scale upon industry, it is clearly worth devoting much more resource to ensuring that the valuations of the non-market benefits (and costs) are more accurate than would be appropriate for a smaller scheme”.

Given the scale of the UK Government’s commitment to NCS, and with the implications across the wider Youth Social Action sector, we believe application of the WV approach is both appropriate and relevant in this case. It is also consistent with the advice in the HM Treasury 2011 report on Social Cost-Benefit analysis.

Data on higher education impacts can be used to conduct a human capital approach to valuing educational outcomes (see p. 14 of The Green Book).

Together the WV and human capital approaches can be used to derive a comprehensive assessment of the VfM of the NCS programme. However, care must be taken when using and combining the results of the two approaches which will be described in full below.

VfM theory

As set out in best-practice guidelines, such as the HM Treasury Green Book and the OECD Guidelines⁷, the valuation of outcomes for the purpose of VfM analysis should be conducted using **money metric measures of welfare change**. What this means is that for individuals the value of outcomes should be measured as **compensating surplus** or **equivalent surplus**. In sum, these approaches to money metrics require that values be assessed by looking at the impact of an outcome (x) on an individual’s welfare (where welfare refers to overall wellbeing and quality of life in the broadest sense) and then to calculate the amount of money that would create the equivalent impact on welfare as outcome (x).

⁷ HM Treasury. (2011). *The Green Book: Appraisal and Evaluation in Central Government* (pp. 1–114). HM Treasury; Organisation for Economic Co-operation and Development (OECD). (2006). *Cost-Benefit Analysis and the Environment: Recent Developments*. Paris, France.

We are, therefore, interested in the impact that the outcomes of the NCS programme have on participants' welfare, and then in monetising this impact on welfare. Within this framework, there are two potential ways to approach this:

- (i) **Constructed VfM** measures a range of outcomes related to a programme and values each of the outcomes separately by assessing the impact on welfare for individuals. In the final stage, the values of each of the outcomes are aggregated within and across individuals. Both positive and negative outcomes must be included and care must be taken when aggregating to avoid double-counting.
- (ii) **Unconstructed VfM** instead measures the impact of the programme as a whole directly on welfare and monetises this impact. The theory and rationale behind this approach is that all impact evaluation is essentially concerned with the impact an outcome has on the individual's welfare. Given this, we can focus directly on welfare impacts as the main measure of interest. Going straight to the final measure of interest (welfare) has a number of benefits. While in unconstructed VfM, it can be difficult to understand which outcomes are contributing to overall VfM, it has the advantage that – provided that we have a robust measure of wellbeing – we do not need to determine and measure all possible outcomes of the programme (the final welfare measure picks up *all* outcomes both positive and negative). It also crucially deals with the issue of double-counting internally (if an outcome is only experienced once by an individual it will only show up once in the improvement of their lives).

It is key to note that both approaches to VfM will, in theory, give the same VfM results if the constructed approach includes every outcome that matters in the analysis. The currently endorsed and employed set of valuation methods in the Green Book and international best-practice guidelines (e.g. revealed preference valuation, stated preference valuation, wellbeing valuation, QALY valuation) can be used to conduct either constructed or unconstructed VfM analysis.

The 2015 NCS evaluation is a constructed approach to VfM. **Our contribution in this report is to conduct an unconstructed VfM assessment of the NCS programme.** We are able to conduct an unconstructed VfM thanks to the inclusion of a number of wellbeing outcomes (happiness, anxiety, purpose and life satisfaction) in the original evaluation. These are four measures of wellbeing with a rich history of research (Deaton 2008; Kahneman et al. 2003; Richard Layard 2009; O'Donnell et al. 2014), and which are endorsed by the UK Wellbeing Programme and used by the ONS (Office of National Statistics).

In this methodology we therefore take the outcomes as having a natural ordering or hierarchy; the four wellbeing measures sit at the top of a pyramid in that they have intrinsic value, with all of the other NCS outcomes sitting underneath with instrumental value.

3. Methodology (wellbeing and human capital approach)

Wellbeing Valuation method

Over the past 15 years economists have developed methods for valuing happiness and life satisfaction (the Wellbeing Valuation method) in a manner consistent with compensating and equivalent surplus money metric methods (Fujiwara 2013; Layard et al. 2008; Welsch 2007). The Wellbeing Valuation (WV) method is now recognised as a method for making relative assessments of VfM in the HMT Green Book and as an alternative method for valuation by the OECD (2013 & 2017). It has been used in research and VfM analysis by the UK Government (e.g. Department for Culture, Media and Sport (DCMS), Department for Work and Pensions (DWP), Cabinet Office)⁸, and the Government of Canada (Public Health Agency Canada⁹), and has featured in over 80 academic publications in economics.

We focus on life satisfaction in this analysis based on the assumption that life satisfaction is a robust measure of wellbeing (Layard 2009) and that the PSM estimator in the Ipsos MORI 2015 evaluation provides a robust estimate of the impact of the NCS programme on life satisfaction. Under these two key assumptions, the unconstructed VfM analysis will provide a full assessment of VfM accounting for *all* of the short-term wellbeing impacts of the NCS programme for participants and dealing with the issue of double-counting the components of wellbeing. There may well be additional impacts to other groups in society, such as businesses and government. The life satisfaction question has been validated in many studies and it has been found to be highly responsive to many life circumstances, events and episodes (see Fujiwara and Campbell (2001) and Fujiwara and Dolan (2016) for a full discussion).

Performing the unconstructed VfM requires an estimate of the impact of the NCS programme on life satisfaction (which comes from the 2015 evaluation) and an impact of money on life satisfaction for the same sample group (this allows us to measure the amount of money that has the equivalent impact on life satisfaction as the NCS programme in order to derive the money metric value). The latter requires estimating separately because it was not part of the 2015 evaluation.

In theory, the estimate of the impact of money on life satisfaction should come from the same group of individuals as in the NCS sample (or should be representative of them). We can derive this estimate from a national data set that contains data on money and wellbeing. We use the British Household Panel Survey (BHPS) which contains data on lottery wins and wellbeing. Lottery wins allows us to derive a robust causal estimate of the impact of money on

⁸ Bakhshi, H., Fujiwara, D., Lawton, R. N., Mourato, S., & Dolan, P. (2015). *Measuring Economic Value in Cultural Institutions* (Cultural Value Project) (p. 103). London, UK: Arts and Humanities Research Council.
Fujiwara, D., Oroyemi, P., & McKinnon, E. (2012). *Wellbeing and Civil Society: Estimating the Value of Volunteering Using Subjective Wellbeing Data* (Working Paper No. 112) (p. 26). London, UK: Department for Work and Pensions. <https://www.gov.uk/government/publications/wellbeing-and-civil-society-estimating-the-value-of-volunteering-using-subjective-wellbeing-data-wp112>. Accessed 2 July 2014

Lawton, R. N., & Fujiwara, D. (2016). Living with aircraft noise: Airport proximity, aviation noise and subjective wellbeing in England. *Transportation Research Part D: Transport and Environment*.

⁹ Latif, E. (2012). Monetary valuation of cardiovascular disease in Canada. *Economics and Business Letters*, 1(1), 46–52. doi:10.17811/ebl.1.1.2012.46-52

life satisfaction because lottery winnings are, by law, randomly assigned¹⁰. It is possible to focus only on a sample of 15-17 year olds in the analysis of the BHPS, but this sample is too small to derive statistically significant results. By using a sample comprised of 15-25 year-olds there is enough sample size in the BHPS to derive statistically significant results. We, therefore, use the results from the 15-25 year-old sample.

The following caveats apply. This sample now includes people in age groups that are not representative of the NCS programme participants, which may imply that our estimate of the impact of money on life satisfaction is not representative of 15-17 year-olds. However, models conducted using a younger age group (e.g. 15-18; 15-20; 15-23 etc) broadly showed similar results to the 15-25 year group, although the results were not statistically significant. Therefore, we can be reasonably confident that the results for the 15-25 year group provide a good proxy for the impact of money on life satisfaction for 15-17 year-olds (the NCS core group).


Therefore, the WV results presented here should be seen as providing a first-order estimate of the wellbeing value of the NCS programme and future research should be aimed at developing on these estimates by undertaking further analysis on the impact of money on wellbeing for 15-17 year olds – this would require new primary data.

Human Capital valuation method

For the unconstructed VfM approach to provide reliable results requires that the measure of wellbeing (here life satisfaction) be robust. This means that the change (improvement) in life satisfaction for NCS participants needs to encompass all impacts and outcomes for participants. This includes long term impacts as well, such as impacts on health, education and employment outcomes. If NCS participants are able to fully predict how the NCS programme will impact on health, education and employment and they care about this now then these long-term impacts should be fully reflected in current life satisfaction responses and improvements.

In this case, the WV method under the unconstructed VfM approach will pick up all outcomes – both now and in the future – and provide a comprehensive assessment of VfM. However, whilst life satisfaction is generally seen as a robust gauge of an individual's wellbeing over a period of time, there is some evidence to suggest that people are poor at predicting how future changes (such as impacts on educational attainment) will impact on their wellbeing (e.g. life satisfaction) (Wilson & Gilbert, 2003). It may also be the case that even if NCS participants are able to predict long-term impacts, they may not care about them now and thus may not internalise them into their life satisfaction scores (i.e. NCS participants know about the long-term benefits of the programme but do not care about them at the moment).

¹⁰ For a full description of the methodology see Fujiwara and Dolan (2016). Our method here uses the same model as in this paper but restricted to 15-25 year-olds. Dolan, P., & Fujiwara, D. (2016). Happiness-Based Policy Analysis. In M. D. Adler & M. Fleurbaey (Eds.), *The Oxford Handbook of Well-Being and Public Policy*.



In either scenario, longer-term benefits of the NCS programme may get missed out in the WV method. One particular area where this may be the case and which can be tested within this study is the impact on education. Using data on higher education progress rates from UCAS EXACT and UCAS STROBE services (which were not included in the 2015 evaluation), we assess whether NCS participants went on to higher rates of entry into higher education.

The human capital approach is a valuation method for educational attainment which measures the value of education through the impact that it has on wages in later life. This wage premium approach is a valid and robust measure of value and welfare change due to educational attainment if the only (or core) mechanism through which education improves our wellbeing is through the impact that it has on our job prospects. It has of course been strongly argued that education in and of itself has a value in addition to any benefits it might confer in the labour market. Valuing educational attainment through wage premia, therefore, is likely to understate some of the benefits of educational attainment and this should be taken into account as part of the caveats in this study.

To anticipate our results we find that the full extent of the educational attainment benefits of the NCS programme are not fully accounted for in the participants' life satisfaction responses and hence they need to be added to the WV results in the VfM analysis. A full explanation of how the human capital and wellbeing valuation results have been accounted for follows on pages 16 to 18.

4. VfM Results (wellbeing and human capital)

Wellbeing Valuation results

The wellbeing valuation of the NCS 2015 programme produces between £3,556 and £5,748 of value per NCS graduate. This works out to a benefit-to-cost ratio of between 2.20 and 4.15 when the costs of running the NCS programme are accounted for. This means that for every £1 spent on the NCS programme in 2015 there is a return to society of £2.20 to £4.15 in terms of improvements in life satisfaction.

The 2015 evaluation found that the impact on life satisfaction varied depending on the season of the programme with the Autumn cohort having the highest impact and the Summer cohort having the lowest impact on life satisfaction. The headline impacts are presented in Table 3 below. A full, technical explanation of the methodology and results taken to produce this VfM assessment of the NCS programme can be found in Appendix 2.

Table 3: A wellbeing VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual NCS graduate level

NCS programme	Life satisfaction improvement versus control group	Delivered cost of programme (per graduate)*	Value of life satisfaction improvement (per graduate)	Benefit-to-cost ratio (return on investment)
Spring	0.46	£1,520	£5,246	3.45
Summer	0.30	£1,620	£3,556	2.20
Autumn	0.51	£1,385	£5,748	4.15

* All programme costs are taken from the Ipsos MORI NCS 2015 evaluation report.

The interpretation of these results is key and they differ in meaning to the VfM results in the 2015 Ipsos MORI evaluation in a number of respects. As stated above, these results represent an unconstructed VfM assessment of the NCS programme. By assessing and valuing the impact on individuals' wellbeing directly, we circumvent the need to value each of the outcomes separately; the unconstructed approach allows us to sweep up all of the outcomes that are important for individuals (both positive and negative) in one calculation. The two outcomes included in the VfM assessment in the 2015 evaluation (volunteering and leadership skills) are therefore both included in the unconstructed VfM.

This is one main reason why the benefit-cost ratios in the 2015 evaluation are lower than the benefit-cost ratios presented here, since many more positive impacts (in addition to volunteering and leadership skills) have been included in this study. A key implication of this is, therefore, that the results of the VfM analysis here and the VfM analysis in the 2015 Ipsos MORI evaluation **should not be added together** since this would lead to double-counting.

Human Capital approach results

NCS has a significant and positive impact on progress into higher education for those young people who need it most.

We find that NCS participants have a significantly higher entry rate to higher education than non-NCS participants (4 percentage point improvement) after controlling for gender, ethnicity and POLAR3 classification (the proportion of the young population that participates in higher education). This is known as the average treatment effect (ATE) of the NCS programme on entry rates to higher education.

We can value these higher education impacts using the human capital approach by multiplying the ATE on entry rates into higher education by the lifetime earning premium associated with higher education (Walker & Zhu, 2013). The net earning premium comes from predicting the gross earnings of non-graduates had they been graduates, and then taking into account the effect of taxation and repayment of a student loan. Walker and Zhu's (2013) paper focuses on comparing the earnings of individuals with a first degree and 2 or more A-Levels with individuals with 2 or more A-Levels and no higher education irrespective of the qualifications individuals get further down the line. For women, this earning premium is on average £277,000 over the lifetime and for males it is £199,000. These values take into account dropouts from university and varying employment over one's career.

We estimate impacts on entry rates to higher education by different *POLAR* quintiles. The participation of local areas (*POLAR*) classification groups areas across the UK based on the proportion of the young population that participate in higher education. *POLAR* is categorised into five quintiles, with quintile 5 representing the area with the highest proportion of the young population participating in higher education (i.e. those most likely to attend higher education); quintile 1 represents areas where young people are least likely to attend higher education.

We use the most recent iteration of the *POLAR* classification (*POLAR3*). This is based on the combined participation rates of those aged 18 between 2005 and 2009, who entered higher education between 2005-06 and 2010-11 academic years.

Table 4 shows the impact and value of NCS participation based on the human capital approach. We find that the positive impact is higher at lower *POLAR* quintiles (quintiles 1-3), which represent areas of low and medium participation in higher education, and that the impact is negative for participants living in areas categorised as quintile 5 (an area of high participation in higher education).

Overall the higher average entry rate for NCS participants is associated with an average net present value¹¹ of £6,861 per participant in increased lifetime earnings (assuming that they graduate aged 21 and retire aged 68). Lifetime earnings impacts are higher for lower *POLAR* quintiles. This is a positive finding for NCS impacts on social mobility – increasing the chances and opportunities of those normally less likely to go to university to go on to higher education.

¹¹ applying a 3.5% discount rate as recommended by HM Treasury's Green Book (2001)

The overall impact for all groups is positive. When looking at the negative impact on people in POLAR quintile 5 (those who are more likely to go to university in the first place) we have two working hypotheses:

- There could be differential self-selection into the programme. If participants see NCS as a way to develop skills for higher education or employment, those from lower POLAR quintiles who chose to go on the programme are more likely to be highly motivated and possibly more able than average in their POLAR quintile as they are seeking the opportunity to advance themselves. Alongside this, NCS participants from higher POLAR quintiles may be more borderline in their chances of getting into university and be using NCS to boost their chances (so we might expect a reduction in successful entry into higher education). Additionally individuals from higher POLAR quintiles not participating in NCS may see it as unnecessary to help them secure their place.
- Research from the Department of Education (Crawford & Cribb, 2012¹²) suggests that young people who take gap years are more likely to be from higher socio-economic backgrounds. It may be that NCS graduates from higher socio-economic backgrounds take up gap year opportunities more frequently than their non-NCS counterparts and fellow NCS graduates from lower socio-economic backgrounds.

More work is required to validate these hypotheses. However, it should not distract from what are some very reassuring and positive findings for the impact of NCS on the prospects of those young people who need it most.

¹² Gap year takers: uptake, trends and long term outcomes. Claire Crawford and Jonathan Cribb Institute for Fiscal Studies through the Centre for Analysis of Youth Transitions (CAYT)

Table 4: Value of NCS participation through entry into higher education

POLAR3	Entry rate % (non NCS)	Entry rate % (NCS)	% uplift (NCS vs non NCS)	Number of Individuals	Average Treatment Effect (% point)	Average treatment effect (discounted by all factors)	Earning premia (lifetime) (male)	Earning premia (lifetime) (female)	Earning premia (lifetime) (average)
Male									
1	22.39%	30.01%	34.02%	71,155	7.62%	6.42%	£12,785		£14,799
2	31.77%	43.64%	37.35%	72,571	11.87%	10.01%	£19,915		£17,676
3	39.53%	48.29%	22.18%	73,890	8.77%	7.39%	£14,711		£13,748
4	46.61%	45.92%	-1.48%	74,714	-0.69%	-0.58%	£-1,611		£1,926
5	61.07%	55.45%	-9.20%	77,441	-5.62%	-4.74%	£-9,427		£-12,885
Female									
1	15.03%	24.91%	65.68%	80,854	9.87%	8.33%	£16,572		
2	22.16%	31.48%	42.01%	79,438	9.31%	7.85%	£15,628		
3	28.75%	36.40%	26.60%	78,119	7.65%	6.45%	£12,835		
4	35.17%	38.09%	8.32%	77,295	2.93%	2.47%	£4,911		
5	49.00%	39.19%	-20.03%	74,569	-9.82%	-8.28%	£-16,474		
Total			11.64%		4.09%		£6,821	£6,899	£6,861

Notes: Earning premia are based on the average net present value over the lifetime, taking into account varying employment over the lifecycle and university dropouts as in Table 14 of Walker & Zhu (2013). We have discounted the average treatment effect to consider the dropout rates between entry to university and attendance, and between attendance and graduation, as well as the probability of death before retirement. A full explanation is in Appendix 2. It was not possible to assess higher education impacts by season and so it is assumed that the values presented in Table 2 apply to all NCS programmes (spring, summer and autumn).

It can be inferred that the human capital values are to some extent additional to the values derived in the WV method. In other words, the values based on the improvement in life satisfaction for NCS participants does not fully internalise the long-term educational benefits. This is clear because the human capital value for the NCS programme of £6,861 (in net present value terms) per participant due to higher education impacts are *higher* than the WV values. If the educational impacts were fully recognised and internalised in the life satisfaction responses of the NCS participants at the time of the surveys, then the observed improvements in life satisfaction would have been higher. In the next section, we describe how we avoid double counting the value of NCS to education that is internalised in life satisfaction.

A full explanation of the higher education outcomes and impacts is found in Appendix 2 of this report.

Overall VfM assessment

In this final section we combine the results of the WV and human capital approach to derive the total benefits of the NCS programme and the overall VfM analysis. As discussed above this is done with careful consideration of the risk of double-counting benefits.

From the Ipsos MORI data, we calculate the contribution of a change in the intention to study at higher education to the change in the participant's life satisfaction. We then deflate the life satisfaction values by this percentage. This allows us to combine the the adjusted valuation based on life satisfaction with the earnings premium from the increased likelihood of being accepted into higher education. A full explanation of the higher education impact and how we avoid double counting is included in Appendix 2 of this report. The results of the overall VfM assessment of the NCS programme are set out in Table 5.

Table 5: Overall value for money assessment (Cost-Benefit Analysis) of the NCS programme at the individual and total programme level over the participants' lifetime

	Values by Programme		
	Spring	Summer	Autumn
Wellbeing valuation: life satisfaction (discounted)	£5,183	£3,531	£5,679
Earnings Premium	£6,861	£6,861	£6,861
Total Benefit per Individual	£12,044	£10,375	£12,541
Number of Participants	4,671	59,471	11,453
Total Benefit for Programme	£56,261,789	£617,015,079	£143,631,263
Total Costs	£7,668,000	£104,112,000	£17,172,000
Benefit-to-cost ratio (return on investment)	7.34	5.93	8.36

Notes: Life satisfaction value adjusted (discounted) to account for a proportion of the human capital value. Earnings premia assumed to be the same across all programmes. Costs sourced from Cameron, Stannard, Leckey & Di Antonio (2017). Costs scaled to include an opportunity cost of 8% as in Jenkins and Kuo (2007). Totals may differ from component parts due to rounding.

The final benefit-to-cost ratios incorporating the WV and human capital values show a return on investment of 7.34 (Spring), 5.93 (Summer programme) and 8.36 (Autumn programme), that means for every £1 spent on the NCS programmes, between £5.93 and £8.36 of value was returned.

References

- Bakhshi, H., Fujiwara, D., Lawton, R. N., Mourato, S., & Dolan, P. (2015). *Measuring Economic Value in Cultural Institutions (Cultural Value Project)* (p. 103). London, UK: Arts and Humanities Research Council.
- Cameron, D., Stannard, J., Leckey, C., Hale, C., & Di Antonio, E. (2017). *National Citizen Service 2015 Evaluation Main report*. Ipsos Mori; Cabinet Office.
- Crawford, C. & Cribb, J. (2012). *Cap year takers: uptake, trends and long term outcomes*. Institute for Fiscal Studies through the Centre for Analysis of Youth Transitions (CAYT).
<http://www.tussenjaartwijfels.info/wp-content/uploads/2015/07/CAYTresearch2012.pdf> Accessed 17 April 2017.
- Deaton, A. (2008). Income, health and wellbeing around the world: Evidence from the Gallup World Poll. *The journal of economic perspectives: a journal of the American Economic Association*, 22(2), 53.
- Dolan, P., & Fujiwara, D. (2016). Happiness-Based Policy Analysis. In M. D. Adler & M. Fleurbaey (Eds.), *The Oxford Handbook of Well-Being and Public Policy*.
<http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199325818.001.0001/oxfordhb-9780199325818-e-9>. Accessed 4 January 2017
- Fujiwara, D. (2013). A General Method for Valuing Non-Market Goods Using Wellbeing Data: Three-Stage Wellbeing Valuation. In CEP Discussion Paper No 1233 (pp. 1–29). London, UK: Centre for Economic Performance, London School of Economics.
http://cep.lse.ac.uk/_new/publications/series.asp?prog=CEP. Accessed 21 May 2014
- Fujiwara, D., & Campbell, R. (2011). Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches. A Discussion of the Current Issues (pp. 1–76). London, UK: HM Treasury.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf. Accessed 13 April 2013
- Fujiwara, D., Oroyemi, P., & McKinnon, E. (2012). *Wellbeing and Civil Society: Estimating the Value of Volunteering Using Subjective Wellbeing Data (Working Paper No. 112)* (p. 26). London, UK: Department for Work and Pensions.
<https://www.gov.uk/government/publications/wellbeing-and-civil-society-estimating-the-value-of-volunteering-using-subjective-wellbeing-data-wp112>. Accessed 2 July 2014
- HM Treasury. (2011). *The Green Book: Appraisal and Evaluation in Central Government* (pp. 1–114). HM Treasury.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf Accessed 21 May 2014
- Kahneman, D., Diener, E., & Schwarz, N. (2003). *Well-Being: Foundations of Hedonic Psychology* (Vol. 13). New York, NY: Russell Sage Foundation.
- Latif, E. (2012). Monetary valuation of cardiovascular disease in Canada. *Economics and Business Letters*, 1(1), 46–52. doi:10.17811/ebl.1.1.2012.46-52
- Lawton, R. N., & Fujiwara, D. (2016). Living with aircraft noise: Airport proximity, aviation noise and subjective wellbeing in England. *Transportation Research Part D: Transport and Environment*, 42, 104–118.
- Layard, R. (2009). Well-being measurement and public policy. In A. B. Krueger (Ed.), *Measuring the Subjective Well-Being of Nations: National Accounts of Time Use and Well-Being* (pp. 145–154). Chicago, IL: University of Chicago Press.
- Layard, R., Mayraz, G., & Nickell, S. (2008). The marginal utility of income. *Journal of Public Economics*, 92(8–9), 1846–1857. doi:10.1016/j.jpubeco.2008.01.007
- O'Donnell, G., Deaton, A., Durand, M., Halpern, D., & Layard, R. (2014). *Wellbeing and Policy* (p. 96). London, UK: Legatum Institute.
<http://www.li.com/docs/default-source/commission-on-well-being-and-policy/commission-on-wellbeing-and-policy-report---march-2014-pdf.pdf?sfvrsn=2>
- Walker, I. & Zhu, Y. (2013). *The Impact of University Degrees on the Lifecycle of Earnings: Some Further Analysis*. BIS Research Paper No.112. Department for Business, Innovation & Skills.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229498/bis-13-899-the-impact-of-university-degrees-on-the-lifecycle-of-earnings-further-analysis.pdf Accessed 17 April 2017.
- Welsch, H. (2007). Environmental welfare analysis: A life satisfaction approach. *Ecological Economics*, 62(3–4), 544–551. doi:10.1016/j.ecolecon.2006.07.01
- Wilson, T. D. & Gilbert, D. T. (2013). Affective Forecasting. *Advances in Experimental Social Psychology*. Vol. 35, pp.345-411.

Appendix 1

Full technical methodology of the wellbeing valuation approach

Wellbeing valuation derives robust value estimates in line with the welfare economic theory on valuation and now features as part of a number of guidelines such as the HM Treasury Green Book guidance and the OECD guidelines on measuring wellbeing (Fujiwara and Campbell, 2011; Green Book, 2011; OECD 2013, 2014).

The wellbeing valuation approach uses self-reported measures of wellbeing (subjective wellbeing) to measure an individual's welfare, using measures such as life satisfaction. The approach assesses the impacts of an outcome (e.g. participation in the NCS), and of income, on subjective wellbeing (SWB) and estimates a monetary value for that outcome. This reveals the amount of money that has the equivalent (exact same) impact on SWB as the outcome being valued and so represents the monetary value of the outcome. The Wellbeing Valuation method adheres to the welfare economic theory of valuation that underpins cost-benefit analysis (CBA) (Hicks and Allen, 1934) where the monetary value of a change in an individual's utility or wellbeing due to experiencing or consuming the good is measured as compensating surplus (CS) or equivalent surplus (ES) (Bockstael and McConnell 1980).

SWB questions are widely included in national surveys across the OECD with the UK being at the forefront where key wellbeing questions are now included in over 20 national surveys.¹ The wellbeing valuation method can be used to analyse data from these large national datasets and derive values for a wide range of different policy areas. Improvement in the life satisfaction score is taken as a proxy for wellbeing in line with best practice guidelines (Dolan and Fujiwara 2016; Layard 2009).

The main technical issue involved in estimating CS is that we have a robust estimate of the *causal effect* of income and the non-market good on life satisfaction. The impact of the NCS on life satisfaction has been estimated in the 2015 evaluation and will not be covered here, where we focus on the income variable. The income variable in life satisfaction models suffers from endogeneity due to reverse causality, selection bias and measurement error, which all tend to lead to *downward* bias in the income coefficient. To nullify this bias we use an instrumental variable (IV) approach, which eliminates the correlation between the error term and the

¹ <http://www.ons.gov.uk/ons/guide-method/method-quality/specific/social-and-welfare-methodology/subjective-wellbeing-survey-user-guide/subjective-well-being-frequently-asked-questions--faq-s-.html#13>

income variable due to endogeneity. We apply a robust IV for income using lottery wins amongst lottery players. Lottery wins have been used in the SWB literature before by Lindahl (2002), Apouey and Clark (2009), Fujiwara (2013b) and Gardner and Oswald (2007) and here we closely follow Fujiwara (2013b).

The British Household Panel Survey (BHPS) provides extensive data on lottery playing in the UK and we use this data to conduct the IV model using the control function rather than the more traditional two-stage least squares (2SLS) estimation. The control function has the benefit that it can estimate causal effects with higher degrees of external validity than 2SLS. That is, for income we can estimate the causal effect for the sample population rather than the local average effect for the complier population, which is an unobservable population group. Under the control function we estimate a correlated random coefficient (CRC) model using lottery wins as an IV (Z) for household income and controlling for previous lottery wins. For previous wins, I sum annual lottery wins over all years in which the respondent was present in the data up to and including $t - 1$. The model is set up as follows (dropping the time and individual subscripts for simplicity):

$$(1) \quad LS = \pi + \beta_1 \ln(M) + \beta_2 X + \varepsilon$$

$$(2) \quad \beta_1 = \alpha_1 + \vartheta_1$$

$$(3) \quad \ln(M) = \pi + \gamma Z + \vartheta_2$$

so that,

$$(4) \quad LS = \pi + \alpha_1 \ln(M) + \beta_2 X + \vartheta_1 \cdot \ln(M) + \varepsilon$$

Here the impact of income on life satisfaction is made up of a constant term and an individually unique term (ϑ_1). This is the unobserved heterogeneity and in essence, the term $\vartheta_1 \cdot \ln(M)$ in (4) removes the complier effect so that $E(\beta_1) = \alpha$ = the average effect of income for the sample. Equation (3) is equivalent to the first stage in 2SLS as it shows the relationship between the instrument (lottery wins) and income. Since M is endogenous in (1), ε and ϑ_2 are correlated, and under the assumption of heterogeneous treatment effects ϑ_1 and ϑ_2 are also correlated. Therefore, ϑ_1 and ε in (4) are estimable from the error term from equation (3): $E(\vartheta_1|X, M) = \theta_1 \vartheta_2$, $E(\varepsilon|X, M) = \rho_1 \vartheta_2$. Equation (4) then becomes:

$$(5) \quad LS = \pi + \alpha_1 \ln(M) + \beta_2 X + \theta_1 \hat{\vartheta}_2 \cdot \ln(M) + \rho_1 \hat{\vartheta}_2$$

where $\hat{\vartheta}_2$ is the predicted error term from (3).

α_1 in (5) represents the causal effect of a log-point change in household income on life satisfaction for the average person in the sample. We restrict the sample to 15-25 year olds in the BHPS.

We find that for this sample group $\alpha_1 = 1.28$.

As derived in Fujiwara (2013) the value (compensating surplus) of the NCS is estimated as:

$$(6) \quad CS = M^0 - e^{\left[\ln(M^0) - \frac{\beta_{NCS}}{\alpha_1}\right]}$$

Where β_{NCS} = the impact of the NCS on life satisfaction which comes from the 2015 evaluation, and where $\alpha_1 = 1.28$ (from the control function model in (5)) and M^0 = sample average income which is £25,700 in the BHPS. Equation (6) provides the results for the Spring, Summer and Autumn NCS programmes (using the estimated β_{NCS} for each programme – note that the estimate of β_{NCS} differs across the programmes) set out in Table 1. of the report (repeated below).

Table 1 – A wellbeing VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual NCS graduate level

NCS programme	Life satisfaction improvement versus control group	Delivered cost of programme (per graduate)*	Value of life satisfaction improvement (per graduate)	Benefit-to-cost ratio (return on investment)
Spring	0.46	£1,520	£5,246	3.45
Summer	0.30	£1,620	£3,556	2.20
Autumn	0.51	£1,385	£5,748	4.15

*All programme costs are taken from the Ipsos MORI NCS 2015 evaluation report.

Appendix 2

A technical explanation of the Human Capital methodology as applied to higher education

We know that going to university has a range of positive impacts to the individual. One such monetisable benefit is increased earnings (Walker & Zhu, 2013). We thus investigate whether NCS participants have a higher rate of entry to university than their non-NCS counterparts, and monetise participation in the NCS through the individual lifetime earning associated with participation in higher education. This value is complementary to the value of participating in the NCS programme to the participant's subjective wellbeing (see section on Additionality below).

To investigate whether NCS participation increases entry into higher education, we compare NCS entry rates (NCS participants accepted to higher education as a percentage of NCS participants) to non-NCS entry rates (non-NCS participants accepted to higher education as a percentage of non-NCS participant national populations of the same age). The NCS participants and non-participants accepted into higher education came from UCAS STROBE (a UCAS service that tracks individuals in the UCAS application system) and UCAS EXACT (a UCAS service that creates datasets about applicants) respectively. We focus on 18 year olds who took part in NCS in 2015 and applied to university in the UCAS cycle 2016. The non-participant entry are calculated by subtracting the number of entries for NCS participants for each subpopulation from the national figures for entries.

This involved four datasets:

1. UCAS (University College Admissions Service) STROBE data:
 - a. NCS participants broken down by UCAS cycle year (when the application is processed), year participated in the NCS and POLAR3 quintile (location classification by level of young participation in higher education where quintile 1 is an area with the lowest young participation rates and quintile 5 is an area with the highest)¹.
 - b. NCS participants broken down by UCAS cycle year (when the application is processed), year participated in the NCS, ethnicity and gender.
2. Participation data from NCS:
 - a. broken down by UCAS cycle year, year participated in the NCS and POLAR3 quintile.
 - b. broken down by UCAS cycle year, year participated in the NCS, ethnicity and gender.
3. UCAS (University College Admissions Service) EXACT data: applicants domiciled in the UK broken down by UCAS cycle year, ethnicity, gender, POLAR3 quintile, and age band for UCAS cycle years 2015 and 2016. This gives the number of entries to a university course for the UK population. We found the **number of entries of those**

¹ POLAR3 is developed by the HEFCE. POLAR3 is the most up-to-date classification and is based on the participation rates of young people between 2005 and 2009 who entered higher education between 2005-06 and 2010-11, and so is most suitable for the age group we focus on.

not participating in the NCS programme by subtracting the number of entries for NCS participants.

4. Mid-year 2015 Official for National Statistics Population estimates (ONS, 2016). The baseline national population of 18 year olds in 2016 is created by ageing forward the population of 17 year olds in the mid-year 2015 ONS Population estimates (ONS, 2016). We break down this national population of 18 year olds in 2016 into POLAR3 quintiles by dividing by 5, given that the latter are approximately equal population shares. POLAR3 quintiles are assigned to Census area wards and so the quintile breakdown is not completely exact. We reach the **non-NCS population** by subtracting NCS participants from these national population figures.

We include only Year 12 students taking part in the 2015 NCS programme and applying to university in 2016. This is because we do not have age information for NCS participants. Those participating in NCS in 2014 and applying to university in 2016 could be in year 11 when they participated in NCS and aged 18 when applying to university, or they could be in year 12 when they participated in NCS and aged 19 when applying to university. We would have then needed to isolate the 18 year olds who applied in 2015 to subtract them from the population of 19 year olds in 2016. Otherwise, we cannot create a baseline population who are eligible to apply for university (many 19 year olds will already be at university). Whilst this restricts us to examining only a proportion of NCS participants (only those participating in Year 12 aged 17 and applying to university aged 18 in 2016), this is the best attempt to make sure that we are tracking young people only at the time where university admission is expected, and not before or after that. We would expect entry rates for the 19 year olds to be similar or higher than the control group for these quintiles, and thus the estimate we derive for 18 year olds to be a conservative estimate of the average effect for all NCS participants. Those applying to university at the age of 19 years old may work a year less and these would decrease the lifetime earnings but because the earnings are at the beginning of their career they are likely to be low.

We calculate the average treatment effect for subgroups broken down by gender, ethnicity and POLAR3 quintiles for those applying to university in the 2016 UCAS cycle year aged 18. The average treatment effect for each category is the mean difference between the entry rate for the NCS participants and the entry rate for the non-NCS participants within the category. The entry rate is simply defined as the number of people within the category who were accepted to university divided by the total population in the category. The total average treatment effect is the population-weighted average of the treatment effects for each category, as expressed by the following equations, where Y indicates entry to university and X is a vector comprising gender, ethnicity and the POLAR3 quintile.

$$(ATE | X = X_i) = (\bar{Y} | NCS = 1, X = X_i) - (\bar{Y} | NCS = 0, X = X_i)$$

$$\bar{Y} | X = X_i = \frac{\sum_{X=X_i} Y_i}{\sum_{X=X_i} 1}$$

$$ATE = \sum_i (ATE | X = X_i) * P(X = X_i)$$

Table 1 presents the estimated effects of NCS participation on university entry, both in total and by category. For POLAR3 quintile 5, the entry rates amongst the NCS participants are lower than in the control group. We suspect that this may be because NCS encourages individuals to do additional voluntary work and take a gap year, and thus delay their studies.

We compare NCS participants to a non-NCS group, controlling for gender, ethnicity and POLAR3 classification. Women are 35% more likely to go to university than men (UCAS, 2016), and NCS have significantly more women than men (70% female vs 30% male (Appendix A, Cameron, Stannard, Leckey, Hale & Di Antonio, 2017)). Individuals from an ethnic minority background are, on average, more likely to go to university than their white British peers (32.9% of white British students taking their GCSEs in 2008 went on the university at age 18 or 19 compared with 50.5% of students from other ethnic backgrounds (Crawford & Greaves, 2015)) and NCS also has significantly more participants from ethnic minority backgrounds than the general population (using data from Appendix A, Cameron, Stannard, Leckey, Hale & Di Antonio (2017) and Nomis (2011)). The aggregate breakdown by these criteria is used to replicate micro-level data, which are then used to match on all these factors simultaneously to calculate the treatment effect. However, we were unable to control for other factors which affect university entrance. For example, there is also a possibility that NCS participants are likely to be more motivated to apply to university than their non-NCS counterparts.

To convert the higher university admission rate into monetary values, we proceed as follows. First, we apply a dropout rate of 4.2% to take into account those who accept a place but do not attend university. This is calculated by subtracting the higher education initial participation rates for 18 and 19 year olds in 2014/15 in the UK (Department of Education, 2015) from the entry rates for the cohort aged 18 in 2014 accepted to start university at age 18 in 2014 or age 19 in 2015 (UCAS, 2015). We then apply a 9% drop-out rate (as in Walker & Zhu, 2013) to account for those dropping out of university after starting. Next, we monetise participation in NCS by multiplying the adjusted average treatment effect by the annualised earning premia and by government revenue (Walker & Zhu, 2013). Walker and Zhu (2016) calculate the average earnings premia and government revenue adjusted for net present value (applying a 3.5% discount rate as recommended by HM Treasury's Green Book (2001) for 47 years (assumed graduate aged 21 and retire aged 68, the current projected state pension age for someone aged 18). This value also takes into account varying employment over the lifecycle and university dropouts. However, it does not account for death between these ages. We further multiply by 96% to account for the survival rate between the age groups of 20-24 years and 65-69 years (Office of National Statistics, 2015).

A higher entry rate for NCS participants is associated with an average value of £6,861 per participant over their lifetime. Table 1 shows that the value is highest for participants living in areas categorised as POLAR3 quintiles 1-3 (areas of low and medium participation in higher education) and negative for participants living in areas categorised as POLAR3 quintile 5 (an area of high participation in higher education).

POLAR3	Entry rate % (non NCS)	Entry rate % (NCS)	% uplift (NCS vs non NCS)	Number of Individuals	Average Treatment Effect (%point)	Average treatment effect (discounted by all factors)	Earning premia (lifetime) (male)	Earning premia (lifetime) (female)	Earning premia (lifetime) (average)
Male									
1	22.39%	30.01%	34.02%	71,155	7.62%	6.42%	£12,785		£14,799
2	31.77%	43.64%	37.35%	72,571	11.87%	10.01%	£19,915		£17,676
3	39.53%	48.29%	22.18%	73,890	8.77%	7.39%	£14,711		£13,748
4	46.61%	45.92%	-1.48%	74,714	-0.69%	-0.58%	-£1,611		£1,926
5	61.07%	55.45%	-9.20%	77,441	-5.62%	-4.74%	-£9,427		-£12,885
Female									
1	15.03%	24.91%	65.68%	80,854	9.87%	8.33%		£16,572	
2	22.16%	31.48%	42.01%	79,438	9.31%	7.85%		£15,628	
3	28.75%	36.40%	26.60%	78,119	7.65%	6.45%		£12,835	
4	35.17%	38.09%	8.32%	77,295	2.93%	2.47%		£4,911	
5	49.00%	39.19%	-20.03%	74,569	-9.82%	-8.28%		-£16,474	
Total			11.64%		4.09%		£6,821	£6,899	£6,861

Table 1: Value of NCS participation through entry into higher education

A note on avoiding Double-Counting

We estimate the extent to which the individual incorporates the future value of the increased likelihood of participating in higher education by deflating the valuation of the impact of participating in NCS on life satisfaction by the contribution of ‘intention to study for a degree’ to life satisfaction. ‘Intention to study for a degree’ is the closest proxy available to give an indication of the individual’s assimilation of the higher probability of participating in higher education that is associated with the programme into their current wellbeing. The contribution of ‘intention to study for a degree’ was calculated by regressing the change in life satisfaction on the change in intention to study for a degree for all programmes. The regression was an OLS, included no controls (appropriate controls were not available due to the data sharing agreement with Ipsos MORI) and used heteroskedasticity robust standard errors. We then multiply the coefficient on the outcome by the mean of the outcome and divide it by the mean life satisfaction as follows:

$$\text{Contribution to } LS = \frac{\beta_i * \mu_x}{\mu_{LS}}$$

Where β is the coefficient, x is the variable, μ is the mean and LS is the life satisfaction. This gives us a sense (without asking directly) of how much the individual incorporates intention to study for a degree in the future into their current life satisfaction. We then deflate the life satisfaction values by the contribution:

$$\text{Adjusted } v(LS) = v(LS) * (1 - \text{Contribution to } LS)$$

where $v(LS)$ = value for life satisfaction. We can then add the adjusted value for life satisfaction to the earnings premium to arrive at a total value without double counting.

Table 2: VfM assessment (Cost-Benefit Analysis) of the NCS programme at the individual and total programme level over the participants' lifetimes

	Values by Programme		
	Spring	Summer	Autumn
Life Satisfaction (discounted for additionality)	£5,830	£3,513	£5,679
Earnings Premium	£6,861	£6,861	£6,861
Total Benefit per Individual	£12,044	£10,375	£12,540
Number of Participants	4671	59471	11453
Total Benefit for Programme	£56,261,789	£617,015,079	£143,631,263
Total Costs*	£7,668,000	£104,112,000	£17,172,000
Benefit-to-cost ratio (return on investment)	7.34	5.93	8.36

* Costs sourced from Cameron, Stannard, Leckey & Di Antonio (2017). Costs scaled to include an opportunity cost of 8% as in Jenkins and Kuo (2007).

Appendix 2: references

Nomis. (2011). *DC2101EW – Ethnic group by sex by age, Census 2011*.

<https://www.nomisweb.co.uk/census/2011/dc2101ew>

Cameron, D, Stannard, J., Leckey, C., Hale, C. & Di Antonio, E. (2017). *National Citizen Service 2015 Evaluation: Main Report*. Ipsos Mori.

Crawford, C. & Greaves, E. (2015). *Ethnic minorities substantially more likely to go to university than their White British peers*. Institute of Fiscal Studies. <https://www.ifs.org.uk/publications/8042>

Dancer, S. (2014). *Additionality Guide: Fourth Edition 2014*. Homes & Communities Agency. UK Government.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/378177/additionality_guide_2014_full.pdf

Department for Education, UK Government. (2016). *Participation Rates in Higher Education: Academic Years 2006/2007 – 2014/2015 (Provisional)*

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/552886/HEIPR_PUBLIC_ATION_2014-15.pdf

Fujiwara, D. & Campbell, R. (2011). *Valuation Techniques for Social Cost-Benefit Analysis: stated preference, revealed preference and subjective well-being approaches. A discussion of the current issues*. HM Treasury.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf

Jenkins, G. & Kuo, C-Y. (2007). *The Economic Opportunity Cost of Capital for Canada - An Empirical Update*. Queen's Economics Department Working Paper No. 1133.

<http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.489.3929&rep=rep1&type=pdf>

HM Treasury. (2011). *The Green Book: Appraisal and Evaluation for Central Government*.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf

Office of National Statistics, UK Government, *Mid-2015 Population Estimates Analysis Tool*, [zip excel file], (Release data: 23rd June 2016),

<https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesanalysisistool>

Office of National Statistics, UK Government. (2015). *Death registration summary tables – England and Wales*.

<https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathregistrationsummarytableseotlandandwalesreferencetable>

UCAS Analysis and research. (2015). *End of Cycle report 2015*.

<https://www.ucas.com/sites/default/files/eoc-report-2015-v2.pdf#page=37>

Walker, I. & Zhu, Y. Department for Business, Innovation & Skills. (2013). *The impact of university degrees on the lifecycle of earnings: some further analysis*. (Research paper number 112). London.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/229498/bis-13-899-the-impact-of-university-degrees-on-the-lifecycle-of-earnings-further-analysis.pdf (See Table 14).

Weale, S. (2016, 18th August). Record number of clearing courses available to A-level students. *The Guardian*. Retrieved from <https://www.theguardian.com/uk>

Appendix 3

Contribution to life satisfaction and mediation analysis

As we have seen, participation in the NCS programme is associated with higher mean life satisfaction in the immediate and three-month post-participation period. Jump was asked to investigate the existing data in an attempt to establish which of the positive outcomes of the NCS programme are responsible for the improvement in life satisfaction. This work will be helpful in understanding what elements of the NCS programme are driving the positive increase in life satisfaction in order to inform the future design of the programme.

As with all the work Jump has been able to undertake for this report, we have been limited by working with the data shared from the 2015 evaluation by Ipsos MORI. This means that the regressions used to estimate the contribution of outcomes - such as confidence - to life satisfaction do not use any further demographic controls - such as income, age, gender, housing and local conditions - that may also affect life satisfaction. The result of this is that we look at the broad associations between these outcomes and life satisfaction within this sample group of young people without such controls.

We have looked at understanding how NCS produces an improved life satisfaction score in two ways.

1. **The Contributions approach:** looking at the data to see what contributes to life satisfaction within this sample of young people. This gives an insight into the association between outcomes and life satisfaction but we cannot establish through this methodology whether NCS participation acts through these outcomes to improve life satisfaction.

For example, with this approach we find that not smoking is associated with improved life satisfaction, but we know that NCS is not designed to affect the outcome of not smoking and so is unlikely to actually contribute to this element of the improvement in life satisfaction. So we undertook a second type of analysis.

2. **Mediation analysis.** This helps us understand *how* NCS participation contributes to life satisfaction. It is the mechanism which we are interested in, both now and for future programme design.

The detailed findings of both approaches are explained below.

1. Contributions to Life Satisfaction

We regress life satisfaction at baseline on a range of variables such as “confidence in leading a team” and “feeling like one can have an impact on the world” at baseline. We then multiply the coefficient on the outcome by the mean of the outcome and divide it by the mean life satisfaction as follows:

$$\text{Contribution to LS} = \frac{\beta_x * \mu_x}{\mu_{LS}}$$

where β is the coefficient, x is the variable, μ is the mean and LS is life satisfaction. This gives us a sense (without asking directly) of how much each of these are important in young people’s evaluations of their lives. We use the baseline data for participants and the control

group as we are interested in the general relationships between life satisfaction and the variables. It is important to note therefore that the results are neither estimates of the causal effect of such variables on life satisfaction nor the causal effect of participating in the NCS on life satisfaction via these variables. However, looking at the general relationships gives an insight into what correlates with life satisfaction in this specific population of young people. A different regression model is constructed for each programme (Spring, Summer or Autumn) with slightly different variables (as shown in Tables 1, 2 and 3 below) and the model is a simple OLS. The variables were chosen on the basis of being significantly affected by participation in NCS and being conceptually distinct from each other. Robust standard errors are used to account for heteroskedasticity. The R squared for the models are 0.16, 0.17 and 0.16 for Spring, Summer and Autumn respectively. The reasonably low R squared are expected for life satisfaction (as much else contributes to life satisfaction beyond these variables), and do not detract from us being able to say something useful about the individual variables of interest.

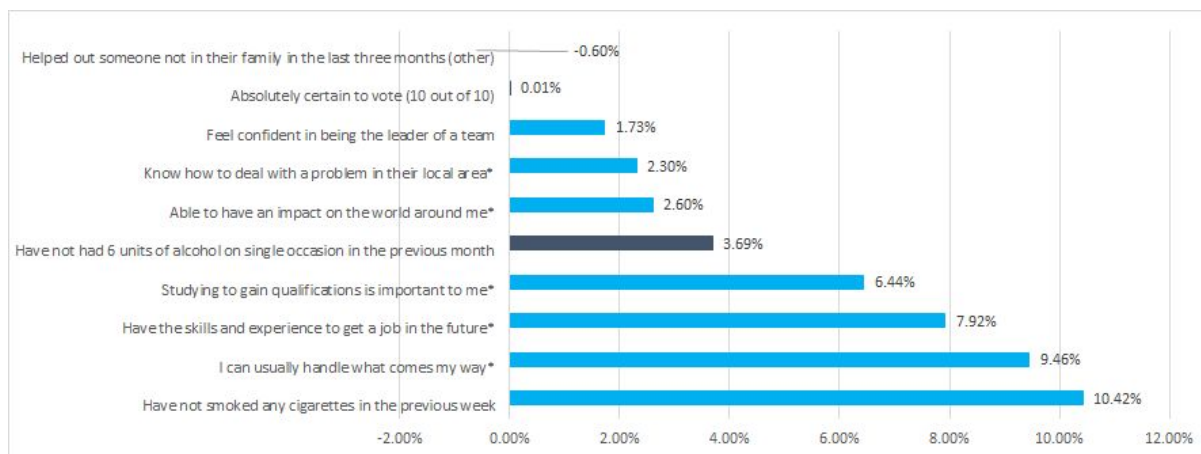
The most important contributor to life satisfaction was not having smoked in the previous week in both the Spring and Summer programme. Whether this is because of a causal effect of smoking on life satisfaction or simply that young people tend to smoke more when they are dissatisfied or in other situations associated with dissatisfaction, we cannot tell from this model. However, not drinking more than 6 units of alcohol in the last week is not significant in either programme (Spring or Autumn). Agreeing that with the statements “I have the skills and experience to get a job in the future” and “I can usually handle what comes my way” feature consistently in the top three contributors for all three programmes. Other statements associated with efficacy are still important but seem to be less so, for example, being very certain to vote or agreeing that “I would know how to deal with a problem in my local area if I wanted to”. Helping others has an association with life satisfaction which is insignificant or significant but negative. This is unusual in that in the literature, subjective wellbeing is usually associated positively with helping behaviour or not at all (Fujiwara, Oroyemi & McKinnon, 2013).

Appendix 3 Table 1: Contributors to Life Satisfaction (Spring Programme)

Variable Name	% Contribution
Have not smoked any cigarettes in the previous week	10.42%***
Agree that “I can usually handle what comes my way”	9.46%***
Agree that they “have the skills and experience to get a job in the future”	7.92%***
Agree that “studying to gain qualifications is important to me”	6.44%**
Have not had 6 units of alcohol on single occasion in the previous month	3.69%
Agree that “I feel able to have an impact on the world around me”	2.60%**
Agree that they would know how to deal with a problem in their local area if they wanted to	2.30%***
Feel confident in being the leader of a team	1.73%*
Absolutely certain to vote (10 out of 10)	0.01%
Helped out by helping out someone not in their family in some other way in the last three months	-0.60%

Note: stars indicate that the variable was significant in a regression of life satisfaction on the outcome variables. *p < .1 **p < .05. ***p < .01. See regression tables in Appendix 3 Table 4.

Appendix 3 Graph 1: Contributors to Life Satisfaction (Spring Programme)



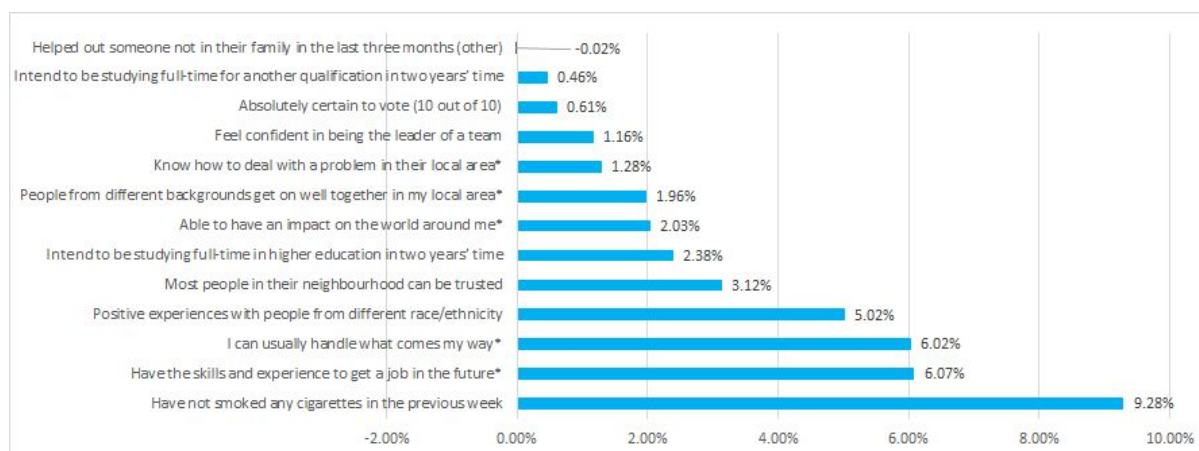
* Agree or strongly agree with the statement. Significant = sky blue.

Appendix 3 Table 2: Contributors to Life Satisfaction (Summer Programme)

Variable Name	% Contribution
Have not smoked any cigarettes in the previous week	9.28%***
Agree that they "have the skills and experience to get a job in the future"	6.07%***
Agree that "I can usually handle what comes my way"	6.02%***
Positive experiences with people from different race/ethnicity	5.02%***
Saying most people in their neighbourhood can be trusted	3.12%***
Intend to be studying full-time for a degree or other higher education qualification in two years' time	2.38%***
Agree that "I feel able to have an impact on the world around me"	2.03%***
Agree that "people from different backgrounds get on well together in my local area"	1.96%***
Agree that they would know how to deal with a problem in their local area if they wanted to	1.28%***
Feel confident in being the leader of a team	1.16%***
Absolutely certain to vote (10 out of 10)	0.61%*
Intend to be studying full-time for another qualification in two years' time	0.46%***
Helped out by helping out someone not in their family in some other way in the last three months	-0.02%

Note: stars indicate that the variable was significant in a regression of life satisfaction on the outcome variables. *p < .1 **p < .05. ***p < .01. See regression tables in Appendix 3 Table 5.

Appendix 3 Graph 2: Contributors to Life Satisfaction (Summer Programme)



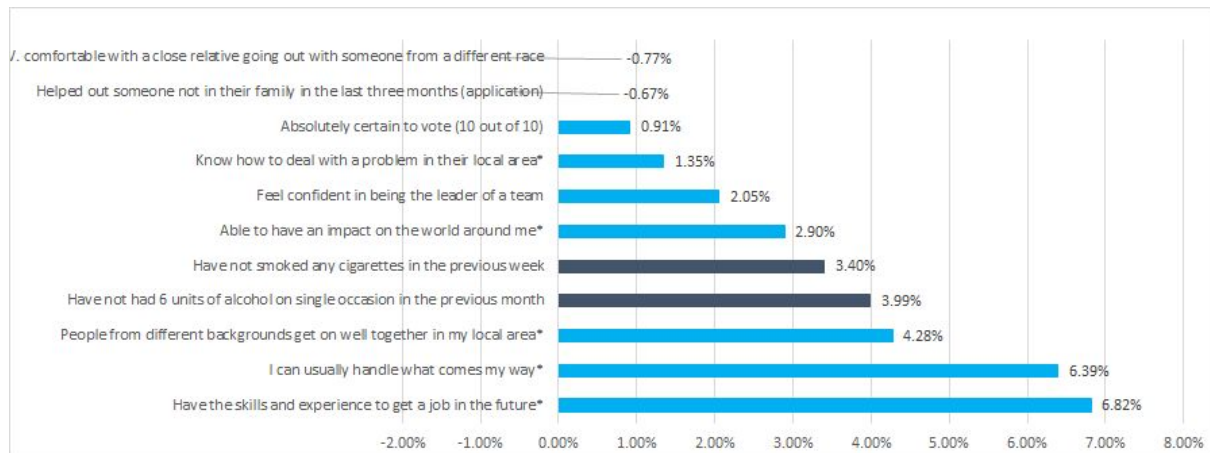
* Agree or strongly agree with the statement. Significant = sky blue.

Appendix 3 Table 3: Contributors to Life Satisfaction (Autumn Programme)

Variable Name	% Contribution
Agree that they "have the skills and experience to get a job in the future"	6.82%***
Agree that "I can usually handle what comes my way"	6.39%***
Agree that "people from different backgrounds get on well together in my local area"	4.28%***
Have not had 6 units of alcohol on single occasion in the previous month	3.99%
Have not smoked any cigarettes in the previous week	3.40%
Agree that "I feel able to have an impact on the world around me"	2.90%***
Feel confident in being the leader of a team	2.05%***
Agree that they would know how to deal with a problem in their local area if they wanted to	1.35%**
Absolutely certain to vote (10 out of 10)	0.91%**
Helped out by helping someone not in their family with a university or job application in the last three months	-0.67%***
Feel very comfortable with a close relative or friend going out with someone from a different race or ethnicity	-0.77%

Note: stars indicate that the variable was significant in a regression of life satisfaction on the outcome variables. *p < .1 **p < .05. ***p < .01. See regression tables in Appendix 3 Table 6.

Appendix 3 Graph 3: Contributors to Life Satisfaction (Autumn Programme)



* Agree or strongly agree with the statement. Significant = sky blue.

Appendix 3 Table 4: Regression of Life Satisfaction on Contributor Variables (Spring)

Variable	β
Feel confident in being the leader of a team	0.23*
Agree that they would know how to deal with a problem in their local area if they wanted to	0.34***
Agree that "I feel able to have an impact on the world around me"	0.32**
Helped out by helping out someone not in their family in some other way in the last three months	-0.14
Absolutely certain to vote (10 out of 10)	0.00
Agree that "studying to gain qualifications is important to me"	0.50**
Agree that they "have the skills and experience to get a job in the future"	0.75***
Agree that "I can usually handle what comes my way"	0.88***
Have not had 6 units of alcohol on single occasion in the previous month	0.27
Have not smoked any cigarettes in the previous week	0.78***
Constant	3.88***
Number of people	
Notes: Heteroskedasticity-robust standard errors. *p < .1 **p < .05. ***p < .01.	

Appendix 3 Table 5: Regression of Life Satisfaction on Contributor Variables (Summer)

Variable	β
Feel confident in being the leader of a team	0.16***
Agree that they would know how to deal with a problem in their local area if they wanted to	0.20***
Agree that “I feel able to have an impact on the world around me”	0.27***
Helped out by helping out someone not in their family in some other way in the last three months	0.00
Absolutely certain to vote (10 out of 10)	0.11*
Intend to be studying full-time for a degree or other higher education qualification in two years’ time	0.30***
Intend to be studying full-time for another qualification in two years’ time	0.20**
Agree that they “have the skills and experience to get a job in the future”	0.58***
Agree that “I can usually handle what comes my way”	0.64***
Have not smoked any cigarettes in the previous week	0.70***
Saying most people in their neighbourhood can be trusted	0.42***
Positive experiences with people from different race/ethnicity	0.45***
Agree that “people from different backgrounds get on well together in my local area”	0.23***
Constant	4.32***
Number of people	3852
Notes: Heteroskedasticity-robust standard errors. *p < .1 **p < .05. ***p < .01.	

Appendix 3 Table 6: Regression of Life Satisfaction on Contributor Variables (Autumn)

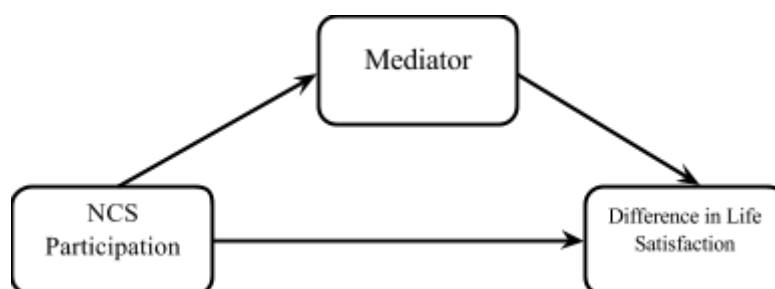
Variable	β
Feel confident in being the leader of a team	0.30***
Agree that they would know how to deal with a problem in their local area if they wanted to	0.20**
Agree that “I feel able to have an impact on the world around me”	0.37***
Helped out by helping someone not in their family with a university or job application in the last three months	-0.31***
Absolutely certain to vote (10 out of 10)	0.17**
Agree that they “have the skills and experience to get a job in the future”	0.65***
Agree that “I can usually handle what comes my way”	0.70***
Have not had 6 units of alcohol on single occasion in the previous month	0.29
Have not smoked any cigarettes in the previous week	0.25
Feel very comfortable with a close relative or friend going out with someone from a different race or ethnicity	-0.09
Agree that “people from different backgrounds get on well together in my local area”	0.47***
Constant	4.85***
Number of people	1845
Notes: Heteroskedasticity-robust standard errors. *p < .1 **p < .05. ***p < .01.	

2. Mediation analysis of NCS participation on Life Satisfaction

The first approach gives an insight into the association between outcomes and life satisfaction, but it does not allow us to establish through this methodology whether NCS participation acts through these outcomes to improve life satisfaction. To understand the mechanisms which link NCS participation to improved life satisfaction, we conduct mediation analysis. Mediation analysis is standard in psychological research and recent contributions from the literature have examined the assumptions required to investigate multiple mediators (VanderWeele & Vansteelandt, 2015). This shows us, for example, that whilst not smoking contributes to life satisfaction (from the first analysis), NCS does not impact significantly on smoking, and therefore this is not a path via which NCS participation affects life satisfaction.

Standard regression analysis gives the direct effect of a one unit change in X (in our case a binary variable: NCS participation) on Y (life satisfaction), holding all else constant. However, it is possible that changing NCS participation changes confidence, for example, and confidence affects life satisfaction, as per Figure 1:

Appendix 3 Figure 1: Direct and Indirect Paths for the Relationship between NCS participation and a Difference in Life Satisfaction.



The total effect of NCS participation on life satisfaction is composed of both the direct and indirect effects. In the case of the NCS programme, we look at the following mediators:

Appendix 3 Table 7: Mediators investigated for each programme

Spring	Summer (standard)	Autumn
Feel confident in being the leader of a team		
Agree that "I would know how to deal with a problem in my local area if I wanted to"		
Agree that "I feel able to have an impact on the world around me"		
Helped out by helping out someone not in their family in some other way in the last three months		Helped out by helping someone not in their family with a university or job application in the last three months
Absolutely certain to vote (10 out of 10)		

Agree that “studying to gain qualifications is important to me”	Intend to be studying full-time for a degree or other higher education qualification in two years’ time	
	Intend to be studying full-time for another qualification in two years’ time	
Agree that “I have the skills and experience to get a job in the future”		
Agree that “I can usually handle what comes my way”		
Have not had 6 units of alcohol on single occasion in the previous month		Have not had 6 units of alcohol on single occasion in the previous month
Have not smoked any cigarettes in the previous week		
	Saying most people in their neighbourhood can be trusted	
	Positive experiences with people from different race/ethnicity	Feel very comfortable with a close relative or friend going out with someone from a different race or ethnicity
	Agree that “people from different backgrounds get on well together in my local area”	Agree that “people from different backgrounds get on well together in my local area”

There are three assumptions required to identify the natural direct and indirect effects:

- 1) There is no unmeasured confounding for the exposure-outcome relationship.

$$LS_{NCS,M} \perp\!\!\!\perp NCS$$

- 2) There is no unmeasured confounding for the mediator-outcome relationship.

$$LS_{NCS,M} \perp\!\!\!\perp M \mid NCS$$

- 3) There is no unmeasured confounding of the exposure-mediator relationship.

$$M_{NCS} \perp\!\!\!\perp NCS$$

Due to the data sharing agreement with Ipsos Mori, control variables were not available to us. This lack of control variables poses the risk of unmeasured confounding. There are many reasons why these assumptions might not hold, such as variation in gender, ethnicity or innate ability between NCS participants and non-participants. To deal with this, Ipsos Mori constructed weights to make the control and treatment group comparable, based on a number of variables such as gender, age, and deprivation. We apply these weights to our regression. Please see the technical report (Cameron, Stannard & Hale, 2016) for details of on which variables they matched.

Following the methodology of VanderWeele and Vandsteelandt (2015) for multiple mediation without interaction between the mediators, we regressed life satisfaction on NCS participation and a vector of mediators [1], and each mediator of interest on NCS participation [2] using OLS regressions with heteroskedasticity-robust standard errors.

For mediators $M = (m^{(1)}, \dots, m^{(K)})$,

$$E[NCS, m] = \theta_0 + \theta_1 NCS + \theta_2^{(1)} m^{(1)} + \dots + \theta_2^{(K)} m^{(K)} + v \quad [1]$$

$$E[NCS] = \alpha_i + \beta_i NCS + u \quad [2]$$

We are interested in how NCS contributes to the *change* in life satisfaction, and so the mediator and outcome variables are the difference between follow-up and baseline. The standardised coefficients from these regressions allow us to calculate the natural direct [3] and indirect effects [4] of NCS participation on life satisfaction. Standardisation means that we have subtracted from every value of every mediator variable the mean of that variable, and then divided it by its standard deviation. This allows us to compare the effects like for like.

The total marginal effect of NCS participation on life satisfaction can be derived as follows:

$$\frac{dLS}{dNCS} = \theta_1 + \theta_2^{(1)} \frac{dm^{(1)}}{dNCS} + \dots + \theta_2^{(K)} \frac{dm^{(K)}}{dNCS} = \theta_1 + \theta_2^{(1)} \beta_1 + \dots + \theta_2^{(K)} \beta_K \quad [3]$$

This helps us to visualize an intuitive decomposition of the total effect as the sum of the first term representing the direct effect of NCS on life satisfaction, and each subsequent term representing the indirect effect via mediator i , for $i = 1, 2, \dots, K$. Tables 2.1-2.3 report these decompositions for each of the Spring, Summer and Autumn NCS programmes, along with the proportion of the total effect that each term represents.

Results

The results broadly corroborate the contributions analysis: agreeing that “I have the skills and experience to get a job in the future” and “I can usually handle what comes my way” were significant mediators across all three programmes. Agreeing that “studying to gain qualifications is important to me” was also a significant mediator in the Spring programme. Feeling confident being the leader of a team, and agreeing that “I feel able to have an impact on the world around me” were also important in the Summer standard and Autumn programmes. In the Summer and Autumn programmes, there was also a community element that significantly mediated the effect of NCS participation on life satisfaction, respectively, having positive experiences with people from different race/ethnicity and agreement that “people from different backgrounds get on well together in my local area”.

However, an interesting difference between the contributions analysis and the mediation analysis is that whilst not smoking is amongst the strongest and significant correlations with life satisfaction in the contributions analysis, not smoking does not appear to significantly mediate the relationship between NCS participation and life satisfaction. Its coefficient $\theta_2^{(k)}$ is negative for Summer and Autumn and insignificant at the 10% level throughout, although NCS participation is significantly correlated with not smoking, and smoking is correlated with life satisfaction when no further variables are accounted for. This suggests that a bivariate regression of life satisfaction on smoking might have captured the effects of other mediators, such as confidence or motivation to study. The lack of mediation by not smoking is expected given that the NCS programme is not designed to have any impact on the cessation of the participants smoking habits.

The summation of the indirect effects as a proportion of the total effect is 0.3272 for Spring, 0.3851 for Summer standard and 0.5867 for Autumn. This suggests that there is still a considerable amount of variation that the mediators don't account for: this variation could be explained by a direct effect or other mechanisms not considered.

Appendix 3 Tables 8-10: Natural direct and indirect effects of NCS participation on life satisfaction

Appendix 3 Table 8: Spring programme

	$\theta_2^{(k)}$	β_i	Indirect Effect	Share of Total Effect	p Value on $\theta_2^{(k)}$
Feel confident in being the leader of a team	0.0271	0.1963**	0.0053	0.0395	0.4411
Agree that "I would know how to deal with a problem in my local area if I wanted to"	0.0726**	0.1321**	0.0096	0.0712	0.0375
Agree that "I feel able to have an impact on the world around me"	0.0173	0.0941**	0.0016	0.0120	0.6427
Helped out someone not in their family in some way in the last three months	0.0608	0.0941**	0.0057	0.0424	0.1755
Agree that "studying to gain qualifications is important to me"	0.0827**	0.0283	0.0023	0.0174	0.0268
Agree that "I have the skills and experience to get a job in the future"	0.1052**	0.1138**	0.0120	0.0888	0.0434
Agree that "I can usually handle what comes my way"	0.1266**	0.0888**	0.0112	0.0834	0.0047
Have not had 6 units of alcohol on single occasion in the previous month	-0.0068	0.0642*	-0.0004	-0.0033	0.8419
Have not smoked any cigarettes in the previous week	-0.0473	0.0688	-0.0033	-0.0241	0.3754
Total Indirect			0.0441	0.3272	
Direct Effect (θ_1)	0.0907				
Total Effect	0.1348				

Note: * p-value < 10%, ** p-value < 5%. Absolutely certain to vote (10 out of 10) omitted due to collinearity.

Appendix 3 Table 9: Summer programme

	$\theta_2^{(k)}$	β_1	Indirect Effect	Share of Total Effect	p Value on $\theta_2^{(k)}$
Feel confident in being the leader of a team	0.0375*	0.1653**	0.0062	0.0744	0.0867
Agree that "I would know how to deal with a problem in my local area if I wanted to"	-0.0042	0.1235**	-0.0005	-0.0062	0.8593
Agree that "I feel able to have an impact on the world around me"	0.0585**	0.1254**	0.0073	0.0880	0.0095
Helped out someone not in their family in some other way in the last three months	0.0094	-0.0455*	-0.0004	-0.0051	0.6633
Absolutely certain to vote (10 out of 10)	0.0244	0.0629**	0.0015	0.0184	0.3133
Intend to be studying full-time for a degree or other higher ed. qual. in two years' time	-0.0142	0.0853**	-0.0012	-0.0146	0.6039
Intend to be studying full-time for another qualification in two years' time	0.0368	-0.0946**	-0.0035	-0.0417	0.1695
Agree that "I have the skills and experience to get a job in the future"	0.0709**	0.1253**	0.0089	0.1065	0.0025
Agree that "I can usually handle what comes my way"	0.1214**	0.0971**	0.0118	0.1413	0.0000
Have not smoked any cigarettes in the previous week	-0.0314	0.0781**	-0.0025	-0.0294	0.2531
Saying most people in their neighbourhood can be trusted	0.0565**	-0.0072	-0.0004	-0.0049	0.0108
Positive experiences with people from different race/ethnicity	0.0858**	0.0535**	0.0046	0.0550	0.0001
Agree that "people from different backgrounds	0.0061	0.0463**	0.0003	0.0034	0.7797

get on well in my local area”					
Total Indirect			0.0321	0.3851	
Direct Effect (θ_1)	0.0513				
Total Effect	0.0834				

Note: * p-value < 10%, ** p-value < 5%

Appendix 3 Table 10: Autumn programme

	$\theta_2^{(k)}$	β_1	Indirect Effect	Share of Total Effect	p Value on $\theta_2^{(k)}$
Feel confident in being the leader of a team	0.1202**	0.2145**	0.0258	0.2161	0.0000
Agree that “I would know how to deal with a problem in my local area if I wanted to”	0.0484*	0.1280**	0.0062	0.0519	0.0796
Agree that “I feel able to have an impact on the world around me”	0.0593*	0.1057**	0.0063	0.0525	0.0538
Absolutely certain to vote (10 out of 10)	0.0386	0.1195**	0.0046	0.0386	0.2297
Agree that “I have the skills and experience to get a job in the future”	0.1165**	0.0788**	0.0092	0.0770	0.0001
Agree that “I can usually handle what comes my way”	0.0785**	0.1340**	0.0105	0.0881	0.0046
Have not smoked any cigarettes in the previous week	0.0183	0.0483*	0.0009	0.0074	0.4923
Agree that “people from different backgrounds get on well in my local area”	0.0526**	0.1133**	0.0060	0.0499	0.0377
Helped out by helping someone not in their family with a university or job application in the last three months	-0.0090	0.0882**	-0.0008	-0.0067	0.7726
Have not had 6 units of alcohol on single occasion in the previous month	-0.0027	0.0818**	-0.0002	-0.0019	0.9446
Feel very comfortable with a close relative or friend going out with someone from a different race or ethnicity	0.0251	0.0656**	0.0016	0.0138	0.3806
Total Indirect			0.0700	0.5867	
Direct Effect (θ_1)	0.0493				
Total Effect	0.1194				

Note: * p-value < 10%, ** p-value < 5%

Appendix 3: References

Cameron, D., Stannard, J. & Hale, C. (2016). National Citizen Service 2015 Evaluation: Technical Report. Ipsos MORI.

Fujiwara, D., Oroyemi, P., & McKinnon, E. (2013). Wellbeing and Civil Society: Estimating the Value of Volunteering Using Subjective Wellbeing Data (Working Paper No.112) (p. 26). London, UK: Department for Work and Pensions.

<https://www.gov.uk/government/publications/wellbeing-and-civil-society-estimating-the-value-of-volunteering-using-subjective-wellbeing-data-wp112> Accessed 2 July 2014

VanderWeele, T. J. & S. Vansteelandt. (2015). *Mediation Analysis with Multiple Mediators*. Epidemiol Method. 2014 Jan; 2(1): 95–115.