



Department  
for Culture  
Media & Sport

# **Further analysis to value the health and educational benefits of sport and culture**

**March 2015**

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## **Acknowledgements**

This work was commissioned as part of the Culture and Sport Evidence (CASE) strategic research programme. The CASE programme is jointly funded by the Department for Culture, Media and Sport, Arts Council England, English Heritage and Sport England.

We are grateful to the CASE project board members Lee Smith (DCMS), Vivien Niblett (Arts Council England), Laura Clayton (English Heritage) and Julie MacPherson (Sport England) for their valuable input and comments on the research.

This analysis was conducted using Understanding Society and the British Household Panel Survey data supplied under the standard End User Licence (EUL) agreement from the Economic and Social Data Service (ESDS). Responsibility for the analysis and interpretation of these data are solely that of the authors.

## Executive Summary

The culture and sport sectors generate important benefits to society, but these benefits can be difficult to measure and value. Data from the British Household Panel Survey and the Understanding Society Survey enable us to measure and value these benefits using two of the largest nationally representative surveys of the UK. Attaching values to benefits allows use of cost-benefit analysis to assess culture and sport related interventions. A population-level analysis was conducted with these surveys to analyse the relationship between engagement in cultural and sporting activities on the one hand and key social outcomes of interest on the other.

Previous research based on the UK's Understanding Society Survey found that engagement in culture and sport was associated with increases in wellbeing, improvements in health, improved educational and economic prospects and higher levels of positive civic participation after controlling for a wide range of other factors (Fujiwara et al., 2014a, Fujiwara et al., 2014b). This report builds upon this work by further examining the links between engaging in culture and sport and health and educational outcomes. We look at the value of these benefits to the individual and to the taxpayer in terms of cost savings.

Multiple regression analysis was undertaken which allowed for the examination of the relationships between the social outcomes of interest as dependent variables (self-reported health and likelihood of pursuing further education) and measures of cultural and sports participation as independent variables (audience and participation in the arts, visiting heritage, museums and libraries in the past year, and playing individual or team sports) whilst controlling for a wide range of other factors (including age, education, income, employment status, gender, marital status, social relationships, region and housing tenure) that existing research suggests might explain varying levels of the social outcomes. Controlling for other factors allows us to make a better judgement on cause and effect relationships, but since we are not using data from an experiment - where people have been randomly assigned to different activities or conditions - we cannot make certain conclusions about the exact magnitude of the impact of cultural and sport engagement. The analysis is based on the best-available data, but we recommend that the results presented here be interpreted and used as upper-bound estimates given the problems with inferring causality from non-experimental datasets.

### Key findings:

#### General Health

- People who engaged in the arts as an audience member, had visited heritage sites, libraries or museums and those who participated in sports in the last year are all more likely to report good health.
- The predicted reduction in GP visits as a result of good health associated with culture and sport participation has a value to society in that it leads to costs savings for the NHS of £13.25 (all sports), £7.14 (team sports), £12.12 (individual sports), £5.07 (audience arts), £2.59 (heritage), £1.05 (library) and £1.89 (museum) per person annum.

- The predicted reduction in the use of mental health services as a result of good health associated with culture and sport participation has a value to society in that it leads to costs savings for the NHS of £17.86 (all sports), £9.63 (team sports), £16.34 (individual sports), £6.84 (audience arts), £3.50 (heritage), £1.42 (library) and £2.55 (museum) per person per annum.
- Using national level data on participation rates in England the total annual NHS cost savings due to reductions in GP visits (predicted as a result of engaging in culture and sport) is estimated to be around £384.9M (all sports), £38.3M (team sports), £347.0M (individual sports), £168.8M (audience arts), £82.2M (heritage), £18M (library) and £44.7M (museum). These are estimates related only to reductions in GP visits. There may be knock-on positive or negative effects that impact on society elsewhere.
- Using national level data on participation rates the total annual NHS cost savings in England due to reductions in the use of mental health services (predicted as a result of engaging in culture and sport) is estimated to be around £518.8M (all sports), £51.7M (team sports), £467.9M (individual sports), £227.8M (audience arts), £111.1M (heritage), £24.3M (library) and £60.3M (museum). These are estimates related only to reductions in the use of mental health services. There may be knock-on positive or negative effects that impact on society elsewhere.

### Summary of potential health and medical service usage savings from culture and sport

Activity	Type of impact	Increase in likelihood of reporting good general health	Reduced likelihood of visiting GP 6+ times per yr/ using psychotherapy services	Estimated annual cost savings (per person)	Estimated population level annual NHS cost savings	Total potential NHS cost savings (GP visits + Psychotherapy)
<b>Sports</b>	GP Visits	14.10%	3.58%	£13.25	£384.9M	£903.7M
	Psychotherapy		1.18%	£17.86	£518.8M	
<b>Arts</b>	GP Visits	5.40%	1.37%	£5.07	£168.8M	£396.6M
	Psychotherapy		0.45%	£6.84	£227.8M	
<b>Heritage</b>	GP Visits	2.76%	0.70%	£2.59	£82.2M	£193.2M
	Psychotherapy		0.23%	£3.50	£111.1M	
<b>Library</b>	GP Visits	1.12%	0.28%	£1.05	£18.0M	£42.3M
	Psychotherapy		0.09%	£1.42	£24.3M	
<b>Museum</b>	GP Visits	2.01%	0.51%	£1.89	£44.7M	£105.1M
	Psychotherapy		0.17%	£2.55	£60.3M	

### **Clinical Depression**

- Sports participants were less likely to report having clinical depression than non-participants (there was no impact of cultural engagement). We estimate that this would lead to an improvement in the individual's Quality Adjusted Life Years (QALYs) (a standardised measure of health related quality of life used by the National Institute for Care and Health Excellence and the Department for Health) that has a value of about £40 per annum per person engaged in sport.
- Using national level data on participation rates in England the total annual value of improvements in QALYs (predicted due to a reduction in clinical depression for people who play any sport) is estimated to be £1.16Bn.

### **Likelihood of attending Further Education**

- Within a sub-sample of 16-18 year olds, participants in the arts and those who visited heritage or libraries were found to be more likely on average to go on to further education in later years (0.99%, 1.02%, and 0.66% respectively). This is a statistically significant increase in the likelihood. As these likelihoods are on average, some 16-18 year olds will necessarily be more likely and others less likely to go on to further education.
- The benefit of engaging in these cultural activities has an estimated value of about £3,000 for participation in arts and heritage and about £2,000 for library over the person's lifetime due to increased earnings. These figures only represents the increase in earnings resulting from the increased likelihood of attending further education associated with cultural engagement and does not include any consideration of additional increases in lifetime earnings resulting from attainment and/or occupations, which would need to be considered in addition to this figure. This figure includes increases in lifetime earnings for the individual plus increased tax receipts for the exchequer.

These results on the relationships between culture and sport and health and educational outcomes are supported by existing literature and suggest that culture and sports participation can help to generate wide-ranging social benefits and cost savings to the exchequer, although the caveats around cause and effect should be noted.

## Chapter 1: Introduction

### 1.1. Background, aims and report overview

The culture and sports sectors play a key role in generating benefits for society. In Fujiwara et al. (2014a) (2014b) we showed that engagement in culture and sports is positively associated with increases in wellbeing, improvements in health, improved educational and economic prospects and higher levels of positive civic participation. Many of these benefits are difficult to measure and value and can therefore get neglected or completely ignored in discussions about how best to allocate scarce resources.

One important benefit arises from the positive impacts that such benefits may have on exchequer funds and taxpayers. This study builds on the first round of research (Fujiwara et al., 2014a) by examining in greater depth the positive links between culture and sport on the one hand and health outcomes and educational prospects on the other, and it estimates the cost savings to the taxpayer associated with these benefits.

The aims of the analysis presented in this report are:

- To develop a logic model based on a literature review detailing the theoretical links between culture and sport on the one hand and health outcomes and educational prospects on the other.
- To assess the relationship between culture and sport and self-reported general health and the possible cost savings that this could create through reductions in medical service usage (GP visits and use of psychotherapy services).
- To assess the relationship between culture and sport and mental health, specifically clinical depression<sup>1</sup> and the associated effect on Quality Adjusted Life Years (QALYs)<sup>2</sup>. And to value changes in QALYs using guidelines from the National Institute of Care and Health Excellence (NICE).
- To estimate the relationship between culture and sport and participation in higher education and to value this relationship in terms of increases in life time earnings and reductions in future unemployment and welfare benefits.

This section provides a summary of the methodology and results and the Annexes contain the full papers and analyses.

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<sup>1</sup> This is a measure based on whether the individual has been diagnosed with clinical depression by a health professional.

<sup>2</sup> QALYs are a standardised measure of health-related quality of life used by the National Institute for Care and Health Excellence (NICE) and the Department for Health. The QALY uses people's preferences concerning different health states and is a single dimension scale aggregating these responses on to a scale of 0 (for dead) to 1 (for full health) for different health conditions. Severe health conditions will be closer to 0 and not so severe conditions will have a QALY value close to 1.



## **1.2. Methodology and data**

The analysis uses data from the British Household Panel Survey (BHPS) and Understanding Society surveys. Both employ large and representative samples of the UK's population<sup>3</sup>.

With DCMS engagement as a co-government funder of the Understanding Society study, the second wave of the survey contained information on a wealth of activities relating to engagement in culture and sports. The Wave 2 data released in January 2013 contained measures of culture and sports activities alongside a range of wider measures of social outcomes.

Using Understanding Society this analysis looks at the relationship between engagement in culture and sports and:

- Self-reported general health
- Clinical depression
- Self-reported likelihood of going on to further/higher education (college or university)

The BHPS and academic studies are then used to derive values for these outcomes:

### **(i) Medical service usage**

Using the BHPS we look at the effects of changes in self-reported general health on medical service usage, specifically number of GP visits and psychotherapy usage, and attach NHS cost savings estimates to reductions in medical service usage rates. We look at self-reported general health on a scale of 1 to 5 where 5 = 'excellent' and 1 = 'very poor'.

### **(ii) Clinical depression**

We use estimates of reductions in Quality Adjusted Life Years (QALYs) due to depression and attach a monetary value to this, using NICE guidelines.

### **(iv) Higher education**

Building upon our previous work in Fujiwara et al. (2014a) (2014b), which showed that engaging in culture and sports increases how likely young people state they are to go on to further/higher education, the BHPS is used to estimate the impact of this reported likelihood to go on to further/higher education on actual education attendance. That is, we estimate the relationship between intention and behaviour for education noting that the previous literature has found only a weak link between intention and behaviour (Webb and Sheeran, 2006). We value this using an estimate of lifetime earnings and impacts on the public purse through increased income taxes.

We assess the relationship with these health and education outcomes associated with nine cultural and sports activities that people may have engaged in over the last year:

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<sup>3</sup> The analysis is based on already available data sources rather than primary data collection.

### **Arts & culture activities**

- Participation in or audience to any art form
- Audience only to the arts
- Participation only in the arts
- Heritage visits
- Library visits
- Museum visits

### **Sports activities**

- Participation in any sport (team or individual sports)
- Participation in team sports only
- Participation in individual sports only

We use a ‘two staged’ process in the analysis with the Understanding Society and BHPS datasets because the data required for this study are housed in the different surveys (the BHPS is required to estimate impacts on medical service usage and educational attainment).

The values derived here represent predicted impacts on the public purse and values to the individual for the *specific* outcomes in question given the best-available survey data<sup>4</sup>. NHS cost savings specifically come from predicted reductions in medical service usage rates, whilst increased income tax receipts and lower benefit payments from employment due to higher levels of educational attainment are more general benefits to the tax payer and public purse. Finally, improvements in QALYs and increased lifetime earnings represent benefits to the individual. Using data from the latest wave of the Taking Part survey we provide indicative population level values for the health impacts.

These are values specifically for these narrow set of benefits and it should be noted that some of the benefits may be offset elsewhere. Where possible we have included knock-on effects – for example the life time earnings estimates have forgone income during higher education years netted off - but it is out of the scope of this analysis to pick up all of the knock-on or spill over effects. The monetary cost and value estimates can be used in cost-benefit analysis and health related cost-effectiveness analysis (for the QALY values).

The analytical approach is broadly similar to the work undertaken as part of the CASE programme in 2010 (Matrix, 2010), which looked at the NHS cost savings and QALY improvements due to the positive health impacts of sports. Matrix (2010) looked at impacts on four physical health outcomes: chronic heart disease, stroke, diabetes and colon cancer. Our study differs in that (i) we focus more on mental health and general health rather than

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<sup>4</sup> These values differ from those estimated in Fujiwara et al. (2014b), which focussed on the individual-level impacts and values only using the Wellbeing Valuation approach. Where individual-level values are picked up in this report, they are for outcomes (individual earnings and QALYs) that are not accounted for in the Wellbeing Valuation study (2014b).

specific physical health conditions; (ii) we also look at education outcomes; and (iii) we also include impacts of cultural engagement.

The analysis, as with most studies in this area, is necessarily based on observational (ie, non-experimental) datasets, where cause and effect relationships are inferred using statistical methods. Throughout the analysis we use the best-available survey data and control for as many of the determinants of the main outcomes as possible in regression analysis in order to get a better understanding of cause and effect relationships, but we cannot make definite statements about causality and therefore recommend that the results be interpreted and used as upper-bound impact estimates. The statistical methodology is in line with the methods used in the original CASE report and the methodology and evidence used in other high-profile publications and reports in this area, such as the Surgeon General's (1996) report on the effects of physical activity on health, which relied mainly on non-experimental longitudinal and cross-sectional evidence.

## **Chapter 2. Summary of literature review**

A literature review was conducted in order to provide an overview of existing research related to the relationship of engaging in culture and sport and mental health outcomes (including clinical depression), medical service utilisation and educational outcomes (including education behaviours and engagement in further education). This review informed the choice of social measures and control variables, and it led to the development of a logic model which maps out the links between culture and sport to health and education outcomes. The full literature review can be found in Annex A.

### **General and mental health outcomes**

The literature review identified studies investigating the relationship of engaging in culture and sport and mental health outcomes, including clinical depression; medical service utilisation; and educational outcomes, including education behaviours such as school attendance and engaging in further education. The studies generally suggested positive relationships but there was also some evidence for weak or null effects. For example, one study found that stress management training was better at reducing the relative risk of a cardiac event than exercise. Another study showed that using sports whilst waiting for CBT (Cognitive Behavioural Therapy) did not positively impact therapeutic outcomes.

A variety of cultural activities were associated with a range of improved mental health outcomes. These activities include expressive writing; making music; reading literature; attending performing arts events; attending non-performing arts or cultural events; participating in dance activities; accessing art forms through CDs, mini discs, tapes or records; listening to the arts through the radio or viewing the arts on television, videos or DVDs; and visiting art galleries. The improvements were in reports of anxiety and depression, as well as life satisfaction, self-reported health, longevity, risk factors for disease, healthy eating, physical activity, and stress.

Physical activity was associated with improved mental health, such as small-sided football games and structured exercise programmes. The evidence indicates physical activity reduces the risk of onset and relapse of depression, and also improves self-assessed health and life satisfaction.

### **Medical service usage**

There was little evidence for a relationship between engaging in cultural activities and medical service usage. The exceptions showed that people aged 65 and older who participated in community-based cultural programs used less medication and visited the doctor less often than those who did not, and that they also had better physical health. Similar findings were reported in evaluations of a variety of arts programmes.

The physical health benefits from exercise are well-established, and one longitudinal study suggested that men who played sport in high school were less likely to visit the doctor as

adults. A number of scholars have suggested that exercise can be used for the prevention and treatment of mental health problems.

### **Educational outcomes**

Engaging in culture and sport improves higher/further educational aspirations and actual higher/further educational attendance, as well as both youth and adult educational performance. A range of cultural activities and characteristics were investigated, including listening and learning to play music and involvement in or attendance at theatre, drama, and dance. The benefits covered higher academic achievement and aspirations, increased likelihood of attending further/higher education, higher IQ scores, better school attendance, improved spatial reasoning and verbal skills, greater mathematic and reading proficiency, and higher motivation, as well as improved creativity, resilience, self-regulation, self-identity, self-esteem, and academic self-concept (that is, self-efficacy and motivation).

Sports and physical fitness were associated with improved higher/further educational aspirations and actual higher/further educational attendance; improved concentration; higher mathematics achievement and reading ability; better verbal, numeric, and reasoning abilities; better grades; and improved memory and school attendance. They were also associated with increased aspirations to attend higher education and actually higher education attendance.

## Chapter 3. Summary of findings

The analysis identified a number of statistically significant positive associations (even after controlling for other possible factors) between engagement with culture and sport on the one hand and a number of wider social impacts on the other. Our results are generally supported by the previous empirical literature in these fields. The study has also valued these relationships in terms of NHS cost savings, QALY values, life time earnings, and impacts on the public purse.

Due to the observational nature of the data (ie, the study is not based on data from experiments like randomised trials), causation cannot be directly inferred and future research should consider this further; however, the main determinants of each social outcome have been controlled for (e.g. age, education, income). Multiple regression analysis of this sort is one of the optimal statistical strategies for identifying causal relationships in instances like this where interventions have not been randomised and this or similar types of analysis have been used extensively in the health economics and policy evaluation literature. Hence the results are informative for policy purposes.

Any bias that may impact on our estimates of causality is likely to be *positive*. Casual estimates may become biased if there are factors that we cannot control for that drive engagement in culture/sport *and* that impact on the outcome of interest (ie, health and education) as well. If any such factors exist we believe that they are likely to be positive influences - ie, that they are factors that both make it more likely that some people engage in culture/sport and that make them healthy anyway (eg, this could be due to that person's upbringing). In such a circumstance some of the observed positive relationship between engagement in culture/sport and the outcomes of interest (health and education) would be due to that person's upbringing and not wholly due to the act of engaging in culture/sport. **We therefore recommend that the predicted impact and value estimates derived in this study be seen and used as upper-bound estimates of the impact of culture and sport on health and education.**

The benefits of sport and culture are estimated as follows (we do not report results for statistically insignificant cultural and sport variables and hence not all types of activities are mentioned in each of the results sections).

### **Health and medical service usage**

After controlling for the main determinants of health and health service usage:

- Those engaging with the arts as an audience member are 5.4% more likely to report good health than those who do not. Sports participants are 14.1% more likely to report good health than non-participants.
- Those who visit heritage sites, libraries or museums are more likely to report good health than those who do not (2.76%, 1.12% and 2.01% respectively).

- In turn, people in good health are 25.4% less likely to frequently visit GPs (defined as 6+ GP visits or more per year) and 8.4% less likely to have used psychotherapy services in the last year than those who are not in good health.
- The estimated per person annual NHS cost savings due to predicted reductions in GP visits are:
  - £13.25 for people who participate in sport.
  - £5.07 for those who engage with the arts as an audience member
  - For those who visit heritage, libraries or museums they are £2.59, £1.05 and £1.89 respectively.
- The estimated per person annual NHS cost savings due to predicted reductions in psychotherapy usage are:
  - £17.86 for people who participate in sport.
  - £6.84 for those who engage with the arts as an audience member
  - For those who visit heritage, libraries or museums they are £3.50, £1.42 and £2.55 respectively.
- Since these are different medical services the cost savings can be added together.

**Table 1: Summary of health and medical service usage results**

Activity	Type of impact	Probability impact on likelihood of reporting good general health	Probability impact on likelihood of visit GP 6+ times / using psychotherapy	Estimated annual cost savings (per person)	Estimated population level annual NHS cost savings	Total potential NHS cost savings (GP visits + Psychotherapy)
Sports						
All sports	GP Visits	14.10%	-3.58%	£13.25	£384.9M	£903.7M
	Psychotherapy		-1.18%	£17.86	£518.8M	
Team sports	GP Visits	7.60%	-1.93%	£7.14	£38.3M	£90.1M
	Psychotherapy		-0.64%	£9.63	£51.7M	
Individual sports	GP Visits	12.90%	-3.28%	£12.12	£347.0M	£814.9M
	Psychotherapy		-1.08%	£16.34	£467.9M	
Cultural activities						
Audience arts	GP Visits	5.40%	-1.37%	£5.07	£168.8M	£396.6M
	Psychotherapy		-0.45%	£6.84	£227.8M	
Heritage	GP Visits	2.76%	-0.70%	£2.59	£82.2M	£193.2M
	Psychotherapy		-0.23%	£3.50	£111.1M	
Library	GP Visits	1.12%	-0.28%	£1.05	£18.0M	£42.3M
	Psychotherapy		-0.09%	£1.42	£24.3M	
Museum	GP Visits	2.01%	-0.51%	£1.89	£44.7M	£105.1M
	Psychotherapy		-0.17%	£2.55	£60.3M	

### Clinical depression

After controlling for the main determinants of mental health:

- Sports participants are 0.5% less likely to report having clinical depression than non-participants.
- The annual QALY value due to this predicted reduction in the risk of depression is about £40 for people who play any sport and £34 for people who play an individual sport (team sports did not come out as significant on its own).

**Table 2: Summary of clinical depression results**

Activity	Probability impact on likelihood of having clinical depression	Annual per person QALY value	Total population annual QALY value
<i>All sports</i>	-0.54%	£39.96	£1.16Bn
<i>Individual sports</i>	-0.46%	£34.04	£974.7M

### Education

After controlling for the main determinants of education attendance and looking at the sub-sample of 16-18 year olds:

- We predict that participants in arts are about 1% more likely to go on to further education than those who do not. For those who visit heritage sites and for those that visit libraries this figure is estimated to be about 1% and 0.7% respectively.
- The per-person lifetime private benefits in wages from the higher likelihood of attending further/higher education are estimated as £2,380 (participants in arts); £2,465 (heritage visits) and £1,587 (libraries).
- The per-person lifetime public benefits in increased tax receipts from the higher likelihood of attending further/higher education are estimated as £790.59 (participants in arts); £818.62 (heritage visits) and £527.06 (libraries).

**Table 3: Summary of education results**

Activity	Type of impact	Probability impact on likelihood of being very likely to enter further education	Probability impact on actually entering into further education	Net private benefits (per person)	Net public benefits (per person)
<i>Participation arts</i>	Further/higher education	14.10%	0.99%	£2,380.15	£790.59
<i>Heritage</i>	Further/higher education	14.60%	1.02%	£2,464.55	£818.62
<i>Library</i>	Further/higher education	9.40%	0.66%	£1,586.77	£527.06



These figures only represent the increase in earnings resulting from the increased likelihood of attending further education associated with cultural engagement and does not include any consideration of additional increases in lifetime earnings resulting from attainment and/or occupations, which would need to be considered in addition to this figure. This figure includes increases in life time earnings for the individual plus increased tax receipts for the exchequer.

## **Annex A: Literature review and logic model**

### **A.1. Literature review**

A literature review was conducted in order to gain insight into the existing research on the social impacts of engaging in culture and sports. This investigation informed the choice of social measures, included within the British Household Panel Survey and the Understanding Society datasets, which were chosen for the current analysis and the control variables included in the model specifications. This review also led to the development of a logic model which maps out the links between culture and sport to health and educational outcomes.

This literature review focused on the relationship of engaging in culture and sport and:

- Mental health outcomes, including clinical depression
- Medical service utilisation
- Educational outcomes, including education behaviours and engagement in further education

#### **Sport, culture, and mental health (including depression)**

There exists a large body of evidence that suggests that art and cultural activities can play a therapeutic role in clinical and health care settings (Arts Council England, 2004; Staricoff, 2004; Bygren et al, 2009a; 2009b; Aldridge, 1993). Exposure to art and cultural activities in healthcare environments has been found to reduce anxiety and depression (Daykin et al, 2008) and increase feelings of empowerment, social inclusion and mental health (Hacking et al. 2008). Undertaking activities such as expressive writing (Smyth et al, 2008), making music (Aldridge, 1993) and reading literature (McArdle et al 2001) including poetry (Collins et al 2006) have all been found to have positive effects on patients' health outcomes.

Whilst these studies focus on the impact of cultural engagement on the health of a subset of the population, healthcare patients, there has been far less focus to date on the mental health benefits of cultural attendance by the general public (O'Neill, 2010). The population-level evidence from epidemiological studies on cultural participation and health that does exist suggests that participating in a range of cultural activities has a positive association with self-reported health (Wilkinson et al, 2007; Johansson et al. 2001) and longevity (Jacobs et al, 2008), and is negatively associated with risk factors for disease (Konlaan et al, 2000; Bygren 1996). Participating in cultural activities is also positively associated with healthy eating and physical activity (Renton et al. 2012).

Windsor (2005) explored a whole range of cultural activities including attending performing arts events, attending non-performing arts or cultural events or venues, participating in dance activities, accessing art forms through CDs, mini discs, tapes or records, and listening to the arts through the radio or viewing the arts on television, videos or DVDs. She found that people undertaking these activities were all more likely to report high levels of health than those that didn't.

Cuypers et al. (2012) found evidence to suggest that participation in receptive and creative cultural activities is significantly associated with good health, good satisfaction with life and low anxiety and depression scores. Relatedly, Clow and Fredhoi (2006) investigated the stress levels, as measured by cortisol, of workers in London prior to and directly after a 30 minute visit to an art gallery. They found a large and rapid drop in cortisol levels that they suggest would take about 5 hours of normal daytime decline to achieve a similar effect.

Like cultural participation, there has been much work that has looked at the beneficial effects of participation in sports for people in clinical populations (Warburton et al, 2006a; Taylor et al, 2004; Murphy et al., 2012). Specifically related to patients suffering from depression, Harris et al. (2006) finds that among those that undertake physical activity there is a lower incidence of reduced concurrent depression. They also suggest that engaging in physical activity can decrease the susceptibility to depression in the context of medical problems and negative life events such as divorce or legal problems. Similarly, Blumenthal et al. (1999) showed that 16 weeks of group exercise training in older patients with major depression was as effective as antidepressant treatment with sertraline.

More generally speaking, there are many studies to suggest that engaging in physical activity and sport leads to better health outcomes and acts as a protective factor against mental health problems (Leadbetter and O'Connor, 2013). Participating in sporting activities such as cycling, general physical activity programmes, small-sided football games and running is positively associated with life expectancy and negatively associated with risk factors for disease (Andersen et al., 2000, Krstrup et al., 2010; Sabia et al., 2012 ). A CASE study (2010) finds positive associations between participation in sport and self-assessed health and life satisfaction.

Many studies demonstrate a link between physical activity and decreased depression at a population level (Harris et al., 2006; Galper et al., 2006; Goodwin, 2003; Paffenbarger et al. 1993; Camacho et al., 1991). Galper et al. (2006) found that relative increases in fitness and habitual physical activity were associated with lower numbers of depressive symptoms and greater emotional wellbeing. Paffenbarger et al. (1993) found that in a 23-year study of a US college male student cohort, later life depression rates were lower among those who, as young men, had been physically active and sports players. Based on a cohort study of people aged over 50 years, Camacho et al. (1991) also shows that greater physical activity is protective against depression. In work that looks specifically at the impact of engagement in sport on wellbeing, Dolan et al (2013) used an instrumental variable approach based on the respondent's perceived benefits of exercise participation to estimate the causal impact of exercise participation on reports of life satisfaction. Their results suggest that exercising increases life satisfaction for both genders and more so for males.

### **Sport, culture, and medical service usage**

There is a lack of research which looks at the population level effects of cultural participation on medical service usage. One example which does exist, focuses specifically on people aged 65 and older, and found that amongst these people, those who participated in professionally conducted community-based cultural programmes reported a higher overall rating of physical health, fewer doctor visits, less medication use, fewer instances of falls, and fewer other health problems than those that didn't (Cohen et al. 2006) There is also evidence to suggest

that that participation in the arts in healthcare settings has a beneficial impact on medical service usage. Van Lith et al (2012), for example, have found that evaluations of a wide variety of arts programmes have reported reductions in symptoms, reduced use of medication and fewer GP visits. Further population-level evidence from epidemiological studies on cultural participation and medical service usage is needed.

The evidence for the effects of sport on medical service usage is stronger. Helbig & Hoyer (2008), for example, found that patients coping with long waiting lists to attend CBT (Cognitive Behavioural Therapy) reported engaging in new activities like sport to handle the long waiting times, although such behaviours did not positively affect therapeutic outcomes. Among about 100 patients with coronary artery disease and ischemia, Blumenthal et al (1997) conducted a randomised experiment that assigned patients to either exercise, exercise receive stress management training or continue their usual care. The relative risk of a cardiac event among those in the exercise group was lower than that of controls, but the effect did not reach statistical significance, and the stress management training group had the lowest risk.

In longitudinal work, Dohle and Wansink (2013) found that whether men played a sport in high school was a strong predictor of later-life physical activity and fewer visits to the doctor. Similarly based on evidence from a male cohort study, Warburton et al (2006b) highlight various health benefits of exercise and establish criteria for prescribing physical activity as a preventative therapy. Callaghan (2004) reviews the benefits of exercise for mental health, arguing that exercise therapy is an under-utilised treatment option for mental health patients and that doctors should make better use of exercise referral schemes.

### **Sports, culture, and education**

Engaging in the arts and cultural activities is positively associated with higher educational performance and development in children, with some studies suggesting there are benefits for adults, too. Studies have linked participation in arts and music related activities with a wide range of education-related benefits such as academic achievement (Catterall et al. 1999; Bamford 2006) and IQ scores (Schellenberg, 2006).

There is also some evidence to suggest that participation in cultural activities such as music and arts programmes is associated with both positive attitudes towards school attendance (Upitis et al 2003) and school attendance itself (Dreezen et al. 1999) and academic aspirations. Noble & Davies (2009) for example, finds that increased cultural capital, which includes participation in cultural activities, is associated with an increased intention to participate in higher education.

Engagement in cultural activities can positively impact actual higher/further educational attendance as well as aspirations. Childs et al (2002) show with a sample of over 16,000 Canadian youth that increased frequency of attendance at art museums or galleries, opera, ballet, classical symphony, or live theatre is associated with increased likelihood of going onto further/higher education.

Winner and Hetland (2001) carried out a meta-analysis of the relevant literature and concluded that three areas of arts participation showed causal links to enhanced academic outcomes: listening to music was found to temporarily improve spatial temporal reasoning, learning to play music was found to improve spatial reasoning, and engaging in classroom drama was found to improve verbal skills.

Catterall et al (1999) investigated the link between engaging in cultural activities and educational performance in a large US-based National Educational Longitudinal Survey. The authors found that engaging in the arts is associated with positive academic developments for children and that the academic advantage accrued by arts-involved children grows over time. Importantly, they found that these advantages are also significant amongst children from low socio-economic backgrounds. Further findings from this work include that students from all socioeconomic backgrounds who report consistently high levels of involvement in instrumental music have greater mathematics proficiency, and that children who reported sustained involvement with theatre and drama were more likely to have high levels of reading proficiency, as well higher levels of motivation.

Specifically in relation to involvement in dance, experimental research carried out by Minton (2002) with high school age students found that those students who were assigned to study dance scored higher than non-dancers on measures of creative thinking. According to Vaghan et al (2011), the learning outcomes that have been put forward in the literature through which engagement in cultural activities is believed to impact upon educational attainment are the following: resilience, self-regulation, self-identity; self-esteem, academic self-concept (that is, self-efficacy and motivation) (Oreck, Baum & McCartney, 1999; Catterall et al. 1999; Deasy, 2001; Hunter, 2005; Bamford, 2006).

Prior research suggests that people who play sports as teenagers have higher educational aspirations and are more likely to go onto further/higher education. Rees & Sabia (2010) show that youth who play sports in high school are more likely to have strong aspirations to attend college. Troutman & Dufur (2007) show that women who play sport in high school have higher odds of completing college. In a longitudinal study of more than 1,000 US youth, Peck et al (2008) show that educationally vulnerable youth (identified as vulnerable according to their academic motivation, achievement, and mental health as well as family, school, and peer contexts) who were highly involved in sports, as well as other school and community-based activities, were more than three times more likely to go onto college than those who were not highly involved. Notably those who were highly involved in sports only and not also other activities were not more likely to go onto further/higher education, suggesting sports may need to be combined with other activities to have a benefit in this domain.

There is evidence to suggest that sports participation also positively influences educational performance. Trudeau and Shepard (2008), for example, reviewed quasi-experimental and longitudinal work on the relationship between physical activity and educational performance in school children and found evidence for a positive relationship between physical activity and intellectual performance. Taras (2005) reviewed the existing literature relating to sports participation and student performance at school and found some evidence to suggest that there may be some short-term improvements in some behaviours related to educational performance from engaging in physical activity, such as improved concentration.

Castelli et al. (2007) looked at cross-sectional data relating to 3<sup>rd</sup> and 5<sup>th</sup> grade students in the US and found that physical fitness was positively associated with total academic achievement as well as with mathematics achievement and reading ability. From these results the authors suggest that physical fitness may be globally related to academic performance amongst teenagers. Similarly, Ruiz et al (2010) carried out a cross-sectional study of adolescents in Spain and found that participation in sports activities was associated with better verbal, numeric and reasoning abilities.

Though a lack of experimental evidence exists in this area, one study by Coe et al. (2006) randomly assigned 214 sixth-grade students to physical education classes or to arts or computer classes for a school semester. Whilst participation in physical education classes didn't significantly affect children's academic grades or performance on a standardized academic achievement test, the children involved in the study who reported high levels of physical activity (that exceeded recommended guidelines) achieved higher academic grades than did less active children. Based on these results, the author suggests that a threshold level of activity may be required to bring about improved academic achievement.

There is strong evidence relating to adults that suggests that engaging in physical activity can improve neurocognitive performance and memory. Based on a systematic literature review of randomised controlled trials that examined the association between aerobic exercise training on neurocognitive performance among individuals aged 18+, Smith et al (2010) found that undertaking aerobic exercise is associated with modest improvements in attention and processing speed, executive function and memory. Similarly, Hopkins et al. (2012) carried out a RCT to investigate the relationship between memory and physical exercise. They found that the experimental group assigned to exercise for a month and to exercise on the day of retesting significantly improved their test scores from their baseline scores relative to those who exercised for a month but did not exercise on the day of testing, those who only exercised on the day of testing and those who were sedentary between test days. Finally, Colcombe et al (2003) found that physical activity has robust but selective benefits for cognition in older adults.

There is also evidence to suggest that participating in sport may impact positively on school engagement. Harrison and Narayan (2009), for example, found that participation in physical activity was positively associated with students completing their homework and attending class. Similarly, Collingwood et al's (2000) investigation of the impact of a 12-week youth physical training course showed that the participants reported significant decreases in poor school attendance upon completion of the programme.

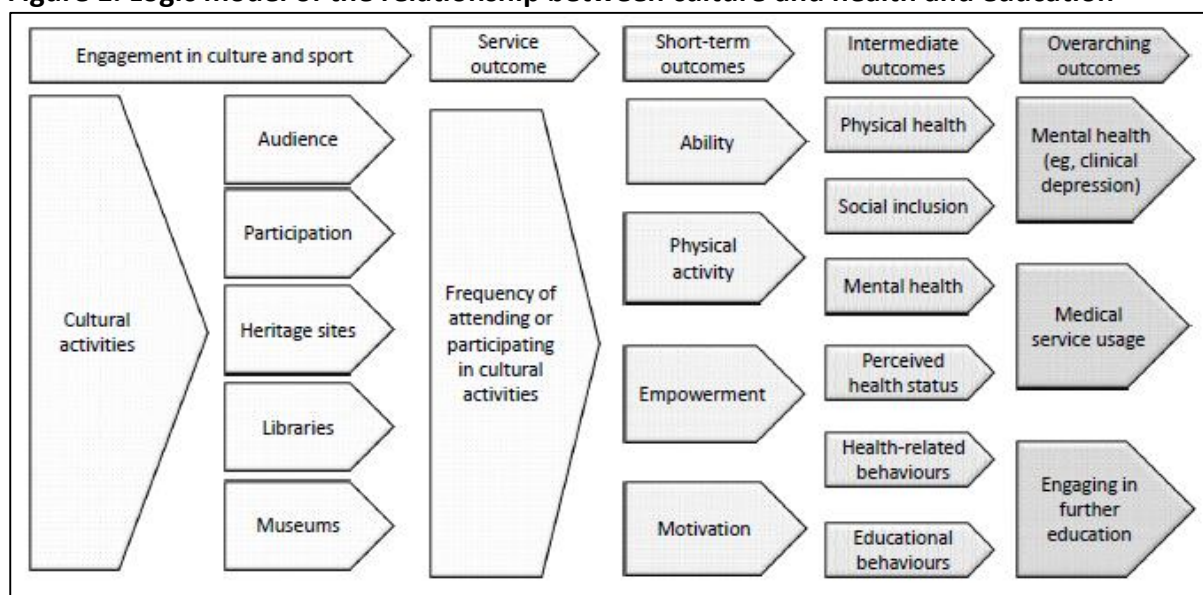
## **A.2. Logic model**

A logic model was developed based on this literature review that links culture and sport to health and educational outcomes (see Figures 1 and 2). This model is a visual systematic representation of the relationship between culture and sport on the one hand and health and education on the other. In general, the literature review suggested that there were positive impacts on the overarching outcomes: reduced medical service usage, improved mental health, and better educational performance and we have described some of the intermediary factors that may mediate the link between sport/culture and the overarching

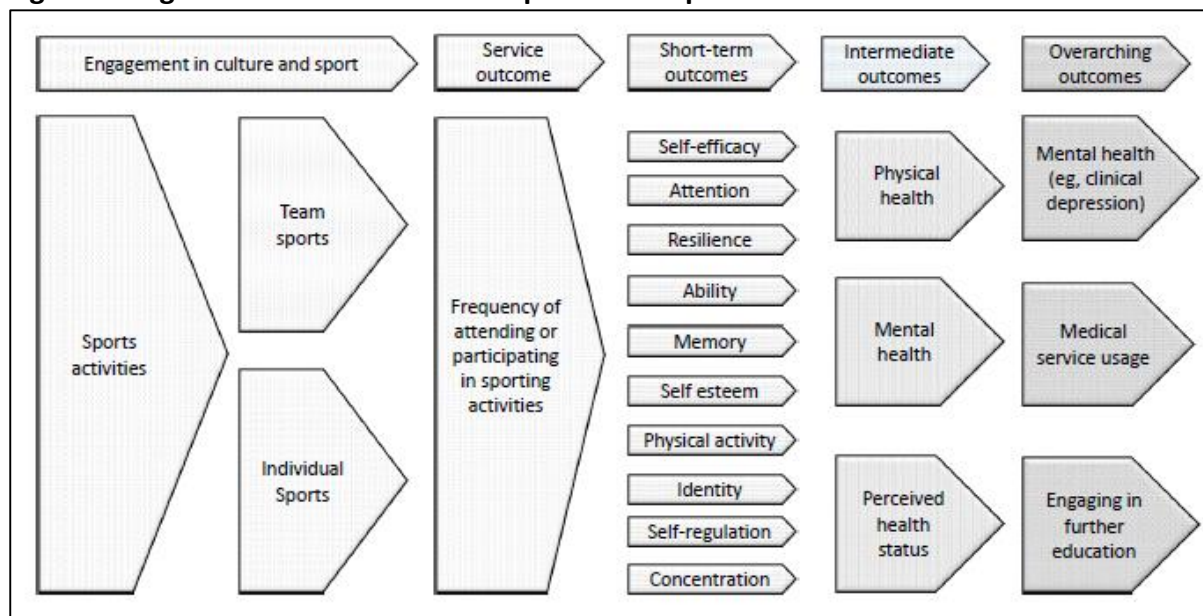
outcomes. But we note that the literature review was less clear about whether engagement in each type of cultural and sporting activity led to *all* of the short-term, intermediate, or overarching outcomes, or about whether a direct relationship between engagement in culture and sport and the overarching outcomes might exist. For example, participating in a cultural activity may be linked to improved mental health via physical activity, but being an audience member might not be.

Any one of the short-term outcomes could lead to the intermediate outcomes and some may impact directly on to the overarching outcomes themselves. There was quantitative and/or qualitative evidence for a link between engagement in culture and sport and each of the short-term and intermediate outcomes. Also note that the process underlying the hypothesized relationship from culture/sport to the overarching outcomes is likely to be different for different people (eg, sport may lead to higher resilience for some people, whilst it may lead to better memory and self-esteem for others, which might both lead to higher educational attainment) – the logic model simply depicts the possible channels through which sport and culture may or have been found to impact on the overarching health and education outcomes. Note that this logic model is derived to explain health and education outcomes *only*. There are other important outcomes related to cultural and sport engagement, like charitable giving and pro-social behaviour, which are not included here for the purposes of exposition; the logic model pertains to the issues of this particular study only.

**Figure 1. Logic model of the relationship between culture and health and education**



**Figure 2: Logic model of the relationship between sport and health and education**





## Annex B: Methodology

### B.1. Statistical methods

The methodological approach develops closely from our previous report Fujiwara et al. (2014a) '*Quantifying the Social Impacts of Culture and Sport*'. Fujiwara et al. (2014a) used the Understanding Society dataset to estimate the impact of engagement in culture and sport on four important social outcomes:

- i. Health.
- ii. Education.
- iii. Employment and economic productivity.
- iv. Civic participation.

The present study looks in more detail at the relationship with health and education of nine cultural and sports activities:

#### Arts & culture activities

- Participation or audience to any art form
- Audience to the arts
- Participation in the arts
- Heritage visits
- Library visits
- Museum visits

#### Sports activities

- Participation in any sport (team or individual sports)
- Participation in team sports
- Participation in individual sports

We use Wave 2 of Understanding Society and run a number of regression models to look at the relationship between engagement in culture and sport and the two outcome domains of interest (health and education) as follows:

$$D_i = \alpha + \beta_1 Q_i + \beta_2 X_i + \varepsilon_i \quad (1)$$

where  $D_i$  is the domain of interest (health, education) for individual  $i$ ;  $Q_i$  is a vector of culture and sports engagement variables and  $X_i$  are other determinants of  $D_i$ .

The general strategy used in this paper has been to control for as many of the determinants of a given outcome as possible using regression analysis in order to get a better understanding of cause and effect relationships. We also note that the sports and cultural engagement variables in the Understanding Society dataset ( $Q_i$  in equation (1)) represent whether individual  $i$  has partaken in any of these activities in the past 12 months, whereas

the health and education variables ( $D_i$  in equation (1)) refer to the time when the survey was administered. This provides some lag in the time between the sport/cultural activity and the health and education outcome which helps to rule out reverse causation (although it cannot help to rule out bias from confounding factors). Multiple regression analysis of this sort is one of the optimal statistical strategies for identifying causal relationships in instances like this where interventions have not been randomised and this type (or similar types) of analysis have been used extensively in the health economics and policy evaluation literature. Hence we believe that the results presented in this paper are informative for policy-making purposes. This statistical methodology is in line with the approach and methods used in the original CASE report (Matrix, 2010) and the methodology and evidence used in high-profile publications in this area, such as the Surgeon General's (1996) report on the effects of physical activity on health, which relied mainly on non-experimental longitudinal and cross-sectional evidence.

We note that any bias that may impact on our estimates of causality is likely to be *positive*. Casual estimates may become biased if there are confounding factors that we cannot control for that drive engagement in culture/sport *and* that *also* impact on the outcome of interest (ie, health and education). If any such factors exist we believe that they are likely to be positive influences - ie, that they are factors that both make it more likely that some people engage in culture/sport and that make them healthy anyway (eg, this could be due to that person's upbringing). In such a circumstance some of the observed positive relationship between engagement in culture/sport and the outcome of interest (health) would be due to that person's upbringing and not wholly due to the act of engaging in culture/sport. **We, therefore, recommend that the predicted impact and value estimates derived in this report be interpreted and used as upper-bound estimates of the impact of culture and sport on health and education.**

Model (1) allows us to assess the relationship between engagement in culture and sport and health and education outcomes. We will then attach values to these estimated relationships using a range of best-practice methods. A fundamental simplifying assumption applied throughout the analysis is that the relationships estimated in Model (1) (ie, between engagement in culture/sport and health and education outcomes) based on the 2010 wave of Understanding Society stay constant over time so that we can attach to them latest cost savings estimates from different time periods (but note that the time periods will be close).

The methodological approach is broadly similar to that used in the CASE programme report (Matrix, 2010), which looked at the impacts of engagement in sport on reductions in health costs and improvements in Quality Adjust Life Years (QALYs). The differences are that we look at a different set of health outcomes and we look at the impacts on educational attainment as well. Furthermore, we look at impacts on these outcomes for culture as well as sport engagement. As in the CASE report (Matrix, 2010) for health impacts we look at NHS cost reductions and the value of improvements in QALYs. We value education outcomes through increases in lifetime earnings and government income tax receipts, as is standard in education policy evaluation (OECD, 2013).

### B.1.1. Health

We look at the relationship between engagement in culture and sport and:

- i. **Frequency of GP visits (through improved general health)**
- ii. **Mental health care service usage - usage of psychotherapy and psychiatric services (through improved general health)**
- iii. **Clinical depression**

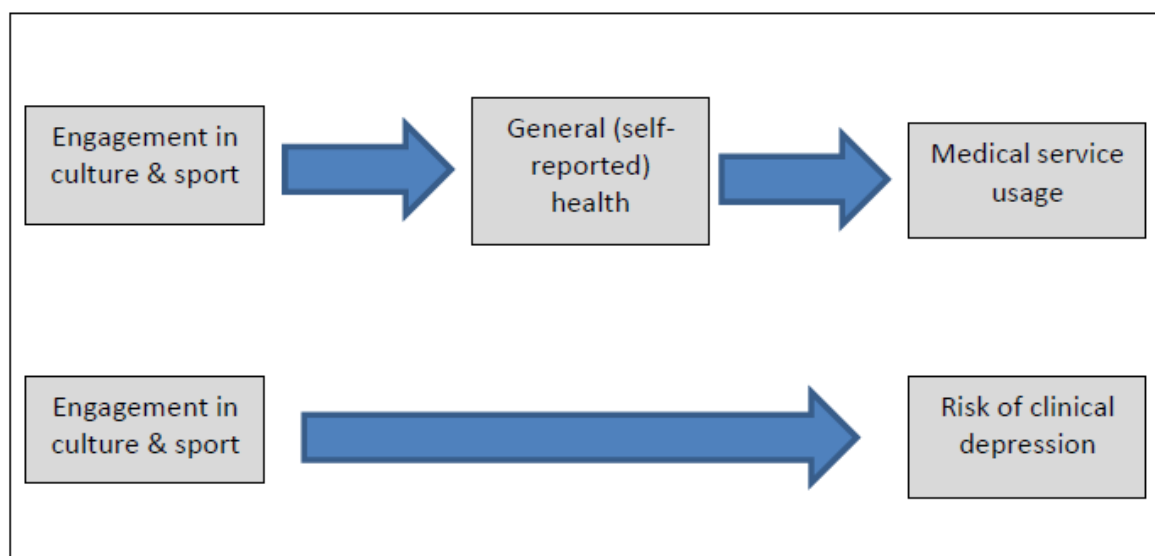
Values are derived by estimating the NHS cost savings associated with reductions in GP visits and reductions in mental health care service usage. We apply a value to the impact on clinical depression by estimating the monetary value associated with an improvement in an individual's Quality Adjusted Life Years (QALYs).

We use equation (1) to look at the direct impact of culture and sport on depression (depression is entered as  $D_i$  in equation (1)). Understanding Society does not contain data on medical service visits/usage. Therefore, for service usage we employ a more indirect route whereby we use equation (1) to assess the impact of culture and sport on general health and then in turn use the British Household Panel Survey (BHPS) to assess the impact of changes in general health on medical service usage:

$$MS_i = \alpha + \beta_3 D_i + \beta_4 X(MS)_i + \varepsilon_i \quad (2)$$

Where  $MS_i$  is medical service usage for individual  $i$  (ie, GP visits or psychotherapy);  $D_i$  is the health domain (general health) and  $X(MS)_i$  are other determinants of  $MS_i$ . The product of the partial derivatives from (1) and (2) (ie,  $\beta_1 \cdot \beta_3$ ) represents the (indirect) effect of culture and sport on medical service usage (ref to similar studies). Again we assume that the relationships estimated in equation (2) (between medical service usage and general health) stay constant over time so that we can attach latest cost savings estimates to them. Figure 3 sets out the statistical approach to estimating health impacts.

**Figure 3. The process of estimating the health impacts of culture and sport**



*Note: Arrows depict causal relationships that we approximate through regression analysis. The caveats regarding problems associated with causal inference in regression analysis should be noted when interpreting this figure.*

### **Valuing predicted reductions in medical service usage**

We apply average NHS cost estimates for GP visits and psychotherapy to the product term ( $\beta_1 \cdot \beta_3$ ) from equations (1) and (2). This derives an estimate of the expected NHS cost savings<sup>5</sup>. Since this looks at two different types of medical service usage the values can be added.

### **Valuing predicted reduced risk of clinical depression**

$\beta_1$  from equation (1) represents the effect of engagement in culture and sport on probability of being diagnosed with clinical depression (when  $D_i$  = depression). We derive QALY estimates associated with depression and apply the standard NICE guidelines for valuing QALYs in order to derive a value for the reduction in depression. This replicates the methodology used in the CASE report (Matrix, 2010) to attach QALY values to chronic heart disease, stroke, diabetes and colon cancer.

### **Interpreting valuations**

NHS related values (cost savings) for medical service usage are often referred to as financial or cashable savings since they have direct implications for NHS or health resources. The value of a QALY has a different interpretation.

The QALY for depression represents the (UK population average) estimate of the health related quality of life associated with depression. The QALY is based on a scale of 0 (for death) to 1 (for full health) and therefore depression will have a QALY score <1. The QALY score is based on the general population's preferences over different health conditions, measured in the UK using the time trade-off (TTO) method which asks respondents to consider how many years of life in full health are equivalent to a longer time in a poor health state. An example of a TTO question would ask people to imagine living as a blind person for say, ten years and then to estimate the shorter amount of time in full health that they would value equally.<sup>6</sup> The shorter the length of time in full health that people would be prepared to trade-off the more severe or undesirable the health condition. The National Institute for Care and Health Excellence (NICE) asks for values to be elicited from the general public in the form of hypothetical preferences, as opposed to individuals who have experienced specific health states. Using the preferences of the general public is broadly consistent with an insurance principle, whereby the ex-ante preferences of those who might be affected by a condition in the future are given weight in allocating resources.

NICE provides guidelines on the value of a QALY. Currently NICE generally accepts "as cost effective those interventions with an incremental cost-effectiveness ratio of less than £20,000 per QALY and that there should be increasingly strong reasons for accepting as cost effective interventions with an incremental cost-effectiveness ratio of over £30,000 per

<sup>5</sup> Using cross product terms to estimate indirect effects or effect pathways are common in the Path Analysis and Simultaneous Equation Modelling literatures (eg, MacKinnon et al., 2002; Kline, ref; Carey, 1998).

<sup>6</sup> Devlin et al (2011)

QALY.”<sup>7</sup> In other words, although treatments are assessed on a case-by-case basis, treatments costing more than £20,000-£30,000 per QALY are generally not considered cost effective. NICE is currently undertaking a consultation on the QALY cost-effectiveness threshold, but in the mean time we will use a value of £20,000 per QALY in this study, which represents a conservative value estimate.

The QALY values used by NICE are, therefore, not cashable savings in the same way that costs associated with reductions in medical service usage are. Rather, they represent the amount that the NHS is generally willing to pay for an improvement in QALYs for its patients. QALY values are based on the general population’s perceptions concerning different health states, and the amount of money that the NHS decides it is willing to spend to improve QALYs. In sum, although cost-per-QALY thresholds represent the amount of money that the NHS *would be prepared to pay*, they may not necessarily translate into costs that the NHS manages to save.

Medical cost savings (ie, cashable savings) are used regularly in cost-benefit calculations. QALY values are used mainly in health related cost-effectiveness analyses, but monetary values can be attached to them so that they can be used in cost-benefit analysis too. The CASE report (Matrix, 2010) adds these values together under the title of ‘total economic value of health gains’. For the above reasons, however, we report them separately in this study.

To estimate QALY values requires knowledge of the health condition or the TTO tariffs for different health states. Therefore, in this study we can only look at the QALY value for depression since it is the only area where a specific health condition is assessed. In other words, we cannot derive QALY values for improvements in general health since we cannot relate this to improvements in QALYs without being more specific.

### B.1.2. Education

We look at the relationship between engagement in culture and sport and participation in further education (FE)/higher education (HE) and derive values for this by estimating the increases in life time earnings and income tax that are due to higher education.

Again this requires an indirect method. We are interested in whether engagement in culture and sport early on leads to participation in FE/HE later. Fujiwara et al. (2014a) estimate the impact of engagement in culture and sport on people’s self-reported likelihood of going on to FE/HE using Understanding Society:

$$EI_i = \alpha + \beta_5 Q_i + \beta_6 X(EI)_i + \varepsilon_i \quad (3)$$

where  $EI_i$  is the self-reported education intention to go on to FE/HE education (college or university) for individual  $i$ ;  $Q_i$  is a vector of culture and sports engagement variables and  $X(EI)_i$  are other determinants of  $EI_i$ .  $\beta_5$  is an estimate of the impact of culture and sports

<sup>7</sup> <http://www.nice.org.uk/niceMedia/pdf/GuidelinesManualChapter8.pdf>

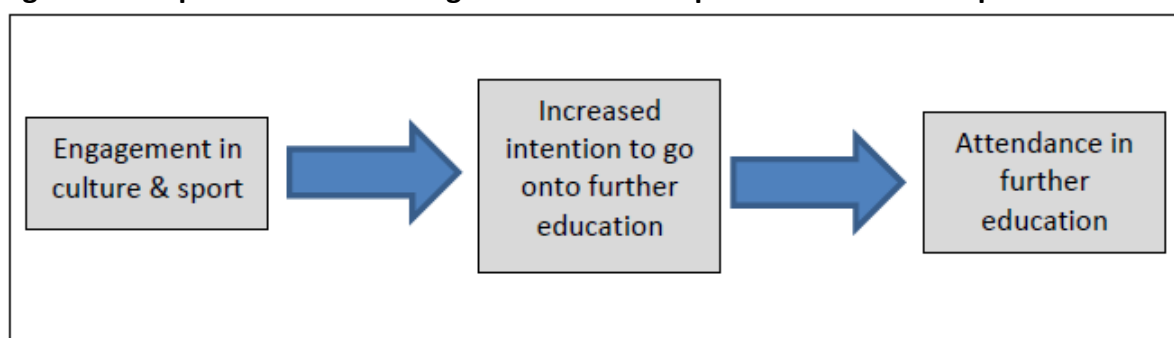
engagement on self-reported likelihood of going on to FE/HE. We look at college and university (ie, FE and HE) since this is how the question is worded in Understanding Society.

Using the longitudinal nature of the BHPS we can assess whether education intention affects education behaviour in later years. We, thus, use the BHPS to subsequently assess the relationship between education intention and behaviour:

$$E_{it} = \alpha + \beta_7 EI_{it-1} + \beta_8 X(S)_i + \varepsilon_i \quad (4)$$

where  $E_{it}$  is whether individual  $i$  is in fulltime education at time  $t$ ;  $EI_{it-1}$  is the self-reported education intention in the previous year and  $X(E)_i$  is a set of other determinants of  $E_i$ .  $\beta_7$  is an estimate of the impact that education intention has on likelihood of actually going onto full time education. The estimate can be used with  $\beta_5$  from equation (3) to derive the effect of culture and sports on education behaviour in later years (estimated as  $(\beta_5 \cdot \beta_7)$ ). Again we assume that the relationships estimated in equations (3) and (4) stay constant over time so that we can attach latest value estimates to them. Figure 4 sets out the statistical approach for estimating education impacts.

**Figure 4. The process of estimating the education impacts of culture and sport**



*Note: Arrows depict causal relationships that we approximate through regression analysis. The caveats regarding problems associated with causal inference in regression analysis should be noted when interpreting this figure.*

### Valuing education impacts

We attach values to the effects of culture and sports on education behaviour in later years (estimated as  $(\beta_5 \cdot \beta_7)$  from equations (3) and (4)) by applying estimates of increased life time earnings and government tax receipts (through increased income tax revenues) to the estimate  $(\beta_5 \cdot \beta_7)$ . This represents the economic value of higher education to both the individual (higher salary) and the public sector (higher tax receipts)<sup>8</sup>.

### B.2. Data

In this study, we use two UK datasets. Data on arts and sport engagement come from Wave 2 of *Understanding Society* (2010-2011), which is a nationally representative sample of 40,000 households conducted annually in a panel format. Wave 2 of *Understanding Society* includes for the first time a wide range of variables related to engagement in arts and sport,

<sup>8</sup> Using cross product terms to estimate indirect effects or effect pathways are common in the Path Analysis and Simultaneous Equation Modelling literatures (eg, MacKinnon et al., 2002; Kline, 1998; Carey, 1998).

taken from the DCMS *Taking Part* survey. Hence we will use Wave 2 as a cross-sectional dataset in the analysis.

The analyses on medical service usage and education behaviour is based on data from the *BHPS*. The *BHPS* is a nationally representative sample of over 10,000 adult individuals conducted between September and December of each year from 1991. Respondents are interviewed in successive waves, and all adult members of a household are interviewed. In 2009 the *BHPS* sample was merged into the Understanding Society sample. Therefore, the two datasets include a large number of the same individuals and are both representative of the UK and hence we use the data sets in conjunction with each other here. Table 4 sets out descriptions of the variables shown in the results tables. Due to the large number of models and variables we only show the variables of interest to this study in the results section (and hence only show a description of these variables here). The models include (control for) many more variables (which are not key to the results here), the descriptions of which can be obtained on request from the authors together with the full model outputs if required.

**Table 4. Variable descriptions**

Variable	Description
<b>Culture and sports</b>	
<i>All arts</i>	1 = participated in / audience member to any of the arts categories below (in the past 12 months); 0 = otherwise
<i>Audience arts</i>	1 = went to film, exhibition, music, play or dance in past 12 months; 0 = otherwise
<i>Participation arts</i>	1 = participated in dance, drama, music, art, craft, or literature in past 12 months; 0 = otherwise
<i>All sports</i>	1 = participated in any of the sports below (in past 12 months) ; 0 = otherwise
<i>Team sports</i>	1 = participated in football, rugby, water sports, basketball, netball, volleyball, cricket, hockey, or baseball, softball or rounders in past 12 months; 0 = otherwise
<i>Individual sports</i>	1 = participated in health, fitness, gym or conditioning; gymnastics; swimming or diving; cycling, BMX or mountain biking, track and field athletics, jogging, cross-country, or road running, hill trekking, backpacking, climbing or mountaineering, golf, boxing, racquet sports, skiing, martial arts, or horse riding in past 12 months; 0 = otherwise
<i>Heritage (how many times visited heritage in the last 12 months)</i>	1 = Once in past year, 2 = Twice in past year, 3 = At least 3/4 times/year, 4 = longer than weekly but at least monthly, 5 = at least once a week; 0 = otherwise
<i>Libraries (how many times they visited libraries in the last 12 months)</i>	1=Once in past year, 2=Twice in past year, 3=At least 3/4 times/year, 4 = longer than weekly but at least monthly, 5=at least once a week; 0 = otherwise
<i>Museums (how many times they visited museums in the last 12 months)</i>	1=Once in past year, 2=Twice in past year, 3=At least 3/4 times/year, 4 = longer than weekly but at least monthly, 5=at least once a week; 0 = otherwise
<b>Other variables</b>	
<i>self reported general health/good_health</i>	1 = very good or excellent; 0 = good, fair, or poor
<i>GP visits</i>	1 = 6+ visits in the past year; 0 = otherwise

**Further analysis to value the health and educational benefits of sport and culture**

<i>psychotherapy</i>	1=been to psychotherapy/psychiatry; 0=otherwise
<i>clinical depression</i>	1=Yes, 0=No
<i>employed</i>	1 = employed; 0 =otherwise
<i>smoker</i>	1=current smoker; 0=otherwise
<i>London</i>	1 = lives in London; 0 = otherwise
<i>Wales</i>	1 = lives in Wales; 0 = otherwise
<i>Scotland</i>	1 = lives in Scotland; 0 = otherwise
<i>N Ireland</i>	1 = lives in N. Ireland; 0 = otherwise
<i>NE</i>	1 = lives in North East; 0 = otherwise
<i>NW</i>	1 = lives in North West; 0 = otherwise
<i>York_hmb</i>	1 = lives in Yorkshire & Humberside; 0 = otherwise
<i>E_mid</i>	1 = lives in East Midlands; 0 = otherwise
<i>W_mid</i>	1 = lives in West Midlands; 0 = otherwise
<i>E_Eng</i>	1 = lives in East England; 0 = otherwise
<i>SE</i>	1 = lives in South East; 0 = otherwise
<i>SW</i>	1= lives in South West; 0 = otherwise
<i>married</i>	1 = married; 0 =otherwise
<i>log (income)</i>	Log of equivalised household income
<i>male</i>	1 = male; 0 = female
<i>nchild</i>	Number of children
<i>age</i>	age of individual
<i>degree</i>	1=has a degree; 0=otherwise
<i>house owned</i>	1 = if owns home; 0 = otherwise
<i>student</i>	1 = full time student; 0=otherwise
<i>good GCSE</i>	Number of GCSEs Grade A-C
<i>social housing</i>	1=in social housing; 0=otherwise
<i>low confidence</i>	1 = feels rather more/much more confident than usual; 0 = otherwise
<i>white</i>	1=white ethnicity; 0=otherwise
<i>industry</i>	1=professional/managerial job; 0=otherwise
<i>talk_neigh</i>	1=talk on most days; 0=otherwise
<i>meet_neigh</i>	1=on most days; 0=otherwise
<i>alcohol_drugs</i>	1= alcohol/drug related health problems; 0 = otherwise
<i>health_insurance</i>	1 = private health insurance; 0=otherwise
<i>debt_burden</i>	1 = somewhat/heavy burden; 0=otherwise
<i>internet</i>	1 = connected to internet; 0=not connected
<i>foreign_born</i>	1 = born outside UK; 0= otherwise



## Annex C: Results

### C.1. General Health

#### C.1.1. General health, sport and culture

In the health domain, we look at the relationship with self-reported general health. Self-reported health is measured on a scale of 1 ('very poor') to 5 ('excellent') and we form a binary variable that takes on 1 if self-reported health = 4 or 5, and 0 otherwise. This is run using a logit model and the marginal percentage effects are calculated at the sample mean value for the other covariates. Based on the literature review (as set out in Fujiwara et al., (2014a)) we control for age, education household income, gender, employment status, marital status, fruit and vegetables consumption, smoker, alcohol consumption, social relations, housing and region. Table 5 shows results for the culture and sports variables that are significant at the 5% level. We present the coefficient sizes, standard errors, sample sizes and R-Squared values for each model.

The results relating to culture in Table 5 are supported by Cuypers et al. (2012) who found that engaging in receptive cultural activities was associated with a 3% and 9% increase in the likelihood of reporting good health by women and men respectively. Leadbetter & O'Connor also found significant positive associations between specific cultural activities and self-reported health, though their findings suggest an even greater likelihood of reporting good health having visited a library or a museum in the past 12 months. The results relating to sports participation are similar to those found by Leadbetter & O'Connor which suggest that having participated in sport in the last four weeks was associated with being twice as likely to report good health.

**Table 5. Relationship between sport and culture and good general health <sup>9</sup>**

Variables	Coefficient	Probability impact	S.E.	Sample size	R-Squared
<b>Sports</b>					
<i>All sports</i>	0.574***	14.10%	0.042	14710	0.085
<i>Team sports</i>	0.304***	7.60%	0.049	14710	0.086
<i>Individual sports</i>	0.521***	12.90%	0.041	14710	0.086
<b>Culture</b>					
<i>Audience arts</i>	0.219***	5.40%	0.047	14710	0.087
<i>Heritage</i>	0.11***	2.76%	0.01	25,893	0.065
<i>Library</i>	0.05***	1.12%	0.01	25,894	0.062
<i>Museum</i>	0.08***	2.01%	0.01	25,896	0.063

Notes: Logit model. Probability = increase in likelihood of reporting good health. \*\*\* 1% significance level, \*\* 5% significance level. Insignificant sports and culture variables are not included in the table. S.E. = Standard errors. R-Squared = Psuedo R-Squared. Probability impacts calculated at the sample mean values of the other covariates. Sport and culture variables are not included together due to problems of multicollinearity. We run 6 models in total: in addition to the control variables Model (1) includes all arts and all sports. Model (2) includes all types of art, team sports, individual sports. Model (3) includes all sports, all types of arts audience, all types of arts participation. Model (4) includes all sports and heritage visits. Model (5) includes all sports and library visits. Model (6) includes all sports and museum visits.

### C.1.2. Medical service usage and general health

Data on GP visits and use of psychotherapy services are not available in Understanding Society, but are available in the BHPS, which is the precursor to Understanding society and also is a representative sample of the UK. A literature review was conducted showing that the following factors are controls for medical service usage:

Age, Area Deprivation, Education, Employment status, Income, Disability or longstanding illness, Smoker, Ethnicity, No. of children, Social class, Geographical region, Social relations, Loneliness, Exercise patterns, Marital status, Parents' health behaviours or mental health history\*, Friends' health behaviours\*, Housing tenure, GHQ, Fruit and vegetable consumption, Alcohol consumption, Recent bereavement\*, UK born/Non-UK born, Health insurance, Internet access, Amount of free time/leisure time.

Not all of these variables were available in the BHPS dataset and those that were available were not necessarily present in all waves of the data for analysis to be conducted. We

<sup>9</sup> In all of the regression results tables **coefficients** indicate a positive or negative relationship with the outcome variable in question. The size of the coefficient represents the impact in absolute terms. The **standard error** is a measure of the precision of the coefficient estimate. **Statistical significance** uses information on the standard error to assess whether the observed association between the variable of interest and the outcome variable (as demonstrated by the size of the coefficient) is not just purely down to chance. The significance test assesses the likelihood of observing the reported relationship between the two variables if no relationship actually existed (known as the null hypothesis). The lower the probability, the more confident we are that a relationship actually exists. In the results tables we show when a coefficient has a probability of less than 1%, 5% and 10% of being observed if there were actually no relationship between the variables.

sought the best strategy to maximise the number of waves (and hence sample size) whilst controlling for as many of the variables as possible in the regression models. Many of the determinant variables are related to socio-economic status, which are captured in our model through household income, employment status, industry sector and a housing tenureship variable. The three variables that could not be included are highlighted with an asterisk. It should be noted that the list of variables above is an exhaustive list of the variables that have been used or proposed before as determinants of medical service usage and that no other quantitative study uses *all* of these variables. In other words, the absence of these variables in this analysis does not weaken the study in a relative sense. The same control variables were used in the GP visits and psychotherapy models. The analysis was conducted using waves M-R (2002-2007).

### C.1.3. GP visits

We run a logit model with the dependent variable defined as six or more GP visits in the previous year, which aligns with the GP visit variable definition used in Fujiwara et al. (2014a).

**Table 6. Impact of health on GP usage**

Dependent Variable: GP visits	Coefficients	S.E.
log income	0.064	0.12
age	0.006	0.01
male	-0.81***	0.13
white	-0.33	0.28
foreign_born	0.698	0.59
nchild	0.073	0.07
married	0.069	0.15
degree	-0.161	0.18
Employed	-0.461**	0.21
Industry	-0.236	0.17
good_health	-2.064***	0.12
talk_neigh	0.183	0.13
meet_people	0.175	0.13
alcohol_drugs	-0.925	1.09
smoker	0.016	0.14
health_insurance	0.061	0.16
debt_burden	0.03	0.13
internet	-0.024	0.16
house_owned	-0.238	0.21
social_housing	0.064	0.27
Wales	0.851*	0.46
Scotland	0.878*	0.45
N_Ireland	0.887*	0.46
NE	0.994*	0.52
NW	0.578	0.48
York_hmb	1.08**	0.5
E_mid	1.33*	0.5

W_mid	0.857***	0.49
E_Eng	0.861*	0.49
SE	0.723	0.47
SW	0.958*	0.51
Constant	-1.35	1.39
N	3,149	
R-squared	0.18	

Notes: \*10% significance \*\*5% significance \*\*\*1% significance. Logit model. Coefficient shows impact on log-odds ratio. S.E. = Standard errors. R-Squared = Psuedo R-Squared.

After controlling for a large range of determinants of medical service usage, people in good health are less likely to visit GPs (6 or more times per year) by 25.4%<sup>10</sup>.

#### C.1.4. Psychotherapy service usage

The BHPS asks whether the respondent has used/visited a psychotherapist (including psychiatrist) over the past year. A logit model was estimated with reported psychotherapy usage as a binary dependent variable.

**Table 7. Impact of health on psychotherapy**

Dependent Variable: Psychotherapy	Coefficient	S.E.
log income	-0.021	0.14
age	0.001	0.01
male	0.175	0.14
white	0.415	0.38
nchild	0.088	0.08
married	-0.188	0.18
foreign_born	0.896	0.66
degree	0.032	0.19
employment	-0.222	0.26
industry	0.02	0.18
good health	-1.06***	0.14
talk neigh	-0.157	0.16
meet people	-0.008	0.15
alcohol drugs	-0.031	1.08
smoker	-0.386***	0.17
health insurance	0.38***	0.16
debt burden	0.046	0.15
internet	-0.242	0.21
house owned	-0.05	0.25
social housing	-0.075	0.34
Wales	0.209	0.45
Scotland	0.206	0.44

<sup>10</sup> This is calculated from the coefficient on 'good\_health' in Table 6 at the sample mean values for the other variables in the regression.

N_Ireland	-0.082	0.46
NE	-0.417	0.59
NW	0.035	0.48
York_hmb	0.616	0.48
E_mid	-0.686	0.62
W_mid	-0.071	0.51
E_Eng	-0.41	0.52
SE	-0.266	0.48
SW	0.317	0.5
Constant	-1.56	1.57
N	3,149	
R-squared	0.05	

Notes: \*10% significance \*\*5% significance \*\*\*1% significance. Logit model.

Coefficient shows impact on log-odds ratio. S.E. = Standard errors. R-Squared = Psuedo R-Squared.

After controlling for a large range of determinants of medical service usage, people in good health are less likely to use psychotherapy services by 8.4% <sup>11</sup>.

### C.1.5 Valuing predicted reductions in medical service usage

#### Unit costs

We use health care costs from data compiled by the Personal Social Services Research Unit (PSSRU) at the University of Kent: “Unit Costs of Health & Social Care 2013” <sup>12</sup>.

We use the unit cost estimate for counselling and psychotherapy (an umbrella term that covers a range of talking therapies) which is £58 per consultation. We assume that people who see therapists see them once every two weeks for the full year. This may be a conservative estimate: long-term psychotherapy on the NHS is 40 sessions per year for one or two years, whilst short-term therapy is 16-20 sessions over 4-6 months (NICE, 2009; White, 2012). The precise number of annual sessions is dependent upon the severity of the condition; this information was not available in the data we analysed.

For GP visits we use the conservative lower bound estimate of £192 per hour (or £3.20 per minute). The average length of a GP surgery consultation is 11.7 minutes which works out to a cost of £37 per GP visit. We assume that those visiting GPs 6 or more times per year visit on average 10 times.

For total annual cost savings to the NHS, we use the most current ONS population estimates available for England, which are from June 2013. We multiple this by the weighted proportion of people engaging in culture and sports in England, which are taken from the most current version of the Taking Part Survey covering 2012/2013. We then multiply this

<sup>11</sup> This is calculated from the coefficient on ‘good\_health’ in Table 7 at the sample mean values for the other variables in the regression.

<sup>12</sup> <file:///D:/Consultancy%20work/Arts/DCMS/DCMS2/Results/Unit%20costs%20health.pdf>

figure by the estimated NHS cost savings per person to generate the total annual cost savings.

**Table 8. Estimated NHS cost savings due to predicted reductions in GP visits**

Variables	Probability impact on likelihood of visiting GP 6+ times	Estimated NHS cost saving per person	Total annual cost savings to the NHS
<b>Sports</b>			
<i>All sports</i>	-3.58%	£13.25	£384,900,412
<i>Team sports</i>	-1.93%	£7.14	£38,340,081
<i>Individual sports</i>	-3.28%	£12.12	£347,048,324
<b>Culture</b>			
<i>Audience arts</i>	-1.37%	£5.07	£168,837,279
<i>Heritage</i>	-0.70%	£2.59	£82,179,668
<i>Library</i>	-0.28%	£1.05	£17,991,968
<i>Museum</i>	-0.51%	£1.89	£44,720,926

Probability impact estimates from product of coefficients on 'good\_health' from Table 7 and culture/sports variables from Table 4.

NHS cost savings represent the predicted annual reduction in costs due to reductions in GP visit frequency per person that partakes in the cultural/sporting activity. For impacts over time they should be discounted using the HM Treasury discount rate.

**Table 9. Estimated NHS cost savings due to predicted reductions in psychotherapy use**

Variables	Probability impact on likelihood of using psychotherapy	Estimated NHS cost saving per person	Total annual cost savings to the NHS
<b>Sports</b>			
<i>All sports</i>	-1.18%	£17.86	£518,816,706
<i>Team sports</i>	-0.64%	£9.63	£51,710,781
<i>Individual sports</i>	-1.08%	£16.34	£467,885,282
<b>Culture</b>			
<i>Audience arts</i>	-0.45%	£6.84	£227,780,471
<i>Heritage</i>	-0.23%	£3.50	£111,053,606
<i>Library</i>	-0.09%	£1.42	£24,331,994
<i>Museum</i>	-0.17%	£2.55	£60,337,758

Notes: Probability impact estimates from product of coefficients on 'good\_health' from Table 7 and culture/sports variables from Table 4.

NHS cost savings represent the predicted annual reduction in costs due to reductions in psychotherapy usage per person that partakes in the cultural/sporting activity. For impacts over time they should be discounted using the HM Treasury discount rate.

Since the analysis looks at two different types of medical service usage the values derived in Tables 8 and 9 can be added together to derive a total NHS cost saving (related to GP and psychotherapy usage) per person. The predicted cost reductions associated with psychotherapy usage are values related to mental health impacts and the predicted costs reductions associated with GP visits can be seen as values related to both mental health and physical health.

## C.2. Clinical depression

### C.2.1. Clinical depression, sport and culture

We use Understanding Society to estimate the relationship between with clinical depression for the nine culture and sports variables. Control variables (determined from a literature review) are age, gender, employment status, marital status, education, household income, occupational class (NSSEC), long term physical illness or disability, smoker, lives alone, region, consumption of fruits and vegetables, alcohol consumption, social relations, home ownership. Table 10 shows results for the culture and sports variables that are significant at the 5% level. We present the coefficient sizes, standard errors, sample sizes and R-Squared values for each model.

**Table 10. Relationship between sport participation and clinical depression**

Variables	Coefficient	Probability impact	S.E. of Coefficient	Sample size	R-Squared
<b>Sports</b>					
All sports	-0.60***	-0.54%	0.25	15,587	0.091
Individual sports	-0.53***	-0.46%	0.16	15,587	0.089

Notes: \*\*\* 1% significance; \*\* 5% significance. Logit model. S.E. = Standard errors. R-Squared = Psuedo R-Squared. Sport and culture variables are not included together due to problems of multicollinearity. We run 6 models in total: in addition to the control variables Model (1) includes all arts and all sports. Model (2) includes all types of art, team sports, individual sports. Model (3) includes all sports, all types of arts audience, all types of arts participation. Model (4) includes all sports and heritage visits. Model (5) includes all sports and library visits. Model (6) includes all sports and museum visits. Coefficient shows impact on log-odds ratio. Log-odds ratios have been converted to probability impacts in column 3 at the sample mean values for all other variables.

After controlling for a large range of determinants of depression, people who play sport are less likely to have depression. Similar to the results shown in Table 10, Goodwin (2003) also found a negative association between participation in sport and probability of suffering from depression. Her findings which are based on an adult US population suggest that amongst those who regularly participate in sports there is a decreased prevalence of major depression. We note that although cultural engagement was found to be positively associated with general health, we do not find any relationship for culture with clinical depression.

## C.2.2. Valuing predicted reductions in risk of depression

We derive a monetary value for predicted reductions in clinical depression by using QALY scores in an approach that replicates the CASE (Matrix, 2010) research that looked at impacts on QALY scores for physical health improvements due to sport.

Guidance from the National Institute for Health and Care Excellence (NICE)<sup>13</sup> and from decision-analysis papers (eg, Simons et al. (2006)) on QALY scores for depression use the following QALY figures from Revicki and Wood (1998):

- Severe depression: 0.30
- Moderate depression: 0.63

As a conservative estimate (note the discussion concerning the potential for over-stating estimates in section B.1.) we use the QALY score for moderate depression (0.63) from Revicki and Wood (1998). Given that Understanding Society is an annual survey we assume that the impact estimates in Table 10 represent the impact of all sports and individual sports on the likelihood of having depression in that year. We assume a QALY loss for clinical depression of 0.37 (estimated as a move from full health<sup>14</sup> (1.0) to moderate depression (0.63)). Using the results from Table 10, the expected QALY improvement over a year (due to reduction in likelihood of depression) is 0.002 ( $0.37 \times 0.0054$ ) for all sports and 0.0017 ( $0.37 \times 0.0046$ ) for individual sports. As discussed above in line with current NICE guidelines we use a conservative QALY value of £20,000.

The total annual NHS cost savings are calculated as described previously for medical service usage, using ONS population estimates and 2012/2013 Taking Part information on the proportion of the adult population engaging in sport.

**Table 11. Annual QALY value due to predicted reduction in risk of depression**

Variables	QALY improvement	Value	Total annual QALY value
<b>Sports</b>			
All sports	0.002	£39.96	£1,160,801,543
Individual sports	0.0017	£34.04	£974,713,280

Notes: Estimated using QALY = £20,000.

These figures represent the predicted annual QALY value due to a reduction in risk of depression per person that partakes in the sporting activity. For impacts over time they should be discounted using the HM Treasury discount rate.

<sup>13</sup> <http://www.nice.org.uk/nicemedia/pdf/cg023fullguideline.pdf>

<sup>14</sup> Note that this is a simplifying assumption due to lack of information on what the QALY score is for the non-depression health state in Table 8. The reference case health state is unlikely to be perfect health and so this simplifying assumption leads to a likely overstatement in the QALY impact of sport and culture, hence providing further rationale for the conservative QALY value for depression.



### C.3. Education

#### C.3.1. Education, sport and culture

We look at the likelihood of 16-18 year olds stating that they will go on to further education (university or college-level) and this information is then used to predict actual attendance in higher education. Education likelihood is reported on a five-point scale. We drop the response 'depends' (only 1% of the sample) and create a dummy variable for the likelihood of entering further education that = 1 if respondent says 'very likely' and 0 = otherwise. The model is run using a logit model and the marginal percentage effects are calculated at the sample mean value for the other covariates. Based on the literature reviews (discussed in Fujiwara et al., 2014a) we control for household income, previous education, gender, age and region.

Since we are only looking at a narrow age bracket in this analysis sample sizes fell to under 900, but this was still sufficient to detect some significant effects. Table 12 shows results for the culture and sports variables that are significant at the 5% level. We present the coefficient sizes, standard errors, sample sizes and R-Squared values for each model.

These results are supported by findings from Noble & Davies (2009) which suggest that participation in cultural activities is positively associated with their self-reported intentions to participate in higher education.

**Table 12: Relationship between cultural engagement and education intention**

Variables	Coefficient	Probability impact	S.E. of coefficient	Sample size	R-Squared
<b>Culture</b>					
Participation arts	0.655***	14.10%	0.229	847	0.025
Heritage	0.704***	14.60%	0.02	2,581	0.106
Library	0.427***	9.40%	0.03	2,582	0.091

Notes: Logit model. \*\*\* 1% significance level, \*\* 5% significance level. S.E. = Standard errors. R-Squared = Psuedo R-Squared. We run 6 models in total: in addition to the control variables Model (1) includes all arts and all sports. Model (2) includes all types of art, team sports, individual sports. Model (3) includes all sports, all types of arts audience, all types of arts participation. Model (4) includes all sports and heritage visits. Model (5) includes all sports and library visits. Model (6) includes all sports and museum visits. Coefficient shows impact on log-odds ratio. Log-odds ratios have been converted to probability impacts in column 3 at the sample mean values for all other variables.

After controlling for a range of determinants of education behaviour participating in arts generally and visiting heritage and libraries are found to be positively associated with reporting being likely to go onto further education. We have discussed issues regarding causality in this paper, but we should make a special mention here that the issue of causal inference is likely to be especially problematic for libraries. The estimated relationship between libraries and FE/HE is likely to show to some extent at least an underlying motivation for educational attainment (which we cannot control for in the analysis) and so concerns regarding over-estimation are especially pertinent for the libraries estimate in Table 12.

In order to make a prediction of this impact on lifetime earnings we assess the extent to which self-reported likelihood of entering further education predicts actual education attendance. We do not base our value estimates on just the increase in intention since intention has been shown to be a poor predictor of behaviour in numerous contexts (Webb and Sheeran, 2006). This is possible using the BHPS since we have longitudinal data on individuals and we have the same variable for education intention (the variable *FEDLIK*) and we can observe whether students who report being likely to go into further education actually do so in later years after controlling for other factors that determine participation in higher education. We run this analysis on the last seven years of the BHPS data since the variable *FEDLIK* is available in those waves. We assess whether reporting being 'very likely' to go onto further education in the previous year predicts being a current full time student now.

**Table 13: Effect of reported intention on probability of being full time student**

Dependent Variable: Full time student	Coefficients	St. Error
lagged 'very likely' to go on to further education	0.464*	0.281
male	0.281	0.273
age	-0.288	0.283
good GCSE grades	-0.05	0.456
lagged social Housing	-0.265	0.464
lagged low confidence	0.103	0.48
constant	6.134	4.82
N	438	
R-Sq	0.013	

Notes: \*10% significance \*\*5% significance \*\*\*1% significance. Logit model. Sample = 17-18 year olds.

After controlling for a range of determinants of educational behaviour, self-reported likelihood of going onto further education (in the previous period) is significantly associated with a small *increased* likelihood of being a full time student but only at the 10% level of significance. In probability terms this is equivalent to a 7% increase - it states that people who report being 'very likely' to go on to further/higher education are 7% more likely to be a full time student in the following year compared to those that do not (report being 'very likely' to go on to further/higher education). This seems like a low association but the result is in line with previous studies that have looked at intentions and behaviour in other domains (Webb and Sheeran 2006). Due to the small sample size we accept this level of significance here.

### C.3.2. Valuing education impacts

The results from Tables 12 and 13 can be used to project the effect of engagement in culture on higher education attendance. This is estimated using the cross-products of the probability estimates from Tables 12 and 13. For example, participation in arts leads to a 14.1% higher likelihood of reporting being 'very likely' to go on to further/higher education and in turn, reporting being 'very likely' to go on to further/higher education leads to a 7% increase in actual attendance likelihood. We can thus project that participation in arts leads to a 0.99% ( $0.141 \times 0.07$ ) increase in the likelihood of *attending* full time education.

**Table 14. Relationship between cultural engagement and educational attendance**

Variables	Probability impact on education intention	Probability impact on education behaviour
<b>Culture</b>		
<i>Participation arts</i>	14.10%	0.99%
<i>Heritage</i>	14.60%	1.02%
<i>Library</i>	9.40%	0.66%

For the purposes of valuation it is assumed that everyone that is currently enrolled as a full time student goes onto complete their education/course. The estimated impacts on education are valued using the OECD (2013) estimates for tertiary education, which includes higher education as well as community colleges, training institutes, technical colleges and distance learning establishments. This broader definition of education fits more closely with the variable definition for FE/HE used in the BHPS and Understanding Society than other UK studies by the Department for Business Innovation and Skills (BIS)<sup>15</sup>, which focuses on university-level education.

The OECD (2013) estimates the private and public benefits of increased educational attainment at the tertiary level. The private net gross lifetime earnings benefits for UK men are estimated to be \$398,500 (£254,900) and for UK women to be \$355,500 (£227,400)<sup>16</sup>. The public net lifetime benefits are made up of increased income tax receipts and social contributions. These are £85,600 (UK male) and £74,600 (UK female). These are net present value estimates from which costs associated with education have been subtracted. Private costs include foregone earnings, cost of studying (minus any grants) and increased future taxes<sup>17</sup>. Public costs are public expenditure on education establishments, grants allocated and lost tax receipts during the training period. The baseline or reference level of education is upper secondary or post-secondary non-tertiary education. We take the average of the male and female private and public benefit estimates.

**Table 15. Projected private and public benefits of increased educational attendance**

Variables	Net private benefits per person	Net public benefits per person	Total net benefits per person
<b>Culture</b>			
<i>Participation arts</i>	£2,380.15	£790.59	£3,170.74
<i>Heritage</i>	£2,464.55	£818.62	£3,283.18
<i>Library</i>	£1,586.77	£527.06	£2,113.83

Notes: Benefit estimates are in 2009 prices and should be uprated to year of interest. Benefits are calculated per person.

<sup>15</sup> "The Impact of University degrees on the lifecycle of earnings: Some Further Analysis".

<https://www.gov.uk/government/publications/university-degrees-impact-on-lifecycle-of-earnings>

<sup>16</sup> Converted in to GBP at the 2009 12-month average exchange rate (£1 = \$1.5633. Source: <http://www.hmrc.gov.uk/exrate/exchangerates-0910.pdf>) (OECD figures are based on 2009 data).

<sup>17</sup> The assumptions made in the calculations are that foregone earnings would be at the minimum wage, that earnings during training are zero and that lifetime earnings are taken as the midpoint at each age group.

Total net benefits represent the projected per person net benefit for the individual and for society of the increased likelihood of FE/HE attendance (due to the cultural activity). They represent the full lifetime impacts and are discounted to present value terms.

## **Annex D: Further research**

The statistical approach used in this study mirrors much of the research in health economics and uses some of the best possible methods for non-experimental data. Our results are generally supported by the previous empirical literature in these fields and many of the findings in this paper are supported by the small but growing number of experimental studies in this area of the health literature. Going forward, research in this area should aim to more conclusively address the issue of causality. Longitudinal data (either from subsequent waves of Understanding Society or from the new element of the Taking Part survey) are useful as we can control for some unobservable factors (those factors that do not change over time) through use of fixed effects regression analysis. Longitudinal data should not be seen as a panacea for the question of causality, however, because they cannot solve for the effect of unobservable factors that are not constant over time (such as people's preferences), which means that we still may not be able to attribute causality fully.

In order to conclusively address the issue of causality, further work using experimental methods - whereby engagement in culture and sport is randomly assigned or randomly encouraged – is recommended.

## Annex E: References

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