On the Relationship between Lifestyle and Happiness in the UK

Adelina Gschwandtner
University of Kent

Sarah L. Jewell
University of Reading

Uma Kambhampati
University of Reading

Contributed Paper prepared for presentation at the 89th Annual Conference of the Agricultural Economics Society, University of Warwick, England
13 - 15 April 2015

On the Relationship between Lifestyle and Happiness in the UK

Adelina Gschwandtner, Sarah L. Jewell** and Uma Kambhampati****

Abstract

In the present paper we attempt to analyse the relationship between 'lifestyle' and happiness in the UK using an instrumental variable approach. Our lifestyle variables have a significantly positive impact on happiness and the impact increases with the use of instruments. This suggests that a 'healthy lifestyle' has a positive impact on happiness and that any policy improving our lifestyle proxies would also make people happier in the UK.

Keywords: Wellbeing, Life Satisfaction, Happiness, Nutrition, Exercise, Lifestyle, Instrumental Variables

JEL Classifications: D31, I31

Acknowledgements:
***Adelina Gschwandtner,** *University of Kent, E-Mail: a.gschwandtner@kent.ac.uk (corresponding author)*
****Sarah Louise Jewell,** *University of Reading, E-Mail: s.l.jewell@reading.ac.uk*
*****Uma S. Kambhampati,** *University of Reading, E-Mail: u.s.kambhampati@reading.ac.uk*

1. Introduction

Diet and life style diseases are known to have developed to the main causes of ill health and death worldwide. Not only in the US but also in Europe the increased consumption of meat, dairy products, oil and fat, sugar, and alcoholic beverages during the second half of the 20th century, correlated with drug abuse, tobacco and lack of exercise have increased the risk of developing certain degenerative diseases like some types of cancer, chronic liver disease, chronic obstructive pulmonary disease, diabetes, heart disease, stroke and obesity. While in 1900 the top three causes of death in the United States were pneumonia, tuberculosis, and diarrhoea, since the 1940s, the majority of deaths in the United States have resulted from heart disease, cancer, and other degenerative diseases. And, by the late 1990s, degenerative diseases accounted for more than 60 percent of all deaths (National Office of Vital Statistics). The picture in the UK is not very different. While recently cancer and heart disease were the most common causes of death in 1900 such diseases were rare, or undetected only 10% of the population were recorded as killed by cancer or circulatory problems (ONS Annual Abstract of Statistics). In particular obesity seems to be a main developing problem that causes illness, death and increasing costs for the health system. Scarborough et al (2011) have estimated the poor diet-related ill health cost the NHS in 2006-2007 to 5.8 billion British Pound (or 7.3 billion Euro). Moreover, these were the largest cost among diet-related, physical inactivity, smoking, alcohol and obesity costs. They have estimated these costs using disability adjusted life years attributable to cardio-vascular diseases (CDV) and cancer caused by poor diet. Among the chronic diseases CDV and cancer seem to be most prevalent and poor diet seems to be the major determinant at least in terms of costs. Additionally, the National Audit Office (NAO) estimated that population meeting national nutritional guidelines would provide health benefits of 19.9 British Pound each year in quality adjusted life years (Office 2008). Nevertheless, it has been argued that the new lifestyle may be unhealthy and lead to illnesses and death but may yet be a rational choice. According to the *theory of rational addiction* an increased consumption in the addictive good in the past raises the marginal utility of current consumption (Becker and Murphy 1988, Becker et al.1991). Therefore, the negative health effect might be compensated through a positive marginal utility effect at least in the short run. While the effect of a poor nutrient may be negative on physical health it may be positive on mental health at least in the short run.[1]

In the present paper we would like to analyse in more depth the relationship between lifestyle (including nutrition and exercise) and life satisfaction in the UK.[2] We aim to do this both in a simple and in a two stage approach using instrumental variables. Through this analysis we hope to gain insight

[1] Chocolate may be such a nutrient that makes happy in the short run but may lead to obesity in the long run. There is a plethora of studies showing the negative impact of obesity on well-being.

[2] Even though the notions ‚wellbeing', ‚happiness'and ‚life satisfaction'are not identical, because they are highly correlated we use them interchangeably as most of the literature does. For example using the Euro-Barometer surveys conducted across 12 European countries, a significant correlation of 0.56 was found between happiness and life satisfaction (Di Tella; MacCulloch; Oswald, 2001).

which is valuable both from psychological view but also from an economic point of view. If we shall find a positive correlation between healthy lifestyle and happiness then any efforts invested in a healthy lifestyle will not only help to save a large amount from the surging health care cost but also make people happier.As with a number of other life satisfaction related studies, our analysis too is affected by endogeneity. In particular, the potential positive relationship between lifestyle and happiness may be driven by a third variable like for example income/wealth. Wealthier people can afford better nutrients and sporting facilities, are on average healthier because they can afford a better health care and are in general also happier. The relation between income/wealth and happiness is not linear; as we know from the Easterlin Paradox (Easterlin 1974) above a specific level of income, happiness does not increase directly proportional to income anymore, but it is in general positive. Another such unobserved variable may be the marital status. Married people may be both happier and more conscious with respect to their lifestyle especially if they have children. The relationship may not necessarily be between life style and happiness but between the two of them and a third unobserved variable (ie income or marital status).[3] This was highlighted by Welsch (2012) who showed that the relationship between organic food and health 'may be spurious due to common unobserved factors, in particular a health oriented lifestyle'. To correct for this endogeneity, Welsch proxied the 'health oriented lifestyle' by a variable related to the degree of agreement to the assertion that a consistent switch to renewable energies is needed. When introduced in the regression this instrument produced an insignificant impact of organic food on health. The author concluded that 'consumers of organic food may have a healthier lifestyle overall which, being unobserved, leads to a positive but spurious relationship between organic food and health status'. At the same time happy people may make healthier lifestyle decisions and therefore, we may be faced with endogeneity caused by reversed causality. Graham, Eggers and Sukhtankar (2004) for example have shown for Russia from 1995-2000 a significant causation from happiness to health and they conclude that happier people may also take better care of their health and could therefore have a healthier lifestyle.

In this paper, we attempt to correct for endogeneity using an instrumental variable approach. To our knowledge this is the first paper that analysis the relationship between lifestyle and happiness in the UK. By this we think that we make a significant contribution not only to the literature of wellbeing and life satisfaction but also hope to bring further the political health care cost-debate in the UK on this front.

The paper is structured as follows. In section two we develop the theoretical basis for our paper. In section three we describe the data we use. In section four we present the empirical strategy together

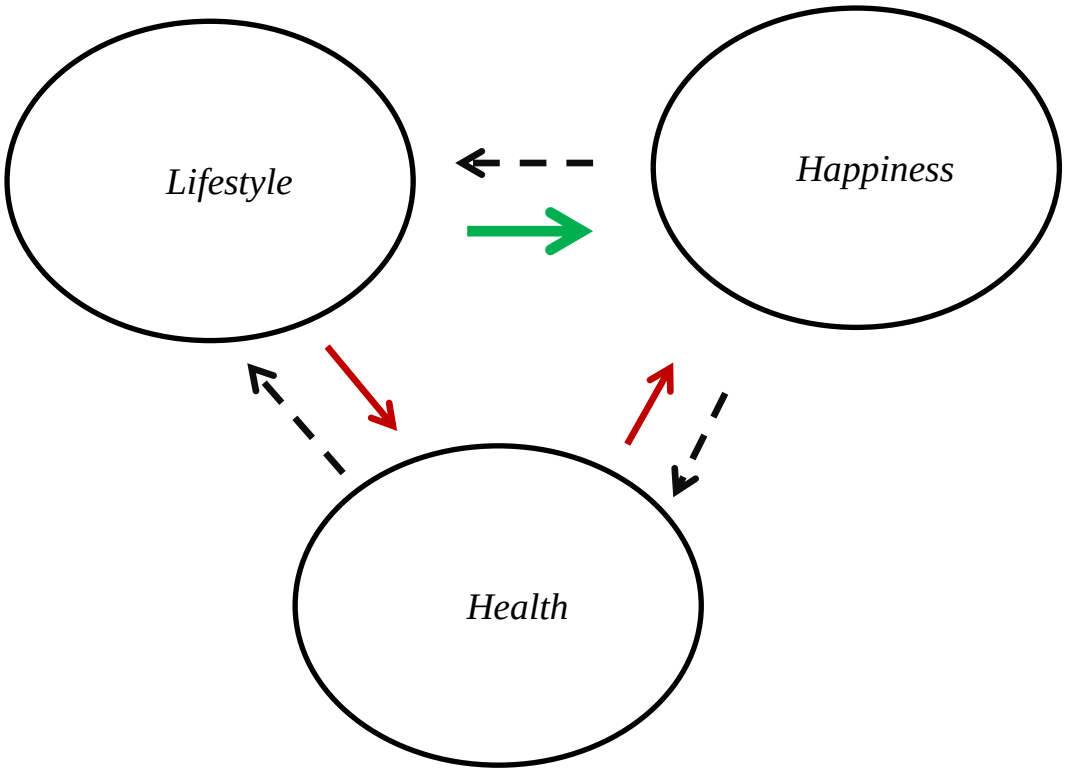
[3] In our study we control for both marital status and income.

with the empirical results. Finally, we conclude, deriving potential policy implications and ideas for future work.

2. Theoretical Background

The relationship between life-style and happiness can be summarized by the following graph:

Figure 1. Lifestyle, Happiness and Health



We are mainly interested to describe the impact of lifestyle on happiness via health. People that have a healthier lifestyle (eat more conscientiously, exercise more…) are assumed in general to be healthier and a better health is assumed to be reflected in a higher well-being/happiness. However, we do acknowledge that a better lifestyle can impact directly on happiness, without necessarily taking the way through a better health. For example people that exercise more produce endorphins and these impacts directly and immediately on their feeling of happiness even if the exercise they do may damage their health. Good examples for this may be extreme sports like skiing or dangerous sports like boxing. Even excessive jogging on a hard ground may damage the joints but usually makes people more balanced and happy in the short run. The same is true for eating. Eating healthy food may impact positively on health in the long run but may also have a short run direct impact on happiness. For example organic products, that are perceived to be healthier, are also perceived to have in general a better taste. Therefore, a better nutrition may have a direct short run impact on happiness independently of the long run effect on health

and its impact on happiness. Of course that all these effects can be also reversed. People that are happier may make better life-style decisions and are usually found also to be in better health. We try to test for this reversed causality and try to find the stronger direction of causation. At the same time, while we are using the classical Grossman health production model, that analyses the impact of various lifestyle decisions on well-being through health, as a theoretical basis, we do not exclude that direct effects from lifestyle on wellbeing exist. The model that we are using is rooted in household theory of health production (Grossman 1972a, Grossman 1972b) and follows closely the one of Chen et al. (2002). Even though we cannot use health in our empirical analysis because it is difficult (if not impossible) to disentangle health from happiness in survey data. Does health involve only physical health? Clearly, not. However, if we include psychological and emotional health, then these are very close in definition to happiness. In addition, there is also an endogeneity that is inherent in these definitions. Thus, happiness will influence physical health as also emotional and psychological health. Therefore, instaed of using health in this paper, we use healthy lifestyle which is like to be reflected in a better health and therefore, we can use Grossman's model as a theoretical basis.

Consumers maximise utility derived from hers Health state (H), her Leisure (L) and some other goods called Z.

$$U = U(H,L, Z) \qquad (1)$$

The health function *H* depends on:

1. **Nutrients**[4] $N_1 \ldots N_k$
2. Φ = a vector of exogenous observable personal and environmental attributes (like gender, education…)
3. μ = a vector of unobservables like genetic ability and health endowment.
4. E = **Exercise time**

Therefore, the health function is given by:

$$H = H(\boldsymbol{N_1, N_2, N_3 \ldots\ldots, N_k, E, \Phi, \mu}) \qquad (2)$$

Consumers maximise utility (1) subject to a budget constraint:

$$V + W(T\text{-}L\text{-}E) = \Sigma P_i N_i + P_z N_z \qquad (3)$$

[4] Even if in our case we have just one nutrient variable called ‚Fruits and Vegetables' the variable usually summarize more than just one nutrient. As can be seen from descriptive statistics, the typical person consumes on average 3 but typically more such nutrients each day.

V = non-labour income[5]

W = market wage depending on the working time which is what is left from total time *(T)* after allocating time to Leisure *(L)* and Exercise *(E).*

From this we can derive reduced-form demand functions for the inputs, characteristics and commodities

$$Q^* = Q^*(P_1, P_2, \ldots\ldots, P_k, P_z, V, W, T, \Phi, \mu) \qquad (4)$$

And a reduced form health-function

$$H^* = H^*(P_1, P_2, \ldots\ldots, P_k, P_z, V, W, T, \Phi, \mu) \qquad (5)$$

[6]

Where $Q^*=\{N_i^*, E^*, Z^*, L^*\}$ is the set of utility-maximising demands for nutrients, exercise, the composite good Z, and leisure.

Equation (5) says that the individual chooses his health state, conditional on the prices of nutrients, wages, income, and exogenous tastes and endowments. These factors work their way through to her health through their impact upon the consumption decisions she makes about health inputs. Health states are endogenous.

The effect for example upon observed health H* of a change in the shadow price P_j can be calculated as follows:

$$dH^*/dP_j = \Sigma(dH/dN_i)(dN_i/dP_j) + (dH/dE)(dE/dP_j) \qquad (6)$$

Which means that the change dH^* in optimal health induced by a change in the price of the input depends upon the relative magnitude of changes in the consumption of all inputs dN_i/dP_j, dE/dP_j and the effect of these consumption changes upon health dH/dN_i, dH/dE,.Our empirical specifications are going to be based on these expressions since we are using nutrition and exercise as proxies for lifestyle.

All the models developed in the recent literature are based on Grossman's (1972) model of health viewed as a capital stock that produces an output of healthy time. Health, in this model is viewed as a form of human capital. However, health capital differs from other forms of human capital by the fact

[5] As typically done in the literature we summarize non-labour income and market wage under the variable 'household income' since this typically includes both.

[6] We do not have prices for nutrietns but we could construct average price indexes for fruits and vegetables a la Mazzocchi et al. (2014).

that while the stock of knowledge affects the market and nonmarket productivity of an individual, the stock of health determines the total amount of *time* s/he spends producing money earnings and commodities and also the productivity of the individual while they are working. An increase in the stock of health reduces the time lost from sick days and the monetary value of this reduction is an index of the return to an investment in health. Therefore, Grossman's model is a pure investment model of health to show that people who earn more are healthier that does not take into account the endogeneity issue. But all other models that have been developed afterwards and attempt to account for endogeneity are rooted in this model and this is the reason why we are using it also here as a theoretical basis.

3. Data and Methodology

We make use of the UK Understanding Society Data. The understanding society data follows a sample of 40,000 UK households over time and began in 2009 as a successor to the UK BHPS longitudinal survey. The survey currently has four waves. We specifically use the sample of individuals who fully respond (provide a full interview and self-completion form) to the wave 2 and provide answers to all the questions we make use of which gives us a sample of about 14,000 men and 18, 000 women. We predominately make use of wave 2 where the questions about nutrition and exercise are asked, along with other health related behaviours such as smoking and alcohol frequency.

As mentioned above, we will analyse the impact of a healthy lifestyle on life satisfaction. Given the endogeneity in this relationship, we will instrument for healthy lifestyle using a number of proxies. In this section, we will discuss the variables that are available in the dataset and also the way in which we model them.

Lifestyle related behaviours

In wave 2 individuals are asked on how many days per week they eat fruit and how many days per week they eat vegetables, and then on the days they eat fruit/vegetables how many portions they eat. We multiplied the number of days they eat fruit/vegetables by the portions they eat per day and then divided by 7 to get a measure of the average portions of fruit and vegetables per day they eat across a week. Individuals were also asked about the type of bread and milk they eat per day but we decided not to use these variables as not all individuals consume bread and milk, potentially due to allergies.

A number of questions are asked in wave 2 in relation to how active an individual is including questions on: type of mild and moderate intensive activities and how often they participate in mild/moderate intensity sport activities; how often they walk 30 minutes or more; and a

ranking on how active they are. We decided to use the sports activity variable since it gives a proxy to how active they were overall. Individuals were asked to rank their sports activity on a scale of 0 to 10 (with 0 no sport and 10 very active).

In wave 2 we have quite a bit of information about smoking such as whether they smoke, how many cigarettes they smoke and whether they smoked in the past.

Life Satisfaction

Life satisfaction is measured asking 'How satisfied or dissatisfied are you with your life overall?' Answers are provided along a seven point scale with 1 being not satisfied at all and 7 being completely satisfied.

Demographic Variables

In all waves various demographic variables are collected. We include age (divided into age groups of 16-24, 25-34, 35-49, 50-65 and 65+), marital status (whether married, cohabiting or not living with a spouse/partner), number of children responsible (split into those 0-3 and those 4-15), highest qualification, ethnicity (grouped into White, Black, Asian, other/mixed), employment status, log of monthly household income (adjusted for household size, with adults weighted as 1 and children 0.5).

We did have personality related variables as agreeability, conscientiousness, extraversion, neuroticism (see for example MCrae and Costa, 1999 for more about the five factor model) but we didn't use them due to their strong endogeneity with happiness.

Proxies and Instruments for Lifestyle

There are a number of potential variables available related to lifestyle however, we decided that nutrition and exercise are both main determinants and have reasonable data information. We have chosen the average number of fruits and vegetables consumed per week as information for nutritional behaviour and participation in sport activities for exercise. Unfortunately, we couldn't choose the type of bread or milk consumed for nutrition due to potential allergies of consumers. We chose the number of fruits and vegetables because even if consumers would be allergic to fruits (fructose), they will still be able to consume vegetables. We than chose the intensity of sports activity described above in order to measure

the level of exercise people perform. Ideally, we would have wanted to use also other variables like the number of hours the person watches television, or green activity behaviour like recycling products or taking own bags for shopping. Unfortunately, we couldn't use these variables either due to their strong endogeneity with happiness or due to incomplete data. Therefore, we decided to stay with fruits and vegetables and sports activity as proxies for lifestyle.

Therefore, in a first step we perform a simple OLS with life satisfaction as a function of various explanatory variables plus our two life style proxies: exercise and portions of fruits and vegetables eaten per day for nutrition:

$$LS = a + b_1x_1 + b_2x_2 + b_3x_3 + \ldots . \mathbf{b_{n-1}\ exercise + b_n\ fruit\ and\ veg} + \varepsilon \qquad (1)$$

Where $x_1, x_2, x_3 \ldots$ are typical variables usually found to influence life satisfaction such as age, marital status, number of children, education, income, job status, exercise and fruit and veg are our variables of main interest and ε is an error term with the usual properties zero mean and constant variance. Results are presented in Table 2 in the results section.

As discussed in the introduction, we need to instrument these two variables. For sports activity we used the access to sport facilities as an instrument because even though people could engage in sporting activities without using a sport facility (like jogging), the probability is higher that they will do so if they have a sports centre nearby. In wave 2 individuals are asked the ease of access to sporting facilities on a 6 point scale from 1 very difficult to 6 very easy. It is reasonable to assume that access to sporting facilities may be positively correlated with exercise but not positively correlated with life satisfaction.

As a proxy for healthy nutrition we have used the variable 'smoked at 16 and still smokes' because it is a proxy for time preference. Those who smoked as a teenager and are still smoking eat fewest portions of fruits and vegetables. Past work in other areas of economics has used smoking as a teenager as a proxy for time preference which in the present setting seems useful as one would expect those who care less about the future are less likely to care for healthy nutrition. It is assumed people who started smoking when they were teenagers and have not given up have a lower time preference. Smoking has been used as an instrument for the returns to education for example (Dickinson, 2013).

The two stage approach can formally summarized as follows:

$$1)\ Exercise = f(all\ explanatory\ variables + \mathbf{Instrument}) \qquad (2)$$

*2) Life Satisfaction=f (**predicted Exercise** + all explanatory variables)* *(3)*

Results are presented in Table 3 in the results section.

4. Descriptive Statistics

Table 1 presents descriptive statistics for our sample for men and women separately. We have a sample consisting of 31,946 observations from which 18,006 are women and 13,940 are men. Therefore, approximatively 56% of our subjects are women. We can observe that our life satisfaction variable has an average value of 5.21 (on a scale from 1 to 7) for both men and women and that it does not differ significantly between men and women. Other studies on welfare have found similar results but have shown that the determinants and what the construct of life satisfaction is, differs by gender (Della Giusta, Jewell and Kambhampati, 2011).

Men seem to engage significantly more in sports activity than women while the percentage of women eating 5 portions of fruits and vegetables per day is significantly higher than for men. The frequency of moderate sports activity seems to be higher for women then for men but the difference doesn't seem to be significant. It seems to be that women do make sports at least as much as men but their sport activity is rather moderate as opposed to men.

Most of our subjects are mature (age groups 35-49 and 50-64) and more than 50% of men and women in our sample belong to these two age groups.

Most people in our sample are married and most of them have A-levels (high school) or a higher level of education such as foundation. There seem to be significantly more men with A-levels and with a degree level than women in our sample. This seems to reflect the fact that our sample spans several generations.

Most people are of white ethnicity and the largest minority is Asian but with a very low percentage (9%men and 8% women). When looking at the number of children we are referring to the age of the youngest child (if the individual states they have a child in the household) with men less likely to report they are responsible for a child.

More men are fulltime (FT) employed than women and the difference seems to be significant while significantly more women are part time (PT) employed than men. The percentage of unemployed men is almost double to the one of women and the percentage of women with family care responsibilities is 12 times higher than the one of men. Women seem to take significantly more of the unpaid burden of family care on their shoulders than men.

Most of our subjects seem to come from London and from the South East of Britain and there seems to be no household income between the two genders.

With respect to the occupation of parents we used parent's occupation instead of father's occupation at age 14 as most studies do and included an indicator of whether subjects were in a single parent family. There were only a few cases of a single father so we combined them with single mother. The variable reflecting parent's occupation is the parent's occupation in the case of a single parent family and the occupation of the parent with the highest occupation in the case of two parent families. The highest percentage is for the occupation category 'skilled traders' since 21% of the parents seem to have this occupation. It is worth noting that the percentage of single parents is quite high in our sample (between 10-11%) and according to the Office of National Statistics (ONS) UK Families and Household report 2012 increasing over the last 16 years: 'There were nearly 2.0 million lone parents with dependent children in the UK in 2012, a figure which has grown steadily but significantly from 1.6 million in 1996'. Moreover, 'In 2012, women accounted for 91 per cent of lone parents with dependent children and men the remaining 9 per cent. These percentages have changed little since 1996. Women are more likely to take the main caring responsibilities for any children when relationships break down, and therefore become lone parents.' This is not only worrying from a gender equality point of view but also because single parents seem to have a lower level of education and higher level of unemployment than cohabitating couples with children. Britain seems to have the fourth largest number of single parents in the EU (Policy Exchange Report 2014).

Looking now at the instruments we can observe that the access to sports facilities seems to be higher for men than for women and this may explain part of the differences in the sports activity between the two genders. Moderate sports activities like jogging can be performed outside a sports facility, however a more intense sports activity may need a sports centre. If women have less access to sports facilities this may be the reason why they engage more in moderate sport activities than men. [7] Both the percentages of people who smoked at 16 and are still smoking or have given up are significantly higher for men than for women. This is probably related to the fact that more men were smoking at at 16 than women.

Table 1. Descriptive Statistics

	Male (obs = 13,940)				Female (obs = 18,006)			
Variable	Mean	Std. Dev	Min	Max	Mean	Std. Dev	Min	Max
Life satisfaction	5.21	1.45	1	7	5.21	1.51	1	7

[7] A question that may be asked– is whether this choice is also endogenous? I.e. do men locate themselves close to sports centres because they know they will need them? However, this question relates to all facilities including parks and other facilities.

Sports activity	3.86	3.06	0	10	3.02	2.74	0	10
Portions of Fruit and Veg	2.81	1.32	1	5	3.13	1.34	1	5
Frequency of moderate sports	4.03	2.34	1	7	4.47	2.35	1	7
Age Group								
16-24	0.11	0.31	0	1	0.11	0.32	0	1
25-34	0.15	0.35	0	1	0.16	0.37	0	1
35-49	0.27	0.45	0	1	0.29	0.45	0	1
50-64	0.26	0.44	0	1	0.25	0.43	0	1
65+	0.21	0.41	0	1	0.19	0.39	0	1
Married	0.58	0.49	0	1	0.51	0.50	0	1
Cohabiting	0.12	0.33	0	1	0.11	0.31	0	1
Education Level								
Degree level	0.25	0.43	0	1	0.22	0.42	0	1
other higher education	0.11	0.31	0	1	0.14	0.35	0	1
A-level	0.23	0.42	0	1	0.17	0.38	0	1
GCSE	0.18	0.38	0	1	0.21	0.41	0	1
other education	0.11	0.31	0	1	0.10	0.30	0	1
No qualifications	0.12	0.33	0	1	0.16	0.36	0	1
Ethnicity								
White	0.85	0.35	0	1	0.85	0.35	0	1
Black	0.03	0.18	0	1	0.04	0.20	0	1
Asian	0.09	0.28	0	1	0.08	0.27	0	1
Mixed/other	0.02	0.15	0	1	0.03	0.16	0	1
Age of the youngest child								
No children under 16	0.75	0.44	0	1	0.68	0.47	0	1
Aged 0-2	0.08	0.28	0	1	0.09	0.29	0	1
Aged 3-4	0.04	0.19	0	1	0.05	0.22	0	1
Aged 5-11	0.09	0.28	0	1	0.11	0.32	0	1
Aged 12-15	0.05	0.21	0	1	0.06	0.24	0	1
FT Employed	0.53	0.50	0	1	0.31	0.46	0	1
PT Employed	0.07	0.25	0	1	0.20	0.40	0	1
Unemployed	0.07	0.25	0	1	0.05	0.21	0	1
Retired	0.23	0.42	0	1	0.23	0.42	0	1
Family care	0.01	0.09	0	1	0.12	0.32	0	1
FT education	0.05	0.23	0	1	0.05	0.23	0	1
Sick/disabled	0.04	0.19	0	1	0.03	0.18	0	1
other	0.00	0.06	0	1	0.00	0.07	0	1
log (household **income**)	7.09	0.76	0	9.90	7.05	0.72	0	9.90
Region								
North East	0.04	0.20	0	1	0.04	0.20	0	1
North West	0.11	0.32	0	1	0.11	0.32	0	1
Yorkshire and Humberside	0.08	0.27	0	1	0.08	0.27	0	1
East Midlamds	0.08	0.28	0	1	0.08	0.27	0	1
West Midlands	0.09	0.28	0	1	0.09	0.28	0	1

East of England	0.10	0.29	0	1	0.09	0.29	0	1
London	0.11	0.32	0	1	0.12	0.32	0	1
South East	0.14	0.34	0	1	0.13	0.34	0	1
South West	0.09	0.28	0	1	0.09	0.28	0	1
Wales	0.05	0.21	0	1	0.05	0.22	0	1
Scotland	0.07	0.25	0	1	0.07	0.26	0	1
Northern Ireland	0.04	0.20	0	1	0.04	0.21	0	1
Parents occupation at age 14								
Not working	0.07	0.26	0	1	0.08	0.28	0	1
Managers	0.13	0.34	0	1	0.13	0.34	0	1
Professional	0.13	0.34	0	1	0.13	0.33	0	1
Associate Professional	0.08	0.27	0	1	0.08	0.27	0	1
Administrative	0.09	0.28	0	1	0.09	0.28	0	1
Skilled trades	0.21	0.41	0	1	0.21	0.41	0	1
Personal Services	0.03	0.18	0	1	0.04	0.19	0	1
Sales and customer services	0.03	0.18	0	1	0.04	0.19	0	1
Process, plant and machinery operative	0.13	0.33	0	1	0.12	0.32	0	1
Elementary	0.08	0.28	0	1	0.08	0.28	0	1
Deceased/..	0.01	0.10	0	1	0.01	0.10	0	1
Single parent family	0.10	0.29	0	1	0.11	0.31	0	1
Instruments								
Ease of access to sporting facilities	4.21	0.94	1	6	4.08	1.04	1	6
Smoked at 16 - still smoke	0.14	0.35	0	1	0.12	0.33	0	1
Smoked at 16 - given up	0.16	0.36	0	1	0.11	0.31	0	1

5. Empirical Strategy and Results

We analyse the relationship between life satisfaction and our lifestyle variables in a two stage approach as described in section 3 above . Table 2 presents the results of a simple OLS regression and Table 3 the results of the IV analysis.

Table 2. Explaining Life Satisfaction (OLS)

	Men	Women
Age group (ref: 25-34)		
Aged 16-24	0.371***	0.304***
	[0.064]	[0.057]
Aged 35-49	-0.06	-0.159***
	[0.045]	[0.040]
Aged 50-64	0.119**	-0.121***
	[0.050]	[0.047]
Aged 65+	0.394***	0.153**

	[0.073]	[0.065]
Marital Status (ref: Not living with a partner)		
Married	0.303***	0.361***
	[0.038]	[0.028]
Cohabiting	0.172***	0.134***
	[0.048]	[0.044]
Highest Qualification (ref: None)		
Degree level	0.014	0.028
	[0.058]	[0.047]
Other higher education	-0.009	-0.054
	[0.061]	[0.049]
A level	-0.052	-0.057
	[0.055]	[0.048]
GCSE	-0.028	-0.055
	[0.057]	[0.045]
Other	-0.047	-0.075
	[0.061]	[0.052]
Ethnicity (ref: white)		
Black	-0.048	-0.087
	[0.090]	[0.074]
Asian	-0.137**	-0.112**
	[0.061]	[0.053]
Other/mixed	-0.149	-0.238***
	[0.117]	[0.080]
Age of Youngest Child in Household (ref: No children under 16 responsible for)		
Aged 0-2	0.145***	0.085*
	[0.051]	[0.050]
Aged 3-4	0.072	-0.103*
	[0.066]	[0.061]
Aged 5-11	-0.049	-0.138***
	[0.054]	[0.046]
Aged 12-15	-0.022	-0.184***
	[0.061]	[0.053]
Job status (ref FT employed)		
PT employed	-0.029	0.092***
	[0.056]	[0.035]
Unemployed	-0.612***	-0.387***
	[0.069]	[0.071]
Retired	0.100*	0.268***
	[0.057]	[0.051]
Family care	-0.468***	-0.04
	[0.178]	[0.047]
FT education	0.228***	0.135**
	[0.074]	[0.064]
Sick/disabled	-1.318***	-1.406***

	[0.085]	[0.085]
Other	-0.149	-0.286
	[0.205]	[0.183]
Log of household income	0.115***	0.115***
	[0.022]	[0.019]
Parent's Occupation Aged 14 (ref: Professional)		
Not working	-0.205***	-0.107*
	[0.070]	[0.060]
Managers and Senior officials	-0.028	-0.043
	[0.046]	[0.041]
Associate Professional and Technical	-0.005	-0.018
	[0.052]	[0.049]
Administrative and Secretarial	0.024	-0.037
	[0.050]	[0.048]
Skilled Trades	-0.019	-0.024
	[0.045]	[0.041]
Personal Service	-0.004	-0.018
	[0.076]	[0.070]
Sales and Customer Service	-0.002	-0.031
	[0.074]	[0.066]
Process, Plant and Machine Operatives	-0.048	-0.017
	[0.054]	[0.049]
Elementary	-0.02	-0.054
	[0.060]	[0.057]
Deceased/Not present	-0.028	-0.042
	[0.156]	[0.130]
Single Parent family	-0.066	**-0.125*** **
	[0.053]	[0.046]
Sport activity	**0.058*** **	**0.052*** **
	[0.005]	[0.005]
Average daily portions of fruit and veg (ref: None)		
1-2 per day	**0.087** **	**0.152*** **
	[0.042]	[0.045]
2-3 per day	**0.156*** **	**0.140*** **
	[0.041]	[0.042]
3-4 per day	**0.193*** **	**0.267*** **
	[0.049]	[0.045]
4-5 per day	**0.204*** **	**0.296*** **
	[0.046]	[0.045]
Days walk 30 mins per week	**0.027*** **	**0.011** **
	[0.005]	[0.005]
Observations	13,954	18,034
R-squared	0.128	0.111

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Includes regional controls

From Table 2 it can be observed that age has the typical U-shaped impact on life-satisfaction. Being young (16-24) has a positive and significant impact on life satisfaction however, being aged 35-49 has a negative impact on life satisfaction for both men and woman but this negative impact is significant only for women. For women, the significant downward dip in middle ages is likely to do with childcare responsibilities and the need to balance career with family responsibilities. After the age of 49 the impact is still negative and significant for women but becomes positive and significant for men. After retirement (65) the impact of age become positive and significant for both men and women but it is significantly higher for men. The relationship between age and happiness is a real puzzle from health perspective. With age the health status of people is supposed to deteriorate and therefore, a lower life satisfaction is expected if a positive relationship between health and life satisfaction is hypothesized. In fact, quite the opposite seems to be the case. People seem to get happier as they get older. This may be considered another potential justification for analysing directly the relationship between lifestyle and life satisfaction without going the way via health.

Being married or cohabitating impacts significantly positively on life satisfaction, with women having a higher coefficient for marrying then man and men having a higher coefficient for cohabitation than women. Therefore, the results may show that women prefer commitment and men prefer the footloose model.

Our results show that higher education does not seem to generate a higher life satisfaction. The relationship between education and life satisfaction is in our study insignificant with some studies even finding a negative one. The conjecture is here that people with higher education levels have higher demands/expectations and compare themselves with peers from higher income levels and therefore, feel less satisfied.

Being of Asian ethnicity impacts significantly negatively the life satisfaction of both men and women. Being of other or mixed ethnicity impacts significantly negatively only the life satisfaction of women. Definitively, having another ethnicity than white impacts negatively on life satisfaction. However, it seems to do so on average more for women than men.

Having babies and little children (<2) impacts positively on the life satisfaction of both men and women but the impact is much higher on men than on women. Starting with the age of 3 the impact of children begins to become negatively significant for women. Maybe because women have to balance the working duties with the caring duties more than men or maybe due to the increasing number of single parents, many of whom are women. The highest negative impact for women seems to be for teenagers. Being responsible for a teenager seems to significantly decrease the life satisfaction of women.

Part time employment impacts significantly positively on the life satisfaction of women and unemployment affects negatively both the life satisfaction of men and of women. Retirement has a significant and positive impact on the life satisfaction of both men and women which fits well together with the positive coefficient of being aged 65 or older. Interestingly, family care impacts significantly negatively only on the life satisfaction of men. Being in full time education impacts significantly positively on the life satisfaction of both men and women while sick or disabled has the opposite effect as expected.

Having a parent who was not working when the individual was young (14 years old) impacts significantly negatively on both men and women. However, the impact on men seems to be significantly higher than for women. This is the only result that is significant with respect to the occupation of the parents. Thus, it does not seem to matter what the parents did, provided they were working.

Being a single parent impacts negatively on both men and women but the impact is much stronger and only significant for women. Probably, because the majority of single parents are women.

Finally, we get to the lifestyle variables: clearly, sports activity impacts positively and significantly on the life satisfaction of both men and women and the result seems to be strongly significant and about equal for both. Engaging in more sporting activity makes both men and women happier. And so does the average number of fruits and vegetables eaten per day. Interestingly, the higher the number of fruits and vegetables eaten per day the higher their positive impact on life satisfaction with the largest coefficient being for 4-5 portions per day. Finally, walking more than half an hour per day impacts significantly positively on both men and women with a higher effect for men than for woman.

Therefore, measured with our life style variables, life style seems to increase the life satisfaction significantly for both men and women. However, it could well be that happier people, that are more satisfied with their lives have a better lifestyle, exercise more and eat more fruits and vegetables. Or, it could be that both happiness and lifestyle are influenced by an unobserved variable that drives both. We have controlled for several such factors like income, job status, children, marriage status etc. but there may still be a variable that we have missed. Therefore, it is crucial to try to account for this. We do so by a two stage instrumental variable approach where in a first stage we look at exercise as a function of various explanatory variables including the instrument and in a second stage we use the predicted value of exercise from stage one to explain life satisfaction together with other variables. The results are presented in Table 3.

Table 3. Instrumental Variable Approach, instrumenting sport activities

	Men			Women		
	Ols - life sat	First stage	IV	Ols - life sat	First stage	IV
Age group (ref: 25-34)						
Aged 16-24	0.367***	0.866***	0.041	0.283***	0.174*	0.206***
	[0.064]	[0.127]	[0.084]	[0.057]	[0.103]	[0.074]
Aged 35-49	-0.044	-1.018***	0.302***	-0.136***	-0.586***	0.100*
	[0.045]	[0.091]	[0.069]	[0.040]	[0.072]	[0.058]
Aged 50-64	0.154***	-1.689***	0.741***	-0.07	-1.029***	0.347***
	[0.049]	[0.096]	[0.093]	[0.047]	[0.084]	[0.077]
Aged 65+	0.439***	-2.334***	1.252***	0.212***	-1.577***	0.849***
	[0.073]	[0.143]	[0.132]	[0.064]	[0.112]	[0.110]
Marital Status (ref: Not living with a partner)						
Married	0.318***	-0.003	0.301***	0.374***	0.036	0.330***
	[0.037]	[0.069]	[0.045]	[0.028]	[0.048]	[0.035]
Cohabiting	0.182***	-0.035	0.185***	0.140***	-0.002	0.134**
	[0.048]	[0.097]	[0.060]	[0.044]	[0.077]	[0.056]
Highest Qualification (ref: None)						
Degree level	0.053	1.094***	-0.394***	0.080*	1.240***	-0.502***
	[0.057]	[0.099]	[0.085]	[0.047]	[0.083]	[0.088]
Other higher education	0.012	0.940***	-0.365***	-0.017	0.915***	-0.448***
	[0.061]	[0.113]	[0.085]	[0.049]	[0.081]	[0.078]
A level	-0.029	0.608***	-0.290***	-0.025	0.895***	-0.447***
	[0.056]	[0.094]	[0.070]	[0.048]	[0.080]	[0.076]
GCSE	-0.011	0.664***	-0.273***	-0.036	0.559***	-0.295***
	[0.058]	[0.096]	[0.073]	[0.045]	[0.071]	[0.061]
Other	-0.036	0.437***	-0.207***	-0.061	0.491***	-0.292***
	[0.061]	[0.101]	[0.072]	[0.052]	[0.080]	[0.066]
Ethnicity (ref: white)						
Black	-0.081	0.487***	-0.254**	-0.118	-0.293**	-0.003
	[0.090]	[0.165]	[0.107]	[0.073]	[0.121]	[0.089]
Asian	-0.160***	-0.136	-0.097	-0.126**	-0.559***	0.107
	[0.061]	[0.105]	[0.072]	[0.053]	[0.090]	[0.070]
Other/mixed	-0.175	0.609***	-0.384***	-0.237***	-0.057	-0.214**
	[0.116]	[0.194]	[0.131]	[0.081]	[0.183]	[0.104]
Age of Youngest Child in Household (ref: No children under 16 responsible for)						
Aged 0-2	0.137***	-0.169	0.222***	0.094*	-0.651***	0.391***
	[0.051]	[0.110]	[0.066]	[0.050]	[0.093]	[0.073]
Aged 3-4	0.049	0.127	0.023	-0.109*	-0.091	-0.051
	[0.066]	[0.138]	[0.082]	[0.061]	[0.112]	[0.078]
Aged 5-11	-0.056	0.308***	-0.153**	-0.135***	0.258***	-0.232***
	[0.054]	[0.104]	[0.065]	[0.046]	[0.081]	[0.058]
Aged 12-15	-0.043	-0.024	-0.03	-0.181***	-0.005	-0.179***
	[0.061]	[0.123]	[0.075]	[0.054]	[0.094]	[0.066]
Job status (ref FT employed)						
PT employed	-0.021	0.174	-0.072	0.099***	0.149**	0.036
	[0.056]	[0.110]	[0.070]	[0.035]	[0.064]	[0.046]

Unemployed	-0.616***	-0.05	-0.543***	-0.368***	-0.048	-0.297***
	[0.069]	[0.117]	[0.079]	[0.071]	[0.110]	[0.083]
Retired	0.103*	0.074	0.091	0.285***	-0.047	0.312***
	[0.057]	[0.116]	[0.070]	[0.051]	[0.087]	[0.062]
Family care	-0.494***	-0.406*	-0.308*	-0.034	0.004	-0.02
	[0.180]	[0.245]	[0.182]	[0.047]	[0.083]	[0.058]
FT education	0.247***	0.341**	0.125	0.150**	0.329**	-0.005
	[0.074]	[0.159]	[0.090]	[0.064]	[0.134]	[0.088]
Sick/disabled	-1.355***	-1.632***	-0.683***	-1.424***	-1.425***	-0.748***
	[0.086]	[0.113]	[0.125]	[0.085]	[0.094]	[0.119]
Other	-0.155	0.14	-0.146	-0.28	0.346	-0.395
	[0.213]	[0.395]	[0.218]	[0.183]	[0.335]	[0.249]
Log of household income	0.113***	0.191***	0.035	0.128***	0.232***	0.024
	[0.022]	[0.041]	[0.026]	[0.019]	[0.036]	[0.025]
Parent's Occupation Aged 14 (ref: Professional)						
Not working	-0.215***	-0.178	-0.135*	-0.122**	-0.581***	0.133*
	[0.070]	[0.128]	[0.082]	[0.060]	[0.105]	[0.079]
Managers and Senior officials	-0.035	-0.025	-0.025	-0.045	-0.077	-0.012
	[0.046]	[0.102]	[0.059]	[0.041]	[0.084]	[0.055]
Associate Professional and Technical	-0.02	-0.13	0.025	-0.024	-0.136	0.032
	[0.053]	[0.120]	[0.070]	[0.049]	[0.097]	[0.065]
Administrative and Secretarial	0.015	-0.059	0.04	-0.049	-0.316***	0.081
	[0.049]	[0.111]	[0.063]	[0.048]	[0.093]	[0.064]
Skilled Trades	-0.025	-0.148	0.029	-0.036	-0.350***	0.117**
	[0.045]	[0.094]	[0.056]	[0.041]	[0.079]	[0.056]
Personal Service	-0.019	-0.214	0.063	-0.018	-0.233*	0.088
	[0.076]	[0.157]	[0.093]	[0.069]	[0.129]	[0.090]
Sales and Customer Service	-0.035	-0.143	0.02	-0.051	-0.448***	0.144*
	[0.075]	[0.166]	[0.092]	[0.066]	[0.117]	[0.086]
Process, Plant and Machine Operatives	-0.065	-0.12	-0.014	-0.032	-0.457***	0.161**
	[0.053]	[0.106]	[0.066]	[0.049]	[0.090]	[0.067]
Elementary	-0.033	-0.182	0.044	-0.071	-0.364***	0.086
	[0.060]	[0.120]	[0.074]	[0.057]	[0.100]	[0.076]
Deceased/Not present	-0.055	-0.16	0.032	-0.059	-0.630***	0.264*
	[0.160]	[0.274]	[0.189]	[0.131]	[0.213]	[0.159]
Single Parent family	-0.066	-0.181*	0.012	-0.114**	-0.031	-0.095*
	[0.053]	[0.099]	[0.064]	[0.046]	[0.075]	[0.056]
Sport activity (0-10)	0.065***		**0.415*** **	0.060***		**0.475*** **
	[0.005]		[0.042]	[0.004]		[0.048]
Ease of Access to Sports Facilities		0.346***			0.242***	
		[0.027]			[0.018]	
Smoking age 16 - still smoke		-0.645***			-0.590***	
		[0.075]			[0.064]	
Smoking age 16 - given up		-0.189***			-0.033	
		[0.071]			[0.067]	

Observations	13,940	13,940	13,940	18,006	18,006	18,006
R-squared	0.124	0.207		0.108	0.171	

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1
Includes regional controls

As can be observed from Table 3 and Table 6 below, most of the results remain unchanged or even get stronger when the instruments are introduced. The most important result, regarding the sport activity becomes much stronger for both men and women suggesting that the causation goes indeed from sport activity to life satisfaction as conjectured by the model and not the other way round. It is not that happier people do more sports but sports do seem to make people happier. The same is true for fruits and vegetables in Table 6 below. Therefore, the instrumental approach seems to confirm or hypothesis that a healthier lifestyle leads to a happier life.

However, there are some changes in the results as well, after the introduction of the instruments that are worth noting: the happiness of both men and women does not seem to decrease with age anymore. Its positive impact is weaker during 35-49 for women but stays significantly positive. The positive impact gets stronger with age.

The qualifications have now all for both men and women a significantly negative impact. The largest impact is for the highest degree as often obtained in the literature and conjectured above.

It is not the Asian ethnicity but rather the Black ethnicity that has a significantly negative impact on the life satisfaction of men.

Interestingly, the impact of income becomes insignificant after the introduction of the instruments suggesting potential endogeneity in this variable.

All the other variables have not changed sign or significance after the introduction of the instruments suggesting that the assumptions of the models are true, from which most importantly, the fact that lifestyle impacts positively on life satisfaction.

Testing the Validity of the Instruments

Table 4 presents tests for the validity of the instruments. As can be seen from this table our instruments pass both the test of over-identifying restrictions, meaning that they are not significantly correlated with the error

term in the second stage model, and the f-test meaning that they add enough significance when added to the regression in order to be sufficiently correlated with the independent variable to be instrumented.

We can see from Table 4 that instrumenting sports activity increases the effect of sport activity on life satisfaction considerably. All the instruments together pass the weak instrument tests and the Sargan over-identifying for both genders.

Table 4 Tests for the Validity of the Instruments

	Men	Women
Sport activity ranking - all instruments		
OLS	0.065***	0.060***
	[0.005]	[0.004]
IV	0.415***	0.475***
	[0.042]	[0.048]
F-test weak instruments	80.9685	85.9848
Sargan over-identifying test	0.682958	4.09742
Sargan test p-value	0.7107	0.1289
Sports activity - access only		
IV	0.429***	0.387***
	[0.052]	[0.072]
F-test weak instruments	166.429	179.168
Sports activity - smoking at 16		
IV	0.479***	0.466***
	[0.059]	[0.079]
F-test weak instruments	38.9533	45.308
Sargan over-identifying test	0.286521	4.21795
Sargan test p-value	0.5925	0.04

6. Robustness Checks

In this section we perform several robustness checks. In Table 5 we show the results for alternative lifestyle measures that we have used. We use the frequency of moderate exercise instead of sports activity and fruit and vegetable consumption and show that the results are robust.

Table 5. Alternative lifestyle measures

	Men	Women
Sport activity ranking		
OLS	0.065***	0.061***
	[0.005]	[0.004]
IV	0.409***	0.475***
	[0.042]	[0.048]
F-test weak instruments	103.727	85.9049
Sargan over-identifying test	3.91339	4.03082
Sargan test p-value	0.1413	0.1333
Frequency of moderate activities		
OLS	0.053***	0.050***
	[0.006]	[0.005]
IV	0.532***	0.550***
	[0.056]	[0.060]
F-test weak instruments	84.9661	82.6817
Sargan over-identifying test	1.4912	17.2752
Sargan test p-value	0.4744	0.0002
Portions of Fruit and Veg		
OLS	0.073***	0.090***
	[0.010]	[0.009]
IV	0.822***	0.808***
	[0.112]	[0.107]
F-test weak instruments	57.1108	59.7252
Sargan over-identifying test	46.9748	59.2035
Sargan test p-value	0	0
Portions of Fruit and Veg (smoking only)		
IV	0.563***	0.655***
	[0.110]	[0.103]
F-test weak instruments	75.1248	87.2854
Sargan over-identifying test	5.93862	7.24846
Sargan test p-value	0.0148	0.0071

In Table 6 we show the results using all instruments in order to instrument for the portions of fruits and vegetables consumed per day. When using instruments we show that the coefficient of fruits and vegetables not only stays positive and significant but even increases in value.

Table 6. Results using all instruments to instrument for fruits and vegetables consumption.

	Men			Women		
	Ols - life sat	First stage	IV	Ols - life sat	First stage	IV
Age group (ref: 25-34)						
Aged 16-24	[0.065]	[0.054]	[0.076]	[0.056]	[0.048]	[0.070]
	-0.123***	0.123***	-0.230***	-0.193***	0.232***	-0.372***
Aged 35-49	[0.045]	[0.039]	[0.056]	[0.040]	[0.034]	[0.053]
	0.011	0.381***	-0.294***	-0.183***	0.563***	-0.610***
Aged 50-64	[0.049]	[0.044]	[0.074]	[0.047]	[0.041]	[0.083]
	0.234***	0.614***	-0.264**	0.055	0.635***	-0.447***
Aged 65+	[0.072]	[0.063]	[0.113]	[0.064]	[0.056]	[0.105]
	[0.073]	[0.143]	[0.132]	[0.064]	[0.112]	[0.110]
Marital Status (ref: Not living with a partner)						
Married	0.303***	0.201***	0.128**	0.360***	0.210***	0.189***
	[0.038]	[0.032]	[0.052]	[0.029]	[0.024]	[0.042]
Cohabiting	0.171***	0.135***	0.069	0.135***	0.078**	0.083*
	[0.048]	[0.041]	[0.059]	[0.043]	[0.035]	[0.050]
Highest Qualification (ref: None)						
Degree level	0.09	0.547***	-0.374***	0.087*	0.786***	-0.530***
	[0.059]	[0.046]	[0.096]	[0.047]	[0.041]	[0.107]
Other higher education	0.059	0.254***	-0.172**	-0.007	0.546***	-0.436***
	[0.061]	[0.050]	[0.080]	[0.050]	[0.040]	[0.085]
A level	-0.002	0.193***	-0.184***	-0.011	0.497***	-0.404***
	[0.056]	[0.043]	[0.071]	[0.049]	[0.040]	[0.081]
GCSE	0.028	0.079*	-0.051	-0.025	0.291***	-0.247***
	[0.058]	[0.044]	[0.069]	[0.045]	[0.036]	[0.062]
Other	-0.018	0.142***	-0.142*	-0.045	0.185***	-0.195***
	[0.062]	[0.048]	[0.074]	[0.052]	[0.042]	[0.064]
Ethnicity (ref: white)						
Black	-0.015	-0.491***	0.335***	-0.1	-0.404***	0.163*
	[0.091]	[0.070]	[0.117]	[0.074]	[0.060]	[0.094]
Asian	-0.153**	-0.273***	0.043	-0.137**	-0.297***	0.043
	[0.061]	[0.048]	[0.077]	[0.053]	[0.043]	[0.068]
Other/mixed	-0.116	-0.277***	0.086	-0.239***	-0.019	-0.236**
	[0.119]	[0.085]	[0.146]	[0.081]	[0.082]	[0.093]
Age of Youngest Child in Household (ref: No children under 16 responsible for)						
Aged 0-2	0.126**	-0.035	0.173***	0.049	0.041	0.027
	[0.051]	[0.047]	[0.063]	[0.050]	[0.044]	[0.060]
Aged 3-4	0.057	-0.033	0.1	-0.121**	0.065	-0.155**
	[0.066]	[0.063]	[0.078]	[0.061]	[0.051]	[0.071]
Aged 5-11	-0.035	-0.013	-0.009	-0.126***	0.067*	-0.169***
	[0.054]	[0.047]	[0.064]	[0.047]	[0.038]	[0.056]
Aged 12-15	-0.037	-0.073	0.029	-0.187***	-0.01	-0.178***
	[0.062]	[0.058]	[0.076]	[0.054]	[0.045]	[0.062]
Job status (ref FT employed)						
PT employed	-0.014	-0.005	-0.002	0.105***	0.050*	0.065

	[0.056]	[0.051]	[0.070]	[0.035]	[0.030]	[0.041]
Unemployed	-0.610***	-0.188***	-0.413***	-0.375***	-0.027	-0.315***
	[0.070]	[0.048]	[0.082]	[0.071]	[0.054]	[0.080]
Retired	0.102*	0.038	0.078	0.264***	0.183***	0.127**
	[0.057]	[0.051]	[0.069]	[0.051]	[0.043]	[0.064]
Family care	-0.491***	-0.171	-0.324	-0.039	0.044	-0.062
	[0.184]	[0.138]	[0.204]	[0.047]	[0.039]	[0.056]
FT education	0.252***	0.220***	0.077	0.158**	0.129**	0.043
	[0.076]	[0.066]	[0.091]	[0.064]	[0.056]	[0.076]
Sick/disabled	-1.462***	-0.164***	-1.269***	-1.504***	-0.196***	-1.319***
	[0.085]	[0.063]	[0.100]	[0.085]	[0.062]	[0.099]
Other	-0.159	0.118	-0.193	-0.262	0.009	-0.261
	[0.218]	[0.177]	[0.222]	[0.180]	[0.153]	[0.217]
Log of household income	0.122***	0.061***	0.070***	0.131***	0.142***	0.022
	[0.022]	[0.018]	[0.026]	[0.019]	[0.017]	[0.027]
Parent's Occupation Aged 14 (ref: Professional)						
Not working	-0.213***	-0.211***	-0.034	-0.137**	-0.221***	0.037
	[0.071]	[0.057]	[0.085]	[0.060]	[0.049]	[0.074]
Managers and Senior officials	-0.023	-0.132***	0.077	-0.045	-0.076*	0.015
	[0.046]	[0.045]	[0.058]	[0.041]	[0.039]	[0.051]
Associate Professional and Technical	-0.012	-0.199***	0.139**	-0.027	-0.045	0.012
	[0.052]	[0.050]	[0.068]	[0.049]	[0.046]	[0.060]
Administrative and Secretarial	0.019	-0.107**	0.098	-0.054	-0.146***	0.057
	[0.050]	[0.050]	[0.065]	[0.048]	[0.044]	[0.058]
Skilled Trades	-0.02	-0.168***	0.109*	-0.042	-0.164***	0.084
	[0.045]	[0.042]	[0.059]	[0.041]	[0.037]	[0.053]
Personal Service	-0.008	-0.303***	0.234**	-0.016	-0.187***	0.135
	[0.077]	[0.071]	[0.097]	[0.069]	[0.062]	[0.085]
Sales and Customer Service	-0.015	-0.302***	0.216**	-0.058	-0.225***	0.111
	[0.076]	[0.069]	[0.096]	[0.066]	[0.057]	[0.083]
Process, Plant and Machine Operatives	-0.053	-0.256***	0.146**	-0.04	-0.228***	0.130**
	[0.054]	[0.048]	[0.071]	[0.049]	[0.044]	[0.064]
Elementary	-0.026	-0.278***	0.191**	-0.069	-0.236***	0.108
	[0.061]	[0.053]	[0.078]	[0.057]	[0.047]	[0.071]
Deceased/Not present	-0.049	-0.215*	0.139	-0.07	-0.331***	0.203
	[0.158]	[0.118]	[0.167]	[0.131]	[0.114]	[0.157]
Single Parent family	-0.075	-0.097**	0.01	-0.118***	0.038	-0.136***
	[0.053]	[0.043]	[0.062]	[0.045]	[0.038]	[0.052]
Portions of Fruit and Veg	**0.073*** **		**0.822*** **	**0.090*** **		**0.808*** **
	[0.010]		**[0.112]**	**[0.009]**		**[0.107]**
Ease of Access to Sports Facilities		0.059***			0.027***	
		[0.013]			[0.010]	
Smoking age 16 - still smoke		-0.389***			-0.412***	
		[0.034]			[0.032]	
Smoking age 16 - given up		0.062*			0.004	
		[0.033]			[0.034]	

Observations	13,924	13,924	13,924	17,995	17,995	17,995
R-squared	0.112	0.131		0.103	0.157	

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1
Includes regional controls

In Table 7 we use just smoking behaviour at 16 in order to instrument for fruits and vegetables and show that the coefficient of this variable stays positive and significant. Therefore, we can conclude that our results are robust.

Table 7. Results using just smoking behaviour to instrument for fruits and vegetables consumed.

	Men			Women		
	Ols - life sat	First stage	IV	Ols - life sat	First stage	IV
Age group (ref: 25-34)						
Aged 16-24	0.435***	-0.136**	0.495***	0.320***	-0.256***	0.466***
	[0.065]	[0.054]	[0.070]	[0.056]	[0.048]	[0.067]
Aged 35-49	-0.123***	0.123***	-0.193***	-0.194***	0.233***	-0.336***
	[0.045]	[0.039]	[0.051]	[0.040]	[0.034]	[0.051]
Aged 50-64	0.01	0.377***	-0.188***	-0.185***	0.562***	-0.522***
	[0.049]	[0.044]	[0.069]	[0.047]	[0.041]	[0.079]
Aged 65+	0.232***	0.601***	-0.092	0.052	0.627***	-0.343***
	[0.072]	[0.064]	[0.107]	[0.064]	[0.056]	[0.101]
Marital Status (ref: Not living with a partner)						
Married	0.303***	0.208***	0.188***	0.361***	0.215***	0.226***
	[0.038]	[0.032]	[0.049]	[0.029]	[0.024]	[0.040]
Cohabiting	0.172***	0.144***	0.105*	0.138***	0.082**	0.096**
	[0.048]	[0.041]	[0.055]	[0.043]	[0.035]	[0.047]
Highest Qualification (ref: None)						
Degree level	0.087	0.554***	-0.217**	0.088*	0.791***	-0.397***
	[0.059]	[0.045]	[0.092]	[0.047]	[0.041]	[0.102]
Other higher education	0.056	0.261***	-0.096	-0.01	0.552***	-0.346***
	[0.061]	[0.050]	[0.074]	[0.050]	[0.040]	[0.081]
A level	-0.006	0.201***	-0.126*	-0.011	0.503***	-0.321***
	[0.056]	[0.043]	[0.066]	[0.048]	[0.040]	[0.078]
GCSE	0.025	0.086*	-0.027	-0.025	0.293***	-0.197***
	[0.058]	[0.044]	[0.063]	[0.045]	[0.036]	[0.059]
Other	-0.02	0.147***	-0.103	-0.046	0.188***	-0.163***
	[0.062]	[0.048]	[0.069]	[0.052]	[0.042]	[0.061]
Ethnicity (ref: white)						
Black	-0.017	-0.505***	0.212*	-0.103	-0.421***	0.11
	[0.090]	[0.070]	[0.108]	[0.074]	[0.061]	[0.090]
Asian	-0.152**	-0.293***	-0.023	-0.139***	-0.311***	0.005
	[0.061]	[0.048]	[0.071]	[0.053]	[0.043]	[0.065]
Other/mixed	-0.118	-0.278***	0.011	-0.244***	-0.023	-0.241***

	[0.119]	[0.086]	[0.134]	[0.081]	[0.081]	[0.087]
Age of Youngest Child in Household (ref: No children under 16 responsible for)						
Aged 0-2	0.126**	-0.044	0.157***	0.048	0.037	0.03
	[0.051]	[0.047]	[0.057]	[0.050]	[0.044]	[0.056]
Aged 3-4	0.061	-0.038	0.089	-0.119*	0.061	-0.144**
	[0.066]	[0.063]	[0.070]	[0.061]	[0.051]	[0.067]
Aged 5-11	-0.034	-0.014	-0.016	-0.125***	0.069*	-0.161***
	[0.054]	[0.047]	[0.058]	[0.046]	[0.038]	[0.053]
Aged 12-15	-0.035	-0.072	0.008	-0.187***	-0.009	-0.180***
	[0.062]	[0.058]	[0.068]	[0.054]	[0.045]	[0.059]
Job status (ref FT employed)						
PT employed	-0.012	-0.004	-0.006	0.104***	0.046	0.075*
	[0.056]	[0.051]	[0.063]	[0.035]	[0.030]	[0.039]
Unemployed	-0.610***	-0.199***	-0.481***	-0.386***	-0.038	-0.335***
	[0.069]	[0.048]	[0.077]	[0.071]	[0.053]	[0.077]
Retired	0.102*	0.033	0.086	0.264***	0.177***	0.157***
	[0.057]	[0.051]	[0.063]	[0.051]	[0.043]	[0.060]
Family care	-0.492***	-0.178	-0.383**	-0.036	0.039	-0.054
	[0.184]	[0.139]	[0.191]	[0.047]	[0.039]	[0.053]
FT education	0.251***	0.217***	0.135	0.156**	0.122**	0.07
	[0.076]	[0.066]	[0.084]	[0.064]	[0.056]	[0.072]
Sick/disabled	-1.461***	-0.201***	-1.332***	-1.504***	-0.212***	-1.357***
	[0.085]	[0.063]	[0.093]	[0.085]	[0.062]	[0.095]
Other	-0.159	0.107	-0.182	-0.262	0.001	-0.261
	[0.218]	[0.176]	[0.211]	[0.180]	[0.152]	[0.204]
Log of household income	0.123***	0.065***	0.089***	0.126***	0.141***	0.042*
	[0.022]	[0.018]	[0.024]	[0.019]	[0.017]	[0.025]
Parent's Occupation Aged 14 (ref: Professional)						
Not working	-0.215***	-0.217***	-0.097	-0.135**	-0.222***	0.003
	[0.071]	[0.057]	[0.079]	[0.060]	[0.049]	[0.071]
Managers and Senior officials	-0.027	-0.132***	0.039	-0.047	-0.078**	0.002
	[0.046]	[0.045]	[0.053]	[0.041]	[0.039]	[0.048]
Associate Professional and Technical	-0.015	-0.200***	0.085	-0.026	-0.042	0.003
	[0.052]	[0.050]	[0.062]	[0.049]	[0.046]	[0.056]
Administrative and Secretarial	0.017	-0.110**	0.069	-0.054	-0.147***	0.034
	[0.050]	[0.050]	[0.058]	[0.048]	[0.044]	[0.055]
Skilled Trades	-0.023	-0.169***	0.061	-0.043	-0.168***	0.059
	[0.045]	[0.042]	[0.054]	[0.041]	[0.036]	[0.050]
Personal Service	-0.011	-0.302***	0.149*	-0.015	-0.188***	0.105
	[0.076]	[0.071]	[0.089]	[0.069]	[0.062]	[0.080]
Sales and Customer Service	-0.015	-0.304***	0.137	-0.057	-0.226***	0.076
	[0.076]	[0.069]	[0.088]	[0.066]	[0.057]	[0.078]
Process, Plant and Machine Operatives	-0.055	-0.259***	0.076	-0.041	-0.227***	0.092
	[0.054]	[0.048]	[0.066]	[0.049]	[0.044]	[0.060]
Elementary	-0.028	-0.281***	0.114	-0.071	-0.237***	0.069
	[0.061]	[0.053]	[0.072]	[0.057]	[0.047]	[0.067]

Deceased/Not present	-0.051	-0.224*	0.072	-0.08	-0.347***	0.137
	[0.158]	[0.119]	[0.159]	[0.131]	[0.114]	[0.149]
Single Parent family	-0.075	-0.100**	-0.019	-0.127***	0.038	-0.140***
	[0.053]	[0.043]	[0.057]	[0.046]	[0.037]	[0.050]
Portions of Fruit and Veg	**0.073*** **		**0.563*** **	**0.090*** **		**0.655*** **
	[0.010]		**[0.110]**	**[0.009]**		**[0.103]**
Smoking age 16 - still smoke		-0.391***			-0.416***	
		[0.034]			[0.032]	
Smoking age 16 - given up		0.060*			0.006	
		[0.033]			[0.034]	
Observations	13,940	13,940	13,940	18,006	18,006	18,006
R-squared	0.124	0.207		0.108	0.171	

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Includes regional controls

7. Conclusions and policy recommendations

Concluding we can argue that together with other variables that have been identified to have a significant impact on life satisfaction, lifestyle has to be also considered. A better lifestyle, reflected in our study by increased exercise and a better nutrition does seem to impact significantly positive on the life satisfaction of both men and women even after correcting for endogeneity using instrumental variables. Therefore, any political measures aimed at increasing the life satisfaction of the population should aim at increasing the exercise and/or improving the nutrition. In our study we have not analysed the relationship between lifestyle and health. But since life satisfaction and health are strongly correlated it can be assumed that any measures improving the lifestyle would also improve the health of the population and could therefore reduce the surging healthcare costs in the UK.

8. Critical assessment of the results and the life satisfaction approach

The subjectivity and hence the usefulness of the happiness/wellbeing/life satisfaction variable has been at constant debate. Some advantages and disadvantages will be only shortly mentioned here:

Advantages:

1. The cornerstone conjecture of the life satisfaction approach is that more direct measures of well-being, such as life satisfaction, rather than the degree to which one‘s preferences have been satisfied, better approximate an individual‘s underlying utility. Much of the motivation for this new approach stems from doubt over whether preferences do actually conform to the basic assumptions usually made (completeness, transitivity, reflexivity, monotonicity etc). A large literature from

behavioural economics and psychology finds that people‘s preferences may not be good indicators of their actual welfare or well-being.

2. Life satisfaction is multidimensional. According to Stiglitz et al. (2008) it includes the following dimensions simultaneously:

   i. Material living standards (income, consumption and wealth);

   ii. Health;

   iii. Education;

   iv. Personal activities including work

   v. Political voice and governance;

   vi. Social connections and relationships;

   vii. Environment (present and future conditions);

   viii. Insecurity, of an economic as well as a physical nature.

   All these dimensions shape people’s well-being, and yet many of them are missed by conventional income and/or utility measures.

Disadvantages:

1. Standard economic theory assumes that utility depends on observable, objective choices made by individuals with respect to consumption of tangible goods and services. Subjectivist experience (such as captured by the subjective well-being (SBW) measures) is often rejected as being ‘unscientific’, because it is not objectively observable. There are several examples of no objectivist theoretical analyses in economics however, such as: emotions (Jon Elster 1998), self-signaling (self-esteem), goal completion, mastery and meaning (Loewenstein 1999) or status (Frank 1985). The objectivist approach restricts the possibility of understanding and influencing human well-being. The subjective approach to utility offers a fruitful complementary path to study the world (Frey and Stutzer 2002).
2. The cardinality of the life satisfaction measure has been often subject to criticism. It is not clear that equal distance between consecutive happiness ratings is the same for all individuals. If the highest score on the scale is 10 it is not clear that the distance between 9 and 10 is the same for each person as the distance between 1 and 2. It is not even clear that it is the same for one individual. But it is very probably to be different between individuals. However, assuming cardinality does not seem to lead to large biases. Moreover, there seems to be high level of consistency and stability in the happiness data. Several studies show this consistency, validity, reliability, and a high degree of stability over time (Diener et al., 1999). Other studies indicate that reported subjective well-being is moderately stable and sensitive to changing life circumstances (Joop Ehrhardt, Willem Saris, and Veenhoven 2000; and Bruce Headey and Alexander Wearing 1991).

3. As subjective survey data are based on individuals' opinions, they are prone to a multitude of systematic and non-systematic biases like: the order of questions, the wording of questions, scales applied, actual mood, and the selection of information processed. The relevance of these errors, however depends on what the data is used for. If it is not used in order to compare levels in utility but to identify determinants of happiness, as in the present case, then we do not need to assume neither comparability nor cardinality. The subjective data can be treated ordinally in econometric analyses so that higher reported subjective well-being reflects higher well-being of an individual. Moreover, many mistakes in people's answers are random and therefore do not bias the estimation results.
4. Endogeneity caused by unobserved variables and endogeneity caused by reversed causality are one of the most severe problems encountered in the happiness literature and have been discussed in the introduction of the paper. However, advanced econometric techniques like the ones used in the present paper, can help to tackle these problems.

References

Becker, G. S. and Murphy K.M. (1988), Theory of rational addiction, The Journal of Political Economy, Vol. 96 (4), 675-700.

Becker, G. S., M. Grossmann and Murphy K.M. (1991), Rational addiction and the effect of price on consumption, The American Economic Review, 81 (2), 237-241

Benet-Martinez, V. and John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, 75, 729-750.

Block G., Patterson B., Subaar A. (1992), Fruit, vegetables, and cancer prevention: a review of the epidemiological evidence, Nutr Cancer, 18, 1-9.

Borghans, L, Duckworth, A,L, Heckman, J and Weel, B. (2008). "The Economics and Psychology of Personality Traits.", *Journal of Human Resources*, 43, 817-860.

Chen, S-N, Shogren, J.F., Orazem, P. F., and Crocker, T. (2002), Prices and health: identifying the effects of nutrition, exercise and medication choices on blood pressure, American Journal of Agricultural Economics, 84(4), 990-1002.

Cobb-Clark, D and Schurer, S. (2011) The Stability of Big-Five Personality Traits, Melbourne Institute Working Paper No. 21/11

Dehghan M., N. Akhtar-Danesh and A. T. Merchant (2011), Factors associated with fruit and vegetable consumption among adults. Journal of Human Nutrition and Dietetics, 24, 128-134.

Della Giusta, M., Jewell, S., and Kambhampati, U. (2011) , Gender and Life Satisfaction in the UK, Feminist Economics, 17 (3), 1-34.

Dickson, M. (2013), The causal effect of education on wages revisited, *Oxford Bulletin of Economics and Statistics*, 75 (4), pp. 477-498.

Di Tella R., MacCulloch Robert J. and Andrew J. Oswald (2001), Preferences over Inflation and Unemployment: Evidence from Surveys of Happiness, The American Economic Review, 91(1), 335-341.

Easterlin, R. A. (1974), Does economic growth improve the human lot? Some empirical evidence. Nations and households in economic growth, 89, 89-125.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B., (2003). A very brief measure of the Big-Five Personality Domains. *Journal of Research in Personality*, 37¸504-528.

Hogan, R. and Hogan, J. (2007). Hogan Personality Inventory Manual, Third Edition, OK: Hogan Assessment Systems

Graham C., Eggers A., Sukhtankar S. (2004), Does Happiness Pay? An exploration based on panel data from Russia, Journal of Economic Behavior & Organization, 55, 319-342

Grossman, M. (1972a), On the concept of health capital and the demand for health. Journal of Political Economy, 80(2), 223-255

Grossman, M. (1972b), The Demand for Health: A Theoretical and Empirical Investigation, New York, NY: Columbia University Press.

Mazzocchi, M., Irz X., Modugno L. and W.B. Traill (2014), A behavioural analysis of the diet-health relationship in the older Italian population, presented at the 88th Annual Conference of the Agricultural Economic Society in Paris 2014.

McCrae R.R. and Costa, P, T. (1999) A Five-Factor Theory of Personality, in *Handbook of Personality: Theory and Research*, ed. by L. A. Pervin and O.P. John, pp139-153. Guildford, New York

Mueller, G. & Plug, E. (2006) Estimating the Effect of Personality on Male and Female Earnings. *Industrial and Labor Relations Review*, 60**,** 3-19.

Office C., Food: An Analysis of the Issue, The Strategy Unit, 2008.

Office of National Statistics, Families and Households, Release 2012, 2013, UK, http://www.ons.gov.uk/ons/rel/family-demography/families-and-households/2013/stb-families.html

Scarborough P., Bhatnagar P., Wickramasinghe K. K., Allender S., Foster C. and M. Rayner (2011), The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK, update to 2006-07 NHS costs, *Journal of Public Health*, 33(4), 527-535.

Södergren M., S. A. McNaughton, J. Salmon, K. Ball and D. A. Crawford (2012), Associations between fruit and vegetable intake, leisure-time physical activity, sitting time and self-rated health among older adults: cross-sectional data from the WELL study, BMC Public Health, 12:551, http://www.biomedcentral.com/1471-2458/12/551

John, O and Srivastava, S. (1999) The Big-Five Trait Taxonomy: History, Measurement, and Theoretical Perspectives in Pervin and O.P. John (Eds.), *Handbook of Personality: Theory and Research* (2nd ed.). New York: Guilford

Tinsley M., (2014), Parenting alone Work and welfare in single parent households, *Policy Exchange Report*, London, UK.

Welsh, H. (2012), Organic Food and Human Health: Instrumental Variable Evidence, Oldenburg Discussion Papers in Economics, V-349-12, Carl von Ossietzky University Oldenburg, Germany.

Wichert, L. and Pohlmeier, W. (2010) female Labor Force Participation and the Big Five, Discussion Paper 10-003, ZEW, Mannheim, Germany