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11 Quality of Life: Assessment

Airports Commission

Final report

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Contents

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Executive summary

Background

The Airports Commission Appraisal Framework[1] provides a framework of 16 Modules (each with associated criteria) which the Commission expects to use to appraise the three airport schemes that it has shortlisted: the Gatwick Airport Second Runway, the Heathrow Airport Northwest Runway and the Heathrow Airport Extended Northern Runway. One of these Modules is concerned with the Quality of Life.

PricewaterhouseCoopers LLP ('PwC') was commissioned by the Airports Commission to undertake research to examine the relationship between aviation and quality of life. PwC has been supported in delivering this work by SImetrica Ltd.

Objectives

The aim of our work is to enable the Commission to assess how far and in what way each shortlisted scheme is expected: "To maintain and where possible improve quality of life for local residents and the wider population".

The objectives of the project are to:

- Determine which quality of life indicators are potentially impacted by aviation;
- Describe how quality of life impacts relate to the other Modules of the Airports Commission Appraisal Framework;
- Analyse available UK datasets to assess evidence on the impact of aviation on quality of life and draw conclusions on the extent to which the negative impacts of aviation compare with its positive impacts; and
- Provide an evidence base (relying on a limited literature review and econometric analysis of two UK datasets) which the Airports Commission can use to assess the three main airport schemes under consideration.

Scope

This project considers the quality of life impacts arising from four aspects of aviation:

- Airport development;
- Airport operations;
- Connectivity (i.e. any effects on passengers from changes in the air transport services available to them); and
- Associated infrastructure (e.g. any surface access effects linked to airport development and operations).

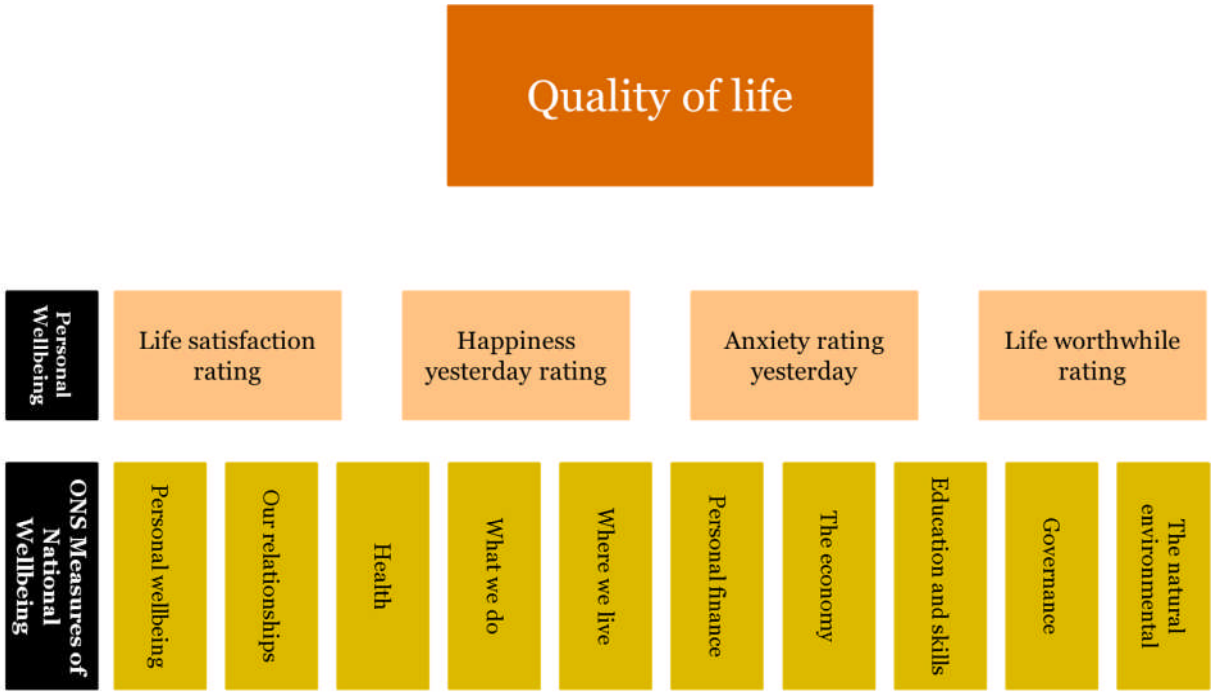
The results are intended to be capable of being applied generally across airport developments rather than specifically to the three airport schemes under consideration by the Airports Commission.

Defining quality of life – positioning subjective wellbeing

The first part of our report develops and populates a logic model which describes how aviation theoretically affects quality of life. We start by defining the key elements of quality of life based on those identified as part of the Measuring National Wellbeing Programme being run by the Office for National Statistics (ONS) where 41 Measures of National Wellbeing are grouped in 10 categories (see Figure 1). One of these categories (governance) is not really relevant to airports but all the other ones are. Our focus is on the Personal Wellbeing category.

[1] Airports Commission, 'Appraisal Framework', 2014 (accessible at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf

Figure 1: Mapping quality of life to Personal Wellbeing and the ONS' National Wellbeing Measures



Recent decades have seen more wellbeing research, partly in response to a strong drive to account more explicitly for wellbeing in policy decisions. This work has defined people's wellbeing in three main ways:

- **The desire satisfaction account** is based on the premise that wellbeing can be inferred from people's actual choices (and preferences);
- **The objective list account** is based on assumptions about people's basic human needs: wellbeing is measured in terms of a set of pre-determined indicators such as mortality rates, health, and literacy rates; and
- **The mental state account** refers to people's subjective experiences of their own wellbeing based on how they feel and think about their lives and is often referred to as **subjective wellbeing**.

Academic and policy research have tended to focus on the first two of these (i.e. the desire satisfaction and objective list accounts) but there has been less research on mental state accounts (i.e. subjective wellbeing).

Subjective wellbeing can be measured in three main ways based on:

- People's overall assessment of their life (life satisfaction) – this is known as **evaluative subjective wellbeing**;
- People's experiences at a specific time – this is known as **affective subjective wellbeing**; and
- How far people's underlying psychological needs are met (e.g. meaning, autonomy, control and connectedness) which contributes towards their wellbeing independent of any pleasure they may bring – this is known as **eudemonic subjective wellbeing**.

The differences between these measures mean that they do not always produce the same picture of wellbeing. For example, there may be differences between what people want, what they experience and what we might rationally think is good for them. As a result, there are pros and cons of each measure. For instance, evaluative measures like life satisfaction include a retrospective element (which distinguishes them from affective wellbeing measures) which can be a problem if people do not always correctly remember their past experiences.

In our later analysis, we assess the impact of aviation in respect to all three measures to understand fully the relationship between aviation and subjective wellbeing. This is the first study to evidence systematically this relationship.

Fitting subjective wellbeing in the Airports Commission's Appraisal Framework

In examining how quality of life and, in particular, subjective wellbeing, fit within the Airports Commission Appraisal Framework, we consider two key questions:

- How do the outcomes covered in other Appraisal Framework Modules relate to quality of life as we have defined it?
- How can quality of life outcomes, in particular those related to subjective wellbeing, be considered alongside those from other Modules?

The Airports Commission Appraisal Framework defines 16 Modules each of which is associated with a number of key outcomes – effects that airport expansion is expected to have on the local and national population (see Table 1)[2][3]. We have mapped the ONS's Measures of National Wellbeing from the nine categories excluding Personal Wellbeing against the Appraisal Framework Modules using the key indicative outcomes suggested in Table 1[4]. Focusing on the direct effects, we find that all the Appraisal Framework Modules which are not operational map to one or more of the ONS's Measures of National Wellbeing. In addition, all the Appraisal Framework Modules except Carbon are expected to affect one of the subjective wellbeing measures that are the focus of this report.

Table 1: Summary of Appraisal Framework Modules, objectives and likely outcomes

#	Appraisal Framework Module	Objectives	Key outcomes (indicative)
1	Strategic fit	• Provide additional capacity and connectivity in line with the assessment of need • Improve the experience of passengers and other users of aviation	• Change in air travel volume • Change in quality of passenger experience
2	Economy impacts	• Maximise wider economic benefits including supporting the competitiveness of the UK economy	• Net change in GDP/employment
3	Local economy impacts	• Promote employment and economic growth in the local area and surrounding region	• Net change in local/regional GDP/employment
4	Surface access	• Maximise the numbers of travellers arriving at the airport on public transport • Accommodate the needs of other users of transport networks, such as commuters, intercity travellers and freight • Enable access to the airport from a wide catchment area	• Change in transit times for airport and other travellers • Change in access to the airport
5	Noise	• Minimise noise impacts	• Change in noise impacts
6	Air quality	• Protect local air quality	• Change in local air quality
7	Biodiversity	• Protect natural habitats and maintain biodiversity	• Change in extent and quality of habitats • Change in biodiversity
8	Carbon	• Minimise carbon emissions in airport construction and operation	• Change in greenhouse gas emissions

[2] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf
[3] We note that the analysis is an indication of likely key outcomes based on the Airports Commission Appraisal Framework rather than an exhaustive list of outcomes
[4] We exclude those Appraisal Framework Modules which are more closely focused on operational and financial aspects (e.g. Modules 13, 14, 15 & 16) as well as Quality of Life (Module 11)

#	Appraisal Framework Module	Objectives	Key outcomes (indicative)
9	Water and flood risk	• Protect the quality of surface and ground waters, use water resources efficiently and minimise flood risk	• Change in flood risk • Change in water availability • Change in water quality
10	Place	• Minimise impacts on existing landscape character and heritage assets	• Change in landscape character • Change in nature of heritage assets
11	Quality of life	• Maintain and where possible improve the quality of life for local residents and the wider population	• Change in subjective wellbeing
12	Community	• Manage and reduce the effects of housing loss on local communities • Reduce or avoid disproportionate impacts on any social group	• Loss of housing • Inequality of impact
13	Cost and commercial viability	• Affordable and financeable, including any public expenditure that may be required and taking account of the needs of airport users	• Financial cost
14	Operational efficiency	• Ensure individual airport and airports system efficiency • Build flexibility into scheme designs • Meet industry safety and security standards	• Financial cost • Change in level of safety • Change in level of security
15	Operational risk	• Enhance individual airport and airports system resilience	• Continuity of air capacity
16	Delivery	• Have the equivalent overall capacity of one new runway operational by 2030 • Actively engage local groups in scheme progression, design and management	• N/A – covered in other outcomes above

Literature review – existing empirical evidence

We have completed a high level literature review to identify empirical evidence that links the outcomes of airports implied by the Airports Commission Appraisal Framework to subjective wellbeing. With the exceptions of Biodiversity (Module 7), Water and flood risk (Module 9) and, to an extent, Community (Module 12), we have found evidence which links airports to the key Appraisal Framework outcomes and then to subjective wellbeing. Our selective literature review has also revealed two significant weaknesses:

- Some important outcomes from the Appraisal Framework Modules such as Community, where a theoretical link with subjective wellbeing was expected but empirical evidence was not found, may warrant further investigation as part of the Commission's further work; and
- Many factors that affect subjective wellbeing are linked indirectly to airports and airport expansion which adds to the uncertainty around the likely impacts of airport developments.

In both cases, the main theoretical links could be supplemented with a more comprehensive literature review to explore the relationships in more detail.

Subjective wellbeing analysis

Approach

We have examined the relationship between different subjective wellbeing measures (i.e. evaluative, affective and eudemonic) and the main airports in England using regression analysis to analyse two large UK national datasets:

- The Annual Population Survey (APS) allows us to look at the wellbeing effects of *living* within airport noise contours and near airports[5]; and
- The Mappiness data allow us to assess the wellbeing effects of *being* within airport noise areas and near airports, including the effects of being in airports and working in airports as they are collected in real time using a mobile phone application[6].

Key results and their interpretation

In summarising the results of our regression analysis, we focus on those results which are statistically significant. The key results from our regression analysis are as follows:

- Airport noise:
  - Living within a daytime aircraft noise contour (over 55dB) is negatively associated with all subjective wellbeing measures: the presence of daytime aircraft noise is associated with lower life satisfaction, lower sense of worthwhile, lower happiness, increased anxiety and lower positive affect balance;
  - There is a marginal negative effect on all subjective wellbeing measures for every additional decibel from aircraft noise over the 55dB threshold;
  - Living within a night time aircraft noise contour is not associated with any statistically significant effect on subjective wellbeing;
  - Being within a high level aircraft noise contour is negatively associated with happiness and feeling relaxed at a specific time;

- Airport proximity:
  - Living near an airport (within 5km), and controlling for other factors that influence subjective wellbeing, does not have any statistically significant effect on subjective wellbeing;
  - Being near an airport does not have an effect on happiness at a specific time, but is negatively associated with feeling relaxed: this effect is larger for people who are working or studying at the time;

- Being in airports:
  - There is no statistically significant difference in happiness and relaxation when comparing people who work in airports with similar people who work outside airports;
  - Being at an airport is positively associated with happiness and, at the same time, negatively associated with feeling relaxed: airports are associated with happiness and excitement, but are also stressful experiences.

Our results need to be interpreted with some caution.

We can be confident that aircraft noise is bad for subjective wellbeing; we have shown this with two different UK datasets, and this finding is consistent with other studies[7]. We can also tentatively state that (any) employment creation associated with airport expansion is good for subjective wellbeing.

But, when we consider these noise and employment effects alongside the other factors associated with living near to airports, we do not find any statistically significant effect of airport proximity on subjective wellbeing. This may be because the positive and negative aspects of living near airports balance each other out. Those living in noise contours but not close enough to airports to benefit from the potential advantages, for example in terms of access to employment opportunities, will be likely to suffer negative effects on their subjective wellbeing due to noise.

Our analysis also has some important limitations:

- There is an issue of bundling – the reason our analysis of the impact of proximity to airports on subjective wellbeing does not suggest a significant effect may be because the positive aspects of living near to airports

[5] The APS uses four questions about individuals' wellbeing – see Section 3.2.1. for further details
[6] The Mappiness data capture three dimensions of momentary wellbeing – see Section 3.2.2 for more information
[7] See, for example, Van Praag and Baarsma, 2005

(e.g. improved transport infrastructure, access to jobs and cheaper property) are offset by the negative effects (e.g. noise, pollution and visual disamenity) but, at present, the available data in the APS do not allow us to analyse the effects of each potential element separately.
- The links between airports and subjective wellbeing are not always direct which adds to the challenges around the likely impacts of airport developments.
- The approach depends on being able to project the impact on subjective wellbeing over time yet there is limited evidence on how these values might be expected to evolve over time.

In addition, other important airport related factors may impact on subjective wellbeing which are currently excluded from our analysis for data reasons:

- Any effect on children is omitted since our analysis is based on data only for adults; and
- The effect on health relies (only) on the limiting health variable in the APS – this does not distinguish between physical and mental health and between differing levels of health condition.

Finally, there is debate about whether the results enable interpersonal comparisons, for example in balancing the negative effects of noise and the positive effects of employment creation. The key issue is whether a change in one person's wellbeing should be treated as equivalent to the same change in another person's wellbeing.

Application of analysis in option appraisal and mitigation

Finally, recognising the limitations we have noted, we explore how our key findings could be used by the Airports Commission as part of its appraisal of each of the schemes and to assess potential mitigations. To do this, we analyse the potential market and non-market impacts which we expect to be captured as part of the Commission's application of its Appraisal Framework. This highlights the key issues that we expect to arise in relation to ensuring that the appraisal is comprehensive whilst avoiding double counting. It also shows that a pre-requisite for incorporating subjective wellbeing is that the impacts are assessed on a robust and consistent basis (so that they can be aggregated): this means that they need to reflect the same geographical and temporal scope as well as avoiding potential double counting.

Valuing the impacts of airport developments on subjective wellbeing

HM Treasury's guidance on appraisal requires both the market and non-market impacts of projects to be measured and, in some cases, valued[8]. Subjective wellbeing is increasingly being recognised as a relevant potential non-market impact. In general, the valuation of non-market impacts follows a methodology which uses compensating or equivalent measures of welfare change. Economists have traditionally measured people's welfare in terms of how far their preferences are satisfied using revealed preference and stated preference valuation techniques. Recent research in psychology and behavioural economics has challenged the role of preferences in economic valuation because they can be context-dependent. In response, a growing literature now uses self-reported subjective wellbeing data (like those we have analysed) to estimate the amount of money that would have the equivalent impact on subjective wellbeing as the non-market impact. Although this approach has some limitations, it avoids hypothetical bias or strategic bias (as in stated preference valuation methods) and is based on data from people's actual experiences[9].

Although we have not applied this approach as part of this report, we illustrate how it could be done as part of the Airports Commission's further work.

Implications of wellbeing analysis for mitigation

If the impact of airports on subjective wellbeing can be valued, it would provide a useful input to understanding the potential scale of any mitigation that might be required before an airport scheme is attractive. It would also provide a basis for comparing different options.

Conceptually, all mitigations fall into one of three broad categories:

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[8] HM Treasury, The Green Book: Appraisal and Evaluation in Central Government, July 2011 (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf)
[9] Fujiwara, D. and Campbell, R. 2011. Valuation Techniques for Social Cost-Benefit Analysis – Stated Preference, Revealed Preference and Subjective Well-Being Approaches, a Discussion of the Current Issues. HM Treasury, London.

- They involve taking steps to avoid any costs (negatives) from arising in the first place;
- They entail seeking to reduce the costs associated with any unavoidable costs (negatives); and
- They require actions to increase the benefits (positives) to compensate for the negatives.

To understand how attractive each mitigation is likely to be, we need to understand:

- Who is likely to be affected by the airport development and in what way they are likely to be affected (i.e. which outcomes are impacted);
- How severe the effects would be without any mitigation; and
- How far different mitigation options would reduce these effects – both how many people are affected and the severity of the effect.

In thinking about the possible mitigations, we distinguish between the construction (or development) phase and the operational phase. In the operational phase, we also consider separately the impacts associated with airport operations and those linked to the improved connectivity provided by an airport development and any effects arising from changes to wider surface access (which could be either positive or negative).

1 Introduction

1.1 Project background

The Airports Commission Appraisal Framework[10] provides a framework of Modules (with associated criteria) which the Commission expects to use to appraise the three airport schemes that it has shortlisted: the Gatwick Airport Second Runway, the Heathrow Airport Northwest Runway and the Heathrow Airport Extended Northern Runway. One of these Modules is concerned with the impact on Quality of Life.

PricewaterhouseCoopers LLP ('PwC') was commissioned by the Airports Commission in accordance with the terms of the Provision of Consultancy for Commercial, Financial and Economic Option Appraisal and Analysis (DfT) framework and the Contract Reference RM 2750 (650) dated 12th February 2014 to undertake a research project examining the relationship between aviation and quality of life.

PwC has been supported in delivering this work by SImetrica Ltd which has been involved in all aspects of the analysis, but has taken the lead in undertaking the wellbeing analysis presented in Section 3 of this report.

1.2 Objectives

The objectives of this project are to:

- Determine which quality of life indicators are potentially impacted by aviation;
- Describe how quality of life impacts relate to the other Modules of the Airports Commission Appraisal Framework[11];
- Analyse available UK datasets to assess evidence on the impact of aviation on quality of life and draw conclusions on the extent to which the negative impacts of aviation compare with its positive impacts; and
- Provide an evidence base (relying on literature reviews and econometric analysis of UK datasets) with which the Airports Commission can assess the three main airport schemes under consideration.

As such, the work is designed to enable the Commission to assess how far and in what way each shortlisted scheme is expected: "To maintain and where possible improve quality of life for local residents and the wider population".

1.3 Scope

The scope of the project is limited to the three main airport schemes under consideration by the Airports Commission: these are one at Gatwick Airport and two at Heathrow Airport. The approach used, however, is intended to be capable of being applied generally.

In considering these issues, the project has considered the quality of life impacts of:

- Airport development;
- Airport operations;
- Connectivity (i.e. any effects on passengers from changes in the air transport services available to them); and
- Associated infrastructure (e.g. any surface access effects linked to airport development and operations).

This work is intended to make the best use of and, where possible, inform the Airports Commission's other appraisal Modules; it does not seek to duplicate analysis conducted in other Modules, for example the local

[10] Airports Commission, 'Appraisal Framework', 2014 (accessible at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf
[11] Ibid

economy Module. This means that some of the impacts covered, for example, as part of the sense of place, landscape and environmental are only analysed as far as they are relevant to quality of life

1.4 Report structure

The remainder of our report is set out in three further sections:

- **Section 2** defines what we mean by quality of life, identifies its key elements and develops a logic model which describes the linkages between aviation and quality of life based on a brief review of the available literature:
- **Section 3** describes our approach to empirical analysis of the impact of aviation on quality of life, in particular subjective wellbeing, based on the use of existing UK data sets and summarises the key results from our analysis:
- **Section 4** analyses the implications of the logic model and the results of the empirical analysis by considering how:
  - The impacts estimated in Section 3 can be valued;
  - The results of our work can potentially be used by the Airports Commission as part of its continuing work to appraise each of the shortlisted schemes; and
  - Our results can be used to inform thinking about how the negative impacts of aviation can be mitigated and the positive impacts enhanced.

A series of Appendices provides further details of our work and its results.

2 How aviation affects quality of life

2.1 Introduction

This Section uses the recent emerging academic literature and other evidence and studies to develop and populate a logic model which:

- Describes how aviation – specifically airport operations, airport development, connectivity and associated infrastructure – theoretically affects quality of life;
- Highlights those dimensions of quality of life which are potentially impacted; and
- Reviews the empirical evidence that is relevant to understanding the potential links between aviation (airports and airport expansions) and quality of life.

The analysis, which is largely technical, builds on HM Treasury's Green Book[12]. It also draws on the Organisation for Economic Co-operation and Development's (OECD) guidelines on measuring wellbeing[13] and the wellbeing economics literature.

Our analysis is set out in five parts. We start by explaining how we define quality of life in terms of subjective wellbeing and then explain how subjective wellbeing relates to other definitions of wellbeing used by the Office for National Statistics (ONS). We then explore the position of quality of life within the Airports Commission's Appraisal Framework. Finally, we explain the key elements of the logic model we have developed, summarise the existing evidence which we have used to inform the logic model and summarise the implications for the logic model.

2.2 Defining quality of life

Debate and research on quality of life has a long history in philosophy and the social sciences. It can be traced back to the Ancient Greeks, and the work of Aristotle and Epicurus, and was formally introduced in to policy evaluation by the Classical Utilitarians, such as Jeremy Bentham and John Stuart Mill.

Recent decades have seen a resurgence of wellbeing research and a strong drive to account more explicitly for wellbeing in policy decisions. This is exemplified by the growing number of national datasets containing wellbeing measures and national programmes such as the Measuring National Wellbeing Programme being run by the ONS and the OECD programme and consultation on subjective wellbeing. It also reflects a strong perceived alignment between quality of life and wellbeing. We note, however, that important challenges remain, for example in establishing the link between wellbeing and mental health[14].

2.2.1 Measures of wellbeing

Broadly speaking there are three ways of measuring people's wellbeing:

- **The desire satisfaction account** is based on the premise that we can infer welfare from people's choices because "what is best for someone is what would best fulfil all of his desires"[15]. Modern-day economic theory is based on this account of welfare (it is usually termed preference satisfaction in economics). In economics

[12] HM Treasury, The Green Book: Appraisal and Evaluation in Central Government, July 2011 (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf)
[13] OECD, OECD Guidelines on Measuring Subjective Wellbeing, 2013 (see http://www.oecd.org/statistics/Guidelines%20on%20Measuring%20Subjective%20Well-being.pdf)
[14] See, for example, the Chief Medical Officer's recent report published Sept 2014 (see https://www.gov.uk/government/publications/chief-medical-officer-cmo-annual-report)
[15] See Parfit, 1984

the 'information' that preferences reveal is called *utility*, which fundamentally refers to the notion of general welfare or wellbeing. Through preferences economists assess welfare from looking at people's choices and market behaviour.

- **The mental state account** refers to people's subjective experiences of their own wellbeing (subjective wellbeing), which is usually measured through self-reports in a survey. It looks at how the individual feels and thinks about his or her life. There is a large range of subjective wellbeing questions including questions on happiness, emotions, life satisfaction, worthwhile/purpose in life, sadness, anxiety and goal attainment. Each taps into different theoretical concepts of wellbeing (see Section 2.2.2 below). The key distinction in relation to the desire satisfaction account is that with preferences we look at what people want, but with subjective wellbeing we look at what makes people feel their lives are going better.
- **The objective list account** of welfare is based on assumptions about basic human needs[16]. Welfare is measured in terms of a set of pre-determined indicators such as mortality rates, health, and literacy rates. Policies and interventions are measured in terms of how they perform against these indicators (i.e. do they improve health or literacy rates etc.?).

A clear distinction between the objective list account on the one hand and the desire satisfaction account and the mental state account on the other is that the latter two accounts of welfare are subjective in that they reflect the views and feelings of individuals, whereas objective list accounts do not ask the individuals in question. The objectivity of this account comes from the fact that items on the list are claimed to be important to an individual's wellbeing *even* if he or she doesn't subjectively think so.

These three measures of wellbeing – although all essentially try to measure human welfare – can give divergent assessments of how a person's life is progressing. Hence, they may lead to different conclusions regarding the desirability of a policy intervention. For example, people may not always choose things that make them happy or more satisfied and items on an objective list account may not be things that people really desire or things that impact on self-reported wellbeing.

No consensus or convention exists on which wellbeing measure is 'right' – over 2,000 years of philosophical enquiry have not managed to solve this question. Given this, and the fact that different accounts of welfare measure different aspects of quality of life, it is, therefore, important that the impact of aviation is assessed using a variety of wellbeing indicators.

The above definitions of wellbeing are helpful for organising how to define, interpret and use quality of life in the context of airports and aviation. The trend in academic and policy discourse on aviation has focused on objective list measures and preferences, for example noise, health and GDP. There has been a lack of research on the implications of aviation for subjective wellbeing. This paper provides the first study to systematically evidence the impact of aviation on subjective wellbeing. As such, it contributes to the previous literature and debate on objective measures and preferences.

2.2.2 Subjective wellbeing

Subjective wellbeing can be assessed in three main ways.

- **Evaluative subjective wellbeing measures** refer to people's global assessments of their life or domains of their life. The most prominent measure is satisfaction with life. Evaluative measures like life satisfaction are made up of a balance of affect (positive and negative emotions and feelings) together with a cognitive assessment of how well one's life measures up to aspirations and goals[17]. A life satisfaction response will incorporate to some extent a retrospective judgement of one's life together with how one feels now[18].
- **Affective subjective wellbeing measures** tap into people's experiences at a specific time. Experience is closely associated with the hedonic mental state account of wellbeing, which depends entirely upon feelings held by the individual during some stated period of time. This is the Benthamite view of wellbeing, where wellbeing is conceived as the average balance of pleasure (or enjoyment) over pain, measured over the relevant period.

[16] See Dolan et al., 2011
[17] See Diener, 1984; Kahneman and Krueger, 2006
[18] See Kahneman and Krueger, 2006

- **Eudemonic subjective wellbeing measures** conceive of people as having underlying psychological needs, such as meaning, autonomy, control and connectedness[19]. These contribute towards wellbeing independently of any pleasure they may bring[20]. These accounts which draw from Aristotle's 'eudemonia' represent the state that all fully rational people would strive towards.

The breadth and complexity of the different subjective wellbeing measures means that they can produce differing conclusions about the impacts of projects (and, also, policy interventions). Evaluations and experience-based measures may sometimes produce similar results[21], but often they do not. For life satisfaction, it appears that unemployment is very bad, marriage is good and retirement is pretty good at least to start with[22], but data on affect have generally found weak associations between subjective wellbeing and these events[23]. Earlier research has found some discrepancies between those activities that people find 'pleasurable' rather than 'rewarding' or 'worthwhile'[24]. For example, time spent with children is relatively more rewarding than pleasurable and time spent watching television is relatively more pleasurable than rewarding.

There are, therefore, two dimensions over which quality of life assessments may diverge:

- At the meta-account level there will clearly be differences between what people want, what they experience and what we might rationally think is good for them. Thus, there will be differences *between* accounts.
- There will be differences *within* accounts as we may get different implications for what is good for one's quality of life even within one account like the differences between experience and evaluative measures in the mental state account discussed above. This would also be the case, say, for different definitions of preference in the desire satisfaction account.

There are pros and cons of each wellbeing measure. For instance, evaluative measures like life satisfaction include a retrospective element (which distinguishes them from affective wellbeing measures). This can be a problem if people do not always correctly remember past experiences[25]. People's current feelings can be influenced by contextual factors present at the time of the interview. This has implications for the interpretation of affective and evaluative measures of wellbeing[26]. Although affective measures are generally seen as being less susceptible to survey related biases, they face the problem of whether momentary measures such as happiness, are broad enough to capture a full evaluation of one's life[27].

In sum, the three subjective wellbeing categories represent a range of wellbeing outcomes. It is important, therefore, to assess aviation in respect to all of them to understand fully the relationship between aviation and wellbeing.

2.2.3 Key research questions

Our primary research aim is to contribute to the empirical evidence on the link between aviation and quality of life and to produce the first systematic study on the relationship between aviation and quality of life measured as subjective wellbeing. Our focus is on measuring impacts on evaluative, affective and eudemonic wellbeing to provide an in-depth analysis. An important aspect of our research is to interpret the results based on the latest research in psychology and philosophy to explain differences we may find across the different measures of subjective wellbeing.

Our research needs to be placed in the context of other measures of wellbeing, including the indicators detailed in the ONS' wellbeing wheel[28] and the Airports Commission Appraisal Framework Quality of Life module. We do this by developing a logic model which sets out the theoretical and evidenced links between aviation and wellbeing broadly defined.

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[19] See Ryff, 1989
[20] See Hurka, 1993
[21] See Blanchflower, 2009
[22] See Dolan et al., 2008
[23] See Knabe et al., 2010
[24] See White and Dolan (2009)
[25] See Kahneman, 2000
[26] See Schwarz and Strack, 1999
[27] See Loewenstein and Ubel, 2008
[28] See http://www.neighbourhood.statistics.gov.uk/HTMLDocs/dvc146/wrapper.html

2.2.4 *Subjective wellbeing and the ONS's Measures of National Wellbeing*

Figure 2 illustrates conceptually how we see subjective wellbeing, which is the focus of our analysis, relating to the ONS' Measures of National Wellbeing. We link the outcomes in our logic model directly to the Measures of National Wellbeing although some measures (e.g. governance) are not really relevant to airports. Nonetheless, the logic model uses the broad structure of the model in Figure 2 to show how airports impact ultimately on overall quality of life.

Figure 2: Mapping quality of life to personal wellbeing and the ONS' Measures of National Wellbeing

2.3 *Positioning quality of life in the Airport Commission's Appraisal Framework*

2.3.1 *Introduction*

In examining how quality of life and, in particular, subjective wellbeing fit within the Airports Commission Appraisal Framework, we consider two key questions:

- How do the outcomes covered in other Appraisal Framework Modules relate to quality of life as we have defined it?
- How can quality of life outcomes, in particular those related to subjective wellbeing, be considered alongside those from other Modules?

In its Appraisal Framework[29], the Airports Commission notes that quality of life is affected by impacts arising in other Modules in its Appraisal Framework, such as transport connectivity, employment, noise, pollution and congestion. Accordingly, the Commission asked the developers of all proposed airport schemes to "look at the key, airport-sensitive determinants of quality of life, drawing together the detailed assessments undertaken in other parts of the Framework to provide an overview of the impacts on quality of life"[30]. Quality of life, therefore, does not stand alone from other types of impacts, such as those related to noise or traffic.

The potential links between the different Appraisal Framework Modules raise the question of how outcomes from the quality of life and other Modules can and should be combined. This part of the section outlines the theoretical links between quality of life (as defined in the previous part of the section) and the Appraisal Framework Modules to develop a coherent view of the conceptual links between airport expansion and different quality of life measures.

[29] Ibid
[30] Ibid

Box 1: How the airport schemes define and assess quality of life

What the Airports Commission Appraisal Framework asked for

As part of its objective to "maintain and where possible improve the quality of life for local residents and the wider population", the Airports Commission Appraisal Framework asks schemes to:

- Synthesise and summarise impacts on quality of life captured elsewhere in the Framework; and
- Show the impact on a selection of quality of life indicators for a range of stakeholder groups.

The Airports Commission Appraisal Framework suggests the following broad steps for this assessment:

- Select quality of life indicators most like to be sensitive to airport development, with reference to the ONS's Measures of National Wellbeing;
- Establish empirical links between aspects of airport development and the selected indicators; and
- Assess impacts on selected quality of life indicators based on scheme-specific features.

In sum, the Airports Commission Appraisal Framework Quality of Life Module asks schemes to "present all of the Commission's analysis pertaining to quality of life in one area [...] to explain, in a uniform, understandable manner, how an airport proposal may improve or detract from the quality of life of key stakeholder groups."

The Airports Commission Appraisal Framework notes that subjective wellbeing measures from the ONS Annual Population Survey could (but need not necessarily) be key pieces of data. The Framework notes two potential uses:

- Subjective wellbeing of stakeholder groups as an end in itself, seen as a key aspect of quality of life; and/or
- Subjective wellbeing as a common currency for determining relative impacts of different objective wellbeing indicators.

How the proposals assess quality of life impacts

The Heathrow proposal contains a specific chapter for quality of life. This draws together evidence including on the local economy, noise, community and air quality, plus additional narrative on health impacts and on gross benefits to be provided to the local community, including monetary compensation and local services. However, although many features of the Airports Commission Appraisal Framework's guidance are touched upon, the chapter does not set out an explicit synthesis of quality of life impacts[31] against a set of consistent indicators, so it is not easy to draw an overall picture of how the balance of different beneficial and adverse impacts on quality of life lies across different stakeholder groups.

The Gatwick proposal also has a specific chapter for quality of life. This chapter defines quality of life with a definition from the World Health Organisation and draws explicitly on the ONS Measuring Wellbeing Programme's wellbeing domains, with a particular focus on links with health. It identifies aspects of the proposed scheme that may affect quality of life and stakeholder groups that may be affected (including community profile), and provides qualitative discussion of how outcomes identified in other Modules may affect these indicators. The chapter provides a summary of which aspects of airport development may affect which groups of people through which wellbeing domains and outcomes. But, the analysis of impacts consists of qualitative discussion rather than measurement against specific indicators so that, while the main expected impacts are summarised and synthesised, it is not easy to reach an overall quantitative conclusion of how the balance of different beneficial and adverse impacts on quality of life lies across different stakeholder groups.

Heathrow Hub's proposal, unlike those for Gatwick and Heathrow, does not have a dedicated chapter for quality of life. Instead, it refers readers to chapters on the strategic case and mitigation strategies. These include analysis of economic and environmental impacts and mitigation, but do not specifically mention quality of life. The implications for quality of life are not drawn out and summarised as described above, so it is not easy to reach an overall conclusion of how the balance of different beneficial and adverse impacts on quality of life lies across different stakeholder groups.

In the initial proposals of Heathrow, Gatwick and Heathrow Hub, the full range of expected impacts are not always fully described or summarised in a way that provides a coherent synthesis of effects on quality of life. In addition, quality of life itself is not generally clearly defined with assessment against key performance indicators linked to back to this definition. The nature of quality of life assessment also varies between the three proposals. Overall, therefore, it is not easy to compare the quality of life impacts of the three schemes on the basis of the proposals against a set of comparable metric. In the context of this report, none of the proposals conduct an analysis of impact on subjective wellbeing.

[31] Impact, in this sense, requires that effects on quality of life are defined relative to a counterfactual (i.e. what would have happened anyway)

2.3.2 The outcomes in the Airports Commission Appraisal Framework

First, we need to understand the expected potential outcomes of each of the Appraisal Framework Modules.

The Airports Commission Appraisal Framework defines 16 Appraisal Modules. Each Module refers to key criteria against which the three airport schemes shortlisted by the Commission will be assessed. Each is associated with a number of key outcomes – effects that airport expansion is expected to have on the local and national population. These are summarised in Table 2[32]. We note that the analysis is an indication of likely key outcomes based on the Airports Commission Appraisal Framework rather than an exhaustive list of outcomes.

The outcomes relating to each Appraisal Framework Module in Table 2 are assessed below in terms of how they map to the ONS quality of life domains and indicators introduced in Section 2.2.

Table 2: Summary of Appraisal Framework Modules, objectives and likely outcomes

#	Appraisal Framework Module	Objectives#	Key outcomes (indicative)+
1	Strategic fit	• Provide additional capacity and connectivity in line with the assessment of need • Improve the experience of passengers and other users of aviation	• Change in air travel volume • Change in quality of passenger experience
2	Economy impacts	• Maximise wider economic benefits including supporting the competitiveness of the UK economy	• Net change in GDP /employment
3	Local economy impacts	• Promote employment and economic growth in the local area and surrounding region	• Net change in local / regional GDP/employment
4	Surface access	• Maximise the numbers of travellers arriving at the airport on public transport • Accommodate the needs of other users of transport networks, such as commuters, intercity travellers and freight • Enable access to the airport from a wide catchment area	• Change in transit times for airport and other travellers • Change in access to the airport
5	Noise	• Minimise noise impacts	• Change in noise impacts
6	Air quality	• Protect local air quality	• Change in local air quality
7	Biodiversity	• Protect natural habitats and maintain biodiversity	• Change in extent and quality of habitats • Change in biodiversity
8	Carbon	• Minimise carbon emissions in airport construction and operation	• Change in greenhouse gas emissions
9	Water and flood risk	• Protect the quality of surface and ground waters, use water resources efficiently and minimise flood risk	• Change in flood risk • Change in water availability • Change in water quality
10	Place	• Minimise impacts on existing landscape character and heritage assets	• Change in landscape character • Change in nature of heritage assets
11	Quality of life	• Maintain and where possible improve the quality of life for local residents and the wider population	• Change in subjective wellbeing (see Section 2.2, above)

[32] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf

#	Appraisal Framework Module	Objectives#	Key outcomes (indicative)+
12	Community	• Manage and reduce the effects of housing loss on local communities • Reduce or avoid disproportionate impacts on any social group	• Loss of housing • Inequality of impact
13	Cost and commercial viability	• Affordable and financeable, including any public expenditure that may be required and taking account of the needs of airport users	• Financial cost
14	Operational efficiency	• Ensure individual airport and airports system efficiency • Build flexibility into scheme designs • Meet industry safety and security standards	• Financial cost • Change in level of safety • Change in level of security
15	Operational risk	• Enhance individual airport and airports system resilience	• Continuity of air capacity
16	Delivery	• Have the equivalent overall capacity of one new runway operational by 2030 • Actively engage local groups in scheme progression, design and management	• N/A – covered in other outcomes above

2.3.3 The links between quality of life and other Appraisal Framework Modules

As discussed in Section 2.2 and shown in Figure 2, the ONS has defined 41 Measures of National Wellbeing which it has grouped in 10 categories. The Personal Wellbeing category captures aspects of overall subjective wellbeing and the remaining nine capture specific other aspects of wellbeing.

To understand how the Appraisal Framework Modules may reflect quality of life, we have mapped the 36 Measures of National Wellbeing indicators from each of these nine categories (i.e. excluding those linked to Personal Wellbeing) against the Appraisal Framework Modules using the key indicative outcomes suggested in Table 2. Our mapping is shown in Table 3. We exclude those Appraisal Framework Modules which are more closely focused on operational and financial aspects[33], as well as Quality of Life (11). We focus on the direct effects. The indicative effects of Appraisal Framework Module outcomes on Measures of National Wellbeing are shown with an *X*.

As Table 3 shows, all the non-operational focused Appraisal Framework Modules map to one or more ONS Measures of National Wellbeing. In addition, all those in Table 3 except Carbon may be expected to affect one of the subjective wellbeing measures that are the focus of this report. For the purposes of this report, we treat these as the relevant Appraisal Framework Modules for defining outcomes that may affect quality of life.

[33] These are: Strategic fit (1), Cost and commercial viability (13), Operational efficiency (14), Operational risk (15), and Delivery (16)

Table 3: Indicative effects of Appraisal Framework Module outcomes on ONS Measures of National Wellbeing

			Appraisal Framework Modules									
			Economy impacts (2)	Local economy impacts (3)	Surface access (4)	Noise (5)	Air quality (6)	Biodiversity (7)	Carbon (8)	Water and flood risk (9)	Place (10)	Community (12)
ONS Measures of National Wellbeing	Our relationships	Satisfaction with family life										
		Satisfaction with social life										
		Someone to rely on										
	Health	Healthy life expectancy at birth		X		X	X					X
		Illness and disability		X		X	X					X
		Satisfied with health		X		X	X					X
		Mental ill health		X		X	X					X
	What we do	Unemployment rate	X	X								
		Satisfaction with job	X	X								
		Satisfaction with leisure time	X	X	X							
		Volunteering										
		Engagement with arts/culture										
		Sports participation										
	Where we live	Crimes against the person										
		Safe walking after dark										
		Accessed natural environment				X		X			X	X
		Neighbourhood belonging		X								X
		Transport access to services		X	X							X
		Satisfaction with accommodation		X		X				X		

		Appraisal Framework Modules									
		Economy impacts (2)	Local economy impacts (3)	Surface access (4)	Noise (5)	Air quality (6)	Biodiversity (7)	Carbon (8)	Water and flood risk (9)	Place (10)	Community (12)
Personal finance	Less than 60% median income		X								X
	Median household wealth	X	X								
	Median household income	X	X								
	Satisfaction with income	X	X								
	Reported difficulty with finances	X	X								
Economy	Real net national income per head	X	X								
	Public sector net debt										
	Inflation										
Education and skills	Human capital	X	X								
	Five or more GCSEs										
	No qualifications										
Governance	Voter turnout										
	Trust in Government										
Natural environment	Greenhouse gas emissions							X			
	Protected areas in the UK						X				
	Renewable energy consumption					X		X			
	Recycling rates							X			

2.4 The theoretical view – a logic model

2.4.1 What is a logic model?

A logic model describes "the relationship between an intervention's inputs, activities, outputs, outcomes, and impacts" [34]. These key components are defined in the context of the airport expansion schemes shortlisted by the Commission in Table 4.

Table 4: Key components of a logic model

Section	Definition in the context of the Airport Commission
Inputs	Resources required to achieve the policy objective of building additional runway capacity in South East England
Activities	Construction of additional runway and supporting infrastructure (including surface access)
Outputs	What would be delivered by each airport if selected (principally increased air traffic movements)
Outcomes	The intermediate outcomes that would be produced by each airport if selected (e.g. more passenger and freight movements, improved accessibility/connectivity) The final outcomes that would arise from the intermediate outcomes
Impacts	Wider economic, social and environmental outcomes

Based on HM Treasury (2011) The Magenta Book: Guidance for Evaluation

At present, only limited evidence and other literature exists on the relationship between aviation and wellbeing. The advantage of developing a logic model (compared to a standard literature review), therefore, is that the theory and evidence needed to assess the potential impacts of airport development does not all need to come solely from airport-related studies. Instead, the focus is on understanding each of the expected links in the relationships between the effects of airport development and quality of life.

2.4.2 Derivation of a logic model linking airport development to quality of life

To develop the logic model, we have mapped the theoretical and empirical links between:

- The different aspects of airport development, including the construction, operation and wider connectivity and surface access provided;
- The environmental, social and economic changes these might be expected to generate; and
- Quality of life as we have defined it.

In theory, airport developments can affect quality of life in many ways. Yet, for the logic model to be useful in assessing each of the proposed airport schemes, it needs to focus on the linkages which are expected to be most material. It also needs to be aligned with the empirical analysis conducted as part of this report which focuses on how airports affect subjective wellbeing which is a core part of the quality of life[35].

To help identify the most material linkages, we have used the Airport Commission's initial assessment of the likely outcomes of the different stages of airport development to structure our logic model. We have also focused on how subjective wellbeing is affected by airport expansion in the logic model. We have then tested the logic model against the published literature (see Section 2.5, below).

[34] HM Treasury (2011) The Magenta Book: Guidance for Evaluation (p21)
[35] OECD (2013) Guidelines on Measuring Subjective Wellbeing

Our logic model uses a bottom-up structural approach to subjective wellbeing whereby domain level wellbeing explains overall wellbeing[36]. For example, leisure satisfaction and home satisfaction drive life satisfaction. Structural theories of subjective wellbeing focus mainly on evaluative measures of wellbeing (i.e. explaining life satisfaction from domain level satisfaction). This means that this structure is most relevant to evaluative wellbeing measures and, possibly, to eudemonic wellbeing too. But we use the broader term 'domain wellbeing' in the logic model to provide a more generalisable approach as there is some evidence that domain satisfaction also drives affective measures of wellbeing [37]. Most empirical tests are consistent with the bottom-up approach to subjective wellbeing[38]. We have followed this example noting that while these domains describe what life satisfaction consists of for the purpose of the logic model, other classifications are possible.

This basic structure of our logic model is described in Table 5, and shown in Figure 3.

Table 5: Defining the structure of the quality of life logic model

Section	Definition in the context of the Airport Commission[39]	Interpretation in context of quality of life
Inputs	Resources required to achieve the policy objective of building an additional runway in South East England	• Any necessary financial support • Any relevant planning and regulatory consents
Activities	How each airport would use the resources if selected	
Outputs	What each airport would deliver with the resources provided if selected	Consideration needs to be given to four elements of the airports' plans[40]: • Airport development • Airport operations • Provision of connectivity • Provision and operation of associated infrastructure We have, therefore, used these elements to categorise and structure the outputs which may impact on quality of life. A detailed exploration of all the specific outputs is beyond the scope of this report, which instead focuses on the links between outcomes and impacts (see below).
Outcomes	The intermediate and final outcomes that would be produced by each airport if selected	Through its Appraisal Framework Modules, the Airports Commission has defined what it sees as the relevant outcomes that may be achieved by each of the airports. As discussed in Section 2.3, some are likely to be particularly relevant to quality of life: • National economy • Local economy impacts • Surface access • Noise • Air quality • Biodiversity • Water and flood risk • Place • Community The expected key outcomes related to each Module are described in Table 2 (above).

[36] See Schimmack, 2008
[37] See Schimmack, 2008
[38] See Schimmack, 2008
[39] Based on Schimmack, 2008
[40] Airports Commission (2014), Quality of Life/Wellbeing Project ID Document

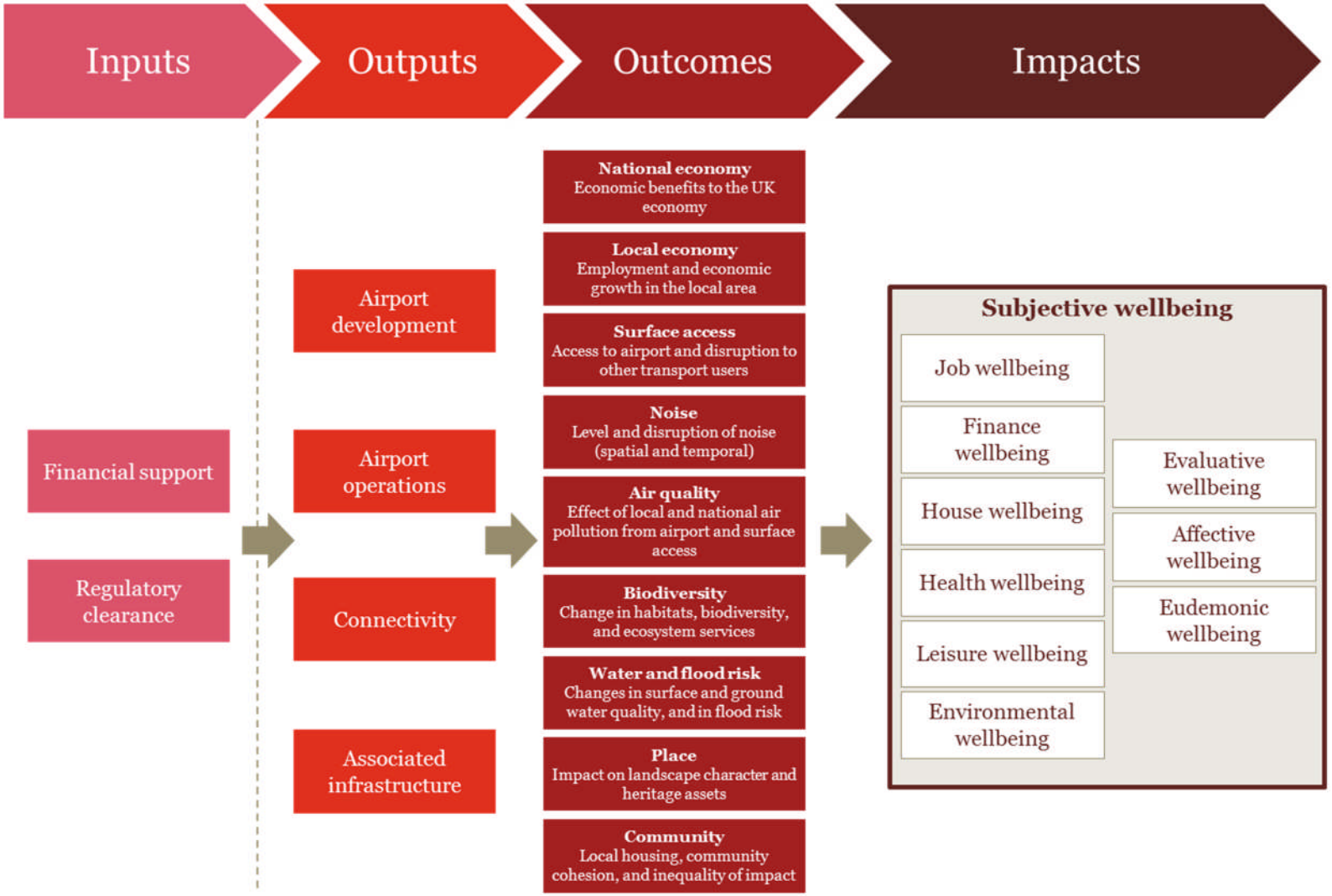
Section	Definition in the context of the Airport Commission[39]	Interpretation in context of quality of life
Impacts	The wider economic, social and environmental outcomes	The impact of interest is the potential change in the quality of life. The Airports Commission notes a number of sources of data with which to measure quality of life. At a conceptual level, however, Van Praag et al (2003) note the following categories: job satisfaction, financial satisfaction, house satisfaction, health satisfaction, leisure satisfaction, and environmental satisfaction[41]. Other classifications are possible based on the literature[42]. Together these contribute to overall subjective wellbeing, as discussed and defined in Section 2.2. In our analysis, the key outcomes of interest are evaluative subjective wellbeing, affective subjective wellbeing and eudemonic subjective wellbeing.

Source: PwC analysis

It is important to understand how aspects of physical and mental health fit within this framework since these have been cited as significant considerations in the Airports Commission's consultations to date. Essentially, our framework captures health effects as potential outcomes which part of those Modules most clearly linked to quality of life (e.g. national and local economy, air quality and noise).

[41] Cited by OECD (2013) Guidelines for Measuring Subjective Wellbeing
[42] Ibid

Figure 3: Structure of quality of life logic model – mapping airport schemes to subjective wellbeing



2.5 Populating the logic model – the empirical evidence in the existing literature

2.5.1 Approach to selective literature review

Having defined the basic theoretical and conceptual structure of our logic model, we conducted a review of the limited literature to identify evidence of links between each Appraisal Framework Module and subjective wellbeing. We had two main aims:

- To refine and, where applicable, support the expected links in the logic model; and
- To provide more detailed information on the links identified through the refined logic model.

Although the literature is still developing (and limited), our review has also been limited. We have sought to identify the key pieces of evidence and provide an initial assessment of their status in relation to our logic model. We have followed a three-step process:

- **Review of reviews:** Identification of recent literature reviews of the determinants of subjective wellbeing;
- **Snowballing:** Identification of further details from the literature where not available in the reviews based on a 'snowballing' technique[43]; and
- **Gap analysis:** Identification of key gaps between the expected theoretical links (Section 2.5, above) and the evidence gathered, and specific searches targeted at those gaps.

We have not been able to complete an overall assessment of the strength of the evidence. Below, we summarise the key conclusions which have emerged from our literature review.

2.5.2 Summary of evidence supporting the logic model

Our review has identified those factors affecting subjective wellbeing that are also likely to be affected by airport expansion via one or more of the Airports Commission Appraisal Framework Modules identified as most potentially relevant in Section 2.2. We summarise the key links we have found in Table 6.

Table 6: Summary of evidence linking key Airports Commission Appraisal Framework outcomes to subjective wellbeing

#	Appraisal Framework Module	Key outcomes (indicative)*	Evidence found?#
2	National economy	• Income/employment	✓ ✓
3	Local economy	• Income/employment	✓ ✓
4	Surface access	• Transit times for airport and other travellers • Traffic externalities • Access to the airport	✓ ✓ ✗
5	Noise	• Impact on health • Impact on sleep • Impact on communities • Impact on amenity	✓ ✓ ✓ ✓
6	Air quality	• Impact on physical health • Impact on amenity	✓ ✓
7	Biodiversity	• Extent and quality of habitats • Biodiversity	✗ ✗

[43] 'Snowballing' means identifying key pieces of literature based what is cited by another piece of literature, in this context starting with the 'review of reviews' described above

#	Appraisal Framework Module	Key outcomes (indicative)*	Evidence found?#
9	Water and flood risk	• Flood risk • Water availability • Water quality	✗ ✓ ✗
10	Place	• Landscape character and physical environment • Access to high quality recreational sites • Change in nature and setting of heritage assets	✓ ✓ ✓
12	Community	• Loss of housing • Inequality of impact • Change in social environment	✗ ✗ ✓

** PwC Analysis; see Details of evidence (below) and Table 2 (above).*

 # PwC Analysis; see Details of evidence (below).

2.5.3 Details of evidence

This part of the Section discusses the evidence summarised in Table 6, showing how it links to the logic model.

National economy

Two key economic metrics at a national level are income and employment. We found evidence on the relationship between both of these metrics and subjective wellbeing.

Income is well known to affect subjective wellbeing. Within countries, individual income and life satisfaction are positively related at any one point in time (i.e. using cross-sectional data)[44]. However, there is also evidence of diminishing marginal subjective wellbeing from income within a country[45]. Put simply, the same amount of money will provide more subjective wellbeing to a poorer person than it will to a rich person. If airport expansion increases individuals' incomes, this evidence suggests that it will raise their wellbeing. Similarly, if it decreases the incomes of other individuals, it can be expected to reduce their wellbeing. But, it also suggests that these positive and negative effects will both be greater when felt by poorer people.

However, this relationship is not about money alone. Firstly, there is evidence that it is not only absolute but relative income that affects subjective wellbeing, suggesting that at least some of the benefit of income is related to perceived status[46]. This suggests that inequality is also important. Secondly, perceived financial status, expectations and aspirations also affect subjective wellbeing[47], showing the relationship is not completely straightforward. This implies that any beneficial or adverse wellbeing effects of airport expansion on incomes is moderated by how people think about their income – in terms of how it compares with other people locally or nationally, how it relates to their aspirations, and how it changes their thinking about the future.

Any changes in income due to airport expansion may be expected to affect a wider set of stakeholders than only the people employed – their families may also experience changes in wellbeing. For example, there is evidence that lower household income may reduce children's wellbeing[48].

In addition to income, employment and unemployment are significant factors in a person's subjective wellbeing. Many empirical studies find a strong negative effect on subjective wellbeing from unemployment, in both national and international datasets[49]. There is some evidence that this may be related to concerns over future finances. There is also some evidence that this negative effect can persist for years after a formerly unemployed person has found work[50]. Given that unemployment is can be associated with poor physical and/or

[44] See Kahneman and Deaton (2010) and Layard et al. (2010)
[45] See Sacks et al. (2010) and Di Tella et al. (2010)
[46] See Van Praag and Ferrer-i-Carbonell (2010)
[47] See Clark et al. (2007)
[48] See Tomlinson et al. (2008)
[49] See Blanchflower & Oswald (2011)
[50] See Dolan et al. (2008)

mental health, it may have additional second order effects on subjective wellbeing[51]. If airport expansion increases employment at the national level, it is therefore likely to increase subjective wellbeing overall.

The effect of unemployment on subjective wellbeing, however, varies depending on individual circumstances: there is some evidence that any effect can be mitigated social legitimacy of unemployment in a person's community and the presence of supporting networks and relationships, as well as the availability of alternative activities for the unemployed to participate in[52].

There is also some evidence that increases in national and/or regional unemployment rates reduce subjective wellbeing[53]. But, at the same time, high national unemployment rates can mitigate the reduction in wellbeing felt by individual unemployed people[54]. This suggests that if airport expansion increases national or regional employment, it may raise the population's overall average level of subjective wellbeing. But, this may come at the expense of making some individuals feel more marginalised.

Local economy

The key economic metrics for local economic impacts of airport expansion are the same as for the national economy: income and employment. The same evidence based as described above for national economy is, therefore, relevant to the assessment of local economic impacts, so is not repeated here. The issue in interpreting the evidence, however, is that airport schemes may create winners and losers if spatial disparities change.

The evidence above suggests that, all else being equal, in subjective wellbeing terms the poor stand to benefit the most from any rises in their incomes, and at the same time lose the most from any reductions in income. At the local level, any changes in employment patterns are likely to have a significant impact on relative wellbeing of different groups or communities.

Surface access

The effect of airport expansion options' surface access strategies on travel time and congestion for other transport network users has the potential to have a significant impact on wellbeing. There is strong evidence that commuting is generally associated with a negative effect on wellbeing experienced in the moment (known as 'affect') and a reduction in life satisfaction[55]. This implies that any disruption to transport users will reduce their momentary wellbeing, and any persistent increases in journey times are likely to negatively impact people's overall wellbeing, at least for commuter journeys.

The Airports Commission Appraisal Framework identifies transport mode, specifically public transport, as an objective for airport expansion schemes. We have not identified systematic research on the relationship between different modes of transport and wellbeing. Yet, there is some evidence that suggests that public transport improvements may enhance wellbeing if they lead to social contact between members of a community[56]. This may imply that local public transport for local communities around the airport is both important to maintain and, if there is significant transport to the airport for work in some communities, public transport could have some wellbeing benefits.

Most of the research on the external effects of traffic on subjective wellbeing focuses on the effects of noise pollution. In one study, a substantial reduction in road traffic was found to greatly reduce annoyance and activity disturbance, increasing subjective wellbeing[57]. The effects of noise on subjective wellbeing are outlined in greater detail below.

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[51] Ibid
[52] Ibid
[53] See Luechinger et al. (2010)
[54] See Shields and Price (2003)
[55] See Kahneman et al. (2004) and Stutzer and Frey (2005, 2008)
[56] See Abdallah and Johnson (2008)
[57] See Ohrstrom (2004)

Noise

The Airports Commission has already undertaken research on the impacts of noise on people affected, for example in terms of health or annoyance (see Box 2)[58]. Noise may also affect subjective wellbeing.

Box 2: Summary of Airports Commission report on noise

In July 2013 the Airports Commission published their Discussion Paper 05 on Aviation Noise which provided a review of existing research and literature on airport noise, as well as open up a number of key issues for debate. Noise is a central issue for the Airports Commission, both in its assessment of options to make better use of existing airport capacity and in considering proposals for new infrastructure, so a comprehensive assessment of what airport noise is, how to define it, measure it and assess the impacts, as well as analyse mitigation strategies is important. In the context of the International Civil Aviation Organisation (ICAO)'s Balanced Approach to Noise Management and the EU's Operating Restrictions Directive, the aim is to ensure that airport noise is addressed in the most cost-effective manner, by requiring airports to explore in turn: noise reduction at source; land use planning and management; operational procedures to mitigate noise; and finally, operating restrictions. This hierarchy of mitigation options is important to bear in mind when considering how to minimise the noise-related quality of life impacts related to additional airport capacity.

Source: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223764/airports-commission-noise.pdf

In general terms, there is evidence that noise pollution reduces subjective wellbeing[59]. In terms of aircraft noise specifically, one Dutch study found that aircraft noise reduced the life satisfaction of inhabitants, but that this was partly compensated by lower rents and house prices[60]. The impact on life satisfaction was also lower if households had noise insulation. This suggests that the well documented effects of noise are reflected in people's subjective wellbeing – where airport schemes increase noise pollution they can be expected to reduce subjective wellbeing. However, we did not find evidence clearly distinguishing between, for example, the marginal effect of noise at different ambient noise levels. This is explored further in our own analysis which is described in Section 3.

There is also some limited evidence that noise may impact people's behaviour with knock-on effects on wellbeing: one study found that people spoke more on the street in quieter areas[61].

Where noise affects sleep, this may be expected to affect wellbeing. Sleep problems are associated with lower life satisfaction, lower happiness and a reduction in other measures of subjective wellbeing[62]. In addition, optimum sleep levels are associated with positive benefits to most measures of subjective wellbeing[63]. If airport schemes change noise patterns such that sleep quality is reduced (or improved) this can be expected to affect subjective wellbeing.

The specific impact of noise from traffic on subjective wellbeing is outlined in the section on surface access above. Noise may also affect psychological health; the link between the latter and subjective wellbeing is described in air quality (see below).

Air quality

There is some evidence that higher concentrations of air pollutants in areas reduce residents' subjective wellbeing[64]. This general impact may be linked to health effects but also other aspects such as the amenity value of clean air. We did not find conclusive evidence separating these effects on subjective wellbeing. Nonetheless, air pollution from airport development, operation and access, including traffic, may affect quality of life.

[58] Airports Commission (2013) Discussion Paper 05: Aviation Noise. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/223764/airports-commission-noise.pdf
[59] See Dolan et al. (2008)
[60] See Van Praag and Baarsma (2005)
[61] See Hart and Parkhurst (2011)
[62] See Kahneman et al. (2004)
[63] See Steptoe et al. (2008)
[64] See, for example, Frey et al. (2010) and Luechinger and Heinz Welsch

More specifically, air quality is closely related to health. Individuals' self-reported and objective health are both linked to subjective wellbeing[65]. Whilst the two health metrics are closely related, self-reported health appears to have the stronger relationship with subjective wellbeing[66]. In addition, specific conditions, including strokes and heart attacks, are known to affect subjective wellbeing[67]. Some care is needed, however, in interpreting this result as the strength of the link is also partly due to the fact that both measures are self-reported and, hence, use the same cognitive processes. Self-reported measures tend to correlate quite strongly. Similarly, psychological health has a very strong relationship with subjective wellbeing – more so than physical health[68].

Biodiversity

We have found limited evidence of a direct link between biodiversity and subjective wellbeing. But there is some evidence of a link between biodiversity and preferences (using desire satisfaction as the account of welfare): for example, contingent valuation studies show that people want and value biodiversity. Preferences are also known to be correlated with subjective wellbeing (especially with life satisfaction). However, there may be closely related or second order effects of changes in habitats and biodiversity that, in turn, affect subjective wellbeing. Some examples can be seen in the section on place below.

Water and flood risk

We did not identify any significant evidence showing a clear direct link between water and flood risk and subjective wellbeing[69]. However, they may be second order effects of changes in flood risk and water quality and availability, such as those on health, which may in turn affect subjective wellbeing.

Place

There is evidence that natural landscapes may be better for subjective wellbeing that urban ones[70]. For example, walks in natural landscapes appear to have a stronger positive effect on the ability to concentrate than urban walks and the psychological health benefits of jogging in an urban park are reported as greater than those of street jogging[71]. To the extent that airport expansion leads to changes in the local landscape character or access to certain local landscapes for individuals, these may affect subjective wellbeing. There is also evidence of a significant link between heritage and wellbeing[72].

If this affects the ability of individuals to participate in physical activity, there may be a further impact. Similarly, any effects on physical or psychological health are likely to affect subjective wellbeing as described above.

Community

Strong social networks and time spent socialising lead to greater subjective wellbeing[73]. There is the possibility, therefore, that social or community disruption due to airport expansion may reduce quality of life for some individuals. There may also be effects that encourage or discourage these social activities – such as the effect of noise on socialising noted above.

2.6 Logic model – summary

Our research has shown that there is a significant amount of evidence which links the outcomes of airports implied by the Airports Commission Appraisal Framework to subjective wellbeing. With the exceptions of Biodiversity, Water and flood risk and, to an extent, Community, we have found evidence which links airports to the key Airports Commission Appraisal Framework outcomes and then to subjective wellbeing.

It has also revealed that there are several significant weaknesses:

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[65] See Dolan et al. (2008)
[66] *Ibid*
[67] See Shields and Wheatley Price (2005)
[68] See Diener and Seligman (2004)
[69] See Carroll et al
[70] See Staats and Hartig (2004)
[71] See Hartig et al. (2003) and Bodin and Hartig (2003)
[72] See Fujiwara et al (2014, forthcoming)
[73] See Watson et al. (2010); Dolan et al. (2008)

- Some important outcomes from the Appraisal Framework Modules such as Community, where a theoretical link with subjective wellbeing was expected but no empirical evidence was found, may warrant further theoretical or empirical investigation; and
- Many of the factors from the academic literature that affect subjective wellbeing are not directly related to airports and airport expansion which adds to the uncertainty around the likely impacts of airport developments: for example, small changes in factors such as the level of social interaction may have significant effects on the wellbeing of individuals since individual characteristics and psychological health are known to affect subjective wellbeing[74].

In both cases, the main theoretical links could be supplemented with a more comprehensive literature review to explore the relationships in more detail.

[74] See Dolan et al. (2008)

3 Subjective wellbeing analysis

3.1 Introduction

This Section describes our analysis of the impact of aviation – specifically airports – on subjective wellbeing. Our empirical analysis is intended to support the logic model developed in Section 2. It applies the approach suggested by the Airports Commission in the Quality of life Module.

We use data from two large and complementary UK datasets (the Annual Population Survey (APS) and Mappiness), both of which contain questions on wellbeing, to analyse the potential links between each of the following aviation factors and subjective wellbeing:

- Proximity to airports;
- Aviation noise;
- Working in airports; and
- Being at airports.

The APS data can be used to assess the effects of living near airports on subjective wellbeing (evaluative, affective and eudemonic). The Mappiness data link individuals' geographic positions to their wellbeing at the time they provide the data. This means they can be used to shed light on how being near or inside airports impacts on how people feel at the time (covering both people who live near or far from airports). The two datasets, therefore, answer fundamentally different research questions about the relationship between airports and subjective wellbeing. As such, they provide new evidence that can be used to build up a holistic assessment of this relationship. Specifically, our analysis in this Section generates new evidence about:

- The effect of living near airports on evaluative, affective and eudemonic wellbeing (APS);
- The effect of living in airport noise contours on evaluative, affective and eudemonic wellbeing (APS);
- The effect of being near an airport on affective wellbeing (at the time of the survey) (Mappiness);
- The effect of being in an airport noise contour on affective wellbeing (at the time of the survey) (Mappiness);
- The effect of working in an airport on affective wellbeing (Mappiness); and
- The effect of being in an airport (leaving/departing/picking up or dropping off people for non-work reasons) on affective wellbeing (Mappiness).

For data reasons, our analysis relates only to the main airports in England. Nonetheless, it provides new evidence regarding the link between aviation and quality of life as measured in terms of subjective wellbeing since these data have not been used to assess these research questions before.

The Section starts by describing the two data sets which we have used and then explains the analysis we have undertaken with each one. Finally, we summarise the key results of our analysis, commenting on both the direction and scale of the impacts we have found and their potential limitations. Further details of our findings can be found in Appendix D, which deals with the APS analysis, and Appendix E, which deals with the Mappiness analysis.

3.2 Data

3.2.1 Annual Population Survey

The APS is a combined statistical survey of households in Great Britain, which is conducted quarterly by the ONS. It incorporates results from the Labour Force Survey, which provides a wealth of data on employment status. The APS is a repeated annual cross-sectional survey of approximately 155,000 households and 360,000 individuals. Since 2011 it has contained the four ONS wellbeing questions and, hence, we have used waves 2011-2012 and 2012-2013 (the latest available wave) in our analysis.

We assess the following five wellbeing measures:

- **Life satisfaction:** "Overall, how satisfied are you with your life nowadays?"
- **Worthwhile:** "Overall, to what extent do you feel the things you do in your life are worthwhile?"
- **Happiness:** "Overall, how happy did you feel yesterday?" (Affective wellbeing)
- **Anxiety:** "Overall, how anxious did you feel yesterday?" (Affective wellbeing)
- **Positive affect balance (PAB):** We generate an affective balance indicator as (Happiness-Anxiety).

Each of these indicators is measured on a scale of 0 to 10 where 0 = '*not at all*' and 10 = '*completely*': the PAB measure is on a scale of -10 to +10.

All the measures are single item measures which – although they have their limitations – have been derived following a consultation process involving leading academics sand the UK public.

We note that affective subjective wellbeing measures are, in theory, measured at different points during the day using the Experience Sampling Method (ESM) or the Day Reconstruction Method (DRM) and relate experiences to specific activities and time points. The APS is a large population sample surveyed at certain points during the year and is not able to repeatedly ask respondents during the day. As an alternative the APS survey 'replicates' the ESM by asking respondents for their experiences and feelings relating to a whole day (yesterday).

The geographical location data (including postcodes, Local Super Output Area (LSOA) and Census Output Code in the APS) were used to combine the data with Defra-compiled noise measurement maps from airport operators in England[75]. This captures aviation impacts at two levels:

- The proximity of an individuals' property to the centre of an airport; and
- The presence of aircraft noise contours for those English airports covered by the Environmental Noise Directive.

Airport proximity is provided for all Census Output Codes (OA) within 5km of the airport reference point (ARP). All distances are calculated from the centre point of the airport, located at the geometric centre of all the usable runways.

Noise contour data were provided at the geographical level of residential dwelling for the Census Output Code derived from annual average noise levels from the 2012 airport operator strategic noise map results. Airport noise data are comprised of daytime (0700-2300 local time) noise (L_{Aeq16h}) and night time (2300 to 0700) noise (L_{night}) calculated over the 92-day summer period from 16 June to 15 September. In each case, a maximum value is given across the Census Output Code, as well as an arithmetic dwelling-weighted average derived from the 2011 annual average noise levels.

The airport operator strategic noise map provides noise contour data for 17 main airports in England:

BHX Birmingham
BLK Blackpool
BOH Bournemouth
BRS Bristol
EMA East Midlands
ESH Shoreham
LBA Leeds Bradford
LCY London City
LGW London Gatwick
LHR London Heathrow
LPL Liverpool
LTN Luton
MAN Manchester
NCL Newcastle
SEN Southend
SOU Southampton
STN Stansted

We take the presence of aircraft noise to begin at 55dB (L_{Aeq16h}) for daytime noise and 50dB (L_{night}) for night time noise. These are the lowest bands of aircraft noise provided in the noise map dataset. Standard reporting for airport noise data begins at 57dB(Leq). There is, however, an argument to begin at the 55/50dB(A) levels

75 http://t1.services.defra.gov.uk/wps/portal/noise/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3hnd0cPE3MfAwN_F3dHA6MwQ59gQzN_QwMzU6B8JG55Z2NidBvgAI4GBHSHg1yL33aQPB7z_Tzyc1P1C3JDIwyyTBQBAXui2A!!/dl3/d3/L2dJQSEvUUt3QS9ZQnZ3LzZfQ0dBSDQ3TDAwT0RHQTAyVjFMUzE2TzEwNjA!/

based on evidence from the World Health Organisation on health and stress effects[76]. We use maximum noise levels in light of evidence that indicates that higher noise levels are associated with greater health and wellbeing effects[77].

Dropping null and unknown responses and restricting the analysis to England provide an overall sample size of 189,058 individuals for waves 2011-2012 and 2012-2013 of the APS.

Descriptions of the variables used in the APS can be found in Appendix D.

3.2.2 Mappiness

Mappiness is an iPhone application that permits individuals to record their wellbeing scores via their phone. The data contain more than one million observations from tens of thousands of individuals in the UK, collected since August 2010. Individuals who have downloaded the application receive randomly timed requests to complete a very short survey.

The survey asks individuals to rate themselves on three dimensions of momentary wellbeing, stating how happy, how relaxed, and how awake they feel (full survey instrument in Appendix E). We focus on happiness and relaxation. Each score is elicited by means of a continuous slider[78]. The ends of each scale are labelled "Not at all" and "Extremely", and an individual positions himself/herself on the scale by drawing a fingertip across the screen.

Individuals are then asked who they are with and can choose either 'alone' or as many as apply out of seven other categories: partner; child(ren); relative(s); peer(s); work client(s); friend(s); other. All 'With whom' variables are coded as 1 if with that person, and 0 otherwise. They are then asked whether they are indoors, outdoors or in a vehicle and whether they are at home, at work or elsewhere. Finally, they are asked what they were doing "just now". The respondent chooses all that apply out of 40 options. All activity variables are coded as 1 if doing the activity and 0 otherwise.

Together with the responses to the survey, the application transmits the satellite positioning location of the individual and the precise time at which the survey was completed. It also records the time elapsed between the random signal and response, allowing a distinction between immediate responses and delayed responses. We exclude responses made more than an hour after the signal was sent on the basis that these no longer represent a sufficiently random sample of experiences. Individuals complete a short survey about their personal circumstances, work status and household characteristics when registering for Mappiness.

We link the location coded at the time of the response in Mappiness to the locations of airport sites and aircraft noise contours. We can, therefore, determine whether people are near airports or noise contours when responding to the subjective wellbeing questions and for those people inside an airport we can determine what they are doing when responding to the subjective wellbeing questions.

We merged the Mappiness data with the Department for Transport's noise contours for London Heathrow (LHR), London Gatwick (LGW) and Stansted (STN)[79]. A 15 km perimeter was created around the London airports (LHR, LGW, STN). To avoid overlap, if respondents fall within more than one airport perimeter, we choose the nearest one. Aircraft noise data is restricted to these three airports. After the data merge each Mappiness response is linked with the associated decibel level from the three airports. There are approximately 12,000 responses in Mappiness from the 57dB+ noise contours for these three airports.

[76] World Health Organisation. (2009). Night noise guidelines for Europe: http://www.euro.who.int/data/assets/pdf_file/0017/43316/E92845.pdf
[77] World Health Organisation. (2009). Night noise guidelines for Europe: http://www.euro.who.int/data/assets/pdf_file/0017/43316/E92845.pdf
[78] See Couper, Tourangeau, Conrad & Singer (2006)
[79] These were the only available noise contours for the Mappiness data

To create proximity variables we generated polygons around airport sites using Google Earth. We looked at the 17 Defra 'noise action plan' airports. We also calculated the distance from each response to the nearest of the airports (from the midpoint of the runway).

The distances are calculated (in metres) from the midpoint of the runway, or in the case of LHR from the midpoint of the nearest of the two runways.

It should be acknowledged that the population of Mappiness respondents differs in a number of ways from the population at large; wealthier people, young people and employed people are over-represented relative to the UK adult population. This should be taken into account when interpreting and extrapolating the results from this study.

Mappiness follows the Experience Sampling Method (ESM)[80], which collects information on individuals' experiences in real time in their natural environments[81]. It, therefore, provides affective wellbeing measures in regularly and in real time rather than for a whole day as in the APS. There are a number of differences between the APS and Mappiness data that should be acknowledged:

- Whereas the happiness and anxiety measures in the APS proxy affective wellbeing (by asking for wellbeing during the previous day), the Mappiness data are measures of affective wellbeing in the purest sense since they are administered repeatedly over the course of a day using ESM. Mappiness provides momentary measures of wellbeing (rather than annualised measures from the APS).
- Since subjective wellbeing responses in Mappiness are more closely aligned with the activity of interest and we have panel data (longitudinal data for each individual) we are able to make more robust inferences about the direction of cause and effect between aviation and subjective wellbeing.
- On the flipside the APS is a nationally representative survey and contains more measures of subjective wellbeing, including evaluative and eudemonic wellbeing which are not included in Mappiness.
- Mappiness focuses on where people are at that moment and the APS focuses on where people reside.

Analysis of the two datasets will, therefore, be complementary and they can provide answers to different research questions on the topic of aviation and wellbeing.

Appendix F provides further details of the questions used by ONS and Mappiness to generate their subjective wellbeing indicators.

3.3 Analysis

3.3.1 Annual Population Survey

Our analysis using the APS has focused on two issues:

- The effect of ***living* near airports** on evaluative, affective and eudemonic wellbeing; and
- The effect of ***living* in airport noise contours** on evaluative, affective and eudemonic wellbeing.

Our analysis uses the airport data augmented APS with multivariate regression analysis. Regression is the most frequently employed statistical approach in both the academic and policy-related wellbeing literature and is one of the optimal approaches to use in observational datasets where the treatment or intervention has not been randomised artificially or naturally as is the case with the APS and also the Mappiness data.

We use regression analysis to estimate the impact of aviation (airport proximity and aircraft noise) on wellbeing. Regression allows us to control for other important determinants of wellbeing. We control for confounding factors[82] like income, education, health and so on, in order to make better-informed claims about the effect of airport proximity and noise on subjective wellbeing. As we discuss below, however, we can never be entirely confident that our estimate of the effect of airport on wellbeing is not biased to some extent by third factors that confound the relationship.

[80] It is the largest ESM survey in the world
[81] See Csikszentmihalyi 2002 and Stone & Shiffman 1994
[82] Confounding factors are those that drive changes in the *both* the outcome variable and the variable of interest

Selection model

First, we test for possible selection effects by regressing airport proximity on a set of socioeconomic variables using a logit model.

We find that women, those from ethnic minorities, renters (private and social), those who are inactive from work through retirement or not seeking work, part-time workers, and the self-employed are more likely to live near airports (Table D.1).

With reference to income variables, those in the highest (3rd, 4th and 5th) income quintiles are successively more likely to live within 5km of airports. These results are statistically significant within 95% confidence levels.

Those with poor health, smokers, and those with education below degree-level are less likely to live near an airport.

This suggests that there is some non-random 'selection' into airport areas by certain groups. It will, therefore, be important to control for confounding factors/other determinants of wellbeing in the analysis and to acknowledge the technical caveats on causal inference that we discuss below. These results are important for the statistical analysis and hence are reported upfront here. The results from further work on selection effects can be found in Appendix D.

Wellbeing models

We have used the following regression model as the base for all of the analyses:

$$SWB_i = \alpha + \beta_1 AP_i + \beta_2 AN_i + \beta_3 X_i + \varepsilon_i \qquad (1)$$

where SWB_i a wellbeing measure for individual i; AP_i is airport proximity; AN_i is airport noise at the postcode level; and X_i is a vector of other determinants of life satisfaction. AP_i is a dummy variable that equals 1 if the individual lives within 5km of an airport and AN_i is airport noise measured in decibels.

We run equation (1) once for every wellbeing measure (five subjective wellbeing measures in total) and in X_i we control for the main determinants of subjective wellbeing[83]:

- Ethnicity
- Household income
- Health status (including diet)
- Marital status
- Employment status
- Social relationships
- Gender
- Age
- Geographic region
- Religion
- Education

In total, we run five models.

All subjective wellbeing models are estimated using ordinary least squares (OLS) regression. This assumes that the subjective wellbeing reporting scale (0 to 10) is cardinal. Research shows that it makes little difference in wellbeing models whether one assumes cardinality or ordinality in the wellbeing variable and, hence, for ease of interpretation we use OLS (as is standard in much of the literature)[84].

[83] See Fujiwara and Campbell (2011)
[84] See Ferrer-i-Carbonell and Frijters (2004)

Wherever possible we compare the size of the coefficients for aircraft noise with those for other control variables contained in the same model. This helps to put the findings in perspective[85]. We use the following ranking system and compare against the following variables/factors:

- **Low magnitude effects** - those leading to a 0.1-3.0 point reduction in life satisfaction on a ten-point scale (e.g. background variables like age, gender, ethnic status and housing status);
- **Medium magnitude effects** - those leading to a 3.1-5.0 point reduction in life satisfaction on a ten-point scale (e.g. lifestyle effects, like being divorced, being a smoker); and
- **High magnitude effects** - those leading to a greater than 5.0 point reduction in life satisfaction on a ten-point scale (e.g. being unemployed and having a health-limiting condition).

Although the ranking is based on the results and trends found in the wellbeing literature on the drivers of subjective wellbeing, it remains open to debate.

In line with best-practice in wellbeing analysis, we control for all of the main determinants of wellbeing in the regression analysis in order to get a better understanding of cause and effect relationships. Due to the observational nature of the data (i.e. the study is not based on data from experiments like randomised trials), however, causation cannot be directly inferred and future research should consider this further. The main determinants of subjective wellbeing have been controlled for, but it should be recognised that the impact estimates may be biased to some degree if there are confounding factors that have not been controlled for in the analysis. This is a risk with any wellbeing analysis using non-experimental data. Having said that, multiple regression analysis along with methods based on similar identifying assumptions (such as matching estimators) has been shown to perform well as a strategy for assessing causal relationships in instances like this where interventions/conditions have not been randomised[86] and these types of analyses have been used extensively in the wellbeing and policy evaluation literature. Hence, it can be argued that the results are informative for policy purposes.

Stage 1 – Airport proximity and airport noise

We run equation (1) three times for each subjective wellbeing measure creating three models per subjective wellbeing measure and hence 15 models in total.

- Model 1: Equation (1) without airport noise ($\boldsymbol{AN_i}$).
- Model 2: Equation (1) in full where $\boldsymbol{AN_i}$ = daytime noise
- Model 3: Equation (1) in full where $\boldsymbol{AN_i}$ = night time noise

Moving from Model 1 to Models 2 and 3 assesses the extent to which the effect of living near an airport (if any) is explained by noise from the airport. In Model 1 the coefficient on airport proximity (β_1) picks up the *full* effect of living near an airport including the noise factor. In Models 2 and 3 the coefficient on airport proximity instead picks up the *partial* effect of living near an airport over and above the effect of airport noise.

The coefficient on airport proximity (β_1) shows the subjective wellbeing impact of living within 5km of an airport compared to not living within 5km. The coefficient on airport noise (β_2) shows the subjective wellbeing impact of living within aircraft noise contours against a reference group of individuals not living within aircraft noise contours.

Stage 2 – Marginal effects of aircraft noise

We run OLS regressions with continuous aircraft noise as the primary independent variable. This provides an estimate of the increase or decrease in subjective wellbeing with each additional dB of aircraft noise for daytime and night time noise contours against a reference group not living in daytime or night time noise contours. We test for a non-linear effect of noise using a squared function but found no significant results for daytime or night time noise.

[85] For a summary of these effects, see Dolan, Peasgood & White (2008) and Kahnemann (2003)
[86] Dehejia, R. and Wahba, S., 1999. Causal Effects in Non experimental Studies: Re-evaluating the Evaluation of Training Programs. Journal of the American Statistical Association, Vol. 94, No. 448. pp. 1053-1062

Stage 3 – Heterogeneous effects (interactive variable models)

We run additional tests to capture the heterogeneous impacts of aircraft noise on populations deemed at risk of negative wellbeing effects of exposure. We develop full OLS models of life satisfaction and aircraft noise (with other controls) of interaction with other variables. We look at people:

- In poor health (defined as anyone self-reporting limiting health conditions on day-to-day life);
- In retirement age (defined as anyone aged 65 or over);
- In unemployment (defined as anyone classed as unemployed or underemployed (working less hours than they want to); and
- Living in social housing (defined as anyone renting local authority or housing association property).

The analysis is run using an interactive variable regression model:

$$SWB_i = \alpha + \beta_1 AP_i + \beta_2 AN_i + \beta_3 AN_i \cdot S_i + \beta_4 X_i + \varepsilon_i \qquad (2)$$

where S_i is the socio-demographic variable that is to be interacted with airport noise. We run equation (2) for each of the interaction terms for daytime and night time noise. The coefficient on the interaction term ($AN_i \cdot S_i$) will demonstrate whether there are additional effects of airport noise for the above groups.

3.3.2 Mappiness survey

Our analysis using the Mappiness data considers four potential impacts:

- The effect of ***being*** **near an airport** on affective wellbeing (at the time of the survey);
- The effect of ***being*** **in an airport noise contour** on affective wellbeing (at the time of the survey);
- The effect of ***working*** **in an airport** on affective wellbeing; and
- The effect of ***being*** **in an airport** (leaving/departing/picking up or dropping off people for non-work reasons) on affective wellbeing.

We run the following regression models using Ordinary Least Squares (OLS):

$$W_{it} = \alpha_{it} + \beta_1 A_{it} + \beta_2 OA_{it} + \beta_3 P_{it} + \beta_4 A_{it} \cdot P_{it} + \beta_5 X_{it} + \varepsilon_{it} \qquad (3)$$

where W is wellbeing (happiness or relaxation) measured on a scale of 0-100; the subscripts i and t respectively denote the individual and time period; A is a vector of airport-related variables; OA is a vector of other activities; and X is a vector of control variables that is made up of location dummies, time indicators (month, day of week, time of day), weather conditions at time of survey and the number of responses an individual has given previously.

Equation (3) is estimated using individual fixed effects to exploit the longitudinal aspects of the data (hence the time subscript t is dropped from α_i). Given the short time periods in the data, socio-demographic variables that are collected from respondents on registration are in effect time-invariant and hence controlled for in the individual fixed effects. Standard errors are clustered at the person level to account for non-independent repeat observations and a robust standard error estimator is deployed to account for heteroscedasticity.

Mappiness, like the APS, is a non-experimental dataset and so the same caveats are relevant when interpreting the results. As with the APS data we use statistical methods in line with the majority of academic research in this area. We control for a wide range of factors that may impact on a person's affective wellbeing responses at the time of the survey (e.g. weather, location, what they are doing and whom they are with) and the fixed effects estimation allows us to control for all time invariant factors specific to the individual. In the case of the Mappiness data (which are predominantly taken over the short/medium term), this will include nearly all socio-demographic factors, including income, gender, employment status, health status and so on. Due to the fact that we can control for a wide range of factors and that Mappiness wellbeing responses are made in close time proximity to the activity of interest, we believe that the results are informative for policy.

Stage 1 – Proximity to airports

We produce two OLS regression models for happy and relaxed scores where A_{it}= distance to the 17 English airports (banded as <3km, 3-4km, 5-5km, 5-7km, 7-11km, and 11-15km).

Responses in the coordinates of the airport polygons were omitted from all analyses to exclude those who were in an airport. This is because we want to focus on how being near airports impacts on wellbeing and people inside airports are likely to have different experiences – they may be leaving for or returning from holiday (or picking someone up) and have happiness levels associated primarily with this (otherwise unobserved) activity.

Stage 2 – Aircraft noise contours

We produce two OLS regression models for happy and relaxed scores where A_{it} = a binary variable that equals 1 if the GPS location of the response falls within an aircraft noise contour (≥57dB) for London Heathrow, London Gatwick and Stansted airports. Again we exclude people within the airport perimeter.

Stage 3 – Airport activities

Airport workers

We assess the happiness and relaxation scores for those individuals who stated that they were at work and who responded from within the airport polygons. In each case, the reference group is the population at work, but not currently located at an airport.

Airport non-workers (travellers etc.)

We assess the happiness and relaxation scores for those individuals not at work and who responded from within the airport polygons. The reference group is people not at work and not at airports. This captures the wellbeing impacts of airports on travellers and those picking up/dropping off friends and relatives at the airport.

Stage 4 – Heterogeneous effects (interactive variable models)

We run additional tests to capture the heterogeneous impacts of aircraft noise on populations deemed at risk of negative wellbeing effects of exposure. We develop full OLS models of happiness/relaxation with aircraft noise interacted with:

- Poor health (self-reported in the Mappiness dataset); and
- Working or studying

Our approach replicates the methodology used for the interactive models with the APS data, whereby the airport noise variable is interacted with health and working/studying.

3.4 Results

3.4.1 Annual Population Survey results

We provide a summary of the main findings. Results that are significant up to the 10% level are deemed to be statistically significant: this is consistent with much of the wellbeing literature. Our full results can be found in Appendix D.

Selection effects

We have discussed some of the main findings above. In additional analysis we looked at individual London airports and found that ethnic minority communities, private renters, non-renter/squatters, part-time workers, and those with lower educational attainment (GCSE or other) are more likely to live within 5km of Heathrow airport (Table D.2). However, those with higher degree education are also more likely to live within 5km of Heathrow than those with degree education. In addition, those in the highest (3rd, 4th and 5th) income quintiles are successively more likely to live within 5km of Heathrow.

Those with one child and three children are less likely to live near Heathrow. We also found a small negative association between age (squared) and airport proximity. These results are statistically significant within 95% confidence.

Ethnic minority communities and those with four or more children are more likely to live within 5km of Gatwick airport (see Table D.3) but those living in private rented accommodation are less likely to live within 5km of Gatwick.

Airport proximity

Airport proximity is not statistically significant in any of the three models for any of the subjective wellbeing variables in Stage 1 (see Tables D4-D.6). This means that with standard control variables, airport proximity has no discernible effect, positive or negative, on any of the subjective wellbeing measures. . Putting aside issues around potential biases, this suggests one of two things:

- Airport proximity has no effect on subjective wellbeing; or
- The positive aspects of living near airports (e.g. improved transport infrastructure, urbanisation, jobs, easy to access airport, cheaper property) are offset by the negative effects (e.g. noise, pollution, visual disamenity, congestion).

The airport proximity variable is a global measure that will pick up most, if not all, of these factors[87]. The data do not allow us to look at these factors on their own (except for airport noise). As we discuss below, airport noise has an effect when separated out from airport proximity. This suggests a second possible explanation namely that airport proximity has positive and negative attributes which tend to offset each other (even when we control for noise separately).

Presence of aircraft noise – daytime

The effects of living in daytime aircraft noise contours (at or above 55dB) on the five subjective wellbeing variables are consistently negative (see Table 7). These results are statistically significant at the 95% level.

The presence of daytime aircraft noise is associated with lower life satisfaction, lower sense of worthwhile, lower happiness and PAB and increased anxiety. Although it is well-documented that these types of analyses, looking at impacts on multiple outcomes, lead to an increased risk of finding a false-positive result just due to chance, the fact that we find consistently negative results across all five subjective wellbeing variables provides additional confidence in these results.

Compared to the negative coefficients for other control variables in the same models (see Table D.5), we find that the negative effect of aircraft noise on life satisfaction is less than the negative effect associated with living in social housing. It is, however, much smaller than that of being unemployed, having poor health or being a smoker.

The negative effect of aircraft noise on peoples' sense of worthwhile is around half that associated with being a smoker, and less than a third that of being underemployed.

The negative effect of aircraft noise on peoples' happiness is less than half that of being divorced and less than the negative effect associated with living in social housing.

The effect of aircraft noise is to increase anxiety at a magnitude that is slightly less than the increased anxiety associated with the effects of smoking.

Table 7: OLS regression statistics for wellbeing factors and the presence/absence of maximum daytime aviation noise levels, controlling for background variables including airport proximity

Maximum daytime noise >55dB(A)	b (unstandardised coefficient)	SE	P>|t|	r^2
Life satisfaction	-0.147***	0.040	0.000	0.137
Sense of worthwhile	-0.126***	0.038	0.001	0.096
Happiness	-0.116*	0.052	0.025	0.068
Anxiety	.201**	.071	0.005	0.040

[87] Note that there is one exception which is that the effect of employment is accounted for in the model and so would not be picked up in the airport proximity variable here

Maximum daytime noise >55dB(A)	b (unstandardised coefficient)	SE	P>|t|	r^2
PAB	-.160**	.053	0.002	0.064

*Notes: N=189,058 * p<0.05; ** p<0.01; *** p<0.001*

Presence of aircraft noise – night time

The presence of maximum night time aircraft noise (at or above 50dB) is not statistically significant for any wellbeing variable (Table 8) We find no evidence that the presence of night time aircraft noise affects peoples' life satisfaction, sense of worthwhile, happiness, anxiety and PAB (Table D.6).

Table 8: OLS regression statistics for wellbeing factors and the presence/absence of maximum night time aviation noise levels, controlling for background variables including airport proximity

Maximum night time noise >50dB(A)	b (unstandardised coefficient)	SE	P>|t|	r^2
Life satisfaction	-.101	.054	0.060	0.137
Sense of worthwhile	-.093	.054	0.085	0.096
Happiness	.024	.069	0.730	0.068
Anxiety	.109	.093	0.241	0.04
PAB	-.048	.070	0.495	0.064

*Notes: N=189,058 * p<0.05; ** p<0.01; *** p<0.001*

Level of aircraft noise – daytime and night time

We find that each additional decibel of daytime aircraft noise is negatively associated with all five wellbeing variables. This effect is statistically significant at the 95% level. The impact is small, but it should be remembered that it is a marginal effect estimate. Our full regression results are available in Table D.7.

Table 9: OLS regression statistics for wellbeing factors and each additional dB of daytime aviation noise levels, controlling for background variables including airport proximity (these factors not shown).

Maximum daytime noise +1dB	b (unstandardised coefficient)	SE	P>|t|	r^2
Life satisfaction	-0.003***	0.001	0.000	0.137
Sense of worthwhile	-0.002**	0.001	0.001	0.096
Happiness	-0.002*	0.001	0.030	0.068
Anxiety	0.003**	0.001	0.005	0.040
PAB	0.003**	0.001	0.003	0.064

*Notes: N=189,058 * p<0.05; ** p<0.01; *** p<0.001*

We find no significant association between night time noise and wellbeing (Table D.8). We should, therefore, apply more confidence to the findings regarding daytime noise, which is found to impact consistently on all subjective wellbeing measures.

Heterogeneous effects of airport noise

The only statistically significant interaction term between the presence of aircraft noise and socio-demographic factors is found for social housing**.** We find that the negative effect of airport noise on life satisfaction is greater for people living in social housing (see Table D.24). We do not find any significant results for the noise and social housing interaction for sense of worthwhile, happiness, anxiety or PAB (see Tables D.25-D.28). It should

be noted that the results are not being driven by the possibility that more social housing is located in noisy areas because the model compares social and non-social housing in equally noisy areas.

Our results do not suggest that aircraft noise is worse for people in poor health (see Tables D.9-D.13), of retirement age (see Table D.14-D.18) and in underemployment (see Tables D.19-D.23). The interaction effects are not statistically significant for these variables.

3.4.2 Mappiness survey results

We provide a summary of the main findings. Results that are significant up to the 10% level are deemed to be statistically significant. The full results tables can be found in Appendix E.

Proximity to airports

Being near an airport is not associated with happiness, but we find a negative association with relaxation (at distance bands of less than 3km and between 4-5km) (see Table 10).

The magnitude of this effect is low but statistically significant. Compared with other activities in the Mappiness dataset it is slightly less than the negative effect of doing shopping errands (see Table E.1).

Table 10: OLS regressions for airport distance model controlling for background variables

Airport distance model		**Happiness**		**Relaxation**
	Coefficient	**SE**	**Coefficient**	**SE**
Nearest of 18 runways < 3km	0.069	0.45	-1.136**	0.488
Nearest of 18 runways >= 3km, < 4km	-0.021	0.346	-0.169	0.45
Nearest of 18 runways >= 4km, < 5km	-0.504	0.384	-1.034**	0.525
Nearest of 18 runways >= 5km, < 7km	-0.164	0.274	-0.252	0.298
Nearest of 18 runways >= 7km, < 11km	0.03	0.187	-0.034	0.207
Nearest of 18 runways >= 11km, < 15km	0.131	0.185	-0.098	0.203
Constant	57.455***	0.608	55.843***	0.701
Observations	1,842,854		1,842,854	
r^2	0.129		0.152	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Airport noise

There is a negative association between aircraft noise at the 66dB level and both happiness and relaxation (see Table 11). This finding is statistically significant at the 5% level.

Table 11: OLS regressions for Mappiness responses within noise contours for three London airports controlling for background variables

	Happiness		**Relaxation**	
	Coefficient	**SE**	**Coefficient**	**SE**
LHR/LGW/STN 57dB band	1.342	1.206	0.176	1.292
LHR/LGW/STN 60dB band	0.358	0.844	-1.285	1.182
LHR/LGW/STN 63dB band	0.415	1.115	-0.389	1.241

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
LHR/LGW/STN 66dB band	-6.344**	3.039	-5.614*	3.225
LHR/LGW/STN 69dB band	0.899	2.22	-3.892	2.848
LHR/LGW/STN 72dB band	-10.419*	5.356	-3.015	5.848
Constant	56.371***	0.808	55.662***	0.927
Observations	1156270		1156270	
r^2	0.124		0.142	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

The negative effects on happiness at the 66dB level are of a mid-level of magnitude (see Table E.4). Compared with other activities in the Mappiness dataset, the negative effects are greater than the negative effects of commuting and queuing combined.

The negative effects on relaxation at the 66dB level are of a mid-level of magnitude. The negative effects on relaxation at the 66dB level are greater than the negative effects of caring for adults or queuing.

There is also a statistically significant negative effect on happiness at the highest (72dB) level but due to the small sample of respondents within this noise contour we disregard this result (n=12, see Table E.3).

These findings suggest that there is some effect of being in aircraft noise contours at the time of responding to the Mappiness application, but only at high levels. Sample sizes are reasonable up to the 66dB level point and so provide confidence that higher levels of airport noise are associated with lower wellbeing.

Airport activities

Airport workers

We do not find a statistically significant difference in wellbeing between workers inside and outside airports (Table E.7).

Airport non-workers (travellers etc.)

Being at an airport is positively associated with happiness. The effects are similar to the happiness increases associated with drinking a tea or coffee and the happiness associated with watching TV (Table E.8)). It is also negatively associated with relaxation and the effect is comparable to more than twice the negative coefficient for doing chores and housework.

These results suggest that being in an airport is associated with a sense of happiness and excitement, but that it is also stressful.

Heterogeneous effects

The negative effects on happiness and relaxation from being 5-10km from a runway are larger for people in poor health. (Table E.9).

The negative effect on relaxation from being 5km from a runway is larger for people working or studying. (Table E.9).

3.4.3 Interpreting the results

Below, we discuss three key issues related to the interpretation of our subjective wellbeing results:

- The principal limitations of our approach;

- The aspects of airports (and airport development) that are not (fully) picked up in our analysis and, indeed, the other existing literature; and
- The ability to make interpersonal comparisons of the results.

Limitations of our subjective wellbeing analysis

Our analysis of subjective wellbeing is subject to three significant specific limitations.

First, there is an issue of bundling. As we note earlier, our analysis of the impact of proximity to airports on subjective wellbeing does not suggest a significant effect. This may be because the positive aspects of living near to airports (e.g. improved transport infrastructure, access to jobs and cheaper property) are offset by the negative effects (e.g. noise, pollution and visual disamenity). At present, the available data in the APS does not allow us to unbundle the different effects of each potential element.

Second, much of the evidence that we have picked up from the academic literature suggests that the effect on subjective wellbeing is indirectly related to airport expansion, rather than directly. This adds to the challenges around the likely impacts of airport developments: for example, small changes in factors such as the level of social interaction may have significant effects on the wellbeing of individuals since their characteristics and psychological health are known to affect subjective wellbeing[88] but our analysis is not currently able to capture this.

Third, our analysis effectively estimates the impact of airports on subjective wellbeing at a point in time. Since subjective wellbeing has been collected on a large scale basis for a relatively short period of time, only limited evidence exists on how the impacts have evolved, and might be expected to evolve, over time, especially over a long period of time when the wider context is subject to change.

Aspects of airports not covered by the analysis

We also note that other important airport related factors which may impact subjective wellbeing are excluded because they cannot be assessed using current UK data and/or previous studies.

First, any effect on children is omitted since our analysis is based on data only for adults which means that we do not know the impact on children. If children are like adults, this means that we will underestimate the costs associated with airport noise on local communities. Linked to this is the possible long-term effect on children's educational attainment.

Second, the effect on health relies only on the limiting health variable in the APS. It does not distinguish between physical and mental health and between differing levels of health conditions. Specific conditions, including strokes and heart attacks, are known to affect subjective wellbeing[89]. Some care is needed, however, in interpreting this result as the strength of the link is partly due to the fact that both measures are self-reported and, hence, use the same cognitive processes. Self-reported measures tend to correlate quite strongly.

These omissions need to be recognised when using and extrapolating the results.

Interpersonal comparisons

The third issue related to the interpretation of our findings is around interpersonal comparability. As with many other policy options, each airport schemes is likely to create winners and losers. A key issue, therefore, is whether and, if so, how these should be balanced.

This topic has a long history in economic and philosophical thought. The key issue is whether a change in one person's wellbeing is equivalent to the same change in another person's wellbeing. In the context of the airport schemes this may depend on whether one person's gain from a new job offsets another person's loss through aircraft noise (both as a result of airport expansion). The empirical wellbeing literature generally assumes interpersonal comparability. This means that if one person's wellbeing increased from 6 to 8 out of 10 (on, say, life satisfaction), this would be the same magnitude as another person's decrease from 7 to 5 out of 10. This

[88] Dolan et al. 2008
[89] Shields and Wheatley Price (2005)

assumption is key to the statistical methods used in the analysis. It is also necessary if we are to aggregate the impacts of aviation in different wellbeing domains, such as employment and noise, across different people. As we discuss below, however, we believe that there is evidence to support this assumption.

Following Robbins, it became the norm in economics to eschew the notion of interpersonal comparability of utility or welfare[90]. This left economists limited to identifying Pareto efficient outcomes or improvements for the purpose of policy analysis (i.e. ones in which nobody was made worse off). The issue of interpersonal comparability of utility in terms of the preference satisfaction account of welfare has been discussed at length[91]. The discussion in relation to subjective wellbeing is, however, more recent. Some evidence exists that subjective wellbeing scores are comparable across individuals. For example, considerable convergence has been observed in affect ratings, especially pain scores across individuals in medical procedures[92]. There is substantial agreement in wellbeing scores between self and third party reports which suggests that people can recognise the satisfaction levels of others[93]. There are correlations between self-reported satisfaction responses and physiological measures[94] and objective circumstances[95].

People from the same language communities "have a common understanding of how to translate internal feelings into a number scale". This implies that people translate verbal labels such as 'very good' or 'bad' on to similar numerical scales[96]. Furthermore, other research suggests that: "although it is very probable that what makes individuals happy or sad differs greatly amongst different cultures, it does seem as if there is a common human 'language' of satisfaction…"[97] Generally, happiness researchers see the growing data on subjective wellbeing "filling the gap" for interpersonally comparable welfare data that economists longed for[98]. Hence "the underlying assumption of a large part of happiness research in economics is that when people are measured in groups, the combination of their happiness scores does reveal useful information with which to make comparisons about social welfare"[99].

3.5 Summary

We have used two large UK national datasets to assess how aviation factors impact on quality of life measured through subjective wellbeing. The APS allows us to look at the wellbeing effects of *living* within airport noise contours and near airports. The Mappiness data are collected in real time during different moments of the day and, hence, allow us to assess the wellbeing effects of *being* within airport noise areas and near airports, including the effects of being in airports and working in airports.

We have examined the effects associated with the main airports in England on a range of subjective wellbeing measures covering evaluative, affective and eudemonic wellbeing across two datasets.

In summarising the results of our regression analysis, we focus on those results which are statistically significant. The key results from our regression analysis are as follows:

- Airport noise:
  - Living within a daytime aircraft noise contour (over 55dB) is negatively associated with all subjective wellbeing measures: the presence of daytime aircraft noise is associated with lower life satisfaction, lower sense of worthwhile, lower happiness, increased anxiety and lower positive affect balance;
  - There is a marginal negative effect on all subjective wellbeing measures for every additional decibel from aircraft noise over the 55dB threshold;
  - Living within a night time aircraft noise contour is not associated with any statistically significant effect on subjective wellbeing;

[90] See Hammond, 1989; Ferrer-i-Carbonell, 2002
[91] See Hammond (ref) and Harsanyi (ref)
[92] See Kahneman (2000)
[93] See van Praag, 2003; Diener and Lucas, 1999
[94] See Davidson, 2000; Kahneman, 2000
[95] See Kahneman et al. 2004; Easterlin, 2004
[96] See van Praag, 2003, p.34.and and Van Praag (1991)
[97] See van Praag et al. (2003. P.5)
[98] See Duncan, 2008, p.170
[99] See Di Tella and MacCulloch, 2006, p.31-32

  - Being within a high level aircraft noise contour is negatively associated with happiness and feeling relaxed at a specific time;

- Airport proximity:
  - Living near an airport (within 5km), and controlling for other factors that influence subjective wellbeing, does not have any statistically significant effect on subjective wellbeing;
  - Being near an airport does not have an effect on happiness at a specific time, but is negatively associated with feeling relaxed: this effect is larger for people who are working or studying at the time;

- Being in airports:
  - There is no statistically significant difference in happiness and relaxation when comparing people who work in airports with similar people who work outside airports;
  - Being at an airport is positively associated with happiness and, at the same time, negatively associated with feeling relaxed: airports are associated with happiness and excitement, but are also stressful experiences.

Our results need to be interpreted with some caution.

We can be confident that aircraft noise is bad for subjective wellbeing; we have shown this with two different UK datasets, and this finding is consistent with other studies[100]. We can also tentatively state that (any) employment creation associated with airport expansion is good for subjective wellbeing.

But, when we consider these noise and employment effects alongside the other factors associated with living near to airports, we do not find any statistically significant effect of airport proximity on subjective wellbeing. This may be because the positive and negative aspects of living near airports balance each other out. Those living in noise contours but not close enough to airports to benefit from the potential advantages, for example in terms of access to employment opportunities, will be likely to suffer negative effects on their subjective wellbeing due to noise.

Our analysis also has some important limitations:

- There is an issue of bundling – the reason our analysis of the impact of proximity to airports on subjective wellbeing does not suggest a significant effect may be because the positive aspects of living near to airports (e.g. improved transport infrastructure, access to jobs and cheaper property) are offset by the negative effects (e.g. noise, pollution and visual disamenity) but, at present, the available data in the APS do not allow us to analyse the effects of each potential element separately.
- The links between airports and subjective wellbeing are not always direct which adds to the challenges around the likely impacts of airport developments.
- The approach depends on being able to project the impact on subjective wellbeing over time yet there is limited evidence on how these values might be expected to evolve over time.

In addition, other important airport related factors may impact on subjective wellbeing which are currently excluded from our analysis for data reasons:

- Any effect on children is omitted since our analysis is based on data only for adults; and
- The effect on health relies (only) on the limiting health variable in the APS – this does not distinguish between physical and mental health and between differing levels of health condition.

Finally, there is debate about whether the results enable interpersonal comparisons, for example in balancing the negative effects of noise and the positive effects of employment creation. The key issue is whether a change in one person's wellbeing should be treated as equivalent to the same change in another person's wellbeing.

[100] See, for example, Van Praag and Baarsma, 2005

As discussed in Section 2, there are also other potentially important quality of life impacts related to aviation that have not been considered here due to data limitations. These may affect the extent to which the negative factors outweigh the positives or vice versa. We explore these issues further in Section 4.

4 Application to options appraisal and mitigation

4.1 Introduction

This final Section explores how the key findings of Sections 2 and 3 could be used by the Airports Commission as part of its appraisal of each of the schemes and to assess potential mitigations. It is divided into three main parts.

First, we consider the significance of the findings from our analysis in Sections 2 and 3 and how they could be applied to the three specific schemes being considered by the Airports Commission within its Appraisal Framework.

Second, we explain how the results from Section 3 could be used to estimate the potential impacts of airport developments on subjective wellbeing. At this stage, our analysis is generic rather than specific to the airport expansion schemes being considered by the Airports Commission.

Finally, we consider the implications for the assessment of potential mitigations. Specifically, we examine how airport developers can, where appropriate, mitigate negative impacts and enhance the positive impacts associated with airport development (i.e. construction) and operation, including wider aspects such as connectivity and associated infrastructure development. Our focus is on people's quality of life, in particular their subjective wellbeing.

4.2 Application of subjective wellbeing to options appraisal

This part of the Section suggests how the approach to the analysis of subjective wellbeing outlined in Sections 2 and 3 could be used to inform the appraisal of the three airport development schemes being considered by the Airports Commission.

In Section 2 we analysed how subjective wellbeing fits into the Airports Commission's Appraisal Framework from a theoretical perspective (based around the logic model we have developed). We also assessed what existing evidence exists that links airports and their development to subjective wellbeing. On this basis, we highlighted those Modules within the Appraisal Framework which are of most relevance to subjective wellbeing.

Below, we consider how best to incorporate subjective wellbeing into the appraisal of each of the airports schemes alongside other market and non-market impacts covered by the Modules. A pre-requisite for doing this is that the impacts are assessed on a consistent basis which potentially allows them to be combined together. This means they need to reflect the same geographical and temporal scope. Most importantly, they need to provide a comprehensive coverage of the impacts whilst, at the same time, avoiding potential double counting. Thus, they need to cover both the construction and operations phases of each of the schemes[101]. More substantively, perhaps, the approach to measuring the market based impacts (in terms of value added) needs to complement that taken to estimating the non-market impacts (which may be more welfare based).

Table 12 summarises the potential market and non-market impacts which we expect to be captured as part of the Commission's application of its Appraisal Framework. We also highlight briefly in the comments column some of the key issues that we expect to arise in relation to ensuring that the appraisal is comprehensive whilst avoiding double counting. We touch upon some of these issues in more detail below.

[101] Operations include airport operations, connectivity and associated infrastructure

Table 12: Potential market and non-market impacts associated with Appraisal Framework Modules and outcomes linked to subjective wellbeing

#	Appraisal Framework Module	Market impacts	Non-market impacts	Comments
1	Strategic fit		• Consumer surplus (non-business travellers) • Wellbeing	We expect the main benefits to be captured as part of the National economy module (Module 2)
2	National economy	• GVA – direct, indirect, induced and catalytic	• Wellbeing – additional jobs	The computable general equilibrium analysis being undertaken as part of this module will provide estimates of the number of net additional jobs expected to arise from each scheme
3	Local economy	• GVA – direct, indirect, induced and catalytic	• Wellbeing – additional jobs	Distributional issues
4	Surface access	• GVA	• Wellbeing • Health costs • Health & safety	The surface access proposals associated with some of the schemes are being appraised separately
5	Noise		• Wellbeing • Health costs • Housing (and other property) values	
6	Air quality		• Wellbeing • Health costs • Housing (and other property) values	Potential impacts need to be confirmed
9	Water and flood risk			Potential impacts need to be confirmed
10	Place		• Wellbeing • Housing (and other property) values	Potential impacts need to be confirmed
12	Community		• Wellbeing	Distributional issues

Incorporating subjective wellbeing into the Appraisal Framework is attractive for two key reasons.

First, it enables different impacts to be weighed against each other (provided robust estimates of each scheme's impact can be estimated). For example, whilst our analysis in Section 3 shows that airport noise has a negative effect on wellbeing, evidence from other research suggests that the employment associated with airports is likely to have a positive impact. Although different people may bear the costs and accrue the benefits, the two potentially should be weighed against each other. We explain how this might be done in Section 4.4.

Second, it provides for a more holistic assessment. For example, whilst the Department for Transport's transport modelling provides estimates of UK air passengers' consumer surplus[102], this may not fully reflect the benefits that they derive in terms of wellbeing from the trips they make.

[102] This is the amount they would be willing to pay to travel on a particular flight over and above the amount they pay as a fare

But care is needed as some of the impacts are effectively 'bundled' and this makes it harder to be sure whether or not there is double counting. A good example of this risk arises from our analysis of the impact of airport proximity on subjective wellbeing. We found no evidence of a statistically significant relationship between proximity and life satisfaction. A possible interpretation of this result is that the positive aspects of living near airports, such as improved transport infrastructure and access to jobs, are offset by the negative effects, for example noise and congestion. As yet, the existing literature on the effects on wellbeing of infrastructure is very limited which means it is difficult to benchmark the results of this analysis.

4.3 Valuing the impacts of airport developments on subjective wellbeing

HM Treasury's guidance on appraisal requires consideration to be given to both the market and non-market impacts of projects[103]. As we have noted, subjective wellbeing is increasingly being recognised as a relevant potential non-market impact which means that the impact is expected to be valued so that it can be incorporated into the options appraisal.

In general, the valuation of non-market impacts in policy appraisal in the UK (and other OECD countries) follows a methodology which values them in terms of compensating or equivalent measures of welfare change. Compensating measures, which are the more common, are defined as the amount of money paid or received that will leave individuals' economic welfare unchanged.

Economists have traditionally measured people's welfare in terms of the extent to which their preferences are satisfied. This is the preference satisfaction account of welfare (see Section 2.2.1) and it is based on the principle that "*what is best for someone is what would best fulfil all of his desires*"[104]. Under the preference satisfaction account, compensating measures of value for non-market goods (bads) can be estimated through people's willingness to pay (WTP) (or willingness to accept (WTA)) in actual or hypothetical markets. This, respectively, refers to revealed preference and stated preference valuation techniques.

Research in psychology and behavioural economics over the last few decades has, however, challenged the role of preferences in economic valuation on the basis that preferences can be context-dependent. What people want may not always align well with what is best for them and, hence, valuations elicited through preference methods may not reflect the true values people attach to non-market impacts[105].

In response to these criticisms a growing literature in economics now uses self-reported wellbeing data as the basis for valuation (i.e. subjective wellbeing). The availability of these data allows economic welfare impacts to be assessed in a different way. Rather than assessing whether a project (or policy) satisfies people's preferences, we can look more directly by assessing whether it impacts on people's actual wellbeing as reported by their level of subjective wellbeing.

Through econometric analysis of subjective wellbeing data, the wellbeing valuation method can be used to attribute values to non-market impacts. This is achieved by estimating the amount of money that would have the equivalent impact on subjective wellbeing as the non-market impact. In this respect, subjective wellbeing data offer a new basis for valuing non-market impacts, such as airport noise and other effects linked to airport development.

The two key benefits of the wellbeing valuation approach are that it does not:

- Suffer from hypothetical bias or strategic bias as in stated preference valuation methods; and
- Require respondents to be fully informed about potential non-market impacts since it is based on data from people's actual experiences[106].

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[103] HM Treasury, The Green Book: Appraisal and Evaluation in Central Government, July 2011 (see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf)
[104] Parfit, D., 1984. Reasons and Person. Oxford University Press
[105] See, for example, Slovic, P. and Lichtenstein, S. (ed.s), 2006. The construction of preference. Cambridge University Press
[106] Fujiwara, D. and Campbell, R. 2011. Valuation Techniques for Social Cost-Benefit Analysis – Stated Preference, Revealed Preference and Subjective Well-Being Approaches, a Discussion of the Current Issues. HM Treasury, London

There are, however, some general limitations of wellbeing valuation which are well documented[107]:

- There are long standing issues associated with estimation of the marginal utility of income;
- Income can have indirect effects on wellbeing through the goods and services it enables to be purchased; and
- The opportunity costs of earning income often cannot be controlled for.

That said, the alternative preference based methods also suffer from significant weaknesses:

- The revealed preference approach depends on markets working efficiently;
- It can be difficult to measure willingness to pay for non-marginal changes; and
- Stated preference based methods can be adversely affected by different forms of survey bias.

Current best practice wellbeing valuation methodology uses life satisfaction measures of subjective wellbeing since the best available estimates of the impact of income on subjective wellbeing are in respect of life satisfaction. Using data from the British Household Panel Survey, it would potentially be possible to follow the methodology set out in Fujiwara (2013)[108] and Fujiwara and Dolan (2014)[109] to estimate the values of the impacts associated with living in areas with day time aircraft noise that exceeds 55dB[110].

Since our analysis of the APS data does not control for house price differences across areas with and without airport noise, the estimated cost would be over and above any market compensation that people may benefit from by living in areas that are affected by aircraft noise (e.g. in the form of lower house prices). They can be interpreted as the monetary compensation required to return people to the level of life satisfaction they would experience if they did not live in areas adversely affected by aircraft noise. This would include the full impact of aircraft noise on subjective wellbeing (over and above the market compensation). It would account for impacts on stress and mental health and physical health but they do not reflect the costs of providing care or foregone productivity.

The values would not, however, indicate the impact on wellbeing or house prices of a 1dB increase (or decrease) in noise as the data do not allow us to assess this. At present, the impact on wellbeing should be seen as representing a 'move' from the average level of noise under the 55dB threshold (which could be say 20dB) to the average level of noise above the threshold (e.g. say 60dB) after any market compensating factors.

The costs could be compared with those which have been estimated in previous work which uses a different valuation method. For example, in its Discussion Paper on noise, the Airports Commission summarised evidence on the relationship between airport noise and house prices[111]. It noted that:

- The general hedonic pricing methodology initially developed in the 1970s is still widely used today[112];
- An early study found that a property exposed to 65L_{Aeq} sold for around 10% less than the same property exposed to 55L_{Aeq}[113];
- More recent studies have sought to control for factors such as demographics and the positive effects that access to an airport can bring:
  - A study of the area around Manchester Airport found that each 1 unit increase in L_{Aeq} (above 55L_{Aeq}) was associated with a 0.47% decrease in property price[114]; and

[107] Fujiwara & Campbell, Valuation Techniques for Social Cost-Benefit Analysis, July 2011
[108] Fujiwara, D., 2013. A General Method for Valuing Non-Market Goods Using Wellbeing Data: Three-Stage Wellbeing Valuation. Centre for Economic Performance Discussion Paper No 1233. London School of Economics
[109] Fujiwara, D. and Dolan, P. 2014. Happiness-Based Policy Analysis. Oxford Handbook of Wellbeing and Public Policy Adler, M. and Fleurbaey, M. (eds) (forthcoming)
[110] This method estimates a separate model for the causal effect of income on life satisfaction using data from lottery wins in the BHPS in order to derive an unbiased estimate for β_{income} (the impact of income on life satisfaction) which is used to estimate the monetary cost of aircraft noise
[111] Airports Commission, Discussion Paper 05: Noise, July 2013
[112] Brooker (2006), 'Aircraft noise: annoyance, house prices and valuations'
[113] Walters (1975), 'Noise and prices'
[114] Pennington et al (1990), 'Aircraft noise and residential property values adjacent to Manchester Airport'

– A study of Atlanta Airport found that properties sold for 20.8% less in the 70-75dB DNL contour than those found below 65dB DNL and that, when controlling for noise impacts, houses further from the airport sold for less suggesting that some benefits are derived from proximity to the airport[115].

4.4 Applying subjective wellbeing estimates – two examples

In this penultimate part of the Section, we explain how the results from our subjective wellbeing analysis and those from the established literature could be applied to the three schemes being considered by the Airports Commission within its Appraisal Framework. We consider two examples:

- The results from our analysis of the APS and Mappiness data which focus on the impact of proximity to airports and to the noise associated with them; and
- The expected impact on employment, locally and nationally, as this is an area where the link to subjective wellbeing is well-established.

Appraising noise impacts

In Section 3, we reported our results from using the APS and Mappiness data – currently the two best UK data sources – to consider the relationship between airports and subjective wellbeing. This enabled us to assess the impact of airport proximity and locations within specified aircraft noise contours on people's subjective wellbeing. Our analysis of the APS suggests that living in an area that suffers from day time aircraft noise (as defined by the 55dB noise contour) is statistically significantly and negatively associated with subjective wellbeing. As we have explained, this correlation with life satisfaction, in particular, could be used to value its impact. These values could then be used to assess the costs associated with noise impacts due to airport expansion.

Box 3: Estimating wellbeing costs associated with airport noise

Step		Data sources
1	Estimate aircraft noise contours for the option for each year of each scheme.	• Derived from work being undertaken as part of Noise Module (Module 5)
2	Calculate the change in the number of homes expected to be included in maximum aircraft day time noise contours of 55dB or over for each year of each scheme (compared to the 'Do minimum base case').	• Office of National Statistics/Census 2011
3	Estimate the additional number of adults living in the affected homes (currently noise costs are only estimated for adults although there is also likely to be an impact on children too) for each year of each scheme.	• Office of National Statistics/Census 2011
4	Multiply the number of adults living in the affected homes by the estimated value of the change in life satisfaction to estimate the aggregated annual cost of day time aircraft noise due to the option for each year of each scheme.	• Follow approach set out in Section 4.3
5	Future impacts should be discounted using the HM Treasury Green Book discount rate: we note, however, that there is no consensus on how to discount wellbeing values.	• HM Treasury Green Book

On the other hand, we found that living near airports (i.e. within a specified radius) does not have an effect on subjective wellbeing overall. As we note in Section 3, this may be because the positive aspects of living near airports (e.g. improved transport infrastructure, urbanisation, jobs, easy to access airport and cheaper property) offset the negative effects (e.g. noise, pollution, visual disamenity and congestion).

[115] Cohen and Coughlin (2008), 'Changing noise levels and house prices near the Atlanta airport'

Our analysis also found no evidence that the presence of night time aircraft noise affects peoples' subjective wellbeing. This implies that it is unlikely to have a significant bearing on the options appraisal.

Appraising employment impacts

The second area we illustrate is the effect on subjective wellbeing of employment.

Analysis in other Modules, in particular both the national and local economy Modules (Modules 2 and 3), suggests that all three schemes will have a net positive effect on employment levels. A consistent finding in the wellbeing literature is that employment is positively associated with a number of measures of subjective wellbeing, including life satisfaction[116].

Our analysis of the Mappiness data found no statistical difference between jobs based in airports and those based outside airports on measures of happiness and relaxation. We assume, therefore, that the value of employment estimated for the general population (which will include some people that work in airports) is applicable to jobs created as part of airport development.

Although the wellbeing effect of the jobs will be internalised in wages to some degree, the available evidence suggests a residual effect of employment on wellbeing after controlling for income.

Box 4: Estimating benefits associated with employment at airports

Step		Data sources
1	Estimate the expected number of additional full time and part-time jobs created by each scheme in each year – if possible distinguish 'local' jobs (i.e. those filled by people living within the noise contour, for example, from other jobs).	• Economic modelling as part of National economy Module (Module 2)
2	Multiply the number additional full time jobs by the wellbeing associated with each full-time job and the number of additional part-time jobs by the effect on wellbeing of a part-time job	
3	The aggregate figure is an estimate of the annual employment related wellbeing benefits due to the option.	
4	Future impacts should be discounted using the Green Book discount rate.	• HM Treasury Green Book

Since the noise and employment impacts are calculated using the same valuation methodology they can be added together as part of the overall appraisal of the implications for subjective wellbeing of the three shortlisted schemes.

4.5 Implications of wellbeing analysis for mitigation options

The ability to value the impact of airports on subjective wellbeing and the other existing evidence discussed in Section 2 provide an important potential input to understanding the scale of any mitigation that might be required before an airport scheme is attractive, especially in terms of its non-market impacts, for example on subjective wellbeing. It is particularly helpful because it puts a value on some of the important non-market impacts affecting key stakeholder groups (notably, but not only, local residents).

Our work also provides an input to comparing the effects of different mitigation options on subjective wellbeing recognising that this is only one of the costs and benefits that need to be considered as part of the overall appraisal of the airport schemes.

[116] Estimates can be found in The *Social Value Bank* (Fujiwara, 2014) http://www.hact.org.uk/social-value-bank

Conceptually, all mitigation options fall into one of three broad categories:

- They involve taking steps to avoid any costs (negatives) from arising in the first place;
- They entail seeking to reduce the costs associated with any unavoidable costs (negatives); and
- They require actions to increase the benefits (positives) to compensate for the negatives[117].

To understand how attractive each mitigation option is likely to be, we need to understand:

- Who is likely to be affected by an airport development and in what way they are likely to be affected (i.e. which outcomes are impacted);
- How severe the effects would be without any mitigation; and
- How far different mitigation options would reduce these effects – both how many people are affected and the severity of the effect.

In thinking about the possible mitigations, we distinguish between the construction (or development) phase and the operational phase. In the operational phase, we also consider separately the impacts associated with the airport operations and those linked to the improved connectivity provided by an airport development and the effects arising from the impact on wider surface access (which could be either positive or negative).

Table 13 illustrates some potential mitigation options against each of the Appraisal Framework Modules. We focus on those outcomes where we have identified evidence of a link between airports and subjective wellbeing (see Section 2.5.2). Once the Commission's further research and analysis have been completed it will be possible to refine this list.

One implication of incorporating subjective wellbeing into the Appraisal Framework is that it encourages and enables consideration of a wide range of possible mitigations. In particular, it means that a much wider range of options which could lead to improved subjective wellbeing can be considered to see whether they might compensate for any negative impacts. These options need not be directly related to the operation of the airport: for example, they may entail providing enhanced access to public space, improving amenity and helping local people acquire new skills and improving their employability. All are known to have an impact on subjective wellbeing. Ultimately, if their impact on say life satisfaction can be established, then their impact can be weighed against other options, and the main elements of the schemes.

Table 13: Illustrative mitigation options addressing Airports Commission Appraisal Framework outcomes linked to subjective wellbeing

#	Appraisal Framework Module	Construction phase	Airport operations	Connectivity (by air transport)	Surface access
1	Strategic fit			• Better meeting demand for air travel – consumer surplus	
2	National economy	• Targeting 'local' residents for job opportunities • Providing training/skills development for local people	• Targeting 'local' residents for job opportunities • Providing training/skills development for local people		
3	Local economy				
4	Surface access				• Improving local transport services for non-airport users

[117] See, for example, the European Investment Bank's Environmental and Social Practices Handbook: http://www.eib.org/attachments/strategies/environmental_and_social_practices_handbook_en.pdf

#	Appraisal Framework Module	Construction phase	Airport operations	Connectivity (by air transport)	Surface access
5	Noise	• Land use planning	• Reduction at source • Noise abatement operational procedures • Operating restrictions		
10	Place	• Providing additional recreational sites • Reducing damage to heritage sites			• Providing improved access to recreational sites
12	Community	• Providing improved access to housing • Enhancing social infrastructure			• Sustaining local connectivity

Appendices

Appendix A – Glossary of key terms

Annual Population Survey (APS): this is a survey conducted quarterly by the Office for National Statistics (ONS). It incorporates results from the Labour Force Survey, which provides a wealth of data on employment status. The APS is a repeated annual cross-sectional survey of approximately 155,000 households and 360,000 individuals. Since 2011 the APS has contained the four ONS wellbeing questions and hence we will use waves 2011-2012 and 2012-2013 (the latest available wave) in our analysis.

Binary variable (or dummy variable): A variable which can only be one of two things, for example, female or not female to be analysed in multivariate linear regression.

Census Output Code (OA): Output areas (OAs) are created for Census data, specifically for the output of census estimates. The OA is the lowest geographical level at which census estimates are provided.

Coefficient: The results of the regressions provide unstandardised coefficients which tell us the effect on the dependent variable (subjective wellbeing) from a change in one unit of the independent variable. If the independent variable is binary, such as the presence or absence of aircraft noise, then the coefficient tells the number of extra (or less) points on a ten-point scale that people in aircraft noise contours have compared to someone outside of aircraft noise contours with all other factors held constant (controlled).

Confounding factors: Factors that drive changes in the *both* the outcome variable and the variable of interest.

Control variables: By controlling for differences in one variable (e.g. age) across two sample populations (those affected by the intervention and those not affected); this allows us to understand the relationship between two variables (an *independent* and a *dependent* variable) without other variables influencing the relationship. The difference we find once we have controlled for age is the difference that we would expect between individuals of the same age in both sample populations.

Dependent variable: Dependent variables are *variables* whose variation we are trying to understand. In our work the dependent variable is subjective wellbeing. However, we may also want know what factors affect the likelihood of living in an airport location. In this case we would make airport proximity the dependent variable to understand the influence of other factors on living in these areas.

Dummy variable: (also known as an indicator variable, design variable, Boolean indicator, categorical variable, binary variable, or qualitative variable) Dummy variables take the value 0 or 1 to indicate the absence or presence of some categorical effect that may be expected to shift the outcome

Independent variable: Independent variables are the variables that might explain variations in a dependent variable. In many cases, independent variables are things in the real world which we might have an influence over, such as income or working hours.

Socio-demographic factors: Refer to 'individual characteristics' and reflect the individual, household, and geographical variables included as controls in our regressions – including age, gender, marital status, number of children, disability, employment status, education level, being a homeowner, having a religion, living in an urban area and average household income in an area.

Linear regression: Linear regression is an approach for modeling the relationship between a scalar dependent variable and one or more explanatory variables.

Local Super Output Area (LSOA): Super output areas (SOAs) were designed to improve the reporting of small area statistics and are built up from groups of output areas (OAs).

Logistic regression: Logistic regressions (or logits) take the natural logarithm of the odds of the dependent variable (e.g. airport proximity) being a case (referred to as the log-odds) for a range of control factors. The logistic regression estimates the odds, as a continuous variable, that the dependent variable is significantly influenced by the independent variable. The predicted value of the logit is converted into predicted odds via an exponential function (the inverse of the natural logarithm).

Reference group: Reference groups are used in order to evaluate and determine the nature of a given individual or other group's characteristics and sociological attributes. Reference groups provide the benchmarks and contrast needed for comparison and evaluation of group and personal characteristics.

Residual: Residuals are an output of regressions. They are the difference, for an individual, between what the *dependent variable* is for that individual, and what the dependent variable is predicted to be given the equation produced by the regression.

Statistical significance: Statistical tests look at a pattern or relationship seen in the data from a sample, and testing if it reflects a real pattern or relationship in the general population. If a result is found to be significant, this means that there is only a small chance that it was just found in the sample by chance (typically 1% or 5% are used as thresholds). If a result is not found to be significant, then we cannot trust that it was not a fluke pattern.

Subjective well-being: An individual's experience of how their life is going assessed through questions in surveys. Happiness, satisfaction with life, an absence of anxiety and feeling that what one does in life is worthwhile are all elements of subjective well-being, but so are a sense of autonomy, self-esteem and feeling that one's relationships are supportive, amongst other things.

Appendix B – ONS national wellbeing indicators

Below, we summarise the ten domains within the ONS's national wellbeing indicators and the indicators which fall under each of them.

Domain	Indicator
Personal well-being	• Medium/high rating of satisfaction with their lives overall • Medium/high rating of how worthwhile the things they do are • Rated their happiness yesterday as medium/high • Rated their anxiety yesterday as medium/low • Population mental well-being
Our relationships	• Average rating of satisfaction with family life • Average rating of satisfaction with social life • Has a spouse, family member or friend to rely on if they have a serious problem
Health	• Healthy life expectancy at birth (male/female) • Reported a long term illness and a disability • Somewhat, mostly or completely satisfied with their health • Some evidence indicating probable psychological disturbance or mental ill health.
What we do	• Unemployment rate • Somewhat, mostly or completely satisfied with their job • Somewhat, mostly or completely satisfied with their amount of leisure time • Volunteered more than once in the last 12 months • Engaged with/participated in arts or cultural activity at least 3 times in last year • Adult participation in 30 minutes of moderate intensity sport, once per week.
Where we live	• Crimes against the person (per 1,000 adults) • Felt fairly/very safe walking alone after dark (men/women) • Accessed natural environment at least once a week in the last 12 months • Agreed/agreed strongly they felt they belonged to their neighbourhood • Households with good transport access to key services or work (2010 = 100) • Fairly/very satisfied with their accommodation
Personal finance	• Individuals in households with less than 60% of median income after housing costs • Median wealth per household, including pension wealth • Median household income • Somewhat, mostly or completely satisfied with the income of their household • Report finding it quite or very difficult to get by financially
The economy	• Real net national income per head • UK public sector net debt as a percentage of Gross Domestic Product • Inflation rate (as measured by the Consumer Price Index)
Education and skills	• Human capital - the value of individuals' skills, knowledge and competences in labour market • Five or more GCSEs A* to C including English and Maths • UK residents aged 16 to 64 with no qualifications
Governance	• Voter turnout (at UK General Elections) • Those who have trust in national Government
The natural environment	• Total greenhouse gas emissions (millions of tonnes) • Protected areas in the UK (Millions hectares) • Energy consumed within the UK from renewable sources • Household waste that is recycled

Appendix C – Indicators used in wellbeing analysis

Variable descriptions

Variable	Description
Gender	1 = female; 0 = male (reference)
Age	Age of respondent as continuous variable
Age Squared	Non-linear function of age
BME	Black or minority ethnic
Religion – Yes	1=Religious; 0=no religion (reference)
Single	Marital status: 1=Single; 0=Married (reference)
Separated	Marital status: 1=Separated; 0=Married (reference)
Divorced	Marital status: 1=Divorced; 0=Married (reference)
Widowed	Marital status: 1=Widowed; 0=Married (reference)
Civil Partner	Marital status: 1=Civil partner; 0=Married (reference)
One child	Number of children: 1=One child; 0=No children (reference)
Two children	Number of children: 1=Two children; 0=No children (reference)
Three children	Number of children: 1= Three children; 0=No children (reference)
Four or more children	Number of children: 1= Four or more children; 0=No children (reference)
Limiting Health	Health: 1= Individual reports health to be limiting on their day to day life; 0=No limiting health conditions (reference)
Smoker – Ex	Smoking: 1=Ex-smoker; 0=No smoking (reference)
Smoker – Yes	Smoking: 1=Current smoker; 0=No smoking (reference)
Own House	Accommodation status: 1=Owns house; 0=Mortgage (reference)
Rent Private	Accommodation status: 1=Private renter; 0=Mortgage (reference)
Rent Social	Accommodation status: 1=Social housing; 0=Mortgage (reference)
No rent/squatters	Accommodation status: 1=Not paying rent/squatting; 0=Mortgage (reference)
Higher Ed	Education: 1=Higher education; 0=Degree (reference)
A level	Education: 1=A-level; 0=Degree (reference)
GCSE	Education: 1=GCSE; 0=Degree (reference)
Ed Other	Education: 1=Other educational training; 0=Degree (reference)
Ed_None	Education: 1=No education; 0=Degree (reference)
Learn – Yes	Education: 1=Further learning; 0=Degree (reference)
Inactive – seeking	Employment: 1=Inactive seeking work; 0=Full time employed (reference)
Inactive – not seeking but w~s	Employment: 1=Inactive not seeking work but wants work; 0=Full time employed (reference)
Inactive – not seeking not w~	Employment: 1=Inactive not seeking work doesn't want work; 0=Full time employed (reference)
Inactive – retired	Employment: 1=Retired; 0=Full time employed (reference)

Variable	Description
Unemployed	Employment: 1=Unemployed; 0=Full time employed (reference)
Student	Employment: 1=Student; 0=Full time employed (reference)
Unpaid Family Worker	Employment: 1= Unpaid family worker; 0=Full time employed (reference)
Underemployed	Employment: 1=Underemployed; 0=Full time employed (reference)
Part-Time	Employment: 1=Part-time; 0=Full time employed (reference)
Full Time Self-Employed	Employment: 1= Full Time Self-Employed; 0=Full time employed (reference)
Full Time 2nd pay quintile	Full time income: 1=2nd pay quintile; 0=1st pay quintile (reference)
Full Time 3rd pay quintile	Full time income: 1=3rd pay quintile; 0=1st pay quintile (reference)
Full Time 4th pay quintile	Full time income: 1=4th pay quintile; 0=1st pay quintile (reference)
Full Time highest pay quintile	Full time income: 1=Highest pay quintile; 0=1st pay quintile (reference)
Face-to-Face Survey	Survey method: 1= Face-to-face survey; 0=Telephone survey (reference)
Airport variable	
MaxDaytime noise	MaxLq16 giving maximum strategic aviation noise map level (L_{Aeq16h}) at a residential dwelling for the Census Output Code (OA): 1=Presence of maximum daytime noise; 0=Absence of maximum daytime noise (reference)
MaxNight time noise	MaxLnight giving 50dB(A), L_{night} noise contours (11pm to 7am,dB Lnight) for maximum annual strategic aviation noise map levels (L_{night}): 1=Presence of max night time noise; 0=Absence of max night time noise (reference)
MeanDaytime noise	MeanLq16 giving mean strategic aviation noise map level data (L_{Aeq16h}): 1=Presence of mean daytime noise; 0=Absence of mean daytime noise (reference)
Mean night time noise	MeanLnight giving 50dB(A), L_{night} noise contours (11pm to 7am,dB Lnight) for and mean strategic aviation noise map level (L_{night}): 1=Presence of mean nighttime noise; 0=Absence of mean night time noise (reference)
Airprox	Airport Proximity is defined as the airport reference point (ARP), the centre point of an airport, located at the geometric centre of all the usable runways: 1=Within a distance ≤5km from the centre point of an airport; 0=>5km from the centre point of an airport (reference)
Continuous Day time Noise	Linear continuous maximum daytime noise variable
Continuous Night time Noise	Linear continuous maximum night time noise variable

Appendix D – APS analysis & results

Table D. 1: Selection effects – Airport Proximity Logistic Regression Model

DV= Airprox5km	Coefficient	SE	z	P>z	95% Conf. Interval	
Female	0.053**	0.019	2.730	0.006	0.015	0.091
Age	-0.001	0.005	-0.250	0.802	-0.011	0.008
Age Squared	0.000	0.000	0.550	0.580	0.000	0.000
BME	0.349***	0.027	12.750	0.000	0.295	0.402
Religion – Yes	0.028	0.021	1.350	0.178	-0.013	0.068
Single	-0.019	0.045	-0.430	0.669	-0.107	0.069
Separated	-0.019	0.045	-0.430	0.669	-0.107	0.069
Divorced	-0.034	0.028	-1.190	0.235	-0.089	0.022
Widowed	0.062	0.048	1.270	0.202	-0.033	0.156
Civil partner	0.186	0.142	1.310	0.189	-0.092	0.464
One child	-0.042	0.027	-1.550	0.121	-0.094	0.011
Two children	-0.055	0.029	-1.930	0.054	-0.111	0.001
Three children	0.023	0.044	0.510	0.609	-0.064	0.109
Four or more children	-0.137	0.071	-1.930	0.053	-0.277	0.002
LimitingHealth	-0.072**	0.023	-3.090	0.002	-0.118	-0.026
Smoker – Yes	-0.051*	0.025	-2.040	0.041	-0.100	-0.002
Smoker – Ex	0.043*	0.020	2.120	0.034	0.003	0.082
RentPrivate	0.187***	0.026	7.130	0.000	0.136	0.239
RentSocial	0.120***	0.028	4.250	0.000	0.065	0.176
No rent/squatters	-0.154	0.109	-1.410	0.159	-0.368	0.060
Higher_Ed	-0.102**	0.032	-3.190	0.001	-0.164	-0.039
Alevel	-0.135***	0.026	-5.110	0.000	-0.186	-0.083
GCSE	-0.145***	0.027	-5.390	0.000	-0.198	-0.093
Ed_Other	-0.174***	0.034	-5.090	0.000	-0.240	-0.107
Ed_None	-0.267***	0.036	-7.480	0.000	-0.337	-0.197
Inactive – seeking	0.012	0.117	0.100	0.919	-0.217	0.241
Inactive – not seeking but w~s	0.150*	0.055	2.740	0.006	0.043	0.258
Inactive – not seeking not w~	0.186***	0.046	4.080	0.000	0.097	0.276

DV= Airprox5km	Coefficient	SE	z	P>z	95% Conf.	Interval
Inactive – retired	0.146**	0.049	2.990	0.003	0.050	0.241
Unemployed	0.031	0.053	0.590	0.557	-0.073	0.135
Student	-0.035	0.074	-0.470	0.640	-0.179	0.110
Unpaid Family Worker	0.268	0.153	1.750	0.079	-0.032	0.568
Underemployed	0.135	0.061	2.200	0.028	0.015	0.255
Part-Time	0.161***	0.043	3.750	0.000	0.077	0.245
Full Time Self-Employed	0.277***	0.049	5.610	0.000	0.180	0.374
Full Time 2nd pay quintile	0.069	0.050	1.390	0.164	-0.028	0.166
Full Time 3rd pay quintile	0.161**	0.049	3.280	0.001	0.065	0.257
Full Time 4th pay quintile	0.231***	0.049	4.710	0.000	0.135	0.327
Full Time highest pay quintile	0.453***	0.048	9.460	0.000	0.359	0.546
_cons	-1.936***	0.134	-14.450	0.000	-2.198	-1.673

*Legend: * p<0.05; ** p<0.01; *** p<0.001; Notes: Sample N= 189,378; R^2 =0.009. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed; (ix) for income variables ref = lowest fulltime pay quintile. Sample is restricted to England and those aged 18 and over.*

When we investigated the selection effects at individual London airports and found that ethnic minority communities, private renters, non-renter/squatters, part-time workers, and those with lower (GCSE or other) educational attainment were more likely to live within 5km of Heathrow airport (see Table D.2, in Appendix). However, those with higher degree education were also more likely to live within 5km of Heathrow than those with degree education. In addition, those in the highest (3rd, 4th and 5th) income quintiles were successively more likely to live within 5km of Heathrow.

Those with one child and three children were less likely to live near Heathrow. We also found a small negative association between age (squared) and airport proximity. These results were statistically significant within 95% confidence.

Ethnic minority communities, and those with four or more children were more likely to live within 5km of Gatwick airport (see Table D.3, in Appendix). Those living in private rented accommodation were less likely to live within 5km of Gatwick.

The Stansted model did not converge, because sample was small (n-45).

There appears to be an association between family size and accommodation status for Gatwick, perhaps reflecting the rurality of these locations, and the availability of larger houses either for buying or renting from social housing.

Table D. 2: Selection effects – Heathrow

Proximity to Heathrow	Coefficient	SE	z	P>z	95% Conf.	Interval
Female	0.201	0.143	1.410	0.159	-0.079	0.481
Age	0.074	0.041	1.800	0.072	-0.007	0.154
Age Squared	-0.001*	0.000	-2.340	0.019	-0.002	0.000
BME	1.578***	0.146	10.820	0.000	1.292	1.864

Proximity to Heathrow	Coefficient	SE	z	P>z	95% Conf.	Interval
Religion – Yes	0.593**	0.173	3.440	0.001	0.255	0.932
Single	0.010	0.183	0.060	0.955	-0.348	0.368
Separated	0.276	0.248	1.110	0.265	-0.209	0.762
Divorced	0.151	0.207	0.730	0.467	-0.255	0.557
Widowed	0.250	0.414	0.600	0.546	-0.562	1.063
Civil partner	1.074	0.867	1.240	0.215	-0.624	2.773
One child	-0.392*	0.197	-1.990	0.046	-0.777	-0.006
Three children	-1.111*	0.393	-2.830	0.005	-1.882	-0.341
Four or more children	-0.504	0.468	-1.080	0.282	-1.422	0.414
LimitingHealth	-0.218	0.187	-1.160	0.245	-0.585	0.149
Smoker – Yes	0.086	0.170	0.510	0.613	-0.248	0.420
Smoker – Ex	0.038	0.152	0.250	0.805	-0.261	0.336
RentPrivate	0.347*	0.169	2.050	0.040	0.016	0.678
RentSocial	0.296	0.201	1.480	0.140	-0.097	0.690
No rent/squatters	0.914*	0.442	2.070	0.039	0.047	1.781
Higher_Ed	0.578**	0.219	2.640	0.008	0.150	1.006
Alevel	0.152	0.211	0.720	0.470	-0.261	0.566
GCSE	0.722***	0.206	3.510	0.000	0.319	1.125
Ed_Other	0.735**	0.242	3.040	0.002	0.261	1.209
Ed_None	0.608*	0.287	2.110	0.035	0.044	1.171
Inactive – seeking	1.090	0.588	1.860	0.064	-0.062	2.242
Inactive – not seeking but w~s	0.797	0.425	1.880	0.061	-0.036	1.630
Inactive – not seeking not w~	0.220	0.377	0.580	0.559	-0.518	0.959
Inactive – retired	0.643	0.422	1.520	0.127	-0.183	1.470
Unemployed	0.512	0.368	1.390	0.164	-0.208	1.233
Student	-2.825	1.045	-2.700	0.007	-4.873	-0.778
Unpaid Family Worker	(omitted)					
Underemployed	-0.071	0.488	-0.150	0.885	-1.028	0.886
Part-Time	0.703*	0.320	2.190	0.028	0.075	1.330
Full Time Self-Employed	0.512	0.375	1.370	0.172	-0.223	1.247
Full Time 2nd pay quintile	0.352	0.378	0.930	0.351	-0.388	1.093
Full Time 3rd pay quintile	1.060**	0.348	3.050	0.002	0.379	1.741
Full Time 4th pay quintile	1.310***	0.353	3.710	0.000	0.618	2.002
Full Time highest pay quintile	1.093**	0.375	2.910	0.004	0.358	1.828
_cons	-7.813***	1.025	-7.630	0.000	-9.821	-5.805

*Legend: * p<0.05; ** p<0.01; *** p<0.001; Notes Sample N= 151,171; R^2 =0.121. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed; (ix) for income variables ref = lowest fulltime pay quintile. Sample is restricted to England and those aged 18 and over.*

Table D. 3: Selection effects – Gatwick

Proximity to Gatwick	Coefficient	SE	Z	P>z	95% Conf.	Interval
Female	0.206	0.207	1.000	0.318	-0.199	0.611
Age	0.003	0.048	0.070	0.945	-0.090	0.096
Age Squared	0.000	0.001	0.080	0.940	-0.001	0.001
BME	0.998***	0.256	3.890	0.000	0.495	1.500
Religion – Yes	-0.106	0.199	-0.530	0.594	-0.497	0.285
Single	0.106	0.241	0.440	0.660	-0.367	0.579
Separated	-0.437	0.592	-0.740	0.460	-1.598	0.723
Divorced	-0.130	0.287	-0.450	0.652	-0.692	0.433
Widowed	0.086	0.550	0.160	0.876	-0.991	1.164
Civil partner	(omitted)					
One child	0.147	0.266	0.550	0.581	-0.375	0.669
Two children	0.187	0.270	0.690	0.489	-0.343	0.716
Three children	-0.098	0.510	-0.190	0.848	-1.098	0.903
Four or more children	1.140*	0.482	2.370	0.018	0.196	2.085
LimitingHealth	0.133	0.250	0.530	0.593	-0.356	0.623
Smoker – Yes	0.126	0.244	0.520	0.606	-0.353	0.605
Smoker – Ex	0.395	0.207	1.910	0.056	-0.011	0.801
RentPrivate	-0.613*	0.294	-2.080	0.037	-1.189	-0.036
RentSocial	-0.443	0.313	-1.410	0.158	-1.057	0.171
No rent/squatters	(omitted)					
Higher_Ed	-0.038	0.308	-0.120	0.901	-0.641	0.565
Alevel	0.383	0.258	1.490	0.137	-0.122	0.889
GCSE	0.222	0.257	0.860	0.387	-0.282	0.726
Ed_Other	0.137	0.342	0.400	0.689	-0.533	0.807
Ed_None	-0.186	0.396	-0.470	0.639	-0.963	0.591
Inactive – seeking	(omitted)					
Inactive – not seeking but w~s	-0.208	0.549	-0.380	0.705	-1.283	0.868
Inactive – not seeking not w~	-0.096	0.442	-0.220	0.827	-0.963	0.770
Inactive – retired	-0.097	0.445	-0.220	0.828	-0.969	0.775
Unemployed	-1.160	0.696	-1.670	0.096	-2.523	0.204

Proximity to Gatwick	Coefficient	SE	Z	P>z	95% Conf.	Interval
Student	-1.504	1.094	-1.370	0.169	-3.649	0.640
Unpaid Family Worker	(omitted)					
Underemployed	-0.775	0.697	-1.110	0.266	-2.140	0.591
Part-Time	-0.170	0.412	-0.410	0.680	-0.976	0.637
Full Time Self-Employed	0.076	0.466	0.160	0.870	-0.838	0.990
Full Time 2nd pay quintile	0.032	0.483	0.070	0.947	-0.913	0.978
Full Time 3rd pay quintile	0.227	0.491	0.460	0.644	-0.736	1.189
Full Time 4th pay quintile	0.162	0.481	0.340	0.737	-0.782	1.105
Full Time highest pay quintile	0.302	0.481	0.630	0.530	-0.641	1.246
_cons	-0.033	0.785	-0.040	0.967	-1.572	1.506

*Legend: * p<0.05; ** p<0.01; *** p<0.001; Notes: Sample N= 148,461; R^2 =0.101. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed; (ix) for income variables ref = lowest fulltime pay quintile. Sample is restricted to England and those aged 18 and over.*

Table D. 4: Airport proximity Model 1 – Standard control variables (Summary of results Model 1 Airport proximity (all wellbeing variables measured on a scale of 0-10))

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Airport Proximity (<5km)	0.005	0.014	-0.002	0.014	-0.006	0.018	0.029	0.024	-0.019	0.018
Female	0.163***	0.011	0.332***	0.011	0.088***	0.014	0.205***	0.018	-0.059***	0.014
Age	-0.109***	0.003	-0.066***	0.003	-0.079***	0.004	0.081***	0.005	-0.080***	0.003
Age Squared	0.001***	0.000	0.001***	0.000	0.001***	0.000	-0.001***	0.000	0.001***	0.000
BME	-0.284***	0.019	-0.210***	0.018	-0.108***	0.022	0.191***	0.029	-0.150***	0.021
Religion – Yes	0.090***	0.012	0.160***	0.012	0.124***	0.015	0.077***	0.019	0.024	0.014
Single	-0.475***	0.014	-0.313***	0.014	-0.392***	0.017	0.147***	0.023	-0.269***	0.017
Separated	-0.718***	0.031	-0.352***	0.029	-0.512***	0.036	0.293***	0.045	-0.404***	0.035
Divorced	-0.520***	0.017	-0.306***	0.017	-0.407***	0.021	0.209***	0.027	-0.308***	0.020
Widowed	-0.788***	0.032	-0.417***	0.030	-0.614***	0.038	0.255***	0.047	-0.433***	0.037
Civil partner	0.249***	0.060	0.262***	0.064	0.200*	0.089	0.02	0.150	0.093	0.105
One child	0.079***	0.015	0.232***	0.015	0.092***	0.019	-0.065**	0.025	0.078***	0.018
Two children	0.156***	0.026	0.351***	0.024	0.158***	0.032	-0.208***	0.042	0.182***	0.031
Three children	0.159**	0.051	0.421***	0.051	0.228***	0.061	-0.220**	0.081	0.222***	0.062
Four or more children	0.272*	0.111	0.426***	0.111	0.306*	0.121	-0.277*	0.140	0.278*	0.109
LimitingHealth	-0.722***	0.015	-0.539***	0.015	-0.703***	0.018	0.890***	0.023	-0.796***	0.018
Smoker – Yes	-0.345***	0.015	-0.238***	0.015	-0.337***	0.019	0.218***	0.024	-0.277***	0.018
Smoker – Ex	-0.077***	0.011	-0.050***	0.011	-0.077***	0.014	0.080***	0.019	-0.078***	0.014
RentPrivate	-0.129***	0.015	-0.049**	0.015	-0.058**	0.019	0.184***	0.025	-0.120***	0.019
RentSocial	-0.258***	0.019	-0.120***	0.018	-0.243***	0.022	0.194***	0.028	-0.219***	0.021

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
No rent/squatters	0.217***	0.064	0.256***	0.063	0.217**	0.080	-0.282**	0.098	0.249**	0.078
Higher_Ed	0.016	0.017	0.01	0.017	0.007	0.022	-0.164***	0.030	0.086***	0.022
Alevel	0.034*	0.014	-0.032*	0.014	-0.004	0.018	-0.175***	0.024	0.086***	0.018
GCSE	0.008	0.015	-0.055***	0.015	-0.001	0.019	-0.252***	0.025	0.126***	0.018
Ed_Other	0.046*	0.022	-0.097***	0.021	0.025	0.025	-0.204***	0.033	0.115***	0.025
Ed_None	-0.008	0.023	-0.244***	0.022	-0.084**	0.027	-0.083*	0.034	-0.001	0.026
Inactive – seeking	-0.426***	0.080	-0.237**	0.076	-0.303**	0.095	0.600***	0.113	-0.457***	0.086
Inactive – not seeking but w~s	-0.649***	0.036	-0.478***	0.036	-0.479***	0.043	0.562***	0.053	-0.519***	0.041
Inactive – not seeking not w~	-0.190***	0.028	-0.177***	0.027	-0.188***	0.034	0.281***	0.043	-0.233***	0.033
Inactive – retired	0.376***	0.027	0.182***	0.026	0.376***	0.033	-0.355***	0.043	0.365***	0.032
Unemployed	-0.785***	0.034	-0.535***	0.033	-0.354***	0.040	0.425***	0.049	-0.390***	0.037
Student	0.073	0.039	0.162***	0.042	0.008	0.052	0.373***	0.068	-0.182***	0.050
Unpaid Family Worker	0.089	0.086	0.190*	0.079	0.229*	0.103	0.146	0.147	0.044	0.109
Underemployed	-0.391***	0.037	-0.192***	0.036	-0.195***	0.045	0.197***	0.057	-0.195***	0.042
Part-Time	0.108***	0.023	0.156***	0.023	0.077**	0.029	0.026	0.038	0.025	0.028
Full Time Self-Employed	0.111***	0.027	0.249***	0.027	0.096**	0.034	0.088*	0.045	0.004	0.033
Full Time 2nd pay quintile	0.051*	0.026	0.038	0.026	0.007	0.034	0.012	0.043	-0.003	0.032
Full Time 3rd pay quintile	0.151***	0.026	0.157***	0.025	0.033	0.033	0.067	0.043	-0.017	0.032
Full Time 4th pay quintile	0.193***	0.025	0.229***	0.024	0.044	0.032	0.063	0.043	-0.009	0.032
Full Time highest pay quintile	0.312***	0.025	0.231***	0.025	0.099**	0.032	0.085*	0.043	0.008	0.032
May-11	0.078	0.046	0.037	0.045	-0.160**	0.056	0.115	0.074	-0.137*	0.055

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Jun-11	0.069	0.045	0.065	0.044	-0.165**	0.056	0.061	0.072	-0.115*	0.054
Jul-11	0.054	0.045	0.043	0.044	-0.164**	0.056	0.042	0.072	-0.104	0.054
Aug-11	0.101*	0.044	0.078	0.043	-0.116*	0.055	-0.097	0.072	-0.012	0.053
Sep-11	0.081	0.044	0.077	0.043	-0.193***	0.055	0.087	0.072	-0.140**	0.053
Oct-11	0.081	0.044	0.084	0.043	-0.194***	0.055	-0.074	0.071	-0.059	0.053
Nov-11	0.101*	0.043	0.095*	0.043	-0.219***	0.055	-0.046	0.071	-0.087	0.053
Dec-11	0.151***	0.044	0.113**	0.043	-0.118*	0.056	-0.107	0.072	-0.007	0.054
Jan-12	0.114**	0.043	0.074	0.042	-0.233***	0.054	-0.054	0.070	-0.09	0.052
Feb-12	0.071	0.046	0.049	0.044	-0.240***	0.057	-0.102	0.072	-0.07	0.054
Mar-12	0.102*	0.043	0.113**	0.042	-0.098	0.054	-0.175*	0.071	0.037	0.053
Apr-12	0.172**	0.056	0.168**	0.054	0.03	0.068	-0.189*	0.090	0.109	0.066
May-12	0.145*	0.067	0.093	0.066	0.061	0.082	-0.175	0.110	0.118	0.081
Jun-12	0.213**	0.068	0.156*	0.067	0.092	0.083	-0.243*	0.111	0.166*	0.082
Jul-12	0.184**	0.067	0.148*	0.066	0.135	0.082	-0.280*	0.109	0.207*	0.081
Aug-12	0.243***	0.067	0.178**	0.066	0.156	0.083	-0.290**	0.111	0.223**	0.082
Sep-12	0.218**	0.067	0.167*	0.066	0.12	0.083	-0.185	0.111	0.151	0.082
Oct-12	0.171*	0.067	0.133*	0.066	-0.018	0.083	-0.143	0.110	0.061	0.081
Nov-12	0.194**	0.067	0.175**	0.066	0.05	0.082	-0.202	0.110	0.125	0.081
Dec-12	0.259***	0.068	0.156*	0.067	0.108	0.083	-0.222*	0.111	0.166*	0.082
Jan-13	0.154*	0.067	0.102	0.066	-0.023	0.082	-0.234*	0.110	0.103	0.081
Feb-13	0.232***	0.067	0.158*	0.066	0.069	0.082	-0.229*	0.110	0.15	0.081

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Mar-13	0.148*	0.068	0.144*	0.066	0.026	0.083	-0.173	0.110	0.1	0.081
Apr-13	0.201**	0.075	0.107	0.075	0.087	0.094	-0.445***	0.120	0.265**	0.090
Sunday	0.012	0.022	-0.034	0.022	0.026	0.027	-0.056	0.036	0.041	0.027
Monday	-0.009	0.017	-0.013	0.016	0.215***	0.021	-0.247***	0.027	0.231***	0.020
Tuesday	-0.01	0.016	-0.005	0.016	0.036	0.020	-0.064*	0.026	0.049*	0.020
Thursday	0.011	0.017	0.018	0.017	0	0.021	0.033	0.027	-0.017	0.020
Friday	0	0.019	0.003	0.018	-0.003	0.023	0.044	0.030	-0.024	0.023
Saturday	-0.028	0.022	-0.065**	0.022	0.035	0.027	0.006	0.036	0.014	0.027
Face-to-Face Survey	-0.129***	0.011	-0.110***	0.011	-0.085***	0.014	-0.014	0.018	-0.036**	0.013
Data set 1= APS 2012-13	-0.066	0.051	-0.05	0.050	-0.217***	0.061	0.089	0.084	-0.154*	0.061
Constant	10.113***	0.076	8.963***	0.077	9.347***	0.096	1.072***	0.124	4.141***	0.093
r^2	0.136		0.096		0.068		0.04		0.064	
N	189162		188594		189148		188897		188788	

*Legend: * p<0.05; ** p<0.01; *** p<0.001 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 5: Airport proximity Model 2 – Control variables maximum presence of daytime aircraft noise (Summary of results Model 2 Daytime noise (all wellbeing variables measured on a scale of 0-10))

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Airport Proximity (<5km)	0.011	0.014	0.002	0.014	-0.003	0.018	0.023	0.024	-0.013	0.018
MaxDaytime Noise	-0.147***	0.040	-0.126**	0.038	-0.116*	0.052	0.201**	0.071	-0.160**	0.053
Female	0.163***	0.011	0.331***	0.011	0.088***	0.014	0.205***	0.018	-0.059***	0.014
Age	-0.109***	0.003	-0.066***	0.003	-0.079***	0.004	0.081***	0.005	-0.080***	0.003
Age Squared	0.001***	0.000	0.001***	0.000	0.001***	0.000	-0.001***	0.000	0.001***	0.000
BME	-0.282***	0.019	-0.207***	0.018	-0.106***	0.022	0.187***	0.029	-0.147***	0.021
Religion – Yes	0.091***	0.012	0.161***	0.012	0.124***	0.015	0.076***	0.019	0.024	0.014
Single	-0.476***	0.014	-0.314***	0.014	-0.392***	0.017	0.148***	0.023	-0.270***	0.017
Separated	-0.718***	0.031	-0.352***	0.029	-0.512***	0.036	0.294***	0.045	-0.404***	0.035
Divorced	-0.520***	0.017	-0.306***	0.017	-0.406***	0.021	0.209***	0.027	-0.308***	0.020
Widowed	-0.788***	0.032	-0.417***	0.030	-0.614***	0.038	0.255***	0.047	-0.433***	0.037
Civil partner	0.251***	0.060	0.263***	0.064	0.201*	0.089	0.019	0.150	0.094	0.105
One child	0.079***	0.015	0.232***	0.015	0.092***	0.019	-0.065**	0.025	0.078***	0.018
Two children	0.156***	0.026	0.351***	0.024	0.158***	0.032	-0.207***	0.042	0.182***	0.031
Three children	0.159**	0.051	0.421***	0.051	0.228***	0.061	-0.220**	0.081	0.222***	0.062
Four or more children	0.270*	0.111	0.425***	0.111	0.305*	0.121	-0.275	0.140	0.277*	0.110
LimitingHealth	-0.722***	0.015	-0.539***	0.015	-0.703***	0.018	0.891***	0.023	-0.797***	0.018
Smoker – Yes	-0.345***	0.015	-0.237***	0.015	-0.337***	0.019	0.219***	0.024	-0.278***	0.018
Smoker – Ex	-0.077***	0.011	-0.049***	0.011	-0.077***	0.014	0.080***	0.019	-0.078***	0.014

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
RentPrivate	-0.128***	0.015	-0.048**	0.015	-0.058**	0.019	0.183***	0.025	-0.120***	0.019
RentSocial	-0.258***	0.019	-0.120***	0.018	-0.243***	0.022	0.194***	0.028	-0.219***	0.021
No rent/squatters	0.218***	0.064	0.257***	0.063	0.218**	0.080	-0.284**	0.099	0.250**	0.078
Higher_Ed	0.016	0.017	0.010	0.017	0.007	0.022	-0.163***	0.030	0.085***	0.022
Alevel	0.032*	0.014	-0.032*	0.014	-0.004	0.018	-0.174***	0.024	0.085***	0.018
GCSE	0.007	0.015	-0.055***	0.015	0.000	0.019	-0.251***	0.025	0.125***	0.018
Ed_Other	0.046*	0.022	-0.096***	0.021	0.026	0.025	-0.204***	0.033	0.116***	0.025
Ed_None	-0.008	0.023	-0.244***	0.022	-0.083**	0.027	-0.083*	0.034	0.000	0.026
Inactive – seeking	-0.426***	0.080	-0.237**	0.075	-0.303**	0.095	0.600***	0.113	-0.457***	0.086
Inactive – not seeking but w~s	-0.649***	0.036	-0.479***	0.036	-0.479***	0.043	0.561***	0.053	-0.519***	0.041
Inactive – not seeking not w~	-0.190***	0.028	-0.177***	0.027	-0.189***	0.034	0.283***	0.043	-0.234***	0.033
Inactive – retired	0.376***	0.027	0.182***	0.026	0.376***	0.033	-0.353***	0.043	0.363***	0.032
Unemployed	-0.785***	0.034	-0.535***	0.033	-0.353***	0.040	0.426***	0.049	-0.390***	0.037
Student	0.073	0.039	0.162***	0.042	0.009	0.052	0.373***	0.068	-0.182***	0.050
Unpaid Family Worker	0.089	0.086	0.190*	0.079	0.229*	0.103	0.148	0.147	0.043	0.109
Underemployed	-0.391***	0.037	-0.192***	0.036	-0.196***	0.046	0.199***	0.057	-0.197***	0.042
Part-Time	0.108***	0.023	0.156***	0.023	0.077**	0.029	0.027	0.038	0.025	0.028
Full Time Self-Employed	0.112***	0.027	0.250***	0.027	0.096**	0.034	0.089*	0.045	0.003	0.033
Full Time 2nd pay quintile	0.052*	0.026	0.037	0.026	0.006	0.034	0.012	0.043	-0.003	0.032
Full Time 3rd pay quintile	0.150***	0.026	0.157***	0.025	0.036	0.033	0.065	0.043	-0.014	0.032
Full Time 4th pay quintile	0.195***	0.025	0.231***	0.024	0.046	0.033	0.063	0.043	-0.008	0.032

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Full Time highest pay quintile	0.313***	0.025	0.231***	0.025	0.100**	0.032	0.086*	0.043	0.008	0.032
May-11	0.078	0.046	0.036	0.045	-0.160**	0.056	0.116	0.074	-0.138*	0.055
Jun-11	0.069	0.045	0.065	0.044	-0.165**	0.056	0.061	0.072	-0.115*	0.054
Jul-11	0.054	0.045	0.044	0.044	-0.164**	0.056	0.041	0.072	-0.103	0.054
Aug-11	0.101*	0.044	0.078	0.043	-0.116*	0.055	-0.097	0.072	-0.011	0.053
Sep-11	0.081	0.044	0.077	0.043	-0.193***	0.055	0.087	0.072	-0.139**	0.053
Oct-11	0.082	0.044	0.084*	0.043	-0.194***	0.055	-0.074	0.071	-0.059	0.053
Nov-11	0.101*	0.043	0.095*	0.043	-0.219***	0.055	-0.046	0.071	-0.088	0.053
Dec-11	0.151***	0.044	0.113**	0.043	-0.118*	0.056	-0.106	0.072	-0.008	0.054
Jan-12	0.113**	0.043	0.074	0.042	-0.232***	0.054	-0.054	0.070	-0.090	0.052
Feb-12	0.071	0.046	0.048	0.044	-0.240***	0.057	-0.102	0.072	-0.071	0.054
Mar-12	0.103*	0.043	0.113**	0.042	-0.097	0.054	-0.175*	0.071	0.037	0.053
Apr-12	0.172**	0.056	0.168**	0.054	0.029	0.068	-0.189*	0.090	0.108	0.066
May-12	0.145*	0.067	0.093	0.066	0.062	0.082	-0.174	0.110	0.117	0.081
Jun-12	0.213**	0.068	0.157*	0.067	0.092	0.083	-0.243*	0.111	0.166*	0.082
Jul-12	0.184**	0.067	0.147*	0.066	0.134	0.082	-0.280*	0.109	0.207*	0.081
Aug-12	0.242***	0.067	0.177**	0.066	0.156	0.083	-0.290**	0.111	0.223**	0.082
Sep-12	0.218**	0.067	0.166*	0.066	0.120	0.083	-0.184	0.111	0.151	0.082
Oct-12	0.170*	0.067	0.132*	0.066	-0.020	0.083	-0.143	0.110	0.060	0.081
Nov-12	0.193**	0.067	0.174**	0.066	0.051	0.082	-0.202	0.110	0.125	0.081
Dec-12	0.260***	0.068	0.158*	0.067	0.110	0.083	-0.224*	0.111	0.168*	0.082

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Jan-13	0.153*	0.067	0.102	0.066	-0.023	0.082	-0.234*	0.110	0.103	0.081
Feb-13	0.232***	0.067	0.157*	0.066	0.071	0.082	-0.232*	0.110	0.153	0.081
Mar-13	0.147*	0.068	0.145*	0.066	0.025	0.083	-0.174	0.110	0.100	0.081
Apr-13	0.198**	0.075	0.107	0.075	0.088	0.094	-0.442***	0.120	0.265**	0.090
Sunday	0.012	0.022	-0.035	0.022	0.027	0.027	-0.058	0.036	0.042	0.027
Monday	-0.008	0.017	-0.013	0.016	0.214***	0.021	-0.247***	0.027	0.230***	0.020
Tuesday	-0.009	0.016	-0.005	0.016	0.035	0.020	-0.064*	0.026	0.049*	0.020
Thursday	0.011	0.017	0.017	0.017	-0.001	0.021	0.033	0.027	-0.017	0.020
Friday	0.000	0.019	0.003	0.018	-0.003	0.023	0.043	0.030	-0.024	0.023
Saturday	-0.028	0.022	-0.064**	0.022	0.035	0.027	0.006	0.036	0.014	0.027
Face-to-Face Survey	-0.130***	0.011	-0.110***	0.011	-0.085***	0.014	-0.014	0.018	-0.036**	0.013
Data set 1= APS 2012-13	-0.066	0.051	-0.050	0.050	-0.218***	0.061	0.090	0.084	-0.155*	0.061
Constant	10.114***	0.076	8.964***	0.077	9.347***	0.096	1.072***	0.124	4.141***	0.093
r^2	0.137		0.096		0.068		0.040		0.064	
N	189058		188491		189044		188793		188684	

*Legend: * p<0.05; ** p<0.01; *** p<0.001 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 6: Airport proximity Model 3 – Control variables maximum presence of night time aircraft noise

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Airport Proximity (<5km)	0.01	0.014	0.001	0.014	-0.005	0.018	0.033	0.024	-0.02	0.018
Airport Proximity (<5km)	0.008	0.014	0.000	0.014	-0.007	0.018	0.027	0.024	-0.018	0.018
MaxNight time noise	-0.101	0.054	-0.093	0.054	0.024	0.069	0.109	0.093	-0.048	0.070
Female	0.163***	0.011	0.331***	0.011	0.088***	0.014	0.206***	0.018	-0.059***	0.014
Age	-0.109***	0.003	-0.066***	0.003	-0.079***	0.004	0.081***	0.005	-0.080***	0.003
Age Squared	0.001***	0.000	0.001***	0.000	0.001***	0.000	-0.001***	0.000	0.001***	0.000
BME	-0.283***	0.019	-0.209***	0.018	-0.109***	0.022	0.190***	0.029	-0.150***	0.021
Religion – Yes	0.091***	0.012	0.161***	0.012	0.124***	0.015	0.077***	0.019	0.024	0.014
Single	-0.476***	0.014	-0.314***	0.014	-0.392***	0.017	0.148***	0.023	-0.270***	0.017
Separated	-0.718***	0.031	-0.352***	0.029	-0.511***	0.036	0.293***	0.045	-0.404***	0.035
Divorced	-0.520***	0.017	-0.306***	0.017	-0.406***	0.021	0.209***	0.027	-0.308***	0.020
Widowed	-0.788***	0.032	-0.417***	0.030	-0.614***	0.038	0.255***	0.047	-0.433***	0.037
Civil partner	0.249***	0.060	0.262***	0.064	0.200*	0.089	0.020	0.150	0.093	0.105
One child	0.079***	0.015	0.232***	0.015	0.092***	0.019	-0.065**	0.025	0.078***	0.018
Two children	0.156***	0.026	0.351***	0.024	0.158***	0.032	-0.208***	0.042	0.183***	0.031
Three children	0.159**	0.051	0.421***	0.051	0.228***	0.061	-0.220**	0.081	0.223***	0.062
Four or more children	0.272*	0.111	0.426***	0.111	0.307*	0.121	-0.276*	0.140	0.278*	0.110
LimitingHealth	-0.722***	0.015	-0.539***	0.015	-0.703***	0.018	0.891***	0.023	-0.796***	0.018
Smoker – Yes	-0.345***	0.015	-0.237***	0.015	-0.338***	0.019	0.219***	0.024	-0.278***	0.018
Smoker – Ex	-0.077***	0.011	-0.049***	0.011	-0.077***	0.014	0.080***	0.019	-0.079***	0.014

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
RentPrivate	-0.129***	0.015	-0.049**	0.015	-0.058**	0.019	0.184***	0.025	-0.120***	0.019
RentSocial	-0.259***	0.019	-0.121***	0.018	-0.244***	0.022	0.195***	0.028	-0.220***	0.021
No rent/squatters	0.217***	0.064	0.256***	0.063	0.217**	0.080	-0.283**	0.099	0.249**	0.078
Higher_Ed	0.016	0.017	0.010	0.017	0.008	0.022	-0.164***	0.030	0.085***	0.022
Alevel	0.033*	0.014	-0.032*	0.014	-0.003	0.018	-0.174***	0.024	0.086***	0.018
GCSE	0.008	0.015	-0.055***	0.015	0.000	0.019	-0.251***	0.025	0.126***	0.018
Ed_Other	0.046*	0.022	-0.096***	0.021	0.026	0.025	-0.204***	0.033	0.116***	0.025
Ed_None	-0.008	0.023	-0.243***	0.022	-0.082**	0.027	-0.084*	0.034	0.001	0.026
Inactive – seeking	-0.426***	0.080	-0.237**	0.076	-0.303**	0.095	0.600***	0.113	-0.457***	0.086
Inactive – not seeking but w~s	-0.649***	0.036	-0.479***	0.036	-0.480***	0.043	0.562***	0.053	-0.520***	0.041
Inactive – not seeking not w~	-0.191***	0.028	-0.177***	0.027	-0.190***	0.034	0.283***	0.043	-0.234***	0.033
Inactive – retired	0.376***	0.027	0.182***	0.026	0.375***	0.033	-0.353***	0.043	0.363***	0.032
Unemployed	-0.785***	0.034	-0.536***	0.033	-0.354***	0.040	0.427***	0.049	-0.390***	0.037
Student	0.073	0.039	0.162***	0.042	0.009	0.052	0.373***	0.068	-0.182***	0.050
Unpaid Family Worker	0.089	0.086	0.190*	0.079	0.229*	0.103	0.148	0.147	0.043	0.109
Underemployed	-0.391***	0.037	-0.193***	0.036	-0.196***	0.046	0.199***	0.057	-0.197***	0.042
Part-Time	0.108***	0.023	0.156***	0.023	0.077**	0.029	0.028	0.038	0.025	0.028
Full Time Self-Employed	0.112***	0.027	0.249***	0.027	0.095**	0.034	0.090*	0.045	0.003	0.033
Full Time 2nd pay quintile	0.051*	0.026	0.037	0.026	0.006	0.034	0.013	0.043	-0.004	0.032
Full Time 3rd pay quintile	0.150***	0.026	0.156***	0.025	0.035	0.033	0.066	0.043	-0.015	0.032
Full Time 4th pay quintile	0.194***	0.025	0.230***	0.024	0.045	0.032	0.064	0.043	-0.009	0.032

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Full Time highest pay quintile	0.312***	0.025	0.230***	0.025	0.099**	0.032	0.088*	0.043	0.006	0.032
May-11	0.078	0.046	0.037	0.045	-0.160**	0.056	0.115	0.074	-0.137*	0.055
Jun-11	0.069	0.045	0.066	0.044	-0.165**	0.056	0.060	0.072	-0.114*	0.054
Jul-11	0.054	0.045	0.044	0.044	-0.164**	0.056	0.041	0.072	-0.103	0.054
Aug-11	0.101*	0.044	0.078	0.043	-0.116*	0.055	-0.097	0.072	-0.011	0.053
Sep-11	0.082	0.044	0.077	0.043	-0.193***	0.055	0.087	0.072	-0.139**	0.053
Oct-11	0.082	0.044	0.084	0.043	-0.195***	0.055	-0.074	0.071	-0.060	0.053
Nov-11	0.101*	0.043	0.096*	0.043	-0.219***	0.055	-0.047	0.071	-0.087	0.053
Dec-11	0.152***	0.044	0.113**	0.043	-0.118*	0.056	-0.107	0.072	-0.007	0.054
Jan-12	0.114**	0.043	0.074	0.042	-0.232***	0.054	-0.055	0.070	-0.090	0.052
Feb-12	0.071	0.046	0.048	0.044	-0.240***	0.057	-0.102	0.072	-0.070	0.054
Mar-12	0.103*	0.043	0.113**	0.042	-0.098	0.054	-0.175*	0.071	0.037	0.053
Apr-12	0.172**	0.056	0.168**	0.054	0.030	0.068	-0.189*	0.090	0.109	0.066
May-12	0.146*	0.067	0.094	0.066	0.062	0.082	-0.175	0.110	0.118	0.081
Jun-12	0.213**	0.068	0.158*	0.067	0.092	0.083	-0.244*	0.111	0.166*	0.082
Jul-12	0.184**	0.067	0.147*	0.066	0.135	0.082	-0.281*	0.110	0.207*	0.081
Aug-12	0.243***	0.067	0.178**	0.066	0.156	0.083	-0.290**	0.111	0.223**	0.082
Sep-12	0.218**	0.067	0.167*	0.066	0.120	0.083	-0.185	0.111	0.151	0.082
Oct-12	0.171*	0.067	0.133*	0.066	-0.020	0.083	-0.143	0.110	0.061	0.081
Nov-12	0.193**	0.067	0.174**	0.066	0.051	0.082	-0.202	0.110	0.125	0.081
Dec-12	0.260***	0.068	0.158*	0.067	0.109	0.083	-0.224*	0.111	0.167*	0.082

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Jan-13	0.153*	0.067	0.102	0.066	-0.023	0.082	-0.234*	0.110	0.103	0.081
Feb-13	0.232***	0.067	0.158*	0.066	0.071	0.082	-0.232*	0.110	0.153	0.081
Mar-13	0.147*	0.068	0.145*	0.066	0.025	0.083	-0.174	0.110	0.100	0.081
Apr-13	0.199**	0.075	0.108	0.075	0.088	0.094	-0.442***	0.120	0.265**	0.090
Sunday	0.011	0.022	-0.035	0.022	0.026	0.027	-0.057	0.036	0.041	0.027
Monday	-0.008	0.017	-0.013	0.016	0.214***	0.021	-0.246***	0.027	0.230***	0.020
Tuesday	-0.009	0.016	-0.005	0.016	0.035	0.020	-0.064*	0.026	0.049*	0.020
Thursday	0.011	0.017	0.017	0.017	-0.001	0.021	0.033	0.027	-0.017	0.020
Friday	0.000	0.019	0.003	0.018	-0.003	0.023	0.044	0.030	-0.024	0.023
Saturday	-0.028	0.022	-0.064**	0.022	0.035	0.027	0.006	0.036	0.014	0.027
Face-to-Face Survey	-0.130***	0.011	-0.110***	0.011	-0.084***	0.014	-0.014	0.018	-0.036**	0.013
Data set 1= APS 2012-13	-0.066	0.051	-0.050	0.050	-0.218***	0.061	0.090	0.084	-0.155*	0.061
Constant	10.113***	0.076	8.963***	0.077	9.347***	0.096	1.073***	0.124	4.141***	0.093
r^2	0.137		0.096		0.068		0.040		0.064	
N	189058		188491		189044		188793		188684	

*Legend: * p<0.05; ** p<0.01; *** p<0.001 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 7: Model 4 Daytime continuous aircraft noise, including full controls and air proximity as additional control (Summary of results Model 4 Daytime noise (all wellbeing variables measured on a scale of 0-10))

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Airport Proximity – 5km	0.011	0.014	0.002	0.014	-0.003	0.018	0.022	0.024	-0.013	0.018
Continuous Daytime Noise	-0.003***	0.001	-0.002**	0.001	-0.002*	0.001	0.003**	0.001	-0.003**	0.001
Female	0.163***	0.011	0.331***	0.011	0.088***	0.014	0.205***	0.018	-0.059***	0.014
Age	-0.109***	0.003	-0.066***	0.003	-0.079***	0.004	0.081***	0.005	-0.080***	0.003
Age Squared	0.001***	0.000	0.001***	0.000	0.001***	0.000	-0.001***	0.000	0.001***	0.000
BME	-0.281***	0.019	-0.207***	0.018	-0.106***	0.022	0.187***	0.029	-0.147***	0.021
Religion – Yes	0.091***	0.012	0.161***	0.012	0.124***	0.015	0.076***	0.019	0.024	0.014
Single	-0.476***	0.014	-0.314***	0.014	-0.392***	0.017	0.148***	0.023	-0.270***	0.017
Separated	-0.718***	0.031	-0.352***	0.029	-0.512***	0.036	0.294***	0.045	-0.404***	0.035
Divorced	-0.520***	0.017	-0.306***	0.017	-0.406***	0.021	0.209***	0.027	-0.308***	0.020
Widowed	-0.788***	0.032	-0.417***	0.030	-0.614***	0.038	0.255***	0.047	-0.433***	0.037
Civil partner	0.250***	0.060	0.263***	0.064	0.201*	0.089	0.019	0.150	0.094	0.105
One child	0.079***	0.015	0.232***	0.015	0.092***	0.019	-0.065**	0.025	0.078***	0.018
Two children	0.156***	0.026	0.351***	0.024	0.158***	0.032	-0.207***	0.042	0.182***	0.031
Three children	0.159**	0.051	0.421***	0.051	0.228***	0.061	-0.220**	0.081	0.222***	0.062
Four or more children	0.270*	0.111	0.425***	0.111	0.305*	0.121	-0.275	0.140	0.277*	0.110
LimitingHealth	-0.722***	0.015	-0.539***	0.015	-0.703***	0.018	0.891***	0.023	-0.797***	0.018
Smoker – Yes	-0.345***	0.015	-0.237***	0.015	-0.337***	0.019	0.219***	0.024	-0.278***	0.018
Smoker – Ex	-0.077***	0.011	-0.049***	0.011	-0.077***	0.014	0.080***	0.019	-0.078***	0.014

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
RentPrivate	-0.128***	0.015	-0.048**	0.015	-0.058**	0.019	0.183***	0.025	-0.120***	0.019
RentSocial	-0.259***	0.019	-0.120***	0.018	-0.243***	0.022	0.194***	0.028	-0.219***	0.021
No rent/squatters	0.218***	0.064	0.257***	0.063	0.218**	0.080	-0.284**	0.099	0.250**	0.078
Higher_Ed	0.016	0.017	0.01	0.017	0.007	0.022	-0.163***	0.030	0.085***	0.022
Alevel	0.032*	0.014	-0.032*	0.014	-0.004	0.018	-0.174***	0.024	0.085***	0.018
GCSE	0.007	0.015	-0.055***	0.015	0	0.019	-0.251***	0.025	0.125***	0.018
Ed_Other	0.046*	0.022	-0.096***	0.021	0.026	0.025	-0.204***	0.033	0.116***	0.025
Ed_None	-0.008	0.023	-0.244***	0.022	-0.083**	0.027	-0.083*	0.034	0	0.026
Inactive – seeking	-0.426***	0.080	-0.237**	0.075	-0.303**	0.095	0.600***	0.113	-0.457***	0.086
Inactive – not seeking but w~s	-0.649***	0.036	-0.479***	0.036	-0.479***	0.043	0.561***	0.053	-0.519***	0.041
Inactive – not seeking not w~	-0.190***	0.028	-0.177***	0.027	-0.189***	0.034	0.283***	0.043	-0.234***	0.033
Inactive – retired	0.377***	0.027	0.182***	0.026	0.376***	0.033	-0.353***	0.043	0.363***	0.032
Unemployed	-0.785***	0.034	-0.535***	0.033	-0.353***	0.040	0.426***	0.049	-0.390***	0.037
Student	0.073	0.039	0.162***	0.042	0.009	0.052	0.373***	0.068	-0.182***	0.050
Unpaid Family Worker	0.089	0.086	0.190*	0.079	0.229*	0.103	0.148	0.147	0.043	0.109
Underemployed	-0.391***	0.037	-0.192***	0.036	-0.196***	0.046	0.199***	0.057	-0.197***	0.042
Part-Time	0.108***	0.023	0.156***	0.023	0.077**	0.029	0.027	0.038	0.025	0.028
Full Time Self-Employed	0.112***	0.027	0.250***	0.027	0.096**	0.034	0.089*	0.045	0.003	0.033
Full Time 2nd pay quintile	0.051*	0.026	0.037	0.026	0.006	0.034	0.012	0.043	-0.003	0.032
Full Time 3rd pay quintile	0.151***	0.026	0.157***	0.025	0.036	0.033	0.065	0.043	-0.014	0.032
Full Time 4th pay quintile	0.194***	0.025	0.231***	0.024	0.046	0.033	0.063	0.043	-0.008	0.032

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Full Time highest pay quintile	0.313***	0.025	0.231***	0.025	0.100**	0.032	0.086*	0.043	0.008	0.032
May-11	0.078	0.046	0.036	0.045	-0.160**	0.056	0.116	0.074	-0.138*	0.055
Jun-11	0.069	0.045	0.065	0.044	-0.165**	0.056	0.061	0.072	-0.115*	0.054
Jul-11	0.054	0.045	0.044	0.044	-0.164**	0.056	0.041	0.072	-0.103	0.054
Aug-11	0.101*	0.044	0.078	0.043	-0.116*	0.055	-0.097	0.072	-0.011	0.053
Sep-11	0.081	0.044	0.077	0.043	-0.193***	0.055	0.087	0.072	-0.139**	0.053
Oct-11	0.082	0.044	0.084*	0.043	-0.194***	0.055	-0.074	0.071	-0.059	0.053
Nov-11	0.101*	0.043	0.095*	0.043	-0.219***	0.055	-0.046	0.071	-0.088	0.053
Dec-11	0.151***	0.044	0.113**	0.043	-0.118*	0.056	-0.106	0.072	-0.008	0.054
Jan-12	0.113**	0.043	0.074	0.042	-0.232***	0.054	-0.054	0.070	-0.09	0.052
Feb-12	0.071	0.046	0.048	0.044	-0.240***	0.057	-0.102	0.072	-0.071	0.054
Mar-12	0.103*	0.043	0.113**	0.042	-0.097	0.054	-0.175*	0.071	0.037	0.053
Apr-12	0.171**	0.056	0.168**	0.054	0.029	0.068	-0.189*	0.090	0.108	0.066
May-12	0.145*	0.067	0.093	0.066	0.062	0.082	-0.174	0.110	0.117	0.081
Jun-12	0.213**	0.068	0.157*	0.067	0.092	0.083	-0.243*	0.111	0.166*	0.082
Jul-12	0.184**	0.067	0.147*	0.066	0.134	0.082	-0.280*	0.109	0.207*	0.081
Aug-12	0.242***	0.067	0.177**	0.066	0.156	0.083	-0.290**	0.111	0.223**	0.082
Sep-12	0.218**	0.067	0.166*	0.066	0.12	0.083	-0.184	0.111	0.151	0.082
Oct-12	0.170*	0.067	0.132*	0.066	-0.02	0.083	-0.143	0.110	0.06	0.081
Nov-12	0.193**	0.067	0.174**	0.066	0.051	0.082	-0.202	0.110	0.125	0.081
Dec-12	0.260***	0.068	0.158*	0.067	0.11	0.083	-0.224*	0.111	0.168*	0.082

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Jan-13	0.153*	0.067	0.102	0.066	-0.023	0.082	-0.234*	0.110	0.103	0.081
Feb-13	0.232***	0.067	0.157*	0.066	0.071	0.082	-0.232*	0.110	0.153	0.081
Mar-13	0.147*	0.068	0.145*	0.066	0.025	0.083	-0.173	0.110	0.1	0.081
Apr-13	0.198**	0.075	0.107	0.075	0.088	0.094	-0.442***	0.120	0.265**	0.090
Sunday	0.012	0.022	-0.035	0.022	0.027	0.027	-0.058	0.036	0.042	0.027
Monday	-0.008	0.017	-0.013	0.016	0.214***	0.021	-0.247***	0.027	0.230***	0.020
Tuesday	-0.009	0.016	-0.005	0.016	0.035	0.020	-0.064*	0.026	0.049*	0.020
Thursday	0.011	0.017	0.017	0.017	-0.001	0.021	0.033	0.027	-0.017	0.020
Friday	0	0.019	0.003	0.018	-0.003	0.023	0.043	0.030	-0.024	0.023
Saturday	-0.028	0.022	-0.064**	0.022	0.035	0.027	0.006	0.036	0.014	0.027
Face-to-Face Survey	-0.130***	0.011	-0.110***	0.011	-0.085***	0.014	-0.014	0.018	-0.036**	0.013
Data set 1= APS 2012-13	-0.066	0.051	-0.05	0.050	-0.218***	0.061	0.09	0.084	-0.155*	0.061
Constant	10.114***	0.076	8.964***	0.077	9.347***	0.096	1.072***	0.124	4.141***	0.093
r^2	0.137		0.096		0.068		0.04		0.064	
N	189058		188491		189044		188793		188684	

*Legend: * p<0.05; ** p<0.01; *** p<0.001 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 8: Model 5 Night time continuous aircraft noise, including full controls and air proximity as additional control (Summary of results Model 5 Night time noise (all wellbeing variables measured on a scale of 0-10))

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Airport Proximity – 5km	0.008	0.014	0.000	0.014	-0.007	0.018	0.027	0.024	-0.018	0.018
Continuous Night time Noise	-0.002	0.001	-0.002	0.001	0.000	0.001	0.002	0.002	-0.001	0.001
Female	0.163***	0.011	0.331***	0.011	0.088***	0.014	0.206***	0.018	-0.059***	0.014
Age	-0.109***	0.003	-0.066***	0.003	-0.079***	0.004	0.081***	0.005	-0.080***	0.003
Age Squared	0.001***	0.000	0.001***	0.000	0.001***	0.000	-0.001***	0.000	0.001***	0.000
BME	-0.283***	0.019	-0.208***	0.018	-0.109***	0.022	0.190***	0.029	-0.150***	0.021
Religion – Yes	0.091***	0.012	0.161***	0.012	0.124***	0.015	0.077***	0.019	0.024	0.014
Single	-0.476***	0.014	-0.314***	0.014	-0.392***	0.017	0.148***	0.023	-0.270***	0.017
Separated	-0.718***	0.031	-0.352***	0.029	-0.511***	0.036	0.293***	0.045	-0.404***	0.035
Divorced	-0.520***	0.017	-0.306***	0.017	-0.406***	0.021	0.209***	0.027	-0.308***	0.020
Widowed	-0.788***	0.032	-0.417***	0.030	-0.614***	0.038	0.255***	0.047	-0.433***	0.037
Civil partner	0.249***	0.060	0.262***	0.064	0.200*	0.089	0.020	0.150	0.093	0.105
One child	0.079***	0.015	0.232***	0.015	0.092***	0.019	-0.065**	0.025	0.078***	0.018
Two children	0.156***	0.026	0.351***	0.024	0.158***	0.032	-0.208***	0.042	0.183***	0.031
Three children	0.159**	0.051	0.421***	0.051	0.228***	0.061	-0.220**	0.081	0.223***	0.062
Four or more children	0.272*	0.111	0.426***	0.111	0.307*	0.121	-0.276*	0.140	0.278*	0.110
LimitingHealth	-0.722***	0.015	-0.539***	0.015	-0.703***	0.018	0.891***	0.023	-0.796***	0.018
Smoker – Yes	-0.345***	0.015	-0.237***	0.015	-0.338***	0.019	0.219***	0.024	-0.278***	0.018
Smoker – Ex	-0.077***	0.011	-0.049***	0.011	-0.077***	0.014	0.080***	0.019	-0.079***	0.014

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
RentPrivate	-0.129***	0.015	-0.049**	0.015	-0.058**	0.019	0.184***	0.025	-0.120***	0.019
RentSocial	-0.259***	0.019	-0.121***	0.018	-0.244***	0.022	0.195***	0.028	-0.220***	0.021
No rent/squatters	0.217***	0.064	0.256***	0.063	0.217**	0.080	-0.283**	0.099	0.249**	0.078
Higher_Ed	0.016	0.017	0.010	0.017	0.008	0.022	-0.164***	0.030	0.085***	0.022
Alevel	0.033*	0.014	-0.032*	0.014	-0.003	0.018	-0.174***	0.024	0.086***	0.018
GCSE	0.008	0.015	-0.055***	0.015	0.000	0.019	-0.251***	0.025	0.126***	0.018
Ed_Other	0.046*	0.022	-0.096***	0.021	0.026	0.025	-0.204***	0.033	0.116***	0.025
Ed_None	-0.008	0.023	-0.243***	0.022	-0.082**	0.027	-0.084*	0.034	0.001	0.026
Inactive – seeking	-0.426***	0.080	-0.237**	0.076	-0.303**	0.095	0.600***	0.113	-0.457***	0.086
Inactive – not seeking but w~s	-0.649***	0.036	-0.479***	0.036	-0.480***	0.043	0.562***	0.053	-0.520***	0.041
Inactive – not seeking not w~	-0.191***	0.028	-0.177***	0.027	-0.190***	0.034	0.283***	0.043	-0.234***	0.033
Inactive – retired	0.376***	0.027	0.182***	0.026	0.375***	0.033	-0.353***	0.043	0.363***	0.032
Unemployed	-0.785***	0.034	-0.536***	0.033	-0.354***	0.040	0.427***	0.049	-0.390***	0.037
Student	0.073	0.039	0.162***	0.042	0.009	0.052	0.373***	0.068	-0.182***	0.050
Unpaid Family Worker	0.089	0.086	0.190*	0.079	0.229*	0.103	0.148	0.147	0.043	0.109
Underemployed	-0.391***	0.037	-0.193***	0.036	-0.196***	0.046	0.199***	0.057	-0.197***	0.042
Part-Time	0.108***	0.023	0.156***	0.023	0.077**	0.029	0.028	0.038	0.025	0.028
Full Time Self-Employed	0.112***	0.027	0.249***	0.027	0.095**	0.034	0.090*	0.045	0.003	0.033
Full Time 2nd pay quintile	0.051*	0.026	0.037	0.026	0.006	0.034	0.013	0.043	-0.004	0.032
Full Time 3rd pay quintile	0.150***	0.026	0.156***	0.025	0.035	0.033	0.066	0.043	-0.015	0.032
Full Time 4th pay quintile	0.194***	0.025	0.230***	0.024	0.045	0.032	0.064	0.043	-0.009	0.032

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Full Time highest pay quintile	0.312***	0.025	0.230***	0.025	0.099**	0.032	0.088*	0.043	0.006	0.032
May-11	0.078	0.046	0.037	0.045	-0.160**	0.056	0.115	0.074	-0.137*	0.055
Jun-11	0.069	0.045	0.066	0.044	-0.165**	0.056	0.060	0.072	-0.114*	0.054
Jul-11	0.054	0.045	0.044	0.044	-0.164**	0.056	0.041	0.072	-0.103	0.054
Aug-11	0.101*	0.044	0.078	0.043	-0.116*	0.055	-0.097	0.072	-0.011	0.053
Sep-11	0.082	0.044	0.077	0.043	-0.193***	0.055	0.087	0.072	-0.139**	0.053
Oct-11	0.082	0.044	0.084	0.043	-0.195***	0.055	-0.074	0.071	-0.060	0.053
Nov-11	0.101*	0.043	0.096*	0.043	-0.219***	0.055	-0.047	0.071	-0.087	0.053
Dec-11	0.152***	0.044	0.113**	0.043	-0.118*	0.056	-0.107	0.072	-0.007	0.054
Jan-12	0.114**	0.043	0.074	0.042	-0.232***	0.054	-0.055	0.070	-0.090	0.052
Feb-12	0.071	0.046	0.048	0.044	-0.240***	0.057	-0.102	0.072	-0.070	0.054
Mar-12	0.103*	0.043	0.113**	0.042	-0.098	0.054	-0.176*	0.071	0.037	0.053
Apr-12	0.172**	0.056	0.168**	0.054	0.030	0.068	-0.189*	0.090	0.109	0.066
May-12	0.146*	0.067	0.094	0.066	0.062	0.082	-0.175	0.110	0.118	0.081
Jun-12	0.213**	0.068	0.158*	0.067	0.092	0.083	-0.244*	0.111	0.166*	0.082
Jul-12	0.184**	0.067	0.147*	0.066	0.135	0.082	-0.280*	0.110	0.207*	0.081
Aug-12	0.243***	0.067	0.178**	0.066	0.156	0.083	-0.290**	0.111	0.223**	0.082
Sep-12	0.218**	0.067	0.167*	0.066	0.120	0.083	-0.185	0.111	0.151	0.082
Oct-12	0.171*	0.067	0.133*	0.066	-0.020	0.083	-0.143	0.110	0.061	0.081
Nov-12	0.193**	0.067	0.174**	0.066	0.051	0.082	-0.202	0.110	0.125	0.081
Dec-12	0.260***	0.068	0.158*	0.067	0.109	0.083	-0.224*	0.111	0.167*	0.082

Explanatory variable	Life satisfaction		Sense of worthwhile		Happiness		Anxiety		Positive Affect Balance	
	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE	Coefficient	SE
Jan-13	0.153*	0.067	0.102	0.066	-0.023	0.082	-0.234*	0.110	0.103	0.081
Feb-13	0.232***	0.067	0.158*	0.066	0.071	0.082	-0.232*	0.110	0.153	0.081
Mar-13	0.147*	0.068	0.145*	0.066	0.025	0.083	-0.174	0.110	0.100	0.081
Apr-13	0.199**	0.075	0.108	0.075	0.088	0.094	-0.442***	0.120	0.265**	0.090
Sunday	0.011	0.022	-0.035	0.022	0.026	0.027	-0.057	0.036	0.041	0.027
Monday	-0.008	0.017	-0.013	0.016	0.214***	0.021	-0.246***	0.027	0.230***	0.020
Tuesday	-0.009	0.016	-0.005	0.016	0.035	0.020	-0.064*	0.026	0.049*	0.020
Thursday	0.011	0.017	0.017	0.017	-0.001	0.021	0.033	0.027	-0.017	0.020
Friday	0.000	0.019	0.003	0.018	-0.003	0.023	0.044	0.030	-0.024	0.023
Saturday	-0.028	0.022	-0.064**	0.022	0.035	0.027	0.006	0.036	0.014	0.027
Face-to-Face Survey	-0.130***	0.011	-0.110***	0.011	-0.084***	0.014	-0.014	0.018	-0.036**	0.013
Data set 1= APS 2012-13	-0.066	0.051	-0.050	0.050	-0.218***	0.061	0.090	0.084	-0.155*	0.061
Constant	10.113***	0.076	8.963***	0.077	9.347***	0.096	1.073***	0.124	4.141***	0.093
r^2	0.137		0.096		0.068		0.040		0.064	
N	189058		188491		189044		188793		188684	

*Legend: * p<0.05; ** p<0.01; *** p<0.001 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 9: Life satisfaction interaction: Poor health and the presence of daytime aircraft noise, including full controls

Life satisfaction	Coefficient	SE.	t	P>t	95% Conf. Interval	
Female	0.147***	0.010	14.620	0.000	0.127	0.167
Age	-0.115***	0.002	-47.330	0.000	-0.119	-0.110
Age Squared	0.001***	0.000	47.850	0.000	0.001	0.001
BME	-0.280***	0.018	-15.820	0.000	-0.315	-0.246
Religion – Yes	0.115***	0.011	10.080	0.000	0.093	0.137
Single	-0.535***	0.014	-38.250	0.000	-0.563	-0.508
Separated	-0.781***	0.031	-25.480	0.000	-0.841	-0.721
Divorced	-0.586***	0.017	-34.160	0.000	-0.620	-0.552
Widowed	-0.791***	0.032	-24.860	0.000	-0.854	-0.729
Civil partner	0.277***	0.061	4.540	0.000	0.157	0.396
One child	0.033*	0.015	2.200	0.028	0.004	0.063
Two children	0.081***	0.015	5.220	0.000	0.050	0.111
Three children	0.102***	0.026	3.960	0.000	0.051	0.152
Four or more children	0.140**	0.044	3.160	0.002	0.053	0.226
RentPrivate	-0.216***	0.015	-14.820	0.000	-0.245	-0.188
RentSocial	-0.486***	0.018	-27.140	0.000	-0.521	-0.451
No rent/squatters	0.217***	0.061	3.530	0.000	0.097	0.337
Higher_Ed	-0.048**	0.017	-2.820	0.005	-0.081	-0.015
Alevel	-0.068***	0.013	-5.120	0.000	-0.094	-0.042
GCSE	-0.159***	0.014	-11.290	0.000	-0.187	-0.132
Ed_Other	-0.147***	0.021	-7.070	0.000	-0.188	-0.106
Ed_None	-0.219***	0.022	-9.810	0.000	-0.263	-0.176
May-11	0.089	0.046	1.950	0.051	0.000	0.179
Jun-11	0.071	0.045	1.570	0.116	-0.018	0.160
Jul-11	0.067	0.045	1.510	0.132	-0.020	0.155
Aug-11	0.134**	0.044	3.070	0.002	0.048	0.219
Sep-11	0.084	0.044	1.900	0.058	-0.003	0.170
Oct-11	0.091*	0.044	2.080	0.038	0.005	0.177
Nov-11	0.112**	0.043	2.590	0.009	0.028	0.197
Dec-11	0.177***	0.044	3.980	0.000	0.090	0.263
Jan-12	0.121**	0.043	2.800	0.005	0.036	0.205
Feb-12	0.086	0.045	1.900	0.057	-0.003	0.175
Mar-12	0.108*	0.043	2.490	0.013	0.023	0.193
Apr-12	0.179**	0.056	3.220	0.001	0.070	0.288

Life satisfaction	Coefficient	SE.	t	P>t	95% Conf.	Interval
May-12	0.170*	0.067	2.540	0.011	0.039	0.300
Jun-12	0.205**	0.068	3.030	0.002	0.073	0.338
Jul-12	0.207**	0.067	3.110	0.002	0.077	0.338
Aug-12	0.252***	0.067	3.770	0.000	0.121	0.383
Sep-12	0.241***	0.067	3.590	0.000	0.109	0.372
Oct-12	0.190**	0.067	2.850	0.004	0.059	0.320
Nov-12	0.190**	0.067	2.830	0.005	0.058	0.322
Dec-12	0.294***	0.067	4.370	0.000	0.162	0.426
Jan-13	0.167*	0.067	2.490	0.013	0.036	0.299
Feb-13	0.256***	0.067	3.840	0.000	0.126	0.387
Mar-13	0.158*	0.067	2.330	0.020	0.025	0.290
Apr-13	0.208**	0.075	2.780	0.006	0.061	0.356
Sunday	0.022	0.022	1.010	0.313	-0.021	0.065
Monday	-0.003	0.016	-0.200	0.838	-0.035	0.029
Tuesday	-0.013	0.016	-0.800	0.422	-0.044	0.018
Thursday	0.014	0.017	0.840	0.404	-0.019	0.046
Friday	0.006	0.019	0.320	0.746	-0.030	0.042
Saturday	-0.002	0.021	-0.090	0.931	-0.043	0.039
Face-to-Face Survey	-0.127***	0.011	-11.880	0.000	-0.148	-0.106
Data set 1= APS 2012-13	-0.064	0.051	-1.270	0.204	-0.164	0.035
Airport proximity	0.032*	0.014	2.270	0.023	0.004	0.059
Poor health	-0.839***	0.015	-55.350	0.000	-0.869	-0.809
Presence of daytime noise	-0.143***	0.042	-3.400	0.001	-0.225	-0.061
Presence of daytime noise and poor health interaction	-0.011	0.115	-0.100	0.922	-0.237	0.214
_cons	10.192***	0.069	147.380	0.000	10.056	10.328

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=199,466; r^2=0.106. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 10: Worthwhile interaction – poor health and the presence of daytime aircraft noise, including full controls

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.289***	0.010	29.200	0.000	0.270	0.309
Age	-0.066***	0.002	-26.840	0.000	-0.071	-0.062
Age Squared	0.001***	0.000	31.280	0.000	0.001	0.001
BME	-0.202***	0.017	-11.810	0.000	-0.236	-0.169
Religion – Yes	0.176***	0.011	15.380	0.000	0.153	0.198
Single	-0.324***	0.014	-23.560	0.000	-0.351	-0.297
Separated	-0.377***	0.028	-13.480	0.000	-0.432	-0.322
Divorced	-0.332***	0.016	-20.480	0.000	-0.364	-0.301
Widowed	-0.418***	0.030	-14.040	0.000	-0.476	-0.360
Civil partner	0.322***	0.062	5.180	0.000	0.200	0.444
One child	0.201***	0.015	13.660	0.000	0.172	0.230
Two children	0.290***	0.015	19.260	0.000	0.261	0.320
Three children	0.363***	0.024	15.240	0.000	0.316	0.410
Four or more children	0.425***	0.043	9.860	0.000	0.341	0.510
RentPrivate	-0.100***	0.015	-6.800	0.000	-0.128	-0.071
RentSocial	-0.308***	0.017	-17.630	0.000	-0.342	-0.274
No rent/squatters	0.246***	0.061	4.060	0.000	0.127	0.365
Higher_Ed	-0.036*	0.016	-2.210	0.027	-0.068	-0.004
Alevel	-0.098***	0.013	-7.300	0.000	-0.124	-0.072
GCSE	-0.195***	0.014	-13.930	0.000	-0.223	-0.168
Ed_Other	-0.241***	0.020	-12.000	0.000	-0.281	-0.202
Ed_None	-0.413***	0.022	-19.060	0.000	-0.456	-0.371
May-11	0.040	0.045	0.900	0.366	-0.047	0.128
Jun-11	0.055	0.044	1.260	0.209	-0.031	0.141
Jul-11	0.046	0.043	1.060	0.291	-0.039	0.131
Aug-11	0.090*	0.042	2.110	0.035	0.006	0.173
Sep-11	0.079	0.043	1.860	0.063	-0.004	0.163
Oct-11	0.090*	0.042	2.130	0.033	0.007	0.174
Nov-11	0.097*	0.042	2.300	0.022	0.014	0.180
Dec-11	0.122**	0.043	2.860	0.004	0.038	0.206
Jan-12	0.071	0.042	1.720	0.086	-0.010	0.153
Feb-12	0.058	0.043	1.330	0.182	-0.027	0.143
Mar-12	0.107*	0.042	2.570	0.010	0.025	0.189
Apr-12	0.166**	0.053	3.120	0.002	0.061	0.270

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
May-12	0.103	0.065	1.590	0.113	-0.024	0.230
Jun-12	0.149*	0.066	2.260	0.024	0.019	0.278
Jul-12	0.162*	0.065	2.510	0.012	0.035	0.289
Aug-12	0.170**	0.065	2.600	0.009	0.042	0.298
Sep-12	0.172**	0.065	2.630	0.009	0.044	0.300
Oct-12	0.160*	0.065	2.460	0.014	0.032	0.287
Nov-12	0.175**	0.065	2.670	0.008	0.047	0.302
Dec-12	0.185**	0.066	2.810	0.005	0.056	0.314
Jan-13	0.101	0.065	1.550	0.122	-0.027	0.229
Feb-13	0.183**	0.065	2.820	0.005	0.056	0.311
Mar-13	0.146*	0.065	2.240	0.025	0.018	0.274
Apr-13	0.115	0.073	1.570	0.117	-0.029	0.259
Sunday	-0.021	0.022	-0.950	0.340	-0.064	0.022
Monday	-0.011	0.016	-0.660	0.507	-0.042	0.021
Tuesday	-0.007	0.016	-0.430	0.669	-0.038	0.024
Thursday	0.019	0.016	1.140	0.255	-0.013	0.051
Friday	0.010	0.018	0.550	0.580	-0.025	0.045
Saturday	-0.043*	0.021	-2.050	0.041	-0.085	-0.002
Face-to-Face Survey	-0.111***	0.011	-10.510	0.000	-0.132	-0.090
Data set 1= APS 2012-13	-0.050	0.049	-1.020	0.309	-0.147	0.047
Airport proximity	0.015	0.014	1.120	0.264	-0.012	0.043
Poor health	-0.628***	0.015	-42.510	0.000	-0.657	-0.599
Presence of daytime noise	-0.091*	0.040	-2.290	0.022	-0.169	-0.013
Presence of daytime noise and poor health interaction	-0.086	0.118	-0.730	0.462	-0.317	0.144

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=198842; r^2=0.077. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 11: Happiness interaction – poor health and the presence of daytime aircraft noise, including full controls

Happiness	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.090***	0.010	29.200	0.000	0.270	0.309
Age	-0.094***	0.002	-26.840	0.000	-0.071	-0.062
Age Squared	0.001***	0.000	31.280	0.000	0.001	0.001
BME	-0.078***	0.017	-11.810	0.000	-0.236	-0.169
Religion – Yes	0.140***	0.011	15.380	0.000	0.153	0.198
Single	-0.425***	0.014	-23.560	0.000	-0.351	-0.297
Separated	-0.552***	0.028	-13.480	0.000	-0.432	-0.322
Divorced	-0.456***	0.016	-20.480	0.000	-0.364	-0.301
Widowed	-0.612***	0.030	-14.040	0.000	-0.476	-0.360
Civil partner	0.233**	0.062	5.180	0.000	0.200	0.444
One child	0.031	0.015	13.660	0.000	0.172	0.230
Two children	0.104***	0.015	19.260	0.000	0.261	0.320
Three children	0.143***	0.024	15.240	0.000	0.316	0.410
Four or more children	0.182***	0.043	9.860	0.000	0.341	0.510
RentPrivate	-0.119***	0.015	-6.800	0.000	-0.128	-0.071
RentSocial	-0.388***	0.017	-17.630	0.000	-0.342	-0.274
No rent/squatters	0.237**	0.061	4.060	0.000	0.127	0.365
Higher_Ed	-0.027	0.016	-2.210	0.027	-0.068	-0.004
Alevel	-0.067***	0.013	-7.300	0.000	-0.124	-0.072
GCSE	-0.100***	0.014	-13.930	0.000	-0.223	-0.168
Ed_Other	-0.091***	0.020	-12.000	0.000	-0.281	-0.202
Ed_None	-0.218***	0.022	-19.060	0.000	-0.456	-0.371
May-11	-0.190***	0.045	0.900	0.366	-0.047	0.128
Jun-11	-0.187***	0.044	1.260	0.209	-0.031	0.141
Jul-11	-0.178***	0.043	1.060	0.291	-0.039	0.131
Aug-11	-0.102	0.042	2.110	0.035	0.006	0.173
Sep-11	-0.207***	0.043	1.860	0.063	-0.004	0.163
Oct-11	-0.195***	0.042	2.130	0.033	0.007	0.174
Nov-11	-0.252***	0.042	2.300	0.022	0.014	0.180
Dec-11	-0.123*	0.043	2.860	0.004	0.038	0.206
Jan-12	-0.240***	0.042	1.720	0.086	-0.010	0.153
Feb-12	-0.251***	0.043	1.330	0.182	-0.027	0.143
Mar-12	-0.131*	0.042	2.570	0.010	0.025	0.189
Apr-12	0.022	0.053	3.120	0.002	0.061	0.270

Happiness	Coefficient	SE	t	P>t	95% Conf.	Interval
May-12	0.066	0.065	1.590	0.113	-0.024	0.230
Jun-12	0.070	0.066	2.260	0.024	0.019	0.278
Jul-12	0.132	0.065	2.510	0.012	0.035	0.289
Aug-12	0.159*	0.065	2.600	0.009	0.042	0.298
Sep-12	0.124	0.065	2.630	0.009	0.044	0.300
Oct-12	-0.023	0.065	2.460	0.014	0.032	0.287
Nov-12	0.044	0.065	2.670	0.008	0.047	0.302
Dec-12	0.120	0.066	2.810	0.005	0.056	0.314
Jan-13	-0.017	0.065	1.550	0.122	-0.027	0.229
Feb-13	0.070	0.065	2.820	0.005	0.056	0.311
Mar-13	0.026	0.065	2.240	0.025	0.018	0.274
Apr-13	0.096	0.073	1.570	0.117	-0.029	0.259
Sunday	0.033	0.022	-0.950	0.340	-0.064	0.022
Monday	0.221***	0.016	-0.660	0.507	-0.042	0.021
Tuesday	0.042*	0.016	-0.430	0.669	-0.038	0.024
Thursday	0.004	0.016	1.140	0.255	-0.013	0.051
Friday	0.006	0.018	0.550	0.580	-0.025	0.045
Saturday	0.048	0.021	-2.050	0.041	-0.085	-0.002
Face-to-Face Survey	-0.087***	0.011	-10.510	0.000	-0.132	-0.090
Data set 1= APS 2012-13	-0.228***	0.049	-1.020	0.309	-0.147	0.047
Airport proximity	0.017	0.014	1.120	0.264	-0.012	0.043
Poor health	-0.793***	0.015	-42.510	0.000	-0.657	-0.599
Presence of daytime noise	-0.087	0.040	-2.290	0.022	-0.169	-0.013
Presence of daytime noise and poor health interaction	-0.070	0.118	-0.730	0.462	-0.317	0.144
_cons	9.531***	0.069	128.650	0.000	8.795	9.068

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=199,441; r^2=0.057 . Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 12: Anxiety interaction – poor health and the presence of daytime aircraft noise, including full controls

Anxiety	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.188***	0.016	11.540	0.000	0.156	0.220
Age	0.085***	0.004	21.780	0.000	0.078	0.093
Age Squared	-0.001***	0.000	-23.120	0.000	-0.001	-0.001
BME	0.199***	0.027	7.300	0.000	0.146	0.253
Religion – Yes	0.062***	0.019	3.360	0.001	0.026	0.099
Single	0.183***	0.023	8.150	0.000	0.139	0.228
Separated	0.323***	0.044	7.400	0.000	0.238	0.409
Divorced	0.260***	0.026	9.930	0.000	0.209	0.312
Widowed	0.245***	0.047	5.270	0.000	0.154	0.337
Civil partner	0.022	0.147	0.150	0.883	-0.267	0.310
One child	-0.040	0.024	-1.660	0.097	-0.088	0.007
Two children	-0.045	0.026	-1.750	0.080	-0.095	0.005
Three children	-0.149***	0.041	-3.620	0.000	-0.230	-0.069
Four or more children	-0.126	0.069	-1.830	0.067	-0.261	0.009
RentPrivate	0.215***	0.024	8.930	0.000	0.168	0.262
RentSocial	0.301***	0.026	11.370	0.000	0.249	0.353
No rent/squatters	-0.291**	0.094	-3.090	0.002	-0.476	-0.107
Higher_Ed	-0.130***	0.029	-4.520	0.000	-0.186	-0.073
Alevel	-0.125***	0.023	-5.460	0.000	-0.170	-0.080
GCSE	-0.167***	0.023	-7.120	0.000	-0.212	-0.121
Ed_Other	-0.134***	0.031	-4.250	0.000	-0.195	-0.072
Ed_None	0.008	0.033	0.250	0.799	-0.056	0.072
May-11	0.140	0.072	1.950	0.051	0.000	0.281
Jun-11	0.071	0.070	1.010	0.313	-0.066	0.208
Jul-11	0.040	0.070	0.560	0.572	-0.098	0.177
Aug-11	-0.091	0.070	-1.300	0.192	-0.228	0.046
Sep-11	0.106	0.070	1.520	0.129	-0.031	0.243
Oct-11	-0.075	0.069	-1.080	0.280	-0.211	0.061
Nov-11	-0.021	0.069	-0.310	0.756	-0.157	0.114
Dec-11	-0.100	0.070	-1.420	0.155	-0.238	0.038
Jan-12	-0.039	0.068	-0.580	0.564	-0.173	0.094
Feb-12	-0.084	0.070	-1.200	0.231	-0.222	0.054
Mar-12	-0.132	0.069	-1.920	0.055	-0.267	0.003
Apr-12	-0.204*	0.088	-2.320	0.020	-0.375	-0.032

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
May-12	-0.194	0.107	-1.810	0.071	-0.404	0.016
Jun-12	-0.267*	0.108	-2.470	0.013	-0.480	-0.055
Jul-12	-0.303**	0.107	-2.830	0.005	-0.513	-0.093
Aug-12	-0.310**	0.108	-2.870	0.004	-0.522	-0.098
Sep-12	-0.238*	0.108	-2.200	0.028	-0.451	-0.026
Oct-12	-0.186	0.107	-1.730	0.083	-0.396	0.024
Nov-12	-0.232*	0.108	-2.150	0.031	-0.443	-0.021
Dec-12	-0.267*	0.109	-2.450	0.014	-0.480	-0.053
Jan-13	-0.263*	0.108	-2.440	0.015	-0.474	-0.052
Feb-13	-0.256*	0.108	-2.380	0.018	-0.467	-0.045
Mar-13	-0.201	0.108	-1.860	0.063	-0.413	0.011
Apr-13	-0.454***	0.118	-3.860	0.000	-0.685	-0.223
Sunday	-0.062	0.035	-1.760	0.078	-0.132	0.007
Monday	-0.251***	0.027	-9.340	0.000	-0.303	-0.198
Tuesday	-0.073**	0.026	-2.830	0.005	-0.123	-0.022
Thursday	0.029	0.027	1.100	0.272	-0.023	0.082
Friday	0.041	0.029	1.400	0.160	-0.016	0.099
Saturday	0.002	0.035	0.050	0.960	-0.067	0.070
Face-to-Face Survey	-0.039*	0.018	-2.220	0.026	-0.073	-0.005
Data set 1= APS 2012-13	0.127	0.082	1.550	0.121	-0.034	0.288
Airport proximity	0.014	0.024	0.590	0.553	-0.032	0.061
Poor health	0.973***	0.022	43.900	0.000	0.930	1.017
Presence of daytime noise	0.195**	0.072	2.720	0.007	0.054	0.336
Presence of daytime noise and poor health interaction	-0.045	0.217	-0.210	0.837	-0.469	0.380
_cons	1.217***	0.111	10.990	0.000	1.000	1.434

*Legend: * p<0.05; ** p<0.01; *** p<0.001 ; N=199,172; r^2=0.033. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 13: PAB interaction – poor health and the presence of daytime aircraft noise, including full controls

PAB	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	-0.049***	0.012	-4.080	0.000	-0.073	-0.026
Age	-0.090***	0.003	-31.000	0.000	-0.095	-0.084
Age Squared	0.001***	0.000	33.240	0.000	0.001	0.001
BME	-0.139***	0.020	-6.930	0.000	-0.179	-0.100
Religion – Yes	0.039**	0.014	2.790	0.005	0.011	0.066
Single	-0.304***	0.017	-18.120	0.000	-0.336	-0.271
Separated	-0.439***	0.034	-12.850	0.000	-0.506	-0.372
Divorced	-0.359***	0.020	-17.870	0.000	-0.398	-0.319
Widowed	-0.428***	0.036	-11.820	0.000	-0.499	-0.357
Civil partner	0.109	0.103	1.060	0.288	-0.092	0.310
One child	0.036*	0.018	1.990	0.047	0.000	0.072
Two children	0.074***	0.019	3.970	0.000	0.037	0.111
Three children	0.147***	0.031	4.810	0.000	0.087	0.207
Four or more children	0.154**	0.052	2.970	0.003	0.052	0.256
RentPrivate	-0.166***	0.018	-9.390	0.000	-0.201	-0.132
RentSocial	-0.345***	0.020	-17.130	0.000	-0.385	-0.306
No rent/squatters	0.263***	0.074	3.550	0.000	0.118	0.409
Higher_Ed	0.051*	0.021	2.430	0.015	0.010	0.093
Alevel	0.029	0.017	1.740	0.082	-0.004	0.062
GCSE	0.033	0.017	1.900	0.057	-0.001	0.067
Ed_Other	0.022	0.024	0.920	0.356	-0.025	0.068
Ed_None	-0.113***	0.025	-4.530	0.000	-0.162	-0.064
May-11	-0.165**	0.053	-3.100	0.002	-0.269	-0.061
Jun-11	-0.131*	0.052	-2.510	0.012	-0.233	-0.029
Jul-11	-0.109*	0.052	-2.090	0.036	-0.211	-0.007
Aug-11	-0.008	0.052	-0.150	0.883	-0.109	0.094
Sep-11	-0.156**	0.052	-3.020	0.003	-0.257	-0.055
Oct-11	-0.059	0.051	-1.150	0.249	-0.160	0.041
Nov-11	-0.117*	0.051	-2.270	0.023	-0.217	-0.016
Dec-11	-0.013	0.052	-0.250	0.803	-0.116	0.089
Jan-12	-0.101*	0.051	-1.980	0.047	-0.200	-0.001
Feb-12	-0.085	0.053	-1.620	0.106	-0.188	0.018
Mar-12	-0.001	0.051	-0.020	0.984	-0.101	0.099
Apr-12	0.113	0.064	1.750	0.081	-0.014	0.239

PAB	Coefficient	SE	t	P>t	95% Conf.	Interval
May-12	0.130	0.079	1.640	0.100	-0.025	0.285
Jun-12	0.168*	0.079	2.110	0.035	0.012	0.324
Jul-12	0.218**	0.079	2.770	0.006	0.064	0.372
Aug-12	0.235**	0.080	2.960	0.003	0.079	0.391
Sep-12	0.181*	0.080	2.270	0.023	0.024	0.337
Oct-12	0.081	0.079	1.020	0.306	-0.074	0.236
Nov-12	0.138	0.079	1.730	0.083	-0.018	0.293
Dec-12	0.194*	0.080	2.430	0.015	0.038	0.351
Jan-13	0.121	0.079	1.530	0.126	-0.034	0.276
Feb-13	0.165*	0.079	2.080	0.038	0.009	0.320
Mar-13	0.115	0.079	1.450	0.146	-0.040	0.271
Apr-13	0.276**	0.088	3.140	0.002	0.104	0.448
Sunday	0.047	0.026	1.810	0.070	-0.004	0.098
Monday	0.235***	0.020	11.750	0.000	0.196	0.275
Tuesday	0.056**	0.019	2.910	0.004	0.018	0.094
Thursday	-0.013	0.020	-0.670	0.500	-0.053	0.026
Friday	-0.018	0.022	-0.820	0.412	-0.062	0.025
Saturday	0.023	0.026	0.880	0.380	-0.028	0.073
Face-to-Face Survey	-0.025	0.013	-1.900	0.057	-0.050	0.001
Data set 1= APS 2012-13	-0.179**	0.060	-2.980	0.003	-0.296	-0.061
Airport proximity	0.001	0.018	0.060	0.954	-0.033	0.035
Poor health	-0.882***	0.017	-51.630	0.000	-0.916	-0.849
Presence of daytime noise	-0.143**	0.052	-2.720	0.006	-0.245	-0.040
Presence of daytime noise and poor health interaction	-0.006	0.171	-0.040	0.971	-0.341	0.329
_cons	4.161***	0.082	50.850	0.000	4.000	4.321

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=199,054; r^2=0.053. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 14: Life satisfaction interaction – old age and the presence of daytime aircraft noise, including full controls

Life satisfaction	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.150***	0.010	14.750	0.000	0.130	0.169
BME	-0.299***	0.018	-16.560	0.000	-0.334	-0.263
Religion – Yes	0.063***	0.011	5.480	0.000	0.040	0.085
Single	-0.293***	0.012	-23.460	0.000	-0.318	-0.269
Separated	-0.796***	0.031	-25.920	0.000	-0.856	-0.736
Divorced	-0.599***	0.017	-34.950	0.000	-0.633	-0.565
Widowed	-0.746***	0.032	-23.330	0.000	-0.809	-0.683
Civil partner	0.288***	0.064	4.500	0.000	0.162	0.413
One child	0.028	0.015	1.950	0.051	0.000	0.057
Two children	0.025	0.014	1.730	0.084	-0.003	0.053
Three children	0.039	0.025	1.520	0.128	-0.011	0.088
Four or more children	0.072	0.045	1.620	0.106	-0.015	0.160
Limiting health	-0.863***	0.015	-58.000	0.000	-0.892	-0.834
Smoker – Yes	-0.420***	0.015	-28.420	0.000	-0.449	-0.391
Smoker – Ex	-0.094***	0.011	-8.710	0.000	-0.116	-0.073
RentPrivate	-0.064***	0.014	-4.510	0.000	-0.092	-0.036
RentSocial	-0.383***	0.018	-20.760	0.000	-0.419	-0.346
No rent/squatters	0.164**	0.062	2.640	0.008	0.043	0.286
Higher_Ed	-0.017	0.017	-1.030	0.305	-0.051	0.016
Alevel	0.066***	0.013	5.010	0.000	0.040	0.092
GCSE	-0.072***	0.014	-5.050	0.000	-0.101	-0.044
Ed_Other	-0.065**	0.021	-3.130	0.002	-0.105	-0.024
Ed_None	-0.115***	0.022	-5.220	0.000	-0.158	-0.072
May-11	0.078	0.045	1.720	0.085	-0.011	0.167
Jun-11	0.063	0.045	1.410	0.160	-0.025	0.150
Jul-11	0.050	0.044	1.130	0.257	-0.037	0.137
Aug-11	0.116**	0.043	2.660	0.008	0.030	0.201
Sep-11	0.070	0.044	1.590	0.112	-0.016	0.156
Oct-11	0.079	0.044	1.810	0.071	-0.007	0.164
Nov-11	0.109*	0.043	2.530	0.012	0.024	0.194
Dec-11	0.156***	0.044	3.550	0.000	0.070	0.243
Jan-12	0.107*	0.043	2.500	0.013	0.023	0.191
Feb-12	0.070	0.045	1.560	0.118	-0.018	0.158
Mar-12	0.095*	0.043	2.220	0.027	0.011	0.179

Life satisfaction	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-12	0.156**	0.056	2.800	0.005	0.047	0.265
May-12	0.145*	0.067	2.160	0.031	0.013	0.276
Jun-12	0.195**	0.068	2.880	0.004	0.062	0.328
Jul-12	0.194**	0.067	2.900	0.004	0.063	0.325
Aug-12	0.239***	0.067	3.560	0.000	0.107	0.370
Sep-12	0.217**	0.067	3.220	0.001	0.085	0.350
Oct-12	0.173**	0.067	2.600	0.009	0.043	0.304
Nov-12	0.167*	0.067	2.480	0.013	0.035	0.299
Dec-12	0.274***	0.068	4.060	0.000	0.142	0.407
Jan-13	0.142*	0.067	2.110	0.035	0.010	0.274
Feb-13	0.230***	0.067	3.440	0.001	0.099	0.361
Mar-13	0.144*	0.068	2.120	0.034	0.011	0.276
Apr-13	0.174*	0.076	2.300	0.021	0.026	0.323
Sunday	0.020	0.022	0.900	0.370	-0.023	0.063
Monday	-0.001	0.016	-0.070	0.945	-0.033	0.031
Tuesday	-0.009	0.016	-0.570	0.567	-0.041	0.022
Thursday	0.020	0.017	1.180	0.237	-0.013	0.053
Friday	0.006	0.019	0.330	0.739	-0.030	0.043
Saturday	-0.002	0.021	-0.070	0.941	-0.043	0.040
Face-to-Face Survey	-0.119***	0.011	-11.060	0.000	-0.140	-0.098
Data set 1= APS 2012-13	-0.063	0.051	-1.220	0.222	-0.163	0.038
Airport proximity	0.020	0.014	1.420	0.156	-0.008	0.048
Over 65	0.464***	0.017	27.830	0.000	0.431	0.496
Presence of daytime noise	-0.150***	0.041	-3.630	0.000	-0.231	-0.069
Presence of daytime noise and over 65	0.150	0.132	1.140	0.255	-0.108	0.408
_cons	7.797***	0.041	189.390	0.000	7.716	7.878

*Legend: * p<0.05; ** p<0.01; *** p<0.001 ; N=197,888; r^2=0.100. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 15: Sense of worthwhile Interaction: Old age and the presence of daytime aircraft noise, including full controls

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.287***	0.010	28.940	0.000	0.268	0.307
BME	-0.244***	0.017	-14.130	0.000	-0.278	-0.210
Religion – Yes	0.166***	0.011	14.590	0.000	0.143	0.188
Single	-0.274***	0.012	-22.400	0.000	-0.298	-0.250
Separated	-0.386***	0.028	-13.790	0.000	-0.441	-0.331
Divorced	-0.318***	0.016	-19.570	0.000	-0.350	-0.286
Widowed	-0.353***	0.030	-11.810	0.000	-0.411	-0.294
Civil partner	0.280***	0.062	4.490	0.000	0.158	0.402
One child	0.139***	0.014	10.000	0.000	0.112	0.166
Two children	0.190***	0.014	13.640	0.000	0.163	0.217
Three children	0.262***	0.023	11.280	0.000	0.217	0.308
Four or more children	0.319***	0.043	7.330	0.000	0.234	0.404
Limiting health	-0.611***	0.014	-42.270	0.000	-0.639	-0.583
Smoker – Yes	-0.292***	0.015	-20.020	0.000	-0.321	-0.264
Smoker – Ex	-0.049***	0.011	-4.610	0.000	-0.069	-0.028
RentPrivate	-0.065***	0.014	-4.560	0.000	-0.093	-0.037
RentSocial	-0.262***	0.018	-14.710	0.000	-0.297	-0.227
No rent/squatters	0.244***	0.061	3.990	0.000	0.124	0.363
Higher_Ed	0.002	0.016	0.110	0.910	-0.030	0.034
Alevel	-0.019	0.013	-1.410	0.160	-0.045	0.007
GCSE	-0.119***	0.014	-8.470	0.000	-0.147	-0.092
Ed_Other	-0.163***	0.020	-8.150	0.000	-0.202	-0.124
Ed_None	-0.297***	0.021	-13.990	0.000	-0.339	-0.255
May-11	0.031	0.044	0.720	0.472	-0.054	0.117
Jun-11	0.049	0.043	1.130	0.257	-0.036	0.133
Jul-11	0.034	0.043	0.780	0.433	-0.051	0.118
Aug-11	0.075	0.042	1.790	0.073	-0.007	0.158
Sep-11	0.067	0.042	1.580	0.114	-0.016	0.150
Oct-11	0.079	0.042	1.870	0.062	-0.004	0.161
Nov-11	0.091*	0.042	2.160	0.031	0.008	0.173
Dec-11	0.106*	0.042	2.500	0.012	0.023	0.189
Jan-12	0.058	0.041	1.410	0.159	-0.023	0.139
Feb-12	0.044	0.043	1.030	0.305	-0.040	0.128
Mar-12	0.093*	0.041	2.250	0.025	0.012	0.174

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-12	0.149**	0.053	2.830	0.005	0.046	0.253
May-12	0.074	0.064	1.150	0.249	-0.052	0.201
Jun-12	0.135*	0.065	2.070	0.039	0.007	0.263
Jul-12	0.142*	0.064	2.210	0.027	0.016	0.268
Aug-12	0.160*	0.065	2.470	0.013	0.033	0.288
Sep-12	0.148*	0.065	2.280	0.022	0.021	0.275
Oct-12	0.135*	0.065	2.090	0.037	0.008	0.261
Nov-12	0.148*	0.065	2.290	0.022	0.021	0.275
Dec-12	0.157*	0.065	2.400	0.016	0.029	0.285
Jan-13	0.083	0.065	1.270	0.204	-0.045	0.210
Feb-13	0.157*	0.065	2.430	0.015	0.031	0.284
Mar-13	0.132*	0.065	2.040	0.041	0.005	0.259
Apr-13	0.089	0.073	1.220	0.222	-0.054	0.232
Sunday	-0.025	0.022	-1.160	0.244	-0.068	0.017
Monday	-0.006	0.016	-0.380	0.701	-0.038	0.025
Tuesday	-0.004	0.016	-0.250	0.802	-0.035	0.027
Thursday	0.022	0.016	1.320	0.187	-0.010	0.054
Friday	0.010	0.018	0.530	0.597	-0.026	0.045
Saturday	-0.045*	0.021	-2.150	0.032	-0.087	-0.004
Face-to-Face Survey	-0.117***	0.011	-11.090	0.000	-0.138	-0.096
Data set 1= APS 2012-13	-0.044	0.049	-0.890	0.374	-0.140	0.053
Airport proximity	0.011	0.014	0.760	0.445	-0.017	0.038
Over 65	0.473***	0.016	29.580	0.000	0.442	0.505
Presence of daytime noise	-0.095*	0.039	-2.450	0.014	-0.171	-0.019
Presence of daytime noise and over 65	-0.151	0.143	-1.060	0.291	-0.430	0.129
_cons	7.795***	0.040	195.700	0.000	7.717	7.874

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=197,285; r^2=0.077. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 16: Happiness interaction -old age and the presence of daytime aircraft noise, including full controls

Happiness	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.092***	0.012	7.380	0.000	0.068	0.116
BME	-0.114***	0.021	-5.390	0.000	-0.156	-0.073
Religion – Yes	0.112***	0.014	7.880	0.000	0.084	0.139
Single	-0.301***	0.015	-19.650	0.000	-0.331	-0.271
Separated	-0.565***	0.036	-15.840	0.000	-0.635	-0.495
Divorced	-0.452***	0.021	-21.990	0.000	-0.493	-0.412
Widowed	-0.547***	0.038	-14.550	0.000	-0.621	-0.474
Civil partner	0.203*	0.086	2.360	0.018	0.034	0.372
One child	-0.019	0.018	-1.080	0.282	-0.055	0.016
Two children	0.001	0.018	0.070	0.946	-0.033	0.036
Three children	0.033	0.030	1.100	0.273	-0.026	0.093
Four or more children	0.087	0.053	1.650	0.100	-0.017	0.190
Limiting health	-0.788***	0.017	-45.330	0.000	-0.822	-0.754
Smoker – Yes	-0.384***	0.018	-21.130	0.000	-0.420	-0.349
Smoker – Ex	-0.081***	0.013	-5.980	0.000	-0.107	-0.054
RentPrivate	-0.032	0.018	-1.810	0.070	-0.067	0.003
RentSocial	-0.311***	0.022	-14.320	0.000	-0.354	-0.269
No rent/squatters	0.202**	0.077	2.630	0.009	0.051	0.352
Higher_Ed	0.011	0.021	0.540	0.586	-0.030	0.053
Alevel	0.044**	0.017	2.600	0.009	0.011	0.078
GCSE	-0.016	0.018	-0.920	0.357	-0.051	0.018
Ed_Other	-0.001	0.024	-0.030	0.980	-0.048	0.047
Ed_None	-0.095***	0.026	-3.690	0.000	-0.146	-0.045
May-11	-0.178**	0.055	-3.260	0.001	-0.285	-0.071
Jun-11	-0.184***	0.054	-3.390	0.001	-0.290	-0.078
Jul-11	-0.177**	0.054	-3.270	0.001	-0.283	-0.071
Aug-11	-0.117*	0.053	-2.200	0.028	-0.221	-0.013
Sep-11	-0.214***	0.054	-3.980	0.000	-0.319	-0.108
Oct-11	-0.191***	0.053	-3.590	0.000	-0.296	-0.087
Nov-11	-0.241***	0.053	-4.530	0.000	-0.345	-0.137
Dec-11	-0.140**	0.054	-2.590	0.010	-0.246	-0.034
Jan-12	-0.241***	0.053	-4.580	0.000	-0.345	-0.138
Feb-12	-0.254***	0.055	-4.620	0.000	-0.361	-0.146
Mar-12	-0.126*	0.052	-2.410	0.016	-0.229	-0.024

Happiness	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-12	0.015	0.066	0.230	0.814	-0.114	0.145
May-12	0.056	0.080	0.700	0.482	-0.101	0.214
Jun-12	0.077	0.081	0.950	0.345	-0.082	0.236
Jul-12	0.138	0.080	1.720	0.085	-0.019	0.295
Aug-12	0.157	0.081	1.950	0.052	-0.001	0.316
Sep-12	0.120	0.081	1.480	0.138	-0.038	0.278
Oct-12	-0.022	0.081	-0.280	0.782	-0.180	0.136
Nov-12	0.037	0.080	0.470	0.642	-0.120	0.195
Dec-12	0.114	0.081	1.410	0.158	-0.044	0.272
Jan-13	-0.028	0.080	-0.350	0.723	-0.186	0.129
Feb-13	0.063	0.080	0.780	0.434	-0.095	0.220
Mar-13	0.027	0.081	0.330	0.742	-0.132	0.185
Apr-13	0.089	0.091	0.980	0.329	-0.090	0.268
Sunday	0.029	0.027	1.090	0.276	-0.023	0.081
Monday	0.226***	0.020	11.100	0.000	0.186	0.266
Tuesday	0.044*	0.020	2.230	0.026	0.005	0.084
Thursday	0.007	0.021	0.360	0.721	-0.033	0.048
Friday	0.006	0.023	0.260	0.792	-0.039	0.051
Saturday	0.042	0.026	1.620	0.106	-0.009	0.093
Face-to-Face Survey	-0.086***	0.013	-6.440	0.000	-0.113	-0.060
Data set 1= APS 2012-13	-0.229***	0.060	-3.800	0.000	-0.347	-0.111
Airport proximity	0.009	0.018	0.520	0.600	-0.026	0.044
Over 65	0.520***	0.020	26.000	0.000	0.481	0.559
Presence of daytime noise	-0.108*	0.053	-2.050	0.041	-0.211	-0.005
Presence of daytime noise and over 65	0.097	0.152	0.630	0.526	-0.202	0.395
_cons	7.753***	0.050	153.790	0.000	7.654	7.852

*Legend: * p<0.05; ** p<0.01; *** p<0.001 ; N=197,868; r^2=0.056. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 17: Anxiety Interaction: Old age and the presence of daytime aircraft noise, including full controls

Anxiety	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.190***	0.016	11.600	0.000	0.158	0.222
BME	0.219***	0.028	7.960	0.000	0.165	0.273
Religion – Yes	0.089***	0.019	4.830	0.000	0.053	0.126
Single	0.031	0.020	1.560	0.120	-0.008	0.071
Separated	0.335***	0.044	7.650	0.000	0.249	0.421
Divorced	0.262***	0.026	9.980	0.000	0.210	0.313
Widowed	0.198***	0.047	4.250	0.000	0.107	0.289
Civil partner	0.025	0.146	0.170	0.867	-0.262	0.312
One child	-0.020	0.023	-0.870	0.387	-0.066	0.025
Two children	0.008	0.024	0.330	0.738	-0.039	0.055
Three children	-0.110**	0.040	-2.750	0.006	-0.189	-0.032
Four or more children	-0.097	0.068	-1.420	0.155	-0.231	0.037
Limiting health	0.983***	0.022	44.910	0.000	0.940	1.026
Smoker – Yes	0.261***	0.023	11.290	0.000	0.216	0.307
Smoker – Ex	0.090***	0.018	4.980	0.000	0.055	0.126
RentPrivate	0.146***	0.024	6.190	0.000	0.100	0.192
RentSocial	0.259***	0.027	9.610	0.000	0.206	0.311
No rent/squatters	-0.265**	0.096	-2.760	0.006	-0.453	-0.077
Higher_Ed	-0.157***	0.029	-5.490	0.000	-0.213	-0.101
Alevel	-0.222***	0.023	-9.660	0.000	-0.267	-0.177
GCSE	-0.246***	0.024	-10.430	0.000	-0.293	-0.200
Ed_Other	-0.192***	0.032	-6.100	0.000	-0.254	-0.131
Ed_None	-0.084**	0.033	-2.580	0.010	-0.148	-0.020
May-11	0.144*	0.072	2.010	0.044	0.004	0.285
Jun-11	0.076	0.070	1.090	0.276	-0.061	0.213
Jul-11	0.054	0.070	0.780	0.438	-0.083	0.191
Aug-11	-0.079	0.070	-1.140	0.254	-0.216	0.057
Sep-11	0.103	0.070	1.480	0.139	-0.033	0.240
Oct-11	-0.066	0.069	-0.950	0.342	-0.202	0.070
Nov-11	-0.022	0.069	-0.320	0.746	-0.157	0.113
Dec-11	-0.082	0.070	-1.170	0.242	-0.220	0.056
Jan-12	-0.027	0.068	-0.400	0.689	-0.161	0.106
Feb-12	-0.071	0.070	-1.010	0.313	-0.208	0.067
Mar-12	-0.130	0.069	-1.890	0.059	-0.265	0.005

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-12	-0.184*	0.088	-2.100	0.036	-0.356	-0.012
May-12	-0.168	0.107	-1.570	0.117	-0.379	0.042
Jun-12	-0.246*	0.108	-2.270	0.023	-0.459	-0.034
Jul-12	-0.280**	0.107	-2.610	0.009	-0.490	-0.069
Aug-12	-0.280**	0.108	-2.590	0.010	-0.492	-0.068
Sep-12	-0.200	0.108	-1.850	0.065	-0.413	0.012
Oct-12	-0.155	0.108	-1.440	0.151	-0.365	0.056
Nov-12	-0.190	0.108	-1.760	0.078	-0.402	0.021
Dec-12	-0.232*	0.109	-2.130	0.033	-0.446	-0.018
Jan-13	-0.234*	0.108	-2.180	0.030	-0.445	-0.023
Feb-13	-0.221*	0.108	-2.040	0.041	-0.432	-0.009
Mar-13	-0.161	0.108	-1.490	0.137	-0.373	0.051
Apr-13	-0.404***	0.118	-3.420	0.001	-0.635	-0.173
Sunday	-0.068	0.035	-1.930	0.053	-0.138	0.001
Monday	-0.255***	0.027	-9.480	0.000	-0.307	-0.202
Tuesday	-0.074**	0.026	-2.860	0.004	-0.124	-0.023
Thursday	0.027	0.027	1.000	0.316	-0.026	0.080
Friday	0.038	0.030	1.280	0.200	-0.020	0.096
Saturday	-0.001	0.035	-0.040	0.968	-0.070	0.067
Face-to-Face Survey	-0.028	0.018	-1.620	0.106	-0.063	0.006
Data set 1= APS 2012-13	0.109	0.082	1.320	0.186	-0.053	0.270
Airport proximity	0.016	0.024	0.660	0.510	-0.031	0.062
Over 65	-0.486***	0.027	-18.260	0.000	-0.539	-0.434
Presence of daytime noise	0.211**	0.072	2.930	0.003	0.070	0.351
Presence of daytime noise and over 65	-0.026	0.223	-0.120	0.908	-0.462	0.411
_cons	2.888***	0.065	44.270	0.000	2.760	3.016

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=197,601; r^2=0.032. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 18: PAB interaction – old age and the presence of daytime aircraft noise, including full controls

PAB	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	-0.049***	0.012	-4.020	0.000	-0.073	-0.025
BME	-0.167***	0.020	-8.230	0.000	-0.207	-0.128
Religion – Yes	0.011	0.014	0.800	0.424	-0.016	0.038
Single	-0.166***	0.015	-11.070	0.000	-0.195	-0.136
Separated	-0.451***	0.034	-13.190	0.000	-0.518	-0.384
Divorced	-0.358***	0.020	-17.800	0.000	-0.397	-0.318
Widowed	-0.372***	0.036	-10.250	0.000	-0.443	-0.301
Civil partner	0.093	0.102	0.910	0.363	-0.107	0.292
One child	0.001	0.018	0.040	0.970	-0.034	0.035
Two children	-0.004	0.017	-0.240	0.810	-0.038	0.030
Three children	0.072*	0.030	2.410	0.016	0.013	0.130
Four or more children	0.092	0.052	1.770	0.077	-0.010	0.193
Limiting health	-0.884***	0.017	-52.420	0.000	-0.917	-0.851
Smoker – Yes	-0.323***	0.017	-18.530	0.000	-0.357	-0.288
Smoker – Ex	-0.086***	0.013	-6.410	0.000	-0.112	-0.059
RentPrivate	-0.089***	0.017	-5.100	0.000	-0.123	-0.055
RentSocial	-0.286***	0.021	-13.920	0.000	-0.326	-0.245
No rent/squatters	0.233**	0.075	3.080	0.002	0.085	0.380
Higher_Ed	0.084***	0.021	4.000	0.000	0.043	0.125
Alevel	0.133***	0.017	7.930	0.000	0.100	0.166
GCSE	0.115***	0.018	6.550	0.000	0.081	0.149
Ed_Other	0.096***	0.024	4.080	0.000	0.050	0.143
Ed_None	-0.005	0.025	-0.210	0.837	-0.054	0.043
May-11	-0.161**	0.053	-3.010	0.003	-0.266	-0.056
Jun-11	-0.132*	0.052	-2.530	0.011	-0.235	-0.030
Jul-11	-0.116*	0.052	-2.210	0.027	-0.219	-0.013
Aug-11	-0.021	0.052	-0.400	0.688	-0.123	0.081
Sep-11	-0.158**	0.052	-3.030	0.002	-0.260	-0.056
Oct-11	-0.062	0.052	-1.200	0.231	-0.163	0.039
Nov-11	-0.110*	0.052	-2.130	0.033	-0.212	-0.009
Dec-11	-0.031	0.053	-0.590	0.558	-0.134	0.072
Jan-12	-0.108*	0.051	-2.110	0.035	-0.208	-0.008
Feb-12	-0.093	0.053	-1.760	0.079	-0.196	0.011
Mar-12	0.000	0.051	0.000	0.999	-0.100	0.101

PAB	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-12	0.099	0.065	1.530	0.125	-0.028	0.227
May-12	0.112	0.079	1.410	0.158	-0.044	0.268
Jun-12	0.161*	0.080	2.010	0.044	0.004	0.317
Jul-12	0.209**	0.079	2.640	0.008	0.054	0.364
Aug-12	0.219**	0.080	2.750	0.006	0.063	0.376
Sep-12	0.159*	0.080	1.990	0.047	0.002	0.316
Oct-12	0.066	0.079	0.830	0.409	-0.090	0.221
Nov-12	0.113	0.080	1.420	0.156	-0.043	0.269
Dec-12	0.174*	0.080	2.170	0.030	0.017	0.332
Jan-13	0.101	0.079	1.270	0.203	-0.055	0.257
Feb-13	0.144	0.080	1.810	0.071	-0.012	0.299
Mar-13	0.095	0.080	1.190	0.233	-0.061	0.251
Apr-13	0.247**	0.088	2.800	0.005	0.074	0.420
Sunday	0.048	0.026	1.860	0.062	-0.003	0.099
Monday	0.240***	0.020	11.960	0.000	0.201	0.280
Tuesday	0.058**	0.019	3.010	0.003	0.020	0.096
Thursday	-0.010	0.020	-0.520	0.604	-0.050	0.029
Friday	-0.017	0.022	-0.740	0.460	-0.060	0.027
Saturday	0.021	0.026	0.820	0.412	-0.030	0.072
Face-to-Face Survey	-0.029*	0.013	-2.250	0.025	-0.055	-0.004
Data set 1= APS 2012-13	-0.170**	0.060	-2.830	0.005	-0.288	-0.052
Airport proximity	-0.004	0.018	-0.210	0.833	-0.038	0.031
Over 65	0.505***	0.020	25.340	0.000	0.466	0.544
Presence of daytime noise	-0.160**	0.053	-3.000	0.003	-0.265	-0.055
Presence of daytime noise and over 65	0.057	0.159	0.360	0.718	-0.254	0.368
_cons	2.434***	0.049	49.760	0.000	2.338	2.530

*Legend: * p<0.05; ** p<0.01; *** p<0.001 ; N=197,486; r^2=0.052 Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 19: Life satisfaction interaction -unemployment/underemployment and the presence of daytime aircraft noise, including full controls

Life satisfaction	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.096***	0.012	8.340	0.000	0.074	0.119
Age	-0.099***	0.003	-32.190	0.000	-0.106	-0.093
Age Squared	0.001***	0.000	30.420	0.000	0.001	0.001
BME	-0.296***	0.021	-13.820	0.000	-0.339	-0.254
Religion – Yes	0.081***	0.013	6.290	0.000	0.055	0.106
Single	-0.441***	0.015	-28.520	0.000	-0.472	-0.411
Separated	-0.681***	0.034	-19.760	0.000	-0.749	-0.614
Divorced	-0.461***	0.020	-23.330	0.000	-0.499	-0.422
Widowed	-0.755***	0.048	-15.680	0.000	-0.849	-0.660
Civil partner	0.259***	0.067	3.880	0.000	0.128	0.389
One child	0.016	0.017	0.960	0.335	-0.017	0.049
Two children	0.048**	0.017	2.820	0.005	0.015	0.081
Three children	0.096***	0.029	3.350	0.001	0.040	0.153
Four children	0.066	0.062	1.050	0.292	-0.056	0.187
Limiting health	-0.542***	0.019	-27.820	0.000	-0.580	-0.504
Smoker – Yes	-0.314***	0.017	-18.420	0.000	-0.347	-0.280
Smoker – Ex	-0.068***	0.012	-5.560	0.000	-0.092	-0.044
RentPrivate	-0.140***	0.017	-8.480	0.000	-0.172	-0.108
RentSocial	-0.213***	0.023	-9.190	0.000	-0.259	-0.168
No rent/squatter	0.188**	0.072	2.600	0.009	0.046	0.329
Higher_Ed	-0.013	0.019	-0.710	0.480	-0.051	0.024
Alevel	-0.003	0.015	-0.200	0.839	-0.032	0.026
GCSE	-0.060***	0.016	-3.720	0.000	-0.092	-0.028
Ed_Other	-0.012	0.026	-0.490	0.627	-0.063	0.038
Ed_None	0.000	0.033	-0.010	0.990	-0.065	0.064
May-11	0.131**	0.050	2.600	0.009	0.032	0.229
Jun-11	0.100*	0.050	1.990	0.047	0.001	0.199
Jul-11	0.077	0.050	1.530	0.126	-0.022	0.176
Aug-11	0.098*	0.050	1.970	0.049	0.001	0.195
Sep-11	0.114*	0.050	2.250	0.024	0.015	0.212
Oct-11	0.078	0.050	1.560	0.119	-0.020	0.176
Nov-11	0.082	0.049	1.650	0.099	-0.015	0.178
Dec-11	0.176***	0.050	3.510	0.000	0.078	0.275

Life satisfaction	Coefficient	SE	t	P>t	95% Conf.	Interval
Jan-12	0.112*	0.049	2.270	0.023	0.015	0.209
Feb-12	0.094	0.051	1.840	0.066	-0.006	0.194
Mar-12	0.108*	0.049	2.200	0.028	0.012	0.205
Apr-12	0.180**	0.063	2.870	0.004	0.057	0.302
May-12	0.179*	0.076	2.360	0.018	0.030	0.328
Jun-12	0.221**	0.078	2.850	0.004	0.069	0.373
Jul-12	0.194*	0.076	2.560	0.010	0.046	0.343
Aug-12	0.234**	0.076	3.080	0.002	0.085	0.383
Sep-12	0.250**	0.077	3.260	0.001	0.100	0.400
Oct-12	0.183*	0.076	2.410	0.016	0.034	0.332
Nov-12	0.217**	0.077	2.830	0.005	0.067	0.367
Dec-12	0.267***	0.077	3.470	0.001	0.116	0.418
Jan-13	0.142	0.077	1.840	0.066	-0.009	0.293
Feb-13	0.257***	0.076	3.390	0.001	0.108	0.406
Mar-13	0.159*	0.077	2.060	0.039	0.008	0.310
Apr-13	0.230**	0.086	2.670	0.008	0.061	0.399
Sunday	0.026	0.025	1.060	0.291	-0.023	0.075
Monday	0.003	0.019	0.180	0.857	-0.034	0.041
Tuesday	-0.004	0.018	-0.210	0.832	-0.040	0.032
Thursday	0.006	0.019	0.330	0.739	-0.031	0.044
Friday	0.007	0.021	0.320	0.746	-0.034	0.048
Saturday	-0.033	0.024	-1.350	0.177	-0.081	0.015
Face-to-Face Survey	-0.102***	0.012	-8.280	0.000	-0.127	-0.078
Data set 1= APS 2012-13	-0.054	0.058	-0.940	0.349	-0.168	0.059
Airport proximity	0.013	0.016	0.820	0.411	-0.018	0.045
Unemployed and underemployed	-0.795***	0.023	-35.300	0.000	-0.839	-0.751
Presence of daytime noise	-0.101*	0.046	-2.200	0.028	-0.192	-0.011
Presence of daytime noise and unemployment/underemployment interaction	-0.019	0.164	-0.110	0.909	-0.340	0.303
_cons	10.005***	0.082	121.430	0.000	9.843	10.166

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=130,213; r^2=0.097. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 20: Worthwhile interaction – unemployment/underemployment and the presence of daytime aircraft noise, including full controls

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.245***	0.011	21.770	0.000	0.223	0.267
Age	-0.059***	0.003	-18.900	0.000	-0.065	-0.053
Age Squared	0.001***	0.000	21.530	0.000	0.001	0.001
BME	-0.200***	0.020	-9.830	0.000	-0.240	-0.160
Religion – Yes	0.149***	0.013	11.630	0.000	0.124	0.174
Single	-0.247***	0.015	-16.160	0.000	-0.277	-0.217
Separated	-0.252***	0.031	-8.170	0.000	-0.313	-0.192
Divorced	-0.207***	0.018	-11.290	0.000	-0.243	-0.171
Widowed	-0.324***	0.042	-7.660	0.000	-0.407	-0.241
Civil partner	0.338***	0.070	4.800	0.000	0.200	0.476
One child	0.176***	0.016	10.990	0.000	0.145	0.208
Two children	0.249***	0.016	15.310	0.000	0.217	0.280
Three children	0.311***	0.027	11.410	0.000	0.258	0.365
Four children	0.321***	0.059	5.430	0.000	0.205	0.437
Limiting health	-0.329***	0.019	-17.600	0.000	-0.365	-0.292
Smoker – Yes	-0.206***	0.017	-12.310	0.000	-0.239	-0.174
Smoker – Ex	-0.058***	0.012	-4.820	0.000	-0.082	-0.035
RentPrivate	-0.060***	0.017	-3.580	0.000	-0.093	-0.027
RentSocial	-0.070**	0.022	-3.190	0.001	-0.114	-0.027
No rent/squatter	0.271***	0.072	3.780	0.000	0.130	0.411
Higher_Ed	-0.022	0.018	-1.200	0.229	-0.057	0.014
Alevel	-0.074***	0.015	-4.940	0.000	-0.104	-0.045
GCSE	-0.141***	0.016	-8.840	0.000	-0.173	-0.110
Ed_Other	-0.173***	0.024	-7.190	0.000	-0.221	-0.126
Ed_None	-0.232***	0.030	-7.730	0.000	-0.291	-0.173
May-11	0.097*	0.047	2.060	0.040	0.005	0.189
Jun-11	0.107*	0.048	2.250	0.024	0.014	0.201
Jul-11	0.066	0.048	1.360	0.173	-0.029	0.160
Aug-11	0.088	0.047	1.870	0.062	-0.004	0.180
Sep-11	0.094*	0.048	1.970	0.049	0.001	0.187
Oct-11	0.085	0.047	1.810	0.071	-0.007	0.178
Nov-11	0.118*	0.047	2.530	0.011	0.027	0.209
Dec-11	0.161***	0.048	3.400	0.001	0.068	0.254

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
Jan-12	0.080	0.046	1.720	0.086	-0.011	0.170
Feb-12	0.080	0.049	1.630	0.103	-0.016	0.175
Mar-12	0.125**	0.046	2.680	0.007	0.034	0.216
Apr-12	0.190**	0.060	3.170	0.002	0.073	0.308
May-12	0.114	0.073	1.560	0.119	-0.029	0.256
Jun-12	0.157*	0.075	2.110	0.035	0.011	0.304
Jul-12	0.157*	0.073	2.150	0.031	0.014	0.299
Aug-12	0.170*	0.074	2.310	0.021	0.026	0.315
Sep-12	0.177*	0.074	2.400	0.016	0.033	0.322
Oct-12	0.158*	0.073	2.170	0.030	0.015	0.301
Nov-12	0.207**	0.073	2.820	0.005	0.063	0.351
Dec-12	0.175*	0.074	2.370	0.018	0.030	0.320
Jan-13	0.102	0.074	1.370	0.169	-0.044	0.248
Feb-13	0.163*	0.073	2.230	0.026	0.020	0.307
Mar-13	0.143	0.073	1.950	0.051	-0.001	0.287
Apr-13	0.150	0.084	1.790	0.074	-0.015	0.315
Sunday	0.006	0.024	0.240	0.809	-0.042	0.053
Monday	0.002	0.019	0.100	0.919	-0.034	0.038
Tuesday	0.010	0.018	0.540	0.586	-0.026	0.046
Thursday	0.009	0.019	0.500	0.617	-0.028	0.047
Friday	0.005	0.021	0.230	0.815	-0.036	0.045
Saturday	-0.068**	0.024	-2.790	0.005	-0.115	-0.020
Face-to-Face Survey	-0.064***	0.012	-5.250	0.000	-0.088	-0.040
Data set 1= APS 2012-13	-0.025	0.056	-0.440	0.656	-0.135	0.085
Airport proximity	0.002	0.016	0.140	0.886	-0.029	0.034
Unemployed and underemployed	-0.593***	0.022	-27.240	0.000	-0.636	-0.550
Presence of daytime noise	-0.122**	0.044	-2.800	0.005	-0.208	-0.037
Presence of daytime noise and unemployment/underemployment interaction	0.178	0.146	1.220	0.223	-0.108	0.464
_cons	8.803***	0.081	108.320	0.000	8.644	8.963

*Legend: * p<0.05; ** p<0.01; *** p<0.0011; N=129,943; r^2=0.068. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 21: Happiness interaction – unemployment/underemployment and the presence of daytime aircraft noise, including full controls

Happiness	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.058***	0.015	3.940	0.000	0.029	0.086
Age	-0.078***	0.004	-20.270	0.000	-0.086	-0.071
Age Squared	0.001***	0.000	20.800	0.000	0.001	0.001
BME	-0.106***	0.026	-4.140	0.000	-0.156	-0.056
Religion – Yes	0.118***	0.016	7.200	0.000	0.086	0.150
Single	-0.348***	0.020	-17.700	0.000	-0.387	-0.310
Separated	-0.439***	0.041	-10.750	0.000	-0.519	-0.359
Divorced	-0.325***	0.024	-13.260	0.000	-0.373	-0.277
Widowed	-0.493***	0.059	-8.400	0.000	-0.608	-0.378
Civil partner	0.250**	0.096	2.610	0.009	0.062	0.438
One child	0.017	0.021	0.790	0.429	-0.024	0.057
Two children	0.085***	0.021	4.060	0.000	0.044	0.127
Three children	0.137***	0.036	3.820	0.000	0.066	0.207
Four children	0.210**	0.070	3.000	0.003	0.073	0.347
Limiting health	-0.517***	0.023	-22.190	0.000	-0.563	-0.472
Smoker – Yes	-0.290***	0.022	-13.430	0.000	-0.332	-0.247
Smoker – Ex	-0.076***	0.016	-4.780	0.000	-0.107	-0.045
RentPrivate	-0.064**	0.021	-3.000	0.003	-0.106	-0.022
RentSocial	-0.167***	0.028	-5.860	0.000	-0.223	-0.111
No rent/squatter	0.211*	0.085	2.470	0.014	0.043	0.378
Higher_Ed	-0.004	0.024	-0.180	0.855	-0.052	0.043
Alevel	-0.024	0.020	-1.200	0.232	-0.062	0.015
GCSE	-0.048*	0.021	-2.350	0.019	-0.089	-0.008
Ed_Other	0.008	0.030	0.280	0.778	-0.051	0.068
Ed_None	-0.044	0.037	-1.160	0.245	-0.117	0.030
May-11	-0.074	0.063	-1.170	0.243	-0.197	0.050
Jun-11	-0.142*	0.063	-2.250	0.024	-0.266	-0.018
Jul-11	-0.150*	0.064	-2.360	0.018	-0.275	-0.025
Aug-11	-0.091	0.062	-1.460	0.145	-0.213	0.031
Sep-11	-0.152*	0.063	-2.400	0.016	-0.276	-0.028
Oct-11	-0.216***	0.063	-3.420	0.001	-0.340	-0.092
Nov-11	-0.211***	0.062	-3.380	0.001	-0.333	-0.089
Dec-11	-0.060	0.064	-0.940	0.345	-0.185	0.065

Happiness	Coefficient	SE	t	P>t	95% Conf.	Interval
Jan-12	-0.227***	0.062	-3.680	0.000	-0.348	-0.106
Feb-12	-0.217***	0.064	-3.370	0.001	-0.342	-0.091
Mar-12	-0.107	0.062	-1.730	0.083	-0.227	0.014
Apr-12	0.039	0.077	0.510	0.610	-0.112	0.191
May-12	0.061	0.095	0.640	0.521	-0.125	0.248
Jun-12	0.112	0.096	1.160	0.246	-0.077	0.301
Jul-12	0.134	0.095	1.420	0.157	-0.052	0.320
Aug-12	0.154	0.096	1.590	0.111	-0.035	0.343
Sep-12	0.147	0.096	1.530	0.125	-0.041	0.334
Oct-12	-0.015	0.095	-0.160	0.873	-0.202	0.172
Nov-12	0.087	0.095	0.910	0.361	-0.099	0.273
Dec-12	0.144	0.096	1.500	0.133	-0.044	0.331
Jan-13	-0.012	0.095	-0.130	0.899	-0.199	0.175
Feb-13	0.099	0.095	1.040	0.298	-0.088	0.285
Mar-13	0.037	0.095	0.380	0.701	-0.150	0.223
Apr-13	0.116	0.108	1.080	0.282	-0.095	0.328
Sunday	0.051	0.031	1.640	0.101	-0.010	0.113
Monday	0.275***	0.024	11.260	0.000	0.227	0.323
Tuesday	0.079***	0.024	3.310	0.001	0.032	0.126
Thursday	0.004	0.024	0.170	0.865	-0.044	0.052
Friday	0.028	0.026	1.060	0.287	-0.023	0.079
Saturday	0.051	0.030	1.720	0.086	-0.007	0.110
Face-to-Face Survey	-0.059***	0.016	-3.680	0.000	-0.090	-0.027
Data set 1= APS 2012-13	-0.203**	0.071	-2.840	0.004	-0.343	-0.063
Airport proximity	-0.007	0.021	-0.330	0.741	-0.049	0.035
Unemployed and underemployed	-0.394***	0.026	-15.070	0.000	-0.445	-0.343
Presence of daytime noise	-0.118*	0.058	-2.030	0.043	-0.232	-0.004
Presence of daytime noise and unemployment/underemployment interaction	-0.065	0.220	-0.290	0.769	-0.496	0.367
_cons	9.257***	0.104	88.660	0.000	9.052	9.461

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=130,216; r^2=0.038. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 22: Anxiety interaction -unemployment/underemployment and the presence of daytime aircraft noise, including full controls

Anxiety	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.204***	0.019	10.480	0.000	0.166	0.242
Age	0.075***	0.005	14.510	0.000	0.065	0.085
Age Squared	-0.001***	0.000	-14.070	0.000	-0.001	-0.001
BME	0.265***	0.033	7.950	0.000	0.200	0.331
Religion – Yes	0.083***	0.022	3.810	0.000	0.040	0.125
Single	0.105***	0.027	3.980	0.000	0.053	0.157
Separated	0.261***	0.052	5.050	0.000	0.160	0.362
Divorced	0.154***	0.032	4.790	0.000	0.091	0.216
Widowed	0.051	0.071	0.720	0.473	-0.088	0.190
Civil partner	0.005	0.170	0.030	0.976	-0.329	0.339
One child	0.015	0.027	0.530	0.594	-0.039	0.068
Two children	-0.020	0.029	-0.680	0.497	-0.076	0.037
Three children	-0.096	0.050	-1.940	0.052	-0.194	0.001
Four children	-0.157	0.090	-1.740	0.081	-0.333	0.020
Limiting health	0.717***	0.030	23.840	0.000	0.658	0.776
Smoker – Yes	0.195***	0.028	7.050	0.000	0.141	0.249
Smoker – Ex	0.106***	0.022	4.920	0.000	0.064	0.149
RentPrivate	0.169***	0.028	6.000	0.000	0.114	0.225
RentSocial	0.082*	0.036	2.320	0.021	0.013	0.152
No rent/squatter	-0.231*	0.109	-2.110	0.035	-0.445	-0.017
Higher_Ed	-0.161***	0.033	-4.810	0.000	-0.226	-0.095
Alevel	-0.207***	0.027	-7.800	0.000	-0.259	-0.155
GCSE	-0.259***	0.028	-9.370	0.000	-0.313	-0.205
Ed_Other	-0.267***	0.039	-6.870	0.000	-0.343	-0.191
Ed_None	-0.177***	0.048	-3.650	0.000	-0.272	-0.082
May-11	0.047	0.084	0.550	0.580	-0.118	0.211
Jun-11	0.043	0.082	0.530	0.598	-0.118	0.205
Jul-11	0.044	0.083	0.530	0.599	-0.119	0.206
Aug-11	-0.118	0.083	-1.430	0.151	-0.280	0.043
Sep-11	0.105	0.083	1.260	0.206	-0.058	0.268
Oct-11	-0.052	0.083	-0.620	0.532	-0.213	0.110
Nov-11	-0.048	0.082	-0.590	0.554	-0.208	0.112
Dec-11	-0.121	0.084	-1.450	0.147	-0.285	0.043

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Jan-12	-0.055	0.081	-0.680	0.499	-0.213	0.104
Feb-12	-0.120	0.083	-1.450	0.148	-0.284	0.043
Mar-12	-0.167*	0.082	-2.050	0.041	-0.327	-0.007
Apr-12	-0.183	0.103	-1.780	0.075	-0.385	0.018
May-12	-0.224	0.127	-1.760	0.079	-0.474	0.026
Jun-12	-0.297*	0.128	-2.310	0.021	-0.548	-0.045
Jul-12	-0.329**	0.127	-2.590	0.010	-0.578	-0.080
Aug-12	-0.332**	0.129	-2.580	0.010	-0.585	-0.080
Sep-12	-0.153	0.129	-1.190	0.235	-0.407	0.100
Oct-12	-0.179	0.127	-1.400	0.161	-0.429	0.071
Nov-12	-0.253*	0.128	-1.970	0.049	-0.504	-0.001
Dec-12	-0.268*	0.130	-2.070	0.039	-0.522	-0.014
Jan-13	-0.294*	0.128	-2.300	0.021	-0.545	-0.044
Feb-13	-0.266*	0.128	-2.080	0.038	-0.518	-0.015
Mar-13	-0.203	0.128	-1.590	0.113	-0.453	0.048
Apr-13	-0.471***	0.140	-3.370	0.001	-0.744	-0.197
Sunday	-0.094*	0.042	-2.240	0.025	-0.176	-0.012
Monday	-0.292***	0.033	-8.940	0.000	-0.356	-0.228
Tuesday	-0.100**	0.031	-3.220	0.001	-0.161	-0.039
Thursday	0.017	0.032	0.530	0.596	-0.046	0.080
Friday	0.024	0.035	0.690	0.490	-0.044	0.092
Saturday	0.011	0.041	0.260	0.797	-0.070	0.091
Face-to-Face Survey	-0.009	0.021	-0.420	0.676	-0.050	0.032
Data set 1= APS 2012-13	0.107	0.098	1.100	0.273	-0.084	0.299
Airport proximity	0.029	0.029	1.020	0.306	-0.027	0.086
Unemployed and underemployed	0.349***	0.033	10.610	0.000	0.285	0.414
Presence of daytime noise	0.188*	0.081	2.310	0.021	0.029	0.348
Presence of daytime noise and unemployment/underemployment interaction	0.000	0.252	0.000	0.999	-0.495	0.495
_cons	1.326***	0.138	9.610	0.000	1.055	1.596

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=130,068; r^2=0.022. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 23: PAB interaction – unemployment/underemployment and the presence of daytime aircraft noise, including full controls

Anxiety	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	-0.073***	0.014	-5.090	0.000	-0.101	-0.045
Age	-0.077***	0.004	-20.320	0.000	-0.085	-0.070
Age Squared	0.001***	0.000	20.260	0.000	0.001	0.001
BME	-0.187***	0.025	-7.630	0.000	-0.235	-0.139
Religion – Yes	0.018	0.016	1.110	0.265	-0.013	0.049
Single	-0.227***	0.019	-11.630	0.000	-0.265	-0.188
Separated	-0.352***	0.040	-8.850	0.000	-0.429	-0.274
Divorced	-0.239***	0.024	-9.900	0.000	-0.287	-0.192
Widowed	-0.268***	0.056	-4.820	0.000	-0.376	-0.159
Civil partner	0.122	0.117	1.050	0.296	-0.107	0.352
One child	0.001	0.020	0.070	0.947	-0.039	0.041
Two children	0.052*	0.021	2.510	0.012	0.011	0.093
Three children	0.118**	0.036	3.270	0.001	0.047	0.188
Four children	0.179**	0.068	2.630	0.009	0.046	0.312
Limiting health	-0.617***	0.023	-27.180	0.000	-0.661	-0.572
Smoker – Yes	-0.243***	0.021	-11.760	0.000	-0.283	-0.202
Smoker – Ex	-0.091***	0.016	-5.780	0.000	-0.122	-0.060
RentPrivate	-0.117***	0.021	-5.640	0.000	-0.157	-0.076
RentSocial	-0.125***	0.027	-4.680	0.000	-0.178	-0.073
No rent/squatter	0.220**	0.083	2.670	0.008	0.058	0.382
Higher_Ed	0.077**	0.024	3.180	0.001	0.030	0.125
Alevel	0.092***	0.019	4.740	0.000	0.054	0.130
GCSE	0.105***	0.020	5.150	0.000	0.065	0.145
Ed_Other	0.137***	0.029	4.750	0.000	0.080	0.193
Ed_None	0.065	0.036	1.810	0.070	-0.005	0.136
May-11	-0.060	0.062	-0.970	0.333	-0.180	0.061
Jun-11	-0.095	0.061	-1.560	0.118	-0.213	0.024
Jul-11	-0.098	0.061	-1.590	0.112	-0.218	0.023
Aug-11	0.013	0.061	0.210	0.836	-0.107	0.132
Sep-11	-0.129*	0.061	-2.120	0.034	-0.248	-0.010
Oct-11	-0.083	0.061	-1.370	0.171	-0.202	0.036
Nov-11	-0.082	0.060	-1.370	0.171	-0.200	0.035
Dec-11	0.029	0.062	0.470	0.639	-0.092	0.149

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Jan-12	-0.087	0.059	-1.480	0.140	-0.204	0.029
Feb-12	-0.050	0.062	-0.800	0.423	-0.171	0.072
Mar-12	0.030	0.060	0.500	0.616	-0.088	0.148
Apr-12	0.111	0.076	1.480	0.140	-0.037	0.259
May-12	0.144	0.094	1.540	0.124	-0.040	0.327
Jun-12	0.205*	0.094	2.180	0.029	0.021	0.389
Jul-12	0.233*	0.093	2.500	0.012	0.050	0.415
Aug-12	0.245**	0.095	2.590	0.010	0.059	0.430
Sep-12	0.150	0.095	1.590	0.112	-0.035	0.336
Oct-12	0.082	0.093	0.880	0.379	-0.101	0.266
Nov-12	0.170	0.094	1.810	0.070	-0.014	0.354
Dec-12	0.209*	0.095	2.200	0.028	0.023	0.395
Jan-13	0.141	0.093	1.510	0.132	-0.043	0.324
Feb-13	0.185*	0.094	1.980	0.048	0.002	0.369
Mar-13	0.121	0.093	1.300	0.195	-0.062	0.304
Apr-13	0.295**	0.104	2.820	0.005	0.090	0.499
Sunday	0.073*	0.030	2.390	0.017	0.013	0.133
Monday	0.284***	0.024	11.720	0.000	0.237	0.331
Tuesday	0.089***	0.023	3.830	0.000	0.043	0.135
Thursday	-0.007	0.024	-0.280	0.780	-0.053	0.040
Friday	0.002	0.026	0.060	0.952	-0.049	0.052
Saturday	0.020	0.030	0.660	0.507	-0.039	0.079
Face-to-Face Survey	-0.025	0.016	-1.600	0.110	-0.055	0.006
Data set 1= APS 2012-13	-0.157*	0.071	-2.210	0.027	-0.297	-0.018
Airport proximity	-0.018	0.021	-0.860	0.388	-0.060	0.023
Unemployed and underemployed	-0.371***	0.025	-15.130	0.000	-0.419	-0.323
Presence of daytime noise	-0.153**	0.059	-2.580	0.010	-0.269	-0.037
Presence of daytime noise and unemployment/underemployment interaction	-0.030	0.208	-0.150	0.884	-0.438	0.377
_cons	3.970***	0.102	39.100	0.000	3.771	4.169

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=130,027; r^2=0.033. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 24: Life satisfaction interaction – social housing and the presence of daytime aircraft noise, including full controls

Life satisfaction	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	0.162***	0.011	14.450	0.000	0.140	0.184
Age	-0.108***	0.003	-37.700	0.000	-0.114	-0.102
Age Squared	0.001***	0.000	35.690	0.000	0.001	0.001
BME	-0.290***	0.019	-15.680	0.000	-0.326	-0.254
Religion – Yes	0.092***	0.012	7.930	0.000	0.069	0.114
Single	-0.475***	0.014	-33.420	0.000	-0.503	-0.448
Separated	-0.738***	0.031	-23.810	0.000	-0.798	-0.677
Divorced	-0.531***	0.017	-30.860	0.000	-0.565	-0.497
Widowed	-0.792***	0.032	-24.930	0.000	-0.854	-0.730
Civil partner	0.260***	0.060	4.300	0.000	0.141	0.378
One child	0.055***	0.016	3.500	0.000	0.024	0.085
Two children	0.108***	0.016	6.600	0.000	0.076	0.140
Three children	0.185***	0.027	6.960	0.000	0.133	0.237
Four children	0.216***	0.046	4.690	0.000	0.126	0.307
Limiting health	-0.720***	0.015	-47.470	0.000	-0.750	-0.691
Smoker – Yes	-0.358***	0.015	-24.090	0.000	-0.387	-0.329
Smoker – Ex	-0.082***	0.011	-7.480	0.000	-0.103	-0.060
Higher_Ed	0.018	0.017	1.070	0.284	-0.015	0.052
Alevel	0.037**	0.014	2.670	0.008	0.010	0.064
GCSE	0.009	0.015	0.590	0.552	-0.020	0.038
Ed_Other	0.038	0.021	1.760	0.079	-0.004	0.080
Ed_None	-0.013	0.023	-0.590	0.557	-0.058	0.031
Inactive – seeking	-0.444***	0.079	-5.590	0.000	-0.600	-0.289
Inactive – not seeking but w~s	-0.662***	0.036	-18.440	0.000	-0.732	-0.591
Inactive – not seeking not w~	-0.201***	0.028	-7.240	0.000	-0.256	-0.147
Inactive – retired	0.376***	0.027	14.150	0.000	0.324	0.428
Unemployed	-0.789***	0.034	-23.490	0.000	-0.855	-0.724
Student	0.055	0.039	1.400	0.160	-0.022	0.131
Unpaid Family Worker	0.087	0.086	1.020	0.308	-0.081	0.255
Underemployed	-0.393***	0.037	-10.670	0.000	-0.466	-0.321
Part-Time	0.107***	0.023	4.710	0.000	0.062	0.151
Full Time Self-Employed	0.116***	0.027	4.230	0.000	0.062	0.169
Full Time lowest pay quintile	0.056*	0.026	2.140	0.032	0.005	0.106

Life satisfaction	Coefficient	SE	t	P>t	95% Conf.	Interval
Full Time 2nd pay quintile	0.156***	0.026	6.100	0.000	0.106	0.207
Full Time 4th pay quintile	0.204***	0.025	8.300	0.000	0.156	0.252
Full Time highest pay quintile	0.323***	0.025	13.110	0.000	0.275	0.372
May-11	0.079	0.046	1.720	0.086	-0.011	0.169
Jun-11	0.071	0.045	1.560	0.118	-0.018	0.159
Jul-11	0.058	0.045	1.300	0.195	-0.030	0.146
Aug-11	0.104*	0.044	2.360	0.018	0.018	0.190
Sep-11	0.085	0.044	1.930	0.054	-0.001	0.172
Oct-11	0.085	0.044	1.920	0.055	-0.002	0.171
Nov-11	0.102*	0.043	2.340	0.019	0.017	0.187
Dec-11	0.153***	0.044	3.460	0.001	0.067	0.240
Jan-12	0.116**	0.043	2.670	0.008	0.031	0.200
Feb-12	0.071	0.046	1.560	0.118	-0.018	0.161
Mar-12	0.104*	0.043	2.400	0.016	0.019	0.190
Apr-12	0.174**	0.056	3.130	0.002	0.065	0.284
May-12	0.146*	0.067	2.180	0.029	0.015	0.278
Jun-12	0.214**	0.068	3.160	0.002	0.081	0.347
Jul-12	0.189**	0.067	2.820	0.005	0.058	0.320
Aug-12	0.246***	0.067	3.660	0.000	0.114	0.377
Sep-12	0.222**	0.067	3.290	0.001	0.089	0.354
Oct-12	0.173**	0.067	2.590	0.010	0.042	0.304
Nov-12	0.195**	0.067	2.890	0.004	0.062	0.327
Dec-12	0.259***	0.068	3.820	0.000	0.126	0.391
Jan-13	0.155*	0.068	2.290	0.022	0.022	0.287
Feb-13	0.232***	0.067	3.460	0.001	0.101	0.363
Mar-13	0.148*	0.068	2.180	0.029	0.015	0.280
Apr-13	0.202**	0.075	2.680	0.007	0.055	0.350
Sunday	0.011	0.022	0.480	0.631	-0.033	0.054
Monday	-0.007	0.017	-0.450	0.653	-0.040	0.025
Tuesday	-0.009	0.016	-0.560	0.572	-0.040	0.022
Thursday	0.012	0.017	0.710	0.479	-0.021	0.045
Friday	0.002	0.019	0.090	0.931	-0.035	0.038
Saturday	-0.027	0.022	-1.270	0.203	-0.070	0.015
Face-to-Face Survey	-0.144***	0.011	-13.440	0.000	-0.165	-0.123
Data set 1= APS 2012-13	-0.067	0.051	-1.310	0.191	-0.167	0.033

Life satisfaction	Coefficient	SE	t	P>t	95% Conf.	Interval
Airport proximity <5km	0.010	0.014	0.670	0.502	-0.018	0.037
Living in social housing	-0.208***	0.019	-11.210	0.000	-0.244	-0.171
Presence of daytime noise	-0.087*	0.040	-2.180	0.029	-0.165	-0.009
Presence of daytime noise and social housing interaction	-0.360**	0.132	-2.720	0.007	-0.619	-0.101
_cons	10.024***	0.075	132.860	0.000	9.876	10.171

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=189,179; r^2=0.136. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 25: Worthwhile interaction – social housing and the presence of daytime aircraft noise, including full controls

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
Female	0.319***	0.011	28.460	0.000	0.297	0.341
Age	-0.069***	0.003	-24.120	0.000	-0.075	-0.064
Age Squared	0.001***	0.000	26.470	0.000	0.001	0.001
BME	-0.215***	0.018	-11.930	0.000	-0.250	-0.179
Religion – Yes	0.160***	0.012	13.760	0.000	0.138	0.183
Single	-0.277***	0.014	-19.620	0.000	-0.304	-0.249
Separated	-0.343***	0.028	-12.070	0.000	-0.399	-0.288
Divorced	-0.294***	0.016	-17.820	0.000	-0.326	-0.261
Widowed	-0.407***	0.030	-13.680	0.000	-0.465	-0.349
Civil partner	0.310***	0.064	4.860	0.000	0.185	0.435
One child	0.215***	0.015	14.110	0.000	0.185	0.245
Two children	0.317***	0.016	19.910	0.000	0.285	0.348
Three children	0.440***	0.025	17.710	0.000	0.391	0.489
Four children	0.512***	0.045	11.300	0.000	0.423	0.601
Limiting health	-0.528***	0.015	-35.950	0.000	-0.557	-0.500
Smoker – Yes	-0.243***	0.015	-16.380	0.000	-0.272	-0.214
Smoker – Ex	-0.054***	0.011	-5.010	0.000	-0.075	-0.033
Higher_Ed	0.004	0.017	0.210	0.833	-0.029	0.036
Alevel	-0.039**	0.014	-2.750	0.006	-0.066	-0.011
GCSE	-0.068***	0.015	-4.620	0.000	-0.097	-0.039
Ed_Other	-0.108***	0.021	-5.150	0.000	-0.150	-0.067
Ed_None	-0.251***	0.022	-11.380	0.000	-0.295	-0.208
Inactive – seeking	-0.262***	0.075	-3.490	0.000	-0.409	-0.115
Inactive – not seeking but w~s	-0.501***	0.036	-14.070	0.000	-0.571	-0.431

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
Inactive – not seeking not w~	-0.199***	0.027	-7.280	0.000	-0.253	-0.146
Inactive – retired	0.170***	0.026	6.550	0.000	0.119	0.222
Unemployed	-0.546***	0.033	-16.610	0.000	-0.610	-0.481
Student	0.164***	0.042	3.900	0.000	0.082	0.246
Unpaid Family Worker	0.166*	0.079	2.120	0.034	0.013	0.320
Underemployed	-0.200***	0.036	-5.590	0.000	-0.271	-0.130
Part-Time	0.132***	0.023	5.820	0.000	0.087	0.176
Full Time Self-Employed	0.242***	0.027	9.070	0.000	0.189	0.294
Full Time lowest pay quintile	0.043	0.026	1.660	0.097	-0.008	0.094
Full Time 2nd pay quintile	0.161***	0.025	6.360	0.000	0.112	0.211
Full Time 4th pay quintile	0.231***	0.024	9.500	0.000	0.184	0.279
Full Time highest pay quintile	0.222***	0.025	8.900	0.000	0.173	0.271
May-11	0.035	0.045	0.770	0.440	-0.054	0.123
Jun-11	0.065	0.044	1.480	0.138	-0.021	0.151
Jul-11	0.045	0.044	1.030	0.305	-0.041	0.131
Aug-11	0.076	0.043	1.760	0.078	-0.009	0.160
Sep-11	0.076	0.043	1.770	0.076	-0.008	0.161
Oct-11	0.084*	0.043	1.960	0.050	0.000	0.169
Nov-11	0.094*	0.043	2.200	0.028	0.010	0.178
Dec-11	0.111*	0.043	2.570	0.010	0.026	0.196
Jan-12	0.073	0.042	1.740	0.082	-0.009	0.155
Feb-12	0.047	0.044	1.080	0.282	-0.039	0.133
Mar-12	0.110**	0.042	2.620	0.009	0.028	0.193
Apr-12	0.167**	0.054	3.090	0.002	0.061	0.272
May-12	0.090	0.066	1.370	0.169	-0.038	0.219
Jun-12	0.157*	0.067	2.360	0.018	0.026	0.288
Jul-12	0.150*	0.066	2.290	0.022	0.021	0.278
Aug-12	0.179**	0.066	2.710	0.007	0.049	0.308
Sep-12	0.161*	0.066	2.440	0.015	0.032	0.291
Oct-12	0.134*	0.066	2.040	0.041	0.005	0.263
Nov-12	0.174**	0.066	2.630	0.009	0.044	0.303
Dec-12	0.154*	0.067	2.310	0.021	0.023	0.284
Jan-13	0.102	0.066	1.540	0.124	-0.028	0.232
Feb-13	0.156*	0.066	2.370	0.018	0.027	0.285
Mar-13	0.141*	0.066	2.140	0.032	0.012	0.270

Sense of worthwhile	Coefficient	SE	t	P>t	95% Conf.	Interval
Apr-13	0.112	0.075	1.490	0.136	-0.035	0.258
Sunday	-0.033	0.022	-1.460	0.145	-0.076	0.011
Monday	-0.012	0.016	-0.740	0.460	-0.044	0.020
Tuesday	-0.004	0.016	-0.240	0.813	-0.035	0.027
Thursday	0.017	0.017	1.050	0.294	-0.015	0.050
Friday	0.005	0.018	0.280	0.777	-0.031	0.041
Saturday	-0.062**	0.022	-2.850	0.004	-0.104	-0.019
Face-to-Face Survey	-0.113***	0.011	-10.680	0.000	-0.134	-0.093
Data set 1= APS 2012-13	-0.051	0.050	-1.030	0.305	-0.149	0.047
Airport proximity <5km	0.004	0.014	0.250	0.802	-0.024	0.031
Living in social housing	-0.114***	0.018	-6.290	0.000	-0.150	-0.079
Presence of daytime noise	-0.092*	0.040	-2.280	0.022	-0.172	-0.013
Presence of daytime noise and social housing interaction	-0.179	0.114	-1.580	0.115	-0.402	0.044
_cons	8.911***	0.076	117.540	0.000	8.762	9.059

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=188,613; r^2=0.098. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 26: Happiness interaction – social housing and the presence of daytime aircraft noise, including full controls

Happiness	Coefficient	SE	t	P>t	95% Conf.	Interval
Female	0.087***	0.014	6.210	0.000	0.060	0.115
Age	-0.079***	0.004	-22.450	0.000	-0.086	-0.072
Age Squared	0.001***	0.000	22.790	0.000	0.001	0.001
BME	-0.110***	0.022	-4.970	0.000	-0.153	-0.066
Religion – Yes	0.125***	0.015	8.570	0.000	0.096	0.153
Single	-0.389***	0.018	-22.110	0.000	-0.423	-0.354
Separated	-0.519***	0.036	-14.330	0.000	-0.590	-0.448
Divorced	-0.409***	0.021	-19.540	0.000	-0.450	-0.368
Widowed	-0.615***	0.038	-16.180	0.000	-0.689	-0.540
Civil partner	0.208*	0.089	2.340	0.019	0.034	0.382
One child	0.038	0.020	1.940	0.052	0.000	0.076
Two children	0.110***	0.020	5.490	0.000	0.071	0.150
Three children	0.177***	0.033	5.450	0.000	0.114	0.241
Four children	0.261***	0.054	4.830	0.000	0.155	0.367
Limiting health	-0.702***	0.018	-38.930	0.000	-0.737	-0.666

Happiness	Coefficient	SE	t	P>t	95% Conf. Interval	
Smoker – Yes	-0.343***	0.019	-18.440	0.000	-0.380	-0.307
Smoker – Ex	-0.079***	0.014	-5.720	0.000	-0.106	-0.052
Higher_Ed	0.008	0.022	0.380	0.702	-0.034	0.051
Alevel	-0.002	0.018	-0.130	0.896	-0.037	0.033
GCSE	-0.001	0.019	-0.050	0.963	-0.038	0.036
Ed_Other	0.021	0.025	0.830	0.409	-0.029	0.071
Ed_None	-0.086**	0.027	-3.180	0.001	-0.139	-0.033
Inactive – seeking	-0.321***	0.095	-3.380	0.001	-0.506	-0.135
Inactive – not seeking but w~s	-0.486***	0.043	-11.390	0.000	-0.570	-0.403
Inactive – not seeking not w~	-0.196***	0.034	-5.760	0.000	-0.262	-0.129
Inactive – retired	0.374***	0.033	11.380	0.000	0.310	0.438
Unemployed	-0.356***	0.040	-8.960	0.000	-0.434	-0.278
Student	0.000	0.052	0.000	0.999	-0.102	0.102
Unpaid Family Worker	0.228*	0.103	2.210	0.027	0.025	0.430
Underemployed	-0.198***	0.045	-4.360	0.000	-0.287	-0.109
Part-Time	0.074*	0.029	2.530	0.012	0.017	0.131
Full Time Self-Employed	0.097**	0.034	2.830	0.005	0.030	0.164
Full Time lowest pay quintile	0.007	0.034	0.220	0.824	-0.058	0.073
Full Time 2nd pay quintile	0.037	0.033	1.140	0.256	-0.027	0.102
Full Time 4th pay quintile	0.049	0.032	1.520	0.129	-0.014	0.113
Full Time highest pay quintile	0.103**	0.032	3.190	0.001	0.040	0.166
May-11	-0.158**	0.056	-2.800	0.005	-0.268	-0.047
Jun-11	-0.161**	0.056	-2.880	0.004	-0.270	-0.051
Jul-11	-0.158**	0.056	-2.830	0.005	-0.267	-0.049
Aug-11	-0.112*	0.055	-2.050	0.041	-0.219	-0.005
Sep-11	-0.188***	0.055	-3.410	0.001	-0.296	-0.080
Oct-11	-0.190***	0.055	-3.460	0.001	-0.298	-0.083
Nov-11	-0.215***	0.055	-3.940	0.000	-0.322	-0.108
Dec-11	-0.114*	0.056	-2.050	0.040	-0.223	-0.005
Jan-12	-0.228***	0.054	-4.200	0.000	-0.335	-0.122
Feb-12	-0.237***	0.057	-4.180	0.000	-0.348	-0.126
Mar-12	-0.094	0.054	-1.740	0.081	-0.199	0.012
Apr-12	0.033	0.068	0.490	0.622	-0.100	0.166
May-12	0.065	0.082	0.780	0.433	-0.097	0.226
Jun-12	0.094	0.083	1.130	0.258	-0.069	0.257

Happiness	Coefficient	SE	t	P>t	95% Conf.	Interval
Jul-12	0.141	0.082	1.720	0.086	-0.020	0.302
Aug-12	0.160	0.083	1.930	0.054	-0.002	0.323
Sep-12	0.125	0.083	1.510	0.132	-0.038	0.287
Oct-12	-0.016	0.083	-0.190	0.847	-0.178	0.146
Nov-12	0.055	0.082	0.670	0.503	-0.106	0.217
Dec-12	0.111	0.083	1.350	0.178	-0.051	0.274
Jan-13	-0.019	0.083	-0.230	0.816	-0.181	0.143
Feb-13	0.073	0.082	0.890	0.373	-0.088	0.235
Mar-13	0.028	0.083	0.330	0.739	-0.135	0.190
Apr-13	0.096	0.094	1.030	0.304	-0.087	0.280
Sunday	0.027	0.027	0.990	0.324	-0.027	0.080
Monday	0.215***	0.021	10.360	0.000	0.174	0.256
Tuesday	0.036	0.020	1.780	0.075	-0.004	0.076
Thursday	0.000	0.021	0.010	0.994	-0.041	0.041
Friday	-0.001	0.023	-0.060	0.954	-0.047	0.044
Saturday	0.036	0.027	1.350	0.179	-0.016	0.088
Face-to-Face Survey	-0.091***	0.014	-6.710	0.000	-0.118	-0.065
Data set 1= APS 2012-13	-0.218***	0.061	-3.550	0.000	-0.338	-0.098
Airport proximity <5km	-0.003	0.018	-0.160	0.874	-0.039	0.033
Living in social housing	-0.222***	0.022	-10.050	0.000	-0.266	-0.179
Presence of daytime noise	-0.089	0.054	-1.650	0.098	-0.194	0.016
Presence of daytime noise and social housing interaction	-0.175	0.163	-1.080	0.282	-0.494	0.144
_cons	9.304***	0.095	97.690	0.000	9.117	9.491

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=189,166; r^2=0.068. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 27: Anxiety interaction – social housing and the presence of daytime aircraft noise, including full controls

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Female	0.207***	0.018	11.320	0.000	0.171	0.243
Age	0.080***	0.005	17.300	0.000	0.071	0.089
Age Squared	-0.001***	0.000	-17.160	0.000	-0.001	-0.001
BME	0.201***	0.029	6.970	0.000	0.144	0.257
Religion – Yes	0.076***	0.019	4.020	0.000	0.039	0.114
Single	0.147***	0.023	6.360	0.000	0.102	0.193

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Separated	0.320***	0.045	7.150	0.000	0.232	0.407
Divorced	0.223***	0.027	8.360	0.000	0.171	0.276
Widowed	0.261***	0.047	5.530	0.000	0.168	0.353
Civil partner	0.004	0.149	0.030	0.979	-0.288	0.296
One child	-0.079**	0.025	-3.140	0.002	-0.129	-0.030
Two children	-0.106***	0.027	-3.970	0.000	-0.159	-0.054
Three children	-0.249***	0.043	-5.810	0.000	-0.333	-0.165
Four children	-0.274***	0.070	-3.910	0.000	-0.412	-0.137
Limiting health	0.889***	0.023	38.700	0.000	0.844	0.934
Smoker – Yes	0.236***	0.024	10.020	0.000	0.190	0.282
Smoker – Ex	0.086***	0.019	4.630	0.000	0.050	0.122
Higher_Ed	-0.164***	0.030	-5.530	0.000	-0.222	-0.106
Alevel	-0.178***	0.024	-7.360	0.000	-0.225	-0.130
GCSE	-0.251***	0.025	-10.060	0.000	-0.299	-0.202
Ed_Other	-0.189***	0.033	-5.730	0.000	-0.254	-0.124
Ed_None	-0.073*	0.034	-2.140	0.033	-0.140	-0.006
Inactive – seeking	0.624***	0.112	5.550	0.000	0.404	0.844
Inactive – not seeking but w~s	0.580***	0.053	10.980	0.000	0.477	0.684
Inactive – not seeking not w~	0.298***	0.043	6.960	0.000	0.214	0.382
Inactive – retired	-0.352***	0.043	-8.160	0.000	-0.437	-0.268
Unemployed	0.431***	0.049	8.750	0.000	0.334	0.527
Student	0.399***	0.068	5.860	0.000	0.266	0.532
Unpaid Family Worker	0.150	0.147	1.020	0.307	-0.138	0.438
Underemployed	0.200***	0.057	3.530	0.000	0.089	0.312
Part-Time	0.030	0.038	0.770	0.439	-0.045	0.104
Full Time Self-Employed	0.087*	0.045	1.960	0.050	0.000	0.175
Full Time lowest pay quintile	0.008	0.043	0.190	0.847	-0.076	0.092
Full Time 2nd pay quintile	0.057	0.043	1.350	0.178	-0.026	0.141
Full Time 4th pay quintile	0.049	0.043	1.140	0.256	-0.035	0.132
Full Time highest pay quintile	0.072	0.043	1.690	0.090	-0.011	0.155
May-11	0.117	0.074	1.590	0.112	-0.027	0.262
Jun-11	0.063	0.072	0.880	0.378	-0.077	0.204
Jul-11	0.038	0.072	0.520	0.600	-0.103	0.179
Aug-11	-0.097	0.072	-1.350	0.177	-0.237	0.044
Sep-11	0.085	0.072	1.180	0.237	-0.056	0.225

Anxiety	Coefficient	SE	t	P>t	95% Conf.	Interval
Oct-11	-0.074	0.071	-1.040	0.299	-0.214	0.066
Nov-11	-0.043	0.071	-0.610	0.539	-0.182	0.095
Dec-11	-0.105	0.072	-1.460	0.145	-0.247	0.036
Jan-12	-0.054	0.070	-0.770	0.444	-0.191	0.084
Feb-12	-0.100	0.072	-1.380	0.167	-0.241	0.042
Mar-12	-0.174*	0.071	-2.450	0.014	-0.312	-0.035
Apr-12	-0.190*	0.090	-2.110	0.034	-0.366	-0.014
May-12	-0.172	0.110	-1.570	0.116	-0.387	0.043
Jun-12	-0.243*	0.111	-2.190	0.028	-0.460	-0.026
Jul-12	-0.278*	0.110	-2.540	0.011	-0.493	-0.063
Aug-12	-0.291**	0.111	-2.630	0.009	-0.508	-0.074
Sep-12	-0.183	0.111	-1.650	0.099	-0.400	0.035
Oct-12	-0.140	0.110	-1.280	0.201	-0.355	0.075
Nov-12	-0.200	0.110	-1.810	0.070	-0.416	0.016
Dec-12	-0.218*	0.111	-1.960	0.050	-0.437	0.000
Jan-13	-0.233*	0.110	-2.110	0.034	-0.448	-0.017
Feb-13	-0.227*	0.110	-2.060	0.040	-0.443	-0.011
Mar-13	-0.169	0.110	-1.530	0.127	-0.385	0.048
Apr-13	-0.444***	0.120	-3.690	0.000	-0.680	-0.208
Sunday	-0.056	0.036	-1.530	0.126	-0.127	0.016
Monday	-0.248***	0.027	-9.030	0.000	-0.302	-0.194
Tuesday	-0.065*	0.026	-2.460	0.014	-0.116	-0.013
Thursday	0.032	0.027	1.180	0.240	-0.022	0.086
Friday	0.042	0.030	1.410	0.160	-0.017	0.101
Saturday	0.006	0.036	0.170	0.865	-0.065	0.077
Face-to-Face Survey	0.006	0.018	0.340	0.737	-0.029	0.041
Data set 1= APS 2012-13	0.091	0.084	1.090	0.278	-0.073	0.255
Airport proximity <5km	0.026	0.024	1.080	0.281	-0.022	0.074
Living in social housing	0.130***	0.027	4.780	0.000	0.077	0.183
Presence of daytime noise	0.231**	0.075	3.100	0.002	0.085	0.377
Presence of daytime noise and social housing interaction	-0.106	0.214	-0.490	0.622	-0.525	0.314
_cons	1.198***	0.123	9.710	0.000	0.957	1.440

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=188,914; r^2=0.039. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 28: PAB interaction – social housing and the presence of daytime aircraft noise, including full controls

PAB	Coefficient	SE	t	P>t	95% Conf. Interval	
Female	-0.060***	0.014	-4.410	0.000	-0.087	-0.034
Age	-0.080***	0.003	-23.220	0.000	-0.086	-0.073
Age Squared	0.001***	0.000	23.280	0.000	0.001	0.001
BME	-0.156***	0.021	-7.340	0.000	-0.197	-0.114
Religion – Yes	0.024	0.014	1.710	0.087	-0.004	0.052
Single	-0.267***	0.017	-15.510	0.000	-0.301	-0.234
Separated	-0.421***	0.035	-12.100	0.000	-0.489	-0.352
Divorced	-0.317***	0.020	-15.500	0.000	-0.357	-0.277
Widowed	-0.436***	0.037	-11.920	0.000	-0.508	-0.365
Civil partner	0.105	0.104	1.010	0.313	-0.099	0.309
One child	0.059**	0.019	3.110	0.002	0.022	0.096
Two children	0.108***	0.020	5.490	0.000	0.069	0.146
Three children	0.213***	0.032	6.690	0.000	0.151	0.276
Four children	0.267***	0.053	5.030	0.000	0.163	0.371
Limiting health	-0.795***	0.018	-45.230	0.000	-0.829	-0.760
Smoker – Yes	-0.289***	0.018	-16.280	0.000	-0.324	-0.255
Smoker – Ex	-0.082***	0.014	-6.040	0.000	-0.109	-0.056
Higher_Ed	0.086***	0.022	3.950	0.000	0.043	0.128
Alevel	0.088***	0.018	4.960	0.000	0.053	0.122
GCSE	0.125***	0.018	6.750	0.000	0.089	0.161
Ed_Other	0.106***	0.025	4.280	0.000	0.057	0.154
Ed_None	-0.006	0.026	-0.240	0.812	-0.057	0.045
Inactive – seeking	-0.478***	0.085	-5.600	0.000	-0.645	-0.310
Inactive – not seeking but w~s	-0.532***	0.041	-13.000	0.000	-0.612	-0.452
Inactive – not seeking not w~	-0.245***	0.033	-7.470	0.000	-0.309	-0.181
Inactive – retired	0.362***	0.032	11.210	0.000	0.299	0.426
Unemployed	-0.393***	0.037	-10.610	0.000	-0.466	-0.321
Student	-0.199***	0.050	-3.980	0.000	-0.297	-0.101
Unpaid Family Worker	0.041	0.109	0.380	0.706	-0.173	0.255
Underemployed	-0.199***	0.042	-4.680	0.000	-0.282	-0.115
Part-Time	0.022	0.028	0.780	0.433	-0.033	0.078
Full Time Self-Employed	0.005	0.033	0.140	0.887	-0.060	0.070
Full Time lowest pay quintile	-0.001	0.032	-0.030	0.980	-0.064	0.062
Full Time 2nd pay quintile	-0.010	0.032	-0.300	0.761	-0.072	0.053

PAB	Coefficient	SE	t	P>t	95% Conf.	Interval
Full Time 4th pay quintile	0.001	0.032	0.030	0.978	-0.061	0.063
Full Time highest pay quintile	0.016	0.032	0.510	0.609	-0.046	0.078
May-11	-0.137*	0.055	-2.500	0.012	-0.245	-0.030
Jun-11	-0.114*	0.054	-2.130	0.033	-0.219	-0.009
Jul-11	-0.098	0.054	-1.820	0.069	-0.204	0.008
Aug-11	-0.010	0.053	-0.180	0.854	-0.115	0.095
Sep-11	-0.136*	0.053	-2.550	0.011	-0.240	-0.031
Oct-11	-0.057	0.053	-1.080	0.281	-0.161	0.047
Nov-11	-0.087	0.053	-1.650	0.100	-0.191	0.017
Dec-11	-0.006	0.054	-0.120	0.906	-0.112	0.099
Jan-12	-0.088	0.052	-1.690	0.092	-0.191	0.014
Feb-12	-0.070	0.054	-1.290	0.196	-0.177	0.036
Mar-12	0.038	0.053	0.730	0.467	-0.065	0.142
Apr-12	0.111	0.066	1.670	0.096	-0.020	0.241
May-12	0.118	0.081	1.450	0.147	-0.041	0.277
Jun-12	0.167*	0.082	2.050	0.040	0.007	0.327
Jul-12	0.209**	0.081	2.590	0.010	0.051	0.367
Aug-12	0.226**	0.082	2.760	0.006	0.066	0.386
Sep-12	0.152	0.082	1.860	0.063	-0.008	0.313
Oct-12	0.061	0.081	0.750	0.451	-0.098	0.220
Nov-12	0.126	0.081	1.550	0.121	-0.033	0.286
Dec-12	0.166*	0.082	2.020	0.043	0.005	0.326
Jan-13	0.104	0.081	1.280	0.199	-0.055	0.263
Feb-13	0.152	0.081	1.870	0.062	-0.008	0.311
Mar-13	0.099	0.081	1.210	0.225	-0.061	0.258
Apr-13	0.270**	0.090	2.990	0.003	0.093	0.447
Sunday	0.041	0.027	1.530	0.125	-0.011	0.093
Monday	0.231***	0.020	11.290	0.000	0.191	0.271
Tuesday	0.050*	0.020	2.510	0.012	0.011	0.088
Thursday	-0.017	0.020	-0.810	0.419	-0.057	0.024
Friday	-0.022	0.023	-0.980	0.327	-0.067	0.022
Saturday	0.015	0.027	0.550	0.586	-0.038	0.067
Face-to-Face Survey	-0.049***	0.013	-3.690	0.000	-0.075	-0.023
Data set 1= APS 2012-13	-0.155*	0.061	-2.540	0.011	-0.275	-0.035
Airport proximity <5km	-0.015	0.018	-0.850	0.395	-0.051	0.020

PAB	Coefficient	SE	t	P>t	95% Conf.	Interval
Living in social housing	-0.177***	0.021	-8.530	0.000	-0.218	-0.136
Presence of daytime noise	-0.163**	0.055	-3.000	0.003	-0.270	-0.056
Presence of daytime noise and social housing interaction	-0.022	0.164	-0.140	0.891	-0.344	0.299
_cons	4.057***	0.092	44.010	0.000	3.877	4.238

*Legend: * p<0.05; ** p<0.01; *** p<0.001; N=188,805; r^2=0.064. Reference groups: (i) for religion variables ref = no religion; (ii) for marital status ref = non-married co-habiting; (iii) for children variables ref = no children; (iv) for health variables ref = good health; (v) for smoker variables ref = non-smoker; (vi) for housing variables ref = mortgage; (vii) for education variables ref = degree; (viii) for employment variables ref = employed. Sample is restricted to England and those aged 18 and over.*

Table D. 29: Logistic regression – high levels of life satisfaction (9-10 on a ten-point scale), including full controls

variable	dy/dx	SE	z	P>z	95% C.I.		X
Some Daytime Noise – MAX	-0.037***	0.009	-4.040	0.000	-0.055	-0.019	0.014
Airport Proximity – 5km	-0.004	0.004	-1.160	0.246	-0.012	0.003	0.133
Female	0.033***	0.003	11.860	0.000	0.028	0.039	0.507
Age	-0.018***	0.001	-25.040	0.000	-0.019	-0.016	41.982
Age Squared	0.000***	0.000	23.300	0.000	0.000	0.000	1988.350
BME	-0.023***	0.004	-5.460	0.000	-0.031	-0.015	0.125
Religion – Don't Know	0.026	0.040	0.660	0.508	-0.052	0.104	0.001
Religion – Yes	0.024***	0.003	8.120	0.000	0.018	0.029	0.672
Single	-0.092***	0.004	-26.290	0.000	-0.099	-0.085	0.389
Separated	-0.089***	0.005	-17.030	0.000	-0.099	-0.079	0.035
Divorced	-0.075***	0.003	-22.380	0.000	-0.081	-0.068	0.100
Widowed	-0.107***	0.004	-23.880	0.000	-0.116	-0.098	0.025
Civil_Partner	0.032	0.023	1.380	0.168	-0.013	0.077	0.003
Civil_Partner_Dissolved	-0.059	0.060	-0.990	0.323	-0.177	0.058	0.000
1 DChild	0.012**	0.004	3.030	0.002	0.004	0.020	0.172
2 DChildren	0.008	0.004	1.920	0.055	0.000	0.016	0.146
3 DChildren	0.022**	0.007	3.300	0.001	0.009	0.036	0.042
4 or More	0.035**	0.011	3.210	0.001	0.014	0.057	0.016
LimitingHealth	-0.081***	0.003	-27.990	0.000	-0.087	-0.076	0.187
Smoker – Don't Know	0.017	0.014	1.190	0.233	-0.011	0.045	0.016
Smoker – Ex	-0.020***	0.003	-7.290	0.000	-0.026	-0.015	0.330
Smoker – Yes	-0.041***	0.003	-11.930	0.000	-0.047	-0.034	0.229
OwnHouse	0.035***	0.004	9.330	0.000	0.027	0.042	0.220
RentPrivate	-0.009*	0.004	-2.190	0.028	-0.017	-0.001	0.226
RentSocial	-0.003	0.004	-0.660	0.509	-0.012	0.006	0.164

variable	dy/dx	SE	z	P>z	95% C.I.		X
Higher_Ed	0.016**	0.005	3.400	0.001	0.007	0.026	0.091
Alevel	0.019***	0.004	4.940	0.000	0.012	0.027	0.241
GCSE	0.018***	0.004	4.590	0.000	0.010	0.026	0.216
Ed_Other	0.046***	0.005	8.510	0.000	0.035	0.056	0.097
Ed_None	0.047***	0.006	8.500	0.000	0.036	0.058	0.100
Learn – Yes	-0.004	0.004	-1.090	0.277	-0.011	0.003	0.220
Inactive – seeking	-0.023	0.017	-1.410	0.160	-0.056	0.009	0.008
Inactive – not seeking but w~s	-0.054***	0.007	-7.700	0.000	-0.067	-0.040	0.046
Inactive – not seeking not w~	0.023**	0.007	3.420	0.001	0.010	0.036	0.097
Inactive – retired	0.070***	0.008	9.310	0.000	0.056	0.085	0.086
Unemployed	-0.074***	0.006	-11.550	0.000	-0.086	-0.061	0.069
Student	-0.004	0.010	-0.450	0.655	-0.024	0.015	0.041
Unpaid Family Worker	0.039	0.022	1.780	0.075	-0.004	0.083	0.003
Underemployed	-0.059***	0.007	-7.940	0.000	-0.074	-0.045	0.033
Part-Time	0.010	0.006	1.690	0.090	-0.002	0.021	0.165
Full Time Self-Employed	0.011	0.007	1.520	0.128	-0.003	0.024	0.066
Full Time lowest pay quintile	-0.006	0.007	-0.900	0.370	-0.019	0.007	0.077
Full Time 2nd pay quintile	-0.012	0.007	-1.830	0.067	-0.025	0.001	0.075
Full Time 4th pay quintile	-0.005	0.006	-0.810	0.419	-0.018	0.007	0.075
Full Time highest pay quintile	0.015*	0.007	2.200	0.028	0.002	0.028	0.082
May-11	0.021	0.012	1.850	0.065	-0.001	0.044	0.039
Jun-11	0.021	0.011	1.800	0.071	-0.002	0.043	0.041
Jul-11	0.022	0.011	1.870	0.061	-0.001	0.044	0.040
Aug-11	0.017	0.011	1.540	0.123	-0.005	0.039	0.044
Sep-11	0.010	0.011	0.920	0.357	-0.012	0.032	0.041
Oct-11	0.018	0.011	1.640	0.101	-0.004	0.040	0.043
Nov-11	0.016	0.011	1.400	0.163	-0.006	0.037	0.045
Dec-11	0.033**	0.012	2.750	0.006	0.009	0.056	0.039
Jan-12	0.014	0.011	1.290	0.196	-0.007	0.036	0.047
Feb-12	0.025*	0.012	2.160	0.031	0.002	0.048	0.041
Mar-12	0.025*	0.011	2.230	0.026	0.003	0.047	0.044
Apr-12	0.035*	0.015	2.420	0.015	0.007	0.064	0.041
May-12	0.032	0.018	1.810	0.071	-0.003	0.067	0.048
Jun-12	0.051**	0.019	2.720	0.007	0.014	0.088	0.039
Jul-12	0.037	0.018	2.060	0.039	0.002	0.072	0.046

variable	dy/dx	SE	z	P>z	95% C.I.		X
Aug-12	0.047*	0.018	2.540	0.011	0.011	0.083	0.041
Sep-12	0.045*	0.018	2.450	0.014	0.009	0.081	0.040
Oct-12	0.031	0.018	1.720	0.085	-0.004	0.065	0.044
Nov-12	0.041*	0.018	2.260	0.024	0.005	0.077	0.042
Dec-12	0.050**	0.019	2.650	0.008	0.013	0.086	0.037
Jan-13	0.027	0.018	1.530	0.126	-0.008	0.061	0.045
Feb-13	0.048*	0.019	2.580	0.010	0.011	0.084	0.041
Mar-13	0.026	0.018	1.490	0.138	-0.008	0.061	0.041
Apr-13	0.043*	0.021	2.080	0.037	0.003	0.083	0.014
Sunday	-0.001	0.006	-0.170	0.867	-0.012	0.010	0.085
Monday	-0.005	0.004	-1.180	0.238	-0.013	0.003	0.169
Tuesday	0.002	0.004	0.500	0.618	-0.006	0.010	0.191
Thursday	0.001	0.004	0.150	0.883	-0.008	0.009	0.170
Friday	-0.007	0.005	-1.600	0.111	-0.016	0.002	0.127
Saturday	-0.013*	0.005	-2.480	0.013	-0.024	-0.003	0.078
Face-to-Face Survey	-0.011***	0.003	-3.820	0.000	-0.016	-0.005	0.581
Data set 1= APS 2012-13	-0.020	0.012	-1.620	0.106	-0.045	0.004	0.504

*Legend: * p<0.05; ** p<0.01; *** p<0.001*

Table D. 30: Logistic regression: Low levels of anxiety (0-2 on a ten-point scale), including full controls

variable	dy/dx	SE	z	P>z	95% C.I.		X
Some Daytime Noise – MAX	-0.030*	0.012	-2.590	0.010	-0.053	-0.007	0.014
Airport Proximity – 5km	-0.004	0.004	-0.960	0.340	-0.012	0.004	0.133
Female	-0.009**	0.003	-2.700	0.007	-0.015	-0.002	0.507
Age	-0.012***	0.001	-14.610	0.000	-0.013	-0.010	41.981
Age Squared	0.000***	0.000	14.170	0.000	0.000	0.000	1988.250
BME	-0.017***	0.005	-3.550	0.000	-0.027	-0.008	0.125
Religion – Don't Know	-0.095*	0.037	-2.560	0.010	-0.167	-0.022	0.001
Religion – Yes	-0.009**	0.003	-2.680	0.007	-0.016	-0.002	0.672
Single	-0.024***	0.004	-5.950	0.000	-0.032	-0.016	0.389
Separated	-0.034***	0.007	-4.720	0.000	-0.048	-0.020	0.035
Divorced	-0.025***	0.004	-5.720	0.000	-0.034	-0.017	0.100
Widowed	-0.033***	0.007	-4.530	0.000	-0.047	-0.019	0.025
Civil_Partner	0.006	0.027	0.210	0.832	-0.047	0.058	0.003
Civil_Partner_Dissolved	-0.120	0.071	-1.700	0.090	-0.258	0.019	0.000

variable	dy/dx	SE	z	P>z	95% C.I.		X
1 DChild	0.011*	0.004	2.440	0.015	0.002	0.020	0.172
2 DChildren	0.008	0.005	1.630	0.104	-0.002	0.017	0.146
3 DChildren	0.027***	0.008	3.490	0.000	0.012	0.042	0.042
4 or More	0.024*	0.012	2.000	0.046	0.000	0.047	0.016
LimitingHealth	-0.096***	0.004	-27.480	0.000	-0.103	-0.089	0.186
Smoker – Don't Know	-0.030	0.016	-1.850	0.064	-0.062	0.002	0.016
Smoker – Ex	-0.010**	0.003	-2.940	0.003	-0.016	-0.003	0.330
Smoker – Yes	-0.007	0.004	-1.620	0.106	-0.014	0.001	0.229
OwnHouse	0.021***	0.004	4.990	0.000	0.013	0.029	0.220
RentPrivate	-0.011*	0.005	-2.440	0.015	-0.020	-0.002	0.226
RentSocial	0.000	0.005	-0.080	0.939	-0.010	0.009	0.164
Higher_Ed	0.049***	0.006	8.890	0.000	0.039	0.060	0.091
Alevel	0.056***	0.005	12.290	0.000	0.047	0.064	0.242
GCSE	0.074***	0.005	15.920	0.000	0.065	0.083	0.216
Ed_Other	0.078***	0.006	12.960	0.000	0.066	0.089	0.097
Ed_None	0.058***	0.006	9.530	0.000	0.046	0.070	0.099
Learn – Yes	-0.021***	0.004	-5.110	0.000	-0.029	-0.013	0.220
Inactive – seeking	-0.056**	0.019	-2.990	0.003	-0.093	-0.019	0.008
Inactive – not seeking but w~s	-0.047***	0.008	-5.580	0.000	-0.063	-0.030	0.046
Inactive – not seeking not w~	-0.009	0.007	-1.190	0.234	-0.023	0.006	0.097
Inactive – retired	0.066***	0.008	8.390	0.000	0.051	0.082	0.086
Unemployed	-0.039***	0.008	-4.880	0.000	-0.055	-0.024	0.069
Student	-0.034**	0.012	-2.930	0.003	-0.057	-0.011	0.041
Unpaid Family Worker	0.025	0.025	1.010	0.313	-0.024	0.075	0.003
Underemployed	-0.020*	0.010	-2.100	0.036	-0.039	-0.001	0.033
Part-Time	0.009	0.007	1.310	0.189	-0.004	0.021	0.165
Full Time Self-Employed	-0.003	0.008	-0.360	0.720	-0.017	0.012	0.066
Full Time lowest pay quintile	0.016*	0.008	2.050	0.041	0.001	0.031	0.077
Full Time 2nd pay quintile	0.005	0.008	0.690	0.489	-0.010	0.020	0.075
Full Time 4th pay quintile	-0.001	0.007	-0.070	0.945	-0.015	0.014	0.075
Full Time highest pay quintile	-0.016*	0.007	-2.230	0.026	-0.030	-0.002	0.082
May-11	-0.020	0.012	-1.640	0.102	-0.044	0.004	0.039
Jun-11	-0.026*	0.012	-2.210	0.027	-0.050	-0.003	0.041
Jul-11	-0.023	0.012	-1.950	0.051	-0.047	0.000	0.040
Aug-11	0.000	0.012	0.020	0.985	-0.024	0.024	0.044

variable	dy/dx	SE	z	P>z	95% C.I.		X
Sep-11	-0.024*	0.012	-2.000	0.045	-0.047	-0.001	0.041
Oct-11	-0.001	0.012	-0.120	0.908	-0.025	0.022	0.043
Nov-11	-0.008	0.012	-0.660	0.510	-0.032	0.016	0.045
Dec-11	0.001	0.012	0.120	0.905	-0.023	0.026	0.039
Jan-12	-0.012	0.012	-0.970	0.333	-0.035	0.012	0.047
Feb-12	0.005	0.012	0.430	0.665	-0.019	0.030	0.041
Mar-12	0.017	0.012	1.400	0.161	-0.007	0.041	0.044
Apr-12	0.011	0.016	0.690	0.492	-0.020	0.041	0.041
May-12	0.012	0.019	0.610	0.540	-0.026	0.049	0.048
Jun-12	0.018	0.019	0.920	0.358	-0.020	0.056	0.039
Jul-12	0.020	0.019	1.050	0.294	-0.018	0.058	0.046
Aug-12	0.026	0.020	1.330	0.183	-0.012	0.064	0.041
Sep-12	0.014	0.019	0.710	0.477	-0.024	0.052	0.040
Oct-12	0.005	0.019	0.250	0.802	-0.033	0.042	0.044
Nov-12	0.019	0.019	1.000	0.317	-0.019	0.058	0.042
Dec-12	0.014	0.020	0.720	0.472	-0.024	0.052	0.037
Jan-13	0.022	0.019	1.150	0.250	-0.016	0.060	0.045
Feb-13	0.027	0.020	1.380	0.168	-0.011	0.065	0.040
Mar-13	0.010	0.019	0.510	0.612	-0.028	0.048	0.041
Apr-13	0.040	0.022	1.790	0.073	-0.004	0.083	0.014
Sunday	0.012	0.006	1.870	0.061	-0.001	0.025	0.085
Monday	0.043***	0.005	8.810	0.000	0.033	0.052	0.169
Tuesday	0.011*	0.005	2.340	0.019	0.002	0.020	0.191
Thursday	-0.009	0.005	-1.940	0.053	-0.019	0.000	0.170
Friday	-0.014*	0.005	-2.580	0.010	-0.024	-0.003	0.127
Saturday	-0.006	0.006	-0.900	0.367	-0.018	0.007	0.078
Face-to-Face Survey	-0.003	0.003	-1.040	0.298	-0.009	0.003	0.580
Data set 1= APS 2012-13	-0.012	0.015	-0.810	0.417	-0.040	0.017	0.504

*Legend: * p<0.05; ** p<0.01; *** p<0.001*

Table D. 31: Logistic regression – high levels of anxiety (7-10 on a ten-point scale), including full controls

variable	die/dx	SE	z	P>z		95% C.I.	X
Some Daytime Noise – MAX	0.014	0.010	1.350	0.178	-0.006	0.034	0.014
Airport Proximity – 5km	0.000	0.004	0.020	0.981	-0.007	0.007	0.133
Female	0.037***	0.003	13.650	0.000	0.031	0.042	0.507
Age	0.008***	0.001	12.320	0.000	0.007	0.010	41.981
Age Squared	0.000***	0.000	-11.520	0.000	0.000	0.000	1988.250
BME	0.021***	0.004	4.830	0.000	0.012	0.029	0.125
Religion – Don't Know	0.074	0.038	1.950	0.051	0.000	0.148	0.001
Religion – Yes	0.006*	0.003	2.190	0.029	0.001	0.012	0.672
Single	0.013***	0.003	3.920	0.000	0.007	0.020	0.389
Separated	0.025***	0.006	4.040	0.000	0.013	0.037	0.035
Divorced	0.021***	0.004	5.460	0.000	0.014	0.029	0.100
Widowed	0.029***	0.007	4.150	0.000	0.015	0.042	0.025
Civil_Partner	0.022	0.024	0.900	0.370	-0.026	0.069	0.003
Civil_Partner_Dissolved	0.106	0.078	1.360	0.174	-0.047	0.258	0.000
1 DChild	-0.010**	0.004	-2.720	0.007	-0.017	-0.003	0.172
2 DChildren	-0.014***	0.004	-3.720	0.000	-0.022	-0.007	0.146
3 DChildren	-0.025***	0.006	-4.260	0.000	-0.036	-0.013	0.042
4 or More	-0.030***	0.009	-3.490	0.000	-0.048	-0.013	0.016
LimitingHealth	0.107***	0.003	30.680	0.000	0.100	0.114	0.186
Smoker – Don't Know	0.052**	0.017	2.950	0.003	0.017	0.086	0.016
Smoker – Ex	0.011***	0.003	3.820	0.000	0.005	0.017	0.330
Smoker – Yes	0.034***	0.004	9.810	0.000	0.028	0.041	0.229
OwnHouse	-0.013***	0.003	-3.910	0.000	-0.020	-0.007	0.220
RentPrivate	0.014***	0.004	3.710	0.000	0.007	0.022	0.226
RentSocial	0.018***	0.004	4.410	0.000	0.010	0.026	0.164
Higher_Ed	-0.010*	0.004	-2.340	0.019	-0.019	-0.002	0.091
Alevel	-0.011**	0.004	-2.850	0.004	-0.018	-0.003	0.242
GCSE	-0.014***	0.004	-3.720	0.000	-0.021	-0.006	0.216
Ed_Other	-0.012*	0.005	-2.560	0.010	-0.021	-0.003	0.097
Ed_None	-0.002	0.005	-0.470	0.641	-0.011	0.007	0.099
Learn – Yes	0.012***	0.003	3.540	0.000	0.005	0.019	0.220
Inactive – seeking	0.071***	0.018	4.040	0.000	0.037	0.106	0.008
Inactive – not seeking but w~s	0.060***	0.008	7.620	0.000	0.045	0.076	0.046
Inactive – not seeking not w~	0.036***	0.006	5.650	0.000	0.024	0.049	0.097

variable	die/dx	SE	z	P>z		95% C.I.	X
Inactive – retired	-0.035***	0.006	-5.820	0.000	-0.046	-0.023	0.086
Unemployed	0.045***	0.008	5.870	0.000	0.030	0.059	0.069
Student	0.032**	0.011	2.890	0.004	0.010	0.054	0.041
Unpaid Family Worker	0.016	0.022	0.730	0.462	-0.027	0.060	0.003
Underemployed	0.018*	0.009	2.150	0.032	0.002	0.035	0.033
Part-Time	0.000	0.006	-0.080	0.938	-0.011	0.010	0.165
Full Time Self-Employed	0.008	0.007	1.250	0.213	-0.005	0.021	0.066
Full Time lowest pay quintile	0.002	0.007	0.330	0.739	-0.011	0.015	0.077
Full Time 2nd pay quintile	-0.007	0.006	-1.060	0.287	-0.019	0.006	0.075
Full Time 4th pay quintile	0.001	0.006	0.150	0.882	-0.011	0.013	0.075
Full Time highest pay quintile	0.000	0.006	0.020	0.981	-0.012	0.012	0.082
May-11	0.013	0.010	1.210	0.225	-0.008	0.033	0.039
Jun-11	-0.003	0.010	-0.310	0.757	-0.023	0.016	0.041
Jul-11	-0.010	0.010	-1.040	0.300	-0.029	0.009	0.040
Aug-11	-0.016	0.009	-1.720	0.085	-0.035	0.002	0.044
Sep-11	-0.004	0.010	-0.390	0.700	-0.023	0.016	0.041
Oct-11	-0.012	0.010	-1.220	0.222	-0.031	0.007	0.043
Nov-11	-0.010	0.010	-1.020	0.308	-0.029	0.009	0.045
Dec-11	-0.019	0.010	-2.040	0.041	-0.038	-0.001	0.039
Jan-12	-0.016	0.009	-1.680	0.093	-0.034	0.003	0.047
Feb-12	-0.016	0.010	-1.600	0.110	-0.035	0.004	0.041
Mar-12	-0.020*	0.009	-2.190	0.028	-0.039	-0.002	0.044
Apr-12	-0.025*	0.012	-2.110	0.035	-0.049	-0.002	0.041
May-12	-0.019	0.015	-1.250	0.212	-0.048	0.011	0.048
Jun-12	-0.024	0.015	-1.620	0.105	-0.054	0.005	0.039
Jul-12	-0.037**	0.014	-2.650	0.008	-0.065	-0.010	0.046
Aug-12	-0.039**	0.014	-2.760	0.006	-0.067	-0.011	0.041
Sep-12	-0.023	0.015	-1.520	0.130	-0.052	0.007	0.040
Oct-12	-0.024	0.015	-1.630	0.103	-0.053	0.005	0.044
Nov-12	-0.025	0.015	-1.690	0.091	-0.054	0.004	0.042
Dec-12	-0.030*	0.015	-2.010	0.044	-0.059	-0.001	0.037
Jan-13	-0.023	0.015	-1.530	0.126	-0.052	0.006	0.045
Feb-13	-0.029	0.015	-1.960	0.050	-0.058	0.000	0.040
Mar-13	-0.025	0.015	-1.680	0.092	-0.054	0.004	0.041
Apr-13	-0.052***	0.015	-3.490	0.000	-0.081	-0.023	0.014

variable	die/dx	SE	z	P>z		95% C.I.	X
Sunday	-0.003	0.005	-0.580	0.565	-0.013	0.007	0.085
Monday	-0.023***	0.004	-5.890	0.000	-0.030	-0.015	0.169
Tuesday	-0.007	0.004	-1.840	0.065	-0.014	0.000	0.191
Thursday	0.002	0.004	0.480	0.631	-0.006	0.010	0.170
Friday	-0.001	0.004	-0.300	0.764	-0.010	0.007	0.127
Saturday	-0.002	0.005	-0.320	0.751	-0.012	0.009	0.078
Face-to-Face Survey	-0.005	0.003	-1.890	0.059	-0.010	0.000	0.580
Data set 1= APS 2012-13	0.011	0.013	0.850	0.396	-0.014	0.036	0.504

*Legend: * p<0.05; ** p<0.01; *** p<0.001*

Appendix E – Mappiness analysis & results

Table E. 1: OLS regressions for airport distance model controlling for background variables

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Nearest of 18 runways < 3km	0.069	0.45	-1.136**	0.488
Nearest of 18 runways >= 3km, < 4km	-0.021	0.346	-0.169	0.45
Nearest of 18 runways >= 4km, < 5km	-0.504	0.384	-1.034**	0.525
Nearest of 18 runways >= 5km, < 7km	-0.164	0.274	-0.252	0.298
Nearest of 18 runways >= 7km, < 11km	0.03	0.187	-0.034	0.207
Nearest of 18 runways >= 11km, < 15km	0.131	0.185	-0.098	0.203
Inside	0	.	0	.
Outdoors	2.869***	0.111	1.991***	0.11
Vehicle	0.037	0.117	-0.12	0.133
Home	0	.	0	.
Elsewhere	1.583***	0.081	0.193**	0.09
Work	-2.418***	0.121	-4.621***	0.14
Working, studying	-1.710***	0.087	-4.294***	0.101
In a meeting, seminar, class	0.398***	0.136	-1.213***	0.162
Travelling, commuting	-2.192***	0.101	-4.432***	0.117
Cooking, preparing food	2.172***	0.084	0.719***	0.094
Housework, chores, DIY	-0.687***	0.088	-3.325***	0.103
Waiting, queueing	-3.943***	0.127	-5.479***	0.154
Shopping, errands	0.649***	0.095	-1.294***	0.11
Admin, finances, organising	-1.385***	0.142	-2.822***	0.159
Childcare, playing with children	2.880***	0.155	0.856***	0.167
Pet care, playing with pets	3.322***	0.174	2.601***	0.196
Care or help for adults	-3.925***	0.518	-4.795***	0.491
Sleeping, resting, relaxing	0.804***	0.077	5.705***	0.108
Sick in bed	-19.032***	0.273	-13.711***	0.282
Meditating, religious activities	4.143***	0.419	5.577***	0.435
Washing, dressing, grooming	1.891***	0.086	0.05	0.099

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Talking, chatting, socialising	4.235***	0.074	3.450***	0.07
Intimacy, making love	12.706***	0.277	10.289***	0.274
Eating, snacking	2.011***	0.058	1.752***	0.058
Drinking tea/coffee	1.396***	0.073	1.331***	0.082
Drinking alcohol	3.642***	0.1	4.229***	0.109
Smoking	0.463**	0.185	0.019	0.201
Texting, email, social media	0.947***	0.086	0.767***	0.086
Browsing the Internet	0.720***	0.082	1.599***	0.094
Watching TV, film	2.202***	0.061	3.969***	0.071
Listening to music	3.379***	0.103	3.238***	0.104
Listening to speech/podcast	1.886***	0.134	2.410***	0.141
Reading	1.802***	0.091	3.753***	0.105
Theatre, dance, concert	6.278***	0.254	3.281***	0.288
Exhibition, museum, library	5.278***	0.271	4.324***	0.333
Match, sporting event	2.312***	0.292	-0.619**	0.31
Walking, hiking	2.524***	0.149	2.223***	0.17
Sports, running, exercise	6.645***	0.164	0.819***	0.242
Gardening, allotment	5.087***	0.296	3.486***	0.337
Birdwatching, nature watching	4.243***	0.425	5.244***	0.478
Computer games, iPhone games	2.612***	0.11	3.679***	0.119
Hunting, fishing	2.790**	1.145	2.555**	1.3
Other games, puzzles	2.292***	0.228	2.309***	0.258
Gambling, betting	1.368**	0.663	-0.874	0.752
Hobbies, arts, crafts	5.177***	0.241	4.410***	0.247
Singing, performing	6.050***	0.284	2.425***	0.425
Something else (version < 1.0.2)	-1.334***	0.169	-2.341***	0.175
Something else (version >= 1.0.2)	-3.037***	0.156	-4.168***	0.145
Spouse, partner, girl/boyfriend	3.999***	0.107	2.588***	0.104
Children	0.382***	0.138	-0.810***	0.147
Other family members	0.770***	0.091	0.263***	0.095
Colleagues, classmates	-0.354***	0.12	-0.971***	0.137
Clients, customers	1.018***	0.307	-0.19	0.331
Friends	4.197***	0.082	3.221***	0.088
Other people participant knows	-0.781***	0.168	-1.587***	0.175

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Between sunrise and sunset, based on time, date and GPS coordinates (0/1)	0.450***	0.072	0.294***	0.075
Proportion domestic gardens	-0.906***	0.336	-0.034	0.398
Proportion of green space	0.532**	0.234	1.123***	0.26
Proportion of water	1.321	0.815	1.36	0.961
East Midlands	0.043	0.288	0.429	0.328
East of England	0.447*	0.242	0.484	0.305
London	0	.	0	.
North East	0.542	0.477	0.321	0.491
North West	0.072	0.257	0.375	0.281
South East	0.248	0.175	0.645***	0.211
South West	0.690***	0.249	1.542***	0.333
West Midlands	0.366	0.306	0.529	0.336
Yorkshire and The Humber	0.147	0.285	0.557	0.34
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	1.491***	0.552	1.525**	0.641
RECODE of response_seq=50	4.165***	0.552	4.719***	0.641
RECODE of response_seq=100	5.047***	0.555	6.041***	0.644
RECODE of response_seq=500	5.417***	0.562	6.901***	0.65
RECODE of response_seq=5000	4.992***	0.672	7.468***	0.742
Mon	0	.	0	.
Tue	0.090*	0.049	0.003	0.052
Wed	0.285***	0.052	0.177***	0.056
Thu	0.461***	0.054	0.247***	0.056
Fri	1.465***	0.06	1.265***	0.062
Sat	2.372***	0.524	2.650***	0.596
Sun	1.722***	0.523	2.451***	0.595
Bank holiday	2.108***	0.531	2.879***	0.6
Working weekday # RECODE of hour=0	0.016	0.38	1.308***	0.474
Working weekday # RECODE of hour=3	-4.486***	1.136	-3.288**	1.307
Working weekday # RECODE of hour=6	-2.900***	0.098	-2.764***	0.115
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.365***	0.05	-0.023	0.056
Working weekday # RECODE of hour=15	0.296***	0.054	-0.175***	0.061
Working weekday # RECODE of hour=18	-0.099	0.081	-0.123	0.091

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Working weekday # RECODE of hour=21	0.240**	0.107	0.930***	0.118
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-2.204	1.718	-0.526	1.541
Weekend or bank holiday # RECODE of hour=6	-1.813***	0.533	-0.586	0.613
Weekend or bank holiday # RECODE of hour=9	-0.574	0.522	-0.034	0.594
Weekend or bank holiday # RECODE of hour=12	-0.557	0.52	-0.441	0.592
Weekend or bank holiday # RECODE of hour=15	-0.619	0.519	-0.484	0.591
Weekend or bank holiday # RECODE of hour=18	-0.445	0.515	-0.409	0.587
Weekend or bank holiday # RECODE of hour=21	-0.391	0.514	-0.156	0.58
Constant	57.455***	0.608	55.843***	0.701
Observations	1842854		1842854	
r^2	0.129		0.152	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 2: OLS regressions for airport distance from airport grouped above and below 5km, controlling for background variables.

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Nearest of 18 runways < 5km	-0.222	0.246	-0.743**	0.32
Nearest of 18 runways 5-10km	-0.077	0.158	-0.079	0.175
Inside	0	.	0	.
Outdoors	2.868***	0.111	1.991***	0.11
Vehicle	0.034	0.117	-0.119	0.133
Home	0	.	0	.
Elsewhere	1.583***	0.081	0.194**	0.09
Work	-2.417***	0.121	-4.621***	0.14
Working, studying	-1.710***	0.087	-4.295***	0.101
In a meeting, seminar, class	0.400***	0.136	-1.218***	0.162
Travelling, commuting	-2.192***	0.101	-4.433***	0.117
Cooking, preparing food	2.171***	0.084	0.720***	0.094
Housework, chores, DIY	-0.687***	0.088	-3.324***	0.103
Waiting, queueing	-3.944***	0.127	-5.480***	0.154
Shopping, errands	0.646***	0.095	-1.293***	0.109
Admin, finances, organising	-1.387***	0.141	-2.824***	0.158

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Childcare, playing with children	2.880***	0.155	0.856***	0.167
Pet care, playing with pets	3.323***	0.174	2.599***	0.196
Care or help for adults	-3.926***	0.519	-4.798***	0.491
Sleeping, resting, relaxing	0.803***	0.077	5.706***	0.108
Sick in bed	-19.032***	0.273	-13.712***	0.282
Meditating, religious activities	4.139***	0.419	5.573***	0.436
Washing, dressing, grooming	1.891***	0.086	0.05	0.099
Talking, chatting, socialising	4.234***	0.074	3.450***	0.07
Intimacy, making love	12.705***	0.277	10.288***	0.274
Eating, snacking	2.011***	0.058	1.752***	0.058
Drinking tea/coffee	1.396***	0.073	1.331***	0.082
Drinking alcohol	3.643***	0.1	4.229***	0.109
Smoking	0.463**	0.185	0.018	0.201
Texting, email, social media	0.946***	0.086	0.765***	0.086
Browsing the Internet	0.720***	0.082	1.599***	0.094
Watching TV, film	2.201***	0.061	3.969***	0.071
Listening to music	3.380***	0.103	3.239***	0.104
Listening to speech/podcast	1.886***	0.134	2.411***	0.141
Reading	1.800***	0.091	3.753***	0.105
Theatre, dance, concert	6.286***	0.254	3.288***	0.288
Exhibition, museum, library	5.279***	0.271	4.325***	0.333
Match, sporting event	2.310***	0.292	-0.616**	0.31
Walking, hiking	2.523***	0.149	2.223***	0.17
Sports, running, exercise	6.644***	0.164	0.819***	0.242
Gardening, allotment	5.086***	0.296	3.483***	0.337
Birdwatching, nature watching	4.245***	0.425	5.241***	0.478
Computer games, iPhone games	2.611***	0.11	3.678***	0.119
Hunting, fishing	2.795**	1.145	2.550**	1.299
Other games, puzzles	2.290***	0.228	2.306***	0.259
Gambling, betting	1.367**	0.663	-0.871	0.752
Hobbies, arts, crafts	5.176***	0.241	4.409***	0.246
Singing, performing	6.049***	0.284	2.423***	0.425
Something else (version < 1.0.2)	-1.334***	0.169	-2.342***	0.175
Something else (version >= 1.0.2)	-3.038***	0.156	-4.167***	0.145

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Spouse, partner, girl/boyfriend	3.998***	0.107	2.586***	0.104
Children	0.382***	0.138	-0.810***	0.147
Other family members	0.769***	0.091	0.263***	0.095
Colleagues, classmates	-0.353***	0.12	-0.970***	0.137
Clients, customers	1.017***	0.307	-0.187	0.331
Friends	4.197***	0.082	3.221***	0.088
Other people participant knows	-0.781***	0.168	-1.588***	0.175
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.450***	0.072	0.294***	0.075
Proportion domestic gardens	-1.096***	0.318	0.009	0.385
Proportion of green space	0.382*	0.215	1.149***	0.239
Proportion of water	0.792	0.803	1.356	0.984
East Midlands	0.006	0.287	0.457	0.324
East of England	0.414*	0.243	0.511*	0.309
London	0	.	0	.
North East	0.514	0.476	0.355	0.489
North West	0.061	0.257	0.384	0.281
South East	0.218	0.175	0.664***	0.21
South West	0.650***	0.249	1.556***	0.333
West Midlands	0.334	0.307	0.549	0.335
Yorkshire and The Humber	0.109	0.283	0.589*	0.332
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	1.489***	0.551	1.523**	0.64
RECODE of response_seq=50	4.163***	0.552	4.716***	0.641
RECODE of response_seq=100	5.044***	0.555	6.039***	0.644
RECODE of response_seq=500	5.415***	0.562	6.899***	0.649
RECODE of response_seq=5000	4.988***	0.672	7.467***	0.742
Mon	0	.	0	.
Tue	0.090*	0.049	0.003	0.052
Wed	0.285***	0.052	0.177***	0.056
Thu	0.461***	0.054	0.248***	0.056
Fri	1.465***	0.06	1.265***	0.062
Sat	2.374***	0.524	2.654***	0.596
Sun	1.724***	0.523	2.454***	0.595
Bank holiday	2.110***	0.532	2.884***	0.6

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Working weekday # RECODE of hour=0	0.015	0.379	1.311***	0.474
Working weekday # RECODE of hour=3	-4.487***	1.136	-3.286**	1.307
Working weekday # RECODE of hour=6	-2.899***	0.098	-2.765***	0.115
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.365***	0.05	-0.023	0.056
Working weekday # RECODE of hour=15	0.297***	0.054	-0.175***	0.061
Working weekday # RECODE of hour=18	-0.098	0.081	-0.123	0.091
Working weekday # RECODE of hour=21	0.241**	0.107	0.931***	0.118
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-2.208	1.718	-0.533	1.541
Weekend or bank holiday # RECODE of hour=6	-1.815***	0.533	-0.589	0.613
Weekend or bank holiday # RECODE of hour=9	-0.576	0.522	-0.037	0.594
Weekend or bank holiday # RECODE of hour=12	-0.559	0.52	-0.444	0.592
Weekend or bank holiday # RECODE of hour=15	-0.62	0.519	-0.487	0.59
Weekend or bank holiday # RECODE of hour=18	-0.447	0.515	-0.411	0.587
Weekend or bank holiday # RECODE of hour=21	-0.392	0.514	-0.158	0.58
Constant	57.546***	0.587	55.787***	0.682
Observations	1842854		1842854	
r^2	0.129		0.152	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 3: Mappiness responses at each dB level for London airports

Airport noise	N responses
0	2,063,666
57	7,937
60	1,733
63	342
66	182
69	75
72	12
Total	**2,073,947**

Table E. 4: OLS regressions for Mappiness responses within noise contours for three London airports controlling for background variables

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
LHR/LGW/STN standard contours average mode 2012 (dB bands)=0	0	.	0	.
LHR/LGW/STN standard contours average mode 2012 (dB bands)=57	1.342	1.206	0.176	1.292
LHR/LGW/STN standard contours average mode 2012 (dB bands)=60	0.358	0.844	-1.285	1.182
LHR/LGW/STN standard contours average mode 2012 (dB bands)=63	0.415	1.115	-0.389	1.241
LHR/LGW/STN standard contours average mode 2012 (dB bands)=66	-6.344**	3.039	-5.614*	3.225
LHR/LGW/STN standard contours average mode 2012 (dB bands)=69	0.899	2.22	-3.892	2.848
LHR/LGW/STN standard contours average mode 2012 (dB bands)=72	-10.419*	5.356	-3.015	5.848
in	0	.	0	.
Outdoors	3.060***	0.163	2.193***	0.154
Vehicle	-0.007	0.153	-0.261	0.173
Home	0	.	0	.
Elsewhere	1.573***	0.104	0.308***	0.115
work	-2.720***	0.167	-4.933***	0.192
Working, studying	-1.656***	0.112	-4.229***	0.128
In a meeting, seminar, class	0.204	0.202	-1.307***	0.226
Travelling, commuting	-1.909***	0.13	-4.087***	0.147
Cooking, preparing food	2.187***	0.099	0.666***	0.112
Housework, chores, DIY	-0.770***	0.103	-3.457***	0.124
Waiting, queueing	-3.802***	0.159	-5.394***	0.191
Shopping, errands	0.581***	0.121	-1.407***	0.137
Admin, finances, organising	-1.214***	0.159	-2.710***	0.167
Childcare, playing with children	2.771***	0.179	0.746***	0.193
Pet care, playing with pets	3.282***	0.203	2.391***	0.229
Care or help for adults	-4.527***	0.658	-5.225***	0.584
Sleeping, resting, relaxing	0.846***	0.09	5.764***	0.122
Sick in bed	-19.571***	0.348	-14.363***	0.336
Meditating, religious activities	4.000***	0.544	5.274***	0.598
Washing, dressing, grooming	1.962***	0.105	0.09	0.124
Talking, chatting, socialising	4.176***	0.087	3.322***	0.084
Intimacy, making love	12.877***	0.359	10.220***	0.354
Eating, snacking	1.984***	0.068	1.677***	0.071
Drinking tea/coffee	1.233***	0.087	1.226***	0.099

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Drinking alcohol	3.565***	0.127	4.031***	0.138
Smoking	0.531**	0.235	0.06	0.267
Texting, email, social media	0.941***	0.112	0.785***	0.111
Browsing the Internet	0.718***	0.108	1.496***	0.127
Watching TV, film	2.211***	0.074	3.915***	0.084
Listening to music	3.387***	0.107	3.215***	0.116
Listening to speech/podcast	2.098***	0.162	2.559***	0.168
Reading	1.883***	0.115	3.859***	0.134
Theatre, dance, concert	5.684***	0.344	2.391***	0.429
Exhibition, museum, library	5.705***	0.377	4.262***	0.504
Match, sporting event	2.421***	0.323	-0.382	0.351
Walking, hiking	2.687***	0.19	2.283***	0.224
Sports, running, exercise	6.709***	0.212	0.495*	0.3
Gardening, allotment	4.804***	0.364	2.828***	0.409
Birdwatching, nature watching	4.408***	0.472	5.347***	0.531
Computer games, iPhone games	2.763***	0.134	3.674***	0.141
Hunting, fishing	3.066**	1.359	2.105	1.537
Other games, puzzles	2.416***	0.296	2.440***	0.301
Gambling, betting	0.784	0.88	-1.215	0.946
Hobbies, arts, crafts	5.196***	0.288	4.433***	0.302
Singing, performing	5.861***	0.355	2.293***	0.583
Something else (version < 1.0.2)	-1.477***	0.211	-2.646***	0.215
Something else (version >= 1.0.2)	-3.409***	0.188	-4.410***	0.186
Spouse, partner, girl/boyfriend	3.726***	0.122	2.408***	0.116
Children	0.460***	0.156	-0.768***	0.164
Other family members	0.618***	0.107	0.175	0.109
Colleagues, classmates	-0.463***	0.173	-1.160***	0.199
Clients, customers	0.755	0.459	-0.391	0.457
Friends	4.212***	0.099	3.223***	0.111
Other people participant knows	-0.926***	0.229	-1.734***	0.227
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.464***	0.09	0.354***	0.093
glud_domgdn_pc	-0.226	0.51	0.781	0.568
glud_green_pc	0.760**	0.337	1.532***	0.352
glud_water_pc	2.836*	1.483	4.242**	1.714

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
East Midlands	0.529	0.328	0.997**	0.388
East of England	0.955***	0.297	1.256***	0.37
London	0	.	0	.
North East	0.418	0.64	0.28	0.682
North West	0.652*	0.371	1.359***	0.385
South East	0.741***	0.229	1.113***	0.265
South West	1.235***	0.308	1.983***	0.426
West Midlands	0.843**	0.37	1.103***	0.396
Yorkshire and The Humber	0.501	0.338	1.244***	0.456
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	2.068***	0.753	1.069	0.865
RECODE of response_seq=50	4.832***	0.753	4.284***	0.865
RECODE of response_seq=100	5.699***	0.756	5.545***	0.868
RECODE of response_seq=500	6.023***	0.765	6.284***	0.875
RECODE of response_seq=5000	5.661***	0.882	6.970***	0.971
Mon	0	.	0	.
Tue	0.037	0.064	-0.009	0.067
Wed	0.275***	0.067	0.244***	0.071
Thu	0.452***	0.069	0.326***	0.072
Fri	1.361***	0.075	1.176***	0.078
Sat	2.143***	0.682	3.144***	0.714
Sun	1.524**	0.681	2.985***	0.714
Bank holiday	1.895***	0.688	3.379***	0.72
Working weekday # RECODE of hour=0	-0.298	0.501	0.893	0.559
Working weekday # RECODE of hour=3	-5.097***	1.375	-4.271***	1.488
Working weekday # RECODE of hour=6	-2.871***	0.122	-2.738***	0.147
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.320***	0.067	-0.03	0.074
Working weekday # RECODE of hour=15	0.252***	0.071	-0.223***	0.081
Working weekday # RECODE of hour=18	-0.167*	0.101	-0.147	0.114
Working weekday # RECODE of hour=21	0.112	0.135	0.865***	0.143
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-3.052	2.389	-1.832	1.96
Weekend or bank holiday # RECODE of hour=6	-1.603**	0.688	-1.14	0.732

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Weekend or bank holiday # RECODE of hour=9	-0.426	0.678	-0.651	0.714
Weekend or bank holiday # RECODE of hour=12	-0.493	0.675	-1.186*	0.712
Weekend or bank holiday # RECODE of hour=15	-0.519	0.675	-1.123	0.711
Weekend or bank holiday # RECODE of hour=18	-0.366	0.671	-1.082	0.707
Weekend or bank holiday # RECODE of hour=21	-0.313	0.67	-0.818	0.704
Constant	56.371***	0.808	55.662***	0.927
Observations	1156270		1156270	
r^2	0.124		0.142	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 5: Mappiness responses inside airport polygons

Inside airport	**N responses**
BHX Birmingham	725
BLK Blackpool	13
BOH Bournemouth	26
BRS Bristol	93
EMA East Midlands	80
ESH Shoreham	8
LBA Leeds Bradford	31
LCY London City	66
LGW London Gatwick	1043
LHR London Heathrow	2077
LPL Liverpool	33
LTN Luton	99
MAN Manchester	351
NCL Newcastle	63
SEN Southend	14
SOU Southampton	126
STN Stansted	306
None	1,842,854

Table E. 6: OLS regressions for working activity within any English airports controlling for background variables

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Inside any airport	-0.685	1.042	-0.803	1.272
inside	0	.	0	.
Outdoors	2.767***	0.304	1.638***	0.337
Vehicle	0.691*	0.41	1.052***	0.4
work	0	.	0	.
Working, studying	0	.	0	.
In a meeting, seminar, class	0.826***	0.161	0.373**	0.18
Travelling, commuting	0.074	0.501	-0.436	0.475
Cooking, preparing food	1.700**	0.788	-0.262	0.949
Housework, chores, DIY	-0.12	0.599	-0.662	0.724
Waiting, queueing	-3.217***	0.457	-2.032***	0.516
Shopping, errands	1.489**	0.723	1.316	0.83
Admin, finances, organising	-0.880***	0.191	-1.304***	0.212
Childcare, playing with children	2.130**	0.872	0.723	1.097
Pet care, playing with pets	6.235***	1.722	5.871***	1.678
Care or help for adults	0.024	0.694	-1.135*	0.608
Sleeping, resting, relaxing	1.852*	0.992	4.005***	1.042
Sick in bed	-18.267***	1.646	-15.548***	1.642
Meditating, religious activities	2.685	1.876	2.382	2.004
Washing, dressing, grooming	0.499	0.884	-1.522	1.042
Talking, chatting, socialising	5.510***	0.176	5.362***	0.178
Intimacy, making love	9.601***	3.499	7.438**	3.094
Eating, snacking	2.074***	0.17	2.220***	0.182
Drinking tea/coffee	1.436***	0.166	1.691***	0.183
Drinking alcohol	5.601***	0.989	7.749***	1.245
Smoking	-0.213	0.77	0.176	0.811
Texting, email, social media	0.974***	0.197	1.043***	0.214
Browsing the Internet	1.324***	0.254	2.866***	0.273
Watching TV, film	1.967***	0.609	4.262***	0.747
Listening to music	3.149***	0.207	3.383***	0.22
Listening to speech/podcast	2.301***	0.419	2.723***	0.505
Reading	0.963***	0.318	2.461***	0.397
Theatre, dance, concert	4.984***	1.378	0.645	1.819

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Exhibition, museum, library	2.623	2.292	1.054	2.807
Match, sporting event	3.404*	1.753	3.862*	2.136
Walking, hiking	0.838	1.051	-0.624	1.138
Sports, running, exercise	7.762***	1.328	5.003***	1.7
Gardening, allotment	-0.82	4.108	2.903	4.655
Birdwatching, nature watching	3.947*	2.368	4.829*	2.789
Computer games, iPhone games	1.685***	0.561	4.081***	0.663
Hunting, fishing	3.708	7.189	9.874	8.466
Other games, puzzles	1.457	1.351	2.162	1.345
Gambling, betting	5.516**	2.763	1.477	2.409
Hobbies, arts, crafts	6.073***	0.852	3.751***	0.867
Singing, performing	3.526***	1.29	0.299	1.86
Something else (version < 1.0.2)	-0.603	0.697	-0.604	0.712
Something else (version >= 1.0.2)	-2.504***	0.547	-2.689***	0.569
Spouse, partner, girl/boyfriend	3.299***	0.451	2.857***	0.485
Children	1.376**	0.695	0.504	0.8
Other family members	1.474***	0.53	2.462***	0.602
Colleagues, classmates	0.666***	0.115	-0.023	0.12
Clients, customers	0.956***	0.247	-0.203	0.246
Friends	4.349***	0.246	3.794***	0.28
Other people participant knows	-0.099	0.497	-0.736	0.558
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.195	0.157	-0.006	0.167
glud_domgdn_pc	0.962	0.765	0.681	0.844
glud_green_pc	0.814*	0.452	0.981**	0.479
glud_water_pc	-1.935*	1.142	-1.002	1.418
East Midlands	0.102	1.04	-0.67	1.09
East of England	-0.12	0.701	-0.624	0.752
London	0	.	0	.
North East	-2.004*	1.155	-1.355	1.447
North West	0.536	0.902	1.128	1.037
South East	-0.179	0.534	-0.263	0.512
South West	-0.646	1.642	-1.423	2.411
West Midlands	0.548	0.792	0.075	0.92
Yorkshire and The Humber	1.163	1.584	2.228	2.162

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	-1.344	1.327	0.918	1.336
RECODE of response_seq=50	2.344*	1.327	6.580***	1.336
RECODE of response_seq=100	3.947***	1.328	9.797***	1.34
RECODE of response_seq=500	4.888***	1.331	11.971***	1.346
RECODE of response_seq=5000	4.814***	1.442	13.377***	1.451
Mon	0	.	0	.
Tue	0.260***	0.091	0.067	0.095
Wed	0.567***	0.095	0.347***	0.1
Thu	0.753***	0.098	0.376***	0.104
Fri	2.140***	0.11	1.892***	0.113
Sat	-0.935	3.32	-0.227	3.348
Sun	-2.16	3.316	-0.691	3.343
Bank holiday	-2.294	3.414	0.343	3.404
Working weekday # RECODE of hour=0	-1.35	1.657	-0.69	1.619
Working weekday # RECODE of hour=3	-2.713	1.896	-3.429	2.426
Working weekday # RECODE of hour=6	-0.704***	0.17	-0.001	0.177
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	-0.178**	0.071	-0.484***	0.079
Working weekday # RECODE of hour=15	-0.199**	0.08	-0.453***	0.087
Working weekday # RECODE of hour=18	-2.160***	0.2	-1.909***	0.214
Working weekday # RECODE of hour=21	-1.506***	0.467	-1.859***	0.504
Weekend or bank holiday # RECODE of hour=0	2.632	3.514	-3.502	3.586
Weekend or bank holiday # RECODE of hour=3	0	.	0	.
Weekend or bank holiday # RECODE of hour=6	1.151	3.41	1.961	3.436
Weekend or bank holiday # RECODE of hour=9	2.279	3.332	2.04	3.368
Weekend or bank holiday # RECODE of hour=12	2.635	3.321	2.22	3.35
Weekend or bank holiday # RECODE of hour=15	2.132	3.33	0.942	3.355
Weekend or bank holiday # RECODE of hour=18	1.421	3.345	-0.149	3.365
Weekend or bank holiday # RECODE of hour=21	0.73	3.384	-0.588	3.501
Constant	53.838***	1.376	43.339***	1.394
Observations	340735		340735	
r^2	0.027		0.038	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 7: OLS regressions for non-working activity within any English airports controlling for background variables

	Happiness		Anxiety	
	Coefficient	**SE**	**Coefficient**	**SE**
Inside any airport	1.548***	0.332	-0.803**	0.395
Indoors	0	.	0	.
Outdoors	2.939***	0.077	2.021***	0.089
Vehicle	0.06	0.106	-0.004	0.124
Home	0	.	0	.
Elsewhere	1.941***	0.073	0.552***	0.077
Working, studying	-1.410***	0.1	-4.718***	0.122
In a meeting, seminar, class	-0.488***	0.184	-2.248***	0.228
Travelling, commuting	-2.545***	0.099	-5.050***	0.124
Cooking, preparing food	2.246***	0.077	0.747***	0.084
Housework, chores, DIY	-0.688***	0.085	-3.454***	0.101
Waiting, queueing	-4.232***	0.131	-6.164***	0.16
Shopping, errands	0.367***	0.094	-1.877***	0.112
Admin, finances, organising	-1.339***	0.117	-2.926***	0.138
Childcare, playing with children	2.895***	0.135	0.923***	0.142
Pet care, playing with pets	3.191***	0.148	2.435***	0.174
Care or help for adults	-6.436***	0.553	-6.964***	0.579
Sleeping, resting, relaxing	0.788***	0.068	5.589***	0.092
Sick in bed	-19.142***	0.278	-13.860***	0.282
Meditating, religious activities	4.009***	0.422	5.395***	0.434
Washing, dressing, grooming	1.998***	0.083	0.037	0.096
Talking, chatting, socialising	3.871***	0.072	3.013***	0.068
Intimacy, making love	12.694***	0.264	10.153***	0.258
Eating, snacking	2.027***	0.056	1.738***	0.056
Drinking tea/coffee	1.353***	0.074	1.259***	0.077
Drinking alcohol	3.595***	0.087	4.044***	0.093
Smoking	0.747***	0.175	0.308*	0.182
Texting, email, social media	0.834***	0.092	0.599***	0.089
Browsing the Internet	0.623***	0.083	1.374***	0.083
Watching TV, film	2.054***	0.056	3.711***	0.063

	Happiness		Anxiety	
	Coefficient	**SE**	**Coefficient**	**SE**
Listening to music	3.266***	0.084	3.010***	0.086
Listening to speech/podcast	1.860***	0.129	2.244***	0.147
Reading	1.925***	0.088	3.756***	0.101
Theatre, dance, concert	6.170***	0.239	2.971***	0.275
Exhibition, museum, library	5.206***	0.268	4.039***	0.328
Match, sporting event	2.126***	0.247	-0.826***	0.26
Walking, hiking	2.375***	0.138	2.138***	0.168
Sports, running, exercise	6.412***	0.154	0.407	0.249
Gardening, allotment	5.201***	0.251	3.469***	0.303
Birdwatching, nature watching	4.584***	0.389	5.741***	0.457
Computer games, iPhone games	2.442***	0.106	3.277***	0.109
Hunting, fishing	2.858**	1.123	2.483*	1.286
Other games, puzzles	2.358***	0.232	2.271***	0.252
Gambling, betting	1.208*	0.711	-0.683	0.833
Hobbies, arts, crafts	4.889***	0.21	4.174***	0.217
Singing, performing	6.118***	0.264	2.121***	0.364
Something else (version < 1.0.2)	-1.612***	0.178	-2.826***	0.187
Something else (version >= 1.0.2)	-3.328***	0.166	-4.443***	0.151
Spouse, partner, girl/boyfriend	3.706***	0.097	2.354***	0.088
Children	0.625***	0.116	-0.631***	0.116
Other family members	0.707***	0.082	0.210***	0.082
Colleagues, classmates	-0.033	0.133	-0.588***	0.161
Clients, customers	1.141***	0.307	-0.598	0.403
Friends	4.100***	0.081	2.833***	0.082
Other people participant knows	-0.756***	0.159	-1.609***	0.172
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.432***	0.075	0.248***	0.078
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	2.057***	0.641	1.324*	0.777
RECODE of response_seq=50	4.423***	0.64	3.679***	0.777
RECODE of response_seq=100	5.104***	0.644	4.429***	0.78
RECODE of response_seq=500	5.324***	0.65	4.947***	0.784
RECODE of response_seq=5000	4.800***	0.749	5.311***	0.866
Mon	0	.	0	.
Tue	0.002	0.058	-0.065	0.062

	Happiness		Anxiety	
	Coefficient	**SE**	**Coefficient**	**SE**
Wed	0.152**	0.06	0.055	0.064
Thu	0.334***	0.061	0.139**	0.065
Fri	1.245***	0.065	1.077***	0.069
Sat	2.647***	0.503	3.323***	0.576
Sun	2.014***	0.503	3.127***	0.576
Bank holiday	2.506***	0.511	3.671***	0.582
Working weekday # RECODE of hour=0	0.648*	0.387	1.964***	0.448
Working weekday # RECODE of hour=3	-4.159***	1.543	-2.697*	1.517
Working weekday # RECODE of hour=6	-3.326***	0.116	-3.476***	0.14
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.729***	0.069	0.337***	0.078
Working weekday # RECODE of hour=15	0.447***	0.072	-0.085	0.084
Working weekday # RECODE of hour=18	0.167*	0.088	0.089	0.1
Working weekday # RECODE of hour=21	0.560***	0.111	1.186***	0.121
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-3.042	1.974	-0.319	1.592
Weekend or bank holiday # RECODE of hour=6	-1.967***	0.511	-1.187**	0.59
Weekend or bank holiday # RECODE of hour=9	-0.702	0.499	-0.554	0.574
Weekend or bank holiday # RECODE of hour=12	-0.676	0.498	-0.92	0.572
Weekend or bank holiday # RECODE of hour=15	-0.759	0.496	-0.971*	0.57
Weekend or bank holiday # RECODE of hour=18	-0.54	0.493	-0.892	0.567
Weekend or bank holiday # RECODE of hour=21	-0.425	0.492	-0.61	0.565
Constant	57.556***	0.657	58.442***	0.789
Observations	1411998		1411998	
r^2	0.116		0.105	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 8: OLS regressions for non-working activity within 17 English airports controlling for background variables

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
BHX Birmingham	2.001**	0.942	0.071	1.222
BLK Blackpool	-7.137**	3.595	-4.003	2.745
BOH Bournemouth	6.125	4.879	2.29	5.275

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
BRS Bristol	-0.662	2.985	-0.856	2.584
EMA East Midlands	-0.166	3.337	-2.351	4.04
ESH Shoreham	-17.007	14.588	-10.49	16.99
LBA Leeds Bradford	-2.412	4.252	0.183	4.432
LCY London City	3.147	2.243	6.801**	3.309
LGW London Gatwick	1.886***	0.708	-0.549	0.78
LHR London Heathrow	0.952**	0.485	-1.422**	0.587
LPL Liverpool	6.340**	3.065	-1.115	3.302
LTN Luton	1.365	1.825	-0.756	2.245
MAN Manchester	5.998***	1.169	2.116	1.437
NCL Newcastle	3.88	2.646	1.545	3.33
SEN Southend	3.887**	1.566	1.542	1.568
SOU Southampton	-0.855	2.545	-2.28	2.83
STN Stansted	0.193	1.19	-3.751***	1.441
in	0	.	0	.
Outdoors	2.940***	0.077	2.022***	0.089
Vehicle	0.061	0.106	-0.004	0.124
Home	0	.	0	.
Elsewhere	1.940***	0.073	0.552***	0.077
Working, studying	-1.411***	0.1	-4.719***	0.122
In a meeting, seminar, class	-0.487***	0.184	-2.248***	0.228
Travelling, commuting	-2.545***	0.099	-5.050***	0.124
Cooking, preparing food	2.246***	0.077	0.747***	0.084
Housework, chores, DIY	-0.688***	0.085	-3.454***	0.101
Waiting, queueing	-4.234***	0.131	-6.164***	0.16
Shopping, errands	0.367***	0.094	-1.878***	0.112
Admin, finances, organising	-1.339***	0.117	-2.926***	0.138
Childcare, playing with children	2.895***	0.135	0.923***	0.142
Pet care, playing with pets	3.191***	0.148	2.435***	0.174
Care or help for adults	-6.437***	0.553	-6.965***	0.579
Sleeping, resting, relaxing	0.788***	0.068	5.589***	0.092
Sick in bed	-19.142***	0.278	-13.860***	0.282
Meditating, religious activities	4.009***	0.422	5.396***	0.434
Washing, dressing, grooming	1.998***	0.083	0.037	0.096

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Talking, chatting, socialising	3.871***	0.072	3.013***	0.068
Intimacy, making love	12.694***	0.264	10.152***	0.258
Eating, snacking	2.027***	0.056	1.738***	0.056
Drinking tea/coffee	1.353***	0.074	1.259***	0.077
Drinking alcohol	3.595***	0.087	4.044***	0.093
Smoking	0.747***	0.175	0.307*	0.182
Texting, email, social media	0.834***	0.092	0.599***	0.089
Browsing the Internet	0.623***	0.083	1.374***	0.083
Watching TV, film	2.055***	0.056	3.712***	0.063
Listening to music	3.267***	0.084	3.010***	0.086
Listening to speech/podcast	1.859***	0.129	2.244***	0.147
Reading	1.925***	0.088	3.756***	0.101
Theatre, dance, concert	6.169***	0.239	2.967***	0.275
Exhibition, museum, library	5.202***	0.268	4.028***	0.327
Match, sporting event	2.126***	0.247	-0.826***	0.26
Walking, hiking	2.374***	0.138	2.138***	0.168
Sports, running, exercise	6.412***	0.154	0.407	0.249
Gardening, allotment	5.201***	0.251	3.469***	0.303
Birdwatching, nature watching	4.584***	0.389	5.741***	0.457
Computer games, iPhone games	2.442***	0.106	3.277***	0.109
Hunting, fishing	2.861**	1.123	2.491*	1.286
Other games, puzzles	2.357***	0.232	2.271***	0.252
Gambling, betting	1.209*	0.71	-0.682	0.833
Hobbies, arts, crafts	4.888***	0.21	4.174***	0.217
Singing, performing	6.118***	0.264	2.120***	0.364
Something else (version < 1.0.2)	-1.612***	0.178	-2.827***	0.187
Something else (version >= 1.0.2)	-3.328***	0.166	-4.444***	0.151
Spouse, partner, girl/boyfriend	3.706***	0.097	2.354***	0.088
Children	0.624***	0.116	-0.631***	0.116
Other family members	0.707***	0.082	0.211***	0.082
Colleagues, classmates	-0.034	0.133	-0.590***	0.161
Clients, customers	1.144***	0.307	-0.596	0.403
Friends	4.100***	0.081	2.833***	0.082
Other people participant knows	-0.757***	0.159	-1.610***	0.172

	Happiness		Relaxation	
	Coefficient	**SE**	**Coefficient**	**SE**
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.432***	0.075	0.248***	0.078
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	2.055***	0.641	1.321*	0.777
RECODE of response_seq=50	4.420***	0.64	3.676***	0.777
RECODE of response_seq=100	5.102***	0.644	4.426***	0.78
RECODE of response_seq=500	5.322***	0.651	4.944***	0.784
RECODE of response_seq=5000	4.797***	0.749	5.308***	0.866
Mon	0	.	0	.
Tue	0.002	0.058	-0.065	0.062
Wed	0.152**	0.06	0.055	0.064
Thu	0.334***	0.061	0.139**	0.065
Fri	1.245***	0.065	1.077***	0.069
Sat	2.648***	0.503	3.323***	0.576
Sun	2.015***	0.503	3.127***	0.576
Bank holiday	2.507***	0.511	3.671***	0.582
Working weekday # RECODE of hour=0	0.649*	0.387	1.964***	0.448
Working weekday # RECODE of hour=3	-4.159***	1.543	-2.697*	1.517
Working weekday # RECODE of hour=6	-3.327***	0.116	-3.478***	0.14
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.729***	0.069	0.336***	0.078
Working weekday # RECODE of hour=15	0.447***	0.072	-0.085	0.084
Working weekday # RECODE of hour=18	0.168*	0.088	0.089	0.1
Working weekday # RECODE of hour=21	0.561***	0.111	1.186***	0.121
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-3.042	1.974	-0.319	1.592
Weekend or bank holiday # RECODE of hour=6	-1.969***	0.511	-1.188**	0.59
Weekend or bank holiday # RECODE of hour=9	-0.703	0.499	-0.554	0.574
Weekend or bank holiday # RECODE of hour=12	-0.676	0.498	-0.92	0.572
Weekend or bank holiday # RECODE of hour=15	-0.759	0.496	-0.970*	0.57
Weekend or bank holiday # RECODE of hour=18	-0.541	0.493	-0.892	0.567
Weekend or bank holiday # RECODE of hour=21	-0.425	0.492	-0.61	0.564
Constant	57.558***	0.657	58.446***	0.789
Observations	1411998		1411998	
r^2	0.116		0.105	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Table E. 9: OLS regressions for airport distance model controlling for background variables

Airport distance model		**Happiness**		**Relaxation**
	Coefficient	**SE**	**Coefficient**	**SE**
runways_18_lt5km	-0.023	0.302	-0.599	0.403
runways_18_5_10km	0.203	0.16	0.366*	0.187
poor_health # runways_18_lt5km	-0.093	0.488	0.317	0.629
poor_health # runways_18_5_10km	-0.749**	0.339	-0.961***	0.361
Working, studying # runways_18_lt5km	-0.62	0.496	-1.104*	0.602
Working, studying # runways_18_5_10km	0.048	0.265	-0.243	0.302
Inside	0	.	0	.
Outdoors	2.869***	0.111	1.992***	0.11
Vehicle	0.034	0.117	-0.119	0.133
Home	0	.	0	.
Elsewhere	1.585***	0.08	0.197**	0.09
Work	-2.419***	0.121	-4.624***	0.139
Working, studying	-1.699***	0.098	-4.232***	0.113
In a meeting, seminar, class	0.399***	0.136	-1.218***	0.162
Travelling, commuting	-2.191***	0.101	-4.433***	0.117
Cooking, preparing food	2.171***	0.084	0.719***	0.094
Housework, chores, DIY	-0.687***	0.088	-3.324***	0.103
Waiting, queueing	-3.943***	0.127	-5.477***	0.154
Shopping, errands	0.645***	0.095	-1.293***	0.109
Admin, finances, organising	-1.386***	0.142	-2.821***	0.159
Childcare, playing with children	2.881***	0.155	0.857***	0.167
Pet care, playing with pets	3.319***	0.174	2.597***	0.196
Care or help for adults	-3.930***	0.518	-4.805***	0.491
Sleeping, resting, relaxing	0.804***	0.077	5.707***	0.108
Sick in bed	-19.033***	0.273	-13.714***	0.282
Meditating, religious activities	4.138***	0.419	5.570***	0.436
Washing, dressing, grooming	1.890***	0.086	0.05	0.099
Talking, chatting, socialising	4.234***	0.074	3.450***	0.07
Intimacy, making love	12.704***	0.277	10.286***	0.274
Eating, snacking	2.011***	0.058	1.752***	0.058

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Drinking tea/coffee	1.395***	0.073	1.331***	0.082
Drinking alcohol	3.644***	0.1	4.230***	0.109
Smoking	0.465**	0.185	0.021	0.201
Texting, email, social media	0.947***	0.086	0.766***	0.086
Browsing the Internet	0.719***	0.082	1.598***	0.094
Watching TV, film	2.201***	0.061	3.969***	0.071
Listening to music	3.380***	0.103	3.238***	0.104
Listening to speech/podcast	1.884***	0.134	2.408***	0.141
Reading	1.800***	0.091	3.751***	0.105
Theatre, dance, concert	6.281***	0.254	3.285***	0.287
Exhibition, museum, library	5.280***	0.272	4.329***	0.333
Match, sporting event	2.309***	0.292	-0.617**	0.31
Walking, hiking	2.525***	0.148	2.226***	0.17
Sports, running, exercise	6.642***	0.164	0.814***	0.242
Gardening, allotment	5.085***	0.296	3.483***	0.337
Birdwatching, nature watching	4.243***	0.425	5.242***	0.478
Computer games, iPhone games	2.610***	0.11	3.677***	0.119
Hunting, fishing	2.793**	1.145	2.553**	1.299
Other games, puzzles	2.291***	0.228	2.307***	0.259
Gambling, betting	1.364**	0.664	-0.878	0.752
Hobbies, arts, crafts	5.174***	0.241	4.407***	0.246
Singing, performing	6.049***	0.284	2.422***	0.424
Something else (version < 1.0.2)	-1.334***	0.169	-2.341***	0.175
Something else (version >= 1.0.2)	-3.039***	0.156	-4.169***	0.145
Spouse, partner, girl/boyfriend	3.998***	0.106	2.586***	0.104
Children	0.383***	0.138	-0.807***	0.147
Other family members	0.767***	0.091	0.261***	0.095
Colleagues, classmates	-0.352***	0.12	-0.968***	0.136
Clients, customers	1.017***	0.307	-0.191	0.331
Friends	4.198***	0.082	3.221***	0.088
Other people participant knows	-0.778***	0.168	-1.585***	0.175
Between sunrise and sunset, based on time, date and GPS coords (0/1)	0.450***	0.072	0.294***	0.075
Proportion domestic gardens	-1.089***	0.318	0.015	0.385
Proportion of green space	0.389*	0.214	1.160***	0.238

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Proportion of water	0.81	0.792	1.387	0.964
East Midlands	0.002	0.287	0.455	0.324
East of England	0.413*	0.242	0.507	0.308
London	0	.	0	.
North East	0.514	0.476	0.355	0.489
North West	0.062	0.257	0.385	0.281
South East	0.213	0.174	0.659***	0.21
South West	0.646***	0.249	1.556***	0.333
West Midlands	0.338	0.307	0.558*	0.334
Yorkshire and The Humber	0.114	0.284	0.596*	0.333
RECODE of response_seq=0	0	.	0	.
RECODE of response_seq=10	1.486***	0.551	1.523**	0.64
RECODE of response_seq=50	4.161***	0.552	4.716***	0.641
RECODE of response_seq=100	5.041***	0.555	6.037***	0.644
RECODE of response_seq=500	5.412***	0.562	6.899***	0.649
RECODE of response_seq=5000	4.986***	0.672	7.466***	0.741
Mon	0	.	0	.
Tue	0.091*	0.049	0.003	0.052
Wed	0.286***	0.052	0.177***	0.056
Thu	0.461***	0.054	0.249***	0.056
Fri	1.465***	0.06	1.266***	0.062
Sat	2.375***	0.524	2.654***	0.595
Sun	1.725***	0.523	2.454***	0.595
Bank holiday	2.110***	0.531	2.884***	0.6
Working weekday # RECODE of hour=0	0.014	0.38	1.310***	0.474
Working weekday # RECODE of hour=3	-4.491***	1.136	-3.289**	1.308
Working weekday # RECODE of hour=6	-2.900***	0.098	-2.766***	0.115
Working weekday # RECODE of hour=9	0	.	0	.
Working weekday # RECODE of hour=12	0.365***	0.05	-0.024	0.056
Working weekday # RECODE of hour=15	0.296***	0.054	-0.176***	0.061
Working weekday # RECODE of hour=18	-0.098	0.081	-0.123	0.091
Working weekday # RECODE of hour=21	0.241**	0.107	0.931***	0.118
Weekend or bank holiday # RECODE of hour=0	0	.	0	.
Weekend or bank holiday # RECODE of hour=3	-2.212	1.717	-0.538	1.539

Airport distance model	Happiness		Relaxation	
	Coefficient	SE	Coefficient	SE
Weekend or bank holiday # RECODE of hour=6	-1.816***	0.533	-0.59	0.612
Weekend or bank holiday # RECODE of hour=9	-0.576	0.521	-0.036	0.593
Weekend or bank holiday # RECODE of hour=12	-0.559	0.519	-0.444	0.591
Weekend or bank holiday # RECODE of hour=15	-0.62	0.519	-0.487	0.59
Weekend or bank holiday # RECODE of hour=18	-0.447	0.515	-0.411	0.586
Weekend or bank holiday # RECODE of hour=21	-0.393	0.513	-0.158	0.58
Constant	57.543***	0.587	55.765***	0.681
Observations	1842854		1842854	
r^2	0.129		0.152	

*Notes: 0 responses indicate reference variable in regression model. Land use variables give proportion (0 – 1) of green space, water and domestic gardens in the LSOA associated with the nearest postcode to the response: * p<0.05; ** p<0.01; *** p<0.001. Fixed effects OLS models*

Appendix F – Survey instruments

Office for National Statistics Annual Population Survey subjective wellbeing Questions

Overall, how satisfied are you with your life nowadays? (Experience)

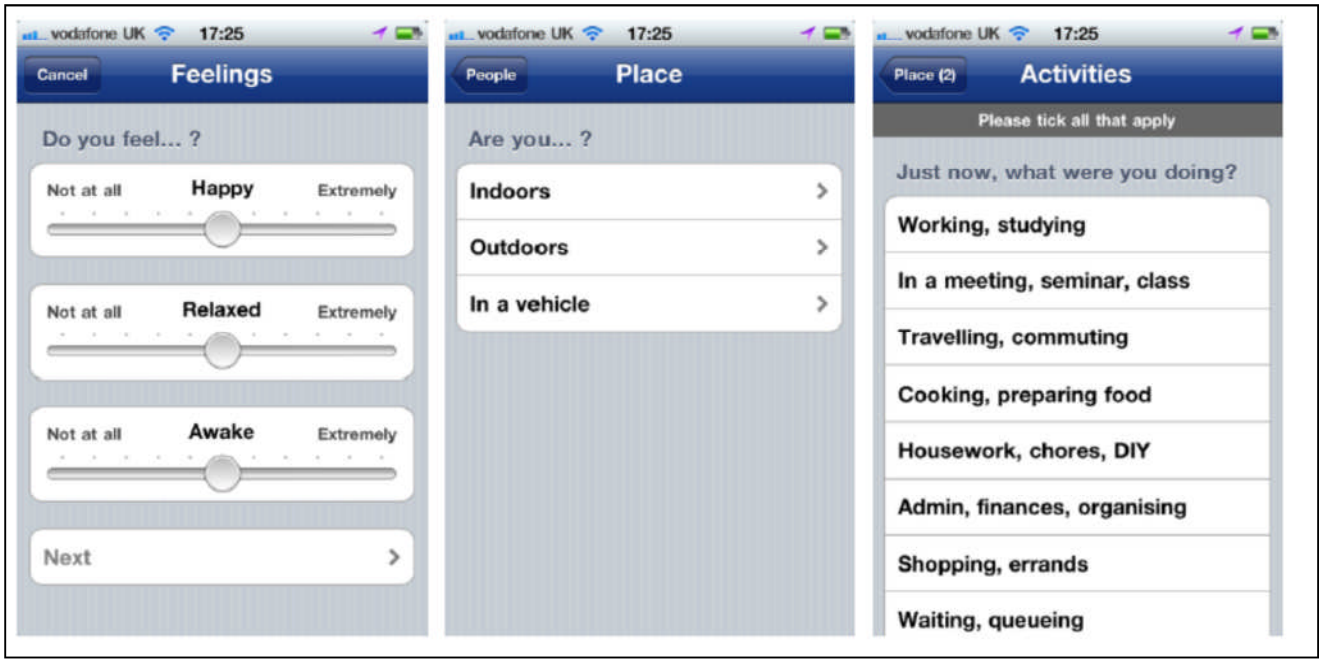
Overall, how happy did you feel yesterday? (Positive affect)

Overall, how anxious did you feel yesterday? (Negative affect)

Overall, to what extent do you feel the things you do in your life are worthwhile? (Eudemonic)

All questions use a 0 – 10 scale.

Mappiness Survey Instrument



If a signal has been received, the app launches directly into the questionnaire.

The questionnaire spans multiple screens, delineated by horizontal rules. Tapping an option suffixed by '>' immediately advances to the next screen.

The first screen has a 'Cancel' button that discontinues the questionnaire, and each subsequent screen has a 'Back' button to return to the preceding screen.

THIS SCREEN IS ILLUSTRATED ABOVE

Feelings

Do you feel... ?

- Happy (slider: Not at all ... Extremely)

- Relaxed (slider: Not at all ... Extremely)
- Awake (slider: Not at all ... Extremely)

Next

People

Please tick all that apply

Are you... ?

- Alone, or with strangers only
- Or are you with your... ?
  - [ ] Spouse, partner, girl/boyfriend
  - [ ] Children
  - [ ] Other family members
  - [ ] Colleagues, classmates
  - [ ] Clients, customers
  - [ ] Friends
  - [ ] Other people you know

Next

THIS SCREEN IS ILLUSTRATED ABOVE

Place

Are you... ?

- Indoors
- Outdoors
- In a vehicle

Place (2)

And are you... ?

- At home
- At work
- Elsewhere
- If you're working from home, please choose 'At home'

THIS SCREEN IS ILLUSTRATED ABOVE

THE ACTIVITIES LIST IS ADAPTED FROM THE AMERICAN TIME USE SURVEY ACTIVITY LEXICON 2009 (US BUREAU OF LABOR STATISTICS) AND THE UNITED KINGDOM 2000 TIME USE SURVEY (UK OFFICE FOR NATIONAL STATISTICS).

Activities

Please tick all that apply

Just now, what were you doing?

- [ ] Working, studying
- [ ] In a meeting, seminar, class
- [ ] Travelling, commuting
- [ ] Cooking, preparing food

- [ ] Housework, chores, DIY
- [ ] Admin, finances, organising
- [ ] Shopping, errands
- [ ] Waiting, queueing
- [ ] Childcare, playing with children
- [ ] Pet care, playing with pets
- [ ] Care or help for adults
- [ ] Sleeping, resting, relaxing
- [ ] Sick in bed
- [ ] Meditating, religious activities
- [ ] Washing, dressing, grooming
- [ ] Intimacy, making love
- [ ] Talking, chatting, socialising
- [ ] Eating, snacking
- [ ] Drinking tea/coffee
- [ ] Drinking alcohol
- [ ] Smoking
- [ ] Texting, email, social media
- [ ] Browsing the Internet
- [ ] Watching TV, film
- [ ] Listening to music
- [ ] Listening to speech/podcast
- [ ] Reading
- [ ] Theatre, dance, concert
- [ ] Exhibition, museum, library
- [ ] Match, sporting event
- [ ] Walking, hiking
- [ ] Sports, running, exercise
- [ ] Gardening, allotment
- [ ] Birdwatching, nature watching
- [ ] Hunting, fishing
- [ ] Computer games, iPhone games
- [ ] Other games, puzzles
- [ ] Gambling, betting
- [ ] Hobbies, arts, crafts
- [ ] Singing, performing
- [ ] Something else

Next >

BY DEFAULT, THIS DIGITAL CAMERA SCREEN IS SHOWN ONLY WHEN OUTDOORS
Please take a photo straight ahead

Or tap Cancel to skip this step

THIS SCREEN IS SHOWN ONLY IF A PHOTO WAS TAKEN

Map

Add this photo to the public map?

Yes > No >

THIS SCREEN IS SHOWN ONLY WHEN OUTDOORS AND IN THE RARE EVENT THAT GPS LOCATION ACCURACY IS STILL WORSE THAN 100M. IT ADVANCES AUTOMATICALLY WHEN ACCURACY REACHES 100M OR A PERIOD OF 60 SECONDS HAS ELAPSED.

Location

Improving location accuracy

Skip >

THE SURVEY DISMISSES ITSELF IMMEDIATELY AFTER THIS SCREEN IS DISPLAYED

Finished

Thank you!

Appendix G – Bibliography

Airports Commission. (2014). Airports Commission: Appraisal Framework (p. 136). London, UK: Airports Commission. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300223/airports-commission-appraisal-framework.pdf

Bentham, J. (1876). An introduction to the principles of morals and legislation. Clarendon Press.

Black, D. A., Black, J. A., Issarayangyun, T., & Samuels, S. E. (2007). Aircraft noise exposure and resident's stress and hypertension: A public health perspective for airport environmental management. Journal of Air Transport Management, 13(5), 264–276. doi:10.1016/j.jairtraman.2007.04.003

Blanchflower, D. G. (2009). International evidence on well-being. In A. B. Krueger (Ed.), Measuring the subjective well-being of nations: National accounts of time use and well-being (pp. 155–226). Chicago, IL: University of Chicago Press.

Brunelle-Yeung, E., Masek, T., Rojo, J. J., Levy, J. I., Arunachalam, S., Miller, S. M., … Waitz, I. A. (2014). Assessing the impact of aviation environmental policies on public health. Transport Policy. doi:10.1016/j.tranpol.2014.02.015

Clark, A. E., & Oswald, A. J. (2002). A simple statistical method for measuring how life events affect happiness. International Journal of Epidemiology, 31(6), 1139–1144. doi:10.1093/ije/31.6.1139

Clark, C., & Stansfeld, S. A. (2011). The Effect of Nocturnal Aircraft Noise on Health: a Review of Recent Evidence (p. 36). London, UK: Report prepared for the London Borough of Hounslow. Retrieved from http://www.hounslow.gov.uk/effect_aircraft_noise_health.pdf

Couper, M. P., Tourangeau, R., Conrad, F. G., & Singer, E. (2006). Evaluating the Effectiveness of Visual Analog Scales A Web Experiment. Social Science Computer Review, 24(2), 227–245. doi:10.1177/0894439305281503

Csikszentmihalyi, M. (2002). Flow: The Psychology of Happiness: The Classic Work on How to Achieve Happiness (New Ed edition.). London: Rider.

Diener, E. D. (1984). Subjective well-being. Psychological Bulletin, 95, 542–575.

Diener, E., Sapyta, J. J., & Suh, E. (1998). Subjective Well-Being Is Essential to Well-Being. Psychological Inquiry, 9(1), 33–37. doi:10.1207/s15327965pli0901_3

Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: three decades of progress. Psychological Bulletin, 125(2), 276–302. doi:10.1037/0033-2909.125.2.276

Dolan, P., Fujiwara, D., & Metcalfe, R. (2011). A Step towards Valuing Utility the Marginal and Cardinal Way (CEP Discussion Paper No. dp1062). Centre for Economic Performance, LSE. Retrieved from http://ideas.repec.org/p/cep/cepdps/dp1062.html

Dolan, P., & Metcalfe, R. (2012). Measuring subjective wellbeing: recommendations on measures for use by national governments. Journal of Social Policy, 41(02), 409–427. doi:10.1017/S0047279411000833

Dolan, P., Peasgood, T., & White, M. (2008). Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. Journal of Economic Psychology, 29(1), 94–122. doi:10.1016/j.joep.2007.09.001

Ferrer-i-Carbonell, A., & Frijters, P. (2004). How important is methodology for the estimates of the determinants of happiness? The Economic Journal, 114(497), 641–659. doi:10.1111/j.1468-0297.2004.00235.x

Frederick, S., & Loewenstein, G. (1999). Hedonic adaptation. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), Well-being: The foundations of hedonic psychology (pp. 302–329). New York, NY, US: Russell Sage Foundation.

Frey, B. S., & Stutzer, A. (2002). What can economists learn from happiness research? Journal of Economic Literature, 40(2), 402–435. doi:10.1257/002205102320161320

Fujita, F., & Diener, E. (2005). Life Satisfaction Set Point: Stability and Change. Journal of Personality and Social Psychology, 88(1), 158–164. doi:10.1037/0022-3514.88.1.158

Fujiwara, D. (2013). A General Method for Valuing Non-Market Goods Using Wellbeing Data: Three-Stage Wellbeing Valuation. In CEP Discussion Paper No 1233 (pp. 1–29). London, UK: Centre for Economic Performance, London School of Economics. Retrieved from http://cep.lse.ac.uk/_new/publications/series.asp?prog=CEP

Fujiwara, D., & Campbell, R. (2011). Valuation Techniques for Social Cost-Benefit Analysis: Stated Preference, Revealed Preference and Subjective Well-Being Approaches. A Discussion of the Current Issues (pp. 1–76). London, UK: HM Treasury. Retrieved from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209107/greenbook_valuationtechniques.pdf

Gujarati, D. N., & Porter, D. C. (2009). Basic Econometrics (5th ed.). McGraw-Hill Irwin.

Hamermesh, D. S. (2004). Subjective Outcomes in Economics (Working Paper No. 10361). National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w10361

Hardoy, M. C., Carta, M. G., Marci, A. R., Carbone, F., Cadeddu, M., Kovess, V., … Carpiniello, B. (2005). Exposure to aircraft noise and risk of psychiatric disorders: the Elmas survey. Social Psychiatry and Psychiatric Epidemiology, 40(1), 24–26. doi:10.1007/s00127-005-0837-x

HM Treasury. (2011). The Green Book: Appraisal and Evaluation in Central Government, *https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/220541/green_book_complete.pdf*

Hurka, T. (1993). Perfectionism. Oxford, UK: Oxford University Press.

Jaccard, J. (2003). Interaction Effects in Multiple Regression. SAGE.

Kahneman, D. (2000). Evaluation by moments: Past and future. In D. Kahneman & A. Tversky (Eds.), Choices, Values, and Frames (pp. 693–708). Cambridge UK: Cambridge University Press.

Kahneman, D., Diener, E., & Schwarz, N. (2003). Well-Being: Foundations of Hedonic Psychology (Vol. 13). New York, NY: Russell Sage Foundation.

Kahneman, D., & Krueger, A. B. (2006). Developments in the measurement of subjective well-being. The Journal of Economic Perspectives, 20(1), 3–24. doi:10.1257/089533006776526030

Kahneman, D., Krueger, A. B., Schkade, D. A., Schwarz, N., & Stone, A. A. (2004a). A Survey Method for Characterizing Daily Life Experience: The Day Reconstruction Method. Science, 306(5702), 1776–1780. doi:10.1126/science.1103572

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. (2004b). Toward National Well-Being Accounts. The American Economic Review, 94(2), 429–434.

Kahneman, D., & Tversky, A. (1984). Choices, values, and frames. American Psychologist, 39(4), 341–350. doi:10.1037/0003-066X.39.4.341

Knabe, A., Rätzel, S., Schöb, R., & Weimann, J. (2010). Dissatisfied with life but having a good day: time-use and well-being of the unemployed. The Economic Journal, 120(547), 867–889. doi:10.1111/j.1468-0297.2009.02347.x

Layard, R. (2009). Well-being measurement and public policy. In A. B. Krueger (Ed.), Measuring the Subjective Well-Being of Nations: National Accounts of Time Use and Well-Being (pp. 145–154). Chicago, IL: University of Chicago Press.

Loewenstein, G., & Ubel, P. A. (2008). Hedonic adaptation and the role of decision and experience utility in public policy. Journal of Public Economics, 92(8–9), 1795–1810. doi:10.1016/j.jpubeco.2007.12.011

Lyubomirsky, S., King, L., & Diener, E. (2005). The Benefits of Frequent Positive Affect: Does Happiness Lead to Success? Psychological Bulletin, 131(6), 803–855. doi:10.1037/0033-2909.131.6.803

MacKerron, G., & Mourato, S. (2013). Happiness is greater in natural environments. Global Environmental Change, 23(5), 992–1000. doi:10.1016/j.gloenvcha.2013.03.010

Navrud, S. (2012). The State-Of-The-Art on Economic Valuation of Noise (Final Report to European Commission DG Environment) (p. 12). Brussels, Belgium: Department of Economics and Social Sciences Agricultural University of Norway

OECD. (2013). OECD Guidelines on Measuring Subjective Well-being (p. 270). Paris, France: OECD Publishing. http://www.oecd.org/statistics/Guidelines%20on%20Measuring%20Subjective%20Well-being.pdf

Parfit, D. (1984). Reasons and Persons. Oxford UK: Oxford University Press

Pavot, W., & Diener, E. (2008). The Satisfaction With Life Scale and the emerging construct of life satisfaction. The Journal of Positive Psychology, 3(2), 137–152. doi:10.1080/17439760701756946

Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. Journal of Personality and Social Psychology, 57(6), 1069–1081. doi:10.1037/0022-3514.57.6.1069

Schwarz, N., & Strack, F. (2003). Reports of subjective well-being: judgmental processes and their methodological implications. In Well-Being: The Foundations of Hedonic Psychology (Vol. 13, pp. 61–84). New York, NY: Russell Sage Foundation.

Stone, A. A., & Shiffman, S. (1994). Ecological momentary assessment (EMA) in behavioural medicine. Annals of Behavioral Medicine, 16(3), 199–202.

Van Praag, B. M. S., & Baarsma, B. E. (2005). Using Happiness Surveys to Value Intangibles: The Case of Airport Noise. The Economic Journal, 115(500), 224–246. doi:10.1111/j.1468-0297.2004.00967.x

White, M. P., & Dolan, P. (2009). Accounting for the richness of daily activities. Psychological Science, 20(8), 1000–1008. doi:10.1111/j.1467-9280.2009.02392.x

World Health Organisation. (2009). Night Noise Guidelines for Europe (p. 184). Copenhagen, Denmark: World Health Organisation. Retrieved from http://www.euro.who.int/ data/assets/pdf_file/0017/43316/E92845.pdf

141010-155843-MA-UK