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Aviation Night Noise Effects (ANNE)

Subjective Study Technical report

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1 Introduction

1.1 About the report

This technical report accompanies the Aviation Night Noise Effects (ANNE) subjective study report, examining the associations of aviation noise exposure during the night-time period with annoyance, subjective sleep disturbance and objective sleep disturbance. This report covers the sample design, recruitment, fieldwork, and data processing.

1.2 Background

Aircraft noise and sleep disturbance

Sleep disturbance is a key health outcome in relation to aircraft noise exposure. Humans continue to respond to sounds in the environment even when asleep and studies have shown that noise can affect sleep in terms of immediate effects (e.g., arousal responses, sleep state changes, awakenings, body movements, total wake time, autonomic responses), after-effects (e.g., sleepiness, daytime performance, cognitive function) and long-term effects (e.g., self-reported chronic sleep disturbance; cardiovascular effects such as increased blood pressure, heart attacks) (Basner and McGuire, 2018, Elmenhorst et al., 2019, Basner et al., 2006).

Two different and distinct types of sleep outcomes have been examined. Subjective (self-reported) sleep disturbance which is linked to external time-average metrics such as L_{night} or $L_{\text{Aeq,8h}}$; and objective sleep disturbance assessed by changes in biophysiological signals (e.g., awakenings, body movement, increases in heart rate and blood pressure) that occur during sleep and have been linked to individual noise events such as indoor or outdoor L_{Amax} as well as time-average metrics. Relying solely on self-reported sleep disturbance can be misleading as people are not aware of themselves or their surroundings (i.e., are unconscious) for most of the night, and the assessment of the previous night necessarily will reflect the few wake periods that are long enough for subjects to regain consciousness (Basner et al., 2012). Also, self-report is prone to response bias, reflected in the fact that subjects will report much higher levels of sleep disturbance if the noise source is mentioned in the question (Basner and McGuire, 2018). Exposure-response functions (ERFs) for aircraft noise effects on objective and subjective sleep disturbance were published to inform the World Health Organization Environmental Noise Guidelines (WHO ENG 2018) (Basner and McGuire, 2018).

Aircraft noise and annoyance

Annoyance is the most prevalent community response in a population exposed to environmental noise. The term annoyance is used to describe negative reactions to noise such as disturbance, irritation, dissatisfaction and nuisance (Guski, 1999), as well as an emotional / attitudinal response (Guski et al., 2017). ERFs typically plot the

percentage of the population highly annoyed (%HA)¹ by the noise source. Acoustic factors, such as the source of the noise and sound level, account for only some of the annoyance response observed. Other factors also play a role, such as the fear associated with the noise source, interference with activities, ability to cope, noise sensitivity, expectations, anger, attitudes to the source – both positive or negative, and beliefs about whether noise could be reduced by those responsible influence annoyance responses (World Health Organization, 2000). Individual factors also contribute, such as age, social disadvantage, and employment status (Notley et al., 2014, Clark et al., 2015, Civil Aviation Authority, 2021a, Gjestland, 2018).

Most ERFs plot time averaged metrics such as L_{den} or $L_{Aeq,16h}$ exposures in relation to the %HA (Civil Aviation Authority, 2021a, World Health Organization, 2018, Guski et al., 2017), and do not consider night-time noise exposure or annoyance at night, per se. Annoyance ERFs from different studies can also show great variation. Self-reported sleep disturbance is often used to reflect annoyance during the night-time period. Conversely, SoNA 2014 assessed sleep disturbance using noise annoyance during the 23.00-7.00 time-period rather than sleep disturbance per se (Civil Aviation Authority, 2021b) presenting ERFs for being highly sleep disturbed (highly annoyed) for $L_{Aeq,8h}$, L_{night} and N60. The ANNE study defines and treats annoyance and self-reported sleep disturbance as separate, but potentially related outcomes, for example, if you are annoyed by noise this might influence your sleep quality; if you have poor sleep quality because of noise you may become annoyed. The study does not address people being annoyed per se because they are sleep disturbed.

After the ANNE study went into field, the Civil Aviation Authority published further secondary analysis of SoNA 2014 (Civil Aviation Authority, 2022), which calculated additional aircraft noise-induced awakening contours for the London Gatwick, London Heathrow, and London Stansted samples. An additional aircraft noise-induced awakening is a metric developed by Basner et al. (2006), based on the maximum sound pressure level of an aircraft noise event and the probability to wake up as assessed using sleep stage changes via polysomnography (objective sleep disturbance). The additional aircraft noise-induced contour maps the number of additional awakenings the population around an airport would experience on average per night for a one-year period attributable to aircraft noise events. SoNA 2014 used these contour data as a proxy for a noise dose in SoNA, finding that the number of additional awakenings was associated with aircraft noise annoyance at night. Additional awakenings also correlated highly ($r \sim > 0.80$) between the number of additional awakenings and average noise metrics such as $L_{Aeq,8h}$ and L_{night} . However, it should be noted that SoNA 2014 did not measure objective sleep disturbance but uses maximum noise levels to estimate additional awakenings.

¹ A Technical Standard governs the measurement of noise annoyance in community surveys (ISO/TS 15666, 2003), with questions typically taking the format 'Thinking about the last year when you are here at home, how much does the noise from aircraft bother, disturb or annoy you?' with responses given on an 11 point numerical scale with 0 being 'not at all annoyed' and 10 being 'extremely annoyed' or on a five point verbal scale, 'not at all', 'slightly', 'moderately', 'very', 'extremely'.

1.3 Study overview

The ANNE study is examining the associations of aviation noise exposure during the night-time period with annoyance, subjective sleep disturbance and objective sleep disturbance.

The study has two parts: the first is a large-scale cross-sectional survey carried out among residents living near eight UK airports to assess associations of aircraft noise exposure at night and subjective sleep disturbance and annoyance. The second part will recruit a sub-sample from the cross-sectional survey into an objective sleep disturbance study, where physiological assessments of (objective) sleep disturbance will be linked to aircraft noise exposure at the participant's home. The question of temporal differences in impacts of aviation noise on sleep disturbance can only be addressed using measures of objective sleep disturbance where aviation noise during specific time-periods of the night can be linked to objective physiologic reactions (e.g., awakenings).

A key outcome from the study will be exposure-response functions (ERFs) showing how time-averaged metrics such as $L_{Aeq,8h}$, $L_{Aeq,T}$,² and event-related metrics (L_{ASmax} , SEL) relate to subjective and objective sleep disturbance, and annoyance, which could be used to update the Government's TAG (Transport Analysis Guidance) methodology for assessing the relationship between aviation noise and health outcomes.

² With a focus on one hour periods of the evening and night-time

2 Methodology

2.1 Sample design

The target population of the cross-sectional survey was residents of households who live in proximity to a UK airport which operates flights during the night-time period³ of 21.00-08.00. Proximity is defined on the annual night-time aviation noise exposure around each airport (L_{night} for the year 2022), rather than by geographical distance to an airport.

A two-stage sampling framework was employed:

Stage 1: purposive sampling of airports with night-flights based on sampling airports with freight versus passenger flights; night-flight restrictions; quota scheme; voluntary restrictions; different ambient background noise/populations (urban/rural) and availability of exposure data to use for sampling. All eligible airports were classified according to each of these characteristics and airports were selected within specific categories so that airports with different patterns of night-time noise exposure were included. The three Designated Airports (London Gatwick; London Heathrow; and London Stansted) were purposively sampled into the study.

Stage 2: stratified random population survey of addresses around each selected airport. Addresses around the selected airports were classified by exposure metrics including $L_{\text{Aeq},8h}$, $L_{\text{Aeq},T}$, N60 and overflight metrics (where available). A stratified random sample of addresses was selected to ensure that a range of night-exposure experiences were included in the sample (aiming to select a sample ranging from >35-40dB and up to 60dB L_{night}).

Stage 1

Purposive sampling, where we choose the airports from the sample frame, was chosen over random selection. Purposive sampling has the advantage that it is a flexible method, which if carefully executed, can ensure airports with a variety of characteristics and available noise exposure data are included. A disadvantage of purposive sampling is that inferences about the relationships between exposure metrics and sleep will be limited to the selected airports.

In comparison, random sampling, where we choose a random sample of airports from the sample frame stratified by a variety of key characteristics, has not been chosen. Random sampling has the advantage that every airport has a known probability of selection, which would allow for inferences on the relationship between exposure and sleep to the residential population exposed to aviation night noise. The disadvantage of

³ Standard definition of night period is 23.00-07.00. UK aircraft noise policy sets the period 23.30 to 06.00 as the period when movement and noise quotas apply at noise-designated airports. The ANNE study is also examining hours outside of the standard definition of the night period and includes 'evening' hours (21.00 to 23.00) and one hour in the 'morning' (07.00-08.00).

random sampling is that there is no control over which airports are included; it is possible that airports with relatively rare combinations of characteristics might be missed; and that some selected airports may not have recent noise exposure data to inform sampling.

The table in Appendix A shows the data used to inform the purposive selection of airports for the study. Twenty airports with aviation night-noise were considered for the study and the table summarises for each airport the operational data for 2016/17 (movements/air freight handled); population exposed for L_{night} ; whether the airports had been sampled in SoNA 2014 or CAP 1731 (Civil Aviation Authority, 2017b); any restrictions for night-time operations; and the general context for the airport (rural/suburban/urban/city). The operational data for 2016/17 was selected as this was the most recent data available for all eight airports, not to have been influenced by aviation impacts of COVID-19.

Eight airports were selected for the study using this data:

- Bristol Airport
- East Midlands Airport
- Glasgow Airport
- London Gatwick Airport
- London Heathrow Airport
- London Stansted Airport
- London Luton Airport
- Manchester Airport

Purposive selection included the 3 designated airports (London Gatwick; London Heathrow; London Stansted). Other airports were then selected based on including airports in the sample:

- with a range of movements throughout the night-time period;
- that undertook freight flights;
- that undertook passenger flights;
- that were geographically spread across the UK;
- that included rural/suburban/urban and city areas; and
- that maximised the inclusion of airports within the sample with a significant number of population exposed to aviation night-noise.

Several airports within the sampling frame were not selected due to the relatively small number of flights and/or population exposed, given the aim to achieve a survey sample of $n=4,000$. A random selection of airports could have resulted in an extremely small sample pool, given the levels of movements and population exposed for many of the airports.

Stage 2

The sampling strategy has been informed by noise exposure data obtained from the Department for Environment, Food and Rural Affairs (Defra) and the Scottish

Government as prepared by the airports for the purpose of producing strategic noise maps under the Environmental Noise Regulations. These datasets are based on aircraft operations which occurred over the course of 2016. To provide an estimation of 2022 noise exposure, these datasets were scaled by the Civil Aviation Authority (CAA) through the use of aircraft movement comparisons between 2016 and 2022.

In order to select residents exposed to relevant levels of night noise exposure, it was necessary to estimate anticipated 2022 average summer night noise exposure. For some airports, the most recent night noise exposure available was from 2016 Round 3 noise mapping. Whilst more recent data was available for some airports, avoiding the effects of COVID-19 meant data was limited to the range 2016-2019. It was felt that using a common 2016 base year from which to estimate 2022 would provide a consistent approach across all airports. Forecast 2022 average summer night ATMs were compared with 2016 annual summer night ATMs to generate airport specific noise adjustment factors. These were then applied to 2016 average annual night noise exposure to produce airport and location specific estimates of 2022 average summer night noise exposure.

A key limitation of these estimates is the lowest reported noise exposure values. This is due to the current policy and legislative requirements not requiring airport noise exposure to be reported below 51dB $L_{Aeq,16hr}$ and 45dB $L_{Aeq,8hr}$, and 55dB L_{den} and 50dB L_{night} respectively (Department for Transport, October 2017, Department for Transport, February 2017).

Due to the complexities of modelling each airport down to these levels over the sampling period, and to ensure that sampling could consider areas which may be exposed to night-time noise at levels as low as 35dB L_{night} , radar data for the first half of 2022 was obtained from the selected airports. This data was used to generate overflight contours in line with the method described by the CAA in CAP 1498 (Civil Aviation Authority, 2017a). Using this data, locations which can be considered overflowed at rates which have the potential to result in noise exposure levels at or above 35dB L_{night} were identified.

To allow ambient noise exposure to be considered as part of the sampling, as a stratifier, road and railway noise exposure data produced by Defra has also been obtained (2016 road and railway noise mapping outputs). This does not include all roads and railway sources, only those considered by Defra under the Environmental Noise (England) Regulations 2006 in 2016/17. The data will therefore include motorways and most A-roads with traffic flows of more than 3 million per year but will not include B roads and residential streets. This data has been used to classify ambient noise levels from road and railway noise sources in the vicinity of each airport, except for Glasgow airport for which these data were not available.

A geospatial database has been developed to support the Stage 2 random sampling of addresses. To facilitate this, the *'UK 2011 census Postcode Headcounts and Households (including Deprivation Ranks for individual Lower Super Output Areas and Data Zones) - UK postcode data and supporting metadata for 2011 frozen postcodes'*

dataset has been adopted. This dataset includes postcode level household and population estimates, alongside wider demographic and deprivation data.

Using geospatial processes, the 2022 aircraft noise exposure estimates, ambient noise data for road and rail sources, and low aircraft noise indicators were assigned to each post code centroid.

For more detail on the noise data used for the ANNE study, see [Appendix A](#).

The survey includes participants with low exposure to aircraft noise for each airport, as well as participants with higher levels of aircraft noise exposure, who reside within the same area. For more detail on the sampling approach used in areas of lower night noise exposure, and what data is available, see [Annex A Sample Design: areas of low night noise exposure](#).

For detail around how the sample was stratified, how it was distributed across noise bands and minimum sample sizes proposed, see [Annex B Sample Design: stratification scheme, distribution and minimum sample sizes](#).

Recruitment

The cross-sectional subjective survey of 4000 participants used push-to-web methodology. This methodology is increasingly used on social surveys and is well suited for a topic that is likely to be salient to participants (Office for National Statistics, 2021). A response rate of 22% was assumed, which matches established recent push-to-web surveys such as the Active Lives Survey. An average of 1.4 adults to respond at participating addresses was expected, because this measure appears to be stable across surveys. All returned paper questionnaires were checked for signs of falsification (survey completed very quickly, straight-lining etc) and usually around 5% of cases are excluded through this process. It was also assumed that about a quarter of the questionnaires that are returned would not be usable, because not enough is filled in or it is completed incorrectly. These assumptions were built into the sample size calculations.

For more information on how the target sample sizes and completion rates were calculated, see [Annex C Sample Design: target sample sizes and completion rates](#).

2.2 Pilot study

It was decided that, in order to ask participants about the most recent summer period, fieldwork would launch post-summer and the full sample would be issued at the same time. A pilot study was therefore carried out during the summer period to allow the questionnaire, participant-facing documents (e.g., invitation letter and reminder letters) and response rate assumptions to be tested ahead of the mainstage study.

The pilot was designed to reflect the mainstage sample design as much as possible. The pilot study covered 4 airports from across the UK which operate flights during the night-time period: East Midlands, Glasgow, London Heathrow and Manchester. These 4 airports were chosen because they were considered the 'largest' of the 8 selected

airports that would be included in the mainstage study, in terms of estimated addresses exposed to night-time aviation noise. Addresses sampled for the pilot study would not be sampled again for the mainstage study and so the larger airports were chosen in order to ensure sufficient sample would still be available for the mainstage study. 2,200 addresses were sampled for the pilot, with 550 addresses from across the target population around each airport being identified/selected.

The pilot used 2 different sample designs:

- Addresses in high noise areas were oversampled in Heathrow and Manchester. In Heathrow and Manchester, 110 addresses were selected from higher noise strata, and 440 addresses were selected from lower noise strata⁴.
- In Glasgow and East Midlands, 550 addresses were selected from across the target population around each airport.

The pilot used 2 different sample designs so that response rates of addresses in different noise strata could be tested and oversampling of addresses in high noise areas could be used to inform the mainstage study sampling strategy. Glasgow and East Midlands both had a lower number of postcodes where $L_{\text{night}} > 54\text{dB}$ and so it was advisable to oversample addresses from higher noise strata in Heathrow and Manchester only to avoid minimising the sample available for the main study in higher noise strata at Glasgow and East Midlands. For the purposes of the pilot study these 2 different sample designs were suitable.

The fieldwork and engagement strategy replicated what was proposed for the mainstage study.

The full report that outlines key findings for different aspects of the pilot study can be found in the [Aviation Night Noise Effects - Pilot Study Report](#).

2.3 Mainstage survey design

The fieldwork took place over 9 weeks (28 October 2022 to 3 January 2023). All sampled addresses were sent an invitation letter that invited 2 adults aged 18 and older in the household to complete a 20-minute online questionnaire. Participants were able to self-select which 2 household members took part. A reminder letter was sent a week later and encouraged non-responders to take part. A second reminder letter was sent three weeks after the invite letter; this contained up to 2 paper questionnaires and pre-paid return envelopes. This ensures that people who do not use the internet or are not comfortable filling out online surveys have an opportunity to take part. We expected about 40% of the response to be on paper and 60% online.

Due to Royal Mail postal strikes that were happening at the time of the survey, it was decided to send a third reminder letter 6 weeks after the initial invite letter, to

⁴ Strata here refers to the grouping of addresses based on specific characteristics i.e. proximity to an airport of interest and noise band. Every address can only be found in one stratum.

encourage all non-responders again. Fieldwork was extended to 3 January 2023 in response to these challenges and to allow time for postal questionnaires to arrive.

The survey invitation letter and survey landing page provided detail about what participation entailed and made clear that participation was voluntary and that participants could change their mind about taking part at any time. A copy of the participant materials can be found in Appendix C.

As a thank you for their participation, a £10 shopping voucher was given to each participant that completed the questionnaire. Participants were offered the choice of either an online e-voucher code or a physical voucher.

2.4 Translations

The need for translations of the cross-sectional survey were considered for this study. 2011 Census data was used to look at the distribution of ethnic minority areas in the selected sample for the mainstage study. It was found that all of the addresses in areas with the highest proportion of ethnic minority residents were around Heathrow airport. The next highest group were primarily around Heathrow again, but moderate numbers were found around Luton and Manchester airports as well. Less than 3% of Heathrow sample addresses were in areas with less than 10% ethnic minority residents, compared to 26% of the sample as a whole.

The most common non-White ethnicity in sample areas was Indian, followed by Other Asian, Black African, and Pakistani. We were unable to analyse English language ability. It should also be noted that this Census data is from 2011.

When weighing up the balance of time and resource constraints versus how many requests for translated surveys were likely to be received, it was decided to not offer translations on this study.

2.5 Noise modelling

We modelled aircraft noise exposure levels at each address where a survey was completed. Limited validation work of the model was undertaken for each airport over two months of the 92-day period capturing L_{ASmax} and SEL event levels to inform the modelling. The modelling reflected the summer period referred to in the online/paper questionnaires. To facilitate this, we engaged and collaborated with airports to obtain NTK (Noise & Track Keeping monitoring) data for the periods of the survey so to model aircraft events using the precise flight-tracks. NTK data includes information from Air Traffic Control radars about the height of an aircraft above airport elevation, the track it has flown, ground speed, and the aircraft's call sign, as well as information on flight destination, aircraft type, and aircraft registration. All modelling was validated in line with CAA CAP2091 (Civil Aviation Authority, 2021b). We made a provision for some noise monitoring to take place around airports in support of the validation exercise where there was unsuitable coverage from the existing noise monitoring terminals with respect to the survey locations. The validated models along with flight-track data

obtained during the survey allow night by night diurnal noise event and exposure metrics to be generated at each survey location for a suite of metrics. See [Annex D: Noise](#) for more detail.

2.6 Rationale for choice of sample size for the cross-sectional subjective survey

Background to estimating sample sizes and power

Sample size estimations have been used to determine how many participants were needed in the cross-sectional survey.

Achieving adequate sized samples is important. If a sample size is too small, we may not get an accurate picture of the whole population and the study may not provide a precise estimate and reliable answers to the study hypotheses. If a sample size is too large, whilst the results will be more accurate, there is a risk of unnecessary complexity and costs being introduced to the study.

There are two types of errors that can be made in trying to determine whether annoyance or sleep disturbance differs between two noise exposure bands:

Type 1 error - rejecting the null hypothesis incorrectly – e.g., the data suggest a difference in annoyance levels or sleep disturbance between two exposure band groups, when in reality there is no difference in annoyance between the exposure band groups; and

Type 2 error – failing to reject the null hypothesis incorrectly - e.g., the data suggest there is no difference in annoyance or sleep disturbance between two exposure band groups when in reality there is a difference in annoyance between the groups.

Several factors inform a sample size calculation (Jones et al., 2003):

- The precision and variance of measurements within any sample
- The magnitude of a clinically significant difference
- The type of statistical test we are performing
- How certain we want to be to avoid a type 1 error (statistical significance level)
- How certain we want to be to avoid a type 2 error (power)

There is a trade-off between type 1 and type 2 errors: if we lower the type 1 error so that we are more confident that any differences we find are true differences this will increase the type 2 error (the chance of missing a true difference). Similarly reducing type 2 errors will increase type 1 errors. Increasing the sample size reduces both error types.

Investigating a national exposure-response curve quantifying the relationship between aviation noise exposure and being highly annoyed and highly sleep disturbed

The main purpose of the cross-sectional study is to provide information for constructing a national exposure-response relationship quantifying the relationship between night-time aviation noise exposure and being highly annoyed and highly sleep disturbed. The sample design based on addresses selected from each airport community, therefore, is tailored for estimating a regression relationship. The sample design based on addresses selected from each airport community, therefore, is designed to ensure that there is sufficient data over a wide range of noise exposures.

Noise exposure is measured in decibels (dB). For UK policy purposes the primary metric for assessing night-time noise exposure is $L_{Aeq,8h}$, which is a time-average sound level over an 8-hour period between 23.00 and 07.00 assessed over a 92-day period (16th June to 15th September). In the UK the highest levels of aircraft noise at night tend to be around 61dB $L_{Aeq,8h}$. Most models curtail the lower threshold to around 42-43dB, as policy/regulation tends to focus on reporting effects from 45dB (e.g., CAP1616 LOAEL; Environmental Noise Regulations). Europe is now allowing reporting below 40dB L_{night} (EU Directive (2020) 2020/367). From a model specification perspective this implies that the median exposure level in the lowest exposure category may not be accurate and that a sensitivity analysis should be performed to determine the magnitude of any potential for bias that could be arising.

Annoyance is assessed using an international Technical Standard (ISO/TS 15666:2021) from which the % highly annoyed (%HA) can be derived. Sleep disturbance can be assessed both subjectively (self-reported) and objectively (e.g., physiological assessments). The key outcome for the survey is % highly sleep disturbed (%HSD), which asks about sleep disturbance following the same format as the 5 point verbal annoyance scale from ISO/TS 15666.

Two regression relationships will be modelled using the survey data:

1. Those using a time-averaged metric⁵ across the whole night-time period e.g. $L_{Aeq,8h}$ which covers 23.00-07.00 time-period.
2. Those using multiple time-averaged metrics across one hour periods of the night-time e.g., $L_{Aeq,1h}$ covering 23.00-00.00; 01.00-02.00 etc.

Analyses addressing the second type of regression relationships will have lower statistical power, as instead of saying “does night noise cause annoyance” we will be asking “does night noise at one time cause more annoyance than night noise at a different time?” – we are looking at differences in annoyance. As there is limited prior evidence available for estimating annoyance and sleep disturbance during specific time-periods we cannot be confident that we will have a sufficient sample size needed to detect any statistically significant differences over the night-time. However, we will

⁵ The time-periods here are illustrative. The ANNE study will examine a range of time-periods of aviation noise exposure ranging from 21.00-8.00, to include ‘morning’ and ‘evening’ hours outside of the typical policy-defined night-time period of 23.00-7.00.

be able to estimate the size of any potential differences and this information will also be of use in planning future studies.

The number of measurements in the two regressions will remain the same. However, using an average of all the data over the whole 8-hour time period will have less variation than the individual eight 1 hour measurements. So, if the relationship is similar over all 8 hours an analysis of the pooled data will have less random error associated with it and more precise estimates of the association of annoyance with noise may arise.

The second set of regressions will enable us to determine if the relationships are similar over the whole night period. However, the power to detect differences in these relationships may be lower. This is because we will be comparing (for example) the slope of two different lines rather than in the first model where we are just determining if the slope of the one line is not zero.

We are interested in the association between noise (e.g., $L_{Aeq,8h}$ or L_{night}) and the percentage of people being highly annoyed (%HA). As annoyance is yes/no we model this using logistic regression in the form of the log(odds) of being highly annoyed according to level of noise. We want to have a large enough sample size to be able to say that there is evidence that a greater proportion of people will be annoyed if they are exposed to greater noise than people exposed to less noise, where we specify the increase in annoyance and the increase in noise, we believe are likely to occur. So, we need to define how we measure changes in noise, changes in annoyance and how large the expected changes are (from previous studies).

- i. For noise (a continuous variable) a common way to express change is in terms of the standard deviation (SD), where the range of noise that a population is exposed to goes from the median minus 2 SDs to the median plus 2 SDs (i.e., this is often called the 95% reference range). From earlier reports it is noted that: "In the UK the highest levels of aircraft noise at night tend to be around 61dB $L_{Aeq,8h}$. Most models curtail the lower threshold to around 42-43dB, as policy/regulation tends to focus on reporting effects from 45dB (e.g., CAP1616 LOAEL; Environmental Noise Regulations). Europe is now allowing reporting below 40dB L_{night} (EU Directive 2020/367)." So, the study population we are interested in will be exposed to noise in the range from 40-61dB which corresponds to an SD of around 5dB.
- ii. For annoyance (a binary variable: highly annoyed - yes/no) a common way to express change is in terms of the odds ratio (OR). For example, if 10% of people are highly annoyed at a median level of 50dB the odds of them being annoyed is 10%:90% i.e. 1:9 or 0.1111. If this odds increases by 30% per 1 SD increase in noise (i.e. OR = 1.3 per 5dB) this would mean that for the highest noise level (60dB = 2SDs increase) around $(1.3)^2 : 9 = 1.69:9 = 1.69/(9+1.69) = 16\%$ of people would be annoyed and at the lowest noise level (40dB = -2 SDs decrease) around $(1.3)^{-2} : 9 = 0.59/(9+0.59) = 6\%$ of people would be annoyed.

Regression estimates from past studies to inform power calculations

Different models have been fitted by different studies. Therefore, to estimate the size of the effect we are expecting we will use the published fitted models to predict the change in odds from 47.5dB to 52.5dB (1 SD around the median dB level).

The available estimates use time-averaged metrics across the whole night-time period with many studies reporting L_{night} (an annualised metric rather than a 92-day metric) rather than $L_{Aeq,8h}$. Overall, this should not have a material impact on the power calculations: we might expect an $L_{Aeq,8h}$ calculation to be slightly higher than an L_{night} calculation, as it is deliberately collected during the warmer summer months when summer flight schedules are in operation.

A number of existing regressions have estimated the effect of aircraft noise exposure at night on annoyance or sleep disturbance. Most relevant for this study are the estimates from meta-analyses provided by the WHO (Basner and McGuire, 2018, Guski et al., 2017) and the night-time analyses of SoNA 2014 (Civil Aviation Authority, 2021c).

The WHO regression estimate for L_{night} and %HSD for aircraft noise is below (Basner and McGuire, 2018): EQN 1

$$AR_{HSD,air} = \frac{(16.7885 - 0.9293 * L_{night} + 0.0198 * L_{night}^2)}{100}$$

Equation 1 (EQN1): % highly sleep disturbed for aircraft noise from Basner & McGuire, 2018

The above formula enables an estimate of the HSD OR for a 5dB increase in L_{night} from 47.5dB to 52.5dB of 1.30. This is reasonably consistent with the OR of 1.94 (95%CI 1.61-2.33) which is also provided in Table 5 of the reference (Basner and McGuire, 2018). This is equivalent to an OR = $(1.94)^{0.5} = 1.39$ per 5dB. The relationship also estimates that 10% of the population are highly sleep disturbed at level of 40dB L_{night} .

Estimates for annoyance are more complex, as few studies estimate effects between aircraft noise exposure during the night-time period and annoyance. The WHO estimated effects for L_{den} (a metric that combines aircraft noise exposure during the day, evening and night-time but adds a 5dB penalty for evening and 10dB penalty for night-time) and %HA (Guski et al., 2017). The WHO regression estimate for L_{den} and %HA is below (Guski et al., 2017): EQN 2

$$Estimated \%HA = -50.9693 + 1.0169 \times L_{den} + 0.0072 \times (L_{den})^2$$

Equation 2 (EQN2): Percentage highly annoyed for aircraft noise from Guski et al., 2017

SoNA 2014 has regression estimates for night-time aircraft noise ($L_{Aeq,8h}$) exposure and %HSD (Civil Aviation Authority, 2021c), which is based only on three of the eight airports in the sample: Gatwick, Heathrow, and Stansted. A limitation to the SoNA regression estimates for night-time aircraft noise is that the question used in the analysis is %HA for the 23.00-07.00 period and not %HSD. Whilst the SoNA 2014 report describes this as 'highly sleep disturbed' this is annoyance. For the purposes of this report, we keep the original nomenclature given by the study authors even though we disagree with it. SoNA 2014 estimated the following regression $L_{Aeq,8h}$ metrics and %HSD during the night-time period: EQN 3

$$\%HSD = \frac{100}{(1 + EXP(10.798 - 0.079 \times L_{Aeq,8h}))}$$

Equation 3 (EQN2): Percentage highly sleep disturbed for aircraft noise from SoNA 2014

This equation is equivalent to an OR = $\exp(0.079 \times 5) = 1.48$ per 5dB. However, there is some concern about this estimate as the logistic curve does not fit the data very well, but it is consistent with the WHO regression estimate. This study also provides the %HSD by $L_{Aeq,8h}$, estimating that 10% are highly annoyed at 49 $L_{Aeq,8h}$.

Effect of Clustered Sampling by Airports

As the populations around individual airports will be sampled this will increase the sampling errors. The sample is clustered which means that the sample around each airport may be more similar within the cluster in comparison to the whole population. It is usual to draw a larger sample size to offset this sampling error. A realistic adjustment for this would be to increase the sample size by at least 10%.

Sample size calculations

The approach to the sample size calculations is based on Novikov's paper "A modified approach to estimating sample size for simple logistic regression with one continuous covariate" (Novikov et al., 2010), in which the Hsieh approximation is judged to be reasonable as the effect sizes are modest. The Hsieh approximation calculation uses the prevalence of the expected proportion with %HSD or %HA in the sample and the OR for an increase in %HSD or %HA of one standard deviation of noise:

Required sample size (n) is given by

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{(1-a)} \right)^2}{[P(1-P)d^2]}$$

where

$$Z_{1-\frac{\alpha}{2}} = 1.96 \text{ corresponding to significance level of 5\%}$$

$Z_{(1-\alpha)} = 0.84$ corresponding to a power of 80%

P = Expected proportion in the sampled population who are annoyed under the alternative hypothesis – this can be approximated by the expected proportion who are annoyed in the whole sample or by the expected proportion who are annoyed at the median noise level in the sample. Both of these will be overestimates.

$d = \ln(\text{OR})$ per 1 SD difference in noise

Table 1 shows percentages using the formulas given above at dB levels of 47.5dB and 52.2dB which are then used to estimate the OR for a 5dB difference in noise levels. The ORs vary from 1.39 and 1.56 for %HSD and 1.83 for %HA. To be conservative we present sample size calculations for ORs ranging from 1.2 to 1.4.

The additional parameter required is the expected proportion under the alternative hypothesis in the whole sample. As this depends on the distributions of noise exposures in the sample it is difficult to estimate it. However, in the SONA 2014 study overall 9.3% were HSD and the overall value is likely to be an overestimate of the parameter we want. Therefore, we present sample size calculations for percentages varying from 5% to 12.5%, with the expectation that it is likely to be below around 7.5%

Two levels of power are given for illustration (80% and 90%), but it is recommended that 90% is adopted as the detection of a significant OR is the main objective of the survey.

Table 2 shows that the proposed sample size of 4,000 provides good and robust power to examine a range of likely ORs around 1.25.

Table 3 inflates the estimates in Table 1 by 10% to take account of the sampling occurring from different airports.

Table 1: Summary of power calculations for each regression estimate

Relationship	Noise metric	Predicted % at 47.5dB	Predicted % at 52.5dB	Calculated OR for a 5dB (1 sd) increase in noise
WHO %HSD (EQN1)	L _{night}	17.3	22.6	1.39
WHO %HA (EQN2)	L _{den}	13.6	22.3	1.83
SoNA %HSD (EQN3)	L _{Aeq,8h}	8.7	12.9	1.56

Table 2: Estimated sample size needed to detect expected odds ratio at the 5% level of statistical significance

Expected OR per 5dB using Hsieh approximation						
Power	Proportion High Sleep Disturbance	1.20	1.25	1.30	1.35	1.40

Expected OR per 5dB using Hsieh approximation						
80%	5%	4,971	3,319	2,401	1,835	1,460
80%	7.5%	3,404	2,272	1,644	1,256	999
80%	10.0%	2,624	1,751	1,267	968	770
90%	5%	6,655	4,443	3,214	2,456	1,954
90%	7.5%	4,556	3,042	2,200	1,682	1,338
90%	10.0%	3,512	2,345	1,696	1,296	1,031

Table 3: Estimated sample size needed to detect expected odds ratio at the 5% level of statistical significance after taking into account the clustering by airport in the survey

Expected OR per 5dB using Hsieh approximation						
Power	Proportion High Sleep Disturbance	1.20	1.25	1.30	1.35	1.40
80%	5%	5,468	3,650	2,641	2,018	1,605
80%	7.5%	3,744	2,499	1,808	1,382	1,099
80%	10.0%	2,886	1,927	1,394	1,065	847
90%	5%	7,320	4,887	3,535	2,702	2,149
90%	7.5%	5,012	3,346	2,420	1,850	1,472
90%	10.0%	3,863	2,579	1,866	1,426	1,134

2.7 Rationale for sampling more than one participant per household

The final stage of selection in any push-to-web survey is to select resident(s) from a selected address to respond to the survey. To maintain the random sampling of individuals, this last step also needs to include random selection. In the case of a face-to-face survey this is achieved by an interviewer asking someone at the address to list everyone living there and selecting a participant using a Kish grid⁶. Attempts have been made to replicate this approach remotely (e.g., on the Community Life Survey, the first major survey to adopt this design), but these have not been successful: methodological work has shown that asking residents to use a pseudo-random approach (e.g. last birthday method), results in an incorrect person completing the survey in a quarter to a third of the time (Park and Humphrey, 2014, Williams, 2015). This is problematic, as the sample is no longer random and includes an element of self-selection. As an alternative, push-to-web surveys by-pass the random selection by asking the whole household or a certain number of household members to complete the survey. Different numbers of maximum participants per household have been tested and two

⁶ The Kish grid or Kish selection grid is a method for selecting members within a household to be interviewed. It uses a pre-assigned table of random numbers to find the person to be interviewed.

has emerged as an industry standard. It represents the best compromise between reducing the selection error caused by a one person design and increased complexity and clustering that come with higher number of participants per address.

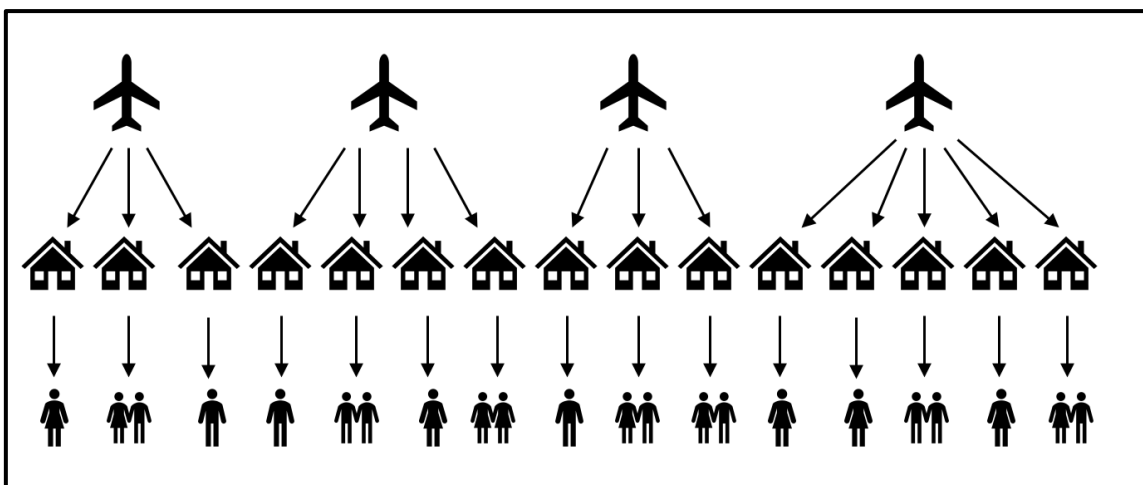
Selecting one person per household would also increase costs for the cross-sectional survey as the sample that is initially selected needs to be 40% larger than what has been assumed.

Given these methodological and practical considerations, we did not recommend selecting one person per household and instead proposed to deal with clustering at the cross-sectional survey analysis stage. This design would further allow us to explore whether responses may vary between households (inter-household differences) and within households (intra-household differences). The achieved sample size of the cross-sectional survey is large enough to allow that.

This only affects the sampling for the cross-sectional survey, as it was decided to follow up only one person per household for the objective study, for logistic reasons and to follow the methodology developed and employed by Basner in use in other aviation night-noise studies. Collecting objective sleep disturbance data simultaneously from more than one participant has not been tested.

The sampling of more than one person per household has implications for and is taken into account in the analysis. We are interested in discovering if various time-averaged and event-based noise metrics are associated with sleep disturbance and annoyance outcomes. We used regression analysis, but unlike traditional regression techniques, our data was not independent of each other for all of the individuals in our study. The data are dependent not only on household, as up to two individuals can participate per household, but are also dependent upon the airport around which the participant lives. This means that our data are clustered and hierarchical (see Figure 1).

Figure 1: Illustration of hierarchical/clustering of dataset by airport, household, and individual level



Multilevel modelling regression techniques will be used to take account of the clustered and hierarchical nature of the data. Failing to recognise the clustering within the data would lead to an underestimation of the standard errors, leading to an overstatement of

statistical significance and therefore increasing the likelihood of Type 1 error. This means that the data collected can vary for individuals and/or also by household. For example, income will vary by household, whereas attitudes to aviation will vary by individual, but may also be shared within households. The analysis needs to account for differences in data across individuals and households or it may overestimate the effect, as the links between household data will be ignored and given more weight in the analysis. Airport is another level by which the data could be linked, as certain operations or attitudes may be shared by individuals experiencing the same airport. Three level models will be used, with individual level outcome and covariates data at level 1 (individual), household level data and covariates at level 2, and airport at level 3.

2.8 Data governance

A Data Protection Impact Assessment (DPIA) was established for the project. The Department for Transport (DfT) are the data controller for the project, with the project partners (NatCen, St George's, University of London (SGUL)), Noise Consultants Limited (NCL) and the University of Pennsylvania (UPenn) each acting as a data processor for the project. The DPIA set out clear processes for the sharing of data with all project partners, including the non-UK project partner (UPenn), as well as for data storage and retention for the project. The DPIA was reviewed throughout the project.

The study was granted ethical approval by St George's, University of London Research Ethics Committee in August 2022 (REC Ref: 2022:0172).

3 Questionnaire content

The recommendations on survey design for aviation noise surveys, carried out by NatCen (NatCen, 2021), were reviewed as part of the questionnaire development. In relation to the assessment of noise annoyance, the report recommended:

- that the standardised annoyance measures recommended by the International Commission on Biological Effects of Noise (ICBEN) and ISO (ISO/TS15666:2021, 2021) are used;
- that the summer reference period (92-day metric) should be used rather than the ICBEN/ISO recommendation about annoyance over the past 12 months, as UK policy is based on reported annoyance over the summer period;
- that measures should assess annoyance in the morning and evening periods where more flights are allowed and for different periods of the night;
- that the 5-point annoyance scale question is used rather than the 11-point annoyance scale question, to enable comparison with SoNA 2014.

NatCen also recommended moving assessments of noise annoyance and sleep to a one-month reference period. However, this is incompatible with the requirement to assess noise and annoyance for the 92-day period relevant for UK policy.

ISO/TS15666: 2021 stipulates that the time-period for the noise metric (e.g., 92 days) has to match the time-period for which annoyance is assessed (e.g., 92 days, last 3 months).

For sociodemographic factors it was recommended that questions were included on:

- employment status
- income
- highest level of education
- caring responsibilities
- dwelling type
- tenure
- length of residence (also recommended in ISO/TS15666: 2021)
- occupation including whether participants work for the airport, whether household income is dependent on aviation or whether they have a job that may be affected by aviation noise
- shift work (for sleep disturbance)
- working from home

For other non-acoustic factors, it was recommended that questions were included on:

- home insulation
- local area
- attitudes towards noise in general (including experiences of non-aviation noise)
- attitudes towards the aviation industry
- other attitudes (mitigations and interventions)

It was also recommended that the short-form version of the Warwick Edinburgh Mental Wellbeing Scale (SWEMWBS) (NHS Health Scotland et al., 2008) was included to assess aviation noise effects on wellbeing.

For sleep, the report recommended a questionnaire approach and the inclusion of the Pittsburgh Sleep Quality Index, as well as questions about sleep disturbance at different times of the night.

This list of recommendations informed the survey content for the ANNE study and were included⁷. The survey asked participants about the “summer” period which was defined as mid-June to mid-September 2022 (the 92-day period of interest, aligned to summertime noise metrics). Established and standardised questions were used, where available, with questions selected to align with those used in SoNA 2014, previous UK national noise surveys and the FAA's National Sleep Study to ensure continuity and comparability where possible.

The full questionnaire can be found in Appendix B.

⁷ The survey was to be completed within 20 minutes, so it was decided to not include questions about the local area which have been used in previous surveys.

4 Data processing

As described in earlier sections, the data were collected from two sources: an online questionnaire and a paper questionnaire. The online questionnaire included some built-in routing and checks within it, whereas the paper questionnaire relied on correct navigation by participants and there was no constraint on the answers they could give.

In addition, the online data were available immediately in the office in their raw form, however the paper questionnaire data had to be scanned and keyed as part of a separate process. Tick box answers were captured by scanning; numbers and other verbatim answers were captured by keying. These data were delivered in batches every few days, and while there is potential for errors to be introduced during the data capture, quality assurance processes were in place to ensure the correct data were entered.

4.1 Data editing

Forced edits

The paper data were subject to errors introduced by participants when they did not follow instructions set out in the paper questionnaire. Many of these errors were dealt with through standard edit rules. Below are some examples of the edit rules:

- If a single code question had more than one category ticked, it was set to 'don't know'.
- For multi-code questions, if an exclusive option was coded alongside one or more multi-choice options, then the exclusive option was disregarded.
- If a participant answered outside of a numerical specified range, then the answer was blanked.

A full record is kept of the forced edits done on the data. These edits are done to improve the quality of the data and to make them more consistent and easier to analyse.

Online edits

Where clearly relevant, the Computer Assisted Web Interviewing program (CAWI) specified numerical ranges to ensure answers were sensible. These were for variables measuring the number of adults/children in the household and height and weight of the participant.

Data harmonisation

Up to 2 adults could respond per household, which meant it was possible that different participants would provide different information about the household. The following variables had to be harmonised:

- HHAdults
- HHChild
- Housing
- OutsideSPC

HHAdult, HHChild and OutsideSPC were harmonised using the following criteria:

- Take the answer of the oldest person
- If still required, take the answer of the first person number

Housing was harmonised using the following criteria:

- If 'owned outright' is given by one response, take this answer
- If 'being bought on a mortgage' is given by one response, take this
- If needed, take the answer of the oldest person
- If still required, take the answer of the first person number

4.2 Coding

Post-survey coding was undertaken by the NatCen Social Research Data Unit. The code frames were specified by the research team based on early returns to the survey. Frequently given responses that were not in the list of available answer options and not able to be back-coded were subsequently added to the code frames. The following variables were coded:

- Complained
- Ethnicity
- Gender
- Slpdisorder
- Sources

4.3 Data quality

With interview-based surveys we have confidence that almost all the data is collected in a controlled manner and from the right individual. With most self-completion survey methods, there is no interviewer to do this work so it must be accomplished via other methods. With that in mind a programme of post-fieldwork validation was implemented.

NatCen has developed a series of validation processes to either raise flags against cases (followed by a manual review of flagged cases) or apply automated removal of cases. These processes are based on the following indicators:

- Length of time to complete the online survey
- The number of questionnaires completed in each household
- Age and gender duplication
- Participant name duplication
- Email address duplication

In particular, the following steps were taken:

Survey length

Cases were removed according to the following process and criteria:

- For each page of the online survey, the median time that it people took to answer it was calculated.
- For each participant, their estimated total time to answer the questionnaire was calculated by adding the median times from all the questions that they answered.
- Then the ratio of their actual time to their estimated time was calculated.
- Statistical outliers were identified using the ratio of actual-to-estimated time and cases were removed on the following basis:
 - Upper and Lower Quartiles for the ratio variable (UQ, LQ) were calculated
 - Interquartile range was calculated: $IQR = UQ - LQ$
 - The lower outlier threshold was set at $LQ - (1.5 \times IQR)$, so anyone with a ratio below this was deemed an outlier and removed from the data.

Number of completed questionnaires

All instances where there were more than 2 completed questionnaires per household were limited to 2 cases using the following criteria:

- Online completes were prioritised over paper completes (assumed better data quality).

Duplicate cases

Cases were flagged for review if the following applied within any given household:

- Both age and gender were duplicated (this includes duplication of missing values) – if so, and either of the following criteria also applied, then a secondary flag was raised:
 - Email address was duplicated
 - Both first name and surname were duplicated

This approach was taken to help identify any valid duplications – e.g., a parent with the same name as their (adult) child, or two people with the same unisex first name.

Flagged cases were manually reviewed across the entire household to determine if they were causes for concern. Examples of causes for concern include if the only difference in name was a middle initial or if the only difference was in a shortening of a name. If a concern was identified, one case was deleted.

In total 115 cases⁸ were removed for quality control purposes, equivalent to 2.7% of the overall number of complete returns.

⁸ These were removed prior to the issuing of the final data set, where $n=4,183$.

5 Weighting

The motivation for weighting the ANNE study is to adjust the data to be representative of the adult population living around the airports of interest. Each of the weighting stages is introduced briefly in this section and described in detail in the following sections of this chapter.

The weighting for the ANNE study followed three steps:

1. Address selection weighting to correct for the unequal probabilities of selection by the 31 strata⁹ and to make the sample of addresses representative of all addresses in the sample frame. The detailed 31 strata can be found in Appendix D.
2. Non-response weighting to reduce any bias which may have been caused by systematic differences in the number of completed surveys (i.e., the number of responding adults) returned by participating households.
3. Calibration weighting to reduce any residual non-response bias at the individual level. This final stage sought to combine the results of the previous stages and then 'force' the profile of the final weighted sample to be in-line with the best available population estimates of the characteristics of residents exposed to aviation noise.

Stage 1: Address selection weights

During the sampling process, addresses were selected with equal probability within each of the strata. In other words, within strata, e.g. Bristol, any household had the same chance to be selected to participate in the survey. However, the sampling fractions varied by strata (because the number of addresses differed between strata and different numbers were sampled from each strata). Selection probability weights were therefore necessary to correct for the unequal probabilities of selection by strata, and to make the issued sample of addresses representative of all addresses in the sample frame. The address selection probability weights (wt1) for each address were calculated as the inverse of the address selection probability (p1). $wt1 = 1/p1$

Stage 2: Individual weights - within-household non-response weights

Differential response rates among individual adults within participating households may cause bias if the differential response is related to survey measures. For example, individual response rates may be lower in larger households, or may be higher in households with high night-time aviation noise annoyance, once household size (i.e., the number of adults in the household) has been controlled for.

Thus, this stage of the weighting aimed to reduce any bias which may have been caused by systematic differences in the number of completed surveys (i.e., the number of responding adults) per household. This additional weight was only calculated for

⁹ The strata were defined on the basis of airport and noise exposure bands.

participating households with more than one adult. For households with only one adult, a weight of one was assumed for this stage.

A logistic regression model was defined for all responding households with 2 or more adults. It was weighted by the weight from the previous stage: wt1.

The following household-level variables were included in the model: number of adults in the household, number of children in the household, household tenure, year the house was built, how long lived at address, and airport.

The outcome measure was whether one or two adults from that household completed the survey.

From this model, the expected number of completed surveys was estimated as one plus the model-predicted probability. The weight (wt2) was calculated as the inverse of this expected number multiplied by the number of eligible adults in the household.

A composite weight for address/household level participation (wt3) was calculated as the product of the weights from the previous stages ($wt3 = wt1 \times wt2$).

Stage 3: Individual calibration

The final stage of the weighting aims to reduce any residual non-response bias at the individual level using calibration weighting. Calibration adjusts the weights so that characteristics of the weighted achieved sample match population estimates.

The composite (household-level) weight from the previous stages (wt3) was calibrated so that the weighted achieved sample (weighted by the final weight) matched the population estimates for age by sex within strata.

In order to calibrate the sample to population totals for age by sex in each strata, some strata have to be grouped due to small cell sizes. Usually, each cell in the calibration weighting would have 30-50 cases. 17 of the 31 strata used for sampling achieved <30 responses and, when breaking these down by age and sex, cell sizes would be too small for calibration.

Therefore, strata were grouped based on noise band as follows:

1. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton: 60+dB
2. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton: 58-59.9dB
3. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 56-57.9dB
4. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 54-55.9dB
5. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 52-53.9dB
6. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 50-51.9dB

7. Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 48-49.9dB
8. East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow: 46-47.9dB
9. Heathrow, Stansted, Luton, Glasgow: 44-45.9dB
10. Bristol (35-47.9 dB), East Midlands, Gatwick, Manchester (35-45.9dB), Heathrow, Stansted, Luton, Glasgow (35-43.9dB)

The calibration weights were scaled to the total responding sample size across strata (ANNE_wt) and these weights should be used for analysing the whole sample.

The calibration weights were then re-scaled to the effective sample size in each of the ten grouped strata and these are the weights to be used for individual strata analysis (ANNE_wt_sc).

Please note strata 10 combines three noise bands. This is because Bristol was the only airport with a noise band of 35-47.9dB and the three airports with a noise band of 35-45.9dB (East Midlands, London Gatwick, Manchester) achieved 176 responses in total. To match the population exactly in terms of age by sex strata 10 would have to be analysed together. Analysing this strata separately is still possible but will likely introduce a small degree of bias in the age sex profile for East Midlands, London Gatwick, Manchester (35-45.9dB). Analysis for Bristol (35-47.9dB) alone would be difficult with only 20 achieved so we would not recommend this.

Defining a population exposed to aviation noise is challenging, as aircraft patterns do not follow administrative boundaries. The possibility of calibrating by ethnicity was explored, however, our recommendation was not to calibrate due to issues with the reliability of the ethnicity data. Firstly, due to the low-level geography of this sample, population estimates for adults on these measures are difficult to find. Normally the Labour Force Survey would be used for ethnicity estimates; however, this only goes down to GOR (region) (Government Offices for the Region) level. Secondly, Census 2021 ethnicity data for England & Wales population aged 18+ was incomplete at the time because a small percentage of LSOAs (Lower Super Output Areas) in the sample frame did not release ethnicity data. Finally, calibrating to ethnicity would have required the use of Census 2011 ethnicity counts (Census 2021 data was not available at the time) for population aged 0+ in Scotland. Scottish data are available for too wide age groups, so age 18+ cannot be estimated (this is to protect individuals). To use these figures, we would have had to scale the numbers down to account for people aged 18+ only, and then scale them up to account for an estimated increase in population between 2011-2021.

Therefore, only calibration to age by sex was feasible for this survey. This is not unusual for surveys which use administrative boundaries in sampling and is in line with what is done on similar surveys.

6 Appendix A: Airport data to inform purposive selection

Table 4: Airport data used to inform purposive selection for the ANNE subjective study

CODE	Airport	Operational Data		Reported Data for 2016			Other Studies?		Restrictions?		General Context	
		Movements 2016/17 ¹	Air Freight Handled 2016 (tons)	>50 L _{night}	>48 L _{night}	>51 L _{night}	In SONA14	In CAP1731	Has Night Restrictions	Subject to DfT Night-time Restrictions	Surroundings (West)	Surroundings (East)
EGLL	London Heathrow Airport	474,963	1541	221,200 ²			Yes	Yes	Yes	Yes	Rural / Suburban	City
EGCC	Manchester Airport	192,293	110		74,700 ³	34,800 ³	Yes	Yes	Yes		Rural / Suburban	City / Suburban
EGPF	Glasgow Airport	98,127	11		41,500 ¹⁶	17,300 ¹⁶		Yes			Rural / Urban	City / Suburban
EGBB	Birmingham International Airport	113,184	30		42,100 ¹³	20,000 ¹³	Yes	Yes	Yes		City / Suburban	Rural
EGNX	East Midlands Airport	73,689	300		14,600 ⁴	5,600 ⁴	Yes		Yes		Rural / Suburban	Rural / Suburban
EGKK	London Gatwick Airport	280,666	80		9,000 ⁵	2,800 ⁵	Yes	Yes	Yes	Yes	Rural / Suburban	Rural / Suburban
EGNM	Leeds Bradford International Airport	44,304	<10		11,400 ⁶	3400 ⁶			Yes		City / Suburban	Rural
EGSS	London Stansted Airport	180,430	223		6,300 ⁷	3,000 ⁷	Yes	Yes	Yes	Yes	Rural / Suburban	Rural
EGGW	London Luton Airport	128,519	25		11,800 ⁸	5,900 ⁸	Yes	Yes	Yes		City centre/Rural	Rural
EGNT	Newcastle International Airport	56,263	<10	1,900 ⁹			Yes				Rural / Suburban	Rural / Suburban
EGGD	Bristol Airport	73,536	<10		2,300 ¹⁰	1,200 ¹⁰			Yes		Rural	Rural / Suburban

EGPH	Edinburgh Airport	122,220	20	4,200 ¹¹				Yes			Rural / Suburban	Rural / City
EGAA	Belfast International Airport	55,155	32	735 ¹²							Urban	Suburban
EGLC	London City Airport	85,169	<10		5,200 ¹⁴	2,000 ¹⁴	Yes		Significant noise related night restrictions		City	City
EGPD	Aberdeen Airport	96,156	<10	4,700 ¹⁵							Urban / Rural	Suburban / Rural
EGPN	Dundee Airport	36,730	<10	1,000 ¹⁷							River / Suburban	River / Suburban
EGGP	Liverpool John Lennon Airport	62,441	<10		3,300 ¹⁸	1,400 ¹⁸			Yes		River / Suburban	Rural / Suburban
EGHH	Bournemouth Airport	36,922	<10		< 100 ¹⁹	< 100 ¹⁹					Suburban	Rural / Suburban
EGHI	Southampton Airport	42,824	<10	0	0 ²⁰	0 ²⁰			Yes		Rural / Suburban	Rural / Suburban
EGNH	Blackpool International Airport	33,749	<10	#N/A							Suburban/ Seaside	Rural / Suburban

1 – data obtained from <https://www.caa.co.uk/Documents/Download/3968/e9d465f7-f3da-4daa-9bf0-205785ab7523/448>

2 – data obtained from https://www.heathrow.com/content/dam/heathrow/web/common/documents/company/local-community/noise/making-heathrow-quieter/noise-action-plan/Noise_Action_Plan_2019-2023.pdf

3 – data obtained from <http://mag-umbraco-media-live.s3.amazonaws.com/6203450/manchester-airport-noise-action-plan-2019-2023-supplmenetary-information.pdf>

4 – data obtained from <https://live-webadmin-media.s3.amazonaws.com/media/5942/ema-nap-supplementary-information-final-publish.pdf>

5 – data obtained from <https://www.gatwickairport.com/globalassets/business--community/new-sub-category-landing-pages/aircraft-noise--airspace/fpt-reports/gal-end-noise-action-plan-2019-2024-lr.pdf>

6 – data obtained from https://lba-production.s3-eu-west-1.amazonaws.com/Help/PDFs-Help/Noise-PDFs/noise-action-plan_2019_2023_formally-adopted-by-defra-on-11.02.19.pdf

7 – data obtained from https://live-webadmin-media.s3.amazonaws.com/media/6013/stn-nap-supplementary-information_lr-5319.pdf

8 – data obtained from <https://www.london-luton.co.uk/LondonLuton/files/b5/b53019bb-a021-43c1-bf07-620048371966.pdf>

9 – data obtained from <https://www.newcastleairport.com/media/2642/noise-action-plan-lr.pdf>

10 – data obtained from <https://www.bristolairport.co.uk/about-us/environment/aircraft-noise>

11 – data obtained from https://nap.edinburghairport.com/assets/documents/NAP_Consultation_Book.pdf

- 12 – data obtained from <https://www.daera-ni.gov.uk/sites/default/files/publications/doe/final-belfast-international-airport-noise-action-plan-round-2.PDF>
- 13 – data obtained from <https://www.birminghamairport.co.uk/media/5325/noise-action-plan-2019-2023-adopted-by-defra-110219.pdf>
- 14 – data obtained from https://assets.ctfassets.net/ggj4kbqgcch2/5OvmkWej5kwQopprH5T90P/995d6f59b252e1df2c92318e656c69bf/LCY_Noise_Action_Plan_2018-2023.pdf
- 15 – data obtained from <https://www.aberdeenairport.com/media/uacsljpa/final-noise-action-plan-2018-compressed.pdf>
- 16 – data obtained from <https://www.glasgowairport.com/media/2492/gla-noise-action-plane-25-oct-2018.pdf>
- 17 – data obtained from <https://www.gov.scot/binaries/content/documents/govscot/publications/strategy-plan/2014/07/dundee-airport-noise-action-plan/documents/00456794-pdf/00456794-pdf/govscot%3Adocument/00456794.pdf>
- 18 – data obtained from <https://www.liverpoolairport.com/media/3430/ljla-noise-action-plan-2017.pdf>
- 19 – data obtained from <https://www.bournemouthairport.com/content/uploads/Attachment-to-Minutes-Noise-Action-Plan-Review-2018.pdf>
- 20 – data obtained from https://www.southamptonairport.com/media/gepdpdjh/sial_noise_action_plan_2018_2023.pdf

7 Appendix B: Questionnaire

Introduction

TS1: [SET TIME STAMP HERE]

ASK ALL

INTRO

Dear Participant, welcome to this national survey that will ask for your views on your local environment, any issues you have and how these might impact your life.

The survey is funded by the Department for Transport who will use the study findings to help inform key policy decisions.

The survey should take you around 20 minutes to complete. You don't have to complete the whole survey in one go – any progress you make will be saved and you can start where you left off when you next log in.

Please confirm that you have received and read the invitation letter and are happy to take part.

ANALYSIS:"Consent"

1. I have read the invitation letter and I'm happy to take part
2. I have not read the invitation letter and/or I do not want to take part

IF INTRO = 2

CONSENTCHK

Please ensure that you have read the invitation letter and are happy to take part. If you have lost the invitation letter, you can read about the study on this website:

naten.ac.uk/ANNESurvey

ANALYSIS:"No consent"

1. Go back to change your answer [GoTo INTRO]
2. Exit the questionnaire - NCOOutcome = 440 (refusal). Make ConsentChk empty after NCOOutcome = 40.

NO DK/NO REF

IF CONSENTSHK = 2

Thanks for thinking about taking part. If you change your mind you can log back in and take part another time.

{DISPLAY}

Aircraft noise annoyance during the night-time period and shoulder hours

TS2: [SET TIME STAMP HERE]

{ASK ALL}

AnnoyIntro

Now some questions about your local environment.

{DISPLAY}

{ASK ALL}

NEIGHBOURHOOD {Q1}

On the whole, how much do you like living in this neighbourhood? Please provide your answer on a scale of 1 to 7, where 1 equals 'definitely like' and 7 equals 'definitely don't like'.

ANALYSIS: "Neighbourhood"

- 1 Definitely like
- 2
- 3
- 4
- 5
- 6
- 7 Definitely don't like

{ASK ALL}

SOURCES {Q2}

Which of the noise sources listed below particularly **bother, disturb or annoy** you during the night **(11pm to 7am)**.

G_Multi_II1 "Multicode instructions"

ANALYSIS: "Noise sources during the night"

- 1 Road traffic noise
- 2 Aircraft, airports, and airfields
- 3 Trains or railway stations
- 4 Building, construction, demolition, renovation or roadworks
- 5 Neighbours (inside their homes)
- 6 Neighbours (outside their homes)
- 7 Entertainment, leisure or sports facilities
- 8 Industrial sites
- 9 Other – please describe
- 10 None of the above [EXCLUSIVE]

{ASK ALL}

Intro1

The following questions are specifically about your experiences during **this summer**. By this we mean the period from mid-June to mid-September 2022.

{DISPLAY}

{ASK ALL}

ANNOYNIGHTRD {Q3}

Thinking about **this summer**, when you were here at home, how much does noise from road traffic **bother, disturb or annoy** you during the night **(11pm to 7am)**?

ANALYSIS: "Road traffic noise annoyance"

- 1 Not at all
- 2 Slightly
- 3 Moderately

- 4 Very
- 5 Extremely

HELP: What do we mean by “this summer?": “We mean the period from mid-June to mid-September 2022.”

{ASK ALL}

Intro2

The next few questions ask about aircraft, airports or airfields.

Please only think about commercial airlines and light aircraft. Do **not** include helicopters, military aircraft, hot air balloons, people or vehicles coming or going from airports or airfields.

{DISPLAY}

{ASK ALL}

ANNOYNIGHTSUMMER {Q4}

Thinking about ** this summer**, when you were here at home, how much does noise from aircraft, airports or airfields **bother, disturb or annoy** you during the night ** (11pm to 7am) **?

ANALYSIS: "Annoyance past 3 months: 11pm to 7am"

- 1 Not at all
- 2 Slightly
- 3 Moderately
- 4 Very
- 5 Extremely

HELP: What do we mean by “this summer?": “We mean the period from mid-June to mid-September 2022.”

{ASK ALL}

ANNOYNIGHTSUMMERSCALE {Q5}

This next question uses a 0 to 10 opinion scale for how much aircraft, airport or airfield noise **bothers, disturbs or annoys** you when you are here at home. If you are not annoyed choose 0; if you are extremely annoyed choose 10; if you are somewhere in between choose a number between 0 and 10.

Thinking about **this summer**, when you were here at home, what number from 0 to 10 best shows how much you were **bothered, annoyed or disturbed** by noise from aircraft, airports or airfields during the night **(11pm to 7am)**?

0 – Not at all 10 – Extremely

HELP: What do we mean by “this summer?": “We mean the period from mid-June to mid-September 2022.”

ANNOYTIMESUMMERA {Q6}

Thinking about ** this summer**, when you were here at home, how much does noise from aircraft, airports or airfields **bother, disturb or annoy** you during these times?

{G_Collapsible_Grid_II1}

ANALYSIS: "Time of aviation noise annoyance 3 months"

GRID ROWS:

- Not at all
- Slightly
- Moderately
- Very
- Extremely

GRID COLS:

1. 9pm-10pm
2. 10pm-11pm
3. 11pm-12am
4. 12am-1am
5. 1am-2am
6. 2am-3am
7. 3am-4am
8. 4am-5am
9. 5am-6am
10. 6am-7am
11. 7am-8am

VARNAME1: ANNOYA9_10
 VARNAME2: ANNOYA10_11
 VARNAME3: ANNOYA11_12
 VARNAME4: ANNOYA12_1
 VARNAME5: ANNOYA1_2
 VARNAME6: ANNOYA2_3
 VARNAME7: ANNOYA3_4
 VARNAME8: ANNOYA4_5
 VARNAME9: ANNOYA5_6
 VARNAME10: ANNOYA6_7
 VARNAME11: ANNOYA7_8

	9pm-10pm	10pm-11pm	11pm-12am	12am-1am	1am-2am	2am-3am	3am-4am	4am-5am	5am-6am	6am-7am	7am-8am
Not at all											
Slightly											
Moderately											
Very											
Extremely											

HELP: What do we mean by “this summer?”: “We mean the period from mid-June to mid-September 2022.”

Subjective sleep disturbance

TS3: [SET TIME STAMP HERE]

{ASK ALL}

HealthIntro

Now some questions about your health.

{DISPLAY}

{ASK ALL}

Health {Q7}

How is your health in general?

Would you say it is ...

ANALYSIS: "General health"

1. Very good
2. Good
3. Fair
4. Bad
5. Very bad

{ASK ALL}

PSQI1 {Q8}

During the past month or so, how would you rate your sleep quality overall?

ANALYSIS: "Sleep quality"

- 1 Very good
- 2 Fairly good
- 3 Neither good nor bad
- 4 Fairly bad
- 5 Very bad

{ASK ALL}

MEDICINE {Q9}

During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?

ANALYSIS: "Sleep medication"

- 1 Not during the past month
- 2 Less than once a week
- 3 Once or twice a week
- 4 Three or more times a week

{ASK ALL}

SLPDISORDER {Q10}

Have you ever been diagnosed by a health professional with any of the following sleep disorders?

{G_Multi_II1}

ANALYSIS: "Sleep disorder"

- 1 Sleep apnoea
- 2 Narcolepsy
- 3 Restless leg syndrome
- 4 Periodic limb movement syndrome
- 5 Insomnia

- 6 Other (please specify)
- 7 None of the above [EXCLUSIVE]

{ASK ALL}
CONDITIONS {Q11}

Have you ever been diagnosed by a health professional with any of the following conditions?

{G_Multi_II1}
ANALYSIS: "Health condition"

- 1 Hypertension / high blood pressure
- 2 Arrhythmia / irregular heartbeat
- 3 Heart disease
- 4 Diabetes
- 5 Cancer
- 6 None of the above [EXCLUSIVE]

{ASK ALL}
CARING {Q12}

Is there someone living in your home that frequently requires your care during the night?

ANALYSIS: "Care during night"

- 1 Yes
- 2 No

{ASK ALL}
FALLASLEEP {Q13}

During the **past month, how long (in minutes) has it usually taken you to fall asleep each night?**

ANALYSIS: "How long to fall asleep"

0...999 Minutes

{ASK ALL}
SLEEPDURATION {Q14}

During the **past month, how many hours of actual sleep did you get at night (this may be different than the number of hours you spent in bed)?**

Please answer in hours and minutes, for example, if you got 90 minutes of actual sleep at night that would be 1 hour 30 minutes.

ANALYSIS: "Hours of sleep"

0...24 Hours
0...59 Minutes of sleep per night

{ASK ALL}
WAKE {Q15}

During the **past month, how often did you wake up during the night?**

Please enter the number of times per night.

ANALYSIS: "How often wake during night"

OPEN

Range: 0...99 times per night

{ASK ALL}

WINDOWSWARM {Q16}

In warmer seasons, do you usually sleep with the windows....

ANALYSIS: "Warmer seasons, sleep with windows..."

- 1 Closed
- 2 Partially open
- 3 Completely open
- 4 Sleep in room with no windows

{ASK ALL}

WINDOWSCOLD {Q17}

In colder seasons, do you usually sleep with the windows....

ANALYSIS: "Colder seasons, sleep with windows..."

- 1 Closed
- 2 Partially open
- 3 Completely open
- 4 Sleep in room with no windows

{ASK ALL}

WINDOW {Q18}

What kind of windows do you have in the room where you sleep?

{G_Multi_II1}

ANALYSIS: "Windows in bedroom"

- 1 Openable – single glazed
- 2 Openable – secondary glazed
- 3 Openable – double glazed
- 4 Openable – triple glazed
- 5 Openable – acoustic glazed
- 6 Openable – don't know glazing [Cannot be answered with 1, 2 3,4]
- 7 Non-openable – single glazed
- 8 Non-openable – secondary glazed
- 9 Non-openable – double glazed
- 10 Non-openable – triple glazed
- 11 Non-openable – acoustic glazed
- 12 Non-openable – don't know glazing [Cannot be answered with 7, 8, 9, 10, 11]
- 13 Sleep in room with no windows [EXCLUSIVE]

{ASK ALL}

SLEEPDISTURB {Q19}

Thinking about ** this summer**, when you were here at home, how much does noise from aircraft, airports or airfields **disturb your sleep** during the night ** (11pm to 7am) **?

ANALYSIS: "Aviation noise sleep disturbance 11pm to 7am 12 months"

- 1 Not at all
- 2 Slightly

- 3 Moderately
- 4 Very
- 5 Extremely

HELP: What do we mean by “this summer?”: “We mean the period from mid-June to mid-September 2022.”

SLEEPTIMEA {Q20}

Thinking about **this summer** , when you were here at home, how much does noise from aircraft, airports or airfields disturb your sleep during these times?

{G_Collapsible_Grid_II1}

ANALYSIS: " Time of aviation noise sleep disturbance 12 months"

GRID ROWS:

- Not at all
- Slightly
- Moderately
- Very
- Extremely
- Do not usually sleep during this time

GRID COLS:

1. 9pm-10pm
2. 10pm-11pm
3. 11pm-12am
4. 12am-1am
5. 1am-2am
6. 2am-3am
7. 3am-4am
8. 4am-5am
9. 5am-6am
10. 6am-7am
11. 7am-8am

- VARNAME1: SLEEPA9_10
- VARNAME2: SLEEPA10_11
- VARNAME3: SLEEPA11_12
- VARNAME4: SLEEPA12_1
- VARNAME5: SLEEPA1_2
- VARNAME6: SLEEPA2_3
- VARNAME7: SLEEPA3_4
- VARNAME8: SLEEPA4_5
- VARNAME9: SLEEPA5_6
- VARNAME10: SLEEPA6_7
- VARNAME11: SLEEPA7_8

	9pm-10pm	10pm-11pm	11pm-12am	12am-1am	1am-2am	2am-3am	3am-4am	4am-5am	5am-6am	6am-7am	7am-8am
Not at all											
Slightly											

Moderately											
Very											
Extremely											
Do not usually sleep during this time											

HELP: What do we mean by “this summer?": “We mean the period from mid-June to mid-September 2022.”

{ASK ALL}

SLEPPATTERNTIME {Q21}

Does noise from aircraft, airfields or airports interfere with your sleeping patterns such as the time you go to bed or get up?

ANALYSIS: "Aviation noise interfere with sleeping pattern"

- 1 Yes
- 2 No

{ASK ALL}

SLEPPATTERNWIN {Q22}

Does noise from aircraft, airfields or airports interfere with sleeping with your windows open?

ANALYSIS: "Aviation noise interfere with windows open"

- 1 Yes
- 2 No
- 3 Sleep in room with no windows

Health status

TS4: [SET TIME STAMP HERE]

{ASK ALL}

WellIntro

You will now read some statements about feelings and thoughts.

Please choose the option that best describes your experience of each over the **last 2 weeks**.

{DISPLAY}

{ASK ALL}

WELLBEING1 {Q23}

(Over the **last 2 weeks**) I've been feeling optimistic about the future.

ANALYSIS: "Feeling optimistic"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

{ASK ALL}

WELLBEING2 {Q24}

(Over the **last 2 weeks**) I've been feeling useful.

ANALYSIS: "Feeling useful"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

{ASK ALL}

WELLBEING3 {Q25}

(Over the **last 2 weeks**) I've been feeling relaxed.

ANALYSIS: "Feeling relaxed"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

{ASK ALL}

WELLBEING4 {Q26}

(Over the **last 2 weeks**) I've been dealing with problems well.

ANALYSIS: "Dealing with problems well"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

{ASK ALL}

WELLBEING5 {Q27}

(Over the **last 2 weeks**) I've been thinking clearly.

ANALYSIS: "Thinking clearly"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

{ASK ALL}

WELLBEING6 {Q28}

(Over the **last 2 weeks**) I've been feeling close to other people.

ANALYSIS: "Close to other people"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often

5 All of the time

{ASK ALL}

WELLBEING7 {Q29}

(Over the **last 2 weeks**) I've been able to make up my own mind about things.

ANALYSIS: "Make up own mind"

- 1 None of the time
- 2 Rarely
- 3 Some of the time
- 4 Often
- 5 All of the time

Non-acoustic factors

TS5: [SET TIME STAMP HERE]

{ASK ALL}

ATTITUDE {Q30}

To what extent do you agree or disagree with the following statements?

{G_Collapsible_Grid_II1}

ANALYSIS: "Attitudes"

GRID ROWS:

- 1 Noise from aeroplanes is bad for the health of myself or my household
- 2 Noise from aeroplanes is bad for children’s education at the local schools
- 3 Noise from aeroplanes makes my home less valuable
- 4 Having an airport in the area is good for the local economy
- 5 I worry about plane crashes around here

- 6 Having an airport in the area makes my home more valuable
- 7 It is convenient to have an airport in the area
- 8 Air travel harms the environment
- 9 I like flying
- 10 Having an airport in the area makes my home less valuable
- 11 I worry about more land being taken over by the airport
- 12 I like watching the aeroplanes.

GRID COLS:

- 1. Strongly disagree
- 2. Disagree
- 3. Not sure
- 4. Agree
- 5. Strongly agree

VARNAME1: Attitude1_health “Aviation noise bad for health”
 VARNAME2: Attitude2_edu “Aviation noise bad for child education”
 VARNAME5: Attitude5_avndec “Aviation noise decreases home
 VARNAME3: Attitude3_eco “Airport good for economy”
 VARNAME4: Attitude4_crash “Worry about plane crashes”
 VARNAME7: Attitude7_airinc “Airport increases home value”
 VARNAME8: Attitude8_conv “Airport convenient”
 VARNAME9: Attitude9_harms “Air travel harms environment”
 VARNAME10: Attitude10_fly “Like flying”
 VARNAME6: Attitude6_airdec “Airport decreases home value”
 VARNAME11: Attitude11_worry “Worry about land for airport”
 VARNAME12: Attitude12_watch “Like watching aeroplanes”

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Noise from aeroplanes is bad for the health of myself or my household					

Noise from aeroplanes is bad for children's education at the local schools					
Noise from aeroplanes makes my home less valuable					
Having an airport in the area is good for the local economy					
I worry about plane crashes around here					
Having an airport in the area makes my home more valuable					
It is convenient to have an airport in the area					
Air travel harms the environment					
I like flying					
Having an airport in the area makes my home less valuable					
I worry about more land being taken over by the airport					
I like watching the aeroplanes.					

{ASK ALL}

FLYING {Q31}

When was the last time you flew from a UK airport?

ANALYSIS: "Last flow from UK airport"

- 1 Within the last 12 months
- 2 Longer than 1 year ago, up to 2 years ago
- 3 Longer than 2 years ago, up to 4 years ago
- 4 Longer than 4 years ago, up to 10 years ago
- 5 More than 10 years ago
- 6 Never

IF FLYING=1 Within the last 12 months

FLYING12MTHS {Q32}

How many trips by air have you made in the **last 12 months**?

Please count outward and return flights and any transfers as one trip. If you are not sure then your best estimate is fine.

ANALYSIS: "How many flights last 12 months"

- 1 1
- 2 2
- 3 3
- 4 4
- 5 5
- 6 Over 5

{ASK ALL}

COPING {Q33}

Which of these things, if any, have you or anyone else in your household done about the noise from aircraft, airfields and airports during the night-time **(11pm to 7am)** within the **last 12 months**?

{G_Multi_II1}

ANALYSIS: "Coping with noise from aircraft"

- 1 Made our own noise (e.g. playing music/white noise) so that we could not hear the noise
- 2 Used earplugs or headphones to avoid hearing the noise
- 3 Keep windows closed
- 4 Started, signed or participated in a campaign, protest or petition
- 5 Took advice, e.g., from Citizen's Advice Bureau, another advice or Legal organisation
- 6 Slept in a different room in the home
- 7 Installed secondary, double, triple or acoustic glazing
- 8 None of the above [EXCLUSIVE]

{ASK ALL}

COMPLAINED {Q34}

Did you complain, write or speak to any of the following about the noise from aircraft, airfields and airports during the night-time ** (11pm to 7am) within the **last 12 months?****

{G_Multi_II1}

ANALYSIS: "Complain about noise from aircraft"

- 1 An airport, airport owner, airport operator or airport consultative committee
- 2 One or more airlines
- 3 The Civil Aviation Authority
- 4 A newspaper or TV/Radio Station
- 5 A resident's association
- 6 The Environmental Health Department in the Local Authority (Council)
- 7 Another Local Authority (Council) Department
- 8 A government department
- 9 The police
- 10 A councillor
- 11 A Member of Parliament
- 12 Other (please write in)
- 13 None of the above [EXCLUSIVE]

{ASK ALL}

INSULATION {Q35}

Has your home had any of the following changes made to it as part of a **noise insulation scheme** run by an airport?

{G_Multi_II1}

ANALYSIS: "Home insulation"

1. Double, or triple glazing
2. Secondary glazing
3. Acoustic glazing
4. Insulation for roofs, lofts, doors or windows
5. Changes to the walls (e.g. soundproofing)
6. Changes to the ceiling (e.g. overboarding/soundproofing)
7. Replacement external doors
8. Ventilation units (to allow fresh air into your home without opening windows and doors)
9. Other

10. No changes have been made to my home as part of a noise insulation scheme run by an airport [EXCLUSIVE]
11. Don't know

Sociodemographic and household factors

TS6: [SET TIME STAMP HERE]

{ASK ALL}

HHINTRO

The next questions are about you and your household.

{DISPLAY}

{ASK ALL}

AGE {Q36}

Which of these age groups are you in?

ANALYSIS: "Age groups"

- 1 18-19 years
- 2 20-24 years
- 3 25-34 years
- 4 35-44 years
- 5 45-54 years
- 6 55-64 years
- 7 65-74 years
- 8 75 years or older

{ASK ALL}

SEX {Q37}

At birth, were you described as...

ANALYSIS: "Respondent sex"

- 1 Male
- 2 Female

{ASK ALL}

GENDER {Q38}

Which of the following options describes how you think of yourself? As a...

ANALYSIS: "Gender identity"

- 1 Man/boy
- 2 Woman/girl
- 3 In another way (please describe)

{ASK ALL}

ETHNICITY {Q39}

What is your ethnic group?

Choose one option that best describes your ethnic group or background.

ANALYSIS: "Ethnicity"

- 1 White – English/Welsh/Scottish/Northern Irish/British
- 2 White – Irish
- 3 White – Gypsy or Irish Traveller
- 4 White - Roma
- 5 Any other white background (please describe)

Mixed/multiple ethnic groups:

- 6 White and Black Caribbean
- 7 White and Black African
- 8 White and Asian
- 9 Any other Mixed/Multiple ethnic background (please describe)

Asian or Asian British:

- 10 Indian
- 11 Pakistani
- 12 Bangladeshi
- 13 Chinese
- 14 Any other Asian background (please describe)

Black/African/Caribbean/Black British

- 15 African
- 16 Caribbean
- 17 Any other Black/Black British/African or Caribbean background (please describe)

Other ethnic group

- 18 Arab
- 19 Latin American
- 20 Any other ethnic group (please describe)

{ASK ALL}

HOUSING {Q40}

Which of these applies to your home?

ANALYSIS: "Tenure"

- 1 Being bought on a mortgage
- 2 Owned outright by household
- 3 Rented from local authority
- 4 Rented from housing association
- 5 Rented from a private landlord
- 6 Shared ownership
- 7 Tied to employment
- 8 Other

{ASK ALL}

HHADULTS {Q41}

How many adults, apart from yourself, aged 18 and over are there in your household?

ANALYSIS: "Number of adults 18+ in household"

0...99 Adults aged 18+

{ASK ALL}

HHCHILD {Q42}

How many children aged under 18 are there in your household?

ANALYSIS: "Number of children in household"

0...99 Children aged 0 to 17

{ASK ALL}

HEIGHT {Q43}

What is your height?

Would you like to write this in metres or in feet and inches?

ANALYSIS: "Height"

- 1 Metres
- 2 Feet and inches
- 3 Don't know
- 4 Prefer not to say

IF HEIGHT = 1 Metres

HEIGHTM {Q44}

Please record your height in metres and centimeters e.g. if you are 1 meter 50 centimetres tall, please record 1.50.

ANALYSIS: "Height metres"

0.01..2.44

IF HEIGHT = 2 Feet and inches

HEIGHTFT {Q45}

Please record your height in feet and inches.

First enter the number of feet.

ANALYSIS: "Height feet"

0..7

IF HEIGHT = 2 Feet and inches

HEIGHTINCH {Q45}

Now enter the number of inches.

ANALYSIS: "Height inches"

0..11

{ASK ALL}

WEIGHT {Q46}

What is your weight?

Would you like to write this in kilograms or in stones and pounds?

ANALYSIS: "Weight"

- 1 Kilograms
- 2 Stones and pounds
- 3 Don't know
- 4 Prefer not to say

IF WEIGHT = 1 Kilograms

WEIGHTKG {Q47}

Please record your weight in kilograms.

ANALYSIS: "Weight in Kg"

1.0..201.0

IF WEIGHT = 2 Stones and pounds

WEIGHTST {Q48}

Please record your weight in stones and pounds.

First enter the number of stones.

ANALYSIS: "Weight in stones"

1..32

IF WEIGHT = 2 Stones and pounds

WEIGHTSP {Q48}

Please record your weight in stones and pounds.
Now enter the number of pounds.
ANALYSIS: "Weight in pounds"

0..13

{ASK ALL}

HEARING {Q49}

Do you have any problems or difficulties with your sense of hearing?
This could include conditions that may affect your ability to hear e.g. tinnitus, an ear infection.
ANALYSIS: "Hearing problems"

- 1 Yes
- 2 No

{ASK ALL}

NOISESENSITIVITY {Q50}

How sensitive would you say you are to noise? Please provide your answer on a scale of 1 to 7, where 1 equals 'not at all sensitive' and 7 equals 'very sensitive'.
ANALYSIS: "Sensitive to noise"

- 1 Not at all sensitive
- 2
- 3
- 4
- 5
- 6
- 7 Very sensitive

{ASK ALL}

WORK {Q51}

Which of these best describes your current situation?
ANALYSIS: "Economic activity"

- 1 Working full time (30 hours a week or more)
- 2 Working part time
- 3 Unemployed and looking for work
- 4 Retired from paid work altogether
- 5 In full-time education
- 6 Looking after the home or family
- 7 Something else

IF WORK = 1 Working full time OR 2 Working part time

WORKHOME {Q52}

Do you ever work from home?
ANALYSIS: "Work from home"

- 1 Yes
- 2 No

IF WORK = 1 Working full time OR 2 Working part time

NIGHTSHIFT {Q53}

Does your job require overnight shift work?

Overnight shift work refers to work for at least 4 hours between 00:00 midnight to 06:00 am in the morning.

ANALYSIS: "Job requires overnight shift work"

- 1 Yes
- 2 No

{ASK ALL}

INTROJOB

The following questions refer to your current main job, or if you are not working now to your last main job.

{DISPLAY}

{ASK ALL}

EMPSTAT {Q54}

Do (did) you work as an employee or are (were) you self-employed?

ANALYSIS: "Employee or self-employed"

- 1 Employee
- 2 Self-employed with employees
- 3 Self-employed or freelance without employees
- 4 I have never had a job

EMPLOY {Q55}

IF EMPSTAT = 1 Employee: How many people work (worked) for your employer at the place where you work (worked)?

IF EMPSTAT = 2 Self-employed with employees: How many people do (did) you employ?

ANALYSIS: "Number of people work for employer/employ"

- 1 1 to 24
- 2 25 or more

IF EMPSTAT = 1 Employee OR 2 Self-employed with employees

SUPERVISE {Q56}

Do (did) you supervise any other employees? (A supervisor or foreman is responsible for overseeing the work of other employees on a day-to-day basis).

ANALYSIS: "Whether supervise employees"

- 1 Yes
- 2 No

IF EMPSTAT = 1 Employee OR 2 Self-employed with employees OR 3 Self-employed or freelance without employees

OCCUPATION {Q57}

Which of the following best describes the sort of work you do in your current job? If you are not working now, please select which best described what you did in your last job.

ANALYSIS: "Occupation"

- 1 **Modern professional occupations** such as: teacher, nurse, physiotherapist, social worker, welfare officer, artist, musician, police officer (sergeant or above) or software designer
- 2 **Clerical and intermediate occupations** such as: secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxiliary or nursery nurse

- 3 **Senior managers or administrators** (usually responsible for planning, organising and co-ordinating work, and for finance) such as: finance manager or chief executive
- 4 **Technical and craft occupations** such as: motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener or train driver
- 5 **Semi-routine manual and service occupations** such as: postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist or sales assistant
- 6 **Routine manual and service occupations** such as: HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter/waitress or bar staff
- 7 **Middle or junior managers** such as: office manager, retail manager, bank manager, restaurant manager, warehouse manager or publican
- 8 **Traditional professional occupations** such as: accountant, solicitor, medical practitioner, scientist or civil/mechanical engineer

IF EMPSTAT <= 4 I have never had a job

WORKAIR {Q58}

Do you currently have work, or have you ever worked, in any of these kinds of employment?

{G_Multi_II1}

ANALYSIS: "Ever worked at airport/airline"

- 1 Working for an airport
- 2 Working for an airline
- 3 Working for another company that does business at an airport
- 4 Work that is not at an airport but gets some benefit from the airport being there
- 5 Other work related to the aircraft or air travel industry
- 6 None of these [EXCLUSIVE]

IF HHADULTS > 0

WORKAIRHH {Q59}

Does anyone in the household have work that includes any of these kinds of employment?

{G_Multi_II1}

ANALYSIS: "Work at airport/airline – other household member"

- 1 Working for an airport
- 2 Working for an airline
- 3 Working for another company that does business at an airport
- 4 Work that is not at an airport but gets some benefit from the airport being there
- 5 Other work related to the aircraft or air travel industry
- 6 None of these [EXCLUSIVE]

{ASK ALL}

CAMPAIGNGRP {Q60}

Are you a member of any group campaigning against a local airport or the aviation industry?

- 1) Yes
- 2) No

{ASK ALL}

INTROHOME

The following questions are about your home.

{DISPLAY}

{ASK ALL}

HOME BUILT {Q61}

In what year was your home originally built?

ANALYSIS: "When home built"

- 1 Before 1919
- 2 1919 – 1940
- 3 1941 – 1960
- 4 1961 – 1990
- 5 1991 – 2000
- 6 2001 – 2010
- 7 2011 – 2020
- 8 After 2020
- 9 Don't know

{ASK ALL}

HOME LONG {Q62}

How long have you lived in this home?

ANALYSIS: "How long lived in home - years"

- 1 Less than 6 months
- 2 Between 6 months and 1 year
- 3 Longer than 1 year, up to 2 years
- 4 Longer than 2 years, up to 5 years
- 5 Longer than 5 years, up to 10 years
- 6 More than 10 years

IF HOME LONG = 1 LESS THAN 6 MONTHS

HOME MONTH {Q63}

How many months is that?

If less than one month, enter 0.

ANALYSIS: "How long lived in home - months"

0...5

{ASK ALL}

DWELLING {Q64}

Which of the following types of building is your home?

ANALYSIS: "Dwelling type"

- 1 Flat, maisonette or apartment
- 2 Bungalow
- 3 House: mid terraced
- 4 House: semi detached
- 5 House: detached
- 6 Other

{ASK ALL}

BED FLOOR {Q65}

On which floor of the building do you sleep? Enter -1 for basement and 0 for ground floor.

ANALYSIS: "Dwelling type - floor"

Range: -1, 0...999

{ASK ALL}

OUTSIDESPC {Q66}

Do you have use of an outdoor space such as a garden, terrace or balcony here?

{G_Multi_I11}

ANALYSIS: "Outdoor space"

- 1 Yes – garden
- 2 Yes – terrace
- 3 Yes – balcony
- 4 No – none [EXCLUSIVE]

Consent to recontact

TS6: [SET TIME STAMP HERE]

{ASK ALL}

OBSTUDYCONSENT {Q67}

St George's, University of London, are planning to undertake a related sleep study that will take place over 7 nights in your home. The study does not involve any travel and does not involve anyone coming to your home. Not everyone is chosen to take part in this study.

If you are chosen, equipment will be shipped to your home. You will be compensated with up to £200 in the form of shopping vouchers for participating in the sleep study. St George's would contact you about the study between November 2022 and December 2023.

If you are chosen, would you be willing for us to provide St George's, University of London, with your name and contact details (address, email and telephone number) so they can get in touch with you and provide more information?

This does not mean you have to take part in this further research. The researchers will explain what taking part would involve and you will be free to refuse if you do not want to take part.

You can cancel this permission at any time by contacting NatCen Social Research either by emailing ANNESurvey@natcen.ac.uk or by telephoning **0800 652 4570**.

ANALYSIS: "Consent to stage 2"

- 1 Yes
 - 2 No
- NODK/REF

{ASK ALL}

GENSTUDYCONSENT {Q68}

In the future, the Department for Transport may want to contact you about further research on aviation noise. Would you be willing to be contacted again in the future?

This does not mean you have to take part in any future studies. The researchers will explain what taking part would involve and you will be free to refuse if you do not want to take part.

You can cancel this permission at any time by contacting NatCen Social Research either by emailing ANNESurvey@natcen.ac.uk or by telephoning **0800 652 4570**.

ANALYSIS: "Recontact consent"

- 1 Yes
 - 2 No
- NODK/REF

IF OBSTUDYCONSENT = 1 Yes OR GENSTUDYCONSENT 1 Yes

ReConName {Q69}

What is your full name?

ANALYSIS: "Full name"

Title [Title]
First name [STRING: 20] NODK/NOREF
Surname [STRING: 20] NODK/NOREF

IF OBSTUDYCONSENT = 1 Yes OR GENSTUDYCONSENT 1 Yes

ReConEmail {Q70 / Q71}

What is your email address?

ANALYSIS: "Email address"

: STRING[60]

Please confirm your email address by typing it in the box below again.

: STRING[60]

HARD CHECK: If answer provided does not include @ or full-stop: "E-mail addresses should contain an @ character and a full stop. Please check and amend."

{HARD CHECK: If the two email addresses do not match: "The two email addresses entered do not match. Please check and amend."}

- 1 I do not have an email address
- 2 I do not wish to provide my email address

IF OBSTUDYCONSENT = 1 Yes OR GENSTUDYCONSENT 1 Yes

ReConTel {Q72} {Q73}

And what is your phone number?

ANALYSIS: "Phone number"

OPEN

{HARD CHECK: If contains characters other than numbers "Please only use numbers without any additional characters or spaces."}

{HARD CHECK: If does not contain 10 or 11 digits or does not start with a 0. "Your answer is not a valid telephone number. UK phone numbers start with 0 and are 10 or 11 digits. Please check and amend."}

- 1 I do not have a telephone number
- 2 I do not wish to provide my telephone number

TS7: [SET TIME STAMP HERE]

{ASK ALL}

VOUCHER

Finally, as a thank you for your time, we would like to offer you a £10 Love2Shop voucher. This will be an electronic voucher sent to your email account.

Please press 'Next' to continue.

DISPLAY

{ASK ALL}

EmailVoucher {Q74 /Q75}

Please provide an email address where you would like the voucher sent to:

ANALYSIS: "Voucher – email"

OPEN

1. I would prefer to receive a physical voucher in the post, sent to my home address
2. I do not require a voucher

Please confirm your email address by typing it in the box below again.

: STRING[60]

HARD CHECK: If answer provided does not include @ or full-stop: "Please check and amend. E-mail addresses should contain an @ character and a full stop."

{HARD CHECK: If the two email addresses do not match: "The two email addresses entered do not match. Please check and amend."}

IF EmailVoucher = <> 2 I do not require a voucher AND ReConName not answered

VoucherName {Q76}

To receive the voucher, you will need to give us your full name:

ANALYSIS: "Full name"

Title [Title]

First name [STRING: 20] NODK/NOREF

Surname [STRING: 20] NODK/NOREF

1 I don't want to provide my name

IF VoucherName = 1 I don't want to provide my name

NoContact

If you do not provide your full name you will not be able to receive the £10 voucher. Are you sure you do not want to provide this? Note, you will not be able to return to the questionnaire at a later date if you change your mind.

ANALYSIS: "Provide name"

1 Yes, I don't want to provide my name

2 No, I would like to provide my name

NODK/NOREF

IF EmailVoucher = 1 AND VoucherName = RESPONSE

AddVch

To make sure your shopping voucher goes to the correct address, please could you confirm that your current address is...

{sample address}

Is this correct?

1 Yes – this address is correct

2 No – this address needs updating

PAGE START

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2

VouchAdd

Please provide the address you would like us to send the voucher to.

If you do not provide your postal address we will not be able to send out a voucher.

DISPLAY

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
VouchAdd_AddressLine
"First line:"
OPEN
DK/REF NOT ALLOWED

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
VouchAdd_AddressLine
"Second line:"
OPEN
ALLOW NA

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
VouchAdd_AddressLine
"Third line:"
OPEN
ALLOW NA

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
VouchAdd_AddressLine
"Town:"
OPEN
DK/REF NOT ALLOWED

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
VouchAdd_AddressLine
"County:"
OPEN
ALLOW NA

IF EmailVoucher = 1 AND VoucherName = RESPONSE AND AddVch = 2
Postcode
"Post Code:"
OPEN
NODK/NOREF
PAGE END

IF (EmailVoucher = 1 AND VoucherName = RESPONSE AND (AddVch = 1 OR VouchAdd = RESPONSE)) OR EmailVoucher = RESPONSE
VouchSent

Please note that it may take up to 21 days for the voucher to arrive.

{IF EmailVoucher=RESPONSE: "Please check your SPAM folder to ensure the electronic voucher did not end up there by mistake."}

Thank you once again for participating in this survey. This is the end of the questions and your answers have been submitted. You can close your browser now.

{DISPLAY}

IF EmailVoucher = 2 I do not require a voucher OR NoContact = 1 Yes, I don't want to provide my name
NoVoucher

{If NoContact = 1: "We do not have your name or postal address so we cannot send you a voucher.

If you want to update your records later, please contact our freephone or send us an email:




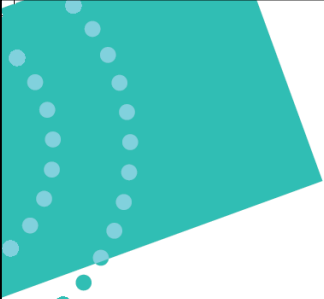
Freephone: 08006524570
Email: ANNESurvey@natcen.ac.uk”}

{If EmailVoucher = 2: “You have said you do not require a voucher. If you want to update your records later, please contact our freephone or send us an email:
Freephone: 08006524570
Email: ANNESurvey@natcen.ac.uk”}

Thank you once again for participating in this survey. This is the end of the questions and your answers have been submitted. You can close your browser now.

8 Appendix C: Survey Materials

C1: Advance letter



The Resident
<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

Ref: P17127/<SerialH><CHK><Date>

Help us understand issues in your local environment and receive a £10 voucher



Dear Resident,

Understanding the issues within our local environment and neighbourhood, and the impact they have on our lives, is important to us all. We would like to invite up to two adults in your household, aged 18 or older, to complete a short **online questionnaire** for this national study. **Each person will receive a £10 voucher as a thank you for taking part.**

The study is funded by the Department for Transport and your response will contribute to informing key policy decisions related to issues in your local environment.

It's easy to take part


Taking part is voluntary and will only take around 20 minutes of your time. Here's how you can take part:

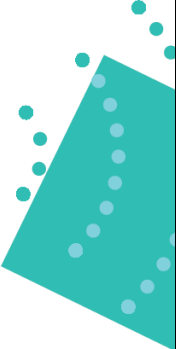
1 VISIT Go to: survey.natcen.ac.uk/ANNESurvey Type the address exactly as shown in the address bar of your web browser	2 ENTER Enter one of the unique access codes below (please note each access code can only be used once):  Person 1: <AccessCode1>  Person 2: <AccessCode2>	3 THANK YOU Complete the study and you'll each receive a £10 Love2Shop voucher as a thank you for taking part
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Further information

You can find out more about the study on the back of this letter. If you have any further questions, please visit natcen.ac.uk/ANNESurvey, email ANNESurvey@natcen.ac.uk or call the Freephone number **0800 652 4570**.

We value your opinions and help with this important national study.

Yours sincerely,

Franziska Marcheselli
Research Director
NatCen Social Research



P17127-Item 1-AdvLet-MS

Frequently Asked Questions

How did you choose my address?

Your address was chosen at random from the Postcode Address File. This file is held by the Post Office and is available to the public.

Who should take part?

We are inviting up to two people aged 18 and over from each selected household to take part in this study. If there are more than two people in your household, you may choose which two take part.

Participation in the study is voluntary, although the success of the study depends on the goodwill and co-operation of those invited to take part.

What is the survey about?

The survey covers a range of questions about your views on your local environment, any issues you have and how these can impact your life. There will also be some questions on your household and your health. The survey will take approximately 20 minutes to complete. Full instructions on how to access the online questionnaire can be found on the front of this letter. You don't have to complete the whole survey in one go – any progress you make will be saved and you can start where you left off when you next log in.

Is the survey confidential?

Yes. We take great care to protect the confidentiality of the information people give us and we take careful steps to ensure the information is secure at all times.

What will happen to any information I give?

Your data will be handled in accordance with the UK General Data Protection Regulations (GDPR). The survey findings are anonymised and nothing we publish will identify you or anyone in your household. The results collected will be used for research and statistical purposes only and will be put together with the answers from hundreds of other people across Great Britain. The survey findings will be published in a report for the Department for Transport who will use the results to inform key policy decisions relating to issues in your local environment. All identifiable information will be stored securely. You can request at any time for your identifiable data to be deleted. To do this, please get in touch with NatCen using the contact details provided on the front of this letter.

For more information about how the information you provide will be used, please see the privacy notice at: natcen.ac.uk/ANNESurvey/privacy.

Is the information I provide safe online?

Yes. We take our responsibility to keep personal information secure very seriously. To make sure your information is protected we use a secure website (HTTPS). This is the same type of website that you would generally see when shopping online. As part of our commitment to the security of your information, NatCen Social Research has regular internal and external audits of its information security, and is accredited to the ISO 27001:2013, the international standard for information security.

Who is carrying out the study?

The Department for Transport is funding the project and has asked NatCen Social Research, an independent research agency, St George's, University of London, Noise Consultants Limited, and the University of Pennsylvania to design, carry out and analyse the survey data. This study has been given a favourable ethical opinion by the NatCen Research Ethics Committee.

NatCen
Social Research

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C2: Reminder letter 1



The Resident

<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

Ref: P17127/<SerialH><CHK>

Your voice matters and deserves to be heard! Help us by completing this survey and receive a £10 voucher

Dear Resident,

Recently, we wrote to you to invite up to two adults in your household, aged 18 years or older, to complete a short **online questionnaire** for a national study about issues within your local environment and neighbourhood, and the impact they have on your life. It is important that as many people as possible take part in the study, which is why we are asking again for your help.

The study is funded by the Department for Transport and your response will contribute to informing key policy decisions related to issues in your local environment.

If you have already completed the questionnaire, thank you! If you – or a second person in your household aged 18 or older – haven't completed it yet then we would be grateful if you could do this as soon as possible. **Each person will receive a £10 voucher as a thank you for taking part.**

It's easy to take part, and it matters



Taking part is voluntary and will only take around 20 minutes of your time. Here's how you can take part:

1 VISIT

Go to:
survey.natcen.ac.uk/ANNESurvey
Type the address exactly as shown in the address bar of your web browser

2 ENTER

Enter one of the unique access codes below (please note each access code can only be used once):

 **Person 1: <AccessCode1>**
 **Person 2: <AccessCode2>**

3 THANK YOU

Complete the study and you'll each receive a **£10 Love2Shop voucher** as a thank you for taking part

Further information

You can find out more about the study on the back of this letter. If you have any further questions, please visit natcen.ac.uk/ANNESurvey, email ANNESurvey@natcen.ac.uk or call the Freephone number **0800 652 4570**.

We value your opinions and help with this important national study.

Yours sincerely,

Franziska Marcheselli
Research Director
NatCen Social Research

P17127-Item 2-RemLet1-MS

Frequently Asked Questions

How did you choose my address?

Your address was chosen at random from the Postcode Address File. This file is held by the Post Office and is available to the public.

Who should take part?

We are inviting up to two people aged 18 and over from each selected household to take part in this study. If there are more than two people in your household, you may choose which two take part.

Participation in the study is voluntary, although the success of the study depends on the goodwill and co-operation of those invited to take part.

What is the survey about?

The survey covers a range of questions about your views on your local environment, any issues you have and how these can impact your life. There will also be some questions on your household and your health. The survey will take approximately 20 minutes to complete. Full instructions on how to access the online questionnaire can be found on the front of this letter. You don't have to complete the whole survey in one go – any progress you make will be saved and you can start where you left off when you next log in.

Is the survey confidential?

Yes. We take great care to protect the confidentiality of the information people give us and we take careful steps to ensure the information is secure at all times.

What will happen to any information I give?

Your data will be handled in accordance with the UK General Data Protection Regulations (GDPR). The survey findings are anonymised and nothing we publish will identify you or anyone in your household. The results collected will be used for research and statistical purposes only and will be put together with the answers from hundreds of other people across Great Britain. The survey findings will be published in a report for the Department for Transport who will use the results to inform key policy decisions relating to issues in your local environment. All identifiable information will be stored securely. You can request at any time for your identifiable data to be deleted. To do this, please get in touch with NatCen using the contact details provided on the front of this letter.

For more information about how the information you provide will be used, please see the privacy notice at: natcen.ac.uk/ANNESurvey/privacy.

Is the information I provide safe online?

Yes. We take our responsibility to keep personal information secure very seriously. To make sure your information is protected we use a secure website (HTTPS). This is the same type of website that you would generally see when shopping online. As part of our commitment to the security of your information, NatCen Social Research has regular internal and external audits of its information security, and is accredited to the ISO 27001:2013, the international standard for information security.

Who is carrying out the study?

The Department for Transport is funding the project and has asked NatCen Social Research, an independent research agency, St George's, University of London, Noise Consultants Limited, and the University of Pennsylvania to design, carry out and analyse the survey data. This study has been given a favourable ethical opinion by the NatCen Research Ethics Committee.

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Social Research

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C3: Reminder letter 2



The Resident

<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

Ref: P17127/<SerialH><CHK>

Your last chance to take part in this national study and receive a £10 voucher

Dear Resident,

We have previously invited up to two adults in your household, aged 18 years or older, to complete a short **online questionnaire** for a national study about issues within your local environment and neighbourhood and the impact they have on your life. It is important that as many people as possible take part in the survey and we really want to hear from you, which is why we are asking again for your help. The study is funded by the Department for Transport and your response will contribute to informing key policy decisions related to issues in your local environment.

If you have already completed the questionnaire, thank you! If you – or a second person in your household aged 18 or older – haven't completed it yet then we would be grateful if you could do this as soon as possible. You still have time to take part but the survey will close on <Deadline>. **Each person will receive a £10 voucher as a thank you for taking part.**

It's easy to take part, and it matters

There are two ways you can take part. Either complete the survey online by following these simple steps:

1 VISIT

Go to:

survey.natcen.ac.uk/ANNESurvey

Type the address exactly as shown in the address bar of your web browser

2 ENTER

Enter one of the unique access codes below (please note each access code can only be used once):

- Person 1: <AccessCode1>
- Person 2: <AccessCode2>

3 THANK YOU

Complete the study and you'll each receive a **£10 Love2Shop voucher** as a thank you for taking part

Or complete the questionnaire on paper

If you would prefer to complete the survey on paper, then please complete the paper questionnaire enclosed with this letter and send it back to us in the pre-paid envelope by <Deadline>. If more than one person is completing the survey using a paper questionnaire, please send each back separately in the envelopes provided.

Further information

You can find out more about the study on the back of this letter. If you have any further questions, please visit natcen.ac.uk/ANNESurvey, email ANNESurvey@natcen.ac.uk or call the Freephone number **0800 652 4570**.

We value your opinions and help with this important national study.

Yours sincerely,

Franziska Marcheselli
Research Director
NatCen Social Research

P17127-Item 3-RemLet2-MS

Frequently Asked Questions

How did you choose my address?

Your address was chosen at random from the Postcode Address File. This file is held by the Post Office and is available to the public.

Who should take part?

We are inviting up to two people aged 18 and over from each selected household to take part in this study. If there are more than two people in your household, you may choose which two take part. Participation in the study is voluntary, although the success of the study depends on the goodwill and co-operation of those invited to take part.

What is the survey about?

The survey covers a range of questions about your views on your local environment, any issues you have and how these can impact your life. There will also be some questions on your household and your health. The survey will take approximately 20 minutes to complete. Full instructions on how to access the online questionnaire can be found on the front of this letter. You don't have to complete the whole survey in one go – any progress you make will be saved and you can start where you left off when you next log in.

How do I send my postal questionnaire?

If you are unable to complete the questionnaire online, we have provided you with a paper version of the questionnaire. Once you have filled in the questionnaire, please place the questionnaire in the envelope you were provided with alongside this letter. The envelope is pre-paid and has the return address already provided. If more than one person in your household has completed a paper questionnaire, please send them back to us in their own separate envelopes.

Is the survey confidential?

Yes. We take great care to protect the confidentiality of the information people give us and we take careful steps to ensure the information is secure at all times.

What will happen to any information I give?

Your data will be handled in accordance with the UK General Data Protection Regulations (GDPR). The survey findings are anonymised and nothing we publish will identify you or anyone in your household. The results collected will be used for research and statistical purposes only and will be put together with the answers from hundreds of other people across Great Britain. The survey findings will be published in a report for the Department for Transport who will use the results to inform key policy decisions relating to issues in your local environment. All identifiable information will be stored securely. You can request at any time for your identifiable data to be deleted. To do this, please get in touch with NatCen using the contact details provided on the front of this letter.

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Is the information I provide safe online?

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Who is carrying out the study?

The Department for Transport is funding the project and has asked NatCen Social Research, an independent research agency, St George's, University of London, Noise Consultants Limited, and the University of Pennsylvania to design, carry out and analyse the survey data. This study has been given a favourable ethical opinion by the NatCen Research Ethics Committee.

NatCen
Social Research

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C4: Reminder letter 3

The Resident

<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

Ref: P17127/<SerialH><CHK>

Your last chance to take part in this national study and receive a £10 voucher

Dear Resident,

We have recently invited up to two adults in your household, aged 18 years or older, to complete a short **online questionnaire** for a national study about issues within your local environment and neighbourhood and the impact they have on your life. This is your last chance to take part and have your say. The study is funded by the Department for Transport and your response will contribute to informing key policy decisions related to issues in your local environment.

If you have already completed the questionnaire, thank you! If you – or a second person in your household aged 18 or older – haven't completed it yet then we would be grateful if you could do this as soon as possible. You still have time to take part but the survey will close on <Deadline>. **Each person will receive a £10 voucher as a thank you for taking part.**

It's easy to take part, and it matters

There are two ways you can take part. Either complete the survey online by following these simple steps:

<p>1 VISIT Go to: survey.natcen.ac.uk/ANNESurvey Type the address exactly as shown in the address bar of your web browser</p>	<p>2 ENTER Enter one of the unique access codes below (please note each access code can only be used once):</p> <ul style="list-style-type: none">Person 1: <AccessCode1>Person 2: <AccessCode2>	<p>3 THANK YOU Complete the study and you'll each receive a £10 Love2Shop voucher as a thank you for taking part</p>
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Or complete the questionnaire on paper

If you would prefer to complete the survey on paper, then please complete the paper questionnaire we sent you previously. Please send it back to us in the pre-paid envelope by <Deadline>. If more than one person is completing the survey using a paper questionnaire, please send each back separately in the envelopes provided.

Further information

You can find out more about the study on the back of this letter. If you have any further questions, please visit natcen.ac.uk/ANNESurvey, email ANNESurvey@natcen.ac.uk or call the Freephone number **0800 652 4570**.

We value your opinions and help with this important national study.

Yours sincerely,

Franziska Marcheselli
Research Director
NatCen Social Research

P17127-Item 6-RemLet3-MS

Frequently Asked Questions

How did you choose my address?

Your address was chosen at random from the Postcode Address File. This file is held by the Post Office and is available to the public.

Who should take part?

We are inviting up to two people aged 18 and over from each selected household to take part in this study. If there are more than two people in your household, you may choose which two take part. Participation in the study is voluntary, although the success of the study depends on the goodwill and co-operation of those invited to take part.

What is the survey about?

The survey covers a range of questions about your views on your local environment, any issues you have and how these can impact your life. There will also be some questions on your household and your health. The survey will take approximately 20 minutes to complete. Full instructions on how to access the online questionnaire can be found on the front of this letter. You don't have to complete the whole survey in one go – any progress you make will be saved and you can start where you left off when you next log in.

How do I send my postal questionnaire?

If you are unable to complete the questionnaire online, we have provided you with a paper version of the questionnaire. Once you have filled in the questionnaire, please place the questionnaire in the envelope you were provided with alongside this letter. The envelope is pre-paid and has the return address already provided. If more than one person in your household has completed a paper questionnaire, please send them back to us in their own separate envelopes.

Is the survey confidential?

Yes. We take great care to protect the confidentiality of the information people give us and we take careful steps to ensure the information is secure at all times.

What will happen to any information I give?

Your data will be handled in accordance with the UK General Data Protection Regulations (GDPR). The survey findings are anonymised and nothing we publish will identify you or anyone in your household. The results collected will be used for research and statistical purposes only and will be put together with the answers from hundreds of other people across Great Britain. The survey findings will be published in a report for the Department for Transport who will use the results to inform key policy decisions relating to issues in your local environment. All identifiable information will be stored securely. You can request at any time for your identifiable data to be deleted. To do this, please get in touch with NatCen using the contact details provided on the front of this letter.

For more information about how the information you provide will be used, please see the privacy notice at: naticen.ac.uk/ANNESurvey/privacy.

Is the information I provide safe online?

Yes. We take our responsibility to keep personal information secure very seriously. To make sure your information is protected we use a secure website (HTTPS). This is the same type of website that you would generally see when shopping online. As part of our commitment to the security of your information, NatCen Social Research has regular internal and external audits of its information security, and is accredited to the ISO 27001:2013, the international standard for information security.




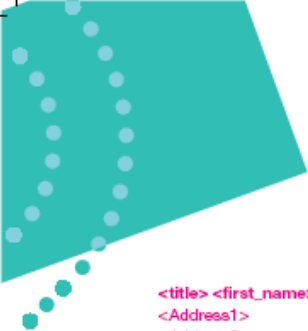
Who is carrying out the study?

The Department for Transport is funding the project and has asked NatCen Social Research, an independent research agency, St George's, University of London, Noise Consultants Limited, and the University of Pennsylvania to design, carry out and analyse the survey data. This study has been given a favourable ethical opinion by the NatCen Research Ethics Committee.

NatCen
Social Research

NatCen Social Research, Kings House, 101-135 Kings Road, Brentwood, Essex CM14 4LX Tel. 0800 526 397. Company limited by guarantee. Reg No. 4392418. A Charity registered in England and Wales (1091768) and in Scotland (SC038454).

C5: Thank you letter



<title> <first_name> <last_name>
<Address1>
<Address2>
<Address3>
<Address4>
<Address5>
<postcode>

Your reference number: P17127/<Seriali><CHK>

Thank you for taking part

Dear <title> <first_name> <last_name>,

Thank you for completing the questionnaire for the national study on local environments and neighbourhoods. Your support and co-operation are greatly appreciated, and your answers will help our research to make a difference.


£10 voucher enclosed

As a token of our appreciation, please find enclosed a £10 Love2Shop shopping voucher which can be spent at many online and high street shops. This voucher is valid for over 18 months.


If you have any difficulty with it, please email ANNESurvey@natcen.ac.uk or call the Freephone number on 0800 652 4570.

Thank you for your help.

Yours sincerely,



Franziska Marcheselli
Research Director
NatCen Social Research



P17127-Item 4-ThankYouLet-MS

C6: PRIVACY NOTICE (St George's, University of London)

1. Who is carrying out his study?

St George's, University of London, NatCen Social Research, Noise Consultants Limited, and the University of Pennsylvania have been asked by the Department for Transport (DfT) to carry out this study. The Department for Transport is a ministerial department; they plan and invest in transport infrastructure to keep the UK on the move.

The **lawful basis** for collecting this data is the performance of a task carried out in the public interest and is necessary for the exercise of DfT's functions as a government department. The Department for Transport is the data controller for the study. St George's, NatCen Social Research, University of London, Noise Consultants Limited, and the University of Pennsylvania are data processors on the study, processing the data collected so that it can be used for research, while ensuring that it will not be possible to identify any participants in the data.

2. What is the study about?

The Aviation Night Noise study is looking at the impact of aircraft noise on sleep in people who live near UK airports. We want to collect information on your heart rate and body movements during the night to evaluate your sleep and to record indoor sounds during a sleep study which would take place in your home over 7 consecutive nights. These sound recordings are needed to identify aircraft noise in your bedroom for individual aircraft flyovers. There will also be survey questions about your household and health. This includes a short a daily questionnaire about sleep quality that would take around 5 minutes to complete and a one-off questionnaire about your health and household that would take around 15 minutes to complete.

3. Do I have to take part?

You are being invited to take part in this research study because you expressed an interest in participating in this study and provided your name and contact details, in a local environment survey, conducted by our study partners NatCen.

Taking part is voluntary. The success of the study depends on the goodwill of those asked to take part. The more people who do take part, the more useful the results will be.

You are free to withdraw from the study at any time without giving a reason. Once the study results have been published, we would not be able to change the results by removing individual information. However, you can request that your personal data is deleted at any time by contacting St George's, University of London or the Department for Transport using the details below.

4. What data is being collected?

Personal data (such as age, gender etc.) and special category personal data, including data on ethnicity and health including heart rate and body movement, will be collected during this research. However, all responses will be anonymised for analysis, so you will not be identifiable.

Your name and contact details, will be stored separately from your data from the sleep study, and will be deleted when no longer required.

5. How we will use your information

We take great care to protect the confidentiality of the information people give us. Your identity will only be known to certain members of the research team.

We will handle your data in accordance with the UK General Data Protection Regulation (UK GDPR). The study report will be anonymised - results will not be presented in a form which reveals your identity.

You can request that your personal data is deleted at any time before the anonymised data has been finalised, by using the contact details provided below.

6. How long will you keep my data?

We would like to keep your data permanently, so researchers at the Department for Transport can make use of it for many years to come. This dataset would not include any identifiable information, such as your name or address. We will delete all names and addresses at the end of the study (the study ends in March 2025). You can request that your personal data is deleted at any time by contacting the Department for Transport or St George's, University of London via the contact details below.

7. How will you keep my data safe?

St George's, NatCen and DfT will store your data in line with ISO27001, ISO 20252 and Cyber Essentials Plus certification. Only staff working on the study will have access to your information and their access will be removed when no longer required.

8. Any questions?

For more information about the study, you can visit <https://www.sgul.ac.uk/about/our-institutes/population-health/projects/aviation-night-noise-effects-study>.

If you have any queries about the study, please contact St George's, University of London at annestudy@sgul.ac.uk or phone 07890 588280. You can also contact the Department for Transport via the general enquiries form:

<https://www.smartsurvey.co.uk/s/contact-department-for-transport>.

You can contact the St George's, University of London Data Protection Officer by email at dataprotection@sgul.ac.uk or phone 020 8725 0668 or write to the Data Protection Officer, Information Services, St George's University of London, Cranmer Terrace, LONDON SW17 0RE. To read our data protection policy, visit www.sgul.ac.uk [DfT's privacy policy \(opens in new window\)](#) has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer. Data Protection Officers are responsible for upholding your rights and making sure we process your information correctly.

If you have a complaint, please get in touch by contacting St George's on dataprotection@sgul.ac.uk or phone 020 8725 0668. You also have the right to lodge a complaint with the Information Commissioner's Office at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF, telephone 0303 123 1113, <https://ico.org.uk/concerns>.

C7: PRIVACY NOTICE (NatCen)

1. Who is carrying out this study?

NatCen Social Research, St George's, University of London, Noise Consultants Limited and the University of Pennsylvania have been asked by the Department for Transport (DfT) to carry out this study. The Department for Transport is a ministerial department; they plan and invest in transport infrastructure to keep the UK on the move.

The **lawful basis** for collecting this data is the performance of a task carried out in the public interest and is necessary for the exercise of DfT's functions as a government department. The Department for Transport is the data controller for the study. NatCen Social Research, St George's, University of London, the Noise Consultants and the University of Pennsylvania are data processors on the study, processing the data collected so that it can be used for research, while ensuring that it will not be possible to identify any participants in the data.

2. What is this study about?

The survey covers a range of questions about your views on your local environment, any issues you have and how these can impact your life. There will also be some questions on your household and your health. The survey will take approximately 20 minutes to complete.

3. Do I have to take part?

Taking part is voluntary. The success of the study depends on the goodwill of those asked to take part. The more people who do take part, the more useful the results will be.

You are free to withdraw from the study at any time without giving a reason. Once the study results have been published, we would not be able to change the results by removing individual information. However, you can request that your personal data is deleted at any time by contacting NatCen Social Research or the Department for Transport using the details below.

4. What data is being collected?

Personal data (such as age, gender etc.) and special category personal data, including data on ethnicity and health, will be collected during this research. However, all responses will be anonymised for analysis, so you will not be identifiable.

If you choose to receive an incentive or agree to be contacted about future research, then we will also ask for your name and contact details. These will be stored separately from your answer to the survey questions and will be deleted when no longer required.

5. How we will use your information

We take great care to protect the confidentiality of the information people give us. Your identity will only be known to certain members of the NatCen research team. We will handle your data in accordance with the UK General Data Protection Regulation (UK GDPR). The study report will be anonymised - results will not be presented in a form which reveals your identity.

We would like to keep your answers to the survey questions permanently, so researchers at the Department for Transport can make use of it for many years to come. This dataset would not include any identifiable information, such as your name or address. You can request that your personal data is deleted at any time before the data has been finalised, by using the contact details provided below.

6. Follow-up studies?

In the survey questionnaire we will ask whether you can be contacted about the second stage of this study carried out by St George's, University of London. If you agree to be contacted, we will pass your name and contact details to St George's who may be in touch to tell you more about the second stage of the study. You will be free to refuse if you do not want to take part. If you want to remove your agreement at any time you can contact the Department for Transport or NatCen Social Research using the contact details below.

In the future, the Department for Transport may also want to contact you about other follow-up research. We will only invite you to take part in follow-up research if you give agreement for this during your interview. The Department for Transport will carefully review all proposals from researchers/organisations to conduct follow-up research before giving approval. The Department for Transport will not pass on any of your details without your permission. The Department for Transport will not approve any requests that are for commercial use. If you are invited to take part in any future studies, you will be free to refuse if you do not want to take part. If you want to remove your agreement to be recontacted at any time you can contact the Department for Transport or NatCen Social Research using the contact details below.

7. How long will you keep my data?

We would like to keep anonymous information from the study permanently, so researchers can make use of it for many years to come. We will delete all names and addresses 3 years after the end of the study (the study ends in March 2023). You may choose to give us permission to keep your personal details. We'll ask you about this separately if you choose to take part. You can request that your personal data is deleted at any time by contacting the Department for Transport or NatCen Social Research using the contact details below.

8. How will you keep my data safe?

NatCen, St George's and DfT will store your data in line with ISO27001, ISO 20252 and Cyber Essentials Plus certification. Only staff working on the study will have access to your information and their access will be removed when no longer required.

9. Any questions?

For more information about the study you can visit natcen.ac.uk/ANSurvey.

If you have any queries about the study, please contact NatCen on ANSurvey@natcen.ac.uk or Freephone 0800 652 4570. You can also contact the Department for Transport via the general enquiries form:

<https://www.smartsurvey.co.uk/s/contact-department-for-transport/>

You can contact the NatCen Data Protection Officer by email at dpo@natcen.ac.uk. To read our data protection policy, visit www.natcen.ac.uk.

[DfT's privacy policy](#) has more information about your rights in relation to your personal data, how to complain and how to contact the Data Protection Officer. Data Protection Officers are responsible for upholding your rights and making sure we process your information correctly.

If you have a complaint, please get in touch by contacting NatCen on ANSurvey@natcen.ac.uk or Freephone 0800 652 4570. You also have the right to lodge a complaint with the Information Commissioner's Office at: Information Commissioner's Office, Wycliffe House, Water Lane, Wilmslow, Cheshire, SK9 5AF, telephone 0303 123 1113, <https://ico.org.uk/concerns>.

9 Appendix D: Detailed strata used for the sampling frame

Table 5: Detailed strata used for the sampling frame for the ANNE subjective study

Strata	Airport	Noise band	Number of delivery points to select
1	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow*	60+ dB	1814
2	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton, Glasgow*	58-59.9 dB	1814
3	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton	56-57.9 dB	1386
4	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton	54-55.9 dB	1112
5	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton	52-53.9 dB	1069
6	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton	50-51.9 dB	1056
7	Bristol, East Midlands, Heathrow, Gatwick, Stansted, Manchester, Luton	48-49.9 dB	1077
8	Glasgow	56-57.9 dB	76
9	Glasgow	54-55.9 dB	93
10	Glasgow	52-53.9 dB	155
11	Glasgow	50-51.9 dB	174
12	Glasgow	48-49.9 dB	143
13	Bristol	35-47.9 dB	89
14	East Midlands	46-47.9 dB	63
15	East Midlands	35-45.9 dB	179
16	Glasgow	46-47.9 dB	43
17	Glasgow	44-45.9 dB	43
18	Glasgow	35-43.9 dB	72
19	Heathrow	46-47.9 dB	1046
20	Heathrow	44-45.9 dB	1046

Strata	Airport	Noise band	Number of delivery points to select
21	Heathrow	35-43.9 dB	2098
22	Gatwick	46-47.9 dB	32
23	Gatwick	35-45.9 dB	100
24	Manchester	46-47.9 dB	105
25	Manchester	35-45.9 dB	326
26	Stansted	46-47.9 dB	47
27	Stansted	44-45.9 dB	47
28	Stansted	35-43.9 dB	100
29	Luton	46-47.9 dB	95
30	Luton	44-45.9 dB	95
31	Luton	35-43.9 dB	179

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